

PAYNE COUNTY
BOARD OF COUNTY COMMISSIONERS
STILLWATER, OKLAHOMA

"NOTICE TO BIDDERS"

Notice is hereby given that the Payne County Board of Commissioners State of Oklahoma, will receive sealed bids for the following:

**BID # 2023-21
PAYNE COUNTY, OK P25 RADIO NETWORK
REQUEST FOR PROPOSAL**

Bid documents may be picked up at the Payne County Clerk's Office at 315 W. 6th, Suite 202, Payne County Administration Building, Stillwater, Oklahoma, or you can request that the Bid Documents be E-mailed to you, call 405-747-8348 to request that they be mailed or E-mailed.

Bids should be mailed or hand delivered to the Payne County Clerk, 315 W. 6th, Suite 202, Stillwater, OK. 74074, Bids must be filed with the Payne County Clerk on or before 9:30 A.M. on DECEMBER 12, 2022. Bids must be sealed and clearly marked:

**BID # 2023-21
FOR
PAYNE COUNTY, OK P25 RADIO NETWORK
REQUEST FOR PROPOSAL
OPENING: DECEMBER 12, 2022 @ 9:30 A.M.
TUSA CONSULTING, DEAN HART 816-518-9223
PAYNE COUNTY DISTRICT 1 COMMISSIONER, ZACH CAVETT, 405-742-4418**

THERE WILL BE A MANDATORY PRE-PROPOSAL MEETING HELD OCTOBER 25, 2022 AT 9 AM AT THE PAYNE COUNTY ADMINISTRATION BUILDING, 315 W. 6TH, STE 200, STILLWATER, OKLAHOMA.

The Board of County Commissioners, or their appointed representative, will evaluate all bids, and reserves the right to reject any or all bids, and reserves the right to waive any of the listed specifications. The Board of County Commissioners reserves the right to accept the bid determined to best serve the needs of Payne County.

Payne County hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, sex or national origin in consideration for an award.

KYLA MCCOMBS
PURCHASING AGENT



Office of
GLENNA CRAIG
Payne County Clerk

BID # 2023-21

**PAYNE COUNTY, OK. P25 RADIO NETWORK – REQUEST FOR PROPOSAL
PAYNE COUNTY COMMISSIONERS**

Vendor and or company representative,

Included in this correspondence you will find information regarding bid specifications, packet information, and instructions per the Payne County Commissioners who are requesting your company submit a bid for the enclosed project or materials.

The enclosed packet has been developed and approved by the Payne County Commissioners, the content of the packet is per their instruction. The Payne County Clerk's office is the facilitator of the bid process and is required to receive and hold all sealed bids per Oklahoma State Statutes to present to the Board of Commissioners in an open session.


If you have any questions, in regards, to the pack content, specifications, and instructions please contact the following:

TUSA CONSULTING, DEAN HART 816-518-9223

PAYNE COUNTY DISTRICT 1 COMMISSIONER, ZACH CAVETT, 405-742-4418

We appreciate your bid and time, in regards, to the process. We look forward to hearing from you.

Kind Regards,


Glenna Craig, Payne County Clerk
State of Oklahoma

All bids can be mailed or emailed to vendors upon request, or can be downloaded for completion from our website:

www.countyclerk.paynecounty.org

CONTACT KYLA MCCOMBS-PAYNE COUNTY PURCHASING AGENT FOR EMAIL OR MAILED BIDS AT:

kmccombs@paynecountyclerk.org

ALL BIDS MUST BE SUBMITTED BACK TO THE PAYNE COUNTY CLERKS OFFICE BY MAIL, OR IN PERSON SEALED BEFORE 9:30 THE DATE OF BID OPENING.

THERE WILL BE A
MANDATORY PRE-
PROPOSAL MEETING
HELD OCTOBER 25,
2022 AT 9 AM AT THE
PAYNE COUNTY
ADMINISTRATION
BUILDING, 315 W. 6TH,
STE 200, STILLWATER,
OKLAHOMA.



Office of
GLENNA CRAIG
Payne County Clerk

INVITATION TO BID

The Board of County Commissioners, Payne County, Oklahoma is seeking sealed bids for:

BID # 2023-21

**PAYNE COUNTY, OK P25 RADIO NETWORK
REQUEST FOR PROPOSAL**

BID # 2023-21

Date Published: OCTOBER 6, 2022

Bidding Period Closing Date and Hour: DECEMBER 12, 2022 @ 9:30 A.M.

Sealed Bid Opening Date and Hour: DECEMBER 12, 2022 @ 9:30 A.M.

Location: "The Gloria Hesser Commissioners Meeting Room" Room 200, Payne County Administration Building.

Address: 315 W. 6th, Ste. 202, Stillwater, OK. 74074

Requesting Authority: PAYNE COUNTY COMMISSIONERS'

TUSA CONSULTING, DEAN HART

PHONE: 816-518-9223

DISTRICT 1 COMMISSIONER, ZACH CAVETT

PHONE: 405-742-4418

Bid submissions are to be addressed to:

**ATTN: Payne County Purchasing Agent
Payne County Clerk's Office
315 W. 6th, Suite 202
Stillwater, OK 74074**


Please review the attached Terms and Conditions pertaining to the submission of this bid.

Please pay particular attention to item (1) of the Terms and Conditions. This item specifies how the bid envelopes are to be identified to prevent inadvertent or premature opening of sealed bids. Your compliance will ensure consideration of your bid by the awarding body. Late bids will not be considered.

The Non-Collusions Affidavit bearing original signature must be notarized and returned with the bid submission.

This packet contains:

1. Invitation to Bid
2. Terms and Conditions for Bidding
3. Affidavit for Filing with Competitive Bid
4. Specifications/Bid forms for desired item(s) (may be more than one page of information).


**Glenna Craig, Payne County Clerk
State of Oklahoma
315 W. 6th, Suite 202
Stillwater, OK 74074**



Office of
GLENNA CRAIG
Payne County Clerk

TERMS AND CONDITIONS
THESE ITEMS APPLY TO AND BECOME A PART OF THE BID
NO EXCEPTIONS TO THESE TERMS AND CONDITIONS WILL BE CONSIDERED

1. Bids must be submitted on the included form only. Each bid shall be placed in a separate envelope. Be sure the envelope is completely and properly identified and sealed, showing the bid name and number in the lower left-hand corner.
2. All bids shall be entered on the Bid Form enclosed or a copy thereof. Bids are to be typewritten or in ink. No bidder may withdraw his proposal for a period of thirty (30) days after the date and hour set for the opening of bids.
3. The bidder shall attach the manufacturer's name of the equipment or material to be furnished, type model numbers descriptive bulletins and specifications. All guarantees and warranties should be clearly stated. This data shall be sufficient detail to describe accurately the equipment or material to be furnished. Manufacturer's specifications, in respect to the successful bidder, shall be considered as part of the contract with Payne County.
4. Any exceptions or deviations from written specifications shall be identified in writing and attached to the bid form.
5. The enclosed affidavit for Filing with Competitive Bid **MUST** be returned with the bid.
6. Payne County reserves the right to reject any and all bids and to waive any technicalities in the bidding.
7. Direct purchase of certain items of equipment or material by Payne County is exempt from Federal Excise Tax and Oklahoma Sales Tax. In such cases, the bidder shall quote prices which do not include Federal Excise Tax and Oklahoma Sales Tax.
8. Bid must show number of days required for delivery under normal conditions. Contractor must keep the County advised at all times of the status of the order. For any exception to the delivery date as specified on this order, vendor shall give prior notification and obtain written approval from the Purchasing Agent. Default in promised delivery date or failure to meet specifications, authorizes the County to purchase supplies elsewhere and charge the full increase of cost and handling to defaulting contractor.
9. Bidder agrees to defend and save Payne County from and against all demands, claims costs expense, damage and judgments based upon infringement of any patent to goods specified in this order or the ordinary use or operation of such goods by the County or use or operation of such goods in accordance with the bidder's direction.
10. If the bid requires a written contract, the successful bidders shall execute a written contract with the county within (10) days after submission of the contracts to said bidder.
11. This bid is submitted as a legal offer, and any bid when accepted by the County constitutes a firm contract.
12. **If the bid is \$50,000.00 or greater, Bidder must furnish a bid bond or cashier's check in the amount of 5% of the bid with bid submission.**
13. **If the bid is \$50,000.00 or greater, successful Bidder must be able to bond. (Performance, Maintenance and Payment Bonds)**
14. Successful bidder will be required to furnish their own Workmen's Comp and General Liability Insurance as required by Oklahoma State Law and by Payne County.



Office of
GLENNA CRAIG
Payne County Clerk

S.A.&I. 425/1-4040 (2000)

AFFIDAVIT FOR FILING WITH COMPETITIVE BID

STATE OF OKLAHOMA)

)SS

COUNTY OF _____)

_____, of lawful age, being first duly sworn, on oath says, that (s)he is the agent authorized by the bidder to submit the attached bid. Affiant further states that the bidder has not been a party to any collusion among bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding; or with any county official or employee as to quantity, quality or price in the prospective contract, or any other terms of said prospective contract, or in any discussions between bidders and any county official concerning exchange of money or other thing of value for special consideration in the letting of a contract.

Firm: _____

Signed by: _____
(manual signature of undersigned)

Title: _____

Address: _____

City: _____ State: _____

Zip: _____ Tax ID: _____

Telephone (____) _____ Fax (____) _____

Subscribed and sworn to before me this _____ day of _____, 20_____.

_____ Notary Public (or Clerk or Judge)

My commission expires: _____

Note:

Each competitive bid submitted to a county, school district or municipality must be accompanied with the above Affidavit as required by 61 Okl.St. Ann. § 138

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FORMS

1.0 Terms and Conditions

1.1 Purpose

This Request for Proposal (RFP) encompasses a turnkey project to provide Payne County, Oklahoma (further known throughout this document as 'Customer') with a new P25 700/800 MHz Digital Simulcast Trunked radio network capable of meeting current and future communication needs, reliably and functionally.

1.2 Instructions

This RFP is a complete document and must be returned intact with the Vendor proposal provided in a point-by-point fashion. The RFP Authorization Form (See Attachments) must be completed. All responses and attachments should be placed into the Vendor proposal immediately behind the area in which the information was requested i.e., a point-by-point response.

If supplementary materials are inserted, each inserted page must be labeled in the bottom margin with the number of the RFP page behind which it is being placed. If more than one page is inserted behind a particular RFP page, then each must be labeled with the appropriate page number plus a letter designator, e.g. 121a, 121b, 121c, etc.

When submitting responses to RFPs, corporate entities are required to comply with Oklahoma State law regarding authorized signatures. A letter of proposal submittal is required. If an official with the proposing Vendor, other than the president executes the letter of transmittal such signature must be accompanied by a certificate or a copy of a resolution adopted by the corporation setting forth the authority of that individual to execute a contract.

The Vendor shall provide a point-by-point and narrative response that must be met as described below. The Vendors shall clearly delineate in its point-by-point response its position with respect to the stated requirement, meaning the statement of any of the following:

- Understood – meaning that the item has been read and its direction or meaning is understood;
- Comply – meaning that the item has been read and that the Vendor agrees and accepts the requirement(s) as stated;
- Comply with Clarification – meaning that the Vendor fully accepts the requirement and is in addition providing an explanation of how it intends to adhere to the requirement(s);

- Exception – meaning that the Vendor understands the Customer's item but cannot accept or undertake the Customer's requirement(s).

Proposal responses that take exception to a stated RFP requirement risk being graded down in the evaluation process. Vendors are encouraged to request clarification of RFP items that are unclear during the period provided within the Customer's open procurement cycle.

1.2.1 Proposal Timeline

<u>Release of Request for Proposal:</u>	Monday, October 3, 2022
<u>Mandatory Pre-Proposal Conference:</u>	Monday, October 25, 2022 at 09:00 AM CST
<u>Vendor Site Visits (Day 1):</u> Immediately following pre-proposal conference.	Monday, October 25, 2022 at 09:00 AM CST
<u>Vendor Site Visits (Day 2):</u> If required to finalize site visits.	Tuesday, October 26, 2022 at 09:00 AM CST
<u>Deadline for Submission of Questions:</u>	Tuesday, November 1, 2022 at 2:00 PM CST
<u>Answers Provided through Addendum No Late</u>	Tuesday, November 8, 2022 at 2:00 PM CST
<u>Proposal Due Date and Time</u>	Monday, December 12, 2022 at 9:30 AM CST
<u>Vendor Oral Presentations</u>	TBD

1.2.2 Mandatory Pre-RFP Conference

This RFP constitutes the full scope of the information request. A mandatory RFP pre-proposal conference will be conducted after the release of this RFP. The time and place of the pre-proposal conference will be at Payne County Board of Commissioners, 315 W 6th Ave #203 Stillwater, Oklahoma 74074 on Monday, October 25 2022 at 09:00 AM CST

1.2.3 Mandatory Site Visits

Vendor site visits shall be made available immediately following the Mandatory Pre-Proposal Conference on Monday, October 25, 2022 and continue on the following day, as needed.

TUSA Consulting will coordinate with the respective agencies within Payne County and escort vendors accordingly.

1.2.4 RFP Questions

If during the review or preparation of the RFP response a Vendor discovers any errors, omissions, or ambiguities, they should submit, in writing, their questions to Payne County. Written RFP questions can be directed via email to Dean Hart, TUSA Consulting Services at dean.hart@tusaconsulting.com and additional contacts as noted. Vendors shall submit all written questions on or before the designated deadline for submission of questions noted in the Proposal Deadline section 1.2.1

All emails must use the following subject line:

Payne County, Oklahoma P25 Radio System RFP Question

1.2.5 Late RFP Response Submission

Any RFP Response submitted after the specified submission due date and time, will not be accepted and will be returned unopened to the submitting organization. All RFP responses will be held in confidence, to the extent permissible by Payne County, Oklahoma law, as applicable.

1.2.6 RFP Response Submittal

The RFP Response shall be divided into two sections: 1) Technical and 2) Pricing. Two (2) copies each of the Technical Response and One (1) electronic searchable copy of the Technical Response AND Two (2) copies each of the Pricing Response and One (1) electronic searchable copy Pricing Response are to be submitted.

The Pricing Responses (including electronic copy) shall be separated from the Technical Response (including electronic copy) and independently sealed. Do NOT put your price in the technical proposal or it will be disqualified.

Each RFP Response shall be submitted in standard 8.5 x 11.5, three ring binders. The entire RFP Response package must be submitted in a sealed container addressed to: Payne County Consultant, 315 W 6th Ave #202, Stillwater, Oklahoma, 74074 and identifying the title of the procurement. The time and date of the Proposal Opening must be plainly marked on the container as well as the Vendor's name, address and State Contractor's License Number.

The RFP opening of the technical proposal or the pricing proposal will be public. All submitting vendors will be notified of the results.

All RFP Responses shall be delivered by hand, with receipt requested, or by certified or registered mail. All RFP Responses become property of Payne County. A cover letter transmitting the RFP Response must accompany the package.

1.2.6.1 Evaluation Specifics

Technical and Pricing Proposals shall be evaluated separately using a weighted point system whereby out of a maximum 100% Overall Project Score, 70% shall be allocated to Technical Proposal evaluation scores, and 30% being allocated to the Pricing Proposal.

Technical Proposals will first be evaluated for overall responsiveness and completeness to the RFP. Proposals that are determined responsive and complete will be evaluated by the Customer and Consultant.

Technical Proposals will be graded in the following areas, listed in relative order of importance, with respect to the requirements as outlined in this RFP:

1. Performance, compatibility, expansion capabilities, and versatility (30%)
2. Reliability, redundancy, and warranty (20%)
3. Vendor qualifications, history of product support, and RFP deviations (10%)
4. Equipment repair, installation, and implementation (10%)
5. Interoperability (15%)

6. Training (5%)
7. Equipment Repair, Maintenance, Availability of Service Parts (5%)
8. Organization, Scope, and Proposal Detail (5%)

The scored results of this Technical Evaluation will be multiplied by 0.70, thereby yielding a weighted technical project-total score. The results of this portion of the Evaluation shall be submitted to Payne County.

At the direction of Payne County as to the suitability and acceptability of the Technical Evaluation Results, the Consultant will next open and evaluate proposed costs for each responsive Technical Proposal.

The relative cost differences between responsive Cost Proposals shall be compared and evaluated. Each of the Pricing Proposals received from responsive Vendors shall have their individual cost evaluation raw scores multiplied by 0.30 and those portion results added together with the Technical Evaluation score, thus yielding an Overall Project Score for each Vendor's response.

That Vendor response receiving the highest Overall Project Score shall be recommended by the Consultant as being the most responsive, best proposal. In the case of a tied Overall Project Score, the Consultant shall recommend that Vendor response having the highest Technical Proposal evaluation score.

1.2.5.2 Total Costs

Payne County reserves the right to evaluate the total project price based on initial cost and lifecycle analyses. Any deviations by Vendors from the pricing requirements herein shall be pre-approved by Payne County in advance of submittal, or they will be construed as being non-conforming, and the submittal may not be given further consideration.

1.3 Definitions

Definitions as used herein:

- a) Vendor:
Any organization, company, or supplier responding to this RFP
- b) Contractor:
The Vendor to whom a Contract is awarded.
- c) Proposal, RFP Response, Submittal:
Correspondence or material furnished by Responders in response to this specification.
- d) Payne County, Owner
Payne County, Oklahoma
- e) Consultant
TUSA Consulting Services II, LLC.
- f) System
Contractor furnished P25 Land Mobile Radio system and related equipment engineered, intergrate, furnished and installed as part of this RFP Response.

1.4 Vendor Standards

The Vendor must have manufactured, delivered and installed at least three radio systems of comparable technology (700/800MHz Project-25 digital voice simulcast transmit/receiver voted, microwave), having comparable size, scope, and with similar terrain.

These three systems shall be described with enough information that "Customer," or its Consultant can reasonably determine their project equivalency.

RFP responses must include a detailed summary of the system and its significant operational features/components, as well as a current customer contact, including name, address, and phone number, title, department, and system responsibility.

Vendors will likewise be required to provide sufficient information necessary to support claims that proposed infrastructure will be functionally and operationally compatible with 700MHz channels (764-767MHz and 773-776MHz, paired with 794-797MHz and 803-806MHz, respectively) as well as the newly configured 800MHz NPSPAC channel plan as a result of FCC-Ordered 800MHz Rebanding. Failure to propose equipment capable of operations on this new spectrum and/or unable to support Project-25 Phase 1 and Phase 2 operations shall be considered non-responsive and that Vendor's response shall be given no further consideration.

A factory authorized service center that is fully staffed and trained to support the proposed infrastructure network, and all related subsystem equipment, must be located within a 120 minute (2 hour) response time of Payne County to be considered adequate to satisfy initial installation, implementation, optimization, warranty and ongoing maintenance needs. The Contractor and all envisioned subcontractors, if any, must be able to legally conduct business within the State of Oklahoma.

