Town of Athol, Massachusetts

Request for Proposal

ARPA-03 Communication and Radio Upgrades

March 29, 2024

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1 General Instructions

1.1 Purpose

The Town of Athol, Massachusetts is requesting proposals for a communications system as specified herein. PROPOSERS interested in providing the specified goods and services shall submit a Proposal to Athol as instructed in this Request for Proposals (RFP). The Town of Athol will weigh the relative merits of proposals submitted by competing offerors and contract award will be made to the offeror submitting the most advantageous proposal, taking into consideration the proposals' relative merits and prices.

1.2 Project Overview

The Town of Athol seeks to replace its legacy conventional UHF analog two-way radio system. The Town requires a single contractor to provide a modern UHF P25 radio system, including a connectivity network and subscribers necessary to support the radio system.

Athol has a land area of 33.4 sq. mi located in North Central Massachusetts. The population of Athol is estimated to be 12,000. The Town's existing radio equipment serves public safety and public service users in Athol. The Town's existing equipment is at end-of-life and no longer provides sufficient coverage or capacity to meet the Town's needs.

The new Athol Communications System will operate on UHF P25 Conventional radio frequencies for voice and data within the Town limits. The successful PROPOSER shall design and install fixed equipment that must be maintainable for at least 15 years after Final System Acceptance.

1.3 Definitions

Athol: Town of Athol

PROPOSER: Any firm that submits a proposal in response to this RFP.

CONTRACTOR: The successful PROPOSER with whom a contract is executed pursuant to this RFP.

CTA: The firm (CTA Consultants, LLC) assisting Athol in the evaluation of Proposals, implementation, and recommendations to Athol on approval of submittals, change orders, in accordance with the requirements of the contract.

PROJECT TEAM: Representatives (typically project managers, deputy project managers, lead engineers and significant assigned project members of Athol, CTA and CONTRACTOR[S], are responsible for management and implementation of the project and communication with other parties on the PROJECT TEAM.

DAYS:

- "Calendar Days" means any day appearing on the calendar, whether a weekday, weekend day, national holiday, state holiday or other day.
- "Days" means Calendar Days, unless specifically listed.
- "Business Days" means Calendar Days excluding: Saturdays, Sundays, and national and/or state recognized holidays.

SCOPE OF WORK: The general character and range of Services and supplies needed, the work's purpose and objectives, and an overview of the performance outcomes expected by Athol.

SERVICES: The services to be performed under the Contract.

STATEMENT OF WORK: The specific provision in the final Contract which sets forth and defines in detail (within the identified Scope of Work) the agreed-upon objectives, expectations, performance standards, Services, deliverables, schedule for delivery and other obligations.

1.4 Procurement Schedule

The anticipated schedule for this procurement is found in Table 1-1. Athol reserves the right to postpone the date and time for submission of Proposals at any time prior to the Proposal deadline, all changes will be made via the addendum process and posted to https://www.athol-ma.gov/home/pages/bidsrfps)

Scheduled Event	Date
RFP Release	March 29, 2024
Pre-Proposal Conference / Site Visits	April 23, & 24
Deadline for PROPOSER Questions	May 3, 2024
Deadline for Proposal Submission	June 24, 2024, at 3 PM
Proposal Evaluation Complete	July 19, 2024
Contract Execution	September 2024
Anticipated Project Completion	Contract Execution + 20 months

Table 1-1 Procurement Schedule

Technical and Price proposals shall remain valid without changes for a time period of one year after submission deadline date.

1.5 Questions Regarding This RFP

All questions regarding this RFP shall be submitted in writing to Mark Cady: AtholMA@CTA-C.com.

Questions or comments must be received by the date indicated in Table 1-1.

PROPOSERS shall not communicate with any other representatives of Athol or CTA regarding this RFP unless directed, in writing, by the Town of Athol's Chief Procurement Officer.

It is critical PROPOSER questions include any areas of the RFP in which you cannot comply and seek relief from the requirement. Terms and Conditions are NOT negotiable once your proposal is submitted.

1.6 Mandatory Pre-Proposal Conference

A mandatory pre-proposal conference for all interested parties will be held for this RFP:

Pre-Proposal Conference	
Date, Time and Location	April 23, 2024, at 9am 280 Exchange St, Athol MA
Registration for Pre-proposal	April 18, 2024

Written questions regarding the RFP may be submitted to Mark Cady at AtholMA@cta-c.com in advance of the pre-proposal conference. Questions not submitted at least one week prior to the pre-proposal conference may not be fully addressed at the conference. PROPOSERs are expected to ask any questions regarding the RFP requirements prior to the date shown in Table 1-1.

1.7 Site Visits

PROPOSERS are responsible for visiting sites involved in this project prior to submission of a Proposal and the request to visit sites must be made not later than the Pre-Proposal Conference. CTA and Athol will work with each PROPOSER to arrange for site visits.

1.8 Applicable Laws and Certifications

This Request for Proposal is issued pursuant to M.G.L. c.30B, §6.

1.9 Answers and Addenda (Appendix F)

Athol will disseminate all questions and answers to all prospective PROPOSERS. Should changes to the RFP become necessary, the changes will be contained in an addendum issued by Athol to all prospective PROPOSERS. Receipt of all Addenda must be acknowledged in the Proposal Transmittal Letter.

ONLY officially published written responses to questions shall be relied upon by the PROPOSERS.

1.10 Instructions for Submitting Proposals

ABSOLUTELY NO PRICE INFORMATION SHALL BE INCLUDED IN THE TECHNICAL PROPOSAL. TECHNICAL PROPOSALS CONTAINING PRICE INFORMATION MAY BE DISQUALIFIED.

PROPOSERS shall submit the separately sealed Technical Proposal and Price Proposal to the following address:

Town of Athol
Attention: Chief Procurement Officer
Town Hall
584 Main Street, Suite 17
Athol, MA 01331

Proposals are due by the date and time indicated in Table 1-1. Proposals submitted after this deadline will not be accepted. PROPOSERS shall submit the follow quantities:

- [one] original hard copy
- [five] hard copies
- [eight] electronic copies

Technical and Price Proposals shall be submitted in separate sealed packages labeled as follows:

Town of Athol Massachusetts
UHF P25 Conventional Radio Communications System

PROPOSER'S Name

1.11 TECHNICAL PROPOSAL *or* PRICE PROPOSAL *as applicable*

Electronic copy software formats:

- Adobe Acrobat Portable Document Format (PDF): Technical and Price proposals must be submitted in separate PDF documents
- Microsoft Excel (Pricing Pages, Responsibilities Matrix, Compliance Matrix)

Technical Proposals shall describe PROPOSER'S plan for the design, including maps, figures, tables, photographs, etc. The PROPOSER shall describe capabilities, limitations, operational procedures of all proposed equipment and shall provide each specifications sheet.

1.12 Withdrawal of Proposals

PROPOSERS may withdraw Proposals by written notice sent to AtholMA@CTA-C.com any time prior to the Proposal submission deadline.

1.13 Technical Proposal Evaluation

Technical Proposals will be evaluated by a technical evaluation team consisting of representatives of Athol and CTA. Technical Proposals will be evaluated in accordance with the technical categories of evaluation found in Appendix A.

1.14 Technical Proposal Questions

The technical evaluation team will generate a list of written questions for each Proposal and will forward the questions to the PROPOSER. Each PROPOSER shall submit written responses to the Point of Contact within five (5) working days from the receipt of the questions. The written responses will be considered clarification on the plan submitted as part of the Proposal.

Terms and Conditions are NOT negotiable once proposal is submitted. Each variance taken to a Term and Condition will result in an exception, during evaluations, which cannot be removed by questions and answers or negotiations.

1.15 Contract Negotiations

Athol will negotiate the service plan with the proposal deemed most advantageous as a condition of contract award. This negotiation is limited to the service plan only. The RFP specifications, scope of services, and contract terms and conditions are non-negotiable.

1.16 Notice of Award

The evaluation team will recommend to Athol the contract be awarded to the Proposal that is determined to be most advantageous. The selected PROPOSER will be notified of the intent to award and begin the process of negotiating a contract.

1.17 RFP Cancellation

Athol is not required to award a contract. The RFP may be cancelled at any time until the proposals are opened, or all proposals may be rejected after opening if it is determined that cancelling the RFP or rejecting all proposals is in the best interest of the Town.

1.18 Contract Execution

Upon the successful completion of contract negotiations, Athol will execute a written contract containing all of the terms and conditions of the contract. The awarded PROPOSER shall execute the contract within 14 days after the receipt of the contract.

1.19 Confidentiality

Proposals will not be opened publicly. All Proposals shall be kept confidential and not disclosed to competing PROPOSERS or any outside individuals except as required by the Code of Massachusetts Public inspection of certain records.

Athol shall not be liable for disclosure of any proprietary information that is not clearly identified as such in the Proposal.

1.20 Incurred Costs

Athol shall not be liable for any costs incurred by the PROPOSER in preparing, submitting, or presenting Proposals; or in anticipation of being awarded the contract under this RFP.

Claims for additional compensation or additional time for completion which are based on lack of knowledge or lack of understanding of any part of the RFP shall not be permitted.

1.21 Proposal Errors and Irregularities

Athol reserves the right to waive minor errors or irregularities in any Proposal if it appears to Athol that such errors or irregularities were inadvertent. Any such errors or irregularities shall be corrected in the Proposal prior to contract execution. ***Proposals with major irregularities may be considered defective and may be rejected immediately if deemed in the best interest of the Town.***

2 Proposal Instructions

2.1 Proposal Outline

Proposals shall include the following items in this order:

- Technical Proposal
  - Introduction and Letter of Transmittal
  - Table of Contents
  - Point-by-Point Response
  - Responsibilities Response
  - Project Team and References
  - Organization Experience and References
  - Service Shop Experience and References
  - Additional Information
  - Tax Attestation Form
  - Certificate of Non-Collusion

- Price Proposal
  - Price Forms
  - Proposal Surety

PROPOSERS MUST PROVIDE ALL REQUIRED DOCUMENTS, FILES, AND FORMS IN YOUR PROPOSAL SUBMISSION.

FAILURE TO INCLUDE ANY ITEM MAY DISQUALIFY YOUR PROPOSAL. DUE TO MASSACHUSETTS PROCUREMENT LAWS, THERE WILL NOT BE ANOTHER OPPORTUNITY TO PROVIDE ITEMS REQUIRED IN THE PROPOSAL.

2.2 Technical Proposal

ABSOLUTELY NO PRICE INFORMATION SHALL BE INCLUDED IN THE TECHNICAL PROPOSAL. TECHNICAL PROPOSALS CONTAINING PRICE INFORMATION MAY BE DISQUALIFIED.

2.2.1 Introduction and Letter of Transmittal

The introduction and letter of transmittal shall provide the necessary certification from the PROPOSER that the signer is authorized to make this Proposal on behalf of the PROPOSER. The letter shall designate by name not more than two individuals authorized to negotiate and sign the contract with Athol on behalf of the PROPOSER. An executive summary may be provided as an attachment to the letter of transmittal. The letter shall contain a description of the scope of the project and the PROPOSER'S general plan for implementation. The letter of transmittal may also briefly set forth any particular information the PROPOSER wishes to bring to Athol's attention.

2.2.2 Point-by-Point Response

The outline of the Proposal shall correspond to the outline of the RFP. For example, if PROPOSER instructions are included in section 123.456 of the RFP, the information requested shall be provided in section 123.456 of the Proposal point-by-point response.

2.2.2.1 Compliance Matrix

The PROPOSER shall provide a compliance statement by completing the compliance matrix found in APPENDIX B. This document is included in a Microsoft Excel file named "PROPOSER'S Name for Athol RFP P25 Radio Communications System Appendix B.xls" provided as part of the RFP package. The PROPOSER shall provide this completed excel file as part of the PDF Proposal submission and in its native Microsoft Excel format. **Failure to provide a soft copy in Microsoft Excel format may result in disqualification.**

The compliance spreadsheet provides space for a compliance response and explanation for each section of the RFP. There are three valid responses:

Response	Meaning
Comply	Proposal *fully* complies with all requirements as stated in the numbered section. * If PROPOSER states Comply and provides an explanation of the compliance, Athol may, at their discretion, consider this a variance.
Variance	Proposed technical plan has variances from the requirements of the section. Explain, in detail, the nature of the variance(s). If your technical plan has a variance to more than one part of a section, identify each variance with detailed explanations for each. Any item not explicitly identified as a variance in the Proposal will be considered fully compliant as written in the RFP.
Not Applicable	This category should ***only*** be used if the section does not apply to the PROPOSER'S Proposal or system configuration. ***Use this response with caution.***

Any other response or lack of response will be assumed to be a variance.

2.2.2.2 Additional Instructions

The outline of the Compliance Matrix shall correspond to the outline of the RFP and has been pre-populated accordingly. The PROPOSER may not add or delete line items in this document. If the PROPOSER finds a need to change this document a request must be made in writing to Athol and if Athol deems it appropriate to make a change, the document will be re-issued via the RFP Addenda process.

2.2.3 Responsibilities Response

2.2.3.1 Responsibilities Matrix

The PROPOSER shall provide a responsibilities statement by completing the Responsibilities Matrix found in RFP APPENDIX C. This document is included in a Microsoft Excel document named "PROPOSER'S Name for ARPA-03 Communication and Radio Upgrades Appendix C.xlsx". The PROPOSER shall provide this completed excel file as part of the PDF Proposal submission and in its native Microsoft Excel format. **Failure to provide this information in its native Microsoft Excel format may result in disqualification or loss of evaluation points.**

The responsibilities matrix shall contain, at a minimum, the following categories:

- PM General Responsibilities
- Design Review (DR)
- General Site Responsibilities
- Individual Site Responsibilities
- System Integration & Staging
- Shipping and Inventory
- System Infrastructure Installation
- Connectivity Network Installation
- System Optimization
- Field Acceptance Testing
- Terminal Equipment
- Training and Cutover
- Final Acceptance

The PROPOSER ***may not*** change the responsibilities as assigned; however, if the PROPOSER does not agree with the responsibilities as assigned the PROPOSER may enter the disagreement in the Grey Notes Column, clearly explaining why the responsibility as assigned is not acceptable to the PROPOSER.

The PROPOSER may include, for consideration, additional categories and subcategories, as well as additional lines within the subcategories. This document will be used throughout the implementation of the project to enhance organization and efficiency.

2.2.4 Qualifications

2.2.4.1 Project Manager and Lead Engineer Resumes and References

PROPOSER shall provide information on each core team member's qualifications to include a detailed resume with references. Each PROPOSER shall provide a minimum of three (3) project references for the Project Manager (PM) and Lead Engineer. These references shall include an email and phone number for the project contact, and a brief description of the team member's roles and responsibilities. Each reference for the proposed project manager and lead engineer shall be from projects of similar size and complexity.

2.2.4.2 Organization Experience and Reference

PROPOSER shall provide information on a minimum of three (3) system implementations of similar size and complexity. Each reference shall include a point of contact that can provide detailed information as to the performance of the PROPOSER'S organization.

2.2.4.3 Warranty and Maintenance Service Organization Experience and References

Service Organization shall have a minimum of 5 fully trained and competent technicians. PROPOSER shall provide information on a minimum of three (3) systems the proposed warranty and maintenance service organization has provided services similar in nature and complexity. Each reference shall include a point of contact that can provide detailed information as to the performance of the warranty and maintenance service organization.

2.2.5 Additional Information

Additional instructions are included for PROPOSERS in some RFP sections, indicated in **bold text** and request specific information to be included in the Proposal, such as details on the feature specified in that section, equipment specification sheets or PROPOSER guarantees.

2.3 Price Proposal

2.3.1 Price Forms

The PROPOSER shall submit a Price Proposal in the forms provided in APPENDIX D. A soft copy of this form is found in a Microsoft Excel file named "PROPOSER'S Name for Athol RFP UHF P25 Conventional Radio Communications System Appendix D Price Proposal.xls" provided as part of the RFP package. The PROPOSER shall provide this completed excel file as part of the PDF Proposal submission and in its native Microsoft Excel format. **Failure to provide a soft copy in Microsoft Excel format may result in disqualification.**

Failure to fill in all blanks in the Price Forms and to supply all information required may be cause for rejection of the Proposal. Any attempt to modify the structure or formulas in the Price Forms may be cause for rejection of the Proposal. If the PROPOSER finds a need to change the Price Forms a request must be made in writing to Athol, and if Athol deems it appropriate to make a change the document will be re-issued via the RFP Addenda process.

2.3.2 Proposal Surety

The Price Proposal shall be accompanied by a Proposal deposit in the form of a bid bond, cash bid bond or a certified check payable to the Town of Athol, Massachusetts. The amount of the deposit shall be [five] percent of the base Proposal price. A PROPOSER that submits a certified or cashier's check must complete, sign and submit the cash bid bond form located in APPENDIX E.

PROPOSERS MUST PROVIDE ALL REQUIRED DOCUMENTS, FILES, AND FORMS IN YOUR PROPOSAL SUBMISSION.

FAILURE TO INCLUDE ANY ITEM MAY DISQUALIFY YOUR PROPOSAL. DUE TO MASSACHUSETTS PROCUREMENT LAWS, THERE MAY NOT BE ANOTHER OPPORTUNITY TO PROVIDE ITEMS REQUIRED IN THE PROPOSAL.

3 General Terms and Conditions

3.1 Proposed Terms and Conditions

It is not the intent of the Town of Athol to negotiate the Terms and Conditions in this section, with the exception of insurance.

If the PROPOSER submits a request for RFP wording change to the Terms and Conditions the Town of Athol will request the PROPOSER withdraw the wording change in the form of a written question and the *question will impact the PROPOSERS technical score as outlined in RFP Appendix A - Responsiveness to the Intent of the Specification – Questions.* Additionally, at the discretion of the Town of Athol.

The terms and conditions as set forth in this Section of the RFP shall take precedence over any supplemental terms and conditions, assumptions, or clarifications contained in the PROPOSER submission.

3.2 TOWN OF ATHOL Form of Contract

RFP Appendix E Town of Athol Form of Contract will be use as the Contract Agreement. The PROPOSER shall acknowledge acceptance of this Form of Contract.

3.3 Right to Reject

The Town of Athol reserves the right to reject any and all proposals and does not commit itself to accepting the lowest bid. The Town of Athol also reserves the right to waive any informality in bids.

3.4 Order of Precedence

The following items shall be incorporated by reference into the Contract. These items shall take precedence in the order in which they are listed:

1. Amendments to the Prime Contract
2. Prime Contract
3. Responsibilities Matrix
4. Written clarifications and negotiated resolutions
5. RFP addenda
6. RFP
7. Proposal amendments
8. Proposal

3.5 Pricing and Payment

Payment will be made based upon Contract Design, Final Acceptance, and Application and Certificate for Payment:

Payment Schedule				
Installation of System	Contract Design Review	Monthly Billing based upon Goods and Services Provided	Conditional Acceptance	Final Acceptance
Services	10%		10% Cutover	10% Project Closeout
Radio System				
Connectivity Network				
Physical Facilities				
Subscriber Units	0%			
Payment Schedule After Final Acceptance				
Warranty and Maintenance	Monthly Payments to be Negotiated After Final Acceptance and Cutover			
Warranty				
Maintenance				

Any payment terms requiring payment in less than 45 days will be regarded as requiring payment 45 days after invoice or delivery, whichever occurs last. This shall not affect offers of discounts for payment in less than 45 days.

The CONTRACTOR may bill monthly with an invoice and attach the required Application and Certificate of Payment. The invoice shall provide detailed deliverable items, e.g. submittals, equipment, services, etc., and price with retainage. The CONTRACTOR'S Application and Certificate for Payment may use AIA Form G702-1992 and G703-1992 Continuation Sheet, or similar. The Consultant will review and certify payment before approval by Athol.

3.6 Price Guarantee

The CONTRACTOR shall guarantee the quoted prices, inclusive of overall contract discount, for all equipment and accessories purchased under the contract and all additional equipment purchased prior to final system acceptance, shall remain valid for a period of two years following final system acceptance.

The CONTRACTOR shall also guarantee that, for the thirteen-year period beginning two years after final system acceptance, the prices for all equipment and accessories purchased under the contract and all additional equipment purchased prior to final system acceptance, shall not increase at a rate higher than the U.S. Consumer Price Index.

The CONTRACTOR shall provide Athol with a complete commercial price listing for all applicable products and parts manufactured by the CONTRACTOR. The CONTRACTOR shall continue to send this price list to Athol once every twelve months until asked to discontinue this practice by Athol.

3.7 Performance and Payment Bonds

A Performance Bond and a Labor and Material Payment Bond, each in a sum equal to 100% of the contracted price and duly executed by the successful PROPOSER as principal and by a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to

Athol, as surety, will be required for the faithful performance of the contract, the payment from labor and materials, and for the guarantee and maintenance of the work. The successful PROPOSER shall furnish the Performance and Labor and Material Payment Bonds within fifteen (15) days of the executed contract.

3.8 Law and Courts

The CONTRACTOR shall comply with all applicable federal laws, Commonwealth of Massachusetts laws, and local statutes, ordinances, and regulations in effect as of the Effective Date of this Agreement or hereafter adopted, in performance of scope of work set forth herein. The contract and all incorporated agreements and documents shall be governed under the laws of the Commonwealth of Massachusetts and its court system.

3.9 Contractual Claims

Contractual claims, whether for money or other relief, shall be submitted in writing to the Point of Contact: Mark Cady at AtholMA@cta-c.com and Shaun Suhoski at ssuhoski@townofathol.org , no later than 60 calendar days after final payment; however, written notice of the CONTRACTOR's intention to file such claim shall have been given at the time of the occurrence or beginning of the work upon which the claim is based. The Radio Implementation Committee shall issue a decision regarding such claim, in writing, no later than 60 calendar days subsequent to notification to the Athol.

For good cause and as consideration for executing this contract, the PROPOSER acting herein by and through the person signing this Proposal on behalf of the PROPOSER as duly authorized agent, hereby conveys, sells, assigns, and transfers to Athol all rights, title and interest in and to all causes of action it may now or hereafter acquire under the anti-trust laws of the United States and the Commonwealth of Massachusetts, relating to the particular goods or services purchased or acquired by Athol.

3.10 Sales Tax Exemption

Athol is exempt from Massachusetts state sales and use taxes. Athol will furnish the CONTRACTOR a Sales and Use Tax Exemption Certificate prior to the issuance of a notice to proceed. The Proposal shall include all other applicable taxes and fees.

3.11 Liquidated Damages

For each and every day the installation of the system shall fail to be complete beyond the date set for completion of installation and any extensions granted under the contract, the CONTRACTOR shall pay to Athol the total amount of all costs resulting from the delay as liquidated damages and not as a penalty. Liquidated damages may be deducted by Athol from any money due or to become due to the CONTRACTOR as compensation under the contract. Liquidated Damages shall not exceed 5 percent of the total amount of the contract per incident/delay. The total of Liquidated Damages shall not exceed the total cost of the contract.

3.12 Indemnity

The CONTRACTOR shall indemnify and save harmless Athol, its officials and employees from all losses, claims, demands, payments, suits, actions, recoveries, and judgments of every nature and description brought or recoverable against Athol, or by reason of any act or omission of the CONTRACTOR, its agent, or its employees, in the execution of the work, or in consequence of any negligence or carelessness in guarding the same, including all liability for, or growing out of any infringement of letter patent or copyright of the United States, in respect to the normal use of the proposed and installed system. Athol will promptly give the CONTRACTOR notice of any such claim.

The successful PROPOSER shall assume all risk and bear any loss or injury to the property or persons occasioned by neglect or accident during the progress of work until the same shall be completed and accepted. The CONTRACTOR shall also assume all blame or loss by reason of neglect or violation by CONTRACTOR of any state or federal law, Athol *jurisdiction* code, or municipal rule regulation, or order. The CONTRACTOR shall give to the proper authorities all required notices relating to the work and shall be responsible for ensuring all official construction permits and licenses are obtained prior to the beginning of work, and for paying all proper fees. Athol will sign permit requests as required and as submitted by the CONTRACTOR. The CONTRACTOR shall make good any injury that may have occurred to any adjoining building, structure, or utility as a consequence of this work. Athol agrees to notify CONTRACTOR in writing as soon as practicable of any claim, demand or cause of action for which Athol will request indemnification from CONTRACTOR. Athol will provide CONTRACTOR with the necessary information and assistance to defend or settle such claim, demand or cause of action. The obligations of CONTRACTOR under this paragraph shall survive the expiration of this Agreement.

At no time shall CONTRACTOR permit any mechanics or similar liens to attach to Athol's premises on account of labor or material furnished to offeror or claimed to have been furnished to offeror, in connection with its work hereunder.

3.13 Dispute Resolution

In the event of any dispute, claim, question, or disagreement arising from or relating to this agreement or the breach thereof, the parties hereto shall use their best efforts to settle the dispute, claim, question, or disagreement. To this effect, they shall consult and negotiate with each other in good faith and, recognizing their mutual interests, attempt to reach a just and equitable solution satisfactory to both parties. If they do not reach such solution within a period of 60 days, then, upon notice by either party to the other, all disputes, claims, questions, or differences shall be finally settled by litigation in the Courts of the Commonwealth of Massachusetts.

3.14 Litigation

The exclusive jurisdiction for any claim or controversy arising out of or relating to this agreement shall be in the district or superior court with subject matter jurisdiction in the Commonwealth of Massachusetts. And each party hereto irrevocably waives any objection it may now or hereafter have as

to the venue of any such suit, action or proceeding brought in such a court or that such court is an inconvenient forum.

3.15 Legality

The PROPOSER shall be responsible for obtaining all required Town permits at their own expense. These may include building permits and business licenses from the Town of Athol prior to beginning work.

A PROPOSER authorized to transact business in the Commonwealth is required to include in its offer or proposal the identification number issued to it by the State Corporation Commission (SCC). Any PROPOSER that is not required to be authorized to transact business in the Commonwealth as a foreign business entity is required to include in its offer or proposal a statement describing why the offeror is not required to be so authorized.

The successful PROPOSER shall comply in every way with the requirements of applicable state and local laws, codes, and ordinances. No claims for additional payment will be approved for changes required to comply with codes, ordinances, and regulations in effect on date of offering, since it is the PROPOSER's responsibility to become familiar with such requirements before submitting a proposal.

3.16 Employment and Labor Rates

The PROPOSER must comply with the Massachusetts law regarding prevailing wage rates, as well as any other provisions related to employment conditions referenced in M.G.L. c.149, §§26-27. See Appendix E for prevailing wage rates. Winning bidders must provide the Town of Athol with certified payroll records within fifteen days after completion of its portion of the work. See Appendix E for Certified Payroll Reporting.

3.17 Responsibility for Safety, Health, and First Aid

The PROPOSER shall ensure their employees and agents comply with all applicable health and safety laws, rules, and regulations without limitation, including but not limited to the Federal, Commonwealth of Massachusetts, Occupational Safety and Health Act of 1970 (OSHA), and Bidder’s company safety regulations as issued and included with this bid.

The PROPOSER shall be responsible for ensuring all work performed under their supervision, or work that the PROPOSER subcontracts, in conjunction with this procurement is in compliance with all applicable safety, building and electrical codes.

3.18 Liability Insurance

The successful PROPOSER shall carry public liability insurance in the amounts specified below, including the contractual liability assumed by the CONTRACTOR, and shall deliver a Certificate of Insurance to Athol with a 60 calendar day cancellation notice provision from carriers acceptable to

Athol and licensed to do business in Athol. The certificate shall be delivered in conjunction with delivery of the executed contract to Athol.

A. Worker's Compensation and Employer's Liability
Insurance as required by M.G.L.

B. Automobile Liability, Including Owner, Non-Owner and Hired Car Coverage
$1,000,000 per accident to include Bodily Injury & Property Damage

C. Commercial General Liability
$2,000,000 per occurrence / $4,000,000 aggregate

Commercial General Liability is to include bodily injury and property damage, personal injury, advertising injury, contractual liability, and products and completed operations coverage. Athol, their officers, employees, agents, and volunteers must be named as additional insureds and be so endorsed on the policy, as evidenced by the certificate of insurance.

D. Professional Liability (Errors and Omissions)
$2,000,000 limit per claim and aggregate

3.19 Assignment

Assignment by the successful PROPOSER to any third party of any contract based on this RFP or any monies due shall be absolutely prohibited and will not be recognized by Athol unless approved by Athol in writing. Approval will not be unreasonably withheld.

3.20 News Release

The PROPOSER shall at no time make any news or advertising releases pertaining to this RFP for any purpose without the prior written approval of the Athol Procurement Officer, and then only in coordination with Athol.

3.21 Transportation and Storage

The CONTRACTOR shall make all arrangements for transportation of equipment in suitable vehicles and by experienced equipment carriers. Supervision of packing, unpacking and placement of equipment shall be furnished by the CONTRACTOR without charge to Athol. The CONTRACTOR shall incur the transportation expenses.

The acquisition of the required storage space will be at the expense of the CONTRACTOR.

Athol will make available to the CONTRACTOR the sites and equipment buildings when they are ready. These will be taken by the CONTRACTOR as is and may be used for storage of contract related

equipment. The CONTRACTOR will be responsible for equipment stored and installed at these sites until Athol accepts the equipment.

3.22 Transfer of Title

The CONTRACTOR shall assume full financial and operational responsibility until the system is accepted by Athol. Only at that time will Athol assume responsibility for and take possession of the system. If the CONTRACTOR desires, transfer of title may be effective upon delivery. However, under no circumstances shall any warranty begin until final acceptance of the system by Athol.

3.23 Equipment, Systems, Software, and Licenses

Any additional limitations, constraints, or warranties on all systems, equipment, software, and licenses provided shall not conflict with the requirements of this RFP. The PROPOSER shall only offer additional systems, equipment, and third-party software limitations or constraints that they are willing to negotiate with Athol in good faith. All systems, equipment, and third-party software shall be supplied and warranted as suitable for the use intended by this RFP.

3.24 Non-Discrimination in Employment

During the performance of this contract, the CONTRACTOR shall be governed by all applicable state and federal regulations, and agrees as follows:

A. The CONTRACTOR will not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The CONTRACTOR agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this non-discrimination clause.

B. The CONTRACTOR, in all solicitations or advertisements for employees placed by or on behalf of the CONTRACTOR, will state that such subcontractor is an equal opportunity employer.

C. Notices, advertisements, and solicitations placed in accordance with federal law, rule or regulation shall be deemed enough for the purpose of meeting the requirements of this section.

D. The CONTRACTOR will include the provisions of the foregoing paragraphs A, B, and C in every subcontract or purchase order [of over $100,000], so that the provisions will be binding upon each subcontractor or vendor.

3.25 Employment of Illegal Aliens

The CONTRACTOR shall certify that it does not, and will not during the performance of the contract, knowingly employ illegal alien workers or otherwise violate the provisions of the Federal Immigration Reform and Control Act of 1986.

3.26 Debarment Status

By submitting their proposal, all PROPOSERS certify that they are not currently debarred from submitting offers on contracts by any agency of the Commonwealth of Massachusetts or the Town of Athol nor are they an agent of any person or entity that is currently debarred from submitting proposals on contracts by any agency of the Commonwealth of Massachusetts or the Town of Athol.

3.27 Force Majeure

Neither party will be liable to the other for any failure or delay in rendering performance arising out of causes beyond its reasonable control and without its fault or negligence. Such causes may include, but are not limited to, acts of God or the public enemy, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and unusually severe weather; but the failure or delay must be beyond reasonable control and without fault or negligence.

If the CONTRACTOR's failure to perform is caused by the default of a subcontractor, and if such default arises out of causes beyond the reasonable control of both the CONTRACTOR and subcontractor, and without the fault or negligence of either of them, the CONTRACTOR shall not be liable for any excess costs for failure to perform, unless the equipment or services to be furnished by the subcontractor were obtainable from other sources in sufficient time to permit the PROPOSER to meet the required delivery schedule. Dates or time of performance will be extended to the extent of delays excused by this section, provided that the party whose performance is affected notifies the other promptly of the existence and nature of such delay.

3.28 Termination for Convenience

The Town of Athol may terminate the Contract at any time for its convenience upon sixty (60) days written notice to the other party. The CONTRACTOR shall be paid for reasonable and authorized services rendered/expenses incurred through the effective date of termination. In the event of termination, all documents and other materials related in the performance of the Contract shall become the property of the Town of Athol.

3.29 Termination with Cause / Default

The Town of Athol may terminate the contract for cause by sending written notice to the CONTRACTOR of CONTRACTOR'S default in the performance of any items of this agreement. Termination shall be without prejudice to any of the Town of Athol's rights or remedies by law. In the event of termination, all documents and other materials related in the performance of the Contract shall become the property of the Town of Athol

The Town of Athol, at its discretion, may provide the CONTRACTOR thirty (30) or more days from the date notice is provided in which to cure the default. Upon failure of CONTRACTOR to cure the default, CONTRACTOR may immediately cancel and terminate this Agreement as of the date of notice. Termination shall be without prejudice to any of the Town of Athol rights or remedies by law.

Upon termination, CONTRACTOR shall withdraw its personnel and equipment, cease performance of any further work under the Agreement, and turn over to Town of Athol any work in process for which payment has been or is willing to be made.

In the event of violations of law, safety or health standards and regulations, this Agreement may be immediately cancelled and terminated by Town of Athol Termination shall be without prejudice to any of the Town of Athol's rights or remedies by law.

3.30 Site Visits

It is mandatory for the PROPOSER to visit all sites offered for use in the proposed system. The PROPOSER shall have a person with site civil experience perform due diligence in assessing the over site conditions (access road, compound, fencing, etc.), shelter condition (inside and outside), tower condition, tower loading, antenna placement, and grounding. PROPOSER'S price proposal shall include all costs to bring all sites into compliance with the RFP requirements. Ignorance of site conditions shall not relieve the CONTRACTOR of any liability or obligations under the contract as agreed to by both parties.

3.31 CONTRACTOR Responsibilities

The CONTRACTOR shall assume total responsibility for delivery, installation, acceptance, and warranty of all hardware, software, and engineering and support services offered in the Proposal, whether the PROPOSER is the manufacturer, producer, author, or supplier of them.

The CONTRACTOR may be required to provide information on its project personnel and subcontractors' personnel for criminal background checks and the issuance of temporary identification card. This requirement will be at the discretion of the site owner. Non-compliance with this RFP requirement may cause a stop work order and all resultant price delays shall be at the expense of the CONTRACTOR.

The CONTRACTOR's project manager shall be the sole point of contact regarding all contractual matters, including the performance, service, and payment of any and all charges resulting from the lease and installation of the entire system configuration, and all other services performed. Failure to meet these obligations shall result in the cancellation of any contracts.

3.32 System Responsibility

The PROPOSER shall be responsible for verifying the completeness and suitability of all work or equipment proposed for this system. The CONTRACTOR shall provide any additional equipment or labor required in order to meet these specifications, without claim for additional payment, it being understood that a complete operating system is required.

The CONTRACTOR shall be responsible for designing, furnishing, and installing all required interfaces with existing systems and equipment, along with such interfaces as might be specified in the system

specification, unless such interfaces are specifically excluded or ascribed to others in this specification. The CONTRACTOR shall be obligated to provide a system that meets all guarantees in the Proposal for the price contained therein.

3.33 Property Damage

The CONTRACTOR shall be responsible for any loss or damage to property caused by their operations or personnel. Damages will be settled with the owner of the property by the CONTRACTOR in the company of an agent in Athol. The CONTRACTOR shall submit a signed damage release for all sites concerned within 30 days after the recommendation of cutover.

3.34 System Use before Acceptance

Athol will not use any part of that system for operational use prior to conditional acceptance, other than for training and testing of the system. Conditional acceptance shall be on a system basis only. Once the Acceptance and Coverage Tests have been passed validating all significant functions, features, coverage, and Cutover has been successfully completed Athol will agree to Conditional Acceptance but will not pay the final milestone until Final Acceptance. Only when the CONTRACTOR has completed all contractual responsibilities and Athol has approved all punch-list items, submittals, as-built drawings, training, maintenance manuals, etc. will Final System Acceptance be achieved.

It may become necessary however, because of unplanned events, for Athol to use a part or all the system or a subsystem. Such use shall not constitute conditional acceptance unless it continues for 30 consecutive days. The CONTRACTOR will be entitled to seek relief from any damages for delays which result from such unplanned use of the system or subsystems.

3.35 Change Order

A written Change Order, signed by both the Town of Athol and CONTRACTOR, shall be required for any modification to the Total Agreement Price, Project Schedule, Project Scope, Project Responsibilities, or other Contract terms. Price increases and/or extensions of time shall not be binding upon either Party unless or until evidenced by a fully executed Change Order. If a project change impacts the critical path of the Project Schedule, both parties must agree on a time frame in advance of executing a Change Order. Any delay in securing site access for sites selected by the PROPOSER, may constitute a schedule delay; however, such delay shall not result in a price increase. If a project change impacts the Project Scope a Change Order must be executed prior to commencement of the Work. Within twenty (20) business days of an identified project change, the CONTRACTOR shall provide a draft change order for review by the Town of Athol. If a Change Order takes longer than thirty (30) business days to execute, through no fault of the Town of Athol, the CONTRACTOR may not make a claim for a project schedule delay.

3.36 Re-Inspections / Retesting

If the CONTRACTOR notifies Athol that a site, system, or subsystem is ready for inspection and/or testing at a *mutually agreed* time and place according to a *mutually agreed* test plan; and if the site, system, or subsystem is inspected and/or tested according to the agreed test plan; and if the site, system or subsystem fails the inspection and/or test and requires reinspection and/or retesting at a later date; all costs that may accrue to Athol and Athol representatives', including compensation at Athol's and Athol representatives' published rates shall be borne by the CONTRACTOR. All direct expenses (including travel, lodging, meals, etc.) will comply with the current US General Services Administration (GSA) per diem rates and shall be borne by the CONTRACTOR. Testing and inspections shall include, if required by the RFP, but are not limited to: Detailed Design Review; Radio System Staging; Microwave Staging; Site Inspections; Equipment Inspections; Base Station Testing; Field Testing; Dispatch Equipment Testing; Interference Testing; System Acceptance Testing; Coverage Acceptance Testing

4 Statement of Work

The statement of work applies to all systems, equipment, facilities, services, and software specified in this RFP. No work will begin on this project until the Town of Athol has provided written NTP.

4.1 Project Management

The CONTRACTOR shall have experience with projects of similar size and scope as the proposed system. Assigned personnel shall have qualifications and experience to perform their tasks for this project.

4.1.1 Single Point of Contact

The CONTRACTOR shall designate a single point of contact for all project-related issues and direct the CONTRACTOR's personnel and assist in resolving project problems.

The CONTRACTOR's point of contact shall be available to the Town of Athol between the hours of 8:00am and 4:00pm Monday through Friday, with exception of State and Federal holidays.

4.1.2 Subcontractors

The CONTRACTOR shall be responsible for all work performed by subcontractors. The CONTRACTOR shall notify the Town of Athol prior to procuring subcontractor(s) to perform tasks and/or provide equipment on the project. *The PROPOSER shall identify all known subcontractors, and the work they will complete, in the proposal*. The Town of Athol has the right to reject proposed subcontractors.

