

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

VoIP COMMUNICATIONS SYSTEM ..... 2

PART 1 - GENERAL ..... 2

1.1 RELATED DOCUMENTS ..... 2

1.2 SUMMARY ..... 2

1.3 CODES AND STANDARDS ..... 5

1.4 SCOPE ..... 6

1.5 SUBMITTALS ..... 8

1.6 QUALITY ASSURANCE ..... 12

1.7 PROJECT CONDITIONS ..... 13

1.8 DELIVERY, STORAGE, AND HANDLING ..... 14

1.9 SEQUENCING AND SCHEDULING ..... 14

1.10 COORDINATION ..... 15

1.11 SPARE COMPONENTS AND EQUIPMENT DELIVERY AND STORAGE ..... 16

1.12 WARRANTY ..... 16

PART 2 - SYSTEM REQUIREMENTS ..... 18

2.1 MANUFACTURERS ..... 18

2.2 TECHNICAL SPECIFICATIONS ..... 18

2.3 EQUIPMENT SPECIFICATIONS ..... 22

PART 3 - EXECUTION ..... 29

3.1 GENERAL ..... 29

3.2 EXAMINATION ..... 33

3.3 MAINTENANCE ..... 34

3.4 SERVICE ..... 35

3.5 EVALUATION CRITERIA ..... 35

3.6 SOFTWARE AGREEMENT ..... 36

3.7 INSTALLATION ..... 36

3.8 CONSTRUCTION PHASING ..... 40

3.9 COORDINATION ..... 40

3.10 IDENTIFICATION ..... 41

3.11 FIELD QUALITY CONTROL ..... 42

3.12 FAIL TESTING ..... 42

3.13 CLEANING ..... 43

3.14 DEMONSTRATION AND TRAINING ..... 43

3.15 RECORD DOCUMENTATION ..... 43

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

SECTION 273000

VoIP COMMUNICATIONS SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Section apply to work of this section.
- B. Division 26 Basic Electrical Materials and Methods sections apply to work specified in this section.
- C. When included as part of this specification, the following divisions contain related requirements and information that shall be adhered to.
  - 1. Division 26 Electrical
  - 2. Division 27 Communications

1.2 SUMMARY

- A. Equipment Installation
  - 1. The Contractor shall provide all required labor necessary to physically install the equipment and components specified in this specification. This includes connection to power systems, grounding, and telecom/data patching of low voltage systems included in this specification. The Contractor shall coordinate any Union Labor requirements associated with this project with the Owner and Construction Manager. The Contractor shall include all such cost in their scope of work and contract.
  - 2. As part of the Contractors bid there shall be a list of Add Alternates as stated throughout this specification. Contractor shall provide complete pricing, including but not limited to: pricing of equipment, bundles, software, labor, etc. Refer to section 1.13 in this specification for more details on bidding requirements.
  - 3. Due to the early nature of this RFP, Owner is requesting a technology roadmap to cover hardware/software updates, changes between date of RFP response and system implementation in July 2016. Owner is requesting a firm bid with a guarantee of latest software and hardware delivered at time of installation.
- B. Extent of VoIP Communications System is hereby defined to include, but not by way of limitation, the provisions of:
  - 1. The term "provide" used throughout this specification and drawings shall mean "furnish and install".
  - 2. All equipment and software as part of the VoIP Communication System is to be provided as **new** and shall not include any used or existing hardware.
  - 3. In general, communications cable infrastructure is provided as part of the base building and included in a separate section of the specifications and drawings. This includes the patch cords inside the Comm Rooms, backbone topology including all copper, single-mode and multi-mode fiber optic cable and terminations from each communications room ("Comm Rooms") and the main communications room (MC).

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

Additionally, horizontal topology including all Cat. 6A UTP from all communication outlets to the nearest Comm Room. Refer to the following specification sections.

- a. 27 11 00 – Common Work for Communications
  - b. 27 13 01 – Fiber Optic Backbone Cabling
  - c. 27 13 02 – Telecommunications Backbone Cabling
  - d. 27 15 01 – Horizontal Cabling
  - e. 27 21 00 – Enterprise Network Switching and Routing System
  - f. 27 21 00 – Enterprise Wireless Network System
  - g. 27 33 53 – Technology Uninterruptible Power Supply (UPS)
4. Coordinate project schedule, installation schedule, phasing and any other requirements deemed necessary with Construction Manager and/or General Contractor and all necessary trades to ensure successful completion of work.
  5. Providing for a complete, fully functioning, and physically/electronically secure VoIP communication system, and include but not be limited to the following:
    - a. Primary Call Processor with licensing and operating software
    - b. Redundant Call Processor with licensing and operating software
    - c. Connectivity to the Public Switched Telephone Network (PSTN) via Router or Gateway
    - d. Analog Station Support (FAX, TTY, other analog devices)
    - e. Endpoints with Licensing
      - 1) IP Endpoints supported by PoE+ switches
      - 2) Analog Ports for FAX machines and misc. devices
      - 3) Audio Conference Units for conference rooms
      - 4) Attendant Positions for reception areas
    - f. Wireless Handsets
    - g. Wireless Mobile Devices to work across 802.11a/c wireless network
    - h. Add-on/Expansion Modules
    - i. Patch Cords for all connections in the Data Center and all Comm Rooms which connect the VoIP system specific equipment; note that patch cords for the LAN equipment will be provided under the Structured Cable Specification already awarded
    - j. Patch Cords for all work station connections to IP Endpoint
  6. Other Applications with required redundancy for physical separation
    - a. Voice Messaging Application
    - b. Unified Messaging
    - c. Unified Communications (SIP applications)
    - d. E911 Application
    - e. Contact Center Application
    - f. Call Accounting Application
  7. VoIP communication system Programming/Configuration:
    - a. Endpoint / Station Programming (User/Role-Based)
    - b. VoIP VLAN Coordination/Assignment
    - c. Call Processing Software Configuration
    - d. Voice Messaging Software Configuration
    - e. Unified Messaging Setup/Coordination
    - f. Phone Placement/Coordination
    - g. Custom XML Application Development and Coordination
  8. Full system coordination with Owner and Engineer
  9. This specification is intended to establish the minimum performance criteria for providing a VoIP communication system. The contractor shall coordinate all system and performance, components and criteria with Owner to ensure project requirements and intent are maintained.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

10. This specification is not intended to contain proprietary information or requirements based on any specific manufacturer system. Any proprietary information included in this specification is unintentional.
11. Weather proof enclosures for telephone handsets and other equipment installed outside or in exterior areas subject to outdoor weather conditions must be included.
12. All cabling infrastructure specific to the VoIP system between the cross-connect and/or patch panels in communications rooms and the VoIP communication system.
13. All physical cable management hardware including, but not limited to D-rings on backboards, wire-ties under this scope of work.
14. Provide all necessary coordination and service requirements with the Owner's preferred Telephone, Carrier Neutral WAN Telecommunications and Internet Service Provider as required to interface equipment.
15. Coordinate all support systems requirements such as architectural, HVAC, electrical, and technology systems.
16. All phasing, temporary distribution/equipment, cutover and implementation shall be coordinated with Construction Manager and Owner.
17. Provide all physical installation of all equipment in cabinets and racks under this scope of work.
18. Device placement. Coordination with owner for final placement of devices.
19. All necessary electronic equipment setup, programming, and configurations. Coordinate with the Owner to establish system programming and configuration requirements.
20. The contractor shall provide, furnish, and install all required patch cords within the VoIP system elements. All patch/wall cords to interconnect end devices to wall outlets, data network to VoIP servers, data network to service provider equipment or hand-off, etc. for work associated with this scope.
21. Connection from power supplies to electrical power receptacles located on walls, UPS, PDUs, and/or vertical power strips.
22. Bond all equipment and components to the nearest telecommunications grounding bus (TGB) bar per Manufacturer recommendations and building code requirements.
23. The VoIP communication system shall be field tested and verified, certified, and guaranteed upon installation. Testing shall include equipment, components, and infrastructure per industry standards, Manufacturer recommendations, and as per this specification.
24. Labeling of all system equipment within this scope, components, hardware, cable, and terminations with mechanically printed labels.
25. Preparation and submission of formal submittals required by project including but not limited to product data, shop drawings, testing reports, as-built drawings, manufacturer user manuals and cabling documentation as required in this specification, including but not limited to rack elevations and mounting details.
26. Contractor and Manufacturer installation and equipment warranties.
27. Manufacturer equipment, components, and solutions warranties for all equipment, components, software, and infrastructure.
28. Onsite administrative and end user training.
29. Manufacturer training of equipment and components.
30. Preparation of maintenance plan recommended by system Manufacturer.
31. Spare parts required for immediate onsite maintenance and troubleshooting to maintain 100% availability during events. See Section 1.11 in Part 1.
32. Coordination with owner and 911 for configuration of E911 application. Vendor is required to populate for the data base including the Intrado system. Vendor shall provide all equipment and programming. See Part 2, Section C.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