The following standards shall apply, as a minimum, to all equipment, installation methods and materials:

- A. EIA/TIA-Electronic/Telecommunications Industry Association
- B. NEC - National Electric Code
- C. NEMA - National Electrical Manufacturer's Association
- D. IEEE - Institute of Electrical and Electronic Engineers, Inc.
- E. FCC - Federal Communications Commission
- F. FAA - Federal Aviation Administration
- G. NFPA - National Fire Protection Association
- H. International Building Codes for the State of Oklahoma
- I. OSHA - Occupational Safety and Health Administration
- J. (R56) Motorola Standards and Guidelines for Communications Sites or equivalent
- K. ISO - Internation Organization for Standards

1.5 Workmanship

All proposed workmanship supportive of the RFP must conform to normal and accepted standards for the telecommunications industry. All fixed site equipment, including electronic communications infrastructure, dispatch consoles, alarm system consoles, network management consoles, electrical wiring, towers, antennas, mounts, etc. are to be installed by or under the supervision of the Contractor.

The Contractor must completely remove and properly dispose of residue due to its work, return the site to a useable state and will be responsible for the cost of repairing all damage caused by the Contractor or its Sub-Contractors during network installation.

Payne County and/or its Consultant reserves the right to halt any radio equipment or civils installation process due to poor workmanship, housekeeping, scheduling, work interruptions, etc.

Work halts that are the result of poor workmanship would not relieve the Contractor of their responsibility to conform to the installation time requirements as stated by Contract.

1.6 Materials

All equipment, except with the expressed written permission of Payne County and its Consultant, must be new and unused, meet telecommunications industry standards, and, where applicable, be registered with and approved by the Federal Communications Commission.

Payne County and its Consultant reserve the right to reject and require the return, at the Contractor's expense, of any defective components that fail to comply with this RFP or lack FCC type approval.

Rejections of material for cause would not provide an extension of time to the Contractor in the performance of contracted requirements. Such rejections or returns will neither validate nor invalidate the remainder of any Contract.

1.7 Subcontractors

It is intended that a single Contractor have total turnkey responsibility for the subsequent Payne County project so as to assure a fully operational System.

Therefore, any Vendor desiring to use Sub-Contractor(s) must include within their response a list and description of potential, qualified Sub-Contractor(s). Payne County shall require documentation and references to ensure the qualification of a proposed Sub-Contractor.

1.8 Premises Visits

Vendors, before submitting an RFP Response, are required to visit the existing Payne County radio infrastructure site premises in order to gain familiarity with conditions which may affect the work or planned solution(s). See section 1.2.1 above for additional details.

Site Visits shall take place immediately following the Pre-Proposal Conference. Due to the large number of sites, site visits could possibly continue on the following day.

Vendors must indicate any special requirements, i.e., architectural, mechanical, electrical, civil or structural modifications, that their equipment may need at either Payne County-owned or non-Payne County-owned locations that are intended to be utilized.

Estimated costs for these special requirements shall be disclosed in the RFP Response. Failure to ask questions on special requirement or provide costs can result in a proposal being scored down.

1.9 Contact

All contact and inquiry concerning this RFP shall be directed to:

<u>Project Name:</u>	Payne County, Oklahoma P25 Radio System
<u>Customer Position</u>	Payne County Consultant
<u>City/County/State:</u>	Payne County, Oklahoma
<u>Customer Contact Name:</u>	Dean Hart, TUSA Consulting Services
<u>Street:</u>	315 W 6th Ave #202
<u>City/State/Zip Code:</u>	Stillwater, Oklahoma, 74074
<u>Phone:</u>	(816) 518-9223
<u>Email:</u>	dean.hart@tusaconsulting.com

Additional Customer Contacts to be included in all email correspondence with Primary Contact:

<u>Contact:</u>	<u>Troy Choplin, Emergency Management Director</u>
<u>Email:</u>	tchoplin@paynecountyok.gov
<u>Phone:</u>	(405) 334-3447

<u>Contact:</u>	Joe Harper, Sheriff
<u>Email:</u>	jharper@sheriff.paynecountyok.gov
<u>Phone:</u>	(405) 612-1359

1.10 Notification

Vendors will be notified of Payne County desire to enter into additional discussions as well as an oral presentation of proposed solutions, if determined necessary.

Payne County ranking of proposals shall be published after a recommendation of the best and most advantageous proposal is presented to the Payne County Board of County Commissioners.

1.11 Installation

1.11.1 Project Time Frame for Completion

The Project's anticipated time frame for completion is no greater than eighteen (18) months from a formal Notice to Proceed. The Project will not be deemed completed until a fully-compliant Project-25 simulcast infrastructure has been installed; all network functionality, audio quality and mandatory coverage testing has satisfactorily been completed in accordance with the Contract's Acceptance Test Plan; receipt of as-built documentation has occurred; and a Certificate of Substantial Completion has been issued by the Consultant for any remaining punch list items.

Standardized Vendor contracts will not be accepted unless suitably modified to comply with this RFP and subsequent RFP Addendums.

1.12 Training

Payne County and Partner Agencies considers training to be of paramount importance.

Telecommunicator training shall be more extensive and will involve all designated regular and relief telecommunicators employed by Payne County and Partner Agencies at the time of system operational testing.

Administrative and telecommunicator training shall be completed on-site by the Contractor's personnel. The Contractor shall provide administrative training for two Communication Network Managers. Software training shall be provided which will enable these personnel to perform functionality/feature changes to fixed site equipment and portables/mobiles, poll the network diagnostics perform traffic and feature usage studies, etc.

It is the desire of Payne County and Partner Agencies that such training is to commence within 60 days upon completion of contract approval by the Payne County Board of Commissioners and execution, and be completed prior to Payne County Design Review (CDR) meeting or a suitable time as desired by Payne County.

Additionally, the Vendor shall develop and train radio system telecommunicators in the proper operation of radio console and backup control station equipment, as is necessary to operate the new P25 trunked radio system.

The Vendor shall coordinate all training and, all sessions must be approved by Payne County and Partner Agencies.

Dispatch, maintenance personnel and network manager follow-up training shall be provided and scheduled no more than sixty (60) days after project completion for the purpose of training reinforcement. All training costs, direct or indirect, such as meeting rooms, instructor travel, lodging and transportation, must be included in the final proposed price.

As an alternative, the Vendor must provide comprehensive maintenance training for two persons, whereby Payne County service/support personnel are qualified in the proper diagnostic, maintenance and repair service skills needed to quickly resolve 700/800MHz communications equipment malfunctions as well as microwave backhaul operational problems.

The Vendor is required to provide operational and full maintenance training for all service/support personnel, either on site or at remote factory locations. This level of training will be essentially equivalent to the level of service training required by the Vendor for its employed maintenance providers. Additionally, the Vendor must develop and train service/support personnel in those aspects of maintenance necessary to ensure the highest availability and reliability of infrastructure resources.

Preventative maintenance training should encompass all elements of proposed infrastructure equipment, inclusive of base stations, trunking controllers, network switches, microwave backhaul, standby generator equipment, battery plants, battery charging systems, tower light systems, site grounding systems, alarm systems and all other subsystems directly or indirectly related to infrastructure reliability and operations.

This maintenance alternative should also include a full complement of test equipment to provide the services as required by the maintenance training.

1.13 Parallel Implementation

In developing RFP Responses, Vendors must consider that the new radio system must be installed in a parallel with the existing radio system. The current system is Payne County only Public Safety Voice communications system and must operate 24/7/365. No interruptions in service of any duration may be allowed without prior approval of Payne County or their designee. Therefore, fully duplicated voice radio systems will coexist for some time.

The period of parallel land mobile radio systems shall afford Payne County the opportunity to thoroughly test the operational functionality of the new system network, dispatch consoles, network features, and high capacity receiver-voting and simulcast transmitter operations.

Since the existing dispatch console equipment shall control the incumbent radio system during the parallel operation phase, the Vendor shall be responsible for developing a plan to accommodate both current and proposed equipment during the parallel and transitional periods of installation, implementation, and cutover to the new system.

Damages similar to the future system requirements maintenance responses or system downtime will be imposed if the current radio system is taken offline during the parallel implementation.

1.14 Manufacturer Support

1.14.1 Payne County requires, at a minimum, a one-year comprehensive warranty on all infrastructure equipment required by the new P-25 radio system. The Warranty term will commence upon Final System Acceptance.

1.14.2 Payne County requires, at a minimum, a three-year comprehensive warranty on all end user equipment required by the new P-25 radio system. The Warranty term will commence upon Final System Acceptance.

1.15 Parts Availability

All proposed system and backbone infrastructure components, inclusive of microwave/backhaul equipment and repair parts shall be commercially available for at least fifteen (15) years from the date of Final System Acceptance.

1.16 Warranty of Network Performance

The Vendor acknowledges that it has carefully reviewed the functional requirements and warrants that the proposed P25 radio System shall function according to equipment specifications, industry standards, and the minimum operative characteristics specified herein in this RFP.

1.17 Remedies

Remedies shall be part of any Contract awarded and negotiated with the Successful Vendor. The scope of these remedies will become part of a contract and shall minimally include a graduated set of monetary penalties for unexcused late or delayed performance by the Contractor. The project schedule's indicated completion date shall be the basis for assessment of completion remedies.

Remedies shall be applied as follows:

Unexcused project completion delays of between 1 day and 30 days beyond the Contract's indicated completion date shall be assessed a penalty of \$1,000 per day.

Unexcused completion delays that extend from Day 31 through Day 70 beyond the Contract's indicated completion date shall be assessed a penalty of \$1,500 per day.

Unexcused completion delays beyond 70 days shall be assessed a remedy of \$2,000 per day.

Any unexcused project completion delay that exceeds 180 days from the Contract's indicated completion date shall trigger an automatic default of the Contract. If the Contractor is unable to cure the reason for its completion failure within 45 additional days, the Contract will self-cancel and the Owner will initiate action against the Contractor's performance bond unless some acceptable accommodation is reached by the Contractor with the Owner. During the 45-day default period, remedies will be assessed at the rate of \$3,000 per day.

Remedies shall also apply to warranty repair service. The RFP and its subsequent contract with the Successful Vendor will include a mandatory warranty period where repair services performed in the field will be necessary. This RFP contains response time periods within which the Contractor is required to provide services and materials.

A failure to perform on the part of the Contractor to meet its contracted response time requirements shall result in a financial penalty of the scope and amount indicated by this RFP.

1.18 Acceptance Testing Process

Acceptance testing procedures will be defined during Customer Design Review. These procedures would essentially test and verify the performance of hardware/software features; coverage performance; reliability and interoperability with neighboring jurisdictions.

The Acceptance Test shall minimally encompass:

1. A Factory Staging Verification of System and network functionality;
2. An installed determination of compliance with Industry standards and published RFP requirements of the various equipment elements provided under the Contract;
3. Functionality of standby power systems;
4. Functionality and path reliability of microwave link segments and the overall network as a whole;
5. A successful completion of a set of voice quality and signal level coverage tests of sufficient scope to confirm that the outdoor, in-vehicle and in-building coverage required by the Contract has been achieved;
6. Completion of a mandatory 30-day reliability burn in absent of any major network failures (i.e., loss of tower site, loss of 25% of network capacity, unreliable m/w functionality, etc.).

1.19 Right of Refusal

Payne County reserves the right to reject any and all RFP Responses received. Acceptance of any Response will not place Payne County under any obligation to purchase any equipment, system or services.

Payne County reserves the right to reject any or all bids and to waive any or all irregularities, mistakes, omissions or informalities relative thereto

This RFP will follow the provision of the County Purchasing Act.

The date and time for the submittals of questions and for the submittal of bids as set forth in this RFP shall be deemed mandatory. The failure to meet all submittal dates as set forth shall constitute a defect in the submission, which shall be grounds for rejection as non-responsive. The failure to meet any submittal dates shall not be considered a waivable irregularity, omission, or informality.

1.20 Bid, Performance, and Payment Bonds

A Performance Bond in the amount of one hundred percent (100%) of the Contract Price shall be provided by the Contractor.

The Performance Bond shall be exercised by Payne County for failure of the Contractor to perform according to the terms of the Contract, i.e., an uncured default condition that results in Contract Cancellation. The Performance Bond shall be in place prior to a notice to proceed.

1.21 Proposal Pricing Summary Sheets

Vendors shall provide detailed price breakdown submittals for infrastructure, network integration/project management, and installation/engineering services. It is not acceptable to lump category costs. Vendors must provide sufficient detail in their pricing proposals whereby it is possible to identify equipment types and services groupings. The format of the price submittal shall follow that as indicated by RFP Section 16 Pricing Considerations.

1.22 Corporate Resolution

RFP Responses must contain a Corporate Resolution or Power of Attorney authorizing and identifying agents to sign their Proposal or other documents as required by this RFP. This Corporate Resolution or Power of Attorney must be certified and notarized.

1.23 Non-Collusion Affidavit

Vendors must complete and submit the Non-Collusion Affidavit form. Attach an executed original in the Original-Marked proposal submittal and a copy of this executed form in all subsequent proposal copies, as required.

1.24 This section was intentionally removed.

1.25 Conflict of Interest

In the interest of ensuring that efforts of the Contractor do not conflict with the interests of Payne County, and in recognition of the Contractor's professional responsibility to Payne County, the Contractor agrees to decline any offer of employment if its independent professional work on behalf of Payne County is likely to be adversely affected by the acceptance of such employment. The initial determination of such a possibility rests with the Contractor. It is incumbent upon the Contractor to notify Payne County and provide full disclosure of the possible effects of such employment on the Contractor's independent, professional work on behalf of Payne County. Final decision on any disputed offers of other employment for the Contractor shall rest with Payne County.

1.26 Contracts

This RFP and the Vendor's proposal will be an integral part of the Contract. Any and all statements made in the proposal will automatically become part of the final Contract for equipment and services.

Omission in the Vendor's proposal of any equipment, services, or provisions herein prescribed shall not be construed so as to relieve the Contractor of any responsibility or obligation necessary to the complete and satisfactory installation of any and all systems, equipment, and services specified. The price and any alternative prices quoted must include all equipment, service, features, materials, labor, etc. necessary to make all the features, services, and equipment, which are included, fully functional. The Vendor agrees that the cost of additional equipment, materials, or labor necessary to meet these requirements, which was not otherwise calculated in the Vendor's proposal, shall be solely at the Contractor's expense.

If there are specific items that are purposefully excluded in the Vendor's indicated price, those must be defined by the Vendor's proposal. If, however, those Vendor-excluded items are what Payne County and its Consultant consider to be normal and customary for a project of this type, any proposal excluding such items will be graded as not meeting minimum requirements for the appropriate RFP category(s) impacted by that exclusion.

Each Vendor proposal must be signed by a duly authorized officer who is empowered to contractually bind the Vendor.

Payne County may or has the right to enter into a contract with the apparent responsive and best Vendor. Should Payne County be unable to finalize a Contract with the apparent responsive and best Vendor, Payne County may exercise the right to enter into a Contract with the apparent responsive Vendor having the next-highest evaluation score.

1.27 Non-Appropriation of Funds

In the event no funds or insufficient funds are appropriated and budgeted by Payne County or are otherwise unavailable for fulfilling the requirements of the Contract, the obligations of Payne County shall terminate on the last day of the fiscal period for which appropriations are received without penalty or expense to Payne County of any kind whatsoever. Payne County will immediately notify the Contractor or its assignee of such occurrence. In the event of such termination, Payne County agrees to peaceably surrender possession of the equipment to the Contractor or its assignee on the date of such termination.

The Contractor will be responsible for packing all equipment and any freight charges.

Payne County will not cancel if any funds are appropriated to it, or by it, for the acquisition, retention or operation of the equipment or other equipment performing similar functions for the current fiscal period in which the termination occurs.

This shall include the next succeeding fiscal period thereafter and that it will not during the funding period give priority to other functionally similar equipment or services.

Contractor shall covenant and agree to indemnify and hold Payne County harmless against any loss, damage liability, cost, penalty, or expense, including attorney's fees, which Payne County does not otherwise agree to in the Contract and which is incurred or arises due to a failure of Payne County to appropriate funds in the manner described herein for a continuation of the Contract or exercise of the alternative to purchase the equipment.

1.28 Purchase Payment Schedule

The following payment schedule shall apply:

- 10% at Contract Design Review.
- 30% at delivery of and inventory by Payne County designee of network infrastructure components to Payne County designated location(s).
- 20% upon infrastructure installation completion.
- 15% upon satisfactory completion of audio quality and signal level coverage testing.
- 10% upon satisfactory completion of all training
- 15% upon Final System Acceptance.
- 100% upon delivery of subscribers to the Customer.

The Vendor agrees that all prices quoted in the RFP Response are valid for 24 months from the Contract execution date. Future price discounts are valid for the time periods indicated in Section 14 Phased Implementation.

1.29 Contractor's Insurance

The Contractor shall be responsible for any and all loss of material connected with the construction due to unexplained disappearance, theft or misappropriation of any kind or nature. The foregoing provisions shall not operate to relieve the Contractor and any Subcontractors of responsibility for loss or damage to their own or rented property or property of their employees of whatever kind or nature, including but not limited to tools, equipment, forms, scaffolding and temporary structures including their contents.

Payne County shall in no event be liable for any loss or damage to any of the aforementioned items or any other property of the Contractor and any Subcontractors, which is not included in the permanent construction.

The Contractor and any Subcontractors hereby waive any right of recovery they may have against Payne County for damage or destruction of property of whatever kind or nature whether it is their own property or property of their employees.

The Contractor acknowledges the title and risk of loss for the new system shall transfer to Payne County upon Final System Acceptance.

The Contractor shall procure and maintain for the duration of the Contract the following insurance policies as mandated by and with minimum limits set by Payne County Procurement Policy with coverage for occurrences and claims that may arise from or in connection with the performance of the obligations hereunder by the Contractor, its agents, employees, representatives and subcontractors:

1. The contractor shall maintain in full force and effect throughout the contract term liability and property damage (casualty) policies. The policy of liability insurance shall cover all of the contractor's operations on the premises, including bodily injury and property damage; shall provide a per-occurrence limit of at least one million and aggregate of two million

The policy shall name Payne County as an additional insured. The property damage policy shall cover the replacement value of the structures and equipment the contractor installs on site.

2. The contractor shall also maintain workers' compensation insurance as required by law, and employers' liability coverage of at least \$1,000,000. Payne County will consider proposals offering reasonable exceptions to the requirements stated above. All policies shall be issued by an insurer of substantial size and financial stability.

The policies or certificates evidencing the coverage provided above shall be submitted at a Pre-Construction Conference prior to commencing any work or Payne County issuance of a formal Notice to Proceed. Such policies or certificates shall provide that insurance will not be materially altered or cancelled without thirty (30) days prior written notice to Payne County.