4.1.3 CONTRACTOR Registration

Firms performing construction work on behalf of the CONTRACTOR shall be licensed with the appropriate authorities. The firms shall be licensed at the time of the submission of the Proposal and must remain licensed through the completion of the work.

The CONTRACTOR and its subcontractors shall have all federal, state, and local licenses necessary to do the work, and shall remain licensed through the completion of the work.

4.1.4 Project Management

4.1.4.1 Project Schedule

The PROPOSER shall provide a preliminary project schedule that reflects all work described in the submitted proposal. The master project schedule shall contain all project activities that are the responsibility of the CONTRACTOR, the Town of Athol, and Athol's Representative to ensure successful design, implementation, and acceptance of the system.

The initial project schedule shall be presented at the Project Kickoff Meeting and once approved by all parties shall be saved as the Project Baseline Schedule
The schedule for the implementation of each communications system location shall be broken out separately on the project schedule.

4.1.4.2 Project Review Meetings and Teleconferences

The CONTRACTOR shall conduct monthly project review meetings, or video conferences, beginning with the Project Kickoff Meeting until Final System Acceptance. Athol shall determine when a video conference may replace an in-person meeting.

Athol's Representative shall organize and conduct regular video conferences between scheduled review meetings if the team deems necessary.

Athol's Representative will provide a virtual meeting platform and inform the PROJECT TEAM members of the call-in number, Web URL, and access codes. The CONTRACTOR shall utilize this virtual meeting platform for all PROJECT TEAM meetings.

4.1.4.3 Action Item List

Athol's Representative will develop and maintain an action item list. The action item list shall include the following items:

- Item Number
- Date Assigned
- Site Name
- Description of the Item
- Responsible Entity
- Assigned Person
- Priority
- Due Date
- Date Completed
- Resolution
- Notes

RFP Section	Submittal	Scheduled Delivery Date
4.1.1	Single Point of Contact information	Fifteen (15) days after NTP
4.1.2	Subcontractor	Thirty (30) days prior to engaging subcontractor
4.2.1	Kick Off Meeting	Thirty (30) days after Project Kickoff Meeting
4.2.2	Design Review (DR) Meeting	One hundred fifty (150) days after NTP
4.2.2	Design Documentation	Fifteen (15) business days prior to DR

4.3.15	FCC Licenses Application(s)	Thirty (30) days after path surveys
9.11.9	FAA Notifications	Sixty (60) days after Approved DR
9.15	Grounding Plan Documentation	Sixty (60) days after Approved DR
9.10.4	Concrete Testing Results	Forty-five (45) days after collection of concrete samples
4.3.19	Final Connectivity Network Field Acceptance Test Plan	Thirty (30) days prior to the Connectivity Network Staging Test
4.3.18	Final Radio System Acceptance Test Plan	Thirty (30) days prior to the Factory staging tests
4.3.16	Interference Analysis and Mitigation	Thirty (30) days after Installation of Radio Equipment
4.4.6	Acceptance Test Results	Thirty (30) days after Acceptance Testing
4.4.2	Connectivity Network Acceptance Test Report & Punch List	Fifteen (15) days after completion of connectivity network testing. When reviewed test report and punch list resolved, Athol will approve.
4.4.3	Radio System Acceptance Test Report & Punch List	Fifteen (15) days after completion of radio system testing. When reviewed test report and punch list resolved, Athol will approve.
4.4.8	Final Cutover Plan	Thirty (30) days prior Cutover
6.3.2.1	Self-Interference Test	Twenty-one (21) days prior to acceptance testing, submit test results for each channel at each site
4.7.2	Training Materials	Sixty (60) days prior to the beginning of class sessions
4.6.4	Subscriber Documentation	Fifteen (15) days prior to subscriber training
4.6.1	Standard Manuals	Thirty (30) days prior Cutover
4.6.2	Physical Facilities As-Built Documentation	Drafts – at the beginning of the thirty (30)-day performance period Finals – thirty (30) days after cutover
4.6.3	System Maintenance Documentation	at the beginning of the thirty (30)-day performance period
3.29	Damage Release Form	Fifteen (15) days prior Final System Acceptance

Table 4-1 Submittal Schedule

4.1.4.4 Project Documentation

The CONTRACTOR shall provide and maintain all the project documentation, sharing it with the PROJECT TEAM from the beginning to System Acceptance and Cutover. At the end of the project, the CONTRACTOR will hand-off to the Town of Athol for future maintenance, all project documentation pertinent to the definition and implementation of this project, e.g. submittals, transmittals, schedules, agendas, charts, data, diagrams, drawings, photographs, maps, emails, licenses, manuals, minutes, permits, procedures, reports, spreadsheets, text files, written plans, etc. shall be provided in soft copy (and PDF at Athol's request) and supplied without copy protection. When appropriate, documentation shall be professionally bound in three-ring binders with section tabs and a table of contents. When submitted for approval or information, documents shall be clearly marked with the name of this project, date, and other tracking information, e.g. contract information, site name and/or drawing/document number. Town of Athol's Representative will provide a Web-based "cloud drive" to safely store and share documents, drawings, maps, photos with all members of the PROJECT TEAM. This Web-based "cloud drive" shall be used by the CONTRACTOR to store all project documentation.

4.1.4.5 Change Orders

If a Change Order is required as stated in the RFP Terms and Conditions, the CONTRACTOR shall submit change order requests to the Town of Athol representatives. A separate change order for each request shall include:

- Customer name
- Project number and title
- Issue date
- Tracking number
- CONTRACTOR name
- Reason for change
- Description of change
- Cost impact
- Schedule impact
- Operational or performance impact

All price revisions shall be provided using the Contract Exhibit B Price Pages document. The Contract Exhibit B Payment Milestones structure shall not be altered.

No changes to the work shall commence until the change order request has been approved by the Town of Athol in writing via a Contract Amendment.

4.1.4.6 Punch List

The CONTRACTOR shall establish and maintain a punch list for inspections, staging tests, field tests and acceptance tests. The list will be published monthly to include a sequential punch list item number, site reference, date identified, description of the item, resolution date, and notes. The Town of Athol/ Athol's Representative will be responsible to review and approve the resolution of each item.

4.2 Planning and Design

The CONTRACTOR shall design, engineer, furnish, install, configure, test, and warranty the systems, equipment and software required by the technical specifications of this RFP. Supply all equipment, software, and services necessary to provide a complete and operational communications system.

4.2.1 Kickoff Meeting

The CONTRACTOR shall proceed with project plans and design activities after receiving written NTP.

The CONTRACTOR shall conduct the Kickoff Meeting at a location provided by Town of Athol for the PROJECT TEAM within twenty (20) days after NTP. The following items shall be discussed at the meeting:

- Introduce Project Team Members and Subcontractors
- Implementation Plan
  - Project Review Meetings & Schedule
  - Action Item Checklist Process
- Project Overview
  - Design Plan
  - Sites Information
  - Schedule for site design visits/ surveys: it is the expectation of the Town of Athol that site visits shall be limited to two (2) visits, inclusive of physical facilities, radio, and connectivity personnel.
  - Baseline Schedule
- Design Review Content / Tentative Date

4.2.2 Design Review (DR)

The CONTRACTOR shall conduct the Design Review (DR) for the PROJECT TEAM, at a location provided by the Town of Athol and within the timeframe identified in Table 4-1. The Design Review is expected to be a single event. If the Design Review is not completed during the agreed upon scheduled visit, all costs for attending an additional meeting, including those incurred by the Town of Athol for its personnel, Town of Athol's Representative and other CONTRACTORS, and any direct expenses (including travel, lodging, meals, etc.), shall be borne by the CONTRACTOR.

The following items are required at the Design Review:

- Project Schedule
- Radio System Technical Design
  - System Configuration
  - System Operations – Features & Functions
  - Coverage Map
  - Alarm System Plan
- List of Deliverables Equipment for each Site (including spare equipment)

- Site Design (Physical Facilities)
  - Site Plans
    - Site Plot Drawing
    - Site Access
    - Site Grounding
  - Towers Elevation and Plans
    - Tower Structural Analysis
    - Antenna Placement Diagrams (include Microwave antennas)
  - Building / Shelter Plans
    - Floor plans and Dimensions
    - Equipment Rack Elevations
    - Electrical System Design
    - AC power and BTU Requirements
    - UPS and / or DC Power System
    - Generator
    - Grounding and Surge Protection
    - HVAC
    - Fire detection / suppression
- Connectivity Network
  - Network Topology Diagrams
  - Path Survey Reports (photographs, figures, profile paths, data sheets, calculations)
  - Fiber optic maps
- Interfaces (between radio system, connectivity network and facilities)
- FCC Licenses (Radio System and Microwave System)
- Emergency Communication Center (ECC)
  - ECC Block Diagram to include Backup radios
  - Console Configuration Plan
  - Logging Recorder Connectivity Plan
- Draft Acceptance Test Plans
  - Radio System (Field test)
  - Microwave/Connectivity Network (Field test)
  - Coverage (Field Drive Test)
  - 30 Operational Test
  - Cutover Plan
- Subscribers
- Template Design & Programming
- Training Plans

The CONTRACTOR shall prepare and submit the above referenced design review documentation to the PROJECT TEAM in soft copy within the timeframe identified in Table 4-1. The CONTRACTOR shall prepare and submit four (4) hard copies of the above referenced design review documentation to the PROJECT TEAM at the Design Review Meeting. Each hard copy shall be provided in a 3-ring binder. Large scale drawings shall be folded to fit in the 3-ring binder.

The PROJECT TEAM will return comments within ten (10) business days after the Design Review. The CONTRACTOR shall make appropriate changes within fifteen (15) business days after receiving the PROJECT TEAM's comments. Once all comments have been resolved to the satisfaction of the PROJECT TEAM, the Town of Athol will approve the DR, or may approve separately each subsystem, site, equipment, and/or functions prior to manufacturing and/or procuring by the CONTRACTOR.

4.3 Implementation

4.3.1 Permits and Licensing

The CONTRACTOR is responsible for obtaining the appropriate federal, state, and local zoning, environmental, special use and construction approvals, permits and licenses necessary for the construction of physical facilities. The CONTRACTOR shall pay all fees and costs associated with obtaining all approvals, permits and licenses.

4.3.2 SHPO and NEPA Studies

The CONTRACTOR shall perform SHPO and NEPA studies where required for selected sites. A realistic timeframe for completion of this effort shall be specifically integrated into the project schedule.

4.3.3 Coordination with Town of Athol's Operations

The CONTRACTOR shall coordinate all work with the Town of Athol's operating and scheduling requirements. It may be required that certain tasks, such as installation, testing and/or cutover, need to be performed outside the Town of Athol's normal working hours.

4.3.4 Infrastructure Equipment Orders

The CONTRACTOR shall submit factory orders and/or purchase material orders for infrastructure equipment only after the Town of Athol has approved, in writing, the system design and authorized factory or material orders. The Town of Athol accepts no responsibility for infrastructure equipment orders placed prior to approval of the design review.

4.3.5 Subscriber Equipment Orders

Except for a nominal quantity for testing purposes, subscriber equipment and accessories shall not be ordered until the Town of Athol has authorized, in writing, the CONTRACTOR to proceed with subscriber equipment orders. Under no circumstances will the Town of Athol accept subscribers placed in storage at the convenience of the CONTRACTOR.

4.3.6 Relocation of Existing Equipment

The CONTRACTOR shall assist the Town of Athol to identify existing equipment that must be relocated to accommodate new equipment required by this RFP. The CONTRACTOR shall pay

any expenses related to existing equipment relocation or disposition of property. If any, relocation of existing equipment must be approved by the Town of Athol prior to relocating.

4.3.7 Equipment, Systems and Software

The CONTRACTOR shall furnish all systems, equipment, and software required by this RFP. Any additional limitations or constraints on all systems, equipment, and software provided shall not conflict with the requirements of this RFP.

The CONTRACTOR shall provide all proprietary and third-party software necessary for overall system operation, including, but not limited to, all interface protocols, interoperability protocols, backbone and network interconnections, auxiliary equipment, subsystem interfaces and communications links. The CONTRACTOR shall only provide additional systems, equipment, and proprietary and third-party software limitations or constraints that they are willing to negotiate with the Town of Athol in good faith.

4.3.8 Installation

The CONTRACTOR shall install all systems, equipment and software required by this RFP.

The CONTRACTOR shall leave all sites in a neat, presentable condition throughout the project. The CONTRACTOR shall remove all rubbish, temporary structures, and equipment generated or used by the CONTRACTOR after installation and prior to acceptance.

4.3.9 Legacy Equipment Decommissioning

4.3.9.1 Legacy Equipment Decommissioning - Infrastructure

The CONTRACTOR shall remove and dispose of decommissioned infrastructure to include shelters, towers, antennas & lines, and legacy radio, paging, and microwave equipment.

4.3.9.2 Legacy Equipment Decommissioning - Subscribers

The CONTRACTOR shall remove decommissioned subscribers to include mobiles, control stations, and antennas and deliver to a designated Athol storage location.

4.3.10 Electrical Power

The CONTRACTOR shall pay all installation fees for electric power (temporary or permanent) and electric bills until system cutover, for any site where the Town of Athol does not have existing electrical service.

4.3.10.1 Existing Electric Service

Location of all existing utilities shall be verified before site work begins. Existing utilities must be protected during site work.

4.3.10.2 New Electric Service

Temporary electric service may be necessary for site development. Temporary service must be coordinated and obtained through the local electric utility. Permanent electric service is preferred to be underground.

4.3.11 Inspect Excavations

The CONTRACTOR shall notify the Town of Athol and the PROJECT TEAM of any excavation at a site fifteen (15) days prior to completion of the excavation. The Town of Athol and the PROJECT TEAM reserves the right to inspect excavations, rock, socket, and reinforcement placement.

4.3.12 Existing AM Radio Station Towers

The CONTRACTOR shall ensure tower construction or alteration shall not disturb the antenna radiation patterns of existing AM broadcast stations.

At the design review, the CONTRACTOR shall provide a report of its initial survey identifying all sites requiring tower construction or alteration that are within one (1) mile of existing non-directional AM stations and within three (3) miles of directional AM stations.

The CONTRACTOR is responsible for the pre-construction analysis. The CONTRACTOR will provide a cost estimate and scope of work for any required remediation of interference and post-detuning testing resulting from the construction or alteration.

The CONTRACTOR shall provide documentation for each site, prior to inspection, either guaranteeing no interference with existing broadcast antenna patterns, or detailing the tower detuning required and the test results confirming that detuning corrected the problem.

4.3.13 Generator Maintenance and Service

The CONTRACTOR shall conduct routine maintenance and operational testing of backup/standby generators until System Acceptance. Following installation, backup/standby generators shall be exercised to at least 30 percent (30%) of nameplate rating for sixty (60) minutes, at least once per month.

4.3.14 MANDATORY OPTION: Frequency Licensing

The CONTRACTOR shall select frequencies, prepare (Regional Planning Committee documentation, if required, and) FCC license application. The Town of Athol will sign and submit (Regional Plan documentation,) FCC application and pay coordination and license fees.

The CONTRACTOR shall perform any modification to existing FCC licenses, planning for the new radio system, that will require coordination and preparation of FCC applications, submittals, and documentation.

4.3.15 Interference Analysis and Mitigation

The CONTRACTOR shall verify that all CONTRACTOR installed equipment is operating within the bounds of the Town of Athol's FCC license, regulations, and published equipment specifications upon completion of system installation.

Prior to installation, the CONTRACTOR shall identify equipment and analyze collocated RF equipment to discover potential sources of intermodulation, spurious emissions, transmitter noise or receiver desensitization that may affect the new system. The CONTRACTOR shall provide a report on this interference analysis, within the timeframe identified in Table 4-1, and include a description of recommended steps the Town of Athol can take to minimize potential interference.

The CONTRACTOR shall be responsible for resolving interference, due to existing collocated equipment, at no cost to the Town of Athol if **all** the following criteria are met:

- the interference is reported before final system acceptance
- the equipment causing the interference was installed and licensed prior to the installation of the CONTRACTOR'S equipment
- the collocated equipment is operating within the bounds of its license, FCC regulations and published equipment specifications

If **all** of the prior conditions are not met, the CONTRACTOR shall *cooperate* with the Town of Athol to resolve identified interference to or from collocated equipment; and the Contractor and the Town of Athol will execute a mutually agreeable change order to remedy the interference.

If the Radio System coverage and performance are subject to degradation or disruption due to anomalous propagation and interference by natural phenomena or other radio Systems ("Outside Interference"), beyond that which the CONTRACTOR should reasonably have anticipated based upon best RF engineering practices and further described in this section, the CONTRACTOR shall not be held responsible for the Outside Interference. In the event of a case of degradation or disruption due to Outside Interference by natural phenomena or an outside party, as described in this paragraph, the CONTRACTOR shall cooperate with the Town of Athol to resolve the interference; and the Contractor and the Town of Athol will execute a mutually agreeable change order to remedy the interference.

4.3.16 Templates Design

The CONTRACTOR shall assist the Town of Athol in developing unique templates for each department or agency. The Town of Athol will be responsible for establishing standard operating procedures. The CONTRACTOR shall provide a preliminary fleet map plan to the Town of Athol within the timeframe identified in Table 4-1.

4.3.17 Final Radio System Acceptance Test Plan

The CONTRACTOR shall provide the final Radio System Acceptance Test Plan (ATP) to the PROJECT TEAM within the timeframe identified in Table 4-1. The testing shall demonstrate proper operation of system features and functions, including fault management functions. All subsystems and equipment shall be exercised during acceptance testing. Tests that cannot be performed at staging should be labeled in the test plan as “Field Test”.

This test plan will be repeated for the Field Radio System Acceptance Test, with the addition of any tests labeled “Field Test”.

4.3.18 Final Connectivity Network Field Acceptance Test Plan

The CONTRACTOR shall provide the Final Connectivity Network Field Acceptance Test Plan within the timeframe identified in Table 4-1. The CONTRACTOR shall perform careful testing to ensure that the RF path performance and end-to-end voice/data circuit performance requirements are measured and documented. The end-to-end performance tests shall specifically include BER and packet data tests in normal and protected configurations. Tests that cannot be performed at staging should be labeled in the test plan as “Field Test”.

This test plan will be repeated for the Field Connectivity Network Acceptance Test, with the addition of any tests labeled “Field Test”.

4.3.19 Shipment and Storage

Upon successful completion of staging tests, and after notification that sites are ready to install fixed network equipment, the Town of Athol will authorize the CONTRACTOR to ship equipment to the radio sites.

4.4 System Acceptance

4.4.1 Inspections

The Town of Athol will conduct site inspections during construction and a Final Inspection at each site. Deficiencies identified by inspections will be recorded as punch list items.

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4.4.1.1 Facility Inspection and Testing

The CONTRACTOR shall notify the PROJECT TEAM when physical facilities will be complete and ready for inspection at a site prior to installation of infrastructure equipment. All site, building, fence, parking, commercial power, backup power, HVAC, grounding, and tower construction shall be installed in a neat and workman-like fashion in compliance with applicable standards.

The CONTRACTOR shall conduct tests for all facility operations at each site, including testing generator and automatic transfer switch, fire alarm system, HVAC operations, minor and major alarms, etc. The Town of Athol's representatives will inspect each site, witness testing operations, and update the project punch list.

4.4.1.2 Final Inspection of Radio Equipment

The CONTRACTOR shall notify the PROJECT TEAM when radio / connectivity infrastructure equipment installation and configuration is complete. The Town of Athol's representatives will inspect equipment installation and prepare a punch list of items required.

The CONTRACTOR shall respond to and resolve punch list items before acceptance testing begins. Exceptions may be waived for punch list items that do not affect radio system performance. The Town of Athol's representatives will record resolution of punch list items.

4.4.2 Connectivity Network Acceptance Testing

Final acceptance testing shall include the same tests as staging and any additional tests that could not be conducted during staging, such as testing involved in existing or new fiber-optic circuits.

Upon completion of installation and final alignment, the CONTRACTOR will perform and record data in accordance with the collection/analysis process agreed to in the ATP for the same type of equipment tests as were made at staging, so long as they are not exclusive staging type tests. Additional tests shall be required for equipment not tested at the factory or staging area, including the following:

- Battery/Charger Equipment
- Antenna System Equipment
- Fiber-optic links
- Microwave path tests
- Microwave network end-to-end verification
- Loopback testing between sites
- Leased connectivity line testing
- Fiber Link End-to-End Verification
- Optical Transport Acceptance Tests

The Town of Athol's representatives will inspect the equipment and witness the field acceptance tests. At completion of the connectivity network acceptance tests, the CONTRACTOR shall provide the following:

- Installed equipment inspection and test documentation dated, notes and three (3) signatures (or initials) for two (2) Athol's representatives and the CONTRACTOR for each test procedure and the results.
- A punch list from failed tests and resolution.
- When the punch list is satisfied, the Town of Athol will approve the connectivity network acceptance tests.

All documentation should be provided to the Town of Athol within the timeframe identified in Table 4-1.

4.4.3 Radio System Acceptance Testing

4.4.3.1 Base Station Tests

The CONTRACTOR shall perform base station tests after equipment installation, configuration, and submit test results twenty-one (21) days prior to acceptance testing. Base station tests shall include:

- Transmitter frequency
- Transmitter deviation or modulation integrity
- Transmitter forward and reflected power
- Combiner forward and reflected power
- Receiver frequency
- Receiver static (unfaded) sensitivity for each channel
- Local operating controls

If the system includes satellite receivers, the Contractor shall perform the receiver tests, and submit results as well.

The Town of Athol will randomly select base stations and receivers to witness re-tests and confirm results. If any test fails, a punch list may require resolution before continuing the Acceptance Tests.

4.4.3.2 Radio System Field Acceptance Testing

The CONTRACTOR shall perform the radio system acceptance test after the ATP has been approved by the Town of Athol and after installation with resolved punch list items. The Town of Athol's representatives will inspect the equipment and witness the field acceptance tests. At completion of the radio system acceptance tests, the CONTRACTOR shall provide the following:

- Installed equipment inspection and test documentation dated, notes and three (3) signatures (or initials) for two (2) Town of Athol's representatives and the CONTRACTOR for each test procedure and the results.
- A punch list from failed tests and resolution.
- When the punch list is satisfied, the Town of Athol will approve the radio system acceptance tests.

All documentation should be provided to the Town of Athol within the timeframe identified in Table 4-1.

4.4.3.3 Failure Mode Testing

The CONTRACTOR shall demonstrate failure mode operation of the system during acceptance testing. All equipment and components, both main and standby, shall be exercised during testing.

All standard system functions and failure modes, including continued system operation during major failures, shall be demonstrated. Alarm functions shall also be demonstrated.

4.4.4 Coverage Acceptance Testing

The CONTRACTOR shall submit the draft Coverage Acceptance Test Plan (CATP) as part of the Design Review documentation, within the timeframe identified in Table 4-1. The PROJECT TEAM will review the CATP, and the Town of Athol will approve the CATP at least sixty (60) days prior to beginning coverage acceptance testing.

Coverage testing shall be performed during full foliage between May and September.

The CATP shall use a voice test to determine passing or failing. The CONTRACTOR may measure signal strength and bit error rate (BER), but this data will only be used "for information" and will not affect the Coverage Acceptance Test.

Based on the CONTRACTOR's input, each service area will be divided into a grid pattern with test tiles and use the TSB-88 Estimate of Proportions analysis to determine the number and size of the test tiles to ensure a statistically valid result for each service area.

Tests will be performed for both talk-in and talk-out directions. Talk-in and talk-out results will be scored separately and provided as separate statistics.

Tests will be performed while in motion.

In each test tile, a single attempt to access the system will be made by pressing the push-to-talk button (automatic re-tries are allowed). If the test radio does not receive a channel grant tone in that tile, the access test for that location has failed.

Testing will be performed using mobile radios provided by the CONTRACTOR under the Contract. Where the coverage requirement is for portable service area, attenuators and (if necessary) circulators will be used to emulate the portable radios mounted on the hip.

The scoring shall be conducted by a voting "team" consisting of one (1) representative each from the Town of Athol, Athol's Representatives, and the CONTRACTOR. The three (3) voting representatives will each listen to the message for each test tile. Two (2) out of three (3) votes shall determine whether a test tile is passed or failed.

The “field team” will test the talk-out path requiring three (3) voting representatives (the Town of Athol, Athol’s Representatives, and the CONTRACTOR) inside the vehicle, and a driver. The driver is ineligible to vote unless they are the official Town of Athol representative.

The “base team” will test the talk-in path requiring three (3) voting representatives (the Town of Athol, Athol’s Representatives, the CONTRACTOR) at the ECC with an IP Console or a control station.

To “Pass” a test tile, you must be able to understand the entire test message. The Team will vote “Fail” for that test tile if the entire message was not understandable. If a word within the message is missing and changes the meaning of the message, the message will be deemed not understandable.

The voice test messages must be spoken clearly with good diction, using unique sentences or phrases with six (6) to fifteen (15) words taking about three (3) to eight (8) seconds.

4.4.4.1 Coverage Test Configuration

Equipment used for testing shall be installed and tested at least forty-eight (48) hours prior to the start of the coverage test. The Town of Athol will inspect the equipment configuration and sample test data twenty-four (24) hours prior to the start of the testing.

4.4.4.2 Accessible Test Tiles

Test tiles will use publicly accessible roads and will not require 4-wheeled drive vehicles to navigate, where no special permission is required from entities (other than the Town of Athol) to enter a tile. The field team will determine if it is safe to enter the tile. All accessible test tiles within the service area will be tested.

4.4.4.3 Inaccessible Test Tiles

Inaccessible test tiles will not be included in the calculations of system coverage performance.

4.4.4.4 Tile Retries

Tiles that fail the initial talk-in or talk-out test may be retried. Re-scoring will be performed with the same procedure. *The CONTRACTOR may retest as many failed tiles as desired; however, no more than five percent (5%) of the total tiles tested are allowed to be counted as a pass-with-retry.*

4.4.4.5 Retry Location

Test retries will be conducted in the same test tile.

4.4.4.6 Re-Testing

In the event the coverage test fails to meet the coverage guarantees, the CONTRACTOR shall make any and all necessary corrections and the Town of Athol will require a full coverage re-test.

4.4.5 MANDATORY OPTION: Critical Building Coverage Testing

Athol ***does not require a critical building coverage guarantee***. Athol does require as a mandatory option, critical building coverage testing for information purposes only.

The CONTRACTOR shall perform coverage testing in each of the critical buildings listed in Table 4-2. Coverage testing will be witnessed by Athol or Athol's Representatives. If coverage within a building is found unusable, Athol may decide to exercise the mandatory option of installing a distributed antenna system in that building. When the distributed antenna system has been installed, the CONTRACTOR will retest the building witnessed by Athol or Athol's Representatives. Testing shall be performed at locations identified previously to verify that coverage deficiencies have been satisfied. Twenty (20) points, evenly distributed, shall be tested on each floor.

Critical Building Information				
Building Name	**Building Address**	**# of Floors**	**Construction Type**	**BDA**
Police Station	208 Exchange Street Athol MA	1	Wood	
Fire Station	2251 Main Street Athol MA	1	Brick	
Athol Hospital	2033 Main Street Athol MA	2	Brick	
Athol Elementary School	1064 Pleasant Street Athol MA	2	Brick	
Athol Middle School	1062 Pleasant Street Athol MA	2	Brick	
Athol High School	2363 Main Street Athol MA	2	Brick	
Town Hall	584 Main Street Athol MA	3	Brick	

Table 4-2 Critical Buildings

4.4.6 Acceptance Test Results

Contractor shall provide a comprehensive report detailing the results of all acceptance testing to the Town of Athol within the timeframe identified in Table 4-1.

4.4.7 System Cutover

The CONTRACTOR shall prepare a plan for cutting over the Town of Athol's operations from the old radio system(s) to the new radio system. The draft cutover plan shall be provided as part

of the Design Review documentation, within the timeframe identified in Table 4-1. The cutover plan shall address the following items:

- Fixed equipment cutover
- Interfaces with and transfer of control from existing systems and equipment
- Dispatching transitions
- Subscriber equipment installation and/or distribution
- Special sequences
- Scheduled downtime
- Dual operation of old and new systems
- Personnel schedules
- Training
- Fallback plans in case of problems or failures

When the Acceptance Testing, Coverage Testing and the thirty (30)-day performance period has been successfully completed, and the Town of Athol approves the Cutover Plan, the Town of Athol will authorize the day and time to cutover.

Cutover from the existing radio system to the new radio system shall be planned to minimize disruption to the Town of Athol's operations.

4.4.8 Beneficial Use

If Town of Athol uses the System or a Subsystem for operational purposes, the CONTRACTOR may request the system or subsystem be deemed in Beneficial Use. Town of Athol will not commence Beneficial Use before Conditional System Acceptance without CONTRACTOR's prior written authorization, which shall not be unreasonably withheld. Upon commencement of Beneficial Use lasting more than thirty (30) consecutive days the CONTRACTOR may request the initiation of the Warranty Period to begin.

4.4.9 Conditional System Acceptance

Conditional System Acceptance shall occur upon successful completion of all Acceptance Tests, Coverage Tests, the thirty (30) Day Performance Period, and successful Cutover. Upon Conditional System Acceptance, the CONTRACTOR will promptly memorialize this event by providing a Conditional System Acceptance Certificate. The Town of Athol will sign the Conditional System Acceptance Certificate within ten (10) business days. Upon successful completion of Conditional System Acceptance, the initiation of the Warranty Period will begin. Punch list items that do not materially affect operation of the radio system or its sub-systems will not hinder conditional system acceptance.

4.4.10 Final System Acceptance

The Town of Athol will provide "Final System Acceptance" upon successful completion of Conditional System Acceptance, all programmed subscriber units have been issued to all departments, all project punch list items are resolved and approved, all submittals (including as-

built documentation, maintenance & operational manuals, etc.) are delivered and accepted, and all services have been satisfactorily performed. Upon Final System Acceptance, the CONTRACTOR will promptly memorialize this event by providing a Final System Acceptance Certificate. Town of Athol will sign the Final System Acceptance Certificate within ten (10) business days. Upon written approval by the Town of Athol of Final System Acceptance all remaining monies will be released to the CONTRACTOR, and the project will be closed.

4.5 Subscriber Equipment Programming, Installation, and Issuance

4.5.1 Subscriber Equipment Programming

The CONTRACTOR shall develop templates based on the fleet map in coordination with the Town of Athol and program subscriber units. The CONTRACTOR shall include a second touch programming for all subscriber units to include control stations.

4.5.2 Mobile Radio Equipment Installation

The CONTRACTOR shall install all new mobile units, vehicular equipment, chargers, and requested accessories. Installation responsibilities shall include removal, as required, of existing equipment after system cutover.

4.5.3 Control Station Equipment Installation

The CONTRACTOR shall install all new control station equipment with transmission line, antennas, remotes (if required), and requested accessories. The Town of Athol will provide the exact location for equipment to the CONTRACTOR and coordinate installation.

4.6 Documentation

4.6.1 Standard Manuals

The CONTRACTOR shall provide operational and maintenance manuals for each model of fixed equipment with shipment within the timeframe identified in Table 4-1. The required quantities are as follows:

Number of Units Purchased	Number of Manuals Required
≤20	Three (3) hard copies One (1) electronic copy
>20	One (1) additional hard copy for each ten (10) additional units

Manuals shall be complete, self-contained and of the same revision level as the equipment provided.

The CONTRACTOR shall provide the Town of Athol with an electronic subscription to the latest equipment manuals and technical service bulletins for a period of five (5) years after system acceptance.

4.6.2 Physical Facilities As-Built Documentation

The CONTRACTOR shall submit two (2) draft hard copies of all facilities as-built documentation to the Town of Athol for review and approval within the timeframe identified in Table 4-1.
Physical facilities/site construction as-built drawings include, but are not limited to, the following:

- Site layout drawings
- Floor plans
- Site grounding drawings
- Building elevation detail drawings with foundations
- Building layout drawings
- AC and DC electrical distribution drawings
- Site utility connection details
- Fence installation details
- Foundation details for shelter, towers, and LPG tank
- Site lighting details
- Fire detection/suppression system drawings
- Tower design detail drawings including light controller wiring
- Antenna, combiner, coax line and antenna placement drawings
- Equipment layout drawings
- Equipment/rack elevation profiles
- Console operator position layout drawings
- Equipment shelter plan: providing AC distribution, lighting, grounding, HVAC, and cable ladder details

The CONTRACTOR shall provide the following quantity of final physical facilities as-built documentation within the timeframe identified in Table 4-1:

- One (1) set per system site in hard copy
- One (1) set per agency (3) in hard copy
- One (1) set in soft copy as PDF files

4.6.3 System Maintenance Documentation

The CONTRACTOR shall provide system maintenance documentation to allow a properly trained technician to understand, configure, maintain, troubleshoot, and repair the radio system. System maintenance documentation includes, but is not limited to the following:

- System operational description, including a description of the function of each major system component, circuit types and signal flow between system components
- System interconnection drawings and block diagrams depicting system architecture

- Numbering and labeling of all interconnecting cabling
- Pin-out of all cabling connectors
- Numbering and labeling of all connections to punch blocks
- System interconnection and installation documentation as required for vendor equipment and/or physical facilities
- Complete list of all major fixed equipment by model number and revision code and installed firmware/software with revision (configuration control) numbers
- A chart or list of software and firmware version numbers, programming parameters and jumper configurations as they apply
- Record of any telephone circuits interconnected with the equipment by circuit number and telephone number
- System level setting procedures and a log of level settings for all control circuits
- Measured levels of alignment, including level-setting block diagrams and logs of all level settings necessary for setup, alignment, and maintenance activities
- Standard operations and maintenance manuals for all equipment and systems
- Equipment floor layouts and rack elevations
- Detailed HVAC heat load and electrical load calculations

The CONTRACTOR shall provide the Town of Athol with two (2) hardcopy sets of draft system maintenance documentation within the timeframe identified in Table 4-1.
The Town of Athol will provide comments, recommendations, and corrections to the system maintenance documentation.

The CONTRACTOR shall address these comments, recommendations, and corrections to the satisfaction of the Town of Athol.

The CONTRACTOR shall provide the following quantity of final system maintenance documentation within the timeframe identified in Table 4-1:

- One (1) set per system site in hard copy
- One (1) set per agency (3) in hard copy
- One (1) set in soft copy as PDF files

4.6.4 Subscriber Documentation

The CONTRACTOR shall supply the following with each subscriber unit purchased:

- One (1) standard operator's manual
- One (1) customized quick reference, a small, laminated guide that can be referenced in the field
- One (1) customized quick reference customized for the Town of Athol's radio system

In addition, the CONTRACTOR shall supply three (3) copies of each manual or reference documentation in electronic format.

During warranty and subsequent maintenance contracts, the CONTRACTOR shall supply addenda as needed to the standard operator's manual and standard quick reference.

4.7 Training

The CONTRACTOR shall work with the Town of Athol to develop a training plan. The plan may include training materials, manuals, schematics, and other documentation within the timeframe identified in Table 4-1.

The plan may include customized radio user and console operator training and training materials, including any quick-reference guides, to the Town of Athol's system configuration. Provide draft training materials, within the timeframe identified in Table 4-1, for the Town of Athol's review and approval.

The Town of Athol will review radio user and console operator training course content and materials and provide comments. When all comments have been addressed, the Town of Athol will approve course content and materials prior to beginning class sessions.

The use of audio and visual aids, as well as actual equipment demonstrations, is required for all courses. The Town of Athol will not accept a course consisting primarily of a trainer lecturing trainee.

The CONTRACTOR may provide professionally produced training manuals to all students. The training manuals shall be furnished to the Town of Athol for continuing education purposes. The manuals shall contain clean, legible copies of all written material and visual aids used by the instructor.

4.8 Warranty and Maintenance

4.8.1 Warranty

4.8.1.1 Infrastructure Warranty

The CONTRACTOR shall warranty the systems, equipment, software, and services provided under the Contract against failures, errors or defects in operation, materials, and workmanship for a period of at least one (1) year after Conditional System Acceptance.

The CONTRACTOR shall warranty all standard physical facilities, e.g. new constructed towers, shelters, generators, HVAC, etc. The CONTRACTOR shall provide a list of physical facilities and equipment that will offer standard warranty beyond one (1) year. (As an example, new towers should include standard five (5) years warranty.)

The CONTRACTOR shall repair, replace, or otherwise correct defective systems, equipment, or software during the warranty period at no cost to the Town of Athol. If a device fails more than twice during the warranty period, the CONTRACTOR shall explain such failures to the Town of Athol. If these failures indicate the equipment is prone to continuing failures, the CONTRACTOR shall replace such equipment at no cost to the Town of Athol.

4.8.1.2 Subscriber Warranty

The CONTRACTOR shall warranty subscribers for three (3) years after final system acceptance. The CONTRACTOR shall repair, replace, or otherwise correct defective equipment or software during the warranty period at no cost to the Town of Athol.

If a subscriber fails more than twice during the warranty period, the CONTRACTOR shall explain such failures to the Town of Athol. If these failures indicate the subscriber is prone to continuing failures, the CONTRACTOR shall replace the subscriber at no cost to the Town of Athol.

4.8.1.3 MANDATORY OPTION: Subscriber Additional Warranty

The CONTRACTOR shall offer an additional three (3) year subscriber warranty at a reasonable cost.

4.8.2 New Equipment Purchases

Equipment purchased after system acceptance shall be covered by its particular warranty period. When new equipment is purchased the maintenance contract will be amended to include the new equipment on a prorated basis from the date of installation to the expiration of the term of the maintenance contract in place at that time.

4.8.3 Annual Maintenance Contract

The CONTRACTOR shall provide maintenance for radio system and connectivity network infrastructure equipment and software provided under this contract.

4.8.4 Maintenance Services

The CONTRACTOR shall provide the following maintenance services during the warranty and subsequent maintenance periods.

4.8.4.1 Hardware Maintenance

4.8.4.1.1 Service Plan

The CONTRACTOR and the Town of Athol shall develop a service plan that includes the following:

- Contact names and phone numbers
- Procedures for reporting service problems
- Procedures for reporting problem resolution
- Escalation procedures

4.8.4.1.2 Infrastructure Preventive Maintenance

The CONTRACTOR shall provide regularly scheduled preventive maintenance as recommended by equipment manufacturer(s). Performance of systems and equipment shall be maintained to original specifications.

Preventive maintenance that may affect normal operation of the system shall be performed at a time agreeable to the Town of Athol and may be outside regular business hours at no additional expense to the Town of Athol.

Verification of simulcast alignment shall be performed on a routine basis.

4.8.4.1.3 MANDATORY OPTION: Subscriber Preventive Maintenance

The CONTRACTOR shall provide regularly scheduled preventive maintenance as recommended by equipment manufacturer(s). Performance of subscriber units shall be maintained to original specifications.

Preventive maintenance that may affect normal operations shall be performed at a time agreeable to the Town of Athol and may be outside regular business hours at no additional expense to the Town of Athol.

4.8.4.1.4 MANDATORY OPTION: Subscriber Maintenance

The CONTRACTOR shall pick up defective subscriber units from a central location, be responsible for repairing units, and is responsible for providing any parts necessary for repair. If the unit cannot be repaired, CONTRACTOR will provide a new unit equivalent or better at no additional charge.