C. Standards and Codes

1. The installation of the VoIP communication system shall comply with all local building codes, authority having jurisdiction (AHJ), FCC, BICSI, EIA, IEEE, NEC, TIA, UL, and other industry standards, codes and methods.

1.3 CODES AND STANDARDS

A. All work including materials and installation shall conform to all applicable sections of currently adopted editions of the codes and standards listed below or the codes, standards and specifications published by the organizations listed below:

1. Uniform Building Code (UBC).
2. State and local codes.
3. ANSI: American National Standards Institute (ANSI).
4. ANSI/TIA-526: Standard Test Procedures for Fiber Optic Systems.
5. ANSI/TIA-568-C: Commercial Building Telecommunications Cabling Standard.
6. ANSI/TIA-569-AC-2012: Commercial Building Standard for Telecommunications Pathways and Spaces.
7. ANSI/TIA-606AB-2012: Administration Standard for Commercial Telecommunications Infrastructure.
8. ANSI/TIA-607-B-2013: Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
9. ASTM: American Society for Testing and Materials
10. BICSI TDMM Telecommunications Distribution Methods Manual (current edition).
11. BICSI Wireless Design Reference Manual (current).
12. ANSI/TIA-1152-2009: Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling.
13. Federal Specification Compliance: Comply with applicable requirements of FS W-C 586, "Electrical Cast Metal Conduit Outlet Boxes, Bodies, and Entrance Caps."
14. ICEA: Insulated Cable Engineers Association.
15. IEEE: Comply with applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141 and 142 pertaining to grounding and bonding of systems, circuits and equipment.
16. IEEE-802.11 a, b, g, n, ac: Wireless Local Area Networks
17. IEEE-802.3: 10Mb/s, 100Mb/s, 1Gb/s, and 10 GbE Ethernet Standards as applicable based on media types (twisted pair copper, fiber optics, etc.).
18. IEEE-802.3ak: 10 GbE Ethernet (evolving copper standard).
19. IEEE-802.3af: Power-over-Ethernet (PoE).
20. IEEE-1100-2005: Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.
21. IEEE-141: Comply with applicable requirements for installation of cable tray systems.
22. IEEE-241: Recommended Practice for Electric Power Systems in Commercial Buildings.
23. ISO/IEC 11801: International Standard on Information Technology – Generic Cabling of Customer Premises.
24. NEC: Comply with applicable local electrical code requirements of the authority having jurisdiction, and the NEC as applicable to electrical boxes and fittings, cable tray systems, and grounding and bonding, pertaining to systems, circuits and equipment.
25. NESC: National Electrical Safety Code.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

26. NEMA: Comply with applicable requirements of NEMA Stds/Pub No.'s OS1, OS2 and PUB 250 pertaining to raceways, outlet and device boxes, covers, and box supports.
27. NEMA: Comply with NEMA Stds/Pub No. VE 1 "Cable Tray Systems".
28. NFPA-70/NEC: National Electrical Code.
29. NFPA-70B: "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable tray systems.
30. UL Compliance: Provide components which are UL-listed and labeled.
31. UL Compliance: Comply with applicable requirements of UL 50, UL 514-series, and UL 886 pertaining to electrical boxes and fittings.
32. UL Compliance: Comply with applicable requirements of UL Standards No.'s 467, "Electrical Grounding and Bonding Equipment", and 869 "Electrical Service Equipment", pertaining to grounding and bonding of systems, circuits and equipment. In addition, comply with UL Std 486A, "Wire Connectors and soldering Lugs for Use with Copper Conductors." Provide grounding and bonding products which are UL-listed and labeled for their intended usage.

- B. Where there is a conflict between the code and the contract documents, the code shall have precedence only when it is more stringent than the contract documents. Items that are allowed by the code but are less stringent than those specified on the contract shall not be substituted.

1.4 SCOPE

A. General

1. This work is to provide a complete, fully-functioning, and turn-key VoIP communication system that support real-time, e911, and store-and-forward voice messaging.
2. Major system components and performance requirements have been listed in this specification. The Contractor shall provide all components necessary for a complete and fully functioning system.
3. All hardware, firmware, operating systems, application software, and client licenses shall be included for a fully operational and turn-key voice communication system meeting and/or exceeding the performance criteria herein.
4. Requirements for any alternates are noted in this specification and must be submitted as an alternative to the specific requirement by the Contractor. All alternates must be reviewed and approved by the Owner. Any changes or alternates shall be included within the project schedule once approved by Owner.

- B. The voice communication system shall be a pure IP based system referred to as Voice over Internet Protocol (VoIP). Voice streams shall be digitized and packetized into IP datagrams between a VoIP call server and VoIP end-point (e.g., IP telephone or IP mobile phone). With both voice and data IP traffic, prioritizing VoIP network traffic through the IP data network is critical for optimal performance. With data traversing the IP data networking in support of broadband communication, segmentation of VoIP traffic from multi-media data traffic is critical. The VoIP communication system shall function and offer users the same fundamental features and functions as any legacy PBX voice communication system.