1.29.1 Other Provisions

The insurance policies required by the Contract shall contain, or be endorsed to contain, the following provisions:

1. Payne County, its officers, agents, servants and employees, shall be added as, additional insured's, under the Comprehensive General Liability and Automobile Liability Coverages.

2. The Workers compensation insurance and Employer's liability coverages shall contain an express waiver of all rights of subrogation against Payne County, its officers, agents, servants, and employees, for losses arising from work performed by the Contractor for Payne County.

3. All insurance policies required by this Contract shall be endorsed to state that coverage shall not be suspended, voided, cancelled by either party

Coverage cannot be reduced or in limits except after thirty (30) days prior written notice by certified mail to Payne County.

1.29.2 Acceptability of Insurers

All insurance required by this Section shall be placed with insurers that are authorized to do business in the State of Oklahoma and have a rating of no less than A- in the most current edition of the A.M. Best Insurance Report. Insurers shall have a minimum financial size category of V2I according to A.M. Best.

1.29.3 Certificates of Insurance

The Contractor shall furnish to Payne County, Certificates of Insurance affecting coverage required by this Contract. The certificates are to be signed by a state licensed agent authorized by that insurer to bind coverage on its behalf and endorsements.

The certificates and endorsements must be received and approved by Payne County prior to the Contract's effective date.

1.30 Affirmative Action / Equal Opportunity Employer

Payne County is an affirmative action/equal opportunity employer that selects contractors without consideration of race, religion, color, ethnic background, sex, age, or handicap. Minority-owned business are encouraged to submit bids.

It is the policy of Payne County to award public building contracts without regard to race, religion, color, creed, national origin, sex, age, or handicapping condition.

1.31 Indemnity

Indemnity terms shall be negotiated and mutually agreed with the apparent winning Vendor as part of final Contract.

1.31.1 Additional Required Forms

Vendors must fill out and return the following forms:

- A. Subcontractor's Disclosure Form
- B. Non-collusion Affidavit Form
- C. Contractor/Vendor Disclosure Form
- D. Proposal Authorization Form

1.31.2 Documents Required

- A. Proof of Performance Bond

2.0 Identified User Needs and Requirements

2.1 General

- 2.1.1** The intent of this RFP is to provide a P25 700/800 MHz Digital Simulcast Trunked Mobile Radio System which shall include multiple tower sites provided with equipment shelters, generators, and additional site hardware, including HVAC to support the Vendor's proposed infrastructure. New buildings must accommodate all proposed radio/microwave equipment, battery plants, DC power supplies, and ancillary equipment as necessary.
- 2.1.2** The Vendor shall be responsible for conducting tower and foundation structural analysis and reinforcement as necessary to any of the existing radio towers in use by the Customer. Vendors are required to propose a comprehensive set of equipment and services that satisfy this RFP's minimum requirements and are encouraged to describe specific areas within their proposal solutions that materially exceed these minimum objectives. Since the existing radio system exhibits a lack of reliable portable in-building radio coverage Countywide, the Vendor shall propose new tower sites (in addition to the current locations) as necessary to satisfy the coverage requirements listed within this document.
- 2.1.3** Section 11 Site Work Requirements, provides for specific workmanship standards for communications facilities that must be met by the Contractor in the course of constructing the system. This RFP provides a baseline of technical requirements coupled with functional objectives that must be considered by responding Vendors. The RFP allows flexibility in the selection of sites and antenna placements by responding Vendors such that their response fully addresses the coverage reliability/audio quality requirements contained in Section 6 Coverage Criteria.

2.2 Current Usage Requirements

A minimal radio system study has been previously undertaken. A summarized detail of

2.2.1 Improved Coverage

The greatest area of concern communicated during the various user interviews was the lack of coverage being provided to support operations. Mobile and portable radio coverage deficiencies are reported by the users to exist in multiple areas throughout Payne County, Oklahoma.

The Customer desires that the radio system coverage be improved to meet best practices in Public Safety. Vendors can find a complete list of the coverage requirements in Section 6 Coverage Criteria.

2.2.2 Current Operable Aspects

The Customer's public safety agencies utilize existing VHF & UHF Conventional Land Mobile Radio System, located throughout the County for daily communication.

The current dispatch center utilize Multiple Manufacturers consoles.

Interoperability with neighboring agencies and the State requires VHF & UHF Channels & Shared radios.

The radios used by end users are limited to Multiple Manufacturers.

2.2.3 Typical Current Radio User Configuration

Most users are equipped with hand-carried portable radios. These radios are

Radios have been historically without a preventative maintenance plan and are repaired on a 'break-fix' basis only.

Radio ergonomics are important to users, which is one reason why an electrically shortened antenna configuration for portable radio units has been defined in Section 6 Coverage Criteria.

Features available for use by the system already enabled in some of the radio subscribers includes:

- LTE/Cellular

2.3 System General Objectives

2.3.1 Talk Paths

Each of the agencies operable within the current LMR radio system utilize

The Vendor shall ensure the P25 radio talk path needs for the system will include those of the existing configuration, plus a net 25% growth/expansion potential of actual in-service talk paths shall be made available. The current radio configuration's channel structure is described in Appendix B Existing Channel Structure.

2.3.2 Call Privacy

The Customer's current radio system selected talk-groups are all open to

The new network should be software-configurable to support the P25 control channel encryption standard as developed by TIA. ANSI/TIA 102.AABB, P25 Trunking Control Channel Formats, May 2002. This document defines the format of trunking control channel transmission for P25 systems. The formats are compatible with the Common Air Interface defined by ANSI/TIA/EIA102.BAAA and both encrypted and non-encrypted formats are defined.

The Vendor shall describe the scope and operation of such provisions inherent or planned within their solution that prevents the types of undesired radio monitoring discussed above.

2.3.3 Voice Encryption

2.3.3.1 Digital voice 256-bit Advanced Encryption Standard (AES) encryption, using Advanced Multi-Band Excitation +2 (AMBE+2 or newer) vocoder technology coupled, shall be included in the system.

2.3.3.2 Three modes of encrypted digital voice operation expected are:

2.3.3.2(a) Unit-to-unit, where conversations transacted in an encrypted talk group are secure. These cannot be monitored at a dispatch or control point;

2.3.3.2(b) Telecommunicator-to-unit, where conversations between the Customer's dispatch center(s) and field

2.3.3.2(c) P25 Smartphone Application call transactions (via commercial cellular and FirstNet or Verizon to typical field/telecommunicator operations within the system.

2.3.3.3 The enhanced P25 System shall provide encrypted transmission functionality so that user radio access delays are equal to those in the clear (non-encrypted) mode to comply with published TIA P25 standard specifications. Encrypted transmissions shall not degrade the operation of clear-voice features nor lengthen system access or audio transport delays to other users. Encryption shall not impair the range of coverage to any level less than that for typical P25 clear-mode digital performance.

2.3.4 End User Equipment

Requirements for end user equipment and training is detailed in Section 12

2.3.5 Gateway and ISSI Interfaces

2.3.5.1 The utilization of gateway technology is necessary for the System and provides a useful and important function in the integration of outside trunked and non-trunked radio systems such as those

- Noble County
- Pawnee County
- Logan County
- Lincoln County
- Creek County
- OKWIN (State of Oklahoma)

Not only is it important for Customer to have integrated communications with neighboring agencies and systems, but also specifically interface with the following systems.

- OKWIN (State of Oklahoma)

The proposed System must be capable of:

2.3.5.2 Base Station Gateway technology shall be provided to interface both analog and digital land mobile radio base stations, on a talkgroup or channel basis, within the P25 trunked solution. By so doing, it would then be possible for radio users equipped with P25 radios operable on the System to select, monitor and individually control these various link-radio resources.

- 2.3.5.3** Broadband Gateway functionality shall be provided within the System to permit selected outside third-party Smartphone users equipped with the appropriate application software to communicate with users/agencies via allowed System talkgroups.
- 2.3.5.4** Inter RF Sub-System Interface (ISSI) technology shall be provided which allows P25 core controllers of disparate radio systems to transact communications across systems/technologies.
- 2.3.5.5** The Customer requires the implementation of each of these gateway technologies as part of the Vendor's proposed configuration as further described by RFP Section 5 Minimum Equipment

2.3.6 User Roaming

- 2.3.6.1** The Vendor's solution shall support future seamless agency user roaming across jurisdictional boundaries via ISSI connections. Functionally, a field radio user who initiates and is in communication with telecommunicators or others on a specific talkgroup within a specific P25 radio system must remain affiliated with those parties while driving across the coverage footprint of ISSI-linked P25 systems. This roaming feature must operate automatically without the need for field users to physically change systems/talk-groups while traversing across tower site/system coverage zones.
- 2.3.6.2** The Vendor shall describe radio user roaming functionality within its proposal. This description shall include an explanation of the process used by user radios to determine when to transition onto the next system, in conjunction with an explanation of radio availability while this ongoing adjacent-system availability determination is underway. Next systems are defined as the same manufacturer P25 cores with similar or different software/hardware revisions to other manufacturers P25 cores.
- 2.3.6.3** The need for a radio user to manually transition between tower site/system coverage zones within a Vendor's proposed network configuration is unacceptable. A manual approach shall be down-graded during the proposal evaluation.

3.0 Infrastructure System Configuration

3.1 General

The Customer has valid licenses for its current radio system(s), as outlined in Appendix E FCC License. The Contractor will be required to undertake necessary FCC license modifications, as required, to accommodate the modernized/expanded System. Any frequency modifications and site additions will be coordinated with the Region 34, Oklahoma Regional Planning Committee.

3.2 System Configuration

3.2.1 The Vendor is required to provide a comprehensive functional and technical solution for a new P25-compliant System. The new digital radio configuration shall utilize the necessary number of infrastructure sites, as determined by the Vendor, to meet the Customer's expressed coverage requirements as described by Section 6 Coverage Criteria.

3.2.2 The system must be designed and deployed to utilize both P25 Phase 1 FDMA & P25 Phase 2 TDMA modulation formats.

3.2.3 In addition, the system shall be capable of a five-channel 700/800MHz NPSPAC analog conventional mutual aid subsystem having the capability of being electronically patched to the system's 700/800MHz talk-groups via conventional base station gateway interfaces with the coverage requirements described in Section 6 Coverage Criteria.

This mutual aid subsystem should be coordinated and be in line with any requirements included in the Region, 34, Oklahoma Regional Planning Committee.

3.2.4 The proposed system shall utilize both existing and Vendor-recommended radio infrastructure sites and shall include, minimally, a primary and secondary/redundant network controller. These network controllers shall be located at sites that provide a geo-redundant configuration to be mutually agreed between the Vendor and the Customer.

- 3.2.5** The Vendor shall indicate a guaranteed level of portable and mobile area coverage and delivered audio quality indicative of their designed solution. The Customer recognizes that portable radio coverage to the same degree as required for mobile operations increases system complexity. These requirements are outlined in Section 6 Coverage Criteria.
- 3.2.6** Physical plant modifications to newly-proposed tower sites, rental sites, existing Customer-owned sites, or the dispatch center(s) as necessary to accommodate the Vendor's proposed system configuration shall be the responsibility of the Contractor and must be factored into the Vendor's Cost Proposal. The Vendor's failure to disclose physical plant modifications (and cost) is contrary to the Customer's turnkey project requirement and shall result in an unfavorable grade of the Vendor's proposal.
- 3.2.7** The Vendor shall provide all pertinent information concerning their equipment, relative to electrical, mechanical, structural and physical space requirements. The Vendor must consider enhanced physical security, cybersecurity, and environmental issues in preparing their response.
- 3.2.8** It shall be the responsibility of the Contractor to provide a turnkey system and to install Industry-accepted standard electrical grounding systems and lightning protection devices to protect proposed equipment from damage due to electrical transients on antenna systems, power, telephone and/ or control cables including upgrading existing facilities if the Contractor plans on reuse of any of those facilities in their proposal. These facilities include all tower and dispatch center sites.
- 3.2.9** Sites determined by the Vendor to be potentially prone to flooding must be so noted in the Technical response. Engineering remedies must be based on 500-Year flood plain data. Remedies shall include elevated equipment shelters as needed to ensure such new equipment is no less than 24-inches above FEMA-predicted 500-year flood plain levels.
- 3.2.10** The delivery and installation of: equipment shelters, security systems, standby and emergency power systems, towers, antenna systems, electrical grounding systems, lightning protectors, transmission lines, cable attachment hardware, transmission line shields, tower-to-building cable tray hardware, and all necessary permitting is part of this project and must be furnished by the Vendor.

3.2.11 All transmit/receive site-related equipment is to be backhaul-connected via digital microwave linkages to be supplied by the Contractor. This microwave backhaul layer shall be configured as a monitored hot-standby loop-protected ring(s) that encompass radio tower sites, simulcast control points, dispatch centers, and network controller locations. The new microwave backhaul layer shall operate principally at 6GHz. 11GHz microwave link segments are permissible only for path segments that are less than 4-miles in length.

3.2.12 The Contractor shall furnish and install all radios, antennas, wiring, wiring hardware, interface electronics and materials necessary, and at no additional cost than that identified in their Contract, to complete the successful implementation and operation of this system and its related equipment groupings.

3.3 System Planning and Capacity

The system shall support the Customer's current user capacity, three times the current channels/talkgroups plus no less than a 25% growth in net traffic. This will include all necessary, hardware, software, and frequencies.

3.3.1 The Contractor shall utilize best engineering practices in selecting the system's frequency plan to maximize the effectiveness of channel resources. The proposed hardware and frequency plan must ensure that frequencies installed at sites cause no adverse receiver desensitization because of intermodulation products and, further, that the Contractor's frequency plan complies with FCC regulations with respect to co-channel and adjacent-channel interference protection criteria.

3.3.2 The Vendor's Technical Response must fully describe its frequency engineering process and must include an initial frequency plan for its proposed configuration (since differences between the Vendor's plan and the existing-system's frequency plan are anticipated). The Vendor must describe its best-practice approach to the monitoring of noise floor levels/degradation at radio tower sites and the steps it would undertake to identify and resolve interference issues, both internal to the radio system's infrastructure, as well as external.

3.3.3 The Vendor must provide a contingency plan, should the initial frequency plan not be available for implementation.

3.4 Major System Equipment Groupings

The Vendor shall provide and shall describe, minimally, the following major equipment groupings as contained within the proposed configuration:

- 3.4.1** Radio Network Controller (Primary and Secondary)
- 3.4.2** Radio Simulcast Control Point/Prime Site
- 3.4.3** Console Electronics/ Audio Controller (Primary/Secondary)
- 3.4.4** P25 Tower/Shelter Sites
- 3.4.5** Conventional Mutual Aid Subsystem (700/800MHz)
- 3.4.6** Microwave Backhaul Network
- 3.4.7** Redundant local area network (LAN) routers/switches
- 3.4.8** Battery Plant & Charger Systems
- 3.4.9** Auxiliary power generators
- 3.4.10** Interoperability Link Base Stations
- 3.4.11** ISSI Gateways
- 3.4.12** Base Station Gateways
- 3.4.13** Broadband Device Gateways
- 3.4.14** The Contractor shall furnish and install all wiring hardware, cable trays, interface electronics, terminal blocks, and materials necessary to complete the successful implementation and operation of this site and its equipment groupings. Infrastructure equipment proposed for the Control Point must meet the minimum requirements specified by Section 5 Minimum Equipment Requirements.
- 3.4.15** The Vendor is required to incorporate a dual primary / redundant, geographically separated network control point design into its proposed infrastructure solution. This requirement is mandatory and a RFP Response failing to include such a dual-site redundancy configuration will be considered as being unresponsive. This redundancy requirement also applies to the simulcast control point.

- 3.4.16** The Vendor shall describe its network controller and simulcast control point redundancy configuration scheme and, if virtualized controller/control point configurations are proposed, the number of such configurations allowable within the proposed solution.
- 3.4.17** The Vendor shall describe the method used to automatically transition to such backup configurations and the transitional latency such transitions apply to the radio network, in seconds or milliseconds. This description shall include the time necessary for the proposed system to sync to the network controller or the simulcast control point, should a system failure require it.

3.5 Typical Infrastructure Site Deployment

The Contractor is required to supply a turnkey solution to include: all technical support, equipment, material and labor necessary to develop each proposed infrastructure radio site into a functional P25 digital radio facility, fully incorporated.

- 3.5.1** A typical P25 radio infrastructure site equipment shelter shall contain, minimally, the following major equipment groupings:
 - 3.5.1.1** 700/800MHz P25 Phase 1/Phase 2 Base Stations
 - 3.5.1.2** GPS-Disciplined Frequency Standard (Redundant)
 - 3.5.1.3** Transmitter Combiner System
 - 3.5.1.4** Transmitter Antenna Systems
 - 3.5.1.5** Receiver Multi-Coupler System
 - 3.5.1.6** Receiver Antenna System
 - 3.5.1.7** Remote Site MPLS Microwave Linkage
 - 3.5.1.8** Local Area Network Equipment
 - 3.5.1.9** 700/800MHz Mutual Aid Subsystem
 - 3.5.1.10** Mutual Aid Antenna System
 - 3.5.1.11** Conventional Base Station Gateway

- 3.5.1.12 Site Alarm Equipment
- 3.5.1.13 Battery Plant & Charger Systems
- 3.5.1.14 Standby Generator Transfer Switch

Infrastructure equipment proposed for all radio sites must meet or exceed the minimum requirements specified by Sections 4 Minimum Operative Characteristics, and 5 Minimum Equipment Requirements.

3.5.2 Tower Site Equipment Configuration

- 3.5.2.1 The P25 simulcast configuration and conventional radio base stations shall operate from a 48 VDC battery-based power source, sized for no less than 8-hours of uninterrupted operation at 100% duty cycle of proposed equipment.
- 3.5.2.2 The battery system shall utilize sealed, long-life lead-calcium, or similar modern cells and 100% redundant battery charger components rated for telecommunication service.
- 3.5.2.3 An automatic, low voltage disconnect device shall be provided to protect the battery plant from discharge-related damage.
- 3.5.2.4 Electrical power switching/disconnect capability shall exist at all sites such that rectifiers, batteries as well as commercial power sources may be separately isolated in a way each component may be serviced safely.
- 3.5.2.5 This switching/disconnect capability shall be designed and configured such that radio network operation is otherwise unimpaired and uninterrupted during any repair or maintenance cycle.
- 3.5.2.6 Base stations shall be housed in open equipment racks. Racks shall be free standing and incorporate drilled rails to accept standard 19" rack panels.
- 3.5.2.7 A minimum of six, but no more than eight DC-operated base stations should be located within a single equipment rack.