4.8.4.2 Emergency Service

Emergency service is reactive maintenance to address any loss of functionality in the radio infrastructure and its supporting equipment.

4.8.4.2.1 Availability

Emergency service shall be available twenty-four (24) hours a day, seven (7) days a week, including weekends and holidays.

4.8.4.2.2 Response Times

A qualified technician shall respond to requests for emergency service within the following time frames:

Failure Type	Time of Notification	Response Time
Major Failure	Any time	Technician shall respond remotely within two (2) hours. If a problem cannot be resolved remotely, a technician shall respond to the location of failure within four (4) hours
Minor Failure	00:00-12:00	Same business day – overtime if needed
Minor Failure	12:01-24:00	Next business day – start job in the morning

Response times are measured from the time the failure is reported. No equipment shall be out of service more than twenty-four (24) hours after failure notification.

The following are considered major failures:

- loss of functionality of any entire site
- failure of the alarm system to report any alarms within its designed alarm reporting cycle
- a continual bit error rate (BER) greater than 1E-6 on any link in the radio system's connectivity network
- a continual packet loss on any link in the radio system's connectivity network
- a loss of signal on any microwave hop

A minor failure is any failure not classified as a major failure.

4.8.4.3 Software Maintenance

4.8.4.3.1 Corrective Upgrades

The CONTRACTOR shall provide at no additional cost corrective upgrades to system and subscriber software when such upgrade if not performed will keep the system from meeting the requirements of this RFP. The availability and frequency of corrective upgrades shall be at the discretion of the CONTRACTOR.

When upgrades are made available to the Town of Athol, the timing to apply these upgrades will be at the sole discretion of the Town of Athol. If deemed necessary by the Town of Athol, the CONTRACTOR shall perform software upgrades during evenings or weekends at no additional cost to the Town of Athol.

This covers only upgrades by the CONTRACTOR or through its designated Original Equipment Manufacturer (OEM) or Software Provider that are:

- remedies for defective software
- remedies for security vulnerabilities
- new releases that are corrective revisions for earlier versions

The CONTRACTOR shall ensure that software upgrades do not have a negative impact on other components of the system.

4.8.4.3.2 New Software Release Enhancements

New software releases that contain enhancements (i.e., new features and capabilities) may be offered for purchase at agreed pricing.

The CONTRACTOR shall make every effort to separate corrective revisions from enhancements. If it is unable to do so, and new releases are necessary to correct problem(s), then the entire release (including enhancements) shall be provided to the Town of Athol at no additional cost.

4.8.4.3.3 MANDATORY OPTION: Software Update Enhancement Subscription

The CONTRACTOR shall provide, as an add-on to the maintenance contract, a software update subscription service to keep Town of Athol's equipment operating at the latest version of software.

4.8.4.3.4 Backup Media and Manuals

Backup electronic media and revised software manuals shall be provided at the time of any software revision to the Town of Athol at no additional cost.

All system definition parameters and other unique information (data base) used to operate the system or associated subsystems shall be backed up onto removable media on a quarterly basis during the maintenance period by the CONTRACTOR. This media shall be turned over to the Town of Athol for safe, off-site storage. Backup functions shall be designed to run in an unattended mode with no requirement to change media during the process.

4.8.5 Service Organization

Warranty and maintenance service shall be performed only by properly trained and authorized maintenance personnel.

The CONTRACTOR or authorized service organization(s) shall maintain comprehensive installation and instruction manuals for all system equipment. These manuals shall be the property of the Town of Athol and shall revert to them at such time as the Town of Athol assumes the maintenance responsibility for the system.

4.8.6 Service Records

The CONTRACTOR shall document all services performed on the system. For each maintenance service, the documentation shall include the following:

- Time started
- Location
- Name, telephone number and e-mail address of technician providing service
- Service performed

- Parts required to perform service
- Time finished

For each emergency service, the documentation shall include the following:

- Time problem was reported
- Name, telephone number and email address of person reporting problem
- Name, telephone number and email address of technician responding to problem
- Time technician responded to problem
- Description of problem
- Description of problem resolution
- Parts or repairs required to resolve problem
- Time problem was resolved, and resolution was reported to the appropriate Town of Athol contact

Service records shall be available for Town of Athol's inspection upon request. Records shall be maintained by the service organization for the duration of system warranty and any follow-on maintenance contracts and shall revert to the Town of Athol upon termination of the warranty or maintenance contract.

4.8.7 Spare Parts

A sufficient supply of spare parts shall be stored at a location to be determined by the Town of Athol, to allow immediate restoration of minimal operation of the system on a rolling repair-and-return basis. Other parts shall be available via emergency request and air freighted within twenty-four (24) hours of the equipment failure. The CONTRACTOR may draw upon this spares inventory as necessary during the warranty/maintenance period, replacing equipment as it is used.

At the end of the maintenance contract, the full complement of spares shall be delivered to the Town of Athol in a repaired condition.

5 General System Requirements

5.1 Scope

The requirements of this section apply to all systems, equipment and software specified in this RFP.

5.2 Deviations from the Specifications

Systems, equipment, and software shall be based upon the latest technology and communications industry standards. The specifications in this RFP are meant to define a level of functionality without being overly restrictive. Deviations from the specifications may be allowed if they (1) will improve operational capability, maintainability, or technical quality; or (2) diminish the propensity toward obsolescence.

5.3 Brand Names

The use of brand names in this specification is intended to establish minimum performance standards and is not intended to be restrictive. The PROPOSER may propose alternate but equal equipment. Proposals using alternate but equal equipment shall be accompanied by point-by-point specification comparisons demonstrating the proposed equipment indeed equals or exceeds the specified equipment in all areas germane to the operational requirements of the RFP.

Any specification requirements that cannot be readily verified based on provided equipment data sheets, may be treated as exceptions during the evaluation.

5.4 System Reliability

5.4.1 Single-Point Failures

Failure of a single device or component (a single-point failure) within the communications system shall not reduce the ability of the system to provide the required communications under routine operational conditions.

5.4.2 Multi-Point Failures

Simultaneous failures of multiple devices or components within the system (a multi-point failure) may reduce the ability of the system to provide communications under routine operational conditions, but the system shall be designed to degrade gracefully, providing at least minimal communications under these conditions.

5.5 General Equipment Specifications

5.5.1 New Equipment

Equipment shall be the latest version of new, standard equipment.

5.5.2 Environmental Specifications

All fixed equipment must meet the following environmental specifications:

Condition	Specifications	
	Indoor	Outdoor
Operational Temperature	+5° to +40° C	-30° to +60° C
Operational Relative Humidity	10 to 90% Non-condensing	0 to 100% Condensing

5.5.3 Equipment Power Requirements

All sites involved in the system have or will have available 120/240 VAC, three-wire, single-phase or 120/208 VAC four-wire, three-phase, 60 Hz electric service. All fixed equipment power supplies, rectifiers or battery chargers must be compatible with the electric service available.

5.5.4 Equipment Grounding

The CONTRACTOR shall ground its equipment to the site ground system in accordance with ANSI J-STD-607-B.

5.5.5 Surge Protection

The CONTRACTOR shall furnish and install surge protective devices (SPDs) on all electrical, communications and control circuits connected to its equipment in accordance with ANSI J-STD-607-B. Where SPDs are or will be provided by others, the CONTRACTOR shall verify the suitability of these SPDs for its equipment. If these SPDs are suitable, the CONTRACTOR is not required to install additional SPDs.

5.5.6 FCC Part 15 Devices

All electrical and electronic equipment must comply with the standards for unintentional and incidental radiators found in 47 CFR 15, “Radio Frequency Devices.”

5.5.7 Proprietary Equipment

The system shall be based as much as possible upon commercial off-the-shelf (COTS) servers, workstations, routers and switches, and associated operating system software. Athol desires the ability to replace this equipment with commercially available equipment, in the event of an emergency.

Specifications for the identified equipment and software must be provided with the system maintenance documentation.

5.5.8 Security Risk FCC Designated Equipment

Pursuant to the Secure and Trusted Communications Networks Act of 2019. The PROPOSER shall not propose any equipment from the vendors listed on the FCC's *List of Equipment and Services Covered by Section 2 of The Secure Networks Act.* FCC Section 1.50002 directs the Public Safety and Homeland Security Bureau to publish a list of communications equipment and services (Covered List) that are deemed to pose an unacceptable risk to the national security of the United States or the security and safety of United States persons. The Covered List and more information on how the Covered List are compiled and updated can be found in the Commission's rules at 47 C.F.R. § 1.50000 *et seq.* Athol will not accept any equipment from vendors on the Covered List, as part of the proposed system.

5.6 Software and Hardware Versions

Versions of software and hardware must be the latest publicly released versions or revisions at completion of system staging.

5.7 Computer and Network Security

Multi-layered security solutions shall be implemented to minimize the risk that a security incident will reduce the ability of the system to provide the required communications under routine operational conditions.

5.7.1 Computer Security

Computers integrated into the system must be configured and equipped to minimize risk to the reliability and availability of the system. All computers running a standard operating system shall be protected with anti-virus software. This requirement includes configuration, software, and documentation. The CONTRACTOR shall work with Athol to ensure all installed equipment follows the Athol network security measures.

5.7.2 Network Security

5.7.2.1 Authentication

All network elements (servers, workstations, routers, switches, etc.) that allow access through the network must support username and password authentication. Elements shall support, at a minimum, ten-character complex passwords. Passwords shall expire, at most, every 90 days.

5.7.2.2 Ports and Protocols

The CONTRACTOR shall supply port and protocol information for all devices connecting to the radio system network at the Design Review (DR). The information must be of sufficient detail to support the creation of default deny filtering in network and security equipment. The CONTRACTOR shall support troubleshooting and resolution of issues associated with the supplied information.

5.8 Installation

Equipment and physical facilities must be installed in a neat and professional manner, employing the highest standard of workmanship and in compliance with applicable standards. All sites must be left in a neat, presentable condition throughout the installation phase of the project. All rubbish, temporary structures, and equipment generated or used by the CONTRACTOR must be removed after completion of the work, and prior to acceptance.

5.8.1 Calibration of Test Equipment

All measuring and test equipment used for installation and/or acceptance testing must be part of a documented calibration program. Calibration must be traceable to the National Institute of Standards and Technology (NIST). The following equipment must be included in the calibration program:

- oscilloscopes
- service monitors
- spectrum analyzers
- network analyzers
- frequency counters
- signal generators
- multimeters used for quantitative measurements
- wattmeters
- time-domain reflectometers
- RF return-loss bridges
- torque wrenches used where torque wrenches are required

5.8.2 Racks and Cabinets

Except for small ancillary equipment (such as dehydrators, coaxial surge suppressors, modems, or punch blocks) and computer equipment for human interface to the radio system (such as consoles and network management system workstations), all fixed communications equipment must be mounted in cabinets or racks.

Cabinets must be suitable for the environment in which they are installed (e.g., NEMA Type 3R or 4X for outdoor installations exposed to rain, sleet, and snow). Shelters or equipment rooms must have appropriate environmental controls (HVAC) for the installed equipment and the environment in which they are installed. Cabinets must be equipped with locking doors or panels.

Racks must meet the requirements of current revision EIA/ECA-310. Racks and cabinets shall be designed and installed to provide easy access to equipment controls and connection points.

5.8.3 Rack and Cabinet Installation

All equipment racks and cabinets must be securely mounted to the floor. If necessary, racks or cabinets must be bolted together or braced from the ceiling to prevent swaying or being

dislodged. Racks must be isolated from floors and ceilings using suitable insulators, insulating plates, washers, and sleeves.

Equipment racks and cabinets must be placed to allow a minimum of thirty-six (36) inches access front and back unless all connection and maintenance points are in the front. Under no conditions shall an equipment rack or cabinet need to be moved for maintenance after installation.

5.8.4 Electromagnetic Exposure

All sites must be designed, protected, and posted to meet the limits for both public and occupational human exposure to radio frequency (RF) electromagnetic fields in accordance with FCC rules and FCC OET Bulletin 65.

Where required by 47 CFR §1.1307(b), the CONTRACTOR shall provide to Athol a statement of compliance with the electromagnetic exposure limits found in 47 CFR §1.1310 for each licensed radio system site within the timeframe identified in Table 4-1.

5.8.5 Labeling

All cables and wiring between equipment must be clearly labeled at both ends indicating source and destination equipment, connector designation and termination points.

5.9 Contractor Commitment

The CONTRACTOR shall maintain and upgrade the operational software to its most recent revision level prior to cutover, upon approval of Athol. There shall be no requirement on Athol's part to incorporate any new features. The Contractor shall provide equipment software patch, upgrade or release notes.

Any change shall have minimal impact on system operations, or the cost shall be assumed by the CONTRACTOR.

6 Radio System

6.1 New System Description

6.1.1 Radio System

Athol needs to implement a new UHF Conventional radio that meets Project 25 standards. Dispatch consoles shall be installed at the PSC. Each proposal shall provide radio coverage, traffic load, and all requirements to meet specifications.

6.1.2 Radio Sites

A list of existing radio sites is provided in Table 9-1 Section 9 Physical Facilities Requirements. The PROPOSER may recommend other sites not listed in the table for inclusion in the system design based on the following criteria:

- Radio coverage
- Connectivity network availability
- Facility availability
- Licensing and permitting
- Physical access
- Availability of electric power
- Cost

6.1.3 Frequency Plan and Traffic Loading Analysis

The CONTRACTOR shall develop and recommend a frequency plan for the radio system based upon a traffic loading analysis and identify the most appropriate frequencies for its system design Athol requires:

- **Busy Hour Impact** – Must measure the **busiest hour** in a year to use mobiles, portables, desktop radios and consoles

The CONTRACTOR shall use the initial number of radios (mobiles, portables, desktop radios and consoles) for all Departments and Agencies from Athol listed in Appendix D Price Proposal Workbook and project the future growth for fifteen (15) years after Final System Acceptance. Athol estimates 1% growth per year; so, the CONTRACTOR shall multiply the initial number of radios by 1% to obtain the number of radios for traffic loading analysis.

Athol Departments and Agencies	Portables	Mobiles	Control / Desktop Stations	Consoles	Remote Console
Fire / EMS Department	51	13			
Police Department	31	11			
Public Safety Communications	4		10	3	1
Public Safety Communications Back-Up	2		4	1	
Emergency Operations Center (EOC)			2		

Table 6-1 Subscribers by agency and Dispatch Center consoles (including back-up control stations)

6.1.4 Interoperability

Athol requires interoperability channels for mutual aid, and other special events. Athol requires the ability to talk with all surrounding jurisdictions both within and outside Athol's service area.

The PROPOSER shall describe in detail and shall provide all equipment and pricing, hardware, and software, necessary to provide interoperability to each of the agencies/jurisdictions provided in the table below. The PROPOSER shall provide all new control stations for each of the interoperability channels required in the table below. Interoperability control stations for neighboring jurisdictions can be shared if the channels can be changed remotely by the dispatch consoles. (i.e. Petersham PD and FD can use the same interoperability control station)

Interoperability Channels					
Channel Name	Existing / New	Frequency Band	System Type	Analog / Digital	Conventional / Trunked
Athol DPW	EXISTING	VHF	SIMPLEX	A	CONVENTIONAL
LPS-7	NEW	800	REPEAT	A	TRUNKED
D8 - Midstate	EXISTING	UHF	REPEAT	A	CONVENTIONAL
CMED	NEW	UHF	REPEAT	A	CONVENTIONAL
Petersham PD	NEW	800	REPEAT	A	TRUNKED
Petersham FD	EXISTING	VHF	REPEAT	A	CONVENTIONAL
New Salem PD	NEW	800	REPEAT	A	TRUNKED
New Salem FD	NEW	800	REPEAT	A	TRUNKED
Orange PD	NEW	800	REPEAT	A	TRUNKED
Orange FD	NEW	800	REPEAT	A	TRUNKED
Phillipston PD	EXISTING	UHF	REPEAT	A	CONVENTIONAL
Phillipston FD	EXISTING	UHF	REPEAT	A	CONVENTIONAL
Royalston PD	EXISTING	UHF	REPEAT	A	CONVENTIONAL
Royalston FD	EXISTING	UHF	REPEAT	A	CONVENTIONAL
Lifeflight (VTAC11)	NEW	VHF	SIMPLEX	A	CONVENTIONAL

Table 6-2 Athol Interoperability Channels

6.1.4.1 Interoperability Channel Recording

All interoperability channels shall be recorded by the logging recorder at the PSC. Describe how the proposed interoperability solution will interface with the logging recorder. PROPOSER shall include all costs for hardware/software required to interface the interoperability solution to the logging recorder.

6.2 Features and Functions

6.2.1 Unit Identifiers

The system shall support at least four thousand (4,000) non-fixed consoles and subscriber units, each with a separate discrete numeric identifier (ID). When a unit transmits, its ID shall be displayed at properly equipped consoles and subscriber units.

6.2.2 Emergency Access

Emergency access shall be by means of an emergency button on the unit. Depressing the emergency button:

- Preemptive audio and visual emergency notification to a continuously manned dispatch position and/or other subscriber units within 0.5 second will be ensured.

6.2.3 MANDATORY OPTION Encryption

6.2.3.1 Encryption Algorithms and Keys

The system and designated subscriber units shall be equipped with AES encryption.

6.2.3.2 End-to-End Encryption

The system shall provide end-to-end encryption, i.e., there shall be no point between a sending unit and receiving unit, whether subscriber unit or console, where an encrypted message is decrypted and transported unencrypted. If the radio system infrastructure equipment and the consoles are in the same building, it is acceptable to transport unencrypted audio between the consoles and infrastructure equipment provided that the equipment room is inside the secured PSC.

6.2.4 Station Identification

The system shall use an automatic means to conform to FCC requirements regarding station identification.

6.3 Performance

6.3.1 System Throughput Delay

System throughput delay is the time from the transmission of an audio signal into a transmitting digital radio microphone to reception of the identical audio signal from a receiving digital radio speaker. The system throughput delay shall be less than the following:

- 250 ms for direct radio-to-radio communications
- 350 ms for direct radio-to-radio communications through a single repeater station

6.3.2 Interference

6.3.2.1 Self-Interference

The radio system shall not cause self-interference. At each radio site, the static sensitivity of each radio system receiver shall be degraded by no more than 3 dB with any combination of radio system transmitters in operation.

6.3.2.2 Interference to Collocated Equipment

The radio system shall not cause interference to incumbent collocated RF equipment within one thousand (1000) ft of the new radio system equipment.

6.3.3 Radio System Reliability

6.3.3.1 System Failure Modes

All possible system failure modes shall be defined in the system's operational capabilities and limitations:

- Master oscillator failure
- Voter/comparator failure
- Interconnection circuit failure
- Transmitter failure
- Receiver multicoupler failure

6.3.4 Radio System Coverage

6.3.4.1 Service Areas

The radio system shall provide coverage in the service areas shown in Figure 6-1.

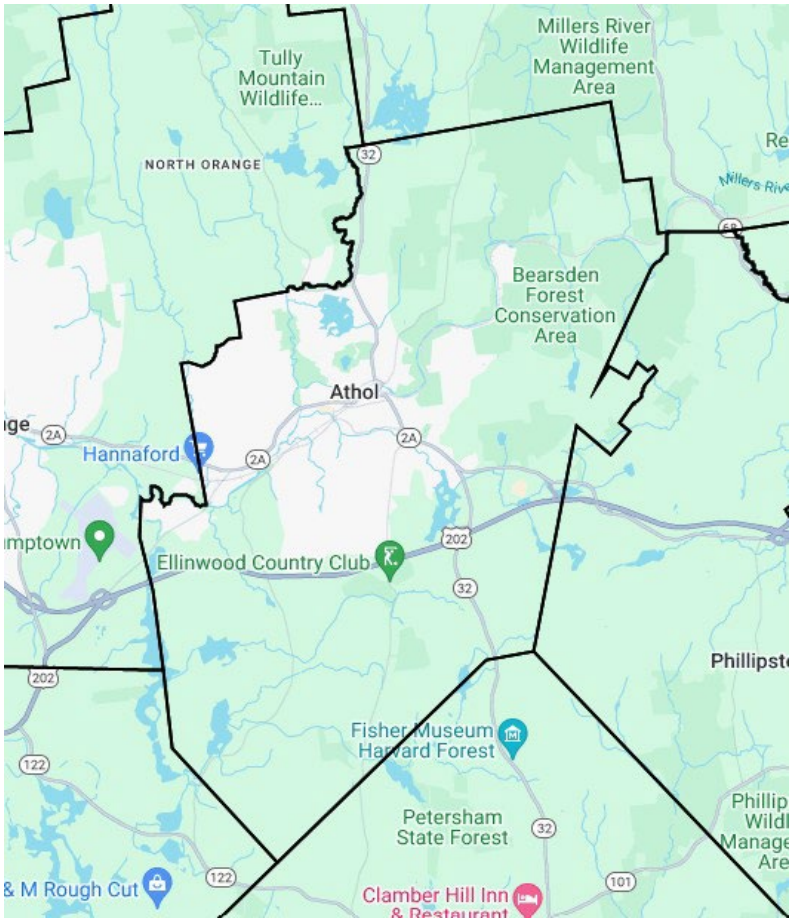

Figure 6-1 Athol Service Area

The Athol service area is shown above. The Athol service area includes the entire town limits for the Town of Athol. The level of signal loss required for indoor portable service areas is provided in the table below Building Attenuation.

6.3.4.2 Building Attenuation

The suburban, urban/suburban, and urban service areas require coverage to and from portable radios in heavy, medium, and light buildings within the defined service area. The following building attenuations are assumed:

Service Area	Building Characterization	Building Attenuation (dB)
Mobile Outdoor	Outdoor	0
Portable Outdoor	Outdoor	0
Portable Light Building	Light Building (Information Only)	10
Portable Medium Building	Medium Building (Information Only)	15

Table 6-3 Building Attenuation for Service Areas

6.3.4.3 Required Coverage Level

The radio system shall provide a minimum delivered audio quality (DAQ) of 3.4 to the receiver in both the talk-out (base to portable) and talk-in (portable to base) directions. DAQ is defined in Telecommunications Industry Association (TIA) Telecommunications Systems Bulletin TSB-88.1-F, *Wireless Communications Systems – Performance in Noise and Interference-Limited Situations – Recommended Methods for Technology-Independent Modeling, Simulation, and Verifications*.

For test sectors requiring portable radio coverage, talk-in and talk-out coverage shall be based on the portable radio mounted at waist level.

6.3.4.4 Service Area Reliability

The radio system shall provide the specified service area reliability (as defined in TSB-88.1-F) to the service area and radio transmission direction (talk-out and talk-in) as follows in the Table 6-6 below.

Service Area	Conditions	Talk-Out	Talk-In
		Service Area Reliability	
Portable Outdoor	Portable on the Hip Outdoors	95%	95%

Table 6-4 Service Area Reliability Requirements

The PROPOSER shall provide a percentage guarantee for the service area as described in the Table above. There is no time availability aspect to this specification. The PROPOSER is independent and may choose its propagation model, terrain database, statistical prediction method, and coverage charts. Areas of TDI shall be displayed as not having coverage and shall not be represented as a separate color on provided maps.

PROPOSERS shall provide separate unbounded coverage maps for each service area and direction (talk-out and talk-in) to support your guarantees. Include your propagation model(s), identify radio models, site locations (longitude, latitude, elevation, Tx and Rx antennae AGL), and detailed parameters.

Also provide the following unbounded coverage maps (for information only) with your proposal:

- Mobile Talk-out and Talk-in Coverage
- Portable Light Building (10 dB) Building Talk-out and Talk-in Coverage
- Portable Medium Building (15 dB) Talk-out and Talk-in Coverage

6.3.4.5 MANDATORY OPTION: In-building BDA

Athol understands the radio system may not provide portable radio coverage inside some medium and heavy buildings. As an option, please provide cost information for equipment and installation of a Bi-Directional Amplifier (BDA) for the following three (3) scenarios:

- Single Story Box Store (Walmart, Lowe's, etc.)
- Multi-story Building (Apartment Complex, Hotels, Schools, etc.)
- Hospital/Prison/Airport

6.4 Radio System Equipment

Equipment shall be of the highest quality, most durable public-safety-grade equipment available. Equipment shall meet or exceed current standards of the Electronic Industries Alliance (EIA) and the Telecommunications Industry Association, and the rules and regulations of the Federal Communications Commission (FCC), in addition to these specifications.

The absence of detailed specifications implies the best general practice will prevail, and high-quality material and workmanship will be applied.

6.4.1 Base Station

Base stations shall meet or exceed the performance requirements of a Class A transceiver as defined in the following standards:

- ANSI/TIA-603-E, *Land Mobile FM or PM Communications Equipment Measurement and Performance Standards*; and
- ANSI/TIA-102.CAAB-E, *Project 25 Land Mobile Radio Transceiver Recommendations, C4FM/CQPSK Modulation*.

6.4.2 Voting Comparator

Voting comparators shall vote both voice and data transmissions. Digital voting comparators shall select the best received signal based on bit error rate (BER). The digital voter shall be capable of selecting the best signal on a frame-by-frame basis.

6.4.3 Antenna Systems

The following minimum specifications, for each fixed antenna system proposed, shall be provided:

- Antenna mounting height and location on tower
- Antenna type and gain

- Transmission line type and loss
- Combining and multi-coupling network

6.4.3.1 Transmission Lines and Antenna System Accessories

Transmission lines shall be one (1) continuous length with a copper conductor and weatherproof jacket. All RF connectors shall be installed in accordance with their manufacturer's installation requirements.

All RF connectors shall be weathertight gold- or silver-plated contacts. All connectors shall be torqued to the manufacturer's specifications using a torque wrench. All connectors shall be soldered, not crimped. Manufacturer-approved wrapping and sealer shall be utilized on all outdoor transmission line in-line and grounding connections to prevent water intrusion. Outdoor installations shall include the proper minimum diameter drip loops in all cabling. Transmission lines shall be securely fastened to a cable tray or ladder attached to the tower using manufacturer approved devices and methods. Mounting hardware, cable hangers, grounding kits and other miscellaneous items shall be supplied to ensure proper installation of the antenna and transmission line. All metal components shall be intrinsically corrosion resistant. A hoisting grip shall be used at the top and at manufacturer recommended intervals to provide strain relief.

6.4.3.2 Transmit Combiners

Combiner insertion loss shall not vary from specifications by more than 0.5 dB on any port.

6.4.3.3 Receiver Multi-couplers

Each unused multi-coupler port shall be terminated with a 50-ohm load.

6.5 Paging System

6.5.1 P25 Paging System

Athol currently operates a UHF paging system. The system uses 1 UHF channel transmitted from High Knob Water Tank to the Public Safety Communications Center.

The CONTRACTOR shall provide paging services via the UHF P25 Conventional Radio System, including any additional infrastructure equipment, hardware, licenses, and tone/paging encoder necessary. Paging shall be able to be initiated from any console at either the Public Safety Communications Center or the Backup Public Safety Communications Center.

6.5.2 UHF Paging Building Attenuation

The Portable Outdoor and Portable Light Building service areas require coverage to pager outdoors and in light buildings within the defined service areas. The following building attenuations are assumed:

Service Area	Building Characterization	Building Attenuation (dB)
Portable Outdoor	Outdoor	0
Portable Light Building	Light Building	10

Table 6-5 UHF Paging Building Attenuation for Service Areas

6.6 Console System

6.6.1 Console Quantities

Athol currently operates three dispatch consoles located in the PSC.

Athol requires replacement of all existing dispatch consoles with new P25 dispatch consoles. The new dispatch consoles will interface with the conventional channels described in Table 6-2. The console system will also support instant recall recorders (IRRs) and interface with the customer's existing Equature logging recorder.

New consoles and all necessary ancillary equipment needed to meet the requirements of this RFP should be provided with the new P25 radio system.

6.6.2 Console System Configuration

The new console system shall maintain and provide the functionality of existing systems and equipment to the same level of performance as the existing configuration.

The new dispatch consoles will interface with the conventional channels described in the Athol Interoperability Channel Table.

New dispatch consoles shall be installed at the following locations:

PSC Location	Quantity of New Consoles
280 Exchange St. Athol, MA	3
Back up PSC 2251 Main St, Athol, MA	1
TOTAL QUANTITY	

Table 6-6 Console Locations

6.6.3 Features and Functions

6.6.3.1 Conventional Radio Channels

The new console system must interface with existing conventional channels and provide the same level of operation as the existing console system. The conventional channels must be capable of being patched.

6.6.3.1.1 Tone Remote Control

The console system shall be equipped with tone remote control capability. The system shall be compatible with industry-standard tone remote control protocols.

6.6.3.1.2 E&M Signaling

The console system shall be capable of E&M signaling to control any conventional radios, if necessary.

6.6.3.1.3 System Guard Tone

A system guard tone shall be available for the conventional radios. All modules shall be capable of generating EIA tone sets, which may be required for special purposes. In compliance with FCC regulations, if control circuit facilities should be lost, the system shall be designed such that the base station transmitter ceases transmitting within five hundred (500) milliseconds.

6.6.3.2 Backup Control Stations

Each console position shall be equipped with one (1) full-featured backup control station. The control station may be located at the console position, or a remote controller may be located at the console position with the control station in a separate equipment room.

6.6.3.3 Instant Recall Recorder

Each console shall be equipped with an instant recall recorder (IRR). The IRR shall be capable of recording radio communications from the selected channel. If telephone communications are performed through the console headset, the IRR shall be capable of recording audio from telephone communications. The IRR shall be capable of storing at least thirty (30) minutes of audio. IRR audio shall be replayed through the console select speaker.

The IRR shall be equipped with the following features:

- Fast forward and reverse
- Simultaneous record and playback

6.6.3.4 Paging Encoder

The console system shall be equipped with integrated paging encoder capabilities and support the two-tone sequential paging format. The encoder shall be capable of initiating a single page or multiple pages at once. The console operator shall be able to review paging sequences before transmission is initiated. Paging sequences shall be queued while other paging sequences are being transmitted. An indication shall be provided at the console to indicate when a paging sequence is complete.

6.6.3.5 MANDATORY OPTION: Auxiliary Inputs and Outputs

The console system shall be equipped with auxiliary inputs and dry contact relay outputs (Aux I/Os) for doorbells, door controls and remote alarms. Auxiliary inputs shall be visible at each console. Auxiliary outputs shall be operable at each console position. The system shall be equipped with at least eight (8) inputs and eight (8) outputs.

6.6.3.6 Concurrent Console Operation

Allowances shall be made for parallel console operation with the existing radio system and the new radio system until complete conversion to the new radio system.

6.6.4 Console Equipment

6.6.4.1 Physical Configuration

Console equipment shall be installed in the existing PSC and at the backup PSC.

The individual consoles shall be modern workstations with CPU and audio cabinets, as necessary. Console monitors shall use flat-panel technology. Workstation CPUs shall be housed in the console furniture to maximize operator work surface.

6.6.4.2 Operator Position Hardware

The CONTRACTOR shall provide the following equipment:

Footswitch:	One (1) single pedal footswitch per console.
Microphone:	One (1) per console, high-quality microphone preferably on a pedestal.
Headset Jacks:	Two (2) headset jacks per console, below table edge mountable, automatically disconnect external microphone and select speaker, the capability to converse on the telephone using the same operator headset and jack that is used for radio conversations shall be provided. Separate volume controls shall be provided to control radio volume and telephone volume to the headsets.
Speakers:	One (1) select speaker and Three (3) unselect speaker per console, with volume controls.

6.6.4.3 Workstation

The workstation shall be mounted below the work surface, but controls shall be accessible to the console operator with minimal effort. The workstation shall use a mouse or similar pointing device. The operator can transmit using either the left or the right mouse button. The workstation shall also have a standard PC keyboard.

6.6.4.4 Flat-panel Display

The display shall be a 24-in flat-panel LCD display. Minimum resolution shall be 1920 x 1080 pixels. Display controls shall be accessible to the console operator. The monitors shall be touch screen capable.

6.6.4.5 Select and Unselect Speakers

Speaker audio output shall be at least 3.5 W. Each speaker shall have its own volume control. The selected speaker shall reproduce the audio from the selected channels. The unselected speaker shall reproduce the audio from the other channels being monitored by the console.

6.6.4.6 Foot Switch

The footswitch shall permit the console operator to key the selected channel. On conventional channels, the footswitch may be programmed to disable coded squelch.

6.6.4.7 Dual Headset Jacks

Each position shall be equipped with two (2) headset jacks. Jacks shall be standard four- or six-wire connections for headsets with integrated microphones. Inserting the headset plug into either jack shall route the select audio to the headset and disable the console select speaker. Headset jacks shall interface with the existing telephone system so that dispatchers can use the same headset for telephone and radio communications.

6.6.5 Console System Operation

6.6.5.1 Console Operating Characteristics

The consoles shall be designed to enhance the operator's capabilities in performing resource management tasks and minimize the effort and concentration required for radio control. Transmitting over the displayed selected channel(s), and instant transmitting over a displayed channel shall be performed with only one (1) operator action.

To minimize operator confusion and mistakes, all channels and users shall be indicated by actual aliases, not numeric resource references. Cross-referencing a number to a channel name shall not be required when performing a dispatching operation. For maximum flexibility, these aliases shall be defined by Athol at system installation and shall be easily changed at any time after system installation. Aliases coding shall allow at least eight (8) alphanumeric characters.

6.6.5.2 Display Areas

Display screens shall be configured to minimize distractions to operators while providing access to all radio dispatch functions from a single screen. The screen shall display:

- System Status
- Radio Controls
- Call History
- Date and Time

6.6.5.3 Active Status Indicator

For each radio resource shown in the radio controls portion of the console screen, the following indications shall be available:

- Permanent indications
  - Resource Alias
  - Volume
  - Mute Status

- On-demand indications
  - Call Status
  - Select
  - Patch
  - Simultaneous Select
  - Busy
  - Multi-Frequency Transmitter
  - Squelch Disable
  - Emergency Call indication and alarms

6.6.5.4 Console Capabilities

The console shall be capable of the following operations:

- **Supervisory Control**: Allows supervisor to override or disable a console position.
- **Patch**: Allows multiple channels to be patched together. The console shall be capable of at least three (3) patches simultaneously.
- **Simultaneous Select**: Allows console operator to call multiple channels at once. The console shall be capable of at least three (3) simultaneous select groups.
- **Intercom**: Allows console operator to selectively talk to another console directly.
- **Console Cross Mute**: Prevents feedback between consoles.
- **Alert Tones**: The console shall be capable of transmitting alert tones over the radio system.
- **Console Pre-Empt**: The console shall have priority or console pre-emption transmit capabilities on conventional radio systems.

6.6.5.5 Time Synchronization

All consoles shall be synchronized to the radio system common time signal reference.

6.6.6 Remote Dispatch Consoles

Remote dispatch operations shall be supported by the Console System to allow Athol to operate console positions at locations other than the PSC. Remote dispatch consoles shall be accessible to the network by direct connection to the network or via other means, such as satellite connectivity. This shall be a fully functional console for radio dispatch. Aux I/O is not required

to be supported. It is envisioned this application could operate on an existing PC or laptop using the microphone and audio/speaker connectors of the PC.

6.7 Logging Recorder

The CONTRACTOR shall interface the existing Equature logging recorder with the new P25C radio system. The recorder shall function as a full featured recorder with the capability of recording all channels, encrypted and clear, on the radio system, conventional channels, and all the PSC's business telephone lines. The recorder shall capture full call data for each such as date and time, caller unit ID and alias, channel alias, emergency, and encrypted status. Calls shall be retrievable later by searching for date and time. The logging recorder system shall remain operational throughout the radio/console system and logging recorder transitions.

6.8 Radio Network Fault/Alarm Management

The Alarm System shall monitor the radio system and microwave network for critical and non-critical failures and status changes. The system shall be continuously and automatically monitored for failure of any key component. Any failure of a key component shall be automatically indicated on the Alarm System.

6.8.1 Alarm Points

The Alarm System shall monitor and alarm major and minor failures, abnormal conditions of operation, and status changes of the radio system and connectivity network. Alarms monitored shall include equipment failures or link failures of or to the following equipment or systems:

- Repeaters
- Antenna systems
- Control systems
- Database alarm systems
- Consoles
- Summary alarms from connectivity system
- Channel banks
- Routers
- Network switches

The above list is a minimum requirement. The Alarm System shall allow any failure or abnormal operating condition to be traced to the equipment level.

In addition to radio system alarms, the following facility alarms at each communications location are to be integrated into the Alarm System:

- Building Intrusion
- Building Low/High Temperature
- Tower Lighting
- Building Smoke/Fire
- Fire Suppression System Discharge

- Air Conditioner Failure
- Commercial Power Failure
- Generator Run
- Generator Control Switch Not Set
- Generator Low Oil Pressure Pre-Alarm
- Generator Low Oil Pressure Alarm
- Generator Low/High Coolant Temperature Pre-Alarm
- Generator Low/High Coolant Temperature Alarm
- Generator Low Fuel in Tank
- Generator Failure Summary Alarm

6.8.2 Alarm Point Inputs

The alarm system shall accommodate the following types of status inputs, at a minimum:

- Form C relay (either N/O or N/C)
- TTL
- RS-232

Where available, SNMP is the preferred method for capturing and reporting alarms to the Alarm System. Any additional third-party equipment that supports the overall communications system shall be provisioned with alarm ports that are compatible with the proposed alarm system.

6.8.3 Alarm Indication

When a major or minor failure or status change occurs, an indication shall be displayed on the alarm system terminal within thirty (30) seconds of the alarm occurrence. The alarm system terminal shall display a report for each alarm containing, at a minimum, the following information:

- Station name
- Point name
- Point status description
- Optional instruction line

Alarms shall remain active until the failure is corrected and the alarm is reset by the operator.

6.8.4 Alarm Point Attributes

The primary alarm description text field shall provide a minimum of forty (40) characters for each alarm status. A secondary alarm description field shall assign the change of state severity: Critical, Major, Minor & Status. The third field shall provide condition indicators for fail and clear, Door Open, Door Closed, etc.

The system shall be capable of classifying alarms into selectable groups such as Critical, Power Alarm Group, Generator, etc.

The Alarm System shall have independent control of whether specified alarms are displayed on the workstation screen or are directly recorded within the history file.

The system shall have the capability of assigning special resolution instructions per alarm point to provide operator directions. The operators shall have the ability to notate comments on alarm points. These comments shall be time stamped and log the operator who created the entry.

7 Connectivity Network

The connectivity network shall provide IP digital connectivity among the conventional radio system with one or more RF sites and at the Public Safety Communications (PSC). The capacity of the network links offers 100 Mbps to support the radio system. Dark fiber-optic cable may be available to link existing Athol owned radio sites and PSC.

The connectivity network shall be designed to meet the availability requirements specified in this RFP. True redundancy shall be provided for all LMR traffic and alarm system circuits, such that the failure of any single path or piece of equipment must not degrade radio system performance.

7.1 Existing Connectivity Network

Athol does not own an existing microwave or fiber-optic network. Athol does have access to state-owned fiber assets.

7.2 Microwave Network Requirements

7.2.1 Configuration

The microwave system shall provide redundant routing to/from each RF site to the PSCs. Failure of a single telecommunications circuit shall not diminish the ability of the connectivity network to provide required connectivity between the RF sites and the PSC. The connectivity design shall have path or equipment redundancy. The system shall be scalable and capable of upgrading capacity by adding additional microwave RF channels via the proposed antenna system. The connectivity network shall be designed to meet the availability requirements specified in this RFP.