- C. The awarded vendor will need to accommodate the needs of the MSFA and the MN Vikings; SMG, the Stadium Operator; the concessionaire; and technology and building automation system providers who will connect to the VoIP system. Your proposal should anticipate pre-opening AMC work based on MSFA, NFL and MN Vikings reviews. As a multi-purpose stadium, additional on-going adjustments will be required periodically. Contractor shall propose optional on call AMC support services.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- D. Awarded contractor shall include costs for a technical representative to be on-site during the first year for all major events. Contractor shall assume 20 events with 8 hours per event. VoIP configurations will be reviewed and Contractor may be required to fine-tune the system following each home game during the first three months of the primary NFL football season.
- E. Contractor shall also provide a per event unit price on the attached pricing form.
- F. System
1. The VoIP communication system shall be a complete, fully functioning, turn-key, voice communication system physically/electronically secure, and include but not be limited to the following all items noted in Part 1, Section 1.2, Item B6.
  2. Refer to Part 2 – '**System Requirements**' for additional requirements.
  3. Communications Infrastructure:  
The system shall function utilizing the communications infrastructure and topology noted below. The Structured Cable Infrastructure is currently provided by others as a separate contract as part of the Base Project. The VoIP communication system shall be coordinated with this infrastructure. The Contractor shall obtain all necessary documentation to ensure VoIP design and installation complies with this requirement. The Contractor shall coordinate VoIP communication system requirements with Base Project Contractor providing infrastructure to ensure all requirements are met.
  4. Horizontal Distribution:  
Category 6A (Augmented) UTP cable supplied by the Structured Cable Infrastructure Contractor and is routed from multi-port communication devices to the nearest Intermediate Communications Room. Cables are terminated at each end with equivalently rated RJ-45 jacks. Other specification sections note communications infrastructure requirements. Patch cords of equal or greater capacity shall be provided by the Structured Cable Infrastructure Contractor to connect end-point devices to the physical LAN switches and IP data networking infrastructure. VoIP desktop phones will connect to PoE+ powered RJ-45 ports for power, physical connectivity, and IP address assignment.
  5. Backbone/Riser Distribution:  
Each Intermediate Communications Room has single-mode OS2 fiber optic cables originating from the Main Communications Room for interfacing LAN switch uplink connections between Core Backbone Switches and Edge Access Switches. Other specification sections note communications infrastructure requirements. Patch cords of equal or greater capacity shall be provided by the Structured Cable Infrastructure Contractor who will also be responsible for making the physical connection (e.g. insertion of RJ45 patch cables and dressing them) with planned cable infrastructure and Data Network Equipment.
  6. Patch Cords:  
This shall include end-point equipment; IP telephone, workstation or desktop computer, connection of VoIP call servers, telecommunications service provider connections (PSTN and WAN), and analog terminals and connections where required.
  7. Electrical Power and Uninterruptable Power Supply (UPS):
    - a. Electrical Power and UPS equipment are being provided by others under a separate contract as part of Base Project in the Main Communications Room and all Communications Rooms.
    - b. The Contractor shall coordinate all power and UPS requirements with the Base Project Contractor providing electrical systems and UPS equipment to ensure all requirements are met for proper shutdown of production servers

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

and cloud infrastructures for this scope and notify Base Project Contractor and Owner of any additional requirements.

- c. UPS provided by the Base Project Contractor shall maintain a minimum of 15-minute runtime or necessary to ensure cutover to emergency generator power.
- G. The VoIP communication system shall include peripheral devices, station equipment, wire and cable, servers, memory, storage, software, distribution frames and all other necessary ancillary equipment.
- H. The VoIP communication system shall be fully scalable to add future users to accommodate large events such as and including Super Bowl capacity requirements and to interface with remote sites as may be required to provide seamless operation and continuity without major upgrade of changing current protocols, software, and hardware. System shall have a minimum 30% capacity increase to support any voice-related requirements for large events with no additional equipment or software licenses required.
- I. The VoIP communication system shall provide back-up control and storage in the event of serious system malfunction utilizing redundant servers for all call servers, voice mail servers and other key components as necessary for call switching. The VoIP communication system shall also be of the current standard production of the Manufacturer at the time of the proposal continuing through to implementation in June of 2016 and shall be expandable in design to meet large scale events including the Super Bowl without replacing the primary servers, processors, software and primary systems.
- J. The Contractor is required to supply the latest version of software, providing all the features enumerated in this specification, at the time of contract award and guarantee current software at time of installation in June of 2016. The equipment must be an off-the-shelf, commercially available solution that meets or exceeds all FCC and UL requirements.
- K. The scope of work and services will be for a complete turnkey and fully operational system. The Contractor will be responsible for interfacing the system to the PSTN including local exchange carriers (LEC), competitive local exchange carriers (CLEC), and inter-exchange carriers (IXC), as designated by the Owner. The Contractor shall also list the FCC and UL registration/listing numbers and guarantee the equipment is certified/registered for direct connection to the public switched network.

## 1.5 SUBMITTALS

### A. General Description and Requirements:

1. In addition to the requirements noted herein, refer to Division 1 Specification for additional requirements.
2. Within 15 days after award of contract or as dictated by the construction schedule (whichever period of time is shorter), the Contractor shall submit prefabrication submittals consisting of product data, compliance matrix and shop drawings for approval. Partial submittals will not be accepted without prior written approval from the Owner. Coordinate all submittal dates with Construction Manager.
3. Review of the Prefabrication Submittals by the Owner is for purposes of tracking the work and contract administration and does not relieve the Contractor of responsibility for any deviation from the Contract Documents, or from providing equipment and/or services required by the Contract Documents which were omitted from the prefabrication submittals.



MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

4. No portion of the project shall commence nor shall any equipment be procured until the prefabrication submittals have been approved in writing by the Owner and Construction Manager. All installations shall be in accordance with the Contract Documents. Note that the implementation of this project is expected to occur in 2016.
  5. Prefabrication submittals shall be accompanied by a letter of transmittal identifying the name of the project, Contractor's name, date submitted for review, and a list of items transmitted.
  6. Contractor shall refer to other parts of this section, for details on specific submittal requirements. A submittal shall not be considered complete until all requirements of this section are completed.
  7. In addition to submitting as required by the Construction Manager and the Owner, the contractor shall provide all submittal documentation electronically for review.
- B. Bid Documents: Refer to Section 1.13 Bid Information for additional requirements.
- C. Compliance Matrix: Provide a specification compliance matrix indicating compliance or deviation for each item in the specification. Any deviations shall be fully explained including proposed change. Compliance Matrix shall be submitted along with Contractors bid. Refer to Section 1.13 Bid Information section later in this specification for additional requirements.
- D. Bill of Materials:
1. Provide a detailed Bill of Materials including all equipment, cables, components, firmware/software, and other options.
  2. Information shall be listed in specific categories according to equipment type and include a basic description, quantities, retail price, extended price, total price, labor hours, labor costs, etc.
  3. List all Equipment Alternates separately at end of report. This should include add and deduct alternates. Alternate pricing shall include all associated costs, including but not limited to: labor, patch cords, and any miscellaneous parts or accessories required to complete the Alternate.
  4. List all Equipment Maintenance and Support items separately at end of report and specify the annual cost for enabling the maintenance and support services agreement for each item.
  5. Provide Unit Cost for each piece of equipment, accessories, and labor so that the Owner may select that equipment during the project to meet expanding or declining requirements.
  6. Refer to Section 1.13 Bid Information section later in this specification for additional requirements.
- E. Product Data: The VoIP communication system Product Data Submittal shall be submitted prior to starting any work for review and approval by Owner. Information shall include detailed manufacturer's specifications for each component to be installed. Submittal shall include a list of every component with Manufacturer's part numbers referenced. Manufacturer data sheets with features, options, ratings, and performance must be included. Product numbers and options to be provided and installed shall be highlighted with a color marker as part of the Product Data Submittal.
1. Component List: Provide complete submittal component list at the beginning of the submittal package. Component list shall identify each component name, manufacturer, and specific product/part number. All part numbers shall clearly indicate special options, color, accessories, etc.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