- 3.5.2.8** Each equipment rack shall incorporate a circuit-breaker power distribution panel incorporating protection for power amplifier, exciter and receiver groupings.
- 3.5.2.9** Individual base station ventilation fan(s), if required, shall be DC powered, thermostatically controlled, internally installed, and shielded.
- 3.5.2.10** Each equipment rack shall be protected by a DC-power circuit breaker, sized for nominal load plus 35% overload factor.
- 3.5.2.11** The primary battery chargers, low-voltage disconnect equipment and a primary DC circuit breaker panel shall be installed in a freestanding enclosed cabinet unit.
- 3.5.2.12** Likewise, the network's primary/backup controllers and related LAN switch/router devices shall be housed in freestanding equipment racks like those used for repeater stations.
- 3.5.2.13** Auxiliary tower site electrical loads essential to proper system operation (i.e. tower top preamp, redundant GPS reference oscillators and receiver multi-coupler) shall be interconnected directly to the site's battery system.

3.5.3 Infrastructure Functionality

The system shall:

- 3.5.3.1** Utilize the TIA specified P25 Common Air Interface (CAI) digital control channel scheme, in which user-initiated feature requests and talk-group/working channel assignments are processed digitally over site-specific control channels.
- 3.5.3.2** Ensure the remaining channels at sites shall operate as working channels for digital voice traffic.
- 3.5.3.3** Utilize an interference-monitored control channel scheme with a level of redundancy that is sufficient to meet the overall requirements and intent of this RFP for a no-break, life-critical radio communications system.

- 3.5.3.4 Ensure the control channel configuration will automatically rotate to other channels, in sequence, should an abnormal number of carrier hits occur on the pre-set control channel.

3.5.4 Failover Scenario Equipment Descriptions

The Vendor shall furnish a description of the effect each of the below listed failure modes would have on their proposed P25 system configuration. The Vendor shall also describe appropriate mitigation/restoration steps to return the system to full operational capability in response to each of the below listed failure conditions, and the time required to achieve restoration.

- 3.5.4.1 Loss of transmitter(s) operation
- 3.5.4.2 Loss of receiver(s) operation
- 3.5.4.3 Failure of dispatch console terminal(s)
- 3.5.4.4 Failure of console/audio interface
- 3.5.4.5 Failure of tower site controller
- 3.5.4.6 Commercial power failure
- 3.5.4.7 Site generator failure
- 3.5.4.8 Failure of entire tower site
- 3.5.4.9 Loss of Control Channel(s)
- 3.5.4.10 Loss of Control Point/Prime Site
- 3.5.4.11 Loss of Secondary Control Point/Prime Site
- 3.5.4.12 Loss of Primary Network Controller
- 3.5.4.13 Loss of Redundant Network Controller
- 3.5.4.14 Loss of single/multiple microwave path connectivity
- 3.5.4.15 Loss of ISSI, Base Station or Broadband Gateway Devices

3.5.5 Tower Site Antenna Systems

The Contractor shall:

- 3.5.5.1** Furnish and install antenna systems designed to meet the coverage requirements and objectives described by Section 6 Coverage Criteria.
- 3.5.5.2** Equip all antenna transmission lines with gas tube lightning arrestor devices (Polyphaser or equivalent).
- 3.5.5.3** Ensure all coaxial cable elements used as interconnecting jumpers for outdoor-mounted equipment or indoor transmitter/receiver components are 1/2" Andrew FSJ4-50B or equal.
- 3.5.5.4** Furnish and install hot dip galvanized side mount hardware sufficient to extend the transmitter and receiver antennas a minimum of 60-inches from the nearest tower-structure element.
- 3.5.5.5** Ensure transmission lines are grounded at the antenna, at 200-foot tower intervals, at the top most part of the tower location, at the midpoint (for all towers greater than 200-feet in height), at the location where the transmission lines enter the cable bridge and at the equipment shelter's transmission line copper entry port.
- 3.5.5.6** Utilize only manufacturer-approved grounding strap kits for the type of transmission line installed.
- 3.5.5.7** Ensure all connecting hardware will be a snap-in type of a size designed for the cable. No tie wraps or electrical tape will be allowed for attaching cables to towers.
- 3.5.5.8** Utilize antenna system mounting brackets, components and associated transmission line attachment hardware that are either stainless steel or hot-dipped galvanized steel.

3.5.6 Network/Audio Control Scheme

The Vendor shall provide detailed descriptions of how the system incorporates high levels of redundancy to assure continued trunked system operation. To provide the highest level of trunked reliability, site/system control schemes shall be IP-based, fully redundant and utilize distributed processor technology to the maximum extent possible.

Primary/Redundant Network and Site control schemes must include protected, redundant power supply units so that the loss of a single power supply will not interrupt control scheme operations.

Radio site controllers shall minimally provide the following features:

- 3.5.6.1** Working channel assignment.
- 3.5.6.2** Verification of user identification.
- 3.5.6.3** Assignment of call priority.
- 3.5.6.4** Electronic tracking of call type, caller/called, call time, channel assignment, etc.
- 3.5.6.5** Monitor/control of special system features.
- 3.5.6.6** Ability to disable/enable call access to specific field units.

3.5.7 Radio Network Alarm System

The Contractor shall furnish and install an automatic alarm system to monitor and alert, at a minimum, operational status (per site) for the following parameters:

- 3.5.7.1** Major Alarm Conditions (Defined as a condition that could lead to equipment failure in less than 2 hours).
 - 3.5.7.1(a)** Primary Network Controller Failure
 - 3.5.7.1(b)** Redundant Network Controller Failure
 - 3.5.7.1(c)** Primary Simulcast Control Point/Prime Site
 - 3.5.7.1(d)** Secondary Simulcast Control Point/Prime Site

- 3.5.7.1(e)** Site Channel Failure
- 3.5.7.1(f)** Control Channel Failure
- 3.5.7.1(g)** Console/Audio Controller Failure
- 3.5.7.1(h)** ISSI/Base Station Gateway Failure
- 3.5.7.1(i)** Receive Multicoupler Failure / Tower Top Amplifier
- 3.5.7.1(j)** AC Power Failure
- 3.5.7.1(k)** High Reflected Power -TX Antenna
- 3.5.7.1(l)** Battery Charger Failure, Major
- 3.5.7.1(m)** Generator Failure/Shutdown
- 3.5.7.1(n)** Tower Light Failure
- 3.5.7.1(o)** Over/Under Temperature Alarm (HVAC failure)
- 3.5.7.1(p)** Low Transmitter Output (each transmitter)
- 3.5.7.1(q)** Microwave Link Failure
- 3.5.7.2** Minor Alarm Conditions (Defined as a condition that has little, to no risk of leading to equipment failure prior to arrival of technical staff).
 - 3.5.7.2(a)** Door Alarm
 - 3.5.7.2(b)** Tripped DC Breakers(s)
 - 3.5.7.2(c)** Battery Charger Failure, Minor
 - 3.5.7.2(d)** Low Fuel
- 3.5.7.3** System Alarm Monitoring

The use of a software-based alarm network scheme is desired since this would allow for off-site maintenance personnel to interrogate the system in response to agency/user-reported operational deficiencies.

In addition, the Contractor shall provide:

- 3.5.7.3(a)** A summed major/minor alarm indication should be displayed on each alarm system terminal position.
 - 3.5.7.3(b)** These alarm positions will be located at both network controller locations and the Customer dispatch location.
 - 3.5.7.3(c)** This alarm indication should appear as both an audible alert and a flag at a conspicuous area on the flat-screen display field.
 - 3.5.7.3(d)** Determination of specific alarm point conditions shall be obtainable from any dedicated alarm system terminal position.
 - 3.5.7.3(e)** These alarms must be capable of email or other common messaging alert to the Customer-designated or proper technical personnel.
 - 3.5.7.3(f)** This solution shall allow for a view of individual component functionality and status involving, at a minimum, base stations, controllers, gateways, charging systems, GPS timing equipment, and other devices essential to the System's operation.
- 3.5.7.4** The Vendor shall include, as an alternative service, Network Operation Center (NOC) monitoring of the system. The Vendor shall include a description of this service as part of their Response.

3.6 Regional Interoperability

Currently, neighboring counties are using VHF systems or OKWIN (State of Oklahoma) 700/800MHz P25 technology. The Customer has a frequent need to communicate with the neighboring county systems, which utilize their own VHF system(s) or are a part of a state P25 radio system.

Seamless interoperability between the P25 digital voice radio networks is a requirement. The ability to monitor and/or patch to the VHF systems is also desired.

The Customer will use new multiband subscriber equipment to operate on these neighboring systems directly where possible and through a gateway otherwise. In preparation for such regional interoperability, The Customer requires the following:

3.6.1 ISSI Gateway

- 3.6.1.1** Vendors shall describe how the proposed System can be interfaced to other regional P25 radio networks now in operation, under development or procurement planning. Further, the Vendor shall describe each operational feature that is supported by its proposed ISSI technology.
- 3.6.1.2** A minimum of one ISSI connection with twenty talk paths each shall be provided and installed by the Contractor as part of this project's implementation.
- 3.6.1.3** Vendors shall propose as an alternative a redundant gateway configuration that will automatically become operable should the primary gateways sustain an electronic/functional failure. The Vendor shall describe its planned ISSI redundancy scheme and functionality.

3.6.2 Base Station Gateway

It is important for The Customer to be able to include effective radio interoperability linkages to external radio systems operated by federal, state, and other non-public safety agencies in the future.

The Vendor shall provide:

- 3.6.2.1** Base Station Gateway devices shall be located at the radio tower sites and allow the interconnection of legacy analog, and other digital radio systems onto the new radio network. The location of the gateways should be part of the vendor's design and located to best serve the interoperability requirements of Customer.
- 3.6.2.2** The Base Station Gateway shall additionally facilitate appropriate Radio-to-IP interfaces and Four-Wire 'Ear and Mouth' (4W E/M) interfaces that are compatible with new radio system's infrastructure and dispatch center configuration.)

3.6.2.3 The furnished Gateway shall provide the below-listed functionality:

3.6.2.3(a) Base Station Gateway shall allow System users to initiate and drop appropriate control link/base stations via talk-group selection on appropriately-programmed System user radios. Any control station or radio device that is interfaced to the Base Station Gateway shall be steerable to a minimum of sixteen (16) channels or talkgroups.

3.6.2.3(b) Users shall be able to monitor traffic on the external radio systems, via the Base Station Gateway device.

3.6.2.3(c) The Customer radio telecommunicators shall have the ability to patch the System's Base Station Gateway channel traffic onto other P25 network talkgroups on an ad-hoc, as-needed basis.

3.6.3 Broadband Gateway Solution

The proposed broadband solution will be a requirement for the standalone proposal and priced as an alternative for the shared proposal.

The ubiquitous use of commercial broadband Smartphone devices presents new opportunities for providing P25 radio access to those entities having the need for communications with The Customer's user agencies.

Vendor shall provide:

3.6.3.1 Furnish and install a Broadband Gateway solution designed to support connectivity with outside cellular device users.

3.6.3.2 The Broadband Gateway Solution shall be located in conjunction with both the primary and redundant Network Controllers.

- 3.6.3.3** Each Gateway shall, as an alternative, be configured as an “automatic-protected” from whereas if the primary Broadband Gateway at a Network Controller site should fail, the equipment would “self-heal” and automatically transition to the backup, redundant Gateway device.
- 3.6.3.4** The Vendor shall identify the required smartphone and licensing for Broadband users. The Vendor shall provide the capability and quantity of users that are included with the design. The quantities for additional user licensing and increments shall also be provided.
- 3.6.3.5** The Broadband Gateway Solution shall support normal P25 voice radio user functionality, inclusive of AES 256-bit encryption.
- 3.6.3.6** The Vendor shall provide a functional description of its proposed Broadband Gateway platform or solution, including automatic failure-recovery modes and alarm notification processes.
- 3.6.3.7** This Broadband Gateway Solution shall be required to interface with FirstNet as well as other commercial cellular carriers utilized by the Customer.

3.7 System Voice Encryption

The following components, at a minimum, require system voice encryption:

- 3.7.1** Each of the network’s P25 trunked digital RF channels shall be equipped to support voice encryption using the Advanced Multiband Excitation +2 (AMBE+2) or newer vocoder.
- 3.7.2** Encrypted mobile and portable units shall be of the same physical size and general configuration as non-encrypted units.
- 3.7.3** Accessory equipment shall be compatible with both types of units.
- 3.7.4** Proposed Phase 1, or Phase 2, radio coverage throughout the area defined in Section 6 Coverage Criteria, in the digital encrypted mode, shall be equal to that in the digital clear mode.

- 3.7.5 The System shall be configured and include both Over-the-Air-Programming (OTAP) and Over-the-Air-Rekeying (OTAR) of user radio equipment as an alternative. Both of these configurations must include the server to accommodate this functionality.
- 3.7.6 As an alternative, the contractor shall provide a Key Management Facility (KMF) and any associated equipment to support the functionality.

3.8 NPSPAC 800MHz Mutual Aid Sub-System

If NPSPAC channels are utilized in the proposed system, the Vendor shall describe in detail the configuration of its NPSPAC 800MHz Mutual Aid subsystem that is optimized to provide mobile radio coverage and conforms to the following requirements:

The mutual aid subsystem will be comprised of five duplex channels that conform to the National Plan, as follows:

8CALL90	851/806.0125MHz
8TAC91	851/806.5125MHz
8TAC92	852/807.0125MHz
8TAC93	852/807.5125MHz
8TAC94	853/808.0125MHz

All channels use CTCSS 156.7Hz

The Contractor shall interconnect these various mutual aid base stations into the P25 trunked radio network via site-located conventional base station gateway devices. Radio telecommunicators shall be capable of monitoring each of these various mutual aid channels.

The Vendor shall provide a description of its proposed mutual aid subsystem configuration, to include, coverage maps depicting VHF, UHF and 700/800 MHz mobile coverage as applicable. Further refinement of the mutual aid subsystem is anticipated and may be undertaken by the Customer as part of the project’s design review meeting process.

The proposed mutual aid solution will be priced as an alternative.

3.9 Physical Security

The Vendor shall propose a comprehensive set of physical and cybersecurity safeguards to protect the integrity of the new system. The physical portion of the furnished communications network shall include:

3.9.1 Video surveillance of fixed remote infrastructure sites. Storage of the video surveillance footage shall be stored internal to the cameras for a minimum of 90 days.

3.10 Cybersecurity

The system may contain various entry points that include ISSI/CSSI and Broadband gateway connections to external radio communications facilities operated by others and the accessibility of the radio system to technical and engineering resources via the Internet. Each of these points must be appropriately secured using firewalls, data encryption, and other means to prevent intentional hacking of critical information or installing viruses and malware that could inhibit or disrupt mission-critical communications.

The Vendor shall provide within its Technical Response, a detailed description of the various cybersecurity measures it would employ to protect the proposed new System, both initially and throughout the warranty and post-warranty maintenance periods.

3.11 WiFi Hotspot

The vendor as an alternative will provide WiFi hotspots that can be used for radio programming at the following locations:

- Perkins Fire
- Cushing Fire
- Sheriff's Office
- Payne County EOC MACC, Glencoe Location
- Yale Fire

4.0 Minimum System Operative Characteristics

4.1 General

In this Section, channel usage characteristics for agencies now operable on the Customer's legacy radio system are presented. From this information, the Vendor can better determine the channel capacity (and subsequently the channel plan) needed to satisfy talk-group structure requirements for this project.

4.2 Minimum System Performance

4.2.1 The Vendor should assume that the current channel configuration/usage will be replaced with a P25 digital radio overlay having a trunked radio talk-group structure.

4.2.2 The Vendor can use this information and other statistics or information to structure capacity studies and related technical considerations necessary to develop a radio frequency channel/capacity plan for the system.

4.2.3 The minimally-acceptable Quality of Service Objective for the system shall be a call blocking rate of no more than 1%, with the delay for such calls that are queued to be no greater than 0.5 seconds.

4.3 The Vendor shall describe in the response:

4.3.1 Typical call setup times for trunked radio calls, which in no case shall exceed 0.5-seconds.

4.3.2 Typical audio processing delays, due to vocoding and digital signal processing, within the Vendor's specific radio technology solution. These delays shall be described for Emergency Calls, Group Calls, Patched Calls, ISSI Calls, Base Station Gateway Calls and Broadband Gateway Calls.

4.3.3 The various levels of call transaction priority as assigned to: Emergency Calls; Group Calls; Fleet Calls; Patched Calls; ISSI Calls; Base Station Gateway Call transactions and Broadband Gateway Calls.

- 4.3.4 How these various call transaction delays can potentially impact site capacity loading, and how does the Vendor mitigate this in the design process.

4.4 System Fleet/Talkgroup Requirements

- 4.4.1 Contractor shall assist The Customer and various user agencies in determining user identification and talk path assignments.
- 4.4.2 Contractor shall program all portable, mobile and control station radios, all System or site controllers and all other equipment to operate on the FCC-licensed operating frequencies and determined talk path profiles. This includes existing equipment that is capable, and may operate on the System, at the time of cutover, supplied by other P25 subscriber manufacturers.
- 4.4.3 Contractor shall prepare and furnish to The Customer "as programmed" records for each control station radio and pager placed on the System.
- 4.4.4 Contractor shall provide training for System/Network Managers sufficient to permit The Customer's prime agencies to add users, create new, or delete obsolete talk paths and to access all other System software-controlled features.
- 4.4.5 Provisions shall be incorporated into the system to allow the Contractor, from its home office, to remotely interrogate the operating system, provide remote technical assistance and install software patches if requested by The Customer.
- 4.4.6 Contractor must provide 4 sets of radio and equipment programming software, appropriately equipped laptop/desktop computers, and all other support equipment and special cables necessary to program all control stations and dispatch consoles supplied by the Contractor.

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5.0 Minimum Infrastructure Equipment Requirements

5.1 General

This Section describes minimally-acceptable requirements for fixed-site radio equipment. All radio equipment installed or provided by the Contractor shall be FCC type accepted under Part 90 of the FCC Rules and Regulations. All supplied equipment shall be in current production and shall meet or exceed the requirements of this Section.

Base station/repeaters shall support P25 Phase 1 and Phase 2 modulation formats and shall support P25 trunked data technology.

5.3 Base/Repeater Stations

All Base/Repeater P25 radios proposed shall:

- 5.3.1** Meet APCO minimum recommendations and EIA/TIA standards for P25 Public Safety digital trunked/conventional radio systems (depending upon application within sites).
- 5.3.2** Furnished equipment must be capable of operation as a combined Phase 1 and Phase 2 infrastructure.
- 5.3.3** Be designed for 100% continuous-duty operation at full manufacturer specification.
- 5.3.4** In P25 multi-site and simulcast configurations, base stations shall utilize linear RF power amplifiers and function in a linear simulcast mode that minimizes to the greatest extent possible destructive time-delay interference within site coverage-overlap regions and minimizes digital modulation distortion, termed modulation fidelity.
 - 5.3.4.1** Modulation fidelity, for this RFP, is a measurement of the degree of closeness that the transmitted modulation matches the ideal theoretical modulation for P25 Phase 2 waveforms.
- 5.3.5** Incorporate site monitor and infrastructure alarm systems having the ability to report major/minor infrastructure functionality alarms on multiple dispatch-located alarm console display devices. Additionally, the alarm reporting system shall have the capability of being remotely accessed for the monitoring and remote-interrogation of field/site related alarms, using a laptop configuration from any node within the network.