7.2.2 Microwave Frequency Bands

The microwave network shall use licensed frequencies in the 4.9, 11, 18 and/or 22 GHz fixed service bands.

7.2.3 Microwave Network Performance

7.2.3.1 Path Availability

Each microwave path shall be designed to provide a minimum two-way path (round-trip) availability of 99.9995 percent at a BER threshold of 1E-6. Note that a one-way microwave path (outbound or inbound) requires the minimum availability of 99.9999 percent at a BER threshold of 1E-6.

Microwave path propagation predictions and designs shall be based on line-of-sight conditions conforming to the following obstruction clearance criteria:

- 0.6 F1 + 10 feet at K = 1.0
- 0.3 F1 at K = 2/3
- F1 at K = 4/3

7.2.3.2 Circuit Quality

The microwave system shall be designed to provide a minimum of 1E-6 BER for each DS1 end-to-end circuit, including any combination of contiguous microwave hops.

7.3 Connectivity Network Management System

The NMS shall provide a single platform for personnel to monitor the connectivity network and to provide adequate alarm information for first level response to system degradation and outages. The NMS shall be a GUI-based, multi-protocol network management tool. The NMS shall provide remote access via VPN with SSL web access control security. The NMS shall be capable of automatic notifications of threshold events that require immediate response and deployment.

Network management consists of the following functions:
- equipment provisioning
- configuration management
- performance management
- security management
- alarm management

The NMS shall provide summary alarm outputs to the radio system.

7.3.1 Configuration Management

The NMS shall provide the interface for configuration of the connectivity network. Connectivity configuration includes items such as the following:
- Provisioning of the microwave radio equipment
- Administrative functions

The NMS shall provide a database for all network elements and configuration parameters. The NMS shall allow the system administrator to perform multiple simultaneous database operations.

7.3.2 Performance Management

The NMS shall display and store system status, alarm indications, administrative functions, and NMS system access. The NMS shall store performance data on electronic media. Real-time storage capacity shall be enough to store system activity records for one (1) full month. The NMS shall display system performance information on an NMS workstation.

Data displayed and stored shall include the following items at a minimum:
- System failures (static and intermittent)
- Historical Report
- Activity Details
- Activity Summaries
- Alarm Control, Display, and Logging

- Equipment Statistics
- Site Statistics
- Event Logs
- On-Screen Reports
- Receive signal level (RSL)
- IP packet statistics such as collisions, jabbers, packet sizing and fragments

Data stored and reported, and thresholds for upper and lower limits shall be customizable.

7.3.3 Security Management

Access to the NMS and other system elements shall be password protected. There shall be at least two (2) levels of password access. Access to status, activity, alarms, and other system information shall be available to three (3) authorized users. Control and diagnostic operations shall be accessible to a limited number of administrator-level users, authorized to control these operations.

The servers shall have the ability to be remotely supported by via VPN. The database administrator shall have the capability to monitor all VPN access and activity while being performed by the remote entity.

Web browser access shall be provided with support monitoring and control functions and administratively restrictive database modifications. Multiple locations and users should be able to access the monitoring screens concurrently.

7.3.4 Fault Management

The NMS shall monitor the connectivity network for critical and non-critical failures and status changes. The system shall be continuously and automatically monitored for failure of any key component. Any failure of a key component shall be automatically indicated at the NMS workstations.

7.3.4.1 Self-Diagnostic Capabilities

The system shall have the following diagnostic capabilities to facilitate and enhance the troubleshooting ability of the NMS system and associated hardware.

- Monitor master and backup server hardware components (disk drives, fans, temperature).
- Gather statistics on quality of polling per address.
- Gather statistics on quality of polling per polling port.
- Ability to view polling activity in text as well as protocol (byte) level.
- Internal operational alarms shall be monitored and appear as other system event alarms.

7.3.4.2 Alarm Points

The NMS shall monitor and alarm major and minor failures, abnormal conditions of operation, and status changes of the radio system and connectivity network. Alarms monitored shall include equipment failures or link failures of or to the following equipment or systems:

- Network management systems
- Database management systems
- Microwave radios
- Network routers
- Network switches

The above list is a minimum requirement. The NMS shall allow any failure or abnormal operating condition to be traced to the shelf sub-system level.

The connectivity NMS shall provide summary alarm outputs connected to inputs of the radio system NMS.

7.3.4.3 Alarm Point Inputs

The alarm system shall accommodate the following types of status inputs, at a minimum:

- Ethernet (SNMP)
- Form C relay (either N/O or N/C)
- TTL

7.3.4.4 Alarm Indication

The NMS GUI screen display shall display the complete monitored network and associated programmed alarms, controls, and status. The GUI layer display progression shall be as follows:

- **Global View:** This shall be a mapped representation of all sites. If an alarm condition exists at a site, a single-colored icon shall illuminate red for critical/major, yellow for minor, green for normal, and blue for manual control.
- **Site Level View:** The site level views shall illustrate the equipment at each individual site. Each equipment sub-system shall be represented by an illuminated colored icon.
- **Equipment View:** The equipment view shall expand the equipment subsystem in the Site Level View and display the individual racks, shelves and modules generating the alarm. Each displayed rack, shelf and module shall have a colored icon illuminated.

When a major or minor failure or status change occurs, an indication shall be displayed on the alarm system terminal within thirty (30) seconds of the alarm occurrence. When an alarm is generated, the icon shall blink the appropriate color and continue to do so until acknowledged. Once an alarm point is acknowledged, the icon shall cease to blink and maintain the color associated with the priority level until the alarm status is normal.

The alarm system terminal shall display a report for each alarm containing, at a minimum, the following information:

- Date and time (stamped by either the master or RTU)
- Station name
- Point name
- Point status description
- Optional instruction line

The user shall have the capability to customize the system's alarm display field's format as to which fields are to be displayed, in what order and in what colors. Clear or normal alarms and/or conditions shall have the capability to be displayed in various colors independent of the coloration of the failed alarms. The system workstations shall have the capability of displaying text and GUI representation all current system monitored alarm status. All event state changes that have not been acknowledged by the user shall be displayed in a separate list of event state changes.

7.3.4.5 Alarm Point Attributes

The primary alarm description text field shall provide a minimum of forty (40) characters for each alarm status. A secondary alarm description field shall assign the change of state severity: Critical, Major, Minor & Status. The third field shall provide condition indicators for fail and clear, Door Open, Door Closed, etc.

The system shall be capable of classifying alarms into selectable groups such as Critical, Power Alarm Group, Generator, etc. The NMS Master shall have independent control of whether specified alarms are displayed on the workstation screen or are directly recorded within the history file.

The system shall have the capability of assigning special resolution instructions per alarm point to provide operator directions. The operators shall have the ability to notate comments on alarm points. These comments shall be time stamped and log the operator who created the entry.

7.3.4.6 Alarm Notification Media

The NMS shall provide remote access via VPN with SSL web access control security. The NMS shall provide automatic notifications of threshold events that require immediate response and deployment, utilizing the Athol' existing Internet connections and/or any new connections provisioned for purposes of contracted network monitoring services.

7.3.4.7 Alarm Analysis

The NMS shall have the capability to establish truth table and threshold routines for leveled response. For example: Site A reports "*Microwave PA output, Low*" (This alarm by itself would not constitute an after-hour's callout). However, coupled with a site B intermittent "*Microwave*

Signal Degrade" the NMS routine script would report "*Site A Microwave Transmitter Alarm, Major, Immediate callout, John Doe*."

7.3.4.8 Visible and Audible Annunciation

Each alarm indication shall provide a visible and audible annunciation when an alarm occurs. The audible alarm may be silenced when the alarm is acknowledged by the operator.

7.3.4.9 Historical Data

The alarm system shall store historical alarm data. Historical alarm reports shall be capable of querying, allowing the operator to produce alarm reports based on date and time, site or subsystem, alarm classification, equipment, or equipment type. Historical data shall be exportable to other software for analysis. The system shall store historical alarm data for a period of at least thirty (30) days.

7.3.5 Protocols

The NMS platform shall have the ability to support concurrently polled protocols on multiple ports. It shall be capable of alarm mediation, such as receiving collected alarms from another monitoring platform or element manager using one (1) or more of the following protocols: SNMPv1, SNMPv2, SNMPv2c, SNMPv3, MODBUS, and TL1. The NMS shall have a MoM SNMPv2c (minimum) port that will report all alarm information to a higher order MoM.

7.4 Software

The system shall support software modularity, which shall allow for selective functionality enhancements to be added or removed based on the specific requirements of Athol.

7.5 Equipment Requirements

The microwave system shall include all equipment required for a complete operational system. The equipment shall be complete, mounted, and wired in racks, ready for operation. Accessories shall include specialized test fixtures, test cords, and adapters. All equipment shall be completely tested at a staging location. Staging tests shall be documented.

The equipment shall be completely solid-state, employing the latest technology, and shall be convection-cooled. All necessary standby switching, alarm sensing, and control shall ensure fully automatic operation. Equipment shall have remote alarm/control capability for any equipment failure.

7.5.1 Digital Microwave Radio

RF terminal equipment shall meet the following requirements:

Primary Power Input:	-48 VDC
Maximum Residual BER:	1E-10
Capacity:	100 Mb/s

RF Terminals are expected to be indoor units unless a special circumstance is encountered. The use of outdoor units ***may*** be considered by Athol on a case-by-case basis; however, this is not the desired configuration.

7.5.1.1 Redundancy

The microwave equipment shall utilize redundancy against failure. All packets shall be automatically protected using BER threshold sensing, IP QoS monitoring and packet switching. All packet loss failures shall be sensed and remotely indicated. The microwave equipment shall have fault-sensing capability that will detect transmitter and receiver failures and bit error rate degradation. The equipment shall provide alarm outputs to the alarm system. The equipment shall provide status indications for local observation.

7.5.2 Microwave Power Supplies

All proposed microwave equipment shall be powered from a nominal -48 VDC supply.

7.5.2.1 Battery Charger/Powerboard Equipment

Microwave and multiplex sites shall be equipped with -48 VDC, positive-ground redundant charger/powerboard units. Charger/powerboard unit's recharge time shall not exceed eight (8) hours to charge a discharged battery plant to its specified capacity. The charger/powerboard supplied shall operate so that it provides adequate current output to support the microwave equipment site load. The charger/powerboard shall be equipped with and wired for operation in an EIA standard rack and shall consist of the following components:

- N + 1 multiple charger units configured for load sharing and redundancy
- Circuit breaker panel equipped with individual distribution circuit breakers
- Ground bar
- Volt/ammeter panel
- System load disconnect panel
- High/low voltage disconnect panels

The charger/powerboard units shall have the capability to operate in a battery-eliminator configuration.

7.5.2.2 Battery Plant Equipment

The battery system shall consist of sealed maintenance-free cells and shall meet or exceed eight (8) hours of operating time for supplied microwave equipment. Battery operating life expectancy shall be at least eight (8) years.

Battery racks shall be installed, assembled, and wired as a complete operational system. Vendor-recommended corrosion-resistant hardware shall be provided to facilitate long-life operation of battery plants. Steel racks used to support battery units shall be protected by an acid-resistant material or coating. System shall be designed for easy access in the event batteries must be replaced.

7.5.3 Microwave Antenna Systems

The antennas, radomes, waveguide, and associated mounting hardware shall be rated to withstand winds and icing conditions common to Athol's service area.

Antennas shall be of solid construction with pressurized feed horns. Antennas may be single polarized or dual polarized. Antennas shall be furnished with long life radomes.

7.5.3.1 Microwave Antenna Mounting

All antennas 6 ft. or greater in diameter shall be secured to the tower with a minimum of two (2) side-braces. Standard 4.5-inch diameter pipe mountings shall be utilized to support the microwave antennas.

7.5.3.2 Microwave Antenna Ice Shield

Ice shields shall be installed above microwave antennas.

7.5.3.3 Microwave Transmission Lines

High quality copper elliptical waveguide shall be employed in continuous lengths for all transmission line runs. Splicing is not permitted. The waveguide shall be installed and grounded in accordance with the manufacturer's recommendations, using hardware approved by the manufacturer for that purpose.

7.5.4 Dehydrator/Pressurization System

The pressurization equipment shall maintain at least five (5) psig of positive pressure in the elliptical waveguide and antenna feed horn. The CONTRACTOR shall include all required fittings, regulators and pressurization lines, gauges, distribution manifolds, and installation hardware. Separate pressure metering shall be provided for each waveguide pressurized. Alarm outputs for low pressure, high pressure, high humidity, and excessive run time shall be provided and connected to the network monitoring and control system.

All installed antenna/transmission lines shall be purged, pressure-tested, and tested for low Voltage Standing Wave Ratio (VSWR) using return loss measurements over the specified frequency band.

7.6 Optical Transport Network Equipment

Dedicated fiber optic links and/or leased lines may be used as components in the connectivity network.

7.6.1 Fiber Optic Cable

Fiber optic cable shall be constructed and installed in accordance with applicable TIA/EIA standards and the manufacturer's recommendations.

The system design shall use redundant cables routed utilizing separate conduits to facilitate communications redundancy between each node. Redundancy configurations should support ring protection and secondary routing capabilities to protect against operational failures along routes.

A cross-connect (x-con) junction rack will be provided to house the splice tray equipment and x-con panels. The rack shall be a standard EIA/ECA-310 relay rack with standard hole spacing and will include the following:

- Fiber management panel to facilitate x-con cable routing
- Universal cable clamp for cable support
- Fiber identification flip chart

7.6.2 Transport Node Equipment

Transport node equipment shall be configured to support loop, or single path with 1+1 or N+1 redundancy switching architectures.

Transport node equipment shall adhere to the base rate and format along with multiplexing scheme specified in the ATIS 0900105(2015) standards and the optical specifications, transmission capabilities, and interface as detailed in ATIS 0900105.06(2002). Optional units shall be provided for 1310 nm and 1550 nm.

In a loop configuration, the transport node equipment shall be fully redundant at the optical network line side and the DS3/DS1 electrical drop side. The network loop will provide a primary (clockwise) DS1 link with a dedicated secondary (counterclockwise) DS1 link for all sites on the loop. The receive section on the line or network side will monitor the DS3 or DS1 signals from both directions and perform a comparative selection according to BER or loss of signal (LOS), then switch to the non-degraded path. The optical node equipment will transmit the DS1 circuits in both directions to allow for receiver-side switching only. The electrical drop side of the transport node equipment shall perform error-free manual and automatic switching functions of all circuits.

The transport node equipment shall fully protect traffic, overhead orderwire, digital service channels and wayside circuits in the event of equipment failure, fiber cut or single link failure.

The transport node equipment shall have fault-sensing circuitry that will detect optical and electrical transmitter, receiver, and sub-rate card failures and BER degradation. The equipment shall provide serial, contact and Simple Network Management Protocol (SNMP) alarm interfaces for reporting to the network management alarm system via a remote terminal unit (RTU). All available alarm points in the equipment and all external control inputs, which may be utilized for remote equipment control functions, shall be described.

Transport node equipment shall meet the following requirements:
- Primary power input of ±24 or ±48 VDC
- Link residual BER of less than 1E-10

7.6.3 Digital Multiplexer Equipment

The digital multiplex equipment shall provide modulation and processing for the DS1 signals between the channel banks/routers and the fiber equipment.

The equipment shall be complete, mounted and wired in racks, ready for operation. Accessories shall include specialized test fixtures, test cords, and adapters. All equipment shall be completely factory-tested and documented in the final configuration.

The equipment shall be completely solid-state, employing the latest technology, and shall be convection-cooled. All necessary standby switching, alarm sensing, and controls shall ensure fully automatic operation, and it shall have remote alarm/control capability for any equipment failure.

Test points and facilities shall enable alignment and testing of all signal levels, including DS1 signals to and from the carrier equipment, levels, clock frequency, BER levels, framing, power supplies, and all interface signals, all with no interruption of service. Built-in alarms shall be provided for major, minor, power failure, BER, and loss of clock or framing.

In addition, a system-wide redundant master oscillator incorporating synchronization signals routed to all 1.544 Mb/s clocks shall be provided to ensure absolute phase coherence of the land mobile simulcast transmitter sites.

Optional clocking should be provided as follows:
- Receive side recovered clocking.
- Transmit master clocking.
- External clocking: GPS, Stratum and Telco reference.

They shall have local and remote provisioning access, be capable of performing loopback functions and testing and have full diagnostic capabilities.

8 Subscriber Equipment

8.1 Definitions

Subscriber unit: a mobile, portable or control station radio are considered Terminal Hardware.

Accessory: a device that interfaces with a subscriber unit such as an external microphone, antenna, control head or battery charger.

8.2 Tiers

Subscriber units shall be provided in two (2) tiers:

- Public Safety
- Non-Public Safety

Public Safety radios shall be the same family of radios with the only differences being equipped features or mandatory options, and price. Accessories for the same family of radios (such as microphones, antennas, batteries, and other features or mandatory options) shall be interchangeable. Non-Public Safety radios are single band radios, typically less expensive, and not necessarily in the same family as the Public Safety radios, with limited features and mandatory options. All subscribers typically include a keypad; some radios may offer a selection – full keypad limited keypad, or without a keypad.

Subscriber units shall be equipped with the features and functions specified in Table 8-1. All subscribers shall be capable of operation in the UHF frequency band(380-520MHz). Selected units shall be dual band or all-band including operation in the VHF band (136-174 MHz) and/or 700/800 MHz frequency bands (768-861 MHz).

Feature	Configuration					
	Mobile		Portable		Control Station/Desktop Remote	
	Public Safety	Non- Public Safety	Public Safety	Non- Public Safety	Public Safety	Non- Public Safety
Multiband (Dual Band or All Band)	Yes		Yes		Yes	
Conventional Channels	128	128	128	128	128	128
Time-Out Timer	Yes	Yes	Yes	Yes	Yes	Yes
Emergency Call Button	Yes	Yes	Yes	Yes	Yes	Yes
Talk-around Operation	Yes	Yes	Yes	Yes	Yes	Yes
Vehicular Charger			Yes	Yes		
Keypad	Yes	Yes	Yes	Yes	Yes	Yes
Encryption Capable	Yes		Yes		Yes	
On/Off Switch	Yes	Yes	Yes	Yes	Yes	Yes
Volume Control	Yes	Yes	Yes	Yes	Yes	Yes
Eight-Character Alphanumeric Display (limited keypad)	Yes	Yes	Yes	Yes	Yes	Yes
Transmit Indicator	Yes	Yes	Yes	Yes	Yes	Yes
Low Battery Indicator			Yes	Yes		
Intrinsically Safe			Yes			
Programming over Wi-Fi	Yes	Yes	Yes	Yes	Yes	Yes
Trunking Capable Legacy	Yes	Yes	Yes	Yes	Yes	Yes
Trunking Capable P25	Yes	Yes	Yes	Yes	Yes	Yes
Bluetooth	Yes	Yes	Yes	Yes	Yes	Yes

Table 8-1 Subscriber Unit Features

8.3 Standards

Subscriber units shall meet or exceed the performance requirements of a Class A transceiver as defined in the following standards:

- ANSI/TIA-603-E, *Land Mobile FM or PM Communications Equipment Measurement and Performance Standards*; and
- ANSI/TIA-102.CAAB-E, *Project 25 Land Mobile Radio Transceiver Recommendations, C4FM/CQPSK Modulation*.

8.4 Environmental Specifications

Subscriber equipment shall meet or exceed the environmental specifications listed in Table 8-2.

Standard	MIL-STD 810C Method/Procedure	MIL-STD 810D Method/Procedure	MIL-STD 810E Method/Procedure	MIL-STD 810F Method/Procedure	MIL-STD 810G Method/Procedure
Low Pressure	500.1 / I	500.2 / II	500.3 / II	500.4 / II	500.5 / II
High Temperature	501.1 / I, II	501.2 / I, II	501.3 / I, II	501.4 / I Hot, II Hot	501.5 / I A1, II A2
Low Temperature	502.1 / I	502.2 / I, II	502.3 / II	502.4 / I C3, II C1	502.5 / I C3, II C1
Temperature Shock	503.1 / I	503.2 / I	503.3 / I	503.4 / I	503.5 / I C
Solar Radiation	505.1 / II	505.2 / I	505.3 / II	505.4 / I	505.5 / I A1
Rain	506.1 / I, II	506.2 / I, II	506.3 / I, II	506.4 / I, III	506.5 / I, III
Humidity	507.1 / I	507.2 / II	507.3 / II	507.4	507.5 / II Aggravated
Salt Fog	509.1 / I	509.2 / I	509.3 / I	509.4	509.5
Dust	510.1 / I	510.2 / I	510.3 / II	510.4 / I	510.5 / I
Immersion (for portables	512.1	512.2	512.3	512.4 / I	512.5
Vibration	514.2 / VIII Cat. F, Curve W	514.3 / I Cat. 1, 10, 11, Cat. 3	514.4 / I Cat. 1, 10	514.5 / I Cat. 24	514.6 / I Cat. 24
Shock	516.2 / I, II	516.3 / I, IV	516.4 / I, II	516.5 / I, IV	516.6 / I, IV, V, VI

Specification	
Temperature (Operating)	-30 to +60° C
Temperature (Storage)	-40 to +80° C
Altitude	15,000 ft
Altitude (Transit)	40,000 ft
Humidity	95% @ 50° C
Shock	1 m
Vibration	5 G
Immersion	IEC 60529 IP67

Table 8-2 Environmental Specifications for Subscriber Equipment

8.5 Project 25 Compliance

Subscriber units shall be fully compliant with the latest versions of the Project 25 Phase 1 (12.5-kHz FDMA) operation as defined in the TIA-102 series of standards and shall be fully interoperable with all TIA-102-compliant conventional radio systems.

The Supplier's Declarations of Compliance (SDoCs) and Summary Test Reports shall be provided in accordance with the Project 25 Compliance Assessment Program for any offered subscribers. Identify any features or functions of the proposed subscribers that do not comply with the TIA-102 standards. Also identify any proprietary features or functions of the proposed subscribers that are not defined in the TIA-102 standards.

8.6 Upgrades to Existing P25 Subscriber Units

The Town of Athol Public Safety agencies currently have some UHF Motorola APX P25 capable radios. Existing P25 capable radios should be upgraded with any necessary software or hardware to enable these existing radios to work on the new UHF P25 conventional radio system. Specific quantities of radios that need to be upgraded for P25 operation are listed in Appendix D: Pricing Workbook.

8.7 All-band

Subscriber equipment shall be capable of operating in all public safety bands (VHF, UHF, and 700/800 MHz) and shall be equipped with appropriate antennas, features, and accessories.

8.8 MANDATORY OPTION: Encryption

8.8.1 Single Key AES Encryption

All public safety subscriber units shall be equipped with P25 compliant single key AES encryption.

8.8.2 Multiple Key AES Encryption

Selected subscriber units shall be equipped with P25 compliant multiple key AES encryption.

8.8.3 Key Fill Device

The encryption key fill device (KFD) shall interface with subscriber units and shall provide the user the ability to load, erase and read key information.

8.9 Bluetooth

Subscriber equipment shall be equipped with Bluetooth.

8.10 Mobile Radio Equipment

Mobile radios shall include the following components and accessories:

- transceiver
- control head
- palm microphone and mounting hook
- speaker
- cabling
- antenna
- mounting hardware

The mounting hardware shall securely fasten the housing to the vehicle.

8.10.1 Trunk-Mounted Mobile Radio Units

Trunk-mounted radios shall come equipped with a key to lock the radio into the housing. The trunk-mounted radio shall be available in a dual-control-head unit option.

8.10.2 Dash-Mounted Mobile Radio Units

The dash-mounted radio shall have the controls mounted on the front panel or surface of the radio. No separate control head shall be required for proper operation of the radio. The radio's

speaker shall be an integral part of the radio package. For configurations requiring a front-panel keypad, the speaker may be at a remote location from the unit.

8.10.3 Mobile Radio Antennas

The mobile radio antenna shall consist of a stainless-steel antenna element, antenna mount and low-loss antenna cable. The mobile radio antenna shall be available in two (2) styles: standard and disguised. Each shall be supplied with a minimum of 15 ft of antenna cable and shall meet or exceed the following specifications:

Frequency Range	VHF: 136 - 174 MHz UHF: 380 - 520 MHz 700/800 MHz: 768 - 861 MHz
Maximum VSWR	1.5:1 (dual-band or all-band VSWR < 2.0:1)
Power Capability	50 W (VHF, dual-band, or all-band: 100 W)

8.10.3.1 Standard Mobile Radio Antennas

Standard mobile radio antenna radiating element shall be removable and replaceable without disturbing the antenna mount. The antenna mount shall be suitable for mounting on a vehicle roof, trunk, light bar, or other similar locations.

8.10.3.2 MANDATORY OPTION: Disguised Mobile Radio Antenna

The disguised mobile antenna shall be similar in design and appearance to cellular mobile antennas. The disguised antenna shall provide “no-hole” mounting.

8.10.3.3 Mobile Antenna Installation

The CONTRACTOR shall observe Athol’s current antenna mounting practices and recommend antenna mounting locations.

8.11 Portable Radio Equipment

The portable radio unit shall be small and of such a form factor that normal operation can be accomplished with one hand. The portable radio shall be supplied with a belt clip, shoulder speaker/mic, antenna, and a Li-ion polymer rechargeable battery. The batteries shall maintain a minimum capacity of 80% rated after one (1) year of service. Each portable radio shall be provided with a carrier or belt clip options and a single-unit charger.

The housing of the portable radio shall be of high-impact resistant material. The Li-ion battery supplied shall provide at least eight (8) hours of operation on a 5% transmit, 5% receive and 90% monitor duty cycle and shall be a positive lock, and quick disconnect type. The battery housing shall be constructed of a material as durable as the portable radio housing and shall match the color and footprint of the

portable radio. The antenna provided with the unit shall be covered with soft plastic or rubber and be provided with a blunt safety tip.

8.11.1 Portable Battery Chargers

AC single- and multi-battery chargers shall be available to charge the portable radio batteries. Chargers shall be capable of charging batteries while either attached or not attached to the portable radio.

Chargers shall be capable of charging a mix of models of batteries. Chargers shall be suitable for either desk or wall mounting and shall be capable of recharging batteries to a full charge in eight (8) or twelve (12) hours or less. Illuminated LEDs shall be provided to indicate whether the unit is charging or fully charged. Charging current shall be regulated and over-charging shall be electronically monitored, controlled, and prevented. Multi-battery chargers shall be capable of recharging a minimum of five (5) batteries at any one time.

8.11.2 Intrinsically Safe Portable Radio

Portable radios for Fire Fighters shall be certified by Underwriters laboratories (UL) that their operation is intrinsically safe for Classes I, II and III; Division 1; Groups C, D, E, F and G; and non-incentive for Class I, Division 2, Groups A, B, C and D. The batteries and speaker / microphones should also be intrinsically safe in the portable radios.

8.11.3 Vehicular Charger

The vehicular charger package shall accept the portable radio and automatically provide the proper charging current from the vehicle's electrical system. The charger package shall be suitable for mounting under the dashboard or in other suitable locations in passenger vehicles, pick-up trucks, vans, and other types of vehicles such as fire engines.

The portable radio shall be secured in the vehicular charger. An illuminated LED shall indicate that the unit is charging. An illuminated LED shall also indicate that the unit is fully charged. Charging current shall be regulated and overcharging shall be electronically monitored, controlled, and prevented.

8.11.4 Speaker / microphone

Speaker / microphones shall meet the same environmental requirements as the portable radio.

8.11.5 Intrinsically Safe Speaker / Microphone

Intrinsically Safe Speaker / microphones shall meet the same environmental and intrinsically safe requirements as the intrinsically safe portable radio. The batteries should also be intrinsically safe in the portable radios.

8.12 Digital Vehicular Repeater

The Digital Vehicular Repeater (DVR) shall achieve a high level of portable coverage outdoors and inside buildings on scene. The DVR shall operate transparently to the user and shall not be required to "turn on", change channels, or make any other undertakings to utilize the DVR. The portable will always remain in DVR mode, unless the portable is not at a location with a vehicle equipped with a DVR.

The DVR shall operate end-to-end encryption from the portable to the radio system and from the radio system to the portable without decrypting transmissions between the transmitter and receiver.

8.12.1 Frequency Band

The DVR can be configured either in-band or cross-band. In-band DVR's can utilize frequencies within the same band as the radio system. Cross-band DVR's can utilize other frequencies with a different band, outside from the radio system.

8.12.2 System Operation

The DVR shall offer three (3) modes of operation:

8.12.2.1 Mobile Operation

The DVR can be disabled, and the mobile radio will operate normally (as if the DVR is removed).

8.12.2.2 Local Repeat

The DVR can be enabled to retransmit signals to and from portables. Signals from the radio system received by the mobile radio shall be heard in the mobile speaker and retransmitted by the DVR on a programmable basis.

When the mobile push-to-talk button is pressed, only the DVR is enabled, allowing the mobile operator to communicate with units on scene. The mobile operator has full priority over the DVR. The operator must enter either the "mobile" or "DVR" mode to transmit to the system over the mobile radio. This mode will be used for on-scene operations where the radio traffic does not need to repeat to dispatch, such as fireground operations or during special events.

8.12.2.3 System Repeat

The mobile radio and the DVR are both enabled. Signals received by the DVR will be heard on the mobile speaker, delivered to the mobile radio, and retransmit the mobile to the radio system. Signals from the radio system received by the mobile radio will be heard in the mobile speaker and retransmit the DVR to all associated portables on that channel.

When the mobile radio push-to-talk button is pressed, both the mobile and the DVR will transmit mobile audio.

8.12.3 Functions

The DVR shall incorporate the following functions mentioned below.

8.12.3.1 Multiple DVR's

When more than one DVR is located on scene, only one (1) DVR shall have priority and enable to transmit and receive while all others stand by. This operation should happen autonomously and should not require vehicle operators to enable or disable their DVR when multiple DVRs are equipped on scene.

If the priority DVR leaves the scene, there shall be an autonomous process that automatically enables one of the standby DVRs to become the priority repeater while all others continue to operate in standby mode.

8.12.3.2 Portable Priority

The DVR shall be programmable to allow priority to portables operating on the DVR. If, while retransmitting a signal from the radio system, the DVR detects a portable transmission, it will cease transmitting the system signal and begin retransmitting the portable signal.

8.12.3.3 Transmit Time-Out

The DVR shall have a programmable time-out timer. The timer shall not reset until the receiver squelch is reset.

8.13 Control Station

The control station shall be provided in a small, attractive cabinet. The PROPOSER is to determine the type of cabinet most suitable for the installation of each control station. The cabinet may be designed for desktop, floor, or wall mounting. The station shall be powered from a 120-VAC, 60-Hz single-phase source. The station shall be operated either locally or remotely under control of the console equipment or a remote-control unit. All control stations provided shall be capable of functioning in either the trunked or conventional mode. The control station may also be used as a limited system backup component in the event of a loss of the system trunking capabilities.

A desktop remote control unit shall be available for operation with the control station. The remote-control unit shall interface with and provide all the features and functions of the control station. The remote-control unit shall provide the capability to control a minimum of five (5) channels. The remote-control unit shall be housed suitable for operation in an office or administrative area. The unit shall include a built-in speaker, volume control, and desk style microphone. The unit shall be furnished with control line and power line surge protectors. The unit shall provide control functions compatible with the control station.

The control station antenna system shall comprise a directional antenna, transmission line, connectors, and miscellaneous hardware. The control station antenna shall meet or exceed the following requirements:

Frequency Range	VHF: 136 - 174 MHz UHF: 380 - 520 MHz 700/800 MHz: 768 - 861 MHz
Maximum VSWR	1.5:1 (dual-band or all-band VSWR < 2.0:1)
Power Capability	50 W (VHF, dual-band, or all-band: 100 W)

9 Physical Facilities Requirements

9.1 General Requirements

Communications facilities shall be of proven design to withstand severe weather including lightning, wind, flooding, ice and snow accumulation, wildfires, and earthquakes.

Facilities shall protect the communications system from the public and shall protect the public from potentially hazardous parts or emissions of the communications system.

Facilities shall be designed and installed in accordance with applicable current codes, ordinances and regulations imposed by authorities having jurisdiction; these current standards; and the communications equipment manufacturer's design and installation current revision standards. Where there is a conflict between requirements, the more stringent requirement shall apply.

9.2 References

9.2.1 Normative References

The following documents, either in whole or in part, are referenced in this physical facilities specification:

American Association of State and Highway Transportation Officials (AASHTO) • AASHTO HB, *Standard Specifications for Highway Bridges*
American Concrete Institute (ACI) • ACI 301-16, Specifications for Structural Concrete • ACI 302.1R-15., Guide for Concrete Floor and Slab Construction • ACI 318-19(22), Building Code Requirements for Structural Concrete and Commentary
American National Standards Institute (ANSI) • ANSI J-STD-607, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
American Society for Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) • ASHRAE Handbook—Fundamentals
American Society of Safety Engineers • ANSI/ASSE Z359, Fall Protection Code
ASTM International • ASTM A615/A615M-22, Standard Specifications for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement • ASTM C31/C31M-22, Practice for Making and Curing Concrete Test Specimens in the Field • ASTM C33/C33M-18, Standard Specifications for Concrete Aggregates • ASTM C39/C39M-21, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

• ASTM C150/C150M-22, Standard Specification for Portland Cement • ASTM D420-18, Standard Guide to Site Characterization for Engineering Design and Construction Purposes • ASTM D1556/D1556M-15e1, Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method • ASTM D1557-12(2021), Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000-ft-lbf/ft3 (2,700 kN-m/m3)) • ASTM D2487-17e1, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) • ASTM D6938-17ae1, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) • ASTM G57-20, Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method
Electronics Industry Alliance (EIA) • EIA/ECA-310-E, Cabinets, Racks, Panels and Associated Equipment
Federal Aviation Administration (FAA) • Advisory Circular 70/7460-1M, Obstruction Marking and Lighting • Advisory Circular 150/5245-43F, Specification for Obstruction Lighting Equipment
Federal Communications Commission (FCC) • Code of Federal Regulations, Title 47, Telecommunications (47 CFR) • Office of Engineering and Technology (OET) Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
Institute of Electrical and Electronics Engineers (IEEE) • IEEE Std. 81-2012, IEEE Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System • ANSI/IEEE Std. 81.2-1991, IEEE Guide to Measurement of Impedance and Safety Characteristics of Large, Extended or Interconnected Grounding Systems
National Electrical Contractors Association (NECA) • NECA 1, Standard Practices for Good Workmanship in Electrical Contracting
National Fire Protection Association (NFPA) • NFPA 70, National Electrical Code • NFPA 72, National Fire Alarm Code • NFPA 101, Life Safety Code • NFPA 110, Standard for Emergency and Standby Power Systems • NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems • NFPA 780, Standard for the Installation of Lightning Protection Systems • NFPA 1221 Standard for Installation, Maintenance, and Use of Emergency Services Communications Systems • NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems
Telecommunications Industry Association (TIA) • TIA-222, Structural Standard for Antenna Supporting Structures

Underwriters Laboratories (UL) • UL 467, Grounding and Bonding Equipment • UL 752, Standard for Bullet-Resisting Equipment • UL 1449, Standard for Surge-Protective Devices • UL 1778, Uninterruptible Power Systems

9.2.2 Informative References

The following references provide additional useful information but are not included in this document:

Alliance for Telecommunications Industry Solutions (ATIS) • ATIS 0600311, DC Power Systems – Telecommunications Environment Protection • ATIS 0600313, Electrical Protection for Telecommunications Central Offices and Similar Type Facilities • ATIS 0600316, Electrical Protection of Telecommunications Outside Plant • ATIS 0600318, Electrical Protection Applied to Telecommunications Network Plant at Entrances to Customer Structures or Buildings • ATIS 0600330, Valve-Regulated Lead-Acid Batteries Used in the Telecommunications Environment • ATIS 0600334, Electrical Protection of Communications Towers and Associated Structures
American Society of Civil Engineers (ASCE) • ASCE 7, Minimum Design Loads for Buildings and Other Structures
Illuminating Engineering Society (IESNA) • IES Lighting Handbook Revision 10T, 2011
Institute of Electrical and Electronics Engineers (IEEE) • IEEE C2, National Electrical Safety Code (NESC) • IEEE 3003.1-2019, Grounding of Industrial and Commercial Power Systems
International Code Council • International Building Code
Telecommunications Industry Association (TIA) • TIA-568.0, Generic Telecommunications Cabling for Customer Premises • TIA-568-C.1, Commercial Building Telecommunications Cabling Standard • ANSI/TIA-568-D, Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components • TIA-568-C.3, Optical Fiber Cabling Components Standard • TIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces

9.3 Sites

9.3.1 General

A typical, dedicated communications site layout is shown in Figure 9-1. The actual layout for each site will vary depending upon the:

- Size and shape of the lot
- Size and type of tower and building
- Number of current and future site tenants
- Existence and location of site utilities
- Federal, State and Local codes, ordinances, and regulations

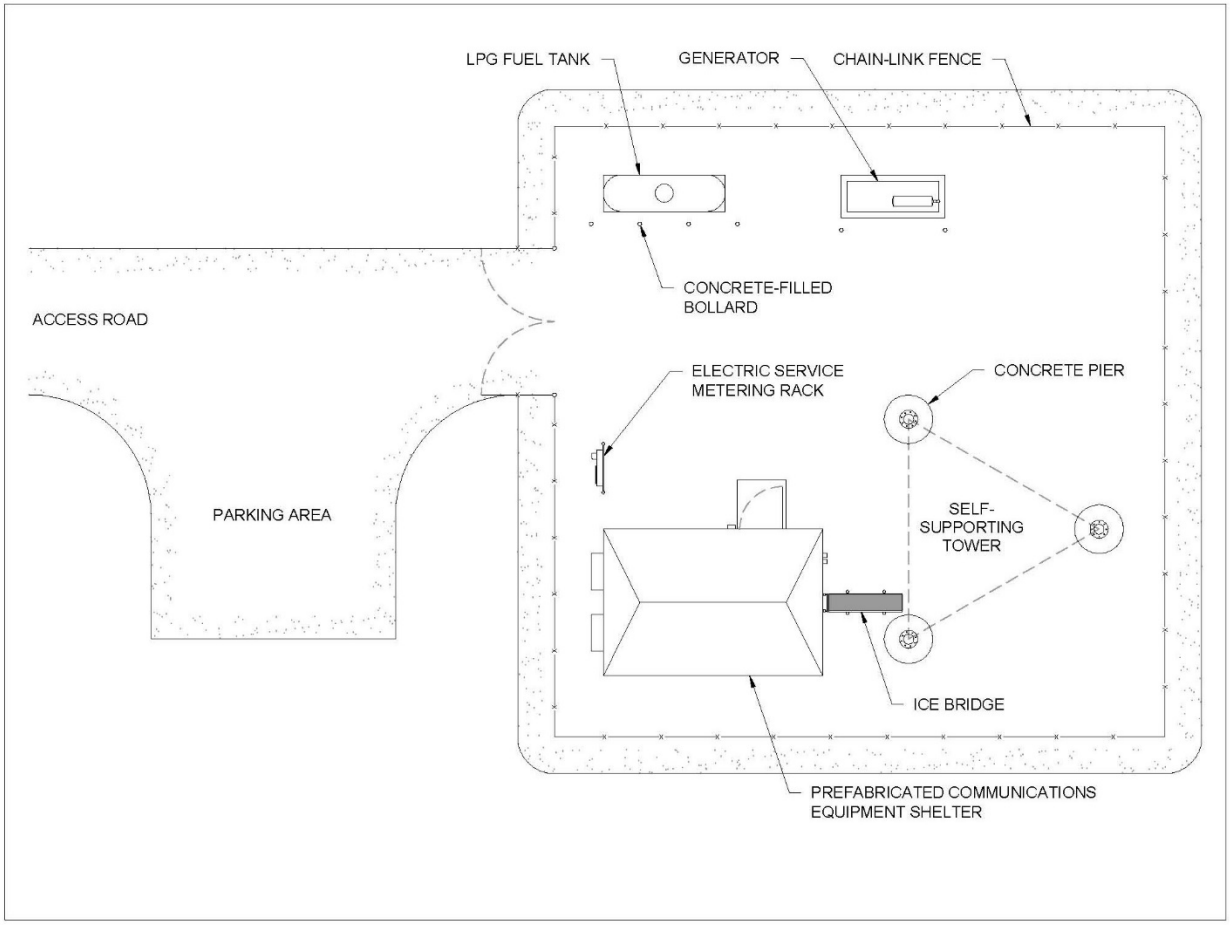

Figure 9-1 Typical Communications Site Layout

9.3.2 Existing Sites

The use of existing sites is encouraged as is appropriate or required. Table 9-1 provides name and address, tower type and height, building or shelter description, owner of property, and briefly lists existing radio equipment at each of the existing sites.