2. Cut-Sheets: Submit manufacturer's cut-sheets on all components listed within this specification and corresponding appendix. All components and parts being used shall be highlighted in color or clearly underlined on cut-sheets to distinguish specific product/part numbers, options, colors, accessories, etc. Cut sheets shall be submitted in the same order of the Component List.
  3. Product Substitutions: This specification is intended to be performance based, thus requirements and products noted are benchmarks. The Contractor may substitute manufacturers and models that may be more cost effective or readily available. All substitutions shall meet or exceed the minimum functional, physical, and technical specifications. Acceptance of such substitutions is at the discretion of the Owner. Additionally, the requirements of Division 1 Specifications shall apply and may supersede requirements noted herein.
  4. Schedule: A detailed schedule shall be submitted with the pre-installation submittals. The schedule shall include the expected timelines, for ordering, shipping, burn-in, configuration, installation, acceptance, and training. The schedule shall be coordinated with the Construction Manager and Owner. Schedule shall be delivered as a complete project plan including tasks to be assigned, milestones, and deliverable dates. The schedule shall be represented with a Gantt chart or similar method.
  5. Warranty Information: Provide all warranty information as described in this specification section for review and approval including the warranty period. If there are any extended warranty options, please specify as part of the Bill of Materials submittal as described above. A 1-year warranty is the minimum requested for the system in this specification, additional costs must be identified in the Bill of Materials if any apply.
  6. Product Certificates: Signed by manufacturers of systems certifying that products furnished comply with requirements.
  7. Installer Certificates: Provide manufacturer certification signed by manufacturer certifying that installers have been trained to install all components of the system and comply with manufacturer's requirements.
- F. Coordination Data: A detailed equipment and component schedule with supporting manufacturer cut-sheets shall be developed for all equipment, components and options for architectural, engineering, and construction coordination. These documents shall include electrical requirements (volts, phase, amps, power consumption, receptacle configuration, etc.), UPS requirements, heat dissipation, temperature operating range, target operating temperature, physical equipment sizes (LxWxH), equipment deployment weight, etc.).
- G. Shop Drawings: The VoIP Shop Drawings shall be submitted prior to ordering of any equipment and starting of any work. Shop drawings are submitted for review and approval by Owner. Additionally, Shop Drawings shall be used for coordination with Construction Manager and Trades by this installer. Information shall include all drawings necessary to present installation intent including diagrams, plans, enlarged plans, elevations, sections, details, and interface to other work or systems.
1. Legend Sheet: Provide drawings including descriptions of all abbreviations and symbols.
  2. VoIP Network Topology Diagram and Spreadsheets: Provided drawing and spreadsheets of all major components located in main communications room, data center, and typical intermediate Comm Rooms. Drawings and spreadsheets shall include relevant information such as room numbers, equipment number and references, LAN switch and port number, LAN switch uplinks, bandwidth, panel numbers, and uplink bandwidths required for the VoIP system and associated devices.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

3. Floor Plans: Provide scaled plan drawings based on architectural backgrounds provided and structured cable infrastructure backgrounds indicating equipment and locations. Note that drawings will be provided in Revit format. Drawings and spreadsheets shall include all relevant information such as room numbers, equipment numbers and references, patch panel numbers, etc.
  4. Enlarged Plans: Provide enlarged scaled plan drawings for equipment layouts in communications rooms. Equipment shall be clearly labeled including numbers and references.
  5. Elevations: Provide scaled drawings for elevations of all equipment layouts in the data center, communications rooms, racks, and cabinets associated with this scope. Equipment shall be clearly labeled including numbers and references. Note that base CAD/Revit templates of the cabinets/racks will be made available to the Contractor.
  6. Details: Provide detail drawings as required to show components requiring greater detail.
  7. Labeling: Provide documentation of all equipment and component labeling as per the Owners requirements and drawings.
  8. Schedule: A detailed schedule shall be submitted with the shop drawings. The schedule shall include the expected timelines for ordering, shipping, burn-in, configuration, installation, acceptance, and training. The schedule shall be coordinated with the Construction Manager and Owner.
- H. As-Built Drawings and Spreadsheets: The VoIP communication system As-Built Drawings and spreadsheets shall be submitted after completing work to the Owner. As-Built Drawings shall indicate final installation of system. Information shall include all drawings necessary to present final installation intent including diagrams, plans, enlarged plans, elevations, sections, details, and interface to other work or systems.
1. Legend Sheet: Provide drawings including descriptions of all abbreviations and symbols.
  2. VoIP Communication and Network Topology Diagram: Provided drawing of all major VoIP infrastructure components located in main communications room, data center, and typical intermediate Communications Room. Drawings shall include relevant information such as room numbers, equipment number and references, LAN switch name/number, LAN switch port used for VoIP connections, LAN switch uplink connections, and aggregate uplink bandwidth.
  3. Floor Plans: Provide scaled plan drawings based on architectural background indicating equipment and locations. Drawings shall include all relevant information such as room numbers, equipment numbers and references, patch panel numbers, etc.
  4. Enlarged Plans: Provide enlarged scaled plan drawings for equipment layouts in communications rooms. Equipment shall be clearly labeled including numbers and references.
  5. Elevations: Provide scaled drawings for elevations of all equipment layouts in communications rooms, racks, and cabinets. Equipment shall be clearly labeled including numbers and references. Note that base CAD/Revit templates of the cabinets/racks will be made available to the Contractor.
  6. Details: Provide detail drawings as required to show components requiring greater detail.
  7. Labeling: Provided documentation of all equipment and component labeling as per the Owners requirements and drawings.
  8. Test Results: Provide all final test results in a table or matrix. Indicate Equipment Type, Number, and Room Number. Contractor is required to list in full all proposed testing included in this scope including but not limited to full dial tone, phone set

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

pre-programming features/functions, unified communications/messaging including interfaces with email servers, contact center functionality, 911 functionality, wireless integration, LAN/WAN and power failure/business continuity testing.

9. VoIP Network Connectivity: The VoIP communication system Contractor shall be required to work with the Data Network Vendor and Owner on implementation of the IP addressing schema (note that IP addressing will be based on IPv6), VLAN assignments, network traffic shaping and/or prioritization (e.g., priority queuing, QoS enablement, etc.), handset configurations, interface configurations, as well as documentation of any special configuration performed during final troubleshooting. LAN/Data Network vendor and Owner shall be responsible for Owner's IP addressing schema and standard design of the LAN. Installation sequencing shall be in order starting with Cable, LAN/Data Network, Wireless Network and then VoIP communications system. Contractor shall abstract all configuration information to be free from passwords.
  
  - I. Field Test Reports: Indicate and interpret test results for compliance with performance requirements of installed systems. Contractor is required to submit a full test plan along with the RFP response including full definition of what will be provided in the Field Test Reports. Owner will have final approval on proposed test plans.
  
  - J. Call Processor Component Failure Tests: Test shall be performed from a station with each handset type connected to an access layer switch:
    1. Call Processor Fail Over – Link Failure
    2. Call Processor Fail Over – Power Failure
  
  - K. Maintenance Information: Provide Maintenance Manuals for the VoIP communications system and components as specified in Division 1. Maintenance information shall include the following:
    1. Detailed operating instructions covering operation under both normal and abnormal conditions.
    2. Routine maintenance requirements and schedule for system components.
    3. Lists of spare parts and replacement components recommended being stored at the site for ready access. Any options for spare parts and replacement components shall be listed in the Price Proposal/Cost as a separate line item.
  
  - L. Warranty Documentation: Provide warranty information on all equipment, components, firmware, operating systems, application software, and labor. This shall include time period, contact information, and processes. Any options for an extended warranty or agreement should be included in the Bill of Materials section as an option with annual pricing.
- 1.6 QUALITY ASSURANCE
- A. VoIP Communication System Contractor Qualifications: An experienced Contractor who is a certified and authorized representative of the Manufacturer, for design, installation, warranty, support and maintenance of units required for this Project, to supervise installation of the system.
    1. Contractors with at least five (5) years of successful installation experience with projects utilizing the proposed VoIP communication system.
    2. The Contractor shall have a fully staffed office with technical installations support personnel that can be at the project site within one (1) hour in the event of an

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

emergency. On-site technical support must be proposed as an option for major events.

3. The Contractor shall be a currently certified reseller and installer of the Equipment and Components Manufacturer and shall provide a warranty on installation/applications. Refer to Warranty Periods for additional requirements.
4. The Contractor shall be a current certified reseller and installer of the proposed VoIP communications system and shall provide warranty on installation/applications. Refer to Warranty Periods for additional requirements.
5. The Contractor shall have certified technicians who are certified by the manufacturer, assigned and physically located in the Twin Cities metropolitan area and who are experienced in providing technical services of similar scope. The Contractor's design shall be reviewed and signed off by the manufacturer's engineers as appropriate.
6. References shall include successful implementation(s) of a similar large scale, complexity and mission critical venue.