- 5.3.6 Utilize the proposed 48 VDC battery backup subsystem.
- 5.3.7 Include a "Fail-over/Fail-Soft" trunking scheme designed to maintain network performance as critical site components fail. System must be fault tolerant with redundant levels of computer hardware/software, as necessary, to maintain trunked operation during equipment failures.
- 5.3.8 Support special services, i.e. encrypted voice, data transmission, multiple Computer Aided Dispatch (CAD) system interfaces, Automatic Vehicle Location (AVL) interfaces, audio recording of talk groups, and collection of system operational data.
- 5.3.9 700/800MHz P25 Repeater station specifications are as follows:
 - 5.3.9.1 General Specifications:
 - 5.3.9.1(a) Frequency Range: 764-776MHz, 851 to 870MHz
 - 5.3.9.1(b) Number of Frequencie One transmit; one receive
 - 5.3.9.1(c) Channel Spacing: 25/12.5KHz
 - 5.3.9.1(d) Channel Capacity: 1
 - 5.3.9.1(e) Input Voltage: 48 VDC operation
 - 5.3.9.1(f) Temperature Range: -30°C to +60°C
 - 5.3.9.1(g) Humidity: 90 % relative humidity @ 50°C (typical)
 - 5.3.9.2 Transmitter specifications are as follows:
 - 5.3.9.2(a) Output Impedance: 50 Ohms
 - 5.3.9.2(b) Power Output: 100 watts
 - 5.3.9.2(c) Frequency Stability: 0.01 PPM from -30 °C to +60 °C ambient, when referenced to site-based GPS-disciplined frequency standard.

- 5.3.9.2(d) Emission: 8K30F1W; 8K70D1W; 9K80F1D; 11K2F3E; 9K80F1D, 9K80D7W or comparable Phase 2 Emission
- 5.3.9.2(e) Modulation Deviation: +/-2.5KHz (12.5KHz), +/- 4KHz (NPSPAC)
- 5.3.9.2(f) Channel Spacing: 25KHz; 12.5 KHz
- 5.3.9.2(g) Audio Distortion: 2% at 1KHz
- 5.3.9.2(h) Audio Response: Within +1, -3db of 6dB/octave per EIA
- 5.3.9.2(i) Spurious/Harmonic: -65dB

5.3.9.3 Receiver specifications are as follows:

- 5.3.9.3(a) Frequency Range: 792-825MHz
- 5.3.9.3(b) Modulation Acceptance: 1KHz off channel
- 5.3.9.3(c) Selectivity: -70dB
- 5.3.9.3(d) Sensitivity: 0.25uv
- 5.3.9.3(e) Intermodulation: -80dB
- 5.3.9.3(f) Spurious/Image: -85dB
- 5.3.9.3(g) Frequency Stability: 0.01-PPM (GPS standard)
- 5.3.9.3(h) Channel Spacing: 12.5KHz
- 5.3.9.3(i) Audio Distortion: 2% at rated audio line level (600-Ohm)
- 5.3.9.3(j) Audio Response: Within +/-3dB of 6dB/octave per EIA
- 5.3.9.3(k) Duty Cycle (EIA): Receiver 100%

5.3.10 Minimum 800MHz Analog Base/Repeater station specifications are as follows:

5.3.10.1 General Specifications:

- 5.3.10.1(a)** Frequency Range: 806 to 869MHz
- 5.3.10.1(b)** Number of Frequencie One transmit; one receive
- 5.3.10.1(c)** Channel Spacing: 25/12.5KHz
- 5.3.10.1(d)** Channel Capacity: 10, minimally
- 5.3.10.1(e)** Input Voltage: 48 VDC operation
- 5.3.10.1(f)** Operating Temperatur -30°C to +60°C
- 5.3.10.1(g)** Humidity: 90 % relative humidity @ 50°C (typical)

5.3.10.2 Transmitter specifications are as follows:

- 5.3.10.2(a)** RF Output Impedance: 50 Ohms
- 5.3.10.2(b)** Power Output: 100 watts
- 5.3.10.2(c)** Frequency Stability: 0.01 PPM from -30 °C to +60 °C ambient, when referenced to site-based GPS-disciplined frequency standard.
- 5.3.10.2(d)** Modulation Deviation: 0 to +/- 5KHz (25KHz), 0 to +/- 4KHz (NPSPEC)
- 5.3.10.2(e)** Modulation Type: Analog FM 16K0F3E
- 5.3.10.2(f)** Channel Spacing: 25KHz; 12.5 KHz
- 5.3.10.2(g)** Audio Distortion: 2% at 1KHz
- 5.3.10.2(h)** Audio Response: Within +1, -3db of 6dB/octave per EIA
- 5.3.10.2(i)** Spurious/Harmonic: -65dB

5.3.10.3 Receiver specifications are as follows:

- 5.3.10.3(a)** Frequency Range: 806-825MHz
- 5.3.10.3(b)** Modulation Acceptanc 1KHz off channel
- 5.3.10.3(c)** Selectivity: -70dB (-80db for 25KHz channel)
- 5.3.10.3(d)** Sensitivity: 0.25uv
- 5.3.10.3(e)** Intermodulation: -80dB
- 5.3.10.3(f)** Spurious/Image: -85dB
- 5.3.10.3(g)** Frequency Stability: 0.01-PPM
- 5.3.10.3(h)** Channel Spacing: 12.5KHz
- 5.3.10.3(i)** Audio Distortion: 2% at rated audio line level (600-Ohm)
- 5.3.10.3(j)** Audio Response: Within +1/-3dB of 6dB/octave per EIA
- 5.3.10.3(k)** Duty Cycle (EIA): Receiver 100%

5.4 Fixed Microwave Equipment Requirements

- 5.4.1** The microwave network shall adhere to The Customer's network management plan as defined in Appendix G: Network Management Requirements.
- 5.4.2** Digital voice/data technology shall be used to minimize audio-phase delays and/or incompatibility of audio levels within the proposed network solution.
- 5.4.3** Where VoIP techniques are used to interconnect infrastructure sites, in lieu of traditional PCM multiplex channel schemes, a robust means shall be provided thereby assuring that the highest priority possible is given to voice packet delivery.
- 5.4.4** Redundant transmit, receive, and baseband equipment for each site, configured for automatic hot standby operation, shall be provided by the Vendor. This redundant equipment will automatically switch to the hot standby component(s) upon failure of the primary equipment.

- 5.4.5** A Microwave Alarm System shall be provided by the Vendor to monitor microwave site functions and to provide alarm status of abnormal operational parameters of equipment associated with the microwave system. Microwave major alarms shall be integrated within the radio alarm packaged supplied by the Vendor.
- 5.4.6** An orderwire channel with individual site handsets will be provided to link all microwave locations for testing and troubleshooting.
- 5.4.7** A separate 48 VDC microwave standby battery system will be provided and sized for 48-hours of continuous microwave equipment operation at each infrastructure site.

 - 5.4.7.1** An automatic low-voltage disconnect system will be employed to protect the battery plant from deep-cycle discharge damage.
- 5.4.8** Microwave system availability shall be no less than 99.999%. 6GHz path segments longer than 12-miles must utilize space-diversity. The system shall be loop-configured with hitless directional switching.
- 5.4.9** Microwave antennas, radomes, and antenna mounts supplied and installed will be capable of surviving wind speeds of up to 150mph and maintaining reliable operations during sustained storm force winds of up to 125mph. Each furnished antenna system will be equipped with dual stiff arms/ruggedized mounts to limit antenna vibration and flexing during high wind events.
- 5.4.10** Minimum operational service parameters of each microwave link are as follows:

 - 5.4.10.1** Unfaded Bit Error Rate (BER): Not Less Than 10⁻¹⁰
 - 5.4.10.2** Calculated RF Link Fade Margin: Not Less Than 40dB
 - 5.4.10.3** Link Outage Level: To coincide with 10⁻³ BER, to occur at a signal level not less than 3db in excess of the calculated RF link fade margin.
- 5.4.11** Microwave system shall incorporate a quadrature amplitude modulated adaptive protocol that automatically adjusts protocol to maintain critical communications during abnormally faded conditions. This technique is intended to extend the microwave system's functionality to beyond that of the normal 40db flat fade margin.

- 5.4.12 Vendors may use high-power amplifiers (i.e., 36dBm to 39dBm), as may be necessary, to achieve the best balance between antenna size versus the 40db flat fade margin requirement.
- 5.4.13 In no case should antennas larger than 8ft. in diameter be considered for this project unless high-performance antennas are required due to interference mitigation requirements as noted by the Frequency Coordinator.
- 5.4.14 The Contractor shall be responsible for the engineering and filing costs for microwave system frequency coordination, prior coordination notification, FCC license application preparation and submittal of necessary microwave licensing documents on behalf of the Customer.

5.5 Additional Submittal Requirements:

The Vendor is not required to present a detailed fixed path design of the proposed microwave subsystem for the purpose of the Technical response, as such work is dependent upon exact antenna placements that will be resolved by the Vendor during the various design review meetings to be held prior to system construction. The Vendor shall provide the following information as part of the Technical proposal:

- 5.5.1 Technical specification literature for its proposed microwave radio, antenna and related equipment.
- 5.5.2 A sample path profile analysis indicative of the scope to be used during the actual microwave analysis process. The sample analysis shall include all of the tower sites that encompass the Vendor's proposed radio infrastructure configuration.
- 5.5.3 A sample test and alignment verification process, to be used during the commissioning of the new microwave subsystem.
- 5.5.4 The Vendor may reuse/reconfigure The Customer's existing microwave equipment as this equipment if it is supported and is expected to have operational value within the new P25 System.
- 5.5.5 The Vendor will provide the bandwidth provided by the proposed microwave system. This information should include the amount of bandwidth for all portions of the radio system and any other equipment/systems integrated in the proposed network. It should also include any additional bandwidth that could be used by the Customer and the interface at each site for the additional bandwidth.

6.0 Coverage Criteria

6.1 General

The System's P25 digital trunked radio network shall be designed to support portable hand-carried radio subscriber equipment on the hip with a speaker microphone, operated on-street, at physical locations throughout the identified service area. The Vendor must fully determine and guarantee the coverage predicted for the proposed solution, as per the functional and operational requirements of this RFP. The Vendor shall provide within the response a sample Coverage Test and Acceptance Plan that encompasses the elements described below:

6.2 Coverage parameters

The Vendor must consider the following operating parameters in the development of their coverage guarantee:

6.2.1 Shoulder/microphone units without antennas will be used with portable radio units in most instances and shall be the normal configuration considered for coverage design. Body and obstruction losses must therefore be considered in the proposed network design for both talk-in/talk-out coverage analyses.

6.2.2 Flexible, quarter wavelength antennas shall be required for portable units. Coaxial-skirt type or $\frac{1}{2}$ wave antennas are not acceptable due to size and other mechanical/ergonomic limitations.

6.2.3 Mobile unit configurations shall utilize low profile unity gain 700/800MHz antennas. These antennas shall be located on the vehicle's trunk, having an average base level height of 3.5 feet.

6.2.4 {Left Intentionally Blank}

6.3 Noise Floor & Interference

It is the intent and requirement that the system shall be designed such that the indicated coverage goals and requirements herein be met irrespective of external noise and interference. Therefore, it is essential that the Contractor undertake whatever measurements, surveys, and studies as necessary such that the state of the noise and interference environment is quantified prior to the system's final design. The final system design shall make such allowances as necessary, including but not limited to reduced repeater site effective sensitivity (predictions) in the presence of noise and interference (as measured) to achieve The Customer's required degree of coverage.

The Contractor shall not excuse a failure of any portion of the coverage test due to external noise or interference, with one exception: If the Contractor can show, with certified measurement data, that the noise and/or interference environment has substantially changed between the initial pre-design measurements/surveys and the time of the performance of the coverage acceptance test. If such findings can be demonstrated, then the coverage requirement for the affected portion of the coverage test may be conditionally accepted by the Customer as an exception.

As part of its proposal development, the Vendor shall undertake a best-faith effort to investigate the existence of abnormal noise/interference levels, if any, and shall incorporate those findings within its coverage map submittals for the proposed system. These measurements shall be conducted between the hours of 8 a.m. – 5 p.m. on normal working days. Off hours and holiday periods will not be acceptable periods for measurements. Ultimate final acceptance of the affected portion of the completed system may be given only if The Customer is shown sufficient information to demonstrate that any observed degradation is beyond the reasonable, Industry-recognized control of the Contractor. If, however, coverage degradation to the system is found to be within the Contractor's control, then whatever additions, modifications, or costs incurred to resolve the coverage deficiency shall be borne solely by the Vendor.

6.4 Intermodulation Study Requirement

The Vendor shall ensure that the proposed System will be within the accepted limits of Industry-accepted engineering practice, free of interference or degradation due to intermodulation (IM) noise/sideband products.

An IM study shall be required to be provided by the Contractor prior to the project's the Customer Design Review (CDR) meeting, and subsequent meetings, as the new radio network is deployed. This study shall investigate the impact of both trunked system channels as well as those channels utilized by the conventional mutual aid and interoperability subsystem. This study shall also include any current co-located equipment that may be present in the shelter and/or tower.

As part of the Technical Response, the Vendor shall fully describe the planned methodology to develop and complete the required noise and IM studies. The Vendor shall submit a representative sample of the noise and IM reporting documentation of sufficient scope and detail to support the methodology, as provided in the Technical Response.

6.5 Service Area

- 6.5.1** Portable radio on-street, on the hip with a speaker microphone coverage must extend throughout no less than 97% of that area within the land region encompassed by Payne County, Oklahoma and two-miles outside of Payne County, Oklahoma at Delivered Audio Quality (DAQ) 3.4.
- 6.5.2** The system shall support mobile radio user coverage throughout the County and two miles outside of the County at 97% coverage at Delivered Audio Quality (DAQ) 4.0.
- 6.5.3** Portable radio coverage within buildings is required. The system shall support no less than 95% coverage/DAQ-3.4 within residential structures and Law/Fire/EMS facilities throughout all areas of the Customer. Residential structure is described as a single story wood frame house with a minimum typical loss of 6db.

In addition, portable radio coverage to this same or greater reliability and audio quality is required within a specific set of critical building locations and critical areas, as listed in Appendix D Critical Building/Area List.

- 6.5.3.1** The system shall support no less than 95% coverage within critical buildings and other type 20dB structures within the city limits of the following cities plus one mile outside the border and along the corridor of major roads with a one-half mile boundary on either side.

6.5.3.1 (a) Stillwater, OK.

6.5.3.1 (b) Perkins, OK.

6.5.3.1 (c) Yale, OK.

6.5.3.1 (d) Cushing, OK.

6.5.3.1 (e) Glencoe, OK.

6.5.3.1 (f) Ripley, OK.

6.5.3.1 (g) Ingalls, OK.

6.5.3.2 The vendor should put an emphasis on providing reliable coverage in all schools regardless of the loss factor for each school. The vendor will guarantee coverage in all schools at no less than 95% coverage at 25db.

6.5.4 All references to coverage reliability in this RFP refer to statistical area reliability. For example, the phrase "95% coverage" indicates that the total area described shall exhibit at least 95% statistical probability that coverage areas, if tested, would be found to support electrical performance which equals or exceeds that minimum signal level necessary for that Contracted delivered audio quality.

6.5.4.1 It will not be acceptable to provide a coverage guarantee which includes a relatively large number of failed points within any single vicinity, while still meeting the overall goal of 95% coverage.

6.5.4.2 It will not be acceptable to have a failure of six or more contiguous test points.

6.6 Propagation Analysis

The Vendor shall provide written descriptions of the processes and propagation models used to calculate proposed area coverage objectives.

Coverage maps and other pertinent calculations must be submitted with the following minimum information clearly defined for each map or submittal:

- 6.6.1 Transmitter site power output.
- 6.6.2 Antenna gain and type (Include transmission line losses).
- 6.6.3 Effective signal level necessary, at both infrastructure and user radio antenna ports, to produce DAQ 3.4 delivered audio quality in the typical land mobile radio environment (inclusive of noise floor degradation, if any).
- 6.6.4 Antenna height.
- 6.6.5 Portable unit effective radiated power.
- 6.6.6 Portable unit effective receiver sensitivity.
- 6.6.7 Transmitter site talk out range, individual sites as well as composite coverage.
- 6.6.8 Portable unit talk-in range, individual sites as well as composite coverage.
- 6.6.9 A statement defining the percentage of land area covered shall be provided for each submitted map configuration.
- 6.6.10 Okamura modeling should be used for propagation projection.

6.7 Radio System Coverage Acceptance Criteria

Verification of the installed system's coverage is a component part of the Test and Acceptance criteria described in Section 14 Phased Implementation.

- 6.7.1 Vehicular coverage testing (performed within a road vehicle during terrestrial coverage testing or watercraft when performing river or lake coverage testing) shall be done with computer-controlled test equipment.

- 6.7.1.1 This equipment shall automatically record the position of the test vehicle (by means of GPS positioning) at the time of a reading and records the signal strength of at least 200 signal samples over a 40-wavelength period for each reading taken within a test grid. Signal strength measurements shall be made continuously along the drive route.

- 6.7.2 Test grid sizes within all city limits shall utilize grid sizes no greater than 1320 feet x 1320 feet (1/4 mile). Grids sizes within rural areas shall be 2640 feet x 2640 feet (1/2-mile).

- 6.7.3 A minimum number of accessible grids, sufficient to provide statistical accuracy of results in the order of 1.25db or less, shall be tested.

- 6.7.4 The Customer and the Contractor shall mutually determine the size/location of grids and a suitable drive route that encompasses the entirety of accessible grids. This testing shall apply to any area capable of being traversed by a 4x4 vehicle. Inaccessible grids will be excluded from the coverage result calculations.

- 6.7.5 Field strength test results obtained throughout the coverage area, in accordance with minimally required reliability percentages, shall be of sufficient level to produce a Delivered Audio Quality (DAQ) rating of 3.4 or higher where required (see Figure 1 below) throughout the predicted service area to be considered passing.

DAQ	Description
5	Reception is very clear, and the message is perfectly readable. No background noise is present, and every word is understood.
4	Reception is clear, but with slight background noise. Message is readable and every word is understood.
3.4	Reception is clear, but with slight background noise. Message is readable and understood with few/occasional missing syllables.
3	Background noise is evident. Message is readable and understood even with missing syllables.

2	Background noise is prevalent. Message is readable with difficulty and requires repetition.
1	Evidence that transmission being made. Voice message is barely discernible, and no words are understood.
0	No transmission is heard. No activity on the channel is evident.

CPC is set to the midpoint of the Range.
SINAD values are NOT to be used for system performance assessment.