If the PROPOSER intends to reuse existing sites that are leased, the PROPOSER shall provide correspondence from the land/tower owners validating the use of the site(s) are technically feasible and verification the desired RAD center height is available. ***All equipment shall be in as few RAD centers as possible****, if using multiple RAD centers consider this when estimating ongoing lease costs.* Provide the estimated annual lease cost for a fifteen (15)-year period in the appropriate tab in Appendix D Pricing Workbook.

Existing / Potential Sites						
Site #	Name	Address	Tower Type / Ht.	Building/Shelter	Owner	Existing Radio Equipment
1	Athol Fire Station 2	2251 Main St. Athol MA	50 ft	Equipment Room	Athol	Existing Radio Equipment
2	Athol Police Station	280 Exchange St, Athol, MA	50 ft	Equipment Room	Athol	Existing Radio Equipment
3	High Knob Water Tank	52 Dean Cir, Athol MA	70 ft	Shelter	Athol	Existing Radio Equipment
4	Phillipston Fire Tower	Prospect Hill Road, Phillipston, MA	100 ft	Shelter	State	none
5	Bearsden Road Tower	775 Bearsden Road, Athol MA	180 ft	no shelter	Crown Castle	none
6	Royalston Tower	44 Warwick Rd, Royalston MA	under construction	Shelter	Town Royalston	none

Table 9-1 Existing and Potential Radio / Microwave Sites

9.3.3 New Sites

New sites (sites not currently in use by Athol, leased or "greenfield", will require various levels of development and construction as determined by the CONTRACTOR.

For any new sites proposed, lease or greenfield, the PROPOSER shall provide correspondence from the land/tower owners articulating they are agreeable to a new lease agreement (or purchase land) with Athol. The PROPOSER shall also provide correspondence from the land/tower owners validating the use of the site(s) are technically feasible and verification the desired RAD center height is available. ***All equipment shall be in as few RAD centers as possible****, if using multiple RAD centers consider this when estimating ongoing lease costs.* Provide the estimated annual lease cost for a fifteen (15)-year period in the appropriate tab in Appendix D Pricing Workbook.

Greenfield sites shall be designed to accommodate one (1) future 10 ft. by 16 ft. shelters. Ingress and egress shall be designed to allow for installation of these shelters or cabinets.

9.4 Utilities – New Sites

Any site that does not have existing electrical service shall be installed according to the specification in this section. Depending on the site layout and the number of tenants at the site, electric meters and service disconnects may be located on a meter support structure near the fence so that meters may be read by utility personnel without entering the compound. At new sites, where additional future tenants are planned, two (2) underground conduits each shall be installed from the service entrance point to planned locations of future shelters.

As much as possible, building or shelter electric service entrance should be located near coaxial cable and telephone service entrances. The electric service ground shall be bonded to the site grounding system.

9.5 Earthwork

9.5.1 Geotechnical Investigations

Geotechnical investigations shall be performed for all new towers. Geotechnical investigations and reporting shall be performed in accordance with ASTM D 420-18. Geotechnical reports shall be prepared and sealed by a professional engineer.

9.5.2 Erosion Control

An erosion control system shall be utilized to protect adjacent property in accordance with federal, state, and local standards and specifications for soil erosion and sediment control.

All areas disturbed by construction activities shall be seeded or vegetated with grass or other plants that are indigenous to the local area. All seeded areas shall be covered with straw. Erosion control measures shall be removed when the site has been stabilized and erosion control measures are no longer necessary.

9.5.3 Materials for Fill, Sub-Grade Preparation and Backfill

Soils shall be classified by test procedures outlined in ASTM D 2487. Moisture-density relations shall be established in accordance with ASTM D 1557 for all fill material to ensure its suitability.

Material for fill and backfill beneath buildings, structures, and towers; for backfill adjacent to buildings, structures, and towers; for trench backfill in every location; and for sub-grade preparation shall be GW, GP, GM, GC, SW, SP, SM, or SC. The largest particles in this fill and backfill shall be no greater than two (2) in. diameter.

Fill material for non-structural applications shall consist of unclassified material from the excavations.

9.5.4 Clearing and Grubbing

Fenced compounds, access roads and parking areas shall be cleared and grubbed of trees and other vegetation, stumps, roots and other material or structures that would hinder the development of the site. Such materials shall be removed to a depth of at least eighteen (18) in. Depressions made by grubbing shall be filled with suitable material and compacted as required.

Materials unsuitable for fill shall be removed from the site and disposed of in accordance with local, state, and federal regulations.

9.5.5 Fills

Where fill is required to raise the subgrade for concrete slabs, fill material shall be placed in horizontal layers not exceeding six (6) in. compacted thickness. Frozen material shall not be used for this purpose.

9.5.6 Backfilling Beneath and Adjacent to Buildings, Structures and Towers

For depths greater than five (5) ft. select fill shall be used from the top of the footing to a point five (5) ft. below finished grade. The select fill, defined as GW or SW material in ASTM D2487, shall extend from the outside and inside faces of the wall to the faces of the excavation if the excavation is sheeted and braced or five (5) ft. from the outside and inside faces of the wall if the excavation is un-sheeted.

9.5.7 Backfilling Trenches

Fuel pipe joints shall be left exposed for testing. After testing, trenches shall be backfilled with suitable materials free from large clumps of earth and rock fragments. Material shall be deposited in six (6) in. horizontal layers and thoroughly and carefully tamped until pipe and conduit have a cover of not less than one (1) ft. Wrapped, coated and plastic material shall be backfilled six (6) in. above the utility line with sand or other finely graded material. For trenches in open areas, remainder of backfill material shall then be placed in the trench in one-foot horizontal layers.

Trenches shall be backfilled simultaneously on opposite sides and compacted simultaneously without dislocating the utility line from installed positions. For trenches beneath pavement, buildings and structures, the entire depth of the trench shall be filled in six (6) in. horizontal layers. Each layer shall be moistened or dried and compacted. Trenches improperly backfilled or where settlement occurs shall be reopened to depth required for proper compaction, refilled, and compacted, with surface restored to required grade and compaction, mounded over in open areas, and smoothed off.

9.5.8 Plastic Marking Tape

Warning tapes shall be installed directly above pipe and conduit at a depth of six (6) in. below finished grade unless otherwise indicated. Tape color shall be as specified and shall bear a continuous printed inscription, identifying the specific utility.

Utility	Color
Electric	Red
Water	Blue
Telephone	Orange
Sewer	Green

9.5.9 Compaction

The degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557. Fill and backfill material shall be moistened or aerated as necessary to provide a moisture content that falls within three percent (3%) of either side of optimum.

The minimum compaction effort required for various fills, backfills, and sub-grades shall be as follows:

Fill, Backfill and Sub-Grade Compaction	Percent of Maximum Density
Under buildings, structures, towers, or adjacent to buildings, structures, or towers	95
Under exterior concrete slabs, including related utility trench backfill and scarified sub-grades	90
Under utility trench backfill in other areas	85

If required, field density tests shall be performed in accordance with ASTM D ASTM D1556/D1556Mor ASTM D 6938.

9.5.10 Soil Sterilization

Areas specified to receive cover material shall be sterilized with a pre-emergent herbicide solution. Treatment shall be applied on the subgrade prior to placing cover material. Application shall be in accordance with the manufacturer's recommendations.

9.5.11 Fenced Compound

Inside the site fence (and guy anchor locations), geotextile fabric shall be installed in areas not covered by concrete. The geotextile fabric shall extend eighteen (18) in. outside the fence. The fabric shall be installed in accordance with manufacturer's instructions. The area under the fabric shall be cleared and sterilized. The top covering over the fabric shall be six (6) in. of #57 aggregate compacted by roller.

9.6 Access Road

Access roads shall be twelve (12) ft. wide and shall be designed for H20 vehicle (as defined in AASHTO HB-17) surface loading. Road surfaces shall be at least six (6) in. of graded aggregate base course, compacted by roller.

Access roads shall be graded to provide positive drainage. Culverts shall be installed to prevent storm runoff from crossing the access road. Access roads shall be designed to allow for delivery of equipment

shelters to the site. Access road entrances shall meet state or local requirements for driveway or uncontrolled intersection sight distances.

At some remote sites, an entrance barrier gate may be required across the access road at the entrance from the road. Entrance barriers shall be swinging tubular steel gates with standard padlock hardware. Entrance barriers shall be set at least twenty-five (25) ft. from the road. Entrance barriers shall be equipped with reflectors to increase visibility at night.

9.7 Parking Area

Outside each fenced site, there shall be adequate parking and turnaround space for two (2) pickup trucks. The parking area shall be designed for H20 vehicle surface loading. The area shall be cleared, sterilized, and covered with six (6) in. of #57 aggregate cover material compacted by roller.

9.8 Chain-Link Fencing

Chain-link fencing shall be installed around communications tower site compounds and around tower guy anchors. Fencing shall include locking gates and other accessories required to provide security for tower sites. Gates shall be equipped with reflectors to increase visibility at night. Appropriate signage shall be installed on the fence and entrance gates.

9.9 Bollards

Bollards shall be installed at the corners of shelters, generators, and fuel tanks where these objects are exposed to vehicular traffic. Bollards shall be four (4) in. O.D. concrete-filled steel pipe.

9.10 Foundations

Concrete foundations for towers, shelters, generators, fuel tanks and other site equipment shall be designed and installed in accordance with ACI 318-19, ACI 301 and ACI 302.1R. and other applicable standards of ACI.

9.10.1 Design

Foundation designs shall be based on the geotechnical conditions at the site. Foundations for towers shall be designed in accordance with TIA-222. All foundation engineering design documentation shall be prepared and sealed by a professional engineer.

9.10.2 Installation

Forms shall be used to ensure proper pouring and forming of foundations. Forms shall be true, rigid, and strong enough to carry loads to which they will be subjected. Steel reinforcement, anchor bolts and other embedded items shall be held rigidly in place during pouring and curing of concrete. Concrete shall be vibrated during pours to eliminate air pockets. Care shall be taken to ensure concrete does not freeze before curing.

9.10.3 Materials

Cement shall meet the requirements of ASTM C150/C150M. Aggregates shall meet the requirements of ASTM C33/C33M. Reinforcing steel shall meet the requirements for Grade 60 reinforcing steel as defined in ASTM A615. Minimum compressive strength of concrete shall be 3000 psf at twenty-eight (28) days or higher as specified by foundation design documentation.

9.10.4 Concrete Testing

During concrete pours, four (4) test cylinders shall be poured in accordance with ASTM C31/C31M for each twenty-five (25) cubic yd. concrete poured. Concrete tests and test reports shall be in accordance with ASTM C39/C39M. If tests indicate that concrete strength is not adequate, the concrete shall be removed and replaced. The CONTRACTOR shall submit concrete testing results report within the timeframe of Table 4-1.

9.11 Towers

New towers and other antenna support structures shall be designed and installed according to TIA-222, Revision H or later and codes, ordinances and regulations of authorities having jurisdiction. Where these standards contain conflicting requirements, the more stringent requirements shall apply.

Upgrades to existing towers or structures where new antennas or other equipment are to be installed shall meet the same requirements of TIA-222, Revision H or later for new towers or structures.

9.11.1 Tower Classification

Towers for the use of public safety or critical infrastructure industry communications systems shall meet the requirements of Class III structures as defined in TIA-222, Revision H or later.

9.11.2 Loads

Each tower shall be designed by a professional engineer in accordance with TIA-222, Revision H or later. The tower should have a design strength that exceeds the loading of the tower, antennas, and appurtenances (antenna support hardware, waveguides and transmission lines, grounding kits, tower lighting systems, tower climbing systems, etc.), ice, wind, and seismic loads. As practical, transmission lines shall be evenly distributed on tower faces to distribute loads.

All proposed current and future loads, including antennas and appurtenances from existing towers or structures, shall be carefully verified before tower analysis is performed. The following information for each proposed antenna shall be provided to the structural engineer:

- Manufacturer, model, size, weight, and effective projected area of the following:
  - Antennas
  - Antenna support hardware
  - Transmission lines or waveguide
- Antenna mounting height

- Tower leg or face on which the antenna will be mounted
- Routing of transmission lines or waveguide

A new tower shall be designed with all planned loads and for the future installation of up to one (1) heavy wireless carrier platforms as defined in TIA-222, Annex C.

It is highly desired that the antennas at place in adjacent ARD centers, when possible, to minimize ongoing costs. If using multiple RAD Center this shall be reflected in the initial and ongoing lease estimates.

9.11.3 Twist and Sway

Towers and antenna support structures for the support of microwave antennas shall be designed to meet the twist and sway requirements of the microwave system design as defined in TIA-222.

9.11.4 Analysis of Towers and Antenna Support Structures

A structural analysis shall be performed in accordance with TIA-222, Revision H or later on new towers and on existing towers where new antennas or other appurtenances are to be installed. The analysis shall include the antenna mount analysis information. The analysis shall state the model and all assumptions used and shall be prepared and sealed by a professional engineer.

9.11.5 Existing Tower Condition Assessment and Mapping

To analyze the structural strength and integrity of an existing tower or other antenna support structure, detailed information is required on the structure and its appurtenances. If this information is unavailable or insufficient, a tower condition assessment and mapping of appurtenances and structural components shall be performed in accordance with TIA-222, Section 15 and Annex J. The condition assessment and mapping shall be prepared and sealed by a professional engineer.

9.11.6 Materials and Fabrication

Materials and fabrication of all towers, guy assemblies, insulators and foundations shall meet the specifications of TIA-222, Revision H or later.

9.11.7 Tower Construction

All work associated with the construction of towers shall be inspected and approved by a professional engineer. The erection of towers shall be in accordance with TIA-222, Revision H or later. The tower shall be grounded continuously during erection.

9.11.8 Tower Climbing Facilities

A climbing ladder or other climbing facility shall be provided for each new tower in accordance with TIA-222, Revision H or later. Each climbing facility shall be equipped with a safety climb

device. Each tower shall be furnished with two (2) personnel belts compatible with the safety climb device. Safety climb devices and personnel belts shall meet the requirements of ANSI/ASSE Z.359.

9.11.9 Obstruction Marking and Lighting

Towers shall be marked and lighted in accordance with FAA Advisory Circular AC 70/7460-1M. Where tower marking or lighting is required, dual lighting systems are preferred. Tower lighting systems shall meet the standards of FAA Advisory Circular AC150/5345-43J. Lighting equipment shall be the same throughout the system to permit commonality of spare parts.

Lighting control systems shall be mounted inside the equipment building and shall have alarm outputs for connecting to remote alarm systems. Alarm outputs shall be wired to the radio system alarm system and displayed at the associated alarm system workstations.

9.11.10 Ice Bridges

An ice bridge shall be installed between the communications shelter and the tower to support and protect transmission lines and other cables. The ice bridge may be self-supporting, or it may be supported at one or both ends. Where the ice bridge is supported at both ends by the shelter and the tower, one of those supports must be electrically insulated to prevent the flow of lightning surge currents through the ice bridge.

9.11.11 Cable Installation

Vertical transmission lines that run on towers shall be installed neatly on cable ladders. Horizontal transmission line runs between the tower and the building shall be protected by an ice bridge. Drip loops or another method to prevent water entry into the shelter shall be utilized.

Cables shall be installed as follows:

- Ice bridges shall be supported by angle brackets. Threaded rod assemblies shall be used to support the angle brackets.
- Cable hangers and hoists shall be installed per cable manufacturer's recommendations.
- For single or multiple cable entry ports, a rubber boot, clamp, and copper panel shall be used at the cable entry bulkhead.
- Cables shall be secured by hardware specially designed for the cable. Tie-wraps are not acceptable means of securing cables to cable ladders or ice bridges. They may be used to secure cables to cable trays.

9.11.12 FAA Notifications

The FAA shall be notified of proposed or actual construction or alteration by completing FAA Forms 7460-1 and 7460-2 and providing supporting data.

9.11.13 MANDATORY OPTION: Site Security Cameras

The CONTRACTOR shall provide security cameras at all sites and a centralized digital video recorder. Security cameras shall be capable of 360 degree views.

9.12 Equipment Shelters – Arrangement & Size

All radio communications equipment shelters shall be bullet-resistant, prefabricated shelters that meet industry standards and the specifications stated herein. Shelters shall be weatherproof and insulated as required by local climate. The roof shall be designed to survive the impact of falling ice. Floors shall be designed for at least 300 psf (for new shelters). All building penetrations shall be sealed.

New equipment shelters shall be sized to house the new radio and connectivity network equipment, existing equipment moved from existing shelters and at least 25% to 50% for future growth.

A typical shelter arrangement is shown in Figure 9-2; however, other configurations will be considered to meet requirements. Equipment racks shall have a minimum clearance of thirty-six (36) inches front and rear. All exterior doors shall be provided with intrusion alarm sensors, which are to be connected to the radio system alarm reporting system. All building alarm connections are to be terminated at a building alarm bus using Type 66 connector blocks.

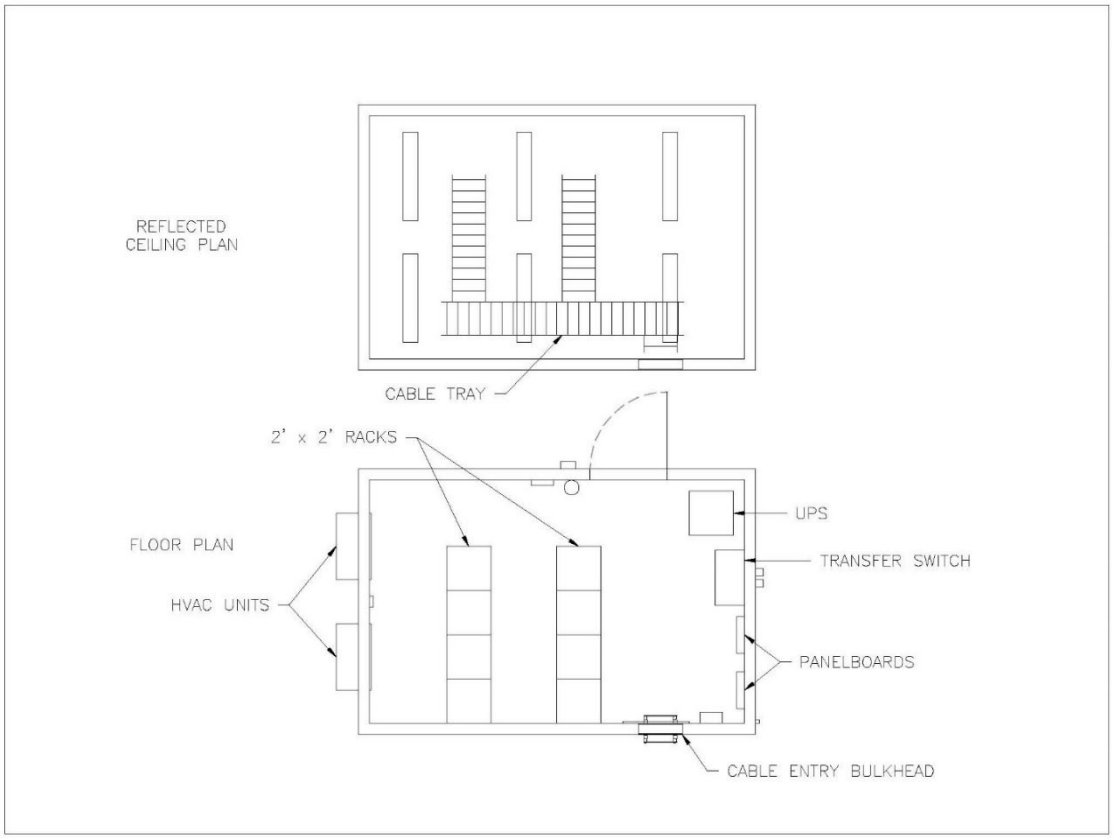

Figure 9-2 Typical Shelter Layout

9.12.1 OPTION: Refurbished Equipment Shelters

PROPOSER shall provide new shelters as part of the base proposal. If the PROPOSER desires refurbished shelters may be proposed as an option. If a refurbished shelter is proposed, as an option, the PROPOSER shall clearly state each instance where the refurbished shelter does not meet the specifications of this RFP.

9.13 Building Systems

9.13.1 HVAC

The heating and cooling system for the radio room shall be sized and selected based on ambient conditions as indicated in the current ASHRAE Handbook Fundamentals for the nearest area applicable and shall include capacity for future building heat loads. The HVAC system shall be capable of maintaining an interior temperature between 70- and 75-degrees Fahrenheit. Heating for the radio room shall be sized to heat the room without equipment heat loads considered. Cooling system is to cool room with equipment, current and future, energized. Future equipment loads shall be assumed to be approximately two (2) kW per additional 2 ft. x 2 ft. rack space. The system shall consist of redundant units with either unit being able to carry the load. Redundant lead/lag controls with alternating timers allowing approximately equal operating time on each air conditioning unit shall be provided.

Load calculations shall be based on actual equipment loads, considering anticipated duty cycles and measured power consumption under operating conditions.

9.13.2 Fire Alarm System

Shelters shall be equipped with a fire alarm system. The fire alarm system shall meet the requirements of NFPA 72. Each zone shall have three (3) detectors. When two (2) of the three (3) detectors enter an alarm condition, all louvers in the zone actuated shall be automatically closed.

9.13.3 Electrical System

9.13.3.1 Codes and Standards

Electrical and cabling work for each shelter shall conform to all local codes, NFPA 70, NFPA 101, ANSI C2 and local utility company standards. Where a product is commercially available as a UL-listed device, a UL-listed device shall be used.

9.13.3.2 Electrical System Design

The general design of the electrical system shall be in accordance with applicable codes and standards. The PROPOSER shall provide a one-line electrical diagram, similar to Figure 9-3.

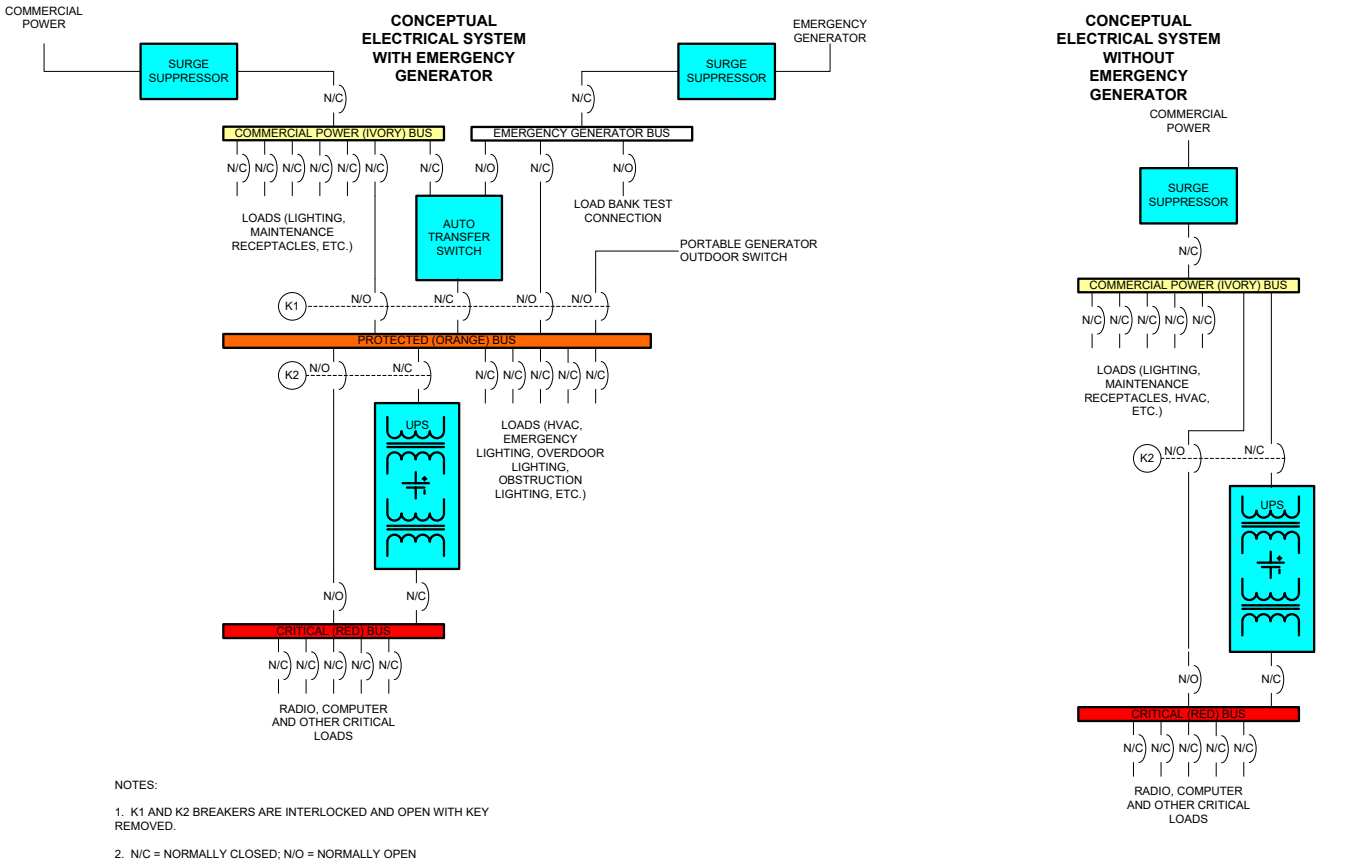

Figure 9-3 Typical Shelter One-Line Diagram

9.13.3.3 Buses

All equipment critical to the proper uninterrupted operation of the communications system shall be served by the critical bus or panelboard, which shall be served by an uninterruptible power supply (UPS).

All equipment that may accept brief temporary interruptions (such as HVAC equipment) or has its own integrated emergency power supply (such as emergency lights) shall be served by the protected bus or panelboard, which shall be served by an emergency generator.

All other equipment not essential to the operation of the communications system may be served by the service bus or panelboard, which will be without power during electric service power failures. Service circuits shall not be run in the same conduit or raceway as critical or protected circuits. The service bus may be eliminated, and all circuits can be served by the protected bus.

9.13.3.4 Bypass Switches

Manual switches shall be provided to allow complete bypass and isolation of the UPS and the automatic transfer switch for maintenance purposes. The switches shall utilize interlocks (Square D Kirk Key interlocks, or equivalent) to prevent simultaneous connection of more than

one power source to the bus. Out-of-position switches (i.e. bypass operation) shall be an input to the radio system alarm system.

9.13.3.5 Temporary Backup Generator

Provisions shall be made for placement and connection to the electrical system of a mobile generator outside the shelter in case the permanently installed standby generator fails. Standby generator operating instructions shall be posted in the room or outdoor cabinet.

9.13.3.6 Surge Suppression

The service entrance and the emergency generator output shall each have independent, appropriately designed surge suppression devices installed. Additionally, because of potential operation with the UPS bypassed, all critical (red) bus branch circuits shall be supplied with surge protection devices at the output of the UPS. Devices shall incorporate current technology and as a minimum should utilize metal oxide varistors (MOVs), gas tube devices and/or equivalent avalanche protection. These units shall have contact alarm and visual indication for device failure.

9.13.3.7 Equipment and Raceways

Minimum conduit size shall be 3/4 in. and all except underground conduit shall be of metal with a zinc coating (EMT or heavier construction). Conduits exposed to the outside shall be rigid, not EMT. Underground conduit shall be two (2) in, or larger rigid PVC with a minimum of twenty percent (20%) excess capacity over code limits, or spare underground conduits shall be included.

9.13.3.8 Receptacles and Plugs

Shelters shall be equipped with one (1) 20-amp double duplex receptacle every ten (10) feet or closer as required by local codes, around the interior perimeter of each shelter. A minimum of two (2) 20-amp circuits shall be provided for this purpose with one (1) circuit supplied from the protected bus using orange receptacles and one (1) circuit supplied from the service bus using ivory receptacles. One (1) exterior 20-amp GFCI receptacle on its own circuit shall be installed on the service bus. Where power cords are plugged into overhead receptacles, twist lock components shall be used.

9.13.3.9 Lighting

Shelter interior lighting shall be provided by fluorescent or LED (preferred) lighting to a level of fifty (50) foot-candles at a working plane of 30 in above the floor. Fluorescent light fixtures shall be supplied with 0°F ballasts.

Exterior LED lighting is to be mounted on exterior wall at each exterior door. A pole-mounted LED light fixture shall be installed at the parking location to supply at least two (2) foot-candles of light at the vehicles. This light should be equipped with a photocell for dusk-to-dawn operation.

9.13.4 Safety

Emergency eyewash stations and fire extinguishers shall be installed in the radio room.

9.14 Backup Power Systems

9.14.1 Standby Generators

Standby generators shall meet the requirements of a Class 168 (168 hour runtime, 7 days), Type 60 (power restoration in 60 sec.), Level 1 (failure could result in loss of human life) emergency power supply system (EPSS) as defined in NFPA 110 and the requirements of NFPA 70, Article 700.

Generators shall be sized to serve 125% of current and future facility electrical loads. Future equipment loads shall be assumed to be approximately 2 kW per additional 2 ft x 2 ft rack space.

Generators shall include control-panel and alarm functionality that provides remote, TCP/IP-based status, configuration, and control. Remote control functions shall include start/stop functionality.

9.14.1.1 Generator Location

Generators may be located inside (preferred) or outside buildings or shelters. Standby generators located outside of the building or shelter shall be located to protect against ice, moisture, vehicles, vandalism, and rodents.

The automatic transfer switch, line surge suppressors and associated equipment should be located inside the building or shelter unless space limitations dictate otherwise. The system shall be designed to facilitate on-site full load testing.

9.14.1.2 Generator Installation

Generators located outdoors shall be mounted on a concrete pad according to the generator manufacturer's recommendations.

Generators located indoors shall be mounted on spring deflection vibration isolators according to generator manufacturer's recommendations. A drip pan shall be installed beneath the unit to collect spills and leaks.

All electrical connections to the unit shall have a section of flexible conduit for vibration isolation. Generators shall have a drain with a plugged ball valve accessible from the outside of the enclosure for draining oil.

9.14.1.3 Automatic Transfer Switches

Automatic transfer switches shall perform site load to generator transfer with an adjustable timer of one (1) to five (5) minutes. The transfer switch shall retransfer the site load to restored

commercial power with an adjustable timer of one (1) to five (5) minutes followed by an adjustable five (5) to twenty (20)-minute generator cool down before shutting off. A make before break bypass switch shall be provided to disconnect the transfer switch and isolate it from the commercial AC power and all site load equipment. This feature will permit transfer switch maintenance and troubleshooting without disconnecting the AC power from the site equipment.

Operating manuals shall be supplied with each generator.

9.14.1.4 Starting System

Batteries shall be maintenance-free with sealed cells. A battery charger shall be utilized to maintain the amp-hour rating and sufficient starting power of the generator battery when the generator is not running. If water-cooled generators are provided for outdoor installations, crankcase heaters and jacket water heaters shall be provided to facilitate cold weather starting. All external generators shall have oil pan heaters.

9.14.1.5 Fuel System

The fuel tank shall be of an approved design and installed in accordance with the local building codes. Standby generators may be powered by diesel fuel, natural gas or liquified petroleum gas (LPG, propane). Fuel systems shall meet the requirements of NFPA 110 Section 7.9 or NFPA 58, LPG Code.

The fuel tank shall be of appropriate size to power and operate 100% of equipment at the site for a minimum of 24 hours x 7 days.

9.14.1.6 Noise Abatement

Where standby generators are located within one thousand (1000) ft. of residences or occupied buildings, generators shall be of a quiet design, with appropriate mufflers or other devices making the unit suitable for installation in residential locations. Noise emissions in all locations shall be limited to levels in compliance with state and local regulations. Outdoor generators shall be installed in sound-attenuating enclosures.

9.14.1.7 Alarms

Safety indications listed in NFPA 110, §5.6.5.2 as Remote Audible shall be inputs to the radio system alarm system. Standby generator run status shall also be an input to the alarm system. Because sites are generally unmanned, audible alarms at the sites shall not be required.

9.14.1.8 Spare Parts

To reduce the need for spare parts inventories from various vendors, backup/standby generators should be from the same manufacturer. “High mortality” spare parts referenced in NFPA 110, §8.2.4 may be stored offsite if typically stocked by the generator owner or the local backup/standby generator repair facility.

9.14.2 Backup Power Supplies

At sites with a standby generator, the uninterruptible power supplies (UPSs) or DC power plants, shall meet or exceed the functional requirements for a Type 0 (non-interruption of power), Class 0.25 (functions fifteen (15) min. at full load), and Level 1 (protection of human life) device as specified in NFPA 111. UPSs or DC power plants shall be of proven design. They shall meet the requirements of NFPA 70, Article 700 and the requirements for an Emergency Power System as defined in NFPA 111. The unit shall continuously protect and condition power for a fully loaded critical bus during normal operation. The unit shall power all infrastructure (radio communications system equipment) for a minimum of thirty (30) minutes for local facilities or with personnel on duty 24 hours x 7 days a week and within five (5) miles. Any site located beyond five (5) miles shall provide power a minimum of two (2) hours runtime.

Units shall provide TCP/IP Ethernet-based management facility, including SNMP network management and web-based status and configuration.

If a UPS is provided, the UPS shall meet the requirements of the following two sections.

9.14.2.1 UPS Emergency Shutoff

The UPS shall have an emergency shutoff switch on the UPS cabinet. Additionally, provisions shall be made to de-energize the facility by operation of a clearly marked emergency switch in proximity to the circuit breaker panel. To prevent inadvertent shutoff, two (2) actions shall be required to engage any emergency UPS shutoff switch (i.e. lift a cover then push a switch, or similar).

9.14.2.2 UPS Bypass Switch

For maintenance and troubleshooting, the UPS shall have an external manual switch that will bypass the UPS AC input to output and disconnect the UPS from the site load and AC input. This will be a make-before-break function switch design in such a way as to prohibit the loss of AC power to the site equipment during and after the switch transfer. This switch shall contain a contact closure that will provide an indication that the bypass function has been activated. The contact closure shall be wired to the alarm system.

In the event of a UPS failure or reduction in output voltage, the UPS shall perform an internal automatic bypass from the AC input to the AC output. This function shall be designed so AC power will be continuous to the site equipment contingent on the presence of commercial or standby generator AC sources.

9.15 Grounding

All site grounding and lightning protection shall be in accordance with the National Electric Code and the grounding and surge protection requirements of ANSI J-STD-607 or:

- Motorola R56 – Standards and Guidelines for Communication Sites
- L3Harris AE/LZT-1234618/1 - Site Grounding and Lightning Protection Guidelines

CONTRACTOR shall provide a grounding plan for each site as identified in Table 4-1.

9.15.1 Common Ground System

There shall be only one (1) common ground system at a communications facility. Grounds for all systems and equipment (including electric service, telephone service, water pipes, etc.) and all metal objects at a site shall be interconnected to equalize voltage rise among all conducting objects at the communications site. The ground system shall be designed to achieve an overall resistance of five (5) ohms or less from any point in the ground system to ground.

9.15.2 Grounding Conductors

All grounding conductor sizes specified are minimum sizes. Flat metal straps or bars may be used in place of wire where the cross-sectional area of the strap or bar meets or exceeds the cross-sectional area of the specified wire. Grounding-conductor insulation shall be green, green with a yellow stripe or marked with green tape or adhesive labels or otherwise colored green at termination points. Grounding conductors shall be supported or secured at intervals of three (3) ft or less. Grounding conductors shall not be run in metal conduit unless the wire is permanently bonded at both ends of the conduit. PVC conduit is preferred.

9.15.2.1 Exterior Grounding Conductors

Unless otherwise stated, exterior grounding conductors shall be solid or stranded, bare copper. Solid conductors are preferred. Conductors installed below grade or partially below grade shall be #2 AWG solid. Below-grade conductors larger than #2 AWG may be stranded. If below-grade conductors are stranded, tinned copper conductors are recommended. Unless otherwise stated, exterior conductors installed entirely above grade shall be #6 AWG. Insulated conductors are preferred for above-grade conductors. Conductors bonded to galvanized steel shall be tinned, bare copper.

9.15.2.2 Interior Grounding Conductors

Interior grounding conductors shall be tinned or untinned stranded copper wire. Interior grounding conductors shall be insulated unless otherwise specified.

9.15.2.3 Grounding Conductor Bends

Grounding conductor lengths shall be kept as short as possible with the minimum number of bends. Conductor bends shall exceed an eight (8) in. radius with an included angle of at least 90 degrees. Bends made at connection points shall turn in the direction of earth ground.

9.15.3 Grounding Equipment

Where a product is commercially available as a UL-listed device, a UL-listed device shall be used.

9.15.4 Connections

Above- and below-grade connections to the grounding electrode system shall be made by exothermic welding or irreversible high-compression connectors. All other above-grade connections shall be made using exothermic welding, lugs, compression connectors, clamps, or other approved means. Connectors shall be designed for the size and type of grounding conductor(s), the surface being grounded, and the metals being bonded. An anti-oxidation compound shall be applied to the surfaces of all mechanical connections. Where lugs are used, two-hole lugs are preferred. Lugs may not be stacked; each lug shall be in direct contact with the surface to which it is being bonded. The removal of galvanization for the purpose of grounding is strictly prohibited. When making connections between dissimilar metals, precautions must be taken to prevent deterioration of grounding surfaces or protective surfaces.

9.15.5 Exterior Grounding System

An exterior grounding system consists of a grounding electrode system, tower ground bar, external building grounding bus bar and grounding conductors from ground bus bars, towers, buildings, fences, cable bridges, generators, and fuel tanks.