B. Manufacturer and Product Qualifications

1. Provide products from manufacturers regularly engaged in the production of Enterprise VoIP communication systems.
2. Provide products from manufacturers whose products of similar types, capacities, and characteristics have been in satisfactory use in similar type projects for not less than five (5) years.

C. Products and Substitutions: All manufacturers' products complying with requirements may be considered. All manufacturer solutions, products, and components proposed and/or substitutions shall be submitted at bid time for review and approval by Owner and Engineer. Cost changes including additions, deduction, or no changes shall be submitted for all items.

D. Alternates: All requested, manufacturer, and/or Contractor proposed alternates shall be submitted at bid time for review and acceptance by Owner. Cost changes including additions, deduction, or no changes shall be submitted for all items.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use. All materials shall be Underwriters Laboratories (UL) Listed unless otherwise noted or required by AHJ.

1.7 PROJECT CONDITIONS

A. Prior to submitting a proposal, the Contractor shall inspect the Contract Documents, and shall become fully informed as to laws, ordinances, regulations and union jurisdictions affecting the project. The Contractor shall immediately bring to the Owner, Construction Manager, and Engineer's attention, in writing, any existing condition or statute that contradicts, is in conflict with, or negates the Contract Documents. Failure of the Contractor to become fully informed as to all above mentioned items shall in no way relieve the Contractor from any obligations with respect to their proposal.

B. The VoIP communications system drawings depict locations of major equipment and components, etc. in a schematic manner. Field conditions and coordination with related trades may warrant relocations of field devices and equipment. No additional compensation will be allowed due to these revisions.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- C. System components and equipment shall be rated for the environments where installed. Normal temperature range requirements for each area within the project will be identified per the following categories noted below.
1. Exterior Areas: -20 to +140°F (-29 to +60°C)
  2. Interior Areas-Seasonal: +32 to +104°F (0 to +40°C)
  3. Interior Areas-Temp Controlled: Typ. 72°F (22.2°C) but range up to +50 to +104°F (+10 to +40°C)
  4. Riser Shafts: -20 to +140°F (-29 to +60°C)
  5. Communication Rooms: Typ. 69°F (20.5°C) but range +32 to +104°F (+0 to +60°C)

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall be responsible for acceptable delivery, storage, and handling of all equipment, components, and options.
- B. Deliver equipment and components in factory-fabricated containers or wrappings, which properly protect equipment from damage.
- C. Handle equipment and components carefully to prevent damage including but not limited to breakage, denting or scoring of surfaces, etc. Do not install damaged units or components; replace with new.
- D. Store equipment and components in original packaging in a dry clean space. Store inside in a well-ventilated space protected from construction traffic, weather, moisture, soiling, humidity, and extreme temperatures. Equipment storage shall comply with Manufacturer specifications for each piece of equipment, component, and option.
- E. All equipment installation shall be coordinated and approved by the Owner and Construction Manager. Electronic communications equipment such as VoIP call servers, call processors, voice mail, unified communications and contact center systems are highly sensitive to dirty environments. Examples, such as drywall compound sanding; is always a problem and can shorten the life of the equipment and void the warranty due to dust. HVAC systems shall also be fully functioning without interruption to ensure the specified temperature range. Equipment shall only be installed when stable power distribution is available with UPS equipment installed. Additionally, equipment shall only be installed in rooms that are physically secure to prevent theft and tampering.

1.9 SEQUENCING AND SCHEDULING

- A. All work shall be reviewed and coordinated with the Owner and Construction Manager prior to commencing.
- B. VoIP communication system equipment and infrastructure are sensitive to environmental conditions including but not limited to temperature, dirt, dust, and water. The contractor shall ensure the storage and installation of all system components are sequenced and scheduled accordingly to prevent any damage, loss of performance, and warranty void of such systems. All mis-handling of items including delivery, storage, handling, and installation of equipment and components shall be replaced with new and re-installed at the Contractors' expense.
- C. The contractor shall not deliver, store, handle, and/or install any equipment or component in a manner that will degrade system performance, reduce life span, and/or void Manufacturer's

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

Warranty. All such items shall be brought to the attention of the Owner and Construction Manager.

- D. Coordinate installation with Tele/Data, Structural, Electrical, HVAC, Plumbing, Fire Protection, and other trades to eliminate disruption and/or conflict with other systems.
- E. Sequence installation of VoIP Network and infrastructure with other work to minimize or eliminate the possibility of damage and soiling during remainder of construction.
- F. Each vendor that is awarded the cabling infrastructure, LAN network, WLAN network, and VoIP communication system must communicate and work with the other vendors during installation, implementation, testing, and final acceptance readiness.

The sequencing of stadium's technology infrastructure implementation will be coordinated with the General Contractor and will include but is not limited to

:

- 1. Cabling Infrastructure
- 2. LAN IP Data Network Infrastructure
- 3. WLAN Infrastructure
- 4. DAS and Wi-Fi Systems
- 5. Building Automation Systems
- 6. Security Systems and Control Rooms
- 7. VoIP Communications System
- 8. Broadcast and AV Infrastructure, Systems and Control Rooms
- 9. IP TV System and Monitors

Testing and final acceptance readiness must be coordinated between the Cabling Infrastructure vendor and the LAN IP data network provider. Testing and final acceptance readiness for the LAN and WLAN infrastructure and VoIP communication system must be coordinated between the VoIP communication system vendor and both the LAN Data Network provider and WLAN infrastructure provider. Each vendor will work with the other vendors to ensure that a complete, end-to-end, IP communications infrastructure is enabled in accordance with the requirements and specifications as stated in this document.

#### 1.10 COORDINATION

- A. Coordinate Work of this Section with the requirements of Owner and Construction Manager.
- B. Coordinate layout and installation of the VoIP communication system equipment with other equipment and electronics that are to be housed within the communication room where other facility infrastructure equipment may be installed. This may include but not be limited to light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- C. Coordinate location of equipment in the communication rooms and spaces with the Owner.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

1.11 SPARE COMPONENTS AND EQUIPMENT DELIVERY AND STORAGE

- A. Contractor shall have available appropriate spare components and equipment, such as power supplies, voice gateways, phones, etc., before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver spare components and equipment to Owner.

1.12 WARRANTY

- A. The warranty requirements shall comply with Division 1 and as noted in this Section. Any conflicts shall meet the most stringent required unless approved otherwise by Owner.
- B. Warranty Periods: Provided below are the minimum warranty period requirements for this work.
  - 1. Contractor Installation and Labor: 1-year.
  - 2. Manufacturer's Electronic Equipment and Components: 1-year.
- C. The Warranty Period shall not start until Owner's written acceptance of system. Acceptance shall not be considered until system is fully operational, fully tested per the Owner approved VoIP communications system test plan, problems corrected and system requirements and performance are verified by Owner.
- D. The Contractor shall provide Installation and Warranty against defects in material and workmanship from time of system Owner acceptance of the installed system. Warranty shall include all parts and labor required to honor the warranty.
- E. The Manufacturer shall provide Electronic Equipment and Components Warranty for all hardware, firmware, operating system, and application software proposed or equivalent maintenance coverage.
- F. A warranty on the Work shall be provided by the Contractor for the terms noted in the Warranty Periods section. If, within the warranty period after the date of final acceptance of the installation or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents or provided by a Manufacturer, any of the work or equipment is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly including all parts and labor after receipt of notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. This obligation shall survive termination of the contract. The Owner shall give such notice promptly after discovery of the condition. Such notice shall be provided by Owner representatives, to be identified, either verbally or in writing.
- G. The Manufacturer shall provide an Infrastructure Warranty as noted in Warranty Periods section for all communications cable infrastructure components provided as part of this scope only; warranty for the overall Structured Cable Infrastructure is covered by others and not part of this scope. This warranty shall cover all components including cable, terminations, patch panels, and wiring panels, etc. to maintain the specified performance and physical criteria as provided as part of this scope. Any such components, link, or channel shall be replaced by the Manufacturer at no cost to Owner during this period. The Contractor and Manufacturer shall submit all information and documentation on Warranty.
- H. Nothing contained in the Contract Documents shall be construed to establish a shorter period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents or any manufacturer's warranty. The establishment of the time period of



MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

warranty after the date of final acceptance or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to the specific obligation of the Contractor to correct the work or equipment, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligations other than specifically to correct the work or equipment.