Table 1

- 6.7.6** Mobile radio signal strength measurements shall be made from either a terrestrial (land) vehicle moving at approximately 35 mph, or a watercraft (river/lake) vehicle traveling at approximately 20-knots.
- 6.7.7** The device used to measure field intensity shall be stable and have a dynamic range suitable for the conditions under test.
- 6.7.8** Prior to the execution of these test activities, all test equipment and data gathering equipment to be used shall be fully certified by an independent testing laboratory having calibration tools traceable to the National Institute of Standards and Technology. These certification documents shall be presented to the Customer's project staff prior to coverage testing.
- 6.7.9** The test output shall be retained by a laptop computer or an equivalent computer device. The Contractor shall submit a written and/ or graphical report containing an analysis of the test results to the Customer daily, and a formal report at the end of the test.
- 6.7.10** The Contractor's analysis shall include maps of the coverage area divided into grids, with the test results for drive tests displayed in each grid on a separate map.
- 6.7.11** All test data, in its raw form, shall be made available for independent inspection.

- 6.7.12 The Customer reserves the right to reject any instrumentation or procedures.
- 6.7.13 During these tests, the system's P25 transmitter(s) output power shall be monitored by the Customer and no adjustments shall be made to the base station(s), antenna system(s), transmitter(s), portable/mobile radio units or test instrumentation after appropriate calibration of all involved equipment.
- 6.7.14 Optimization data for the infrastructure will be provided to the Customer prior to the commencement of these tests. Optimization data will include at a minimum, antenna sweeps, TX power measured at the base station output and the combiner output, receive sensitivity, and any other data deemed necessary to prove the system is optimized and ready for testing.
- 6.7.15 Should The Customer reject any portion of the test, the Contractor shall correct the errors and omissions as defined by the Customer at no additional cost.

6.8 Audio Quality Test Process

In addition to the signal level collection method describe above, the Contractor shall be required to conduct a voice audio quality test of the system.

- 6.8.1 The P25 digital portion of the new radio system shall encompass an automated BER Test for both in-bound and outbound transmission pathways.
- 6.8.2 The Contractor shall, as part of its Acceptance Test, produce a BER Test Report that correlates actual BER to predicted results.
- 6.8.3 Of those accessible grids evaluated because of the field-testing process, no fewer than 97% shall achieve a BER that is directly correlated to DAQ-3.4, as defined by EIA/TIA TSB-88D, as depicted by Table 1. A call transmission failure in either direction shall be considered a failure of the tested grid.
- 6.8.4 The BER test shall encompass the same grid structure as devised for the signal level test process.
- 6.8.5 A manually-conducted voice quality test simulating in-residence portable radio operations shall also be conducted.

- 6.8.5.1** In conducting portable voice quality testing, vehicular-mounted mobile radios and proposed portable radios will be utilized in Contractor-equipped vehicles, but with appropriate transmission line attenuators installed to replicate outdoor portable radio operations.
- 6.8.5.2** The Customer's service area shall be comprised of test grids equal to those used in BER testing.
- 6.8.5.3** Test calls for each grid will be transacted, as required vehicle-to-base/console and base/console-to-vehicle or portable-to-base/console and base/console-to-portable, with the results for each call segment scored as per TSB-88D recommendations.
- 6.8.5.4** No fewer than 97% of the total number of grids tested in this manner shall be ranked as achieving DAQ-3.4 audio quality, or higher.
- 6.8.5.5** A failure in either call direction shall be considered as a failure of the tested grid.
- 6.8.6** The following voiced audio quality verification process shall apply:

 - 6.8.6.1** The portable radio voice quality testing shall be performed using a minimum of ten phonetically balanced phrases, to be supplied by the Contractor.
 - 6.8.6.2** A successful test measurement shall be one which requires no repetition, and as defined in Table 1 to understand the spoken phrase and with a DAQ-3.4.
 - 6.8.6.3** A successfully tested grid is defined as one in which communications from a dispatch console to a field radio unit, as well as for the reverse path, are not less than DAQ 3.4 as described above.
- 6.8.7** The Customer shall designate the test team(s) to participate in coverage testing.

- 6.8.8** All test vehicles shall be provided by the Contractor and be off-road capable. Where boats are required, these shall be provided by the Customer. It is anticipated that any boats used in this coverage testing would be for informational purposes only.
- 6.8.9** Testing shall commence daily at 8:00 AM and will cease at 4:30 PM. At least three teams will conduct the tests in the interest of timely completion.
- 6.8.10** Failure of Contractor test equipment shall not be considered as an acceptable reason for a Contract time extension.
- 6.8.11** The Customer will not pay for retesting caused by delays or equipment failures.
- 6.8.12** Testing will proceed through weekends and during peak foliage until concluded.
- 6.8.13** Final System Acceptance shall not be achieved until the constructed system successfully equals or exceeds the coverage performance guaranteed by the Contract.

6.9 Critical Building Coverage Test Process

- 6.9.1** Coverage shall be no less than 95% inside of the listing of representative buildings contained in Appendix D Critical Building/Area List. It is desired that most of these building structures shall be supported by the proposed fixed infrastructure (tower sites). However, the Vendor shall exercise good judgment in balancing the proliferation of costly infrastructure tower sites with the number of building sites. The use of building amplifier systems, while necessary in some instances, shall likewise be minimized to the most practical and fiscally responsible extent possible.
- 6.9.2** The Vendor shall specifically identify those buildings from that list that are likely to require building amplifier systems.
- 6.9.3** If any of these representative buildings fail to demonstrate 95% reliable coverage (DAQ 3.4 Audio Quality), the following procedure will be followed:

6.9.3.1 The Vendor must propose a detailed testing method showing how the failed building will be tested to verify that it does or does not meet the in-building coverage criteria. Median density loss testing is strongly recommended for any failed building.

6.9.3.2 If System radio coverage gaps are identified versus Vendor as-proposed coverage models, the Contractor will be responsible for modifying the System, at no additional cost to the Customer, to achieve the required coverage within the failed building. Remediation may include any or all the following approaches, as

- Bi-directional amplifier (BDA) system installed in the building.
- Satellite receiver systems in or near the building.
- Modifying/adjusting repeater site antenna systems.

The determination to utilize a BDA within any structure shall be engineered as a part of a comprehensive system design. The Contractor shall not install any BDA system in structures that shall introduce interference into the overall P25 System operation.

If any changes are made to the fixed sites (such as re-orienting antenna patterns) in order to resolve building coverage failures, then a complete re-test of coverage shall be required at no additional cost to the Customer.

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7.0 Dispatch Console Requirements

7.1 General

It is a requirement that the Customer's existing/legacy radio configuration remain operationally available during the installation and acceptance phases of the P25 System. The Customer will permit the co-location of new dispatch console equipment with this legacy equipment during the project's user migration phase and until project acceptance.

7.2 Radio Console Locations

7.2.1 The Customer currently utilizes multiple dispatch centers for 911, Law, Fire, EMS, and other public safety agencies. The dispatch centers are located at Multiple Locations. There is a quantity of Fourteen (14) consoles at these locations.

- Sheriff 6
- Cushing 5
- Yale 1
- EOC 2

7.2.2 Customer has a backup dispatch center. This backup location is located the EOC at 6919 N. Rose Road, Glencoe, OK. 74032.

7.3 Console Installation Requirements

In proposing a console solution, the Vendor shall:

7.3.1 Replace all existing radio dispatch consoles at The Customer's dispatch center(s) with an IP-based solution and have seamless integration with the newly proposed system radio network.

7.3.2 Install new radio dispatch equipment cabling that must, likewise, be completed in a manner that causes no interference with the operation of the existing legacy network.

7.3.3 Carefully evaluate dispatch facilities prior to initial design review to determine the most effective means to install and implement its new dispatch console equipment and associated subsystems.

7.3.4 Any solution that would cause the temporary interruption of the existing radio system for any duration must be reviewed and approved, in advance, by the affected entities and the Customer.

7.4 Desired Functionality

Due to the critical nature of the communications services provided by these public safety dispatch facilities, a high degree of reliability for the new radio dispatch console subsystem is required.

7.4.1 General Operations

The console subsystem, to the greatest extent possible, shall:

- 7.4.1.1** Be automatically self-correcting.
- 7.4.1.2** Provide continuous and automatic self-testing and diagnosis.
- 7.4.1.3** Alert the operator in the event of component or sub-system failure.
- 7.4.1.4** Allow continued operation of the remaining consoles in the event of failure to a specific console, through isolation of the defective console device.
- 7.4.1.5** Be of a design that eliminates single points of failure.
- 7.4.1.6** Utilize packet-based, in lieu of traditional circuit-switched, technologies.
- 7.4.1.7** Modularity is likewise envisioned to reduce the number of sub-systems affected by a single component failure. Repair of sub-systems without totally disabling multiple radio console positions shall be required, as continued console operation is necessary during repair.

7.4.2 Diagnostics

- 7.4.2.1** The new dispatch console subsystem shall be equipped with several self-diagnostic elements that continuously monitor and verify the correct operation of each distributed microprocessor, each audio path in the console electronics, and between the console electronics and the system.
- 7.4.2.2** Diagnostic capability shall be distributed among independent and redundant subsystems and shall not rely on one central diagnostic circuit.

7.4.3 Power Supply

It is a critical requirement that power loss or surges shall not affect radio dispatch operations.

7.4.3.1 Power loss or surges shall not alter the system software or operating parameters at the radio dispatch positions.

7.4.3.2 External power to each console shall be supplied by a nominal 120VAC, 60Hz, single-phase power source.

7.4.3.3 All dispatch console equipment, in each dispatch facility, shall be connected to an individual outlet on a circuit that is protected by a UPS and supported by the site's emergency power generator. The Vendor will provide a load study to ensure and validate the UPS and generator are sized to support any new equipment in the dispatch center.

The proposed UPS will have a graphical display that shows battery life and voltage incoming and outgoing on the device.

7.4.4 Flat Panel Display

7.4.4.1 A state-of-the-art color, non-interlacing minimum 22-inch display shall be provided.

7.4.4.2 Each operator shall have the ability to change screen displays to suit operator preferences.

7.4.4.3 No less than eight console preferences shall be configurable for each console.

7.4.4.4 The screen(s) are required to be touchscreen.

7.4.5 Headset Jack Configuration

7.4.5.1 All radio consoles shall, at a minimum accommodate both right-handed and left-handed operators.

7.4.5.2 All radio consoles shall be configured for dual headset and local microphone operations.

7.4.5.3 Each console shall provide independent transmit audio level settings for audio inputs from the headset microphone and a desktop microphone, such that telecommunicators may freely switch operation without affecting dispatch audio quality.

7.4.5.4 Dual headset jacks shall be provided at each position for training and supervisory purposes.

7.4.6 Footswitch

7.4.6.1 The Contractor shall supply and install a switch for each console.

7.4.6.2 Each footswitch will operate PTT of the selected channel(s).

7.4.6.3 The footswitch shall be heavy duty, rated for constant and continuous use, and shall be designed so as not to skid on a smooth flooring surface.

7.4.7 Master Time Source

7.4.7.1 A time generator system shall be provided, by the Contractor, that references the Global Positioning System to synchronize all dispatch clocks and logging recorders at all radio console positions/centers.

7.4.7.2 This time generator system shall be made to fully interface to and control the event-time display of the radio consoles, console audio recorder, radio network management tools, radio network alarm system, and microwave alarm system at each radio dispatch location.

7.4.8 Dispatcher Headsets

Each position shall be capable of utilizing a wireless headset hardware for connectivity into the proposed radio console headset jack hardware. The following headsets are currently in use by the Customer and are required to operate with the new dispatch consoles:

7.4.8.1	<u>Make</u>	<u>Model</u>
	Plantronics	Encore Pro HW710

7.4.9 Digital Fixed Station Interface

The console system shall be capable of modern digital fixed-station interface (DFSI) connectivity to base stations and other fixed radios.

7.4.10 Dispatch Console Positions

Each of the radio dispatch consoles shall include all controls that apply to the various channel/talk-groups and auxiliary functions for the console.

Each console position shall contain as a minimum:

- 7.4.10.1** Select Speaker – for audio from selected channels/talk-groups, with volume control.
- 7.4.10.2** Unselect speaker – for audio from unselected channels/talk-groups, with volume control.
- 7.4.10.3** Resource selectable speaker – Minimum of 1 additional speaker which allow for console audio resources to be dynamically assigned by the operator.
- 7.4.10.4** Transmit Function – a color-coded transmit function to control the push to talk (PTT) function for the selected transmitter(s) and/or talk-group(s).
- 7.4.10.5** CTCSS Monitor or Disable Function – shall disable the receiver CTCSS decoder of selected conventional base station(s) operating on conventional channels for monitoring purposes.
- 7.4.10.6** Clock – shall display time in twenty four-hour formats and shall be synchronized with the time server.
- 7.4.10.7** VU Meter or Audio Level Display.
- 7.4.10.8** Keypad or screen representation of a keypad for numeric data entry.
- 7.4.10.9** Microphone – desktop microphone type. This microphone shall be resistant to interference, such as transmitting hum from lights, cathode ray monitors, or other devices used in the proximity of the console.
- 7.4.10.10** Dual Headset Jack – a dual headset jack shall be provided which will allow for use of a headset equipped with RJ-327 type plug with modular adapter. Separate headset volume controls for radio and telephone audio output shall be provided.

7.4.10.11 Intercom – intercom between operator positions shall be provided. A visual display shall be provided to identify both the calling and called parties by console name. Multiple simultaneous intercom conversations between individual consoles shall be possible.

7.4.10.12 ID Display on the channel window for standard calls and emergency calls with a minimum of eight alphanumeric characters.

7.4.10.13 All Receiver Mute Function – a function, which will mute the received audio from all unselected channels, shall be provided. This muting function shall be programmable in predetermined increments.

7.4.10.14 Simultaneous Select and Instant Transmit Function – controls shall be provided that allows the operator to manually select any combination of console controlled base stations for simultaneous transmissions. Three selectable combinations shall be allowed at the discretion of the telecommunicator.

7.4.10.14(a) The patch shall utilize a single trunked channel when patching more than one talk group.

The Vendor will describe how the system will communicate from different type talkgroups or resources integrated to base station gateways.

- P25 - P25 Talkgroup
- P25 Encrypted Talkgroup - P25 Talkgroup
- P25 Encrypted Talkgroup Key 1 - P25 Encrypted Talkgroup Key 2
- Conventional - P25 Talkgroup
- Conventional - P25 Encrypted Talkgroup
- Base State Gateway P25 Talkgroup - P25 Talkgroup
- Base Station GW P25 Encrypted Talkgroup - P25 Encrypted Talkgroup

7.4.10.15 Emergency/ Reset

7.4.10.15(a) Consoles shall receive emergency alerts from the trunked radio system regardless of the status of the channel control window.

- 7.4.10.15(b)** Emergency messages shall be indicated by a flashing ID, and emergency ID character and an audible alert.
- 7.4.10.15(c)** Telecommunicator acknowledgment of the message shall silence the audible alert and stop the flashing display.
- 7.4.10.15(d)** Multiple emergency messages shall be queued in the display stack and the emergency ID character shall continue to flash until all messages have been viewed and subsequently cleared by the telecommunicator.

7.4.10.16 Alert Tones

The console shall be provided with three distinct tones used for alerting purposes over the air. Each alert tone shall be immediately broadcast, when activated, on the selected radio channel.

The following selections shall be available as a minimum:

- 7.4.10.16(a)** Alert 1 – Steady Alert Tone – shall generate a nominal 1000 Hz steady tone.
 - 7.4.10.16(b)** Alert 2 – Warbling Tone – shall generate a warbling tone.
 - 7.4.10.16(c)** Alert 3 – Pulsed Alert Tone – shall initiate an automatic sequence, consisting of a nominal 1000 Hz tone, for a period of two (2) seconds.
- 7.4.10.17** Paging Encoders – Each console shall include a multi-tone paging/signaling encoder that is accessible, minimally, through the data entry keyboard.
- 7.4.10.18** Call Indication – a color-coded status call indicator shall be provided for each receiver in a channel control window on the display screen.

- 7.4.10.19** Individual Volume Adjust – shall be provided for each channel on the console. Associated color-coded status indicators shall continuously show whether the channel is in the full or adjustable volume control shall be automatically bypassed when a channel is placed in select status.
- 7.4.10.20** Talk-group/Channel Cross Patch
- 7.4.10.21** Channel/Group Name – designated channel/group control modules shall include a minimum of eight-character alphanumeric display symbols to identify the channel/group.
- 7.4.10.22** Talk-Group/Channel Busy Indication
- 7.4.10.23** NENA interface – Connectivity to existing E911 and future NG911/IP telephony system (provided by others) for single headset operation.

7.5 Video Display Installation

- 7.5.1** The installation of the Video Display(s) used for the radio dispatch positions shall be capable of desk mounted on furniture or dispatch console furniture display arms.
- 7.5.2** Contractor-furnished cabling shall be neatly installed and protected from physical damage. Installation plans will be approved by The Customer prior to physical installation.
- 7.5.3** Cable raceways shall be used where possible.
- 7.5.4** No cabling shall create a safety or mobility problem for dispatch personnel.

7.6 Console Electronics Description

- 7.6.1** Console electronic circuitry shall be housed in an equipment rack/enclosure specific for each dispatch console position.
- 7.6.2** When installed by the Contractor, sufficient space for front and rear servicing of this equipment shall be provided.
- 7.6.3** The use of a centralized console electronic bank that supports audio and control signaling between multiple dispatch console positions is non-compliant and will be rejected.

7.6.4 Console electronic enclosures shall contain the various microprocessors, console interfaces, auxiliary function interfaces and other interfaces needed for radio dispatch operations.

7.6.5 If multiple circuit cards are required within the Vendor's enclosure solution, these shall be of plug-in design and shall be able to be inserted and/or removed with power applied and the location's other dispatch positions/equipment remaining on-line.

7.6.6 System Interfaces

7.6.6.1 The digital voice network's radio dispatch subsystem shall include the circuitry required to operate remotely-controlled base stations and the system repeaters as described by this RFP.

7.6.6.2 At a minimum, each base station interface shall consist of a plug-in circuit card (or the software equivalent) containing VoIP-related circuitry, line driver amplifiers, two-wire and four-wire receive amplifiers, digital automatic level adjustment circuitry and fault-diagnostic circuitry.

7.6.6.3 The interface shall also be capable of remotely controlling base stations via E/M multiplex-channel, and 2175Hz tone-burst signaling, as may be needed for legacy equipment.

7.6.7 Auto Diagnostics/Self-Healing and Diagnostic Features

7.6.7.1 The radio dispatch subsystem shall be equipped with many self-diagnostic capabilities that shall be configured to continuously monitor and verify the correct operation of each distributed microprocessor, each audio path in the console electronics and between the electronics and each radio network base station site.