9.15.5.1 Ground Rods

Ground rods shall be solid copper, hot-dipped galvanized steel, copper-clad steel, or stainless steel, at least 5/8 in. diameter and eight (8) ft. long. Ground rods shall be driven into the earth using appropriate tools. The depth of the upper end of the ground rod shall be at the same depth as the ground ring, at least thirty (30) in. below grade. If a ground rod cannot be driven straight down the total length of the ground rod, it shall be driven at an angle not greater than forty-five (45) degrees. Auguring and backfilling are not permissible unless used in conjunction with doping. Maximum distance between ground rods shall be twice the length of a single ground rod.

9.15.5.2 Electrolytic Ground Rods

Electrolytic ground rods may be used in locations with poor soil conductivity or limited space where standard ground rods are insufficient to provide a low-impedance ground. Electrolytic ground rods should be considered for use in locations where the grounding electrode system will be covered by pavement or concrete. Electrolytic ground rods shall be UL-listed, maintenance-free and shall meet all federal, state, and local environmental regulations.

9.15.5.3 Ground Plates

Ground plates may be used in special locations where conditions prevent the use of standard ground rods. Ground plates shall be at least 0.06 in. thick with a surface area of at least two (2) sq ft. They shall be installed at least thirty (30) in. below grade.

9.15.5.4 Doping of Ground Systems

Doping of the soil may be necessary to enhance soil conductivity or protect the grounding electrode system from highly acidic soils. The doping material is added around the ground rod in an augured hole or around a conductor in a trench. The doping material shall have a constant cured resistivity of twelve (12) ohm-cm or less. It shall set up to a hard, permanent material and shall not decompose or dissolve over time. It shall not require any maintenance after installation. It shall not accelerate corrosion of the grounding system. The doping material shall meet all federal, state, or local environmental regulations.

9.15.5.5 Grounding Electrode System Conductors

Grounding electrodes shall be interconnected by grounding electrode system conductors to create the grounding electrode system. Grounding electrode system conductors shall be #2 AWG. Grounding electrode system conductors shall be installed at least thirty (30) in. below grade.

9.15.5.6 Ground Rings

Ground rods shall be interconnected to form a ground ring around each tower and communications shelter. Tower ground rings shall be installed at least two (2) ft. beyond tower foundations. Building ground rings shall be installed three (3) ft. beyond building foundations or 2 to 6 ft. beyond the roof dripline. All ground rings at a site shall be connected to each other with at least two (2) #2 AWG wire.

9.15.5.7 Ground Radials

Ground radials are recommended at lightning-prone sites, sites with high soil resistivity or sites normally occupied. Radials may be twenty-five (25) to eighty (80) ft. in length. They shall be cut to different lengths to prevent resonance. Radials shall be equally spaced and radiate from the tower ground ring. They shall be installed thirty (30) in. below grade. Ground rods shall be installed and connected to the radials separated by no more than the sum of their lengths.

9.15.6 Grounding of Towers and Other Antenna Support Structures

The following sections provide general instructions for grounding towers and other antenna support structures. Special situations, such as the use of cathodic protections systems, shall be designed by a professional engineer specializing in the design of these systems. Drilling holes in towers or loosening tower bolts to install grounding is strictly prohibited.

9.15.6.1 Steel Monopoles

Steel monopoles shall be bonded to a tower ground ring by four (4) #2 AWG wires. The ground ring shall consist of at least four (4) ground rods.

9.15.6.2 Self-Supporting Towers

Each leg of a self-supporting steel lattice tower shall be bonded to a tower ground ring by #2 AWG wire. The ground ring shall consist of at least one (1) ground rod per leg with additional ground rods as required to keep the distance between ground rods to less than twice the length of a single ground rod.

9.15.6.3 Guyed Towers

The base of a guyed tower shall be bonded to a tower ground ring by three (3) #2 AWG wire. The grounding conductors shall be bonded to the ground ring within two (2) ft. of the ground rods. The ground ring shall consist of at least three (3) ground rods. At each guy anchor point, a ground rod shall be installed approximately two (2) ft. from the anchor footing. Guy wires shall be bonded to the ground rod by one (1) #2 AWG wire. The grounding conductor shall be connected to the guy wires using UL-listed mechanical clamps. Exothermic welds are not allowed. Where the guys are anchored within the fenced site compound, each ground rod shall be tied back to the tower ground ring below ground, using #2 AWG wire.

9.15.6.4 Antenna Support Structures on Buildings

Buildings on which an antenna support structure is mounted shall have a lightning protection system designed and installed in accordance with NFPA 780. A typical lightning protection system has a grounding conductor around the perimeter of the roof and at least two (2) down conductors to the grounding electrode system. The lightning protection system may be bonded to building steel in at least two (2) locations in lieu of the down conductors. Metal objects on the roof shall be bonded to the lightning protection system.

For a roof-mounted, self-supporting steel lattice tower, the tower legs shall be interconnected with #2 AWG wire to form a tower ground ring. The tower ground ring (or the base plate of antenna masts or guyed towers) shall be bonded to the lightning protection system by two (2) #2 AWG wires. The conductors shall be extended in opposite directions and bonded to the lightning protection system within two (2) ft. of a down conductor or a connection to building steel.

Guy wires associated with towers on top of buildings shall be grounded at their anchor points to the lightning protection system in a similar manner.

9.15.6.5 Ice Bridges Grounding

Each support post of an ice bridge shall be bonded to the grounding electrode system by a #2 AWG wire. The ice bridge shall be bonded to each support post by #6 AWG wire. If the ice bridge consists of more than one (1) section, the sections shall be bonded together by #6 AWG jumpers.

Where the ice bridge is supported by the tower and/or the building and does not have support posts, the following shall apply:

- Where an ice bridge is supported by the tower, it shall be bonded to the tower and electrically isolated from the building. Bonding to the tower may be accomplished by multiple mechanical connections or by bonding the ice bridge to the tower by a #6 AWG wire, to the TGB by a #6 AWG wire, or directly to the grounding electrode system by a #2 AWG wire in flexible non-metallic conduit.
- Where an ice bridge is supported by the building, it shall be bonded to the building and electrically isolated from the tower. At the building, the ice bridge shall be bonded either to the external ground bus bar by a #6 AWG wire or directly to the grounding electrode system by a #2 AWG wire.
- Where an ice bridge is supported by both the building and the tower, the tower end shall be isolated from the tower by an insulating slip-joint device. At the building, the ice bridge shall be bonded either to the external ground bus by a #6 AWG wire or directly to the grounding electrode system by a #2 AWG wire. At the tower, the ice bridge shall be bonded directly to the grounding electrode system by a #2 AWG wire in flexible non-metallic conduit.

9.15.6.6 Tower Ground Bus Bar

A tower ground bus bar (TGB) shall be mounted at the base of each tower or antenna support structure below the point where transmission lines turn toward the communications building or room. The TGB shall be solid copper at least two (2) in. wide and 0.25 in. thick mounted on 2-in. insulators. In locations where the tower is not protected from runoff from the TGB, the TGB shall be tinned. The length of the TGB and the number of conductors mounting holes are determined by the expected current and future number of conductors to be attached.

The TGB shall be bonded to the grounding electrode system by a #2 AWG tinned, solid, bare copper wire in flexible non-metallic conduit. In addition, the TGB may be bonded to the tower either directly using approved hardware or by a jumper.

Additional TGBs may be installed on the tower for the grounding of transmission line grounding kits. These TGBs shall be bonded to the tower by #2 AWG tinned, solid, bare, copper wire.

9.15.6.7 Tower-Top Amplifiers

Tower-top amplifiers shall be grounded to the tower by a #6 AWG wire. Connections to the amplifier shall be made according to the manufacturer’s recommendations.

9.15.6.8 Transmission Lines

The outer conductor of each transmission line, including waveguide, shall be grounded with appropriate coaxial cable grounding kits. These shall be installed per manufacturer's recommendations at a minimum of three (3) locations:

- At the top of the vertical run near the antenna. The grounding kit grounding conductor shall be connected to a vertical structural member of the tower using the clamp provided with the grounding kit or to a TGB using an appropriate two-hole lug.

- At the bottom of the vertical run, just above where the transmission line turns from the tower toward the communications building or room. The grounding conductor shall be connected to the TGB using an appropriate two-hole lug. This point shall be as low to the ground as feasible.
- Immediately outside the cable entrance to the equipment building, just ahead of the coaxial suppressor. The grounding conductor shall be connected to the external ground bus bar (EGB) using an appropriate two-hole lug.

Additional grounding bonds shall be installed to keep the distance between grounding kits to less than seventy-five (75) ft. along the vertical run.

9.15.7 Grounding of Buildings or Shelters

9.15.7.1 Exterior Ground Ring

An exterior ground ring (EGR) shall be installed around the perimeter of each dedicated communications building or shelter. The EGR shall incorporate one (1) ground rod at each corner of the building. As necessary, additional ground rods shall be added so the maximum distance between rods is less than the sum of the length of the ground rods. A ground rod shall be installed directly below the transmission line entrance to the building.

9.15.7.2 Exterior Ground Bus Bar

An exterior ground bus bar (EGB) shall be mounted on the exterior of the building below the cable entrance panel. The EGB shall be solid copper at least 2 in. wide and 0.25 in. thick mounted on 2 in. insulators. The length of the EGB and the number of conductors mounting holes are determined by the expected current and future number of conductors to be attached.

The EGB shall be bonded to the grounding electrode system by a #2 AWG wire. A larger size wire or copper straps are preferred.

The EGB may be eliminated where a cable entrance panel is installed that includes integrated coaxial ground clamps.

9.15.7.3 Cable Entrance Panel

The cable entrance panel shall be bonded to the EGB by a #2 AWG wire.

9.15.8 Grounding of Fences

All metal fences, including gates, within six (6) ft. of the grounding electrode system or any grounded object shall be bonded to the grounding electrode system as follows:

- Each corner fence post and each gate support post shall be bonded to the grounding electrode system by #2 AWG wire.
- Each gate shall be bonded to the gate support post by a flexible copper grounding conductor (#6 AWG wire or equivalent). The flexibility of the grounding conductor shall not be compromised by the bonding process.

9.15.9 Grounding of Metal Objects

The following items must be bonded to the grounding electrode system:

- Emergency generator and generator support base
- Fuel tanks and metal fuel pipes, whether above or below ground
- Electric service and telephone service ground systems
- Any other sizable metal object within six (6) ft. of the grounding electrode system or any grounded object

9.15.10 Interior Grounding System

9.15.10.1 Single-Point Grounding System

Communications buildings, shelters or equipment rooms shall have a single-point grounding system. All equipment and metallic objects shall be connected to the exterior grounding system at a single location.

To facilitate creation of a single-point ground, transmission lines, electric service, telephone circuits, etc., shall enter the communications building or shelter near one another and the master ground bus bar.

9.15.10.2 Master Ground Bus Bar

A master ground bus bar (MGB) shall be installed below the cable entry panel. The MGB shall serve as the single-point ground connection for all internal communications system equipment. The MGB shall be solid copper at least 2 in. wide and 0.25 in. thick mounted on 2 in. insulators. The length of the MGB and the number of conductors mounting holes are determined by the expected current and future number of conductors to be attached. The MGB shall be bonded to the EGR by a #2 AWG wire. The grounding conductor shall extend downward from the MGB and exit the building at a forty-five (45) degree angle. The grounding conductor shall be run in flexible non-metallic conduit from the point it passes into the wall until in runs below ground.

9.15.10.3 Secondary Ground Bus Bars

Secondary ground bus bars (SGBs) may be installed in the same room or in other rooms as needed to simplify connections to the MGB. Equipment may be bonded to the SGB rather than directly to the MGB. The SGB shall be at least 2 in. wide and 0.25 in. thick mounted on 2 in. insulators. The SGB shall be bonded to the MGB by a #2 AWG wire.

9.15.10.4 Grounding of Surge Suppressors

Each coaxial surge suppressor installed at the cable entry point shall be bonded to the MGB by a #6 AWG wire. As an option, a secondary ground bus bar (SGB) may be installed below transmission lines in order to facilitate grounding of multiple surge suppressors. The SGB shall be bonded to the MGB by a #2 AWG wire. Some cable entry panels may include an integrated surge-suppressor SGB. This SGB is bonded directly to the EGR through the cable entry panel, so bonding to the MGB is unnecessary.

9.15.10.5 Interior Grounding Ring

An interior grounding ring (IGR, often called a halo ground) shall be installed around the perimeter of the equipment room. The IGR shall be mounted on 2 in. insulators approximately one 1 ft. below the ceiling or eight (8) ft. above floor level, whichever is lower. The IGR shall consist of two (2) #2 AWG wires of approximately equal length. There shall be a gap between the two (2) conductors of at least four (4) in. at the opposite end of the room from the MGB.

9.15.10.6 Connections to the Interior Ground Ring

Items mounted along the perimeter of the equipment room, including the following, shall be bonded to the IGR by a #12 AWG wire:

- Electrical panelboards and transient-voltage surge suppressors (TVSSs)
- Telephone terminal block enclosures and surge suppressors
- Emergency generators (if located indoors)
- Metal battery racks
- Doors
- Door frames
- Ventilation ducts
- Water pipes
- Electrical conduits
- Any significant metal object within six (6) ft. of any other grounded object

9.15.10.7 Equipment Grounding Bus

An equipment grounding bus (EGB) consists of a conductor bonded to the MGB or SGB and radiating outward to equipment locations. The EGB typically runs within cable tray. The EGB may have multiple taps to branch to multiple rows of equipment racks or cabinets. The EGB conductors shall be #2 AWG wire. EGB conductors shall be routed to minimize the distance from the equipment to the MGB or SGB.

9.15.10.8 Rack and Cabinet Ground Bus

A rack or cabinet ground bus (RGB) shall be installed at each rack or cabinet. The RGB shall be #6 AWG wire. The rack or cabinet shall be grounded to the EGB or the RGB by #6 AWG wire.

9.15.10.9 Grounding of Equipment

Each equipment chassis within a rack or cabinet shall be connected to the RGB by #12 AWG wire. Equipment grounds shall not be daisy chained. Communications equipment shall not be connected to the IGR. All equipment, whether mounted in racks or cabinets or in some other manner, shall be connected either to the MGB, an SGB or an EGB.

9.15.10.10 Cable Trays

Cable trays shall be connected to the MGB by a #2 AWG copper wire. Cable tray sections shall be bonded together by #6 AWG copper wires.

9.15.11 Communications Center Grounding

A communications center ground bus (#2 AWG copper wire) shall be run under the flooring for each equipment row, if possible, in a manner to allow each equipment to tie into this ground with a #6 AWG solid or stranded, green-insulated copper wire. The ground bus shall be short and direct with no sharp bends and shall not run parallel within 2 in. of any power or signal leads. The ground bus shall connect to a single-point master ground bus bar, and then connect to the exterior building ground, except if no external ground system is being installed as part of the equipment installation. Any ground system installed shall be effectively connected to the existing building ground or electrical service ground.

Console bays shall be bonded together and shall be connected to the communications center ground bus with a short, direct run of #6 AWG or larger solid or stranded, green-jacketed copper wire, avoiding sharp bends.

9.16 Surge Suppression

All power and communications circuits entering and exiting the communications shelter or room shall be protected by the application of appropriate surge protective devices (SPDs) employing metal-oxide varistors (MOVs) or silicon avalanche diodes (SADs).

9.16.1 Transmission Line Surge Protective Devices

All RF transmission lines, including unused spares, must be protected by coaxial SPDs. Transmission line SPDs shall be located within 2 ft. of the entrance to the building, or if the communications equipment room is not near the building entrance, within 2 ft. of the entrance to the communications equipment room. Coaxial SPDs shall be grounded as indicated above.

9.16.2 Electric Service Panelboard Surge Suppression

A Type 1 transient voltage surge suppressor (TVSS) shall be placed on the source side of service entrance panels, and on the load side of transfer switches or distribution panels. The suppressor shall be installed in parallel via a circuit breaker sized according to the manufacturer's recommendation (typically 60-amp) rated for the interrupting current of the panel. The lead lengths from the protective devices shall be as short as possible. The TVSS enclosure shall be grounded to the IGR with #6 AWG wire. A remote status indicator must be available.

9.16.3 AC Power In-Line Protection

When the above TVSSs are used, no additional TVSSs are required on site. If main/branch panel TVSS is not available, each AC utility power line shall be equipped with a two-way surge protector.

9.16.4 Telephone Lines

All telephone lines, T1 lines, data, and control lines (excluding all fiber-optic lines) entering a site shall be equipped with bi-polar, bi-directional SAD surge protectors. The location for these protectors can be at the equipment or telephone patch panel depending upon the application. For these hazards, protectors shall be connected with a #6 AWG or larger solid copper wire or strap to either the equipment ground or telephone patch panel ground.

10 Abbreviations & Acronyms

Abbreviations and Acronyms List			
AASHTO	American Association of State and Highway Transportation Officials	DMZ	Demilitarized Zone
AC	Alternating Current	DS1	Digital Signal 1
AC	Advisory Circulars	DS3	Digital Signal 3
ACI	American Concrete Institute	DVD	Digital Video Disc
AES	Advanced Encryption Standard	DVR	Digital Vehicular Repeater
AM	Amplitude Modulation	E&M	Ear & Mouth
ANSI	American National Standard Institute	EGB	Equipment Grounding Bus
ASCE	American Society of Civil Engineers	EGR	Exterior Ground Ring
ASHRAE	American Society for Heating, Refrigeration and Air-conditioning Engineers	EIA	Electronic Industries Association
ASSE	American Society of Safety Engineers	EMT	Electrical Metallic Tubing
ASTM	American Society for Testing and Materials	EPSS	Emergency Power Supply System
ATIS	Alliance for Telecommunications Industry Solutions	ERP	Effective Radiated Power
ATP	Acceptance Test Plan	F1	First Fresnel Zone Height
AUX I/Os	Auxiliary Inputs/Outputs	FAA	Federal Aviation Administration
AWG	American Wire Gauge	FCC	Federal Communications Commission
BER	Bit Error Rate	FDMA	Frequency Division Multiple Access
C4FM/CQPSK	Continuous 4-level Frequency Modulation / Continuous Quadrature Phase Shift Keying	GC	Clayey Gravel
CAD	Computer Aided Dispatch	GM	Silty Gravel
CD-ROM	Compact Disc Read-Only Memory	GP	Gravel Poorly Graded
CFR	Code of Federal Regulations	GPS	Global Positioning System
COTS	Commercial Off-the-Shelf	GUI	Graphical User Interface
CPU	Central Processing Unit	GW	Gravel Well-Graded
DAQ	Delivered Audio Quality	HIPS	Host-Bases Intrusion Prevention Software
dB	Decibel	HVAC	Heating, Ventilation, and Air Conditioning
dBm	Decibel-milliwatt	Hz	Hertz
DC	Direct Current	I/O	Input / Output
DDR	Detailed Design Review	ID	Identifier

Abbreviations and Acronyms List			
IDU/ODU	Indoor Unit/Outdoor Unit	P25	APCO Project 25
IEEE	Institute for Electrical and Electronics Engineers	PA	Power Amplifier
IESNA	Illuminating Engineering Society of North America	PC	Personal Computer
IGR	Interior Ground Ring	PDF	Portable Document Format
IP	Internet Protocol	PSF	Pounds-Force Per Square Foot
IRR	Instant Recall Recorder	psig	pounds per square inch gage
K	K factor	PVC	Polymerizing Vinyl Chloride
KFD	Key Fill Device	QoS	Quality of Service
KMF	Key Management Facility	RF	Radio Frequency
LED	Light-Emitting Diode	RFP	Request for Proposal
LMR	Land Mobile Radio	RGB	Rock or Cabinet Ground Bus
LPG	Liquefied Petroleum Gas	RSL	Received Signal Level
MGB	Mater Ground Bus Bar	RTU	Remote Terminal Unit
MHSB	Monitored Hot Stand-by	RX	Receiver
MoM	Manager of Managers	P25	APCO Project 25
N/C	Normally Closed	PA	Power Amplifier
N/O	Normally Opened	SAD	Silicon Avalanche Diodes
NECA	National Electrical Contractors Association	SC	Clayey Sand
NEMA	National Electrical Manufactures Association	SGB	Secondary Ground Bus Bar
NEPA	National Environmental Policy Act	SHPO	State Historic Preservation Offices (National Register)
NESC	National Electrical Safety Code	SM	Silty Sand
NFPA	National Fire Protection Association	SNMP	Simple Network Management Protocol
NIST	National Institute of Standards and Technology	SNMPv1	Simple Network Management Protocol Version 1
nm	nanometer	SNMPv2	Simple Network Management Protocol Version 2
NMS	Network Management System	SNMPv2c	Simple Network Management Protocol Sub-version 2
NTP	Notice to Proceed	SNMPv3	Simple Network Management Protocol Version 3
O.D.	Outside Diameter	SP	San Poorly Graded
OC3	Optical Carrier 3	SPD	Surge Protection Devices
OEM	Original Equipment Manufacturer	SSL	Secure Sockets Layer
OET	Office of Engineering & Technology	STD	Standard
OTAP	Over the Air Programming	STS-1	Synchronous Transport Signal 1
OTAR	Over the Air Rekeying	SW	Sand Well-Graded
T1	T-Carrier	TGB	Tower Ground Bus Bar

TIA	Telecommunications Industry Association		
TL1	Transaction Language 1		
TSB	Telecommunications Systems Bulletin		
TTL	Time to Live		
TVSS	Transient-Voltage Surge Suppressor		
TX	Transmitter		
UHF	Ultra-High Frequency		
UL	Underwriters Laboratories		
UPS	Uninterruptible Power Supply		
USB	Universal Serial Bus		
VAC	Voltage Alternating Current		
VDC	Voltage Direct Current		
VHF	Very-High Frequency		
VPN	Virtual Private Network		
VSWR	Voltage Standing Wave Ratio		
W	Watt		

Appendix A – Evaluation Criteria

Scoring of Proposals

The Town of Athol will select the responsive and responsible PROPOSER submitting the most advantageous proposal, taking into consideration the PROPOSER's system configuration and design, coverage adequacy, project manager/lead engineer/organization experience, warranty and maintenance service organization experience, and schedule. The proposals will be evaluated using the following scoring designators:

Scoring Category	Description
Highly Advantageous	The proposal meets all the specific RFP requirements for the given evaluation category.
Most Advantageous	The proposal meets most of the specific RFP requirements for the given evaluation category.
Not Advantageous	The proposal does not meet the specific RFP requirements for the given evaluation category.

The three scoring designators will be assigned based on a percentage of the total point allocation for each evaluation category. The detailed breakdown of percentages is shown below:

Scoring Category	Percentage of Available Points Per Category
Highly Advantageous	95-100% of point allocation
Most Advantageous	80-95% of point allocation
Not Advantageous	Less than 80% of point allocation

Proposals will be evaluated based on the categories below:

Category	Point Allocation
Pricing (30 Points)	
Infrastructure / Subscriber Costs	25
14 Year Ongoing Costs (Operations & Maintenance)	5
Technical (70 Points)	
System Configuration and Design – Major Exceptions	10
Coverage Adequacy	25
Responsiveness to the Intent of the Specification – Minor Exceptions	10

Responsiveness to the Intent of the Specification – Questions	5
Project Manager Experience	5
Lead Engineer Experience	5
Warranty and Maintenance Service Organization Experience	5
Schedule	5
Total Evaluation Points	**100**

Grounds for Rejection

A proposal may be rejected for any of the following reasons:

- Failure to accept the Terms and Conditions as written in Section 3 of the RFP
- Failure to accept Athol Form of Contract Document.
- Submitting a Technical Proposal containing pricing information.
- Failure to provide a *redacted* Technical Proposal, in electronic PDF format, that is compliant with Code of the Commonwealth of Massachusetts.
- Failure to provide a complete proposal, based upon the requirements of RFP Section 2.
- The proposed system is incomplete, e.g. specified subsystems or interfaces to existing equipment are not proposed.
- The proposed radio system will not provide the capacity to support the number of users specified in the RFP.
- Failure to provide a coverage guarantee.
- The PROPOSER'S schedule is unrealistic. A schedule may be deemed unrealistic if *important tasks or milestones are omitted* or if insufficient time is allocated to tasks.
- The PROPOSER's Price Proposal Worksheet does not provide the required details in the Pricing Sheets. Bundling pricing will not be accepted.
- Including scope of work and technical assumptions in sections other than Section 4 of the Technical Proposal.

Evaluation Categories

PRICING

Pricing shall be scored based upon the last pricing workbook submitted to Athol prior to final evaluation.

The pricing evaluation is separated into two subcategories: Infrastructure / Subscriber Costs, and 14-year running costs.

Infrastructure / Subscriber Costs: Shall comprise the total initial cost for the system infrastructure and all subscriber units.

Infrastructure:
Infrastructure costs shall include all fixed equipment (Radio and Microwave systems), physical facilities (shelters, towers, generators, HVAC, access roads, etc.) all dispatch equipment (consoles, back-up control stations, logging recorder, etc.), alarm system, software, all costs associated with acquisition, designing, staging, delivery, installation, construction, implementation, configuration, testing, cutover, and all services (project management, engineering, training, etc.).

Infrastructure costs shall include all costs associated with first-year operation of the base system, including the following:
- purchase or 1st year lease of sites or property
- 1st year lease of equipment room and/or tower space
- 1st year lease of connectivity network (e.g. fiber-optic)
- regulatory fees
- setup and implementation of utilities
- initial full tank of generator fuel
- 1-year warranty

Subscribers:
Subscriber costs will be based on pricing information in the Price Proposal worksheet, provided the proposed subscribers are compliant with the RFP. Where proposed subscriber equipment is not compliant or list prices are unavailable, the evaluation team will estimate the cost for compliant subscriber equipment based on proposed list prices.

Subscriber costs include the following:
- subscriber units (mobiles, portables, pagers, control stations)
- all ancillary items required to operate and charge the unit
- subscriber services (delivery, programming, installation)
- required features and functionality specified by the RFP
- accessories requested by Athol in the RFP
- 3-year warranty

The following costs are excluded in the calculation of infrastructure/subscriber costs:
- operations and maintenance
- contingent discounts

- mandatory options identified in the RFP
- options offered by the PROPOSER.

Points will be awarded to each proposal based on the following formula:

$$PIC_n = \frac{MinIC}{IC_n} \times PIC_0$$

Where:
PIC_n is the points awarded to Proposal *n* for this subcategory
MinIC is the lowest Initial Costs of all valid proposals
IC_n is the Initial Costs of Proposal *n*; and
PIC_0 is the total points allocated to this category.

Where infrastructure or subscriber costs are not included in the Proposal, they will be estimated by the evaluation team.

14 Year Ongoing Costs

14 Year Ongoing Costs include the following long-term costs:

- Years 2-15 maintenance plan
- annual radio infrastructure preventive maintenance and site inspections
- bi-annual subscriber preventive maintenance
- system refresh or any incremental upgrades necessary to maintain system operations for 15 years
- software and system updates/upgrades necessary to maintain system operations for 15 years
- new site lease costs – if Athol must lease property to build a tower
- existing site lease costs - tower space and/or ground space for shelter/generator
- connectivity network maintenance
- dispatch equipment maintenance plan (consoles, control stations, logging recorder, etc.)

Where these costs are not included in the Proposal, they will be estimated by the evaluation team. These costs will be based on pricing information in the Price Proposal worksheets, provided that proposed warranty and maintenance services are compliant with the RFP. Where proposed services and support is not compliant, the cost will be estimated based on proposed prices for compliant services and support. If proposed prices are unavailable for RFP required services and support, the evaluation team will estimate the cost of compliant support.

Points will be awarded to each proposal according to the following formula:

$$P14YearCost_n = \frac{Min14YearCost}{14YearCost_n} \times P14YearCost_0$$

Where:
$P14YearCost_n$ is the points awarded to Proposal *n* for this category
$Min14YearCost$ is the lowest 14 Year Ongoing Costs of all valid proposals
$14YearCost_n$ is the 14 Year Ongoing Costs of Proposal *n*; and
$P14YearCost_0$ is the total points allocated to this category.

TECHNICAL

System Configuration and Design

Evaluation points will be awarded for proposed system configurations and designs that meet the RFP requirements. This category also evaluates system capacity (current and future), guaranteed coverage, planned locations with existing or new radio sites, connectivity network topology, simulcast design, interoperability, redundancy, reliability, functions, and features. If the evaluation team determines that the Proposal has not met the RFP requirements, the evaluation team will mark the non-compliance as a major exception at their discretion.

The following are examples of possible major exceptions, not meant to be exhaustive or all-inclusive:

- failure to ***substantially*** comply with RFP Terms and Conditions
- failure to accept the Sample Contract Document
- submission of additional Terms and Conditions that are in conflict with the RFP Terms and Conditions
- failure to propose all equipment and services (to include physical facilities upgrades) necessary to provide a complete and working system as specified in the RFP
- proposing equipment that fails to meet specifications at numerous points
- proposing equipment that does not meet the specifications, however the PROPOSER has a product line that does meet the specifications
- proposing equipment that is not public safety grade
- the proposed system's modes of operation inhibit the ability of a user to perform his duties safely and efficiently
- a system configuration that significantly affects dependability
- system redundancy that is significantly less than specified in the RFP
- system traffic loading capacity fails to meet current and future voice & data communications specified by the RFP and/or does not comply with public safety industry standards
- Acceptance Test Plan not compliant with the RFP requirements
- failure to comply with the RFP re-testing requirements

Points for this category will be awarded based on the higher score obtained by one of the following two methods:

1. Two (2) points will be deducted for each major exception; or
2. Points will be awarded based on the following formula:

$$PConfig_n = \frac{E_1 + E_2 + \ ... + EN - E_n}{E_1 + E_2 + \ldots + E_N} \times PConfig_0$$

Where:
$PConfig_n$ is the points awarded to Proposal n for this category
E_n is the number of major exceptions found in Proposal n
N is the number of valid proposals; and
$PConfig_0$ is the points allocated to this category.

Coverage Adequacy

Evaluation points will be awarded according to coverage guaranteed. All PROPOSERS meeting the coverage specifications will be provided 100 percent (100%) of the points for this category.

For proposals not meeting the coverage specifications, a one-point deduction shall be assessed for each one percent inadequacy in meeting the specification in any direction (talk-out and/or talk-in) for each service area.

Responsiveness to the Intent of the Specifications – Minor Exceptions

Points in this category will be deducted if minor exceptions in equipment, system specifications, or pricing are found by the evaluation team. The following are examples of minor exceptions, though this list is not intended to be all-inclusive or exhaustive:

- Equipment proposed does not meet the specifications, and the PROPOSER'S product line does not meet the specifications.
- Proposed equipment does not meet the specifications, and the Proposal states "Exception" in the Compliance section (Appendix B).
- Proposed equipment does not meet the specifications, but the Proposal states "Comply" or "Comply with Clarification" in the Compliance section (Appendix B).
- Proposed equipment can meet the specifications and stated "Comply", but the Proposal would require purchasing additional system features or functions listed "optional".

1. One quarter (1/4) points will be deducted for each minor exception; or

2. Points will be awarded based on the following formula:

$$PMinorexp_n = \frac{E_1 + E_2 + \cdots + E_N - E_n}{E_1 + E_2 + \cdots + E_N} \times PResponse_0$$

Where:
$PMinorexp_n$ is the points awarded to Proposal *n* for this subcategory,
E_n is the number of minor exceptions found in Proposal *n,*
N is the number of valid proposals; and,
$PResponse_0$ is the points allocated to this category.

Responsiveness to the Intent of the Specifications – Questions

If sections of the technical or price proposals are missing items, require clarification or require additional explanation to determine if the proposal meets or deviates from RFP requirements, the evaluation team will submit written questions. The total number of questions for each proposal will be calculated and points will be awarded using the following:

1. One quarter (1/4) points will be deducted for each question; or
2. Points will be awarded based on the following formula:

$$PQuestion_n = \frac{Q_1 + Q_2 + \cdots + Q_N - Q_n}{Q_1 + Q_2 + \cdots + Q_N} \times PResponse_0$$

Where:
$PQuestion_n$ is the points awarded to Proposal *n* for this subcategory,
Q_n is the number of questions asked for Proposal *n*,
N is the total number of valid proposals; and,
$PResponse_0$ is the points allocated to this category.

Project Manager Experience

The evaluation team will contact each of the three (3) references, submitted by the PROPOSER, for the project manager. The evaluation team will ask several questions and the reference will submit a rating response to each question: 5 Excellent, 4 Good, 3 Satisfactory, 2 Fair, 1 Poor. If no response is received from a reference, or a question is not answered, the evaluation team will assign 0. The responses to each question from a single reference will be averaged to produce a total score for that reference. The total scores from all references will be averaged to produce an overall score for the category.

Lead Engineer Experience

The technical evaluation team will contact each of the three (3) references, submitted by the PROPOSER, for the lead engineer. The evaluation team will ask several questions and the reference will submit a rating response to each question: 5 Excellent, 4 Good, 3 Satisfactory, 2 Fair, 1 Poor. If no response is received from a reference, or a question is not answered, the evaluation team will assign 0. The responses to each question from a single reference will be averaged to produce a total score for that reference. The total scores from all references will be averaged to produce an overall score for the category.

Warranty and Maintenance Service Organization Experience

The technical evaluation team will contact each of the three (3) references, submitted by the PROPOSER, for the service organization proposed to perform the warranty and maintenance work. The evaluation team will ask several questions and the reference will submit a rating response to each question: 5 Excellent, 4 Good, 3 Satisfactory, 2 Fair, 1 Poor. If no response is received from a reference, or a question is not answered, the evaluation team will assign 0. The responses to each question from a single reference will be averaged to produce a total score for that reference. The total scores from all references will be averaged to produce an overall score for the category.

Schedule

All points in this category will be awarded to each PROPOSER that proposes a schedule that meets the specified schedule in Section 2. If the proposed schedule does not meet the specified schedule, points will be awarded based on the following formula:

If $Sched_n \leq$ RFPSched, then

$$PSched_n = PSched_0$$

If RFPSched $< Sched_n <$ 2 x RFPSched, then

$$PSched_n = PSched_0 \times \left(2 - \frac{Sched_n}{RFPSched} \right)$$

If $Sched_n \geq$ 2 x *RFPSched*, then

$$PSched_n = 0$$

Where

$PSched_n$ is the points awarded to Proposal *n* for this category;

RFPSched is the number of days in the schedule specified in the RFP

$Sched_n$ is the number of days in the schedule proposed in Proposal *n*; and

$PSched_0$ is the points allocated to this category.

FINAL SELECTION

Athol shall select the PROPOSER which, in its opinion, has made the best proposal and provides the best value to Athol.

Athol shall notify all PROPOSERS of the Notice of Intent to Award. Upon issuing a Notice of Intent to Award, Athol will expect the selected PROPOSER to negotiate in good faith and execute a contract within sixty (60) days. Failure to execute a contract within sixty (60) days may be grounds for Athol to end negotiations with the selected PROPOSER and begin negotiations with the next highest ranked PROPOSER.

Athol reserves the right to waive any informalities or irregularities. Athol may cancel the RFP at any time and may reject all Proposals, or any portion thereof, if it is deemed in their best interest.

Appendix B - Compliance Matrix

See attached excel file

Appendix C - Responsibilities Matrix

See attached excel file

Appendix D – Price Proposal Forms - Instructions

D.1 General Instructions

ABSOLUTELY NO PRICE INFORMATION SHALL BE INCLUDED IN THE TECHNICAL PROPOSAL. TECHNICAL PROPOSALS CONTAINING PRICE INFORMATION MAY BE DISQUALIFIED.

The PROPOSER shall enter detailed prices for the proposed system(s), equipment, software, and services in the Microsoft Excel workbook provided. The PROPOSER shall submit this completed workbook in its native Microsoft Excel format, failure to do so may result in rejection of the Proposal or loss of evaluation points. The PROPOSER shall also submit all sheets in the Microsoft Excel pricing pages as a PDF, and included in the Price Proposal submission, failure to provide all pricing information as a PDF copy may result in rejection of the Proposal.

The following notes apply, as appropriate, to all the cost pages:

- The PROPOSER shall include all costs for a turnkey system related to each specified cost area.
- PROPOSER **shall not bundle pricing**, when line items are available to submit detailed pricing.
- PROPOSER shall complete each worksheet in the pricing pages to allow for detailed evaluation.
- Items with no associated cost shall be indicated by zero (0) dollars in the appropriate cost column.
- Items that are not required or not applicable to the proposed system shall be noted as “N/A”, in the Note column, and no costs shall be included for these items.
- The PROPOSER shall enter costs not specifically requested in the “Other Related Costs” cells that have been provided.
- Where costs for a line Item are included as part of another line item, the PROPOSER shall reference the item number which includes the cost.
- In case of calculation errors or inaccuracies in the submitted pricing forms, the unit pricing shall prevail.
- All equipment required for a complete operational system shall be assumed to be included in the total system cost.

Failure to adhere to the above notes may result in rejection of the Proposal or loss of evaluation points.

D.2 Specific Instructions

D.2.1 General Setup

The price forms are provided in Microsoft Excel workbook file named "*Appendix D - Price Proposal Workbook.xlsx*". Tabs are provided as follows:

- Project Information Worksheet
- Project Summation
- A. Physical Facilities
- B. Radio System
- C. Connectivity Network
- D. Dispatch Centers
- E. Services
- F. Public Safety Subscribers
- G. Project Discount
- H. Ongoing Costs
- I. Project Options
- J. Maintenance Options
- K. Mandatory Unit Pricing
- Notes

D.2.2 Color Definition

The colors black, gray, and white are used throughout this workbook to simplify data entry. **Data or text shall only be entered into gray cells**. Text and data shall not be entered in cells that are not gray, to do so will create errors on the workbook and may result in rejection of the Proposal or loss of evaluation points. If an error occurs the PROPOSER shall reach out to the Town in writing, to request a revised Appendix D.

D.2.3 Project Information

The PROPOSER shall enter the date of submission, the PROPOSER's legal name, and the site names into the gray cells.

D.2.4 Base Quote Totals

The worksheet labeled "Project Summation" is used to display all the section totals, total base system, project discount, grand total, maintenance, project options, and maintenance options. Project options and maintenance are not summed into the grand total price.

The worksheet contains formulas that pull the numbers from the individual worksheets and performs elementary arithmetic for adding and subtracting. This page is for display purposes only and no information shall be added by the PROPOSER.

D.2.5 Infrastructure Related Costs

Worksheets are included for the following categories of systems:

- Physical Facilities
- Radio System
- Connectivity Network
- Dispatch Centers

The PROPOSER shall use these worksheets to enter all related costs for systems, equipment, software, installation, and programming for that category.

Columns A and B list equipment and installation totals per individual line item. Cells A3 and B3 sum all equipment and installation costs for the entire category. Cell A2 sums cells A3 and B3 together. The total from cell A2 (on each worksheet) is reported on the "Project Summation" worksheet and, if clicked, will take you to the Project Summation sheet.

If there are significant detailed notes the PROPOSER believes necessary, enter a designated note number next to the line item in column C and insert the note in the worksheet labeled "Notes" at the end of the Price Proposal Workbook. Columns D and E list numbers and titles of each line item. The PROPOSER shall denote all pricing information for each line item in the proposed system.