- I. If system operation is not fully restored during the warranty period within one (1) business days, the Owner reserves the right to require the Contractor to provide on-site Manufacturer's service technicians at no additional cost to the project or Owner.
- J. The Owner reserves the right to expand or add to the system during the warranty period using firm(s) other than the Contractor for such expansion without affecting the Contractor's responsibilities and warranty, provided that the expansion is done by a firm which is an authorized dealer or agent for the equipment of system being expanded.
- K. Special warranty specified in this Specification shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
  - 1. Special Warranty for Equipment and Components: Written warranty, signed by Manufacturer and Contractor agreeing to correct system deficiencies and replace components that fail in materials or workmanship within specified warranty period when installed and used according to manufacturer's written instructions. This warranty shall be in addition to, and not limiting, other rights Owner may have under other provisions of the Contract Documents.
  - 2. Contractor shall guarantee operation and functionality and fix any problems at no cost to the Owner during the warranty. The Owner will not accept the system at turn-over until the system has been field tested, verified, certified, and guaranteed that requirements have been fulfilled as outlined in Section I.

1.13 BID INFORMATION

- A. Vendor shall provide an executive summary of the proposed solution based on the Background and Objectives as defined in Section 1.0, the Scope of Work in Section 3.0 and the configuration information in Section 4. Please go beyond standard boiler plate platform descriptions and provide a personalized description of your proposed solution.
- B. In support of the executive summary, please provide descriptions of the proposed system including growth increments and the major components/software required to reach maximum size. Vendor shall describe the method and steps of growing the proposed system beyond requested capacity.
- C. Vendor shall provide a Visio drawing of the proposed solution and estimated amount of rack space needed to support major components.
- D. Response Format
  - 1. Please note that the RFP is divided into sections. Responders are required to comply with the RFP format, to utilize the forms provided for answers to specific questions and to respond to all items requested. The first section should present a general overview of the equipment, features and other major characteristics of the

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

proposed systems. This overview should include how the voice communications system and ancillary systems are configured and a description of how each system will interface and operate with each other.

2. Cost for Response Preparation
3. Costs for developing Responses are entirely the responsibility of the vendor participating in this RFP process and shall not be chargeable in any manner to MSFA.
4. Required Attachments
5. Please provide the following attachments for the system and options proposed as applicable:
  6. Executive summary of the proposed solution
  7. Response Form
  8. Manufacturer's warranty or support letter
  9. General system description
  10. SIP Certification
  11. Compliance Matrix
  12. Outline of critical dates and time frames for voice communications system installation
  13. Complete engineering data, illustrations and descriptive data covering the proposed equipment including a schematic and bay front of the voice communications system
  14. Equipment itemization per configuration (Bill of Materials)
  15. Sample Contract - Maintenance Agreement

## PART 2 - SYSTEM REQUIREMENTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products and solution by one of the following VoIP communications system Manufacturers listed in alphabetic order:

1. Avaya
2. Cisco
3. Mitel
4. NEC
5. ShoreTel
6. Unify

Alternative manufacturers may be submitted for review and potential approval.

### 2.2 TECHNICAL SPECIFICATIONS

- A. Architecture:

1. General:
  - a. The VoIP communication system shall be a converged platform that provides a fully redundant call server infrastructure to achieve 100% availability for tenants, users, and systems. This includes but is not limited to the following:
    - i. Office Spaces
    - ii. Storage Rooms
    - iii. Point of Sale Locations
    - iv. Guest Relations

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- v. Tenant Services
  - vi. Press Areas
  - vii. Analog Phone Services
  - viii. FAX Machines
  - ix. Custom Interfaces and Advertising
  - x. Food and Beverage Ordering Systems
  - xi. Other systems and requirements shall be determined and coordinated by Contractor with Owner.
- b. The general architecture shall use a standard VoIP call processor located in the Main Communications Room, or in a location coordinated with the Owner. Location of redundant processor to be determined by Owner.
  - c. The Call processor shall be tied into the Public Switched Telephone Network to provide outbound calling from handsets located within the building.
  - d. Digital, analog and/or SIP trunks shall terminate directly on PSTN Router/Gateway equipment in the VoIP communication system.
  - e. Any-to-Any IP phone set or IP mobile phone set communications within the facility must be supported across the enterprise IP data networking infrastructure with high-priority and low-latency.
  - f. The VoIP communication system shall be new and shall also be of the current standard production of the manufacturer at the time of the proposal and shall be expandable in design and implementation.
  - g. The Contractor is required to supply the latest version of software, providing all the features enumerated in this specification, at the time of contract award. Additionally the Contractor will be required to install the "then current" software at time of installation which is expected to be in 2016.
  - h. The VoIP communication system shall be an off-the-shelf commercially available solution that meets or exceeds all FCC and UL requirements. The Contractor shall also list the FCC and UL registration/listing numbers and guarantee the equipment is certified and registered.
  - i. The Contractor and Manufacturer shall propose system components including hardware and devices that meet or exceed the intent of this specification and associate performance.
2. Network Topology:
- a. The IP data networking infrastructure consists of both Layer 3 IP routing/switching and Layer 2, IEEE 802.1q VLANs for traffic segmentation and isolation.
  - b. The IP data networking infrastructure will enable a dedicated, voice VLAN to support the enterprise's any-to-any IP voice communications.
  - c. Contractor shall refer to the LAN network specification 27 21 00 for reference to the design of the Data Network.
  - d. Contractor is responsible for coordinating the implementation, testing, and documentation/labeling of the VoIP communication system with the Data Network provider. Physical PoE+ ports allocated within each LAN switch will be assigned specifically for VoIP network connections by the Data Network provider.
  - e. Traffic shaping, traffic prioritization, and Quality of Service (QoS) enablement will be applied where needed.
  - f. E911 VoIP connections must be enabled with the highest level of availability, redundancy, and alternate path communications and dual Telco entrance and demarcation points.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

3. UPS Systems:  
Contractor shall refer to Specification Section 27 53 33 *Technology Uninterruptable Power Supply* for refer to the design of the UPS system. Contractor is responsible to coordinate the requirements of the VoIP communication system with the UPS System provider.

B. Voice Communications System Features

1. Trunks  
The VoIP communication system shall be capable of connecting to various types of trunks and lines. These are listed below:

- a. ISDN PRI
- b. SIP
- c. Analog Trunks

Trunking Capacity

- a. The VoIP communication system shall be initially wired and equipped with a gateway to accommodate (6) 2-way (analog/copper) central office trunks (ground start). These trunks shall support six (6) Power Failure Transfer (PFT) locations across the facility. Locations to be defined by Owner.
- b. The VoIP communication system shall be wired for, but not equipped for, a minimum of 20% growth of analog central office trunks.
- c. The VoIP communication system shall be initially wired and equipped with a router/gateway to accommodate 30 concurrent SIP trunks plus ticketing with 12 agents designed with a 1:2 ratio for a total of 54 simultaneous conversations.
- d. The VoIP communications system shall have the capacity to handle concurrent SIP trunks as required for Super Bowl capacity planning.