7.6.7.2 In the case of voice transactions using the Internet Protocol, specialized coding shall be used to assure the timely delivery of audio packets to destinations such that recovered or transmitted audio is absent of noticeable voice delays or audio truncation.

7.6.8 Console Auxiliary I/O Functions

- 7.6.8.1** All external auxiliary input and/or output (Aux I/O [logic or relay]) functions shall be controlled through an auxiliary interface module.
- 7.6.8.2** These functions shall be controlled from the console position as required.
- 7.6.8.3** The Aux I/O shall be capable of operating an alternative 3-light status light/alert system, supplied by the Vendor, to indicate each position is operating a radio transmission, or telephone call, on each console position.

7.7 Fallback Control Stations

- 7.7.1** Each dispatch and supervisory position shall be equipped with a P25 trunked control station to permit radio dispatch operations to continue in the event of radio console equipment or connectivity failures.
- 7.7.2** These control stations, in addition to the minimum requirements specified by Section 5.3, must contain an alphanumeric display to provide information on talk-group selection and emergency call alerts.
- 7.7.3** Each control station shall be operated either by a stand-alone footswitch and headset jack or be integrated to the console and operate with the console footswitch and headset jack.

7.8 Training

The Vendor shall propose training for up to 38 telecommunicators and 4 telecommunicator supervisors.

7.9 Trunked Logging Recorder and Interface

The vendor shall provide a new Eventide DX, radio trunked logging recorder and proper interface to provide capability for recording any talkgroup on the System and other

- 7.9.1** Capability to record from a Solacom Guarding, via IP recording.
- 7.9.2** At least twenty-four (24) channel analog recorder inputs for telephone lines, and other analog audio sources.
- 7.9.3** At least twenty-four (24) channel VOIP recorder inputs for telephone lines.

7.10 PSAP Logging Recorder

The vendor shall provide each PSAP, a logging recorder that support all 911 lines/trunks or Administrative lines. These recorders should be considered part of a large logging recorder network with a software application that allows the PSAP to create a case from the logging recorder in the PSAP to the trunked logging recorder that may be at a different location.

- Glencoe EOC
- Cushing
- Yale
- Sheriff

8.0 General Equipment and Shelter Requirements

8.1 Shelter Design Considerations

Equipment shelters shall be of a concrete floor, bullet-resistant, prefabricated concrete aggregate type designed to house radio communications, the standby power generator/transfer switch, and sensitive electronic equipment:

- 8.1.1 The exterior wall measurements shall be no less than 10ft high, 12ft wide and 30ft long. Interior dimensions shall include nominal wall, roof and floor dimensions, to be determined by Contractor.
- 8.1.2 Equipment shelters must provide an interior climate suitable for the operation of sensitive electronic equipment, that is, it must be dust proof, watertight and airtight.
- 8.1.3 The shelter shall include a separate power generator equipment area that includes a separate access doorway and a fire-barrier separator that isolates the generator area from the HVAC-conditioned radio equipment space.
- 8.1.4 This generator equipment area shall also be equipped with a ceiling mounted, thermostatically controlled, electrical heater.
- 8.1.5 Each equipment shelter shall be supported by a reinforced concrete pad with attachment devices appropriate for securing the building assembly to survive hurricane or straightline type force (no less than 150-mph) winds.
- 8.1.6 Any sites located within a FEMA 500-Year Floodplain shall require elevation due to the increased flood risk. These equipment shelters shall be elevated upon approved concrete piers or galvanized steel framework.
 - 8.1.6.1 The finished length of piers/framework shall extend, minimally, four feet above ground level but otherwise in accordance with FEMA's 500-Year floodplain elevation height plus an 24-inch contingency margin.
- 8.1.7 Any metal components, attachment hardware, cross-braces and lifting eyes shall be hot-dip galvanized metal after fabrication.

8.2 Shelter Configuration Details

- 8.2.1 The exterior wall finish shall be exposed aggregate concrete. Seeding of aggregate for an exposed aggregate finish is not acceptable. Exterior walls must be bullet resistant as defined below.
- 8.2.2 The roof shall be a flat, tapered type having a minimum slope of 1/2" per foot from the roof centerline.
 - 8.2.2.1 The roof shall be designed to support a minimum of 100-lbs/sq. ft. distributed load.
 - 8.2.2.2 A roof shield shall be provided and installed by the Contractor, above the equipment shelter and of sufficient size to adequately protect the shelter and personnel from falling materials via the nearby radio site's tower.
- 8.2.3 All exterior wall, floor and roof joints shall be sealed using a compressible, resilient sealant. There shall be no exposed roof-to-wall or wall-to-floor joints.
- 8.2.4 Cement used in concrete shelters shall be standard Portland cement conforming to the requirements of the "Standard Specification of Portland Cement", ASTM Designation C150. Concrete aggregate shall conform to the requirements of the "Specifications for Concrete Aggregates" ASTM C33 and "Specifications for lightweight aggregates for structural concrete" ASTM C330.
- 8.2.5 Exterior concrete surfaces shall be sealed with a minimum of two coats of THOROGLAZE® H Concrete Sealer or equivalent.
- 8.2.6 The shelter's interior floor shall be covered with 1/8" x 12" x 12" industrial weight solid vinyl floor tile. Floor color shall be light beige.
 - 8.2.6.1 The subfloor shall be designed to support a minimum of 200 lbs. / sq. ft. distributed floor load, while on foundation, or as needed to support proposed equipment. Consideration should be given to the area(s) for the proposed 48VDC battery plant weight load.
- 8.2.7 Walls shall have a minimum thermal insulation factor of R11.

- 8.2.8** The shelter's roof shall have a minimum thermal insulation factor of R19.
- 8.2.9** Interior wall surfaces shall be faced with white vinyl/coated wood paneling.
 - 8.2.9.1** The interior ceiling surface shall be white, vinyl coated plywood. Seams in the plywood shall be trimmed with batten strips painted to match the ceiling.
- 8.2.10** Building openings for the door, air-conditioners, transmission line entrance and other entries shall be framed and sealed in such a manner that moisture cannot penetrate the insulation within the walls or the interior walls of the structure.
- 8.2.11** Each door measuring 36"W x 84"H x 3" made of thick insulated bullet-resistant steel, and equipped with a three-point latch, shall be provided. All door hardware shall be stainless steel and incorporate three external hinges having non-removable hinge pins. Door shall open outward to maximize internal building utilization.
 - 8.2.11.1** The term 'bullet-resistant' is defined, for this RFP, as unable to be penetrated by a .30-06 or .308 commercial cartridge firing a lead tipped, 160-grain projectile, at not more than 2600 fps muzzle velocity. The projectile will be test-fired at a range of 100 yards. The structure/material must not be completely penetrated at that distance.
- 8.2.12** Fiberglass exterior awnings shall be provided to protect the door entrance(s) and air-conditioner units.
- 8.2.13** All hardware used on the exterior surfaces of this shelter shall be either hot-dipped galvanized or stainless steel. Wafer, MDF (Medium-Density Fiberboard), or particleboard wood products are not an acceptable construction material for this project.
- 8.2.14** Contractor shall provide detailed fabrication drawings for the concrete foundation (or steel frameworks), designed to adequately support the proposed building structures and wind loads.
 - 8.2.14.1** Additionally, the building frame shall be mechanically bonded to the concrete/steel foundation. Strapping and anchor materials shall be hot-dipped galvanized protected.

- 8.2.14.2 Building, and foundation detail drawings and related calculations must be reviewed, approved and stamped by a State of Oklahoma-licensed Professional Engineer (P.E.)

8.3 Shelter Electrical Requirements

- 8.3.1 Each shelter shall be equipped with overhead cable trays located above all planned equipment rack groupings.
 - 8.3.1.1 Auxiliary cable trays shall be provided to support transmission lines and telecommunications cables, as necessary.
 - 8.3.1.2 All cable tray joints shall be electrically bonded using No. 6 AWG copper wire jumpers with approved compression fittings.
 - 8.3.1.3 Trays shall be bonded to the interior ground halo.
- 8.3.2 Individual, properly grounded with home run grounds, 120VAC, 20A electrical circuits shall be provided to each of the equipment racks/cabinets.
- 8.3.3 Each shall be terminated as a single, duplex outlet mounted on the cable tray directly above the center of each planned equipment rack.
- 8.3.4 Individual, properly grounded with home run grounds, 240VAC, 30A electrical circuits shall be provided for each battery charger unit.
- 8.3.5 Sufficient flexible conduit shall be provided above the rack to permit interconnection to chargers located at the bottom of the rack.
- 8.3.6 DC wiring for the radio network's battery plant and interconnection to the various equipment groupings shall be furnished and installed, as required.
- 8.3.7 DC wiring for the radio network's battery plant and interconnection to the various equipment groupings shall be furnished and installed, as required.
- 8.3.8 Install eight (8), properly grounded with home run grounds, quad 120VAC convenience outlets, two each on the two longest walls and one each on each of the remaining walls.

- 8.3.9** Install four (4), properly grounded with home run grounds, quad 120VAC convenience outlets shall be installed within the generator space.
- 8.3.10** Twelve (12) 120VAC ceiling mounted outlet boxes shall be provided, each with one (1) duplex receptacle and home run ground. These receptacles should be spaced according to areas of located 120VAC equipment or future expansion space areas.
- 8.3.11** The Contractor shall furnish and install one circuit breaker panel board. Panel board shall be sized for all the indicated branch circuits, equipment loads plus a fifty percent growth factor.

8.4 Electrical/Transient Grounding System

- 8.4.1** The Contractor shall furnish and install an interior and buried exterior electrical grounding system and power surge protection for each location, as follows:
 - 8.4.1.1** A single #2AWG copper conductor ground halo shall be installed on all four interior walls, spaced approximately six inches below ceiling level. The halo shall include a twelve-inch gap/break at the furthest point from the single-point ground attachment, which shall coincide with the RF transmission line entrance.
 - 8.4.1.2** Ground halo shall be mounted on six-inch standoffs, located on twelve-inch centers. It shall be affixed to the transmission line ground entry-port buss bar.
 - 8.4.1.3** This ground entry-port buss bar must be equipped with an Alarm, connected to the network's alarming system, to indicate ground failure, tamper, or theft.
 - 8.4.1.4** All equipment cabinets, racks, transmission line entrance and cable trays shall be individually bonded to the halo using #6AWG copper conductors with approved compression fittings.
 - 8.4.1.5** Interior halo shall be bonded to an exterior, buried ground network using low impedance copper conductors.

- 8.4.1.6** Electrical transient protectors shall utilize MOV and avalanche clamp devices such as the Transector Systems Model 1101-808 series or equivalent. This device shall be installed on the commercial power feed as well as the standby generator feed to the power transfer switch.
- 8.4.1.7** A single, stranded #00AWG copper exterior ground system shall be installed about the building and tower perimeter, located below the frost line, as identified locally, and exothermically bonded to the building frame, interior halo, transmission line ladder, generator system, ice shields, and radio tower legs. All site grounding practices and methods shall meet a recognized telecommunications standard such as IEEE, Motorola R56 or the current revision of Harris AE/LZT 123 46181/1.

8.5 Shelter Lighting Requirements

- 8.5.1** Install 4-foot, 2-bulb, 80-watt fluorescent light fixtures as necessary to provide effective illumination for each equipment rack, and within the generator room.
- 8.5.2** Install emergency exit and interior lighting as required by fire code.
- 8.5.3** Exterior lights above the door(s) and area lights on each of the exterior shelter corners shall be controlled by, at a maximum, two light switches located just inside the main door opening on the side away from the hinges at shoulder height.
- 8.5.4** No LED lights are permitted on exterior walls without prior approval by the Customer.

8.6 HVAC Requirements

- 8.6.1** The Contractor shall furnish and install a dual, wall-mounted heating and air-conditioning system appropriately sized for each shelter/equipment heat load.
- 8.6.2** Each HVAC unit shall incorporate circuitry to ensure that both compressors do not attempt to restart at the same time.
- 8.6.3** HVAC configuration must include timer circuits to rotate use of the air conditioner units on a weekly basis.

- 8.6.4 The HVAC configuration shall include appropriate sensors to cause both air conditioners to run simultaneously as needed to more rapidly reduce the internal temperature to a safe operating level.
- 8.6.5 Equipment shall be furnished with compressor anti-cycle circuitry to prevent short-cycle starts against high compressor head pressure.
- 8.6.6 Equipment shall be furnished with a compressor hot gas bypass (or its equivalent) to minimize electrical power surges because of compressor cycling.
- 8.6.7 Design of HVAC system shall take into consideration the following environmental conditions:
 - 8.6.7.1 Desired Interior Temperature: 70 degrees F
 - 8.6.7.2 Maximum Outdoor Temperature: 115 degrees F
 - 8.6.7.3 Minimum Outdoor Temperature: -15 degrees F
 - 8.6.7.4 Transmitter Power Dissipation: 8,000 watts (24 RF Channels)
 - 8.6.7.5 System Controller: 850 watts
 - 8.6.7.6 Battery Charger/Inverter: 2,000 watts
 - 8.6.7.7 Lighting: 750 watts (Intermittent)
- 8.6.8 Buildings shall incorporate a thermostatically controlled fan system designed to operate in the event of a total HVAC failure and where the building's interior temperature exceeds 90°F.
 - 8.6.8.1 This system shall incorporate appropriate dampers, screens and filters to limit dust and insect entry into the building.
 - 8.6.8.2 A second fan system of this type shall be installed within the generator space.

8.7 Shelter Alarm Systems

- 8.7.1** The Contractor shall furnish and install an over/under temperature sensor, continuously adjustable over the range of 32°F to 120°F, having independent Form-C output contacts suitable for high/ low temperature alarm activation.
- 8.7.2** The Contractor shall furnish and install a door entry alarm sensor, magnetic type, having a Form-C contact closure output.
- 8.7.3** The Contractor shall furnish and install single-loop smoke/ fire alarm system.
- 8.7.4** Smoke/fire alarm sensors shall be mounted above battery charger equipment, in the generator room, and in vicinity of AC power distribution panel board.
 - 8.7.4.1** Smoke/fire alarm panel shall have visual indicators depicting individual alarm sensor status.
 - 8.7.4.2** Smoke/fire alarm panel shall operate from both 120VAC and 12VDC battery power sources.
 - 8.7.4.3** The State Fire Marshal will inspect the proposed fire alarm system, if required.
- 8.7.5** All shelters shall be equipped with an inert gas fire suppression system that is environmentally approved and not injurious to communications personnel. The system shall be connected to the shelter fire/ smoke system alarms. Trigger of the system causing a gas discharge shall cause the air conditioners to automatically shut off.
- 8.7.6** The air conditioner units must be manually restarted to purge the shelter of the gas, after all evidence of combustion is resolved. All necessary plumbing and overhead dispersal equipment shall be provided. The system shall have modes for test and maintenance that do not trigger activation. The system shall be installed and delivered with a primary tank, online and a spare, full tank, offline.

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9.0 Diesel Generator Equipment Requirements

9.1 A standby power generator system shall be furnished by the Contractor for each infrastructure site.

For its proposed infrastructure sites, the Vendor shall include:

- 9.1.1 The necessary labor and materials, as required, to furnish and install diesel fuel tanks, automatic transfer switches, manual-operated auxiliary generator connector facilities, alarm functionality and electrical wiring services to provide fully operational standby power systems.

A generator housed inside the provided equipment shelter, in accordance with the manufacturer's specifications for shock and vibration mounting, ventilation, fuel supply and electrical connections.
- 9.1.2
- 9.1.3 The radiator air inlet shall incorporate a baffle to protect the radiator core from exterior wind-blown debris damage.
- 9.1.4 It shall be the responsibility of the Contractor to provide, install and test a complete and operable standby power generator with automatic transfer switch.
- 9.1.5 Equipment shall be new, factory tested at 0.8 power factor for 3-hours and shall be installed within the required equipment shelters, in accordance with local area building and electrical codes.
- 9.1.6 The following documentation shall be supplied by the Contractor for the generator set and transfer switch supplied:
 - 9.1.6.1 Specification and data sheets for the exact type and model generator and transfer switch supplied pursuant to this procurement, including all options and accessories included.
 - 9.1.6.2 Manufacturer's certification of prototype testing.
 - 9.1.6.3 Manufacturer's warranty documents.
 - 9.1.6.4 Shop drawings showing plan and elevation views of the equipment.

- 9.1.6.5 Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
- 9.1.6.6 Manufacturer's installation instructions.
- 9.1.6.7 Operator's and maintenance manuals that outline routine maintenance and troubleshooting procedures.
- 9.1.6.8 Transfer switch manual and wiring diagram.
- 9.1.7 Start-Up Service shall be included with the following requirements:
 - 9.1.7.1 A factory authorized service representative shall provide initial start-up service and shall conduct on site acceptance testing.
 - 9.1.7.2 The representative must remain until site acceptance is completed, as witnessed by the Customer.
 - 9.1.7.3 Load test records for the installed generator system shall be furnished to the Customer.
- 9.1.8 The following type of engine configuration will be used:
 - 9.1.8.1 The generator package shall include a diesel-configured engine coupled with low reactance, brushless 120/240vac single-phase, 60Hz generator.
 - 9.1.8.2 The generator package shall be equipped with:
 - 9.1.8.2.1 A temperature compensated automatic voltage regulator.
 - 9.1.8.2.2 Under/over-speed protection function;
 - 9.1.8.2.3 A control panel;
 - 9.1.8.2.4 Engine block heater;
- 9.1.9 The generator shall have the following ratings:

- 9.1.9.1** Output power rating of the generator shall be sized for the full calculated load of the affiliated site, inclusive of a 50% excess load factor.
- 9.1.9.2** In no instance shall the proposed generator be configured for less than 45KW output.
- 9.1.9.3** The generator shall also be capable of continuous 24-hour operation, full single-phase output at 1.0 pf.
- 9.1.9.4** The following specifications shall also apply:
 - 9.1.9.4.1** Voltage Regulation: Maintained with +/- 2% of rated voltage for constant load between no load and full load.
 - 9.1.9.4.2** Frequency Regulation: Maintained within 0.5% from steady state no load to steady state rated load.
 - 9.1.9.4.3** Single-Step Load Pickup: 100% of rated output power, less applicable derating factors, with the engine generator at operating temperature.
- 9.1.10** The generator shall have the following Set Controls:
 - 9.1.10.1** The generator shall be a remote-start type compatible with the automatic transfer switch to be supplied pursuant to this procurement.
 - 9.1.10.2** Manual starting and stopping shall be provided from the control pane
 - 9.1.10.3** Cranking control: Shall provide a minimum of three cranking cycles of at least 15-seconds before lockout and activation of an over-crank alarm condition.
 - 9.1.10.4** The generator shall automatically shut down and lock out upon:
 - 9.1.10.4.1** Failure to start (over-crank)
 - 9.1.10.4.2** Over speed

9.1.10.4.3 Low lubricating oil pressure

9.1.10.4.4 High engine temperature

9.1.10.4.5 Low Coolant level

9.1.10.4.6 Other factors that may be harmful to the generator

9.1.11 Alarm contacts shall be provided to allow transmission of fault alarms for any of the above conditions, plus low oil pressure pre-warning, high coolant temperature pre-warning, low coolant temperature, low fuel and an alarm indication when the generator set is running.