D.2.6 Services

The PROPOSER shall use this worksheet to enter all costs related to project management, engineering, testing, training, documentation for that category. This includes the following:

- Labor (services/qty)
- Out-of-Pocket (expenses/qty)

D.2.7 Subscriber Related Costs

Worksheets are included for the following categories:

- Public Safety Subscribers
- Non-Public Safety Subscribers

The PROPOSER shall use this worksheet to enter all related costs for equipment, installation, and programming for that category. The PROPOSER shall denote all pricing information for each line item used for a specified subscriber unit.

PROPOSERS shall enter the Model Number in the grey cells of Column C. Column F provides the total number, all departments, for that line item. The next two columns are gray for PROPOSER input: column G is for equipment per unit costs; column H is for install/program per unit cost. The next column I has a mix of gray and white cells, the gray cell may be used to enter quantities and the white cells have pre-populated qualities based upon the Town's agency needs. Columns J & K calculate total equipment and installation/program costs for that line item for the Town's Agency. The two cells in columns J & K above the agency name total equipment and installation costs per site. Above these cells is a single cell that totals both equipment and installation costs per agency.

Columns G - K are repeated for each agency that will operate on the PROPOSED system.

D.2.8 Project Discount Worksheet

This worksheet is separated into the following categories:

- Infrastructure Project Discount
- Subscribers Project Discount

The PROPOSER shall use this worksheet to insert any discount associated with the proposed system design. The PROPOSER shall complete Column F to provide the monetary discount offered. The PROPOSER shall separate the discounts offered for infrastructure and subscribers as outlined in the worksheet.

D.2.9 Project Options

The PROPOSER shall use this worksheet to enter all costs related to options. The PROPOSER shall offer the options as described on this worksheet. If the PROPOSER desires to offer additional options, they may be included after the named options.

Columns A and B list equipment and installation totals per individual line item. The total from cell A2 is reported on the "Project Summation" worksheet. The next two columns are gray for PROPOSER input: Column F is for equipment costs and column G is for installation costs.

D.2.10 Ongoing Costs (Years 1 through 15)

The PROPOSER shall use this worksheet to enter all costs related to ongoing costs for years 1 -15.

It is expected the only costs to be included in 1st Year Maintenance will be the Lease Costs for each site not owned by Athol.

Columns A and B list services and spare parts totals per individual line item. Cells A3 and B3 sum all equipment and installation costs for the entire category. Cell A2 sums cells A3 and B3 together. The total from cell A2 is reported on the "Project Summation" worksheet.

The PROPOSER shall denote all pricing information for each line item that is necessary for maintaining the implemented system. The PROPOSER shall separate all necessary services and spare parts for complete maintenance as outlined in the worksheet.

The next two columns are gray for PROPOSER input: Column F is for 2nd year maintenance services costs; column G is for 2nd year spare parts costs. Columns F & G are repeated for each year of maintenance costs, through year 15.

D.2.11 Ongoing Costs Options (Years 1 through 15)

The PROPOSER shall use this worksheet to enter all costs related to Ongoing Costs Options. The PROPOSER shall offer the options as described on this worksheet. If the PROPOSER desires to offer additional options, they may be included after the named options.

The PROPOSER shall denote all pricing information for each line item that is necessary for maintaining the implemented system. The PROPOSER shall separate all necessary services and spare parts for complete maintenance as outlined in the worksheet.

The next two columns are gray for PROPOSER input: Column F is for optional 1st year warranty/maintenance services costs; column G is for 1st year warranty/maintenance spare parts costs. Column H is for optional 1st year warranty/maintenance services costs; column G is for 1st year warranty/maintenance spare parts costs. Column H is for 2nd year optional maintenance services costs; column I is for 2nd year optional spare parts costs. Columns H & I are repeated for each year of optional maintenance and spare parts costs, through year 15.

D.2.12 Mandatory Unit Pricing Worksheet

The PROPOSER shall use this worksheet to enter the subscriber equipment unit and unit installation costs that will be used for future purchasing. The PROPOSER shall offer the options as described on this worksheet. If the PROPOSER desires to offer additional options, they may be included after the named options.

This worksheet will not be included in the base quote total and will only be used as a reference in future purchases by Athol. PROPOSERS shall enter Model Number in the gray cells of column C, enter the per unit equipment cost in column D, and enter the per unit installation and program costs in column E.

The pricing provided on this sheet **shall not** be different than the pricing on sheet for Public Safety Subscribers and the sheet for Non-Public Safety Subscribers.

D.2.13 Notes

The PROPOSER shall use this worksheet to enter any detailed notes of explanation. The PROPOSER shall enter the following information: column A shall reference the specific worksheet to which the note corresponds; column B shall reference the assigned note reference # as entered in column C of the specified worksheet; and column C shall be the detailed notes of explanation.

IFB #

TOWN OF ATHOL

CONTRACT & GENERAL CONDITIONS

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DATE:

This contract is entered into on, or as of, this date by and between the Town of Athol (the "Town"), and

_____
_____
_____
_____
_____

1. This is a contract for the procurement of the following:

2. The contract price to be paid to the Contractor by the Town of Athol is:

3. Payment will be made as follows:

   Net 30 days

*Specifications are incorporated as part of this contract and hereto attached.

4.1 Acceptance: All contracts require proper acceptance of the described goods or services by the Town of Athol. Proper acceptance shall be understood to include inspection of goods and certification of acceptance performance of services by authorized representatives of the Town to insure that the goods or services are complete and are as specified in the contract.

4.2 Contract Documents: All documents relative to the contract including (where used) Instructions to Bidders, Proposal Form, General Conditions, Supplementary General Conditions, General Specifications, Other Specifications included in Project Manual, Drawings and all Addenda issued during the bidding period. The Contract Documents are complementary, and what is called for by any one shall be as bidding as if called for by all. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper performance of the contract.

4.3 The Contractor: The "other party" to any contract with the Town. This term shall (as the sense and particular contract so require) include Vendor, Contractor, Engineer, or other label used to identify the other party in the particular contract. Use of the term "contractor" shall be understood to refer to any other such label used.

4.4 Date of Substantial Performance: The date when the work is sufficiently complete, the services are performed, or the goods delivered, in accordance with contract documents, as modified by Amendments and Change Orders.

4.5 Goods: Goods, Supplies or Materials.

4.6 Subcontractors: Those having a direct contract with the Contractor. The term includes one who furnished material worked to a special design according to the Drawings or Specifications of this work, but does not include one who merely furnished material not so worked.

4.7 Work: The services or materials contracted for, or both.

5. TERM OF CONTRACT AND TIME FOR PERFORMANCE

This contract shall be fully performed by the Contractor on or before _____ unless extended pursuant to a provision for extension contained in the contract documents at the sole discretion of the Town and not subject to assent by the Contractor and subject to the availability and appropriation of funds. The time limits stated in the contact documents are of the essence of the contract.

6. SUBJECT TO APPROPRIATION:

Notwithstanding anything in the contract documents to the contrary, any and all payments, which the Town is required to make under this contract, shall be subject to appropriation or other availability of funds as certified by the Town Accountant.

7. PERMITS AND APPROVALS:

Permits, licenses, approvals, and all other legal or administrative prerequisites to its performance of the contract shall be secured and paid for the Contractor.

8. THE CONTRACTOR'S BREACH AND THE TOWN'S REMEDIES:

Failure of the Contractor to comply with any of the terms or conditions of this Contracts shall be deemed a material breach of this Contract, and the Town of Athol shall have all the rights and remedies provided in the contract documents, the right to cancel, terminate, or suspend the contract in whole or in part, the right to maintain any and all actions at law or in equity or other proceedings with respect to a breach of this Contract including damages and specific performance, and the right to select among the remedies available to it by all of the above.

9. STATUTORY COMPLIANCE:

9.1 This contract will be construed and governed by the local provisions of applicable federal, state and local laws and regulations; and wherever any provisions of the contract or contract documents shall conflict with any provision or requirement of federal, state or local law or regulation, then the provisions of law and regulation shall control. Where applicable to the contract, the provisions of General Laws are incorporated by reference into this contract, including but not limited to the following:

General Laws Chapter 30B: - Procurement of Goods and Services.

General Laws Chapter 30, Sec. 39, et seq: - Public Works Contracts.

General Laws Chapter 149, Sec. 44A, et seq: - Public Buildings Contracts.

9.2 Wherever applicable law mandates the inclusion of any term and provision into a municipal contract, this section shall be understood to import such term or provision into this contract. To whatever extent any provision of this contract shall be inconsistent with any law or regulation limiting the power or liability of cities and towns, such law or regulation shall control.

9.3 The Contractor shall give all notices and comply with all laws regulations bearing on the performance of the contract. If the Contractor performs the contract in violation of any applicable law or regulation, the Contractor shall bear all costs arising therefrom.

9.4 The Contractor shall keep itself fully informed of all existing and future state and National Laws and Municipal By-Laws and regulations and of all orders and decrees of any bodies or tribunals having jurisdiction in any manner affecting those engaged or employed in the work, of the materials used in the work or in any way affecting the conduct of the work, if any discrepancy or inconsistency is discovered in the Drawings, Specifications or Contract for this work in violation of any such law, by-law, regulation, order or decree, it shall forthwith report the same in writing to the Town. It shall, at all times, itself observe and comply with and shall cause all its agents, employees and Subcontractors to observe and comply with all such existing and future laws, by-laws, regulations, orders and decrees; and shall protect and indemnify the Town of Athol, and its duly appointed agents against any claim or liability arising from or based on any violation whether by him or its agents, employees or Subcontractors or any such law, by-law, regulation or decree.

10. CONFLICT OF INTEREST:

Both the Town and the Contractor stipulate to the applicability of the State Conflict of Interest Law (General Laws Chapter 268A), and this contract expressly prohibits any activity, which shall constitute a violation of that law. The Contractor shall be deemed to have investigated its applicability to the performance of this contract; and by executing the contract documents the Contractor certifies to the Town that neither it nor its agents, employees, or subcontractors are thereby in violation of General Laws Chapter 268A.

11. CERTIFICATION OF TAX COMPLIANCE:

This contract must include a certification of tax compliance by the Contractor, as required by General Laws Chapter 62C, Sec. 49A, (Requirement of Tax Compliance by All Contractors Providing Goods, Services, or Real Estate Space to the Commonwealth or Subdivision).

12. DISCRIMINATION:

The Contractor will carry out the obligations of this contract in full compliance with all of the requirements imposed by or pursuant to General Laws Chapter 151B (Law Against Discrimination), and any executive orders, rules, regulations, and requirements of the Commonwealth of Massachusetts as they may from time to time be amended.

13. ASSIGNMENT:

Assignment of this contract is prohibited, unless assignment is provided for expressly in the contract documents.

14. CONDITION OF ENFORCEABILITY AGAINST THE TOWN:

This contract is only binding upon, and enforceable against the Town if: (1) the contract is signed by the Chief Procurement Officer designee; and (2) endorsed with approval by the Town Accountant as to appropriation or availability of funds; and (3) endorsed with approval by the Town Counsel as to form.

15. CORPORATE CONTRACTOR:

If the Contractor is a corporation, it shall endorse upon this contract (or attach hereto) its Clerk's Certificate certifying the corporate capacity and authority of the party signing this contract for the corporation. Such certificate shall be accompanied by a letter or other instrument stating that such authority continues in full force and effect as of the date the contract is executed by the Contractor. This contract shall not be enforceable against the Town of Athol unless and until the Contractor complies with this section.

The Contractor (and Subcontractors as defined in Paragraph 1-C of the General Conditions), if a foreign corporation shall comply with the provisions of the General Laws, Chapter 181, Sections 3 & 5, and any Acts and Amendments thereof, and in addition thereto, relating to the appointment of the Commissioner of Corporations as its attorney, shall file with the Commissioner of Corporations a Power of Attorney and duly authenticated copies of its Charter of Certificate of Incorporation; and said Contractor shall comply with all the laws of the Commonwealth.

16. LIABILITY OF PUBLIC OFFICIALS:

To the full extent permitted by law, no official, employee, agent or representative of the Town of Athol shall be individually or personally liable on any obligation of the Town under this contract.

17. NOTICES:

Any notice permitted or required under the provisions of this contract to be given or served by either of the parties hereto upon the other party hereto shall be in writing and signed in the name or on the behalf of the party giving or serving the same. Notice shall be deemed to have been received at the time of actual service or three (3) business days after the date of a certified or registered mailing properly addressed. Notice to the Contractor shall be deemed sufficient if sent to the address set forth in the contract, and to the Town of Athol, by being sent to the Selectmen, Town Hall, Athol, MA 01331.

18. BINDING ON SUCCESSORS:

This contract shall be binding upon the Contractor, its assigns, transferees, and/or successors in interest (and where not corporate, the heirs and estate of the Contractor).

19. COMPLETE CONTRACT:

This instrument, together with its endorsed supplements, and the other components of the contract documents, constitutes the entire contract between the parties, with no agreements other than those incorporated herein.

20. CONTRACT TYPE SUPPLEMENTS:

The foregoing provisions apply to all contracts to which the Town of Athol shall be a party. One of the following "SUPPLEMENTS" must be checked as applicable to this Contract, shall be attached hereto, and shall in any event apply as the nature of the contract requires. The Supplement contains additional terms governing the contract:

( ) GOODS
SUPPLEMENT "G" – Applicable to Contracts for the procurement of ***Goods*** (governed by the provisions of General Laws Chapter 30B).

(X) SERVICES
SUPPLEMENT "S" – Applicable to Contracts for the procurement of ***Services*** (governed by the provisions of General Laws Chapter 30B).

( ) CONSTRUCTION
SUPPLEMENT "C" - Applicable to Contracts for the ***Construction*** of:

(1) Public Buildings and Public Works (governed by the provisions of General Laws Chapter 30B).
(2) Public Buildings (governed by the provisions of General Laws Chapter 149, Section 44A et seq.); and
(3) Public Works (governed by the Provisions of General Laws Chapter 30, Sec. 39M, et seq.).

SUPPLEMENT "G"

1. This form supplements the Town of Athol, "Contract and General Conditions," and applies only to contracts for the procurement of goods.
2. "Goods" shall mean Goods, Supplies, or Materials, as described in the Contract and General Conditions.
3. Change orders may not increase the quantity of goods by more than ten (10%) percent, in compliance with General Laws Chapter 30B, Sec. 13.
4. This contract for purchase includes the following delivery, installation or setup requirements:

SUPPLEMENT "S"

1. This form supplements the Town of Athol, "Contract and General Conditions", and applied only to contracts for the procurement of services.

2. "Services" shall mean the furnishing of labor, time, or effort by the contractor. This term shall not include employment agreements, collective bargaining agreements, or grant agreements.

3. Change Orders: Change orders may not increase the quantity of services by more than 10 (10%) percent, in compliance with General Laws Chapter 30B, Sec. 13.

4. Minimum Wage/Prevailing Wage: The Contractor will carry out the obligations of this contract in full compliance with all of the requirements imposed by or pursuant to General Laws, Chapter 151, Sec. 1, et seq. (Minimum Wage Law) and any executive orders, rules, regulations, and requirements of the Commonwealth of Massachusetts as they may from time to time be amended. The Contractor will at all times comply with the wage rates as determined by the Commissioner of the Department of Labor and Industries, under the provisions of General Laws, Chapter 149, Sections 26 to 27D (Prevailing Wage), as shall be in force and as amended.

5. Indemnification: The Contractor hereby assumes the entire responsibility and liability for any and all injury to or death of any or all persons, including the Contractor's employees, and for any and all damage to property caused by, resulting from or arising out of any act, omission, or neglect on the part of the Contractor or of any Subcontractor or of anyone directly or indirectly employed by any of them, or of anyone for whose acts any of them may be liable in connection with operations under the Contract.

   5.1 The Contractor further agrees to indemnify and hold harmless the Town, including the agents, employees and representatives of either, from and against all claims, damages, losses, and expenses, including attorney's fees, arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom and (b) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

   5.2 The Contractor shall be responsible for all damage or injury to property of any character during the prosecution of the work resulting from any

act, omission, neglect, or misconduct in the manner or method of executing the work or due to the non-execution of the works or at any time due to defective work or materials.

5.3 In any and all claims against the Town or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone for whose acts any of them may be liable, the indemnification obligation under this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Workmen's Compensation Acts, disability benefit acts or other employee benefit acts.

5.4 The obligations of the Contractor under this paragraph shall not extend to the liability of the Town, its agents or employees, arising out of (a) the preparation or approval of Maps, Drawings, Opinions, Reports, Surveys, Change Orders, Designs or Specifications, of (b) the giving of or the failure to give directions of instructions by the Town, its agents or employees provided such giving or failure to give directions or instructions is the primary cause of the injury or damage.

5.5 The intent of the Specifications regarding insurance is to specify minimum coverage and minimum limits of liability acceptable under the Contract. However, it shall be the Contractor's responsibility to purchase and maintain insurance of such character and in such amounts as will adequately protect it and the Town from and against all claims, damages, losses and expenses resulting from exposure to any casualty liability I the performance of the work.

CERTIFICATE BY CORPORATION
TO
SUBMIT BID AND EXECUTE CONTRACT

The Board of Directors of the_____
(NAME OF CORPORATION)

have authorized_____,_____
(NAME) (OFFICER)

of this Company, be and he hereby is authorized to submit bids and execute contract and bonds in the name and behalf of said Company, and affix its Corporate Seal thereto, and such execution of any contract or obligation in this Company's name on its behalf by such _____
(OFFICER)

under seal of the Company, shall be valid and binding upon this Company,

A TRUE COPY ATTEST: _____
(CLERK)

PLACE OF BUSINESS: _____

I hereby certify that I am Clerk of the _____

That _____is the duly

elected _____ of said Company.

_____
(CLERK)

CORPORATE SEAL

CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this Certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

_____
Name of person signing bid or proposal

_____
Name of business

COMPANY DATA FORM

(1) If a partnership
Full names and addresses of all partners

_____

_____

_____

_____

_____

Business Address

_____Telephone_____

(2) If a Corporation
Full Legal Name

_____

State of Incorporation

_____

Qualified in Massachusetts Yes:_____ No:_____

Place of Business in
Massachusetts

_____Telephone_____

Pursuant to M.G.L. Ch. 62C, sec. 49A, I certify under the penalties of perjury that I, to my best knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

_____ _____
Social Security Number or Taxpayer Identification Number Contractor

DATE_____ By: _____
Name of signatory and Title

STATE TAX FILING & VERIFICATION OF PAYMENT FORM

Pursuant to M.G.L. c. 62C, §49A, I certify under the penalties of perjury that I, to my best knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

_____ _____

*Signature of Individual or Corporate Name (Mandatory) By: Corporate Officer (Mandatory, if Applicable)

_____

** Social Security # (Voluntary) or Federal Identification Number

- Approval of a contract or other agreement will not be granted unless this certification clause is signed by the applicant.

** Your social security number will be furnished to the Massachusetts Department of Revenue to determine whether you have met tax filing or tax payment obligations. Providers who fail to correct their non-filing or delinquency will not have a contract or other agreement issued, renewed, or extended. This request is made under the authority of Massachusetts G.L. c. 62c s. 49A.

Provider

DATED: _____

THE TOWN OF ATHOL:

TOWN MANAGER/PROCUREMENT OFFICER

_____
MICHAEL SZLOSEK

THE CONTRACTOR BY: _____
PRESIDENT OR DULY AUTHORIZED AGENT

TOWN ACCOUNTANT: _____
CERTIFIED AS TO APPROPRIATION

TOWN COUNSEL: _____
CERTIFIED AS TO FORM

MAURA HEALEY
Governor

KIM DRISCOLL
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES
Secretary

MICHAEL FLANAGAN
Director

Awarding Authority: Town of Athol

Contract Number: ARPA-03-PSRCU **City/Town:** ATHOL

Description of Work: Upgrade existing radio transmission site(s); potential new construction of repeater; furnish and install equipment at base dispatch and vehicle fleet.

Job Location: Athol, MA

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- **The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor.** For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The annual update requirement is not applicable to 27F "rental of equipment" contracts. **The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.**
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Issue Date: 03/26/2024 **Wage Request Number:** 20240325-059

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$38.95	$15.07	$18.67	$0.00	$72.69
	06/01/2024	$39.95	$15.07	$18.67	$0.00	$73.69
	12/01/2024	$39.95	$15.07	$20.17	$0.00	$75.19
	01/01/2025	$39.95	$15.57	$20.17	$0.00	$75.69
	06/01/2025	$40.95	$15.57	$20.17	$0.00	$76.69
	12/01/2025	$40.95	$15.57	$21.78	$0.00	$78.30
	01/01/2026	$40.95	$16.17	$21.78	$0.00	$78.90
	06/01/2026	$41.95	$16.17	$21.78	$0.00	$79.90
	12/01/2026	$41.95	$16.17	$23.52	$0.00	$81.64
	01/01/2027	$41.95	$16.77	$23.52	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.02	$15.07	$18.67	$0.00	$72.76
	06/01/2024	$40.02	$15.07	$18.67	$0.00	$73.76
	12/01/2024	$40.02	$15.07	$20.17	$0.00	$75.26
	01/01/2025	$40.02	$15.57	$20.17	$0.00	$75.76
	06/01/2025	$41.02	$15.57	$20.17	$0.00	$76.76
	12/01/2025	$41.02	$15.57	$21.78	$0.00	$78.37
	01/01/2026	$41.02	$16.17	$21.78	$0.00	$78.97
	06/01/2026	$42.02	$16.17	$21.78	$0.00	$79.97
	12/01/2026	$42.02	$16.17	$23.52	$0.00	$81.71
	01/01/2027	$42.02	$16.77	$23.52	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.14	$15.07	$18.67	$0.00	$72.88
	06/01/2024	$40.14	$15.07	$18.67	$0.00	$73.88
	12/01/2024	$40.14	$15.07	$20.17	$0.00	$75.38
	01/01/2025	$40.14	$15.57	$20.17	$0.00	$75.88
	06/01/2025	$41.14	$15.57	$20.17	$0.00	$76.88
	12/01/2025	$41.14	$15.57	$21.78	$0.00	$78.49
	01/01/2026	$41.14	$16.17	$21.78	$0.00	$79.09
	06/01/2026	$42.14	$16.17	$21.78	$0.00	$80.09
	12/01/2026	$42.14	$16.17	$23.52	$0.00	$81.83
	01/01/2027	$42.14	$16.77	$23.52	$0.00	$82.43
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
	06/01/2024	$39.94	$9.65	$17.14	$0.00	$66.73
	12/01/2024	$41.27	$9.65	$17.14	$0.00	$68.06
	06/01/2025	$42.66	$9.65	$17.14	$0.00	$69.45
	12/01/2025	$44.04	$9.65	$17.14	$0.00	$70.83
	06/01/2026	$45.48	$9.65	$17.14	$0.00	$72.27
	12/01/2026	$46.92	$9.65	$17.14	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASBESTOS WORKER (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (WORCESTER)*	12/01/2023	$40.80	$14.50	$11.05	$0.00	$66.35
	06/01/2024	$41.80	$14.50	$11.05	$0.00	$67.35
	12/01/2024	$42.80	$14.50	$11.05	$0.00	$68.35
	06/01/2025	$43.80	$14.50	$11.05	$0.00	$69.35
	12/01/2025	$44.80	$14.50	$11.05	$0.00	$70.35
ASPHALT RAKER *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
AUTOMATIC GRADER-EXCAVATOR (RECLAIMER) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
BATCH/CEMENT PLANT - ON SITE *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 2*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
	06/01/2024	$39.94	$9.65	$17.14	$0.00	$66.73
	12/01/2024	$41.27	$9.65	$17.14	$0.00	$68.06
	06/01/2025	$42.66	$9.65	$17.14	$0.00	$69.45
	12/01/2025	$44.04	$9.65	$17.14	$0.00	$70.83
	06/01/2026	$45.48	$9.65	$17.14	$0.00	$72.27
	12/01/2026	$46.92	$9.65	$17.14	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2024	$48.12	$7.07	$20.60	$0.00	$75.79

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$31.28	$7.07	$13.22	$0.00	$51.57
2	65	$31.28	$7.07	$13.22	$0.00	$51.57
3	70	$33.68	$7.07	$14.23	$0.00	$54.98
4	75	$36.09	$7.07	$15.24	$0.00	$58.40
5	80	$38.50	$7.07	$16.25	$0.00	$61.82
6	85	$40.90	$7.07	$17.28	$0.00	$65.25
7	90	$43.31	$7.07	$18.28	$0.00	$68.66
8	95	$45.71	$7.07	$19.32	$0.00	$72.10

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (LOWELL)*	02/01/2024	$60.26	$11.49	$22.90	$0.00	$94.65
	08/01/2024	$62.36	$11.49	$22.90	$0.00	$96.75
	02/01/2025	$63.66	$11.49	$22.90	$0.00	$98.05
	08/01/2025	$65.81	$11.49	$22.90	$0.00	$100.20
	02/01/2026	$67.16	$11.49	$22.90	$0.00	$101.55
	08/01/2026	$69.36	$11.49	$22.90	$0.00	$103.75
	02/01/2027	$70.76	$11.49	$22.90	$0.00	$105.15

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Lowell*

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.13	$11.49	$22.90	$0.00	$64.52
2	60	$36.16	$11.49	$22.90	$0.00	$70.55
3	70	$42.18	$11.49	$22.90	$0.00	$76.57
4	80	$48.21	$11.49	$22.90	$0.00	$82.60
5	90	$54.23	$11.49	$22.90	$0.00	$88.62

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.18	$11.49	$22.90	$0.00	$65.57
2	60	$37.42	$11.49	$22.90	$0.00	$71.81
3	70	$43.65	$11.49	$22.90	$0.00	$78.04
4	80	$49.89	$11.49	$22.90	$0.00	$84.28
5	90	$56.12	$11.49	$22.90	$0.00	$90.51

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL*OPERATING*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49

ENGINEERS LOCAL 98

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

CAISSON & UNDERPINNING BOTTOM MAN	12/01/2023	$45.48	$9.65	$18.22	$0.00	$73.35
LABORERS - FOUNDATION AND MARINE	06/01/2024	$46.96	$9.65	$18.22	$0.00	$74.83
	12/01/2024	$48.43	$9.65	$18.22	$0.00	$76.30
	06/01/2025	$49.93	$9.65	$18.22	$0.00	$77.80
	12/01/2025	$51.43	$9.65	$18.22	$0.00	$79.30
	06/01/2026	$52.98	$9.65	$18.22	$0.00	$80.85
	12/01/2026	$54.48	$9.65	$18.22	$0.00	$82.35

For apprentice rates see "Apprentice- LABORER"

CAISSON & UNDERPINNING LABORER	12/01/2023	$44.33	$9.65	$18.22	$0.00	$72.20
LABORERS - FOUNDATION AND MARINE	06/01/2024	$45.81	$9.65	$18.22	$0.00	$73.68
	12/01/2024	$47.28	$9.65	$18.22	$0.00	$75.15
	06/01/2025	$48.78	$9.65	$18.22	$0.00	$76.65
	12/01/2025	$50.28	$9.65	$18.22	$0.00	$78.15
	06/01/2026	$51.83	$9.65	$18.22	$0.00	$79.70
	12/01/2026	$53.33	$9.65	$18.22	$0.00	$81.20

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$44.33	$9.65	$18.22	$0.00	$72.20
	06/01/2024	$45.81	$9.65	$18.22	$0.00	$73.68
	12/01/2024	$47.28	$9.65	$18.22	$0.00	$75.15
	06/01/2025	$48.78	$9.65	$18.22	$0.00	$76.65
	12/01/2025	$50.28	$9.65	$18.22	$0.00	$78.15
	06/01/2026	$51.83	$9.65	$18.22	$0.00	$79.70
	12/01/2026	$53.33	$9.65	$18.22	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	03/01/2024	$47.12	$9.83	$19.97	$0.00	$76.92
	09/01/2024	$48.37	$9.83	$19.97	$0.00	$78.17
	03/01/2025	$49.62	$9.83	$19.97	$0.00	$79.42
	09/01/2025	$50.87	$9.83	$19.97	$0.00	$80.67
	03/01/2026	$52.12	$9.83	$19.97	$0.00	$81.92
	09/01/2026	$53.37	$9.83	$19.97	$0.00	$83.17
	03/01/2027	$54.62	$9.83	$19.97	$0.00	$84.42

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$21.20	$9.83	$1.73	$0.00	$32.76
2	45	$21.20	$9.83	$1.73	$0.00	$32.76
3	55	$25.92	$9.83	$3.40	$0.00	$39.15
4	55	$25.92	$9.83	$3.40	$0.00	$39.15
5	70	$32.98	$9.83	$16.51	$0.00	$59.32
6	70	$32.98	$9.83	$16.51	$0.00	$59.32
7	80	$37.70	$9.83	$18.24	$0.00	$65.77
8	80	$37.70	$9.83	$18.24	$0.00	$65.77

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$21.77	$9.83	$1.73	$0.00	$33.33
2	45	$21.77	$9.83	$1.73	$0.00	$33.33
3	55	$26.60	$9.83	$3.40	$0.00	$39.83
4	55	$26.60	$9.83	$3.40	$0.00	$39.83
5	70	$33.86	$9.83	$16.51	$0.00	$60.20
6	70	$33.86	$9.83	$16.51	$0.00	$60.20
7	80	$38.70	$9.83	$18.24	$0.00	$66.77
8	80	$38.70	$9.83	$18.24	$0.00	$66.77

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARPENTER WOOD FRAME *CARPENTERS-ZONE 3 (Wood Frame)*	10/01/2023	$25.55	$7.02	$4.80	$0.00	$37.37
	10/01/2024	$26.65	$7.02	$4.80	$0.00	$38.47
	10/01/2025	$27.75	$7.02	$4.80	$0.00	$39.57
	10/01/2026	$28.85	$7.02	$4.80	$0.00	$40.67

All Aspects of New Wood Frame Work

Apprentice - *CARPENTER (Wood Frame) - Zone 3*

Effective Date - 10/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$15.33	$7.02	$0.00	$0.00	$22.35
2	60	$15.33	$7.02	$0.00	$0.00	$22.35
3	65	$16.61	$7.02	$1.00	$0.00	$24.63
4	70	$17.89	$7.02	$1.00	$0.00	$25.91
5	75	$19.16	$7.02	$4.80	$0.00	$30.98
6	80	$20.44	$7.02	$4.80	$0.00	$32.26
7	85	$21.72	$7.02	$4.80	$0.00	$33.54
8	90	$23.00	$7.02	$4.80	$0.00	$34.82

Effective Date - 10/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$15.99	$7.02	$0.00	$0.00	$23.01
2	60	$15.99	$7.02	$0.00	$0.00	$23.01
3	65	$17.32	$7.02	$1.00	$0.00	$25.34
4	70	$18.66	$7.02	$1.00	$0.00	$26.68
5	75	$19.99	$7.02	$4.80	$0.00	$31.81
6	80	$21.32	$7.02	$4.80	$0.00	$33.14
7	85	$22.65	$7.02	$4.80	$0.00	$34.47
8	90	$23.99	$7.02	$4.80	$0.00	$35.81

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $18.52/ 3&4 $21.07/ 5&6 $28.70/ 7&8 $31.26

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (LOWELL)*	01/01/2024	$49.33	$13.00	$23.57	$1.30	$87.20

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CEMENT MASONRY/PLASTERING - Lowell*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.67	$13.00	$15.93	$0.00	$53.60
2	60	$29.60	$13.00	$18.57	$1.30	$62.47
3	65	$32.06	$13.00	$19.57	$1.30	$65.93
4	70	$34.53	$13.00	$20.57	$1.30	$69.40
5	75	$37.00	$13.00	$21.57	$1.30	$72.87
6	80	$39.46	$13.00	$22.57	$1.30	$76.33
7	90	$44.40	$13.00	$23.57	$1.30	$82.27

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CRANE OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$43.06	$13.78	$15.15	$0.00	$71.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2024	$56.06	$9.95	$23.95	$0.00	$89.96
	07/01/2024	$57.26	$9.95	$23.95	$0.00	$91.16
	01/01/2025	$58.46	$9.95	$23.95	$0.00	$92.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$9.95	$0.00	$0.00	$37.98
2	55	$30.83	$9.95	$6.66	$0.00	$47.44
3	60	$33.64	$9.95	$7.26	$0.00	$50.85
4	65	$36.44	$9.95	$7.87	$0.00	$54.26
5	70	$39.24	$9.95	$20.32	$0.00	$69.51
6	75	$42.05	$9.95	$20.93	$0.00	$72.93
7	80	$44.85	$9.95	$21.53	$0.00	$76.33
8	90	$50.45	$9.95	$22.74	$0.00	$83.14

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.63	$9.95	$0.00	$0.00	$38.58
2	55	$31.49	$9.95	$6.66	$0.00	$48.10
3	60	$34.36	$9.95	$7.26	$0.00	$51.57
4	65	$37.22	$9.95	$7.87	$0.00	$55.04
5	70	$40.08	$9.95	$20.32	$0.00	$70.35
6	75	$42.95	$9.95	$20.93	$0.00	$73.83
7	80	$45.81	$9.95	$21.53	$0.00	$77.29
8	90	$51.53	$9.95	$22.74	$0.00	$84.22

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 2*	12/01/2023	$44.48	$9.65	$18.07	$0.00	$72.20
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 2*	12/01/2023	$45.48	$9.65	$18.07	$0.00	$73.20
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 2*	12/01/2023	$45.23	$9.65	$18.07	$0.00	$72.95
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 2*	12/01/2023	$45.48	$9.65	$18.07	$0.00	$73.20
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 2*	12/01/2023	$45.23	$9.65	$18.07	$0.00	$72.95
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 2*	12/01/2023	$44.48	$9.65	$18.07	$0.00	$72.20
For apprentice rates see "Apprentice- LABORER"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$68.70	$9.40	$23.12	$0.00	$101.22

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$73.60	$9.40	$23.12	$0.00	$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *DRAWBRIDGE - SEIU LOCAL 888*	07/01/2020	$26.77	$6.67	$3.93	$0.16	$37.53
ELECTRICIAN *ELECTRICIANS LOCAL 96*	09/03/2023	$45.99	$13.00	$18.84	$0.00	$77.83
	09/01/2024	$47.05	$13.99	$19.22	$0.00	$80.26
	09/07/2025	$48.16	$14.98	$19.60	$0.00	$82.74
	09/06/2026	$49.38	$15.96	$20.00	$0.00	$85.34

Apprentice - *ELECTRICIAN - Local 96*

Effective Date - 09/03/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.40	$13.00	$0.55	$0.00	$31.95
2	45	$20.70	$13.00	$0.62	$0.00	$34.32
3	48	$22.08	$13.00	$15.49	$0.00	$50.57
4	55	$25.29	$13.00	$15.94	$0.00	$54.23
5	65	$29.89	$13.00	$16.59	$0.00	$59.48
6	80	$36.79	$13.00	$17.55	$0.00	$67.34

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.82	$13.99	$0.56	$0.00	$33.37
2	45	$21.17	$13.99	$0.64	$0.00	$35.80
3	48	$22.58	$13.99	$15.79	$0.00	$52.36
4	55	$25.88	$13.99	$16.26	$0.00	$56.13
5	65	$30.58	$13.99	$16.91	$0.00	$61.48
6	80	$37.64	$13.99	$17.90	$0.00	$69.53

Notes:

Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2024	$61.98	$16.18	$20.96	$0.00	$99.12
	01/01/2025	$62.83	$16.28	$21.36	$0.00	$100.47
	01/01/2026	$63.68	$16.38	$21.76	$0.00	$101.82
	01/01/2027	$64.53	$16.48	$22.16	$0.00	$103.17

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 41*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.99	$16.18	$0.00	$0.00	$47.17
2	55	$34.09	$16.18	$20.96	$0.00	$71.23
3	65	$40.29	$16.18	$20.96	$0.00	$77.43
4	70	$43.39	$16.18	$20.96	$0.00	$80.53
5	80	$49.58	$16.18	$20.96	$0.00	$86.72

Effective Date - 01/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.42	$16.28	$0.00	$0.00	$47.70
2	55	$34.56	$16.28	$21.36	$0.00	$72.20
3	65	$40.84	$16.28	$21.36	$0.00	$78.48
4	70	$43.98	$16.28	$21.36	$0.00	$81.62
5	80	$50.26	$16.28	$21.36	$0.00	$87.90

Notes:
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2024	$43.39	$16.18	$20.96	$0.00	$80.53
	01/01/2025	$43.98	$16.28	$21.36	$0.00	$81.62
	01/01/2026	$44.58	$16.38	$21.76	$0.00	$82.72
	01/01/2027	$45.17	$16.48	$22.16	$0.00	$83.81
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FIELD ENG.INST/ROD-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$18.84	$4.80	$4.10	$0.00	$27.74
FIELD ENG.PARTY CHIEF:BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$21.33	$4.80	$4.10	$0.00	$30.23
FIELD ENG.SURVEY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$22.33	$4.80	$4.10	$0.00	$31.23
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 96*	09/03/2023	$45.99	$13.00	$18.84	$0.00	$77.83
	09/01/2024	$47.05	$13.99	$19.22	$0.00	$80.26
	09/07/2025	$48.16	$14.98	$19.60	$0.00	$82.74
	09/06/2026	$49.38	$15.96	$20.00	$0.00	$85.34
For apprentice rates see "Apprentice- ELECTRICIAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIRE ALARM REPAIR / MAINT/COMMISSIONING *ELECTRICIANS LOCAL 96*	09/03/2023	$45.99	$13.00	$18.84	$0.00	$77.83
	09/01/2024	$47.05	$13.99	$19.22	$0.00	$80.26
	09/07/2025	$48.16	$14.98	$19.60	$0.00	$82.74
	09/06/2026	$49.38	$15.96	$20.00	$0.00	$85.34
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIREMAN *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56

Apprentice - *OPERATING ENGINEERS - Local 98 Class 3*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.42	$13.38	$15.15	$0.00	$51.95
2	70	$27.32	$13.38	$15.15	$0.00	$55.85
3	80	$31.22	$13.38	$15.15	$0.00	$59.75
4	90	$35.13	$13.38	$15.15	$0.00	$63.66

Notes:

Steps 1-2 are 1000 hrs.; Steps 3-4 are 2000 hrs.