2. General System Features

- a. FEATURE
- b. 911 Notification
- c. E911 Support
- d. Account Codes – Verified & Non-Verified
- e. ANI/DNIS/ISDN Number Delivery
- f. Auto Hold
- g. Automatic Route Selection (ARS)
- h. Automatic Ring Down
- i. Bandwidth Management
- j. Callback
- k. Call Duration Display
- l. Call Forward – Busy/ No Answer
- m. Call Hold
- n. Call History
- o. Calling Line ID
- p. Call Park
- q. Call Pick-up - Directed & Group
- r. Call Recording
- s. Call Transfer – Blind & Consultative
- t. Call Waiting
- u. Camp-on
- v. Class of Restriction

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- w. Class of Service
- x. Compression
- y. Conference Calling (6 party)
- z. Direct Station Select/Busy Lamp Field (DSS/BLF)
- aa. Direct Inward Line
- bb. Direct Inward System Access (DISA)
- cc. Direct Inward Dial (DID)
- dd. Distinctive Ringing
- ee. Do Not Disturb (DND)
- ff. Forced Non-Verified Account Codes
- gg. Hot Desking/Hoteling
- hh. Hot Line
- ii. Hunt Groups
- jj. Intercom Calling w/Hands free Answerback
- kk. ISDN PRI Support
- ll. Last Call Return
- mm. Last Number Redial
- nn. Malicious Call Trace
- oo. Music/Message-on-Hold
- pp. Name Suppression on Outbound Calls
- qq. Message Waiting Indicator
- rr. Night Service (minimum 2)
- ss. Off-Hook Voice Announce
- tt. Ringing Line Select
- uu. Simple Network Time Protocol (SNTP)
- vv. Speed Dial - Personal & System
- ww. Station Message Detail Recording (SMDR)
- xx. Trunk Answer From Any Station (TAFAS)

C. Base Applications

- 1. Primary Call Processing
- 2. Redundant Call Processing
- 3. Call Accounting
- 4. Redundant E911
- 5. VoIP Communication System Management
- 6. Unified Communications
- 7. Unified Messaging

D. Endpoints

- 1. Type-A – Refer to 'Administrative Endpoint' below, for additional requirements.
- 2. Type-B – Refer to 'Basic Endpoint' below, for additional requirements.
- 3. Type-C – Refer to 'Conference Endpoint' below, for additional requirements.
- 4. Type-D – Refer to 'Wireless Handsets' below for additional requirements.

E. Add Alternate Equipment

- 1. Others
  - a. Contractor Proposed Alternates
  - b. Manufacturer Proposed Alternates

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

F. Maintenance Options

1. 24-7 (4-hour response)
2. 8-5 (4-hour response)
3. Next Business Day

G. VoIP communication system Support and Management

1. Onsite
2. Remote
3. Term Options
  - a. Year-1
  - b. Year-2
  - c. Year-3
  - d. Year-4
  - e. Year-5

2.3 EQUIPMENT SPECIFICATIONS

A. Server Requirements

1. Contractor shall state which applications require dedicated servers and which can be virtualized for the following: Primary Call Processing; Redundant Call Processing; Unified Messaging Application; E911 Application, Contact Center Application; Call Accounting.
2. Contractor shall provide specifications for each virtual application.
3. All dedicated servers furnished and installed must have RAID-1 configuration for Operating Systems Software and System Software. Hot swappable RAID 5 drive arrays shall be provided for data storage.
4. Each server shall have (2) 10/100/1000 Mbps Ethernet network interface cards (NIC) for primary and redundant links and be interconnected to Data Center Switches using RJ45 jacks. Contractor is to list and provide full server requirements.
5. All servers shall be installed in fully enclosed cabinets provided by Structured Cable Infrastructure Contractor as part of the overall data center and MPOP rooms.

B. Call Processors

1. Primary and Redundant Call Processors
  - a. Provide a Primary and Secondary/Redundant Call Processor using Contractor's recommended design (physical or virtual).
  - b. Primary Call Processor shall be tied to a Redundant Call Processor to provide failover.
  - c. The Primary Call Processor shall be located in the Owners Data Center. The Secondary/Redundant Call Processor shall be located within the facility; location to be determined.
  - d. The system will be used for processing voice calls internally and to the PSTN, etc.
  - e. The system shall support the project required users to (1,500) users/devices at a single location.
    - 1) The system shall have the capacity for a 30% expansion to support large venues such as the Final Four. Additional expansion beyond a 30% expansion will be required for

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

events such as the Super Bowl without primary system upgrades such as processors and servers.

C. Features and Applications

1. E911 Application

- a. An internal emergency 911 application shall be provided with a redundant format using a dedicated server (if required) specific to this application.
- b. The primary E911 Application will be located in the Owner's Data Center. The location for the redundant/backup application shall be determined by the Owner.
- c. 911 and 9-911 calls will be routed to internal security which will require the ability to know the exact location of the caller within the stadium.
- d. E911 application must perform priority notification and screen pop the associated PC with the location of the caller (floor, quad, room, extension number, name, etc.).
- e. E911 shall use a graphical representation of the location as well as text detail is required.
- f. Contractor shall be responsible for creating the database and working with Intrado to keep the database current.
- g. Contractor shall provide as an Add/Alternate configuration and pricing for a redundant application design.
- h. Product Specification:
  - 1) Contractor shall submit products for approval, with all requested information above included.

2. Voice Messaging System

- a. Voice Messaging System shall integrate with the VoIP communication system
- b. Product Features
  - 1) Automated Attendant
    - i. Multi-level greetings during open and closed business hours.
    - ii. A company directory that uses extension numbers or names as the dialing method.
    - iii. Single digit dialing options.
    - iv. Multiple greetings to support the stadium.
    - v. A caller can dial and be transferred to an extension or mailbox number at any time during the auto attendant greeting, regardless of what menu level the caller is currently in.
    - vi. Dial by Name Capability.
    - vii. The system shall also provide for automatically changing the system greeting, based upon the time of day (business hours and after hours) and day of the week.
  - 2) Subscriber Mailboxes
    - i. Personal greeting, recorded name and call handling options including standard, in a meeting, out of office, extended absence.
    - ii. Personal mailbox management including login security/password, change password, ability to create personal distribution lists.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- iii. Ability to utilize all voice messaging features independent of subscriber's location (remote access).
  - iv. Messaging features including mark urgent or private, address by extension, name or by distribution list.
  - v. Tutorial to assist with initial set up. Are tutorials available on line or web based?
  - vi. Message waiting notification by message waiting light indicator on the phone, dial pager, dial an extension or dial an external number.
  - vii. Basic user controls including playback, record, pause, rewind, forward, delete, save, and skip to next message and reply.
  - viii. Seamless, integrated transfer of a caller directly into a subscriber mailbox.
- 3) Voice Message Reporting
- i. A complete reporting package must also be provided which minimally includes the following reporting capabilities:
    - a. Overall System Usage - Port Traffic, Disk Utilization, and Number of Messages left and currently stored.
    - b. Per Subscriber Usage - Total Messages per User, Number and Last Time of User Log-in, Average Message Length, Total Message Storage Used.
    - c. The system shall also provide a complete set of diagnostics and alarm indications.
    - d. There must be security measures to prevent unauthorized use of the proposed system.
    - e. The back-up capabilities for the system shall be a minimum of Disk Backup.
- 4) Quantity: 75 mailboxes, minimum 15 consecutive sessions/ports.
3. Call Accounting Application
- A call accounting application shall be provided to bill tenants for long distance voice usage. The systems shall be capable for service charge-back to tenant groups to be defined by Owner.

The call accounting application will be located in the Owner's Data Center.

- a. Contractor shall provide the server if required; or specifications for virtualized application if available.
- b. A minimum of 8 tenant groups shall be supported in initial design.