9.1.11.1 These alarm contacts shall be wired into, and shall be reported by, the radio network alarm system.

9.1.12 Meters shall be provided and located both at the generator and within the equipment shelter, to indicate output voltage, output current, running time, and frequency/RPM.

9.1.13 An AC rheostat (or electronic equivalent) shall be supplied for fine tuning of the generator's output voltage.

9.1.14 These devices shall be mounted either on the transfer switch door or a separate, remote panel.

9.1.15 Each generator must have the capability to communicate to a central control software terminal, via the IP network, to allow for remote start and other diagnostic capabilities.

9.1.16 Each Diesel-Generator shall have the following fuel supply requirements:

9.1.16.1 The Contractor shall supply a new, corrosion-proof, 750-gallon diesel storage tank to be installed on a concrete or elevated steel foundation, as dependent upon site flood plain conditions.

9.1.16.2 If the fuel tank is located some significant distance from the equipment shelter generator room, the Contractor shall then install a "day tank" adjacent to the generator and sized to sustain operations for a 4-hour period.

- 9.1.16.3** The fuel tank shall provide sufficient fuel to provide five days of continuous operation of the generator set, at full load under low ambient temperature.
- 9.1.16.4** The fuel tank shall have a shield installed above to prevent debris from the nearby tower puncturing or damaging the tank shell.
- 9.1.16.5** The tank shall be refilled after the conclusion of radio network acceptance tests.
- 9.1.16.6** Fuel lines shall be buried below the frost line, as determined by the location.
- 9.1.16.7** A low fuel-level alarm and fuel spill alarm shall be provided.
- 9.1.16.8** All fuel supply lines will be sized accordingly for the generator running at full load.
- 9.1.16.9** All necessary regulators, drip pots, piping, meters, or other supplies needed for installation that meets local fire and building codes shall be furnished and installed.
- 9.1.16.10** Contractor shall supply a full fuel tank at time of System Acceptance.
- 9.1.17** A residential-grade exhaust silencer shall be installed on the generator.
- 9.1.18** Battery and Charger specifications are as follows:

 - 9.1.18.1** An AGM (sealed Gel Battery) starting battery or equivalent, rated for the engine type to be supplied, shall be furnished and installed with the generator package.
 - 9.1.18.2** This battery shall be float charged by a 10-ampere, voltage-regulated charger which is powered by a protected 120VAC source.
 - 9.1.18.3** Float, taper and equalize charge settings shall be provided.
 - 9.1.18.4** Battery charger shall be physically located within the generator transfer switch enclosure.

9.1.18.5 Battery and charger must be able to operate in, as low as, 10-degrees

9.1.18.6 Form-C charging system alarm contacts shall be provided and connected to the network's alarm system to report loss of AC power, low battery voltage and excessively high battery charging current.

9.1.19 The following Cooling System components are required:

9.1.19.1 A radiator-cooled engine is required.

9.1.19.2 The radiator shall be filled with a water/coolant mixture in accordance with the engine manufacturer's recommendations.

9.1.19.3 A thermostatically-controlled water jacket coolant heater shall be provided and installed in accordance with the manufacturer's recommendations.

9.1.20 The Generator Base shall have the following characteristics:

9.1.20.1 The generator set shall be mounted on a heavy-duty steel base which is anchored to a Contractor-furnished building foundation.

9.1.20.2 The base shall maintain alignment between generator set components and shall include vibration isolators.

9.2.0 The Generator Transfer Switch

9.2.1 An automatic transfer switch which provides switching of the equipment shelter electrical load between commercial power and generator power shall be supplied and installed for each Vendor proposed standby generator.

9.2.1.1 Each transfer switch shall be completely factory assembled and shall contain electronic controls designed for surge voltage isolation, with voltage sensors on all phases of both input power sources.

9.2.1.2 Permanently attached manual handles shall also be installed on the transfer switch.

- 9.2.1.3** The switch shall provide positive mechanical and electrical interlocking, and mechanically-held contacts.
- 9.2.1.4** Quick-make and quick-break contact mechanisms shall be provided for manual transfer under load.
- 9.2.1.5** Each transfer switch shall be installed in a key locking, UL listed, NEMA rack to be mounted on a wall within the radio equipment shelter.
- 9.2.1.6** The switch shall be fully wired and integrated with the engine generator set in accordance with local electrical and fire codes.
- 9.2.1.7** A manually-operated transfer switch, as well as appropriate power connectorization, shall be provided to allow the interconnection of an auxiliary, trailered generator set should the permanently-located generator fail in operation, utilizing an Appleton plug.
- 9.2.1.8** All transfer switches and accessories shall be U.L. listed and labeled, tested per U.L. Standard 1008 and CSA Approved.
- 9.2.1.9** Transfer switches shall be double-throw electrically and mechanically interlocked and mechanically-held in both positions.
- 9.2.1.10** Main switch contacts shall be high-pressure silver alloy.
- 9.2.1.11** Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent inter phase flashover.
- 9.2.1.12** Form-C contacts shall be provided in each main switch position for alarm reporting purposes.
- 9.2.1.13** These contacts shall be connected to the network's alarm system for reporting transfer status.
- 9.2.1.14** Each transfer switch shall be continuously rated for operation in ambient temperature ranges of -30 to +105 degrees F.

- 9.2.1.15** Transfer switches shall be rated, minimally, to carry the generator's full rated output, inclusive of the 50% added capacity over calculated equipment loading.
- 9.2.1.16** The Line-In, Generator-In and Load side terminations for the automatic transfer switch shall be protected from lightning transients using a combination of Metal Oxide Varistor (MOV) and avalanche Zener diode technologies.
- 9.2.1.17** All alarm and instrumentation wiring from the generator, that enters the equipment shelter, must likewise include appropriate lightning surge protection in the form of solid-state, fast-acting voltage clamp devices whose clamping voltage is closely matched to normal individual-alarm signal amplitudes.
- 9.2.1.18** Transfer switch control shall be solid state and designed for a high level of immunity to power line surges and transients.
- 9.2.1.19** The device shall be tested in accordance with IEEE Standard 587-1980 (or latest revision).
- 9.2.1.20** Controls shall have optically isolated logic inputs, and isolation transformers for AC inputs.
- 9.2.1.21** Relays shall be installed on all outputs.
- 9.2.1.22** Solid state under voltage sensors shall simultaneously monitor all phases of the standby power source and the commercial power source.
- 9.2.1.23** Pick up and drop out voltage settings shall be adjustable.
- 9.2.1.24** Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase.
- 9.2.1.25** Controls shall be provided with solid state over voltage sensors, adjustable from 100-130% of nominal input voltage to monitor the source.
- 9.2.1.26** An adjustable time delay shall be provided.

- 9.2.1.27** Automatic controls shall signal the engine generator to start upon signal from normal source sensors.
- 9.2.1.28** A time delay start, variable from 0 to 5 seconds, shall be provided to avoid nuisance startups.
- 9.2.1.29** Battery voltage starting contacts shall be gold, dry type contacts which have been factory wired to a field wiring terminal block.
- 9.2.1.30** The switch shall transfer when the emergency source reaches the set point voltage and frequency.
- 9.2.1.31** A time delay shall be provided for transfer that shall be continuously variable from 0 to 120 seconds.
- 9.2.1.32** The switch shall retransfer the load to commercial power after a delay.
- 9.2.1.33** This time delay shall be variable (adjustable) from 0 to 30 minutes to avoid short engine run times.
- 9.2.1.34** The retransfer time delay shall be immediately bypassed if the emergency generator fails.
- 9.2.1.35** A control shall automatically signal the engine generator to stop after a time delay, which shall be adjustable from 0 to 10 minutes, the time starting upon return to commercial power.
- 9.2.1.36** Power for transfer operation shall be from the source to which the load is being transferred.
- 9.2.1.37** Diagnostic indicators shall be provided to allow the last successful step in the sequence of control functions to be pinpointed.
- 9.2.1.38** The present status of the control functions shall also be indicated.
- 9.2.1.39** These functions, at a minimum, shall include:
 - 9.2.1.39.1** Source 1 OK

9.2.1.39.2 Start generator set

9.2.1.39.3 Source 2 OK

9.2.1.39.4 Transfer timing

9.2.1.39.5 Transfer complete

9.2.1.39.6 Retransfer timing

9.2.1.39.7 Retransfer complete

9.2.1.39.8 Timing for stop

9.2.2 A key-operated Front Panel selector switch shall be provided which will provide the following functions:

9.2.2.1 Test to simulate commercial power loss to allow testing of the generator set with or without transfer of the load.

9.2.2.2 Normal - leaves the transfer switch in its normal operating position.

9.2.2.3 Retransfer a momentary position which will provide an override of the retransfer time delay and cause immediate return to the commercial power source (if available).

9.2.3 An Exerciser Clock setting shall be included which allows setting the day, time and duration of a generator set exercise/test period. Tests under load or with no load shall be selectable.

10.0 Tower Requirements

All vendors shall comply with the Customer tower ordinances and local codes in addition to the requirements listed in this RFP.

10.1 Basic Design

- 10.1.1 The basic standard for the design of newly required steel antenna towers, wave guide bridges and supporting structures, shall be ANSI/TIA-222-H.
- 10.1.2 Towers shall be triangular shaped, solid-rod structure having an overall height to be determined by the Vendor, based on the requirements of area coverage and availability of unobstructed microwave paths for site connectivity. Limits of available space in certain areas may dictate the use of self-supported towers.
- 10.1.3 Each tower shall be designed for a minimum sustained 150-mph wind speed with the full complement of necessary antennas and required lights and other Federally-required equipment.
- 10.1.4 Antenna loads shall be as determined by Vendor; however, the design shall include a minimum 30% growth factor in the top 1/3 of the tower, inclusive of microwave antennas. Vendors are encouraged to investigate local tower code information and respond accordingly.
- 10.1.5 All fabricated tower assemblies and parts shall be hot-dipped galvanized after fabrication per ASTM Standard A123. Hardware shall be galvanized per ASTM Standard A153 and B695. Other types of zinc coating or plating are not acceptable.
- 10.1.6 Towers shall be supplied with a full-length transmission line ladder(s) designed to accept transmission lines needed for the proposed design plus a 30% growth factor.
- 10.1.7 Towers shall be equipped with an outside climbing ladder/cable type safety devices and LED lighted in accordance with FAA and current OSHA regulation 29 CFR 1910.27.
 - 10.1.7.1 This device shall not interfere with the ease of climbing from one rung of the ladder to the next.

- 10.1.7.2** There must be at least two sources of climbing safety belts compatible with the safety climb anti-fall system, as supplied with the tower.
- 10.1.8** Tower lighting shall conform to FAA Advisory Circular AC 70/7460-1M, or current revision, Obstruction Marking and Lighting. VHF, UHF and 800 MHz radio equipment may be operational/co-located at the various trunked radio sites. Therefore, it is imperative that only shielded, RFI-conditioned lighting devices be provided.
- 10.1.9** The Vendor shall provide detailed tower lighting equipment specification literature in its response sufficient in scope where The Customer can determine the suitability of the proposed lighting system with respect to planned or anticipated radio operations.
- 10.1.10** The Contractor shall install tower lighting controls in a temporary fixture adjacent to the tower, operated by a photo control, and provide a Form-C contact wired into the alarm panel. (Note: This controller device is to be relocated within the site equipment shelter once fully constructed. Please allow sufficient lighting control cable slack to allow for re-installation inside the equipment shelter.
- 10.1.11** All antennas, tower top amplifier (TTA), and transmission lines specified by the licensed frequencies and Contractor's system design shall be furnished and installed by the Contractor.
- 10.1.12** A site's Electrical Grounding System shall be furnished and installed by the Contractor in accordance with the following minimum practices:

 - 10.1.12.1** Install a ground ring around the base of the tower, consisting of 10'x 5/8" ground rods driven to a depth necessary to meet the required resistance measurement of the specifications, adjacent to the foundation of the tower at each leg.
 - 10.1.12.2** Ground rods shall be interconnected by a minimum #00AWG stranded copper wire, which is to be exothermically welded to the top of each ground rod.
 - 10.1.12.3** Copper wire and ground rods shall be installed in a trench below the local frost line.
 - 10.1.12.4** Maximum spacing between rods shall not exceed twice the length of the ground rod.

- 10.1.12.5** Each tower leg shall be bonded to the ground ring using #00 AWG stranded tinned copper cable, which has been exothermically welded to a flat, 4-inch square solid steel tab located near the base of each tower leg.
- 10.1.12.6** Each cable lead will run to the closest ground rod through an insulated sleeve to minimize wire damage.
- 10.1.12.7** The upper end of the sleeve should be sealed with a non-shrinking compound such as RTV to prevent water from collecting within the sleeve.
- 10.1.12.8** The Contractor shall avoid making any acute bends as the ground wire transitions from the foundation.
- 10.1.12.9** Bends should be a minimum of 9-inches in radius.
- 10.1.12.10** To complete the exothermic welding process, attachment area on the tower tab shall be cleaned and coated with a cold galvanizing compound.
- 10.1.12.12** The ground bar must be tamper and theft resistant. The wire lead must be sleeved so that it is protected from physical damage.
- 10.1.12.13** Like above, the upper end of the sleeve shall be sealed with a non-shrinking compound like RTV to prevent water from entering and collecting within the sleeve.
- 10.1.12.14** This ground wire lead shall be installed at the time the tower ground ring is installed.
- 10.1.12.15** The ground rod/ring system shall extend around the perimeter of the equipment shelter, transmission line copper entrance port into the shelter and to the perimeter fence.
- 10.1.12.16** Ground system ring around the tower base shall be located a minimum of 36 inches away from the tower foundation.
- 10.1.12.17** The tower ground system ring shall be connected to the equipment shelter ground ring in at least two places, on the closest corners of the shelter ring.

- 10.1.12.18** The Contractor shall electrically bond all transmission line outer shields to the structure at the top of the tower immediately below the antenna and at the line midpoint if the tower's height is over 200-feet.
- 10.1.12.19** Likewise, bond all transmission line shields near the bottom segment of the tower, approximately one-foot above the bend made to enter the waveguide-bridge and again at the shelter's antenna entry port/panel.
- 10.1.12.20** Use only transmission line grounding kits approved by the manufacturer for use on the type and diameter of transmission lines provided. All installed grounding kits shall be weather sealed.
- 10.1.12.21** Fencing shall be grounded to the ground ring via #2 AWG solid copper wires, bonded via exothermic welding at each fence post.
- 10.1.12.22** Exothermic welds shall be cleaned and protected with a minimum two coats of cold galvanize material. Gates shall utilize braided, flexible straps.
- 10.1.12.23** The shelter's interior halo ground and transmission line copper inside entrance port (buss bar) shall exothermically bond to the outdoor ground.
- 10.1.12.24** A ground test well shall be provided at a minimum of two locations along the ground loop.
- 10.1.12.25** One test well shall be located adjacent to the tower and the other at the far side of the equipment shelter loop.
- 10.1.12.26** Each test well shall consist of a minimum 6-inch diameter PVC material that extends down to the depth of two feet and shall allow the attachment of a test wire to measure ground resistance.
- 10.1.12.27** A screw on or drop on cover that is easily removable to allow testing shall be provided.

10.1.12.28 Grounding system resistance shall be measured to be 3-ohms or less between any point on the ground system and earth ground.

10.1.12.29 Measurement shall be done with a 4-point ground resistance tester and not by a clamp on resistance tester.

10.2 Guy Wires

10.2.1 Galvanized guy strand shall conform to the minimum requirements of ASTM Standard A475 Extra High Strength (EHS) or equivalent recognized standard.

10.2.2 Prefomed guy grips and dead-ends shall be designed specifically for the length, size and type of cable being used. This shall include the size, number, and lay of the wires and electrochemical compatibility of the material.

10.2.3 An adequate bend radius shall be provided, as per the manufacturer's recommendations, at the inside of cable attachments consisting of a thimble.

10.2.4 Shackles used to connect guy assemblies shall be forged from AISI grade 1035 or 1045 steel or equivalent and suitably heat-treated (quenched and tempered, normalized or annealed).

10.2.5 Turnbuckle devices shall be installed at the anchor end of the guy assembly for adjusting the guy tension. In initial installations, the minimum take-up adjustment available after the structure is plumb and the guy tensions are set shall be 6 inches for guys with normal diameter of 0.5-inches and 10-inches for guys with normal diameter greater than 0.5 inches.

10.2.6 All guy wires shall be bonded to ground rods using, minimally, a #2AWG solid, tinned copper wire. Bonding shall include use of guy wire grounding clamps that are tin-plated bronze (or similar type material) to prevent electrolysis. Grounding attachment clamps shall be installed above the guy wire turnbuckle.

10.2.7 Guy wire anchor plates are to be grounded using, minimally, a #2AWG solid, tinned copper wire that is exothermically welded to the anchor plate. Welds shall be cleaned and treated with cold galvanized coatings to prevent rusting.

- 10.2.8 All guy wires shall include ice clips ahead of the preforms. Turnbuckle safety cables must use a "Figure 8" configuration.

10.3 Required Tower Submittals

- 10.3.1 The Contractor shall furnish wind-load stress, geotechnical reports and foundation calculations used in the design of the proposed tower structure. Existing towers shall be evaluated for structural, electrical grounding and foundation stability, inclusive of identification/resolution of corrosion within tubular members and the suitability to support additional antenna loads as necessary to accommodate the newly added Contractor-furnished equipment.
- 10.3.2 The Contractor shall furnish documentation approved by a registered professional engineer, licensed in the State of Oklahoma certifying that the proposed new tower(s) and foundation(s), as well as required modifications to be made to existing towers, meet the requirements of EIA/TIA-222-H.
- 10.3.3 Prior to initial design review, Contractor shall perform soil pH value testing at all proposed new tower sites.
- 10.3.4 The Contractor shall furnish written certification that all installed tower components on both new and existing towers have been properly constructed and hot-dipped galvanized.
- 10.3.5 The Vendor shall furnish documentation as to any special condition or restriction applied to the use of materials, products or equipment contained in their response.
- 10.3.6 Contractor shall provide to The Customer, a minimum of two sets of completed "as-builts" on each tower and shelter installed or modified in this project. In the case of new structures, this shall include engineering and design documentation from the tower and shelter manufacturer.
- 10.3.7 Installed structural members or welded structural assemblies, except for standard hardware, shall have a part number. The part numbers shall correspond with the Contractor's assembly drawings. Part numbers are to be permanently attached (stamped, welded lettering, and/or stamped on a plate that is welded to the member, etc.) to the member before all protective coatings are applied. Attached/affixed part numbers shall have a minimum character height of 0.50 inches.