Apprentice to Journeyworker Ratio:1:6

FLAGGER & SIGNALER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$25.48	$9.65	$17.14	$0.00	$52.27
	06/01/2024	$26.51	$9.65	$17.14	$0.00	$53.30
	12/01/2024	$26.51	$9.65	$17.14	$0.00	$53.30
	06/01/2025	$27.59	$9.65	$17.14	$0.00	$54.38
	12/01/2025	$27.59	$9.65	$17.14	$0.00	$54.38
	06/01/2026	$28.71	$9.65	$17.14	$0.00	$55.50
	12/01/2026	$28.71	$9.65	$17.14	$0.00	$55.50
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE II*	03/01/2024	$49.47	$8.83	$20.27	$0.00	$78.57

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *FLOORCOVERER - Local 2168 Zone II*

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.74	$8.83	$1.76	$0.00	$35.33
2	55	$27.21	$8.83	$1.76	$0.00	$37.80
3	60	$29.68	$8.83	$3.52	$0.00	$42.03
4	65	$32.16	$8.83	$3.52	$0.00	$44.51
5	70	$34.63	$8.83	$16.75	$0.00	$60.21
6	75	$37.10	$8.83	$16.75	$0.00	$62.68
7	80	$39.58	$8.83	$18.51	$0.00	$66.92
8	85	$42.05	$8.83	$18.51	$0.00	$69.39

Notes: Steps are 750 hrs.
% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $32.63/ 3&4 $39.28/ 5&6 $59.86/ 7&8 $66.52

Apprentice to Journeyworker Ratio:1:1

FORK LIFT *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$39.25	$13.78	$15.15	$0.00	$68.18
GENERATORS/LIGHTING PLANTS *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$35.80	$13.78	$15.15	$0.00	$64.73
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 2)*	01/01/2024	$45.56	$9.95	$23.95	$0.00	$79.46
	07/01/2024	$46.76	$9.95	$23.95	$0.00	$80.66
	01/01/2025	$47.96	$9.95	$23.95	$0.00	$81.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 35 Zone 2*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.78	$9.95	$0.00	$0.00	$32.73
2	55	$25.06	$9.95	$6.66	$0.00	$41.67
3	60	$27.34	$9.95	$7.26	$0.00	$44.55
4	65	$29.61	$9.95	$7.87	$0.00	$47.43
5	70	$31.89	$9.95	$20.32	$0.00	$62.16
6	75	$34.17	$9.95	$20.93	$0.00	$65.05
7	80	$36.45	$9.95	$21.53	$0.00	$67.93
8	90	$41.00	$9.95	$22.74	$0.00	$73.69

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$9.95	$0.00	$0.00	$33.33
2	55	$25.72	$9.95	$6.66	$0.00	$42.33
3	60	$28.06	$9.95	$7.26	$0.00	$45.27
4	65	$30.39	$9.95	$7.87	$0.00	$48.21
5	70	$32.73	$9.95	$20.32	$0.00	$63.00
6	75	$35.07	$9.95	$20.93	$0.00	$65.95
7	80	$37.41	$9.95	$21.53	$0.00	$68.89
8	90	$42.08	$9.95	$22.74	$0.00	$74.77

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

GRADER/TRENCHING MACHINE/DERRICK *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 63*	01/01/2024	$43.80	$10.64	$17.54	$2.05	$74.03
	07/01/2024	$45.05	$10.64	$17.54	$2.05	$75.28
	01/01/2025	$46.30	$10.64	$17.54	$2.05	$76.53
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 96*	09/03/2023	$45.99	$13.00	$18.84	$0.00	$77.83
	09/01/2024	$47.05	$13.99	$19.22	$0.00	$80.26
	09/07/2025	$48.16	$14.98	$19.60	$0.00	$82.74
	09/06/2026	$49.38	$15.96	$20.00	$0.00	$85.34
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 63*	01/01/2024	$43.80	$10.64	$17.54	$2.05	$74.03
	07/01/2024	$45.05	$10.64	$17.54	$2.05	$75.28
	01/01/2025	$46.30	$10.64	$17.54	$2.05	$76.53
For apprentice rates see "Apprentice- SHEET METAL WORKER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING -WATER) *PLUMBERS LOCAL 4*	03/01/2024	$53.95	$9.90	$17.42	$0.00	$81.27
	09/01/2024	$55.35	$9.90	$17.42	$0.00	$82.67
	03/01/2025	$56.75	$9.90	$17.42	$0.00	$84.07
	09/01/2025	$58.15	$9.90	$17.42	$0.00	$85.47
	03/01/2026	$59.55	$9.90	$17.42	$0.00	$86.87
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PLUMBERS LOCAL 4*	03/01/2024	$53.95	$9.90	$17.42	$0.00	$81.27
	09/01/2024	$55.35	$9.90	$17.42	$0.00	$82.67
	03/01/2025	$56.75	$9.90	$17.42	$0.00	$84.07
	09/01/2025	$58.15	$9.90	$17.42	$0.00	$85.47
	03/01/2026	$59.55	$9.90	$17.42	$0.00	$86.87
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 2*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
	06/01/2024	$39.94	$9.65	$17.14	$0.00	$66.73
	12/01/2024	$41.27	$9.65	$17.14	$0.00	$68.06
	06/01/2025	$42.66	$9.65	$17.14	$0.00	$69.45
	12/01/2025	$44.04	$9.65	$17.14	$0.00	$70.83
	06/01/2026	$45.48	$9.65	$17.14	$0.00	$72.27
	12/01/2026	$46.92	$9.65	$17.14	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (WORCESTER)*	09/01/2023	$48.15	$14.75	$19.61	$0.00	$82.51
	09/01/2024	$51.23	$14.75	$19.61	$0.00	$85.59
	09/01/2025	$54.31	$14.75	$19.61	$0.00	$88.67
	09/01/2026	$57.38	$14.75	$19.61	$0.00	$91.74

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Worcester*

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.08	$14.75	$14.32	$0.00	$53.15
2	60	$28.89	$14.75	$15.37	$0.00	$59.01
3	70	$33.71	$14.75	$16.43	$0.00	$64.89
4	80	$38.52	$14.75	$17.49	$0.00	$70.76

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.62	$14.75	$14.32	$0.00	$54.69
2	60	$30.74	$14.75	$15.37	$0.00	$60.86
3	70	$35.86	$14.75	$16.43	$0.00	$67.04
4	80	$40.98	$14.75	$17.49	$0.00	$73.22

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (WORCESTER AREA)*	03/16/2024	$53.67	$8.35	$26.70	$0.00	$88.72

Apprentice - *IRONWORKER - Local 7 Worcester*

Effective Date - 03/16/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$32.20	$8.35	$26.70	$0.00	$67.25
2	70	$37.57	$8.35	$26.70	$0.00	$72.62
3	75	$40.25	$8.35	$26.70	$0.00	$75.30
4	80	$42.94	$8.35	$26.70	$0.00	$77.99
5	85	$45.62	$8.35	$26.70	$0.00	$80.67
6	90	$48.30	$8.35	$26.70	$0.00	$83.35

Notes:

Apprentice to Journeyworker Ratio:1:4

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90

For apprentice rates see "Apprentice- LABORER"

LABORER *LABORERS - ZONE 2*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65

Apprentice - *LABORER - Zone 2*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$22.72	$9.65	$16.89	$0.00	$49.26
2	70	$26.50	$9.65	$16.89	$0.00	$53.04
3	80	$30.29	$9.65	$16.89	$0.00	$56.83
4	90	$34.07	$9.65	$16.89	$0.00	$60.61

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65
	06/01/2024	$39.19	$9.65	$17.14	$0.00	$65.98
	12/01/2024	$40.52	$9.65	$17.14	$0.00	$67.31
	06/01/2025	$41.91	$9.65	$17.14	$0.00	$68.70
	12/01/2025	$43.29	$9.65	$17.14	$0.00	$70.08
	06/01/2026	$44.73	$9.65	$17.14	$0.00	$71.52
	12/01/2026	$46.17	$9.65	$17.14	$0.00	$72.96

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER (Heavy & Highway) - Zone 2*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$22.72	$9.65	$17.14	$0.00	$49.51
2	70	$26.50	$9.65	$17.14	$0.00	$53.29
3	80	$30.29	$9.65	$17.14	$0.00	$57.08
4	90	$34.07	$9.65	$17.14	$0.00	$60.86

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.51	$9.00	$16.89	$0.00	$49.40
2	70	$27.43	$9.00	$16.89	$0.00	$53.32
3	80	$31.35	$9.00	$16.89	$0.00	$57.24
4	90	$35.27	$9.00	$16.89	$0.00	$61.16

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 2*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 2*	12/01/2023	$38.36	$9.40	$16.89	$0.00	$64.65
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 2*	12/01/2023	$37.95	$9.65	$17.20	$0.00	$64.80
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 2*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 2*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2024	$47.89	$11.49	$21.37	$0.00	$80.75
	08/01/2024	$49.57	$11.49	$21.37	$0.00	$82.43
	02/01/2025	$50.61	$11.49	$21.37	$0.00	$83.47
	08/01/2025	$52.33	$11.49	$21.37	$0.00	$85.19
	02/01/2026	$53.41	$11.49	$21.37	$0.00	$86.27
	08/01/2026	$55.17	$11.49	$21.37	$0.00	$88.03
	02/01/2027	$56.29	$11.49	$21.37	$0.00	$89.15

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.95	$11.49	$21.37	$0.00	$56.81
2	60	$28.73	$11.49	$21.37	$0.00	$61.59
3	70	$33.52	$11.49	$21.37	$0.00	$66.38
4	80	$38.31	$11.49	$21.37	$0.00	$71.17
5	90	$43.10	$11.49	$21.37	$0.00	$75.96

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.79	$11.49	$21.37	$0.00	$57.65
2	60	$29.74	$11.49	$21.37	$0.00	$62.60
3	70	$34.70	$11.49	$21.37	$0.00	$67.56
4	80	$39.66	$11.49	$21.37	$0.00	$72.52
5	90	$44.61	$11.49	$21.37	$0.00	$77.47

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2024	$62.42	$11.49	$23.56	$0.00	$97.47
	08/01/2024	$64.52	$11.49	$23.56	$0.00	$99.57
	02/01/2025	$65.82	$11.49	$23.56	$0.00	$100.87
	08/01/2025	$67.97	$11.49	$23.56	$0.00	$103.02
	02/01/2026	$69.32	$11.49	$23.56	$0.00	$104.37
	08/01/2026	$71.52	$11.49	$23.56	$0.00	$106.57
	02/01/2027	$72.92	$11.49	$23.56	$0.00	$107.97

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.21	$11.49	$23.56	$0.00	$66.26
2	60	$37.45	$11.49	$23.56	$0.00	$72.50
3	70	$43.69	$11.49	$23.56	$0.00	$78.74
4	80	$49.94	$11.49	$23.56	$0.00	$84.99
5	90	$56.18	$11.49	$23.56	$0.00	$91.23

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.26	$11.49	$23.56	$0.00	$67.31
2	60	$38.71	$11.49	$23.56	$0.00	$73.76
3	70	$45.16	$11.49	$23.56	$0.00	$80.21
4	80	$51.62	$11.49	$23.56	$0.00	$86.67
5	90	$58.07	$11.49	$23.56	$0.00	$93.12

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANIC/WELDER/BOOM TRUCK *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 3) *MILLWRIGHTS LOCAL 1121 - Zone 3*	01/01/2024	$41.20	$10.08	$21.22	$0.00	$72.50
	01/06/2025	$43.48	$10.08	$21.22	$0.00	$74.78
	01/05/2026	$45.76	$10.08	$21.22	$0.00	$77.06

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 3*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.66	$10.08	$5.36	$0.00	$38.10
2	65	$26.78	$10.08	$6.34	$0.00	$43.20
3	75	$30.90	$10.08	$18.78	$0.00	$59.76
4	85	$35.02	$10.08	$19.76	$0.00	$64.86

Effective Date - 01/06/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$23.91	$10.08	$5.36	$0.00	$39.35
2	65	$28.26	$10.08	$6.34	$0.00	$44.68
3	75	$32.61	$10.08	$18.78	$0.00	$61.47
4	85	$36.96	$10.08	$19.76	$0.00	$66.80

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 $5.72, Step 2 $6.66)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

MORTAR MIXER *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
OILER *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$35.02	$13.78	$15.15	$0.00	$63.95
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS VI *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$32.74	$13.78	$15.15	$0.00	$61.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2024	$56.06	$9.95	$23.95	$0.00	$89.96
	07/01/2024	$57.26	$9.95	$23.95	$0.00	$91.16
	01/01/2025	$58.46	$9.95	$23.95	$0.00	$92.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$9.95	$0.00	$0.00	$37.98
2	55	$30.83	$9.95	$6.66	$0.00	$47.44
3	60	$33.64	$9.95	$7.26	$0.00	$50.85
4	65	$36.44	$9.95	$7.87	$0.00	$54.26
5	70	$39.24	$9.95	$20.32	$0.00	$69.51
6	75	$42.05	$9.95	$20.93	$0.00	$72.93
7	80	$44.85	$9.95	$21.53	$0.00	$76.33
8	90	$50.45	$9.95	$22.74	$0.00	$83.14

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.63	$9.95	$0.00	$0.00	$38.58
2	55	$31.49	$9.95	$6.66	$0.00	$48.10
3	60	$34.36	$9.95	$7.26	$0.00	$51.57
4	65	$37.22	$9.95	$7.87	$0.00	$55.04
5	70	$40.08	$9.95	$20.32	$0.00	$70.35
6	75	$42.95	$9.95	$20.93	$0.00	$73.83
7	80	$45.81	$9.95	$21.53	$0.00	$77.29
8	90	$51.53	$9.95	$22.74	$0.00	$84.22

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2024	$46.96	$9.95	$23.95	$0.00	$80.86
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	07/01/2024	$48.16	$9.95	$23.95	$0.00	$82.06
	01/01/2025	$49.36	$9.95	$23.95	$0.00	$83.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.48	$9.95	$0.00	$0.00	$33.43
2	55	$25.83	$9.95	$6.66	$0.00	$42.44
3	60	$28.18	$9.95	$7.26	$0.00	$45.39
4	65	$30.52	$9.95	$7.87	$0.00	$48.34
5	70	$32.87	$9.95	$20.32	$0.00	$63.14
6	75	$35.22	$9.95	$20.93	$0.00	$66.10
7	80	$37.57	$9.95	$21.53	$0.00	$69.05
8	90	$42.26	$9.95	$22.74	$0.00	$74.95

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.08	$9.95	$0.00	$0.00	$34.03
2	55	$26.49	$9.95	$6.66	$0.00	$43.10
3	60	$28.90	$9.95	$7.26	$0.00	$46.11
4	65	$31.30	$9.95	$7.87	$0.00	$49.12
5	70	$33.71	$9.95	$20.32	$0.00	$63.98
6	75	$36.12	$9.95	$20.93	$0.00	$67.00
7	80	$38.53	$9.95	$21.53	$0.00	$70.01
8	90	$43.34	$9.95	$22.74	$0.00	$76.03

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2024	$45.02	$9.95	$23.95	$0.00	$78.92
	07/01/2024	$46.22	$9.95	$23.95	$0.00	$80.12
	01/01/2025	$47.42	$9.95	$23.95	$0.00	$81.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.51	$9.95	$0.00	$0.00	$32.46
2	55	$24.76	$9.95	$6.66	$0.00	$41.37
3	60	$27.01	$9.95	$7.26	$0.00	$44.22
4	65	$29.26	$9.95	$7.87	$0.00	$47.08
5	70	$31.51	$9.95	$20.32	$0.00	$61.78
6	75	$33.77	$9.95	$20.93	$0.00	$64.65
7	80	$36.02	$9.95	$21.53	$0.00	$67.50
8	90	$40.52	$9.95	$22.74	$0.00	$73.21

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.11	$9.95	$0.00	$0.00	$33.06
2	55	$25.42	$9.95	$6.66	$0.00	$42.03
3	60	$27.73	$9.95	$7.26	$0.00	$44.94
4	65	$30.04	$9.95	$7.87	$0.00	$47.86
5	70	$32.35	$9.95	$20.32	$0.00	$62.62
6	75	$34.67	$9.95	$20.93	$0.00	$65.55
7	80	$36.98	$9.95	$21.53	$0.00	$68.46
8	90	$41.60	$9.95	$22.74	$0.00	$74.29

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	01/01/2024	$45.56	$9.95	$23.95	$0.00	$79.46
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	07/01/2024	$46.76	$9.95	$23.95	$0.00	$80.66
	01/01/2025	$47.96	$9.95	$23.95	$0.00	$81.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.78	$9.95	$0.00	$0.00	$32.73
2	55	$25.06	$9.95	$6.66	$0.00	$41.67
3	60	$27.34	$9.95	$7.26	$0.00	$44.55
4	65	$29.61	$9.95	$7.87	$0.00	$47.43
5	70	$31.89	$9.95	$20.32	$0.00	$62.16
6	75	$34.17	$9.95	$20.93	$0.00	$65.05
7	80	$36.45	$9.95	$21.53	$0.00	$67.93
8	90	$41.00	$9.95	$22.74	$0.00	$73.69

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$9.95	$0.00	$0.00	$33.33
2	55	$25.72	$9.95	$6.66	$0.00	$42.33
3	60	$28.06	$9.95	$7.26	$0.00	$45.27
4	65	$30.39	$9.95	$7.87	$0.00	$48.21
5	70	$32.73	$9.95	$20.32	$0.00	$63.00
6	75	$35.07	$9.95	$20.93	$0.00	$65.95
7	80	$37.41	$9.95	$21.53	$0.00	$68.89
8	90	$42.08	$9.95	$22.74	$0.00	$74.77

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2024	$43.62	$9.95	$23.95	$0.00	$77.52
	07/01/2024	$44.82	$9.95	$23.95	$0.00	$78.72
	01/01/2025	$46.02	$9.95	$23.95	$0.00	$79.92

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.81	$9.95	$0.00	$0.00	$31.76
2	55	$23.99	$9.95	$6.66	$0.00	$40.60
3	60	$26.17	$9.95	$7.26	$0.00	$43.38
4	65	$28.35	$9.95	$7.87	$0.00	$46.17
5	70	$30.53	$9.95	$20.32	$0.00	$60.80
6	75	$32.72	$9.95	$20.93	$0.00	$63.60
7	80	$34.90	$9.95	$21.53	$0.00	$66.38
8	90	$39.26	$9.95	$22.74	$0.00	$71.95

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.41	$9.95	$0.00	$0.00	$32.36
2	55	$24.65	$9.95	$6.66	$0.00	$41.26
3	60	$26.89	$9.95	$7.26	$0.00	$44.10
4	65	$29.13	$9.95	$7.87	$0.00	$46.95
5	70	$31.37	$9.95	$20.32	$0.00	$61.64
6	75	$33.62	$9.95	$20.93	$0.00	$64.50
7	80	$35.86	$9.95	$21.53	$0.00	$67.34
8	90	$40.34	$9.95	$22.74	$0.00	$73.03

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65
	06/01/2024	$39.19	$9.65	$17.14	$0.00	$65.98
	12/01/2024	$40.52	$9.65	$17.14	$0.00	$67.31
	06/01/2025	$41.91	$9.65	$17.14	$0.00	$68.70
	12/01/2025	$43.29	$9.65	$17.14	$0.00	$70.08
	06/01/2026	$44.73	$9.65	$17.14	$0.00	$71.52
	12/01/2026	$46.17	$9.65	$17.14	$0.00	$72.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$38.78	$15.07	$18.67	$0.00	$72.52
	06/01/2024	$39.78	$15.07	$18.67	$0.00	$73.52
	12/01/2024	$39.78	$15.07	$20.17	$0.00	$75.02
	01/01/2025	$39.78	$15.57	$20.17	$0.00	$75.52
	06/01/2025	$40.78	$15.57	$20.17	$0.00	$76.52
	12/01/2025	$40.78	$15.57	$21.78	$0.00	$78.13
	01/01/2026	$40.78	$16.17	$21.78	$0.00	$78.73
	06/01/2026	$41.78	$16.17	$21.78	$0.00	$79.73
	12/01/2026	$41.78	$16.17	$23.52	$0.00	$81.47
	01/01/2027	$41.78	$16.77	$23.52	$0.00	$82.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 2)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$46.11	$9.40	$23.12	$0.00	$78.63
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$46.11	$9.40	$23.12	$0.00	$78.63

Apprentice - *PILE DRIVER - Local 56 Zone 2*

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	$0.00	$0.00	$0.00	$0.00	$0.00

Notes: Apprentice wages shall be no less than the following Steps;
(Same as set in Zone 1)
1$57.06/2$61.96/3$66.87/4$69.32/5$71.78/6$71.78/7$76.68/8$76.68

Apprentice to Journeyworker Ratio:1:5

PIPELAYER *LABORERS - ZONE 2* For apprentice rates see "Apprentice- LABORER"	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
PIPELAYER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PLUMBER & PIPEFITTER *PLUMBERS LOCAL 4*	03/01/2024	$53.95	$9.90	$17.42	$0.00	$81.27
	09/01/2024	$55.35	$9.90	$17.42	$0.00	$82.67
	03/01/2025	$56.75	$9.90	$17.42	$0.00	$84.07
	09/01/2025	$58.15	$9.90	$17.42	$0.00	$85.47
	03/01/2026	$59.55	$9.90	$17.42	$0.00	$86.87

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PLUMBER/PIPEFITTER - Local 4*

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$21.58	$9.90	$0.00	$0.00	$31.48
2	50	$26.98	$9.90	$0.00	$0.00	$36.88
3	60	$32.37	$9.90	$0.00	$0.00	$42.27
4	70	$37.77	$9.90	$7.71	$0.00	$55.38
5	80	$43.16	$9.90	$7.71	$0.00	$60.77

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$22.14	$9.90	$0.00	$0.00	$32.04
2	50	$27.68	$9.90	$0.00	$0.00	$37.58
3	60	$33.21	$9.90	$0.00	$0.00	$43.11
4	70	$38.75	$9.90	$7.71	$0.00	$56.36
5	80	$44.28	$9.90	$7.71	$0.00	$61.89

Notes:

Steps - 2000 hrs; Step 4 w/lic 75%, Step 5 w/lic 85%
Step 4 w/lic $52.59, Step 5 w/lic $57.44

Apprentice to Journeyworker Ratio:1:3

PNEUMATIC CONTROLS (TEMP.) *PLUMBERS LOCAL 4*	03/01/2024	$53.95	$9.90	$17.42	$0.00	$81.27
	09/01/2024	$55.35	$9.90	$17.42	$0.00	$82.67
	03/01/2025	$56.75	$9.90	$17.42	$0.00	$84.07
	09/01/2025	$58.15	$9.90	$17.42	$0.00	$85.47
	03/01/2026	$59.55	$9.90	$17.42	$0.00	$86.87
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWDERMAN & BLASTER *LABORERS - ZONE 2*	12/01/2023	$38.86	$9.65	$17.14	$0.00	$65.65
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWDERMAN & BLASTER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$39.36	$9.40	$16.89	$0.00	$65.65
	06/01/2024	$40.69	$9.40	$16.89	$0.00	$66.98
	12/01/2024	$42.02	$9.40	$16.89	$0.00	$68.31
	06/01/2025	$43.41	$9.40	$16.89	$0.00	$69.70
	12/01/2025	$44.79	$9.40	$16.89	$0.00	$71.08
	06/01/2026	$46.23	$9.40	$16.89	$0.00	$72.52
	12/01/2026	$47.67	$9.40	$16.89	$0.00	$73.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS 170 -J.G.MacLellan (Lunenburg)*	02/02/2024	$29.00	$11.17	$8.00	$0.00	$48.17
	01/01/2025	$29.00	$11.57	$8.00	$0.00	$48.57
	02/02/2025	$29.50	$11.57	$8.00	$0.00	$49.07
	02/02/2026	$29.50	$12.37	$8.00	$0.00	$49.87
	01/01/2027	$30.00	$12.37	$8.00	$0.00	$50.37
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
ROLLER OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$38.42	$13.78	$15.15	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	02/01/2024	$50.03	$12.78	$21.45	$0.00	$84.26
	08/01/2024	$51.53	$12.78	$21.45	$0.00	$85.76
	02/01/2025	$52.78	$12.78	$21.45	$0.00	$87.01
	08/01/2025	$54.28	$12.78	$21.45	$0.00	$88.51
	02/01/2026	$55.53	$12.78	$21.45	$0.00	$89.76

Apprentice - *ROOFER - Local 33*

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.02	$12.78	$6.21	$0.00	$44.01
2	60	$30.02	$12.78	$21.45	$0.00	$64.25
3	65	$32.52	$12.78	$21.45	$0.00	$66.75
4	75	$37.52	$12.78	$21.45	$0.00	$71.75
5	85	$42.53	$12.78	$21.45	$0.00	$76.76

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.77	$12.78	$6.21	$0.00	$44.76
2	60	$30.92	$12.78	$21.45	$0.00	$65.15
3	65	$33.49	$12.78	$21.45	$0.00	$67.72
4	75	$38.65	$12.78	$21.45	$0.00	$72.88
5	85	$43.80	$12.78	$21.45	$0.00	$78.03

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
(Hot Pitch Mechanics' receive $1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	02/01/2024	$50.28	$12.78	$21.45	$0.00	$84.51
	08/01/2024	$51.78	$12.78	$21.45	$0.00	$86.01
	02/01/2025	$53.03	$12.78	$21.45	$0.00	$87.26
	08/01/2025	$54.53	$12.78	$21.45	$0.00	$88.76
	02/01/2026	$55.78	$12.78	$21.45	$0.00	$90.01
For apprentice rates see "Apprentice- ROOFER"						
SCRAPER *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$38.42	$13.78	$15.15	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SELF-PROPELLED POWER BROOM *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$35.80	$13.78	$15.15	$0.00	$64.73
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 63*	01/01/2024	$43.80	$10.64	$17.54	$2.05	$74.03
	07/01/2024	$45.05	$10.64	$17.54	$2.05	$75.28
	01/01/2025	$46.30	$10.64	$17.54	$2.05	$76.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 63*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$19.71	$4.79	$4.76	$0.92	$30.18
2	50	$21.90	$5.32	$5.29	$1.03	$33.54
3	55	$24.09	$5.85	$5.82	$1.13	$36.89
4	60	$26.28	$6.38	$6.35	$1.23	$40.24
5	65	$28.47	$6.92	$6.88	$1.33	$43.60
6	70	$30.66	$7.45	$7.41	$1.44	$46.96
7	75	$32.85	$7.98	$7.94	$1.54	$50.31
8	80	$35.04	$8.51	$15.42	$1.64	$60.61
9	85	$37.23	$9.04	$15.95	$1.74	$63.96
10	90	$39.42	$9.58	$16.48	$1.85	$67.33

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$20.27	$4.79	$4.76	$0.92	$30.74
2	50	$22.53	$5.32	$5.29	$1.03	$34.17
3	55	$24.78	$5.85	$5.82	$1.13	$37.58
4	60	$27.03	$6.38	$6.35	$1.23	$40.99
5	65	$29.28	$6.92	$6.88	$1.33	$44.41
6	70	$31.54	$7.45	$7.41	$1.44	$47.84
7	75	$33.79	$7.98	$7.94	$1.54	$51.25
8	80	$36.04	$8.51	$15.42	$1.64	$61.61
9	85	$38.29	$9.04	$15.95	$1.74	$65.02
10	90	$40.55	$9.58	$16.48	$1.85	$68.46

Notes:

Apprentice to Journeyworker Ratio:1:3

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.24	$15.07	$18.67	$0.00	$72.98
	06/01/2024	$40.24	$15.07	$18.67	$0.00	$73.98
	12/01/2024	$40.24	$15.07	$20.17	$0.00	$75.48
	01/01/2025	$40.24	$15.57	$20.17	$0.00	$75.98
	06/01/2025	$41.24	$15.57	$20.17	$0.00	$76.98
	12/01/2025	$41.24	$15.57	$21.78	$0.00	$78.59
	01/01/2026	$41.24	$16.17	$21.78	$0.00	$79.19
	06/01/2026	$42.24	$16.17	$21.78	$0.00	$80.19
	12/01/2026	$42.24	$16.17	$23.52	$0.00	$81.93
	01/01/2027	$42.24	$16.77	$23.52	$0.00	$82.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.53	$15.07	$18.67	$0.00	$73.27
	06/01/2024	$40.53	$15.07	$18.67	$0.00	$74.27
	12/01/2024	$40.53	$15.07	$20.17	$0.00	$75.77
	01/01/2025	$40.53	$15.57	$20.17	$0.00	$76.27
	06/01/2025	$41.53	$15.57	$20.17	$0.00	$77.27
	12/01/2025	$41.53	$15.57	$21.78	$0.00	$78.88
	01/01/2026	$41.53	$16.17	$21.78	$0.00	$79.48
	06/01/2026	$42.53	$16.17	$21.78	$0.00	$80.48
	12/01/2026	$42.53	$16.17	$23.52	$0.00	$82.22
	01/01/2027	$42.53	$16.77	$23.52	$0.00	$82.82
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 669*	04/01/2023	$47.43	$11.45	$16.61	$0.00	$75.49

Apprentice - *SPRINKLER FITTER - Local 669*

Effective Date - 04/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$21.34	$8.22	$0.00	$0.00	$29.56
2	50	$23.72	$8.22	$0.00	$0.00	$31.94
3	55	$26.09	$11.45	$7.20	$0.00	$44.74
4	60	$28.46	$11.45	$8.35	$0.00	$48.26
5	65	$30.83	$11.45	$8.35	$0.00	$50.63
6	70	$33.20	$11.45	$8.60	$0.00	$53.25
7	75	$35.57	$11.45	$8.60	$0.00	$55.62
8	80	$37.94	$11.45	$8.60	$0.00	$57.99
9	85	$40.32	$11.45	$8.60	$0.00	$60.37
10	90	$42.69	$11.45	$8.60	$0.00	$62.74

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2024	$61.34	$11.49	$23.59	$0.00	$96.42
	08/01/2024	$63.44	$11.49	$23.59	$0.00	$98.52
	02/01/2025	$64.74	$11.49	$23.59	$0.00	$99.82
	08/01/2025	$66.89	$11.49	$23.59	$0.00	$101.97
	02/01/2026	$68.24	$11.49	$23.59	$0.00	$103.32
	08/01/2026	$70.44	$11.49	$23.59	$0.00	$105.52
	02/01/2027	$71.84	$11.49	$23.59	$0.00	$106.92

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.67	$11.49	$23.59	$0.00	$65.75
2	60	$36.80	$11.49	$23.59	$0.00	$71.88
3	70	$42.94	$11.49	$23.59	$0.00	$78.02
4	80	$49.07	$11.49	$23.59	$0.00	$84.15
5	90	$55.21	$11.49	$23.59	$0.00	$90.29

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.72	$11.49	$23.59	$0.00	$66.80
2	60	$38.06	$11.49	$23.59	$0.00	$73.14
3	70	$44.41	$11.49	$23.59	$0.00	$79.49
4	80	$50.75	$11.49	$23.59	$0.00	$85.83
5	90	$57.10	$11.49	$23.59	$0.00	$92.18

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$48.33	$9.65	$18.22	$0.00	$76.20
	06/01/2024	$49.81	$9.65	$18.22	$0.00	$77.68
	12/01/2024	$51.28	$9.65	$18.22	$0.00	$79.15
	06/01/2025	$52.78	$9.65	$18.22	$0.00	$80.65
	12/01/2025	$54.28	$9.65	$18.22	$0.00	$82.15
	06/01/2026	$55.83	$9.65	$18.22	$0.00	$83.70
	12/01/2026	$57.33	$9.65	$18.22	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$44.45	$9.65	$18.22	$0.00	$72.32
	06/01/2024	$45.93	$9.65	$18.22	$0.00	$73.80
	12/01/2024	$47.40	$9.65	$18.22	$0.00	$75.27
	06/01/2025	$48.90	$9.65	$18.22	$0.00	$76.77
	12/01/2025	$50.40	$9.65	$18.22	$0.00	$78.27
	06/01/2026	$51.95	$9.65	$18.22	$0.00	$79.82
	12/01/2026	$53.45	$9.65	$18.22	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$44.33	$9.65	$18.22	$0.00	$72.20
	06/01/2024	$45.81	$9.65	$18.22	$0.00	$73.68
	12/01/2024	$47.28	$9.65	$18.22	$0.00	$75.15
	06/01/2025	$48.78	$9.65	$18.22	$0.00	$76.65
	12/01/2025	$50.28	$9.65	$18.22	$0.00	$78.15
	06/01/2026	$51.83	$9.65	$18.22	$0.00	$79.70
	12/01/2026	$53.33	$9.65	$18.22	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRACTORS *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$38.42	$13.78	$15.15	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.82	$15.07	$18.67	$0.00	$73.56
	06/01/2024	$40.82	$15.07	$18.67	$0.00	$74.56
	12/01/2024	$40.82	$15.07	$20.17	$0.00	$76.06
	01/01/2025	$40.82	$15.57	$20.17	$0.00	$76.56
	06/01/2025	$41.82	$15.57	$20.17	$0.00	$77.56
	12/01/2025	$41.82	$15.57	$21.78	$0.00	$79.17
	01/01/2026	$41.82	$16.17	$21.78	$0.00	$79.77
	06/01/2026	$42.82	$16.17	$21.78	$0.00	$80.77
	12/01/2026	$42.82	$16.17	$23.52	$0.00	$82.51
	01/01/2027	$42.82	$16.77	$23.52	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2023	$56.56	$9.65	$18.67	$0.00	$84.88
	06/01/2024	$58.04	$9.65	$18.67	$0.00	$86.36
	12/01/2024	$59.51	$9.65	$18.67	$0.00	$87.83
	06/01/2025	$61.01	$9.65	$18.67	$0.00	$89.33
	12/01/2025	$62.51	$9.65	$18.67	$0.00	$90.83
	06/01/2026	$64.06	$9.65	$18.67	$0.00	$92.38
	12/01/2026	$65.56	$9.65	$18.67	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2023	$58.56	$9.65	$18.67	$0.00	$86.88
	06/01/2024	$60.04	$9.65	$18.67	$0.00	$88.36
	12/01/2024	$61.51	$9.65	$18.67	$0.00	$89.83
	06/01/2025	$63.01	$9.65	$18.67	$0.00	$91.33
	12/01/2025	$64.51	$9.65	$18.67	$0.00	$92.83
	06/01/2026	$66.06	$9.65	$18.67	$0.00	$94.38
	12/01/2026	$67.56	$9.65	$18.67	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2023	$48.63	$9.65	$18.67	$0.00	$76.95
	06/01/2024	$50.11	$9.65	$18.67	$0.00	$78.43
	12/01/2024	$51.58	$9.65	$18.67	$0.00	$79.90
	06/01/2025	$53.08	$9.65	$18.67	$0.00	$81.40
	12/01/2025	$54.58	$9.65	$18.67	$0.00	$82.90
	06/01/2026	$56.13	$9.65	$18.67	$0.00	$84.45
	12/01/2026	$57.63	$9.65	$18.67	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2023	$50.63	$9.65	$18.67	$0.00	$78.95
	06/01/2024	$52.11	$9.65	$18.67	$0.00	$80.43
	12/01/2024	$53.58	$9.65	$18.67	$0.00	$81.90
	06/01/2025	$55.08	$9.65	$18.67	$0.00	$83.40
	12/01/2025	$56.58	$9.65	$18.67	$0.00	$84.90
	06/01/2026	$58.13	$9.65	$18.67	$0.00	$86.45
	12/01/2026	$59.63	$9.65	$18.67	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.24	$15.07	$18.67	$0.00	$72.98
	06/01/2024	$40.24	$15.07	$18.67	$0.00	$73.98
	12/01/2024	$40.24	$15.07	$20.17	$0.00	$75.48
	01/01/2025	$40.24	$15.57	$20.17	$0.00	$75.98
	06/01/2025	$41.24	$15.57	$20.17	$0.00	$76.98
	12/01/2025	$41.24	$15.57	$21.78	$0.00	$78.59
	01/01/2026	$41.24	$16.17	$21.78	$0.00	$79.19
	06/01/2026	$42.24	$16.17	$21.78	$0.00	$80.19
	12/01/2026	$42.24	$16.17	$23.52	$0.00	$81.93
	01/01/2027	$42.24	$16.77	$23.52	$0.00	$82.53
VOICE-DATA-VIDEO TECHNICIAN *ELECTRICIANS LOCAL 96*	09/03/2023	$34.49	$13.00	$17.22	$0.00	$64.71
	09/01/2024	$35.29	$13.99	$17.57	$0.00	$66.85
	09/07/2025	$36.12	$14.98	$17.91	$0.00	$69.01
	09/06/2026	$37.04	$15.96	$18.27	$0.00	$71.27

Apprentice - *VOICE-DATA-VIDEO TECHNICIAN - Local 96*

Effective Date - 09/03/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.25	$13.00	$4.31	$0.00	$34.56
2	55	$18.97	$13.00	$4.36	$0.00	$36.33
3	60	$20.69	$13.00	$16.81	$0.00	$50.50
4	65	$22.42	$13.00	$16.86	$0.00	$52.28
5	70	$24.14	$13.00	$16.91	$0.00	$54.05
6	75	$25.87	$13.00	$16.97	$0.00	$55.84
7	80	$27.59	$13.00	$17.02	$0.00	$57.61
8	85	$29.32	$13.00	$17.07	$0.00	$59.39

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.65	$13.99	$4.41	$0.00	$36.05
2	55	$19.41	$13.99	$4.46	$0.00	$37.86
3	60	$21.17	$13.99	$17.15	$0.00	$52.31
4	65	$22.94	$13.99	$17.20	$0.00	$54.13
5	70	$24.70	$13.99	$17.25	$0.00	$55.94
6	75	$26.47	$13.99	$17.30	$0.00	$57.76
7	80	$28.23	$13.99	$17.36	$0.00	$59.58
8	85	$30.00	$13.99	$17.41	$0.00	$61.40

Notes:

Apprentice to Journeyworker Ratio:1:1

WAGON DRILL OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
WATER METER INSTALLER *PLUMBERS LOCAL 4*	03/01/2024	$53.95	$9.90	$17.42	$0.00	$81.27
	09/01/2024	$55.35	$9.90	$17.42	$0.00	$82.67
	03/01/2025	$56.75	$9.90	$17.42	$0.00	$84.07
	09/01/2025	$58.15	$9.90	$17.42	$0.00	$85.47
	03/01/2026	$59.55	$9.90	$17.42	$0.00	$86.87
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$29.67	$9.25	$1.89	$0.00	$40.81
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$42.03	$9.25	$10.27	$0.00	$61.55
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$34.62	$9.25	$10.07	$0.00	$53.94
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$27.20	$9.25	$1.82	$0.00	$38.27
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$42.03	$9.25	$14.35	$0.00	$65.63
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$37.09	$9.25	$10.87	$0.00	$57.21
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$27.20	$9.25	$1.82	$0.00	$38.27
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$22.25	$9.25	$1.82	$0.00	$33.32
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$49.45	$9.25	$17.48	$0.00	$76.18

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 08/30/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$29.67	$9.25	$3.39	$0.00	$42.31
2	65	$32.14	$9.25	$3.46	$0.00	$44.85
3	70	$34.62	$9.25	$3.54	$0.00	$47.41
4	75	$37.09	$9.25	$5.11	$0.00	$51.45
5	80	$39.56	$9.25	$5.19	$0.00	$54.00
6	85	$42.03	$9.25	$5.26	$0.00	$56.54
7	90	$44.51	$9.25	$7.34	$0.00	$61.10

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$30.73	$4.70	$3.17	$0.00	$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

Appendix F – PROPOSER Questions

F1 General Instructions

The PROPOSER shall enter any questions in the Appendix F PROPOSER Questions spreadsheet prior to submission of the proposal. The format of entering RFP information and questions should follow the example below:

Date Submited	#	RFx Document	RFP Section Number/ Name	RFP Outline Item Number	RFP Requirement	Clarification Request	Client Response/ Clarification
	1	CLIENT - Name of Clinet's RFP	5 Microwave Network Requirements	5.1.1			
	2						
	3						