Product Specification:

- a. Contractor shall submit products for approval, with all requested information above included.
- b. System shall include the following:
  - 1) Activity Reports
  - 2) Definition/System Records
  - 3) Account Information/Profiles
  - 4) Service/Transactions Code
  - 5) Assign Services/Transaction
  - 6) Invoicing Activities
  - 7) Statements



MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- c. Call Accounting Application shall integrate with Owner's finance system: Microsoft Dynamics. Initial design shall support 600 stations
- 4. Contact Center Application
  - a. A contact center application shall be provided to support a contact center in Ticketing Area.
  - b. System should provide standard reporting package.
  - c. Product Features
    - 1) Multi-Button End Point programmed to support ACD functionality
    - 2) Agent Identification
    - 3) Calls Waiting Display
    - 4) Flexible Work Time
    - 5) Headset Compatibility
    - 6) Make Busy/Unavailable Status
    - 7) Recording Capability
    - 8) Remote Agent
    - 9) Silent Monitor
    - 10) Supervisor Alerts
    - 11) Supervisor Answer Calls in Queue
    - 12) Supervisor Terminal
  - d. Report requirements:
    - 1) Number of calls by extension, time of day, etc.
    - 2) Call duration by agent
    - 3) On hold time per call/per agent
    - 4) Reports per call queue: length of time in queue
    - 5) Number of abandoned calls per queue
    - 6) Length of time in the queue before abandoning
    - 7) Number of calls going to message system (if this option is chosen)
    - 8) Agent Statistics
    - 9) Log in/Log out time
    - 10) Make Busy/Unavailable time
  - e. Initial design shall be for 12 agents and one (1) supervisor.
  - f. Submit Add/Alternate for two (2) additional ACD groups with 10 agents each and one (1) supervisor.
  - g. Provide unit pricing for all ACD components including bundle options for licensing.
- 5. Unified Communications – SIP enabled application support
  - a. Integration with Exchange at the time of installation
  - b. Vendor shall provide information and pricing for option to integrate with Office 365 as an Add/Alternate.
  - c. Provide basic functionality for real-time communications including:
    - 1) Availability/Presence
    - 2) Instant Messaging/Chat
    - 3) Click to call
- 6. Unified Messaging
  - a. Non-real time integrated voice messaging (\*.wav audio files) and store-and-forward facsimiles integrated with e-mail server and client.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

License Quantity: 75

7. Mobile Twinning/Extension to Cellular
  - a. Ability to 'twin' an internal office extension to a cellular device.

License Quantity: 75

8. Centralized VoIP Communication System Management
  - a. Monitors and evaluates the status of all the key components of a VoIP communication system, including the underlying transport infrastructure.
  - b. Presents the current status of the system through service-level views of the network and provides contextual tools to view current alert status and historical information.
  - c. Provides current information about connectivity- and registration-related outages affecting all IP phones in the system and provides additional contextual information for location and identification of the phones.
  - d. Provides reporting and statistics on system usage.
  - e. Provides for easy provisioning and management of VoIP communication system components.
  - f. Product Specification:
    - 1) Contractor shall submit products for approval, with all requested information above included.
9. Ring Down Application

Owner is looking for the equivalent to a traditional ring down circuit for eighteen (18) locations considered 'Areas of Refuge.' Contractor shall describe design alternatives to traditional ring down stations for fast access from Area of Refuge to Security Desk.
10. WebRTC

Contractor shall provide specific capabilities and pricing information regarding the optional incorporation of WebRTC with your proposed solution. Describe your vision of how WebRTC will work with your proposed solution. Contractor should also include a roadmap of the introduction of future WebRTC capabilities and enhancements.

D. IP Endpoints

1. General: VoIP handsets shall be powered remotely from in-line power distribution injected by PoE LAN switches. Devices with pixel-based LCD displays shall provide dynamic soft keys that guide users through call features and functions, and can support additional information services through XML capabilities. Handsets shall have fixed feature keys for redial, transfer, conference and voice-mail access; a volume-control toggle, providing easy decibel-level adjustments of the handset and ringer; hearing-aid-compatible handset, meeting Americans with Disabilities Act requirements; hold key, providing users with a visual indication (a red light) that they have placed a call on hold. Handsets shall be wall mount or desk type.
2. Administrative Endpoint

Type: Multiline with Display  
Reference: Type-A Device

  - a. Features:
    - 1) Up to (6) Customizable Line/Autodialing Buttons
    - 2) Up to (4) Feature Buttons

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- 3) Full Duplex Speakerphone
- 4) Voicemail Access Key
- 5) 10/100/1000 BASE-T (2) Port Ethernet Switch
- 6) Power over Ethernet (PoE) Class 2

b. Product Specification:

- 1) Contractor shall submit products for approval, with all requested information above included.

Quantity: 450

Add/Alternate Unit Pricing for 10/100 BASE –T

3. Basic Endpoint

Type: Basic Set

Reference: Type-B

a. Features:

- 1) (4) Feature Buttons
- 2) Paging Speakerphone
- 3) Power over Ethernet (PoE) Class 1
- 4) Wall-mountable

b. Product Specification:

- 1) Contractor shall submit products for approval, with all requested information above included.

Quantity: 240

4. Conference Room Endpoint

Type: Audio Conferencing End Point

Reference: Type-C

a. Features:

- 1) Expansion Microphones (“Spider-mikes”)– Optional Add/Alternate
- 2) Power over Ethernet (PoE) Class 3

b. Product Specification:

- 1) Contractor shall submit products for approval, with all requested information above included.

Quantity: 7

5. Wireless Handsets

Type: Wireless Handset

a. Features:

- 1) Integrates with proposed IPT system
- 2) Speakerphone Capability
- 3) Supports 802.11a/c

b. Product Specification:

- 1) Contractor shall submit products for approval with all requested information included

Quantity: 25 including license

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

6. Expansion Modules  
Reference: Expansion/Add-on Module  
Expansion Modules shall allow for additional line appearances and/or busy lamp appearances.  
Provide Expansion Modules on administrative staff handsets; as coordinated with the Owner.
  - a. Product Specification:
    - 1) Contractor shall submit products for approval, with all requested information above included.

Quantity: 4
7. Attendant Console Software  
Provide attendant console application license at main operator consoles. Owner may opt for using a multi-button end point with expansion module.
  - a. Product Specification:
    - 1) Contractor shall submit products for approval, with all requested information above included.
    - 2) Contractor shall provide PC requirements

Quantity: 4
8. TTY Hardware  
Contractor shall provide integration for TTY locations around the stadium with the proposed Voice over IP communications system to support TTY locations around the stadium.  

Quantity: 4

ADD/ALTERNATE: Contractor shall state any options to support a soft-phone application that would meet ADA compliance and include associated requirements and unit pricing.
9. Weatherproof Enclosures  
Contractor shall include weatherproof housings to support phones in wet environmental areas such as truck docks; compost/garbage areas, etc. Exact count verified at time of implementation.  

Quantity: 20
10. Blue Light Emergency Tower Phone  
Owner desires a unit price for a blue light emergency tower phone for parking area.
11. Softphone  
Contractor shall provide specifications to support soft phone application. Include PC requirements as well as licensing costs on Unit Pricing.
12. Misc. Components - Line Cords  
Owner is requesting all line cords connecting phone to wall jack to be 12' length. In addition, 10 line extenders with 10 additional 12' line cords.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

Quantity: 10

13. Misc. Components - Wall Mount Kits  
Contractor shall include wall mount kits for 150 multi-button endpoints and 230 basic IP endpoints.

Quantity: 150 multi-button endpoint wall mount kits

Quantity: 230 basic IP endpoint wall mount kits

E. Network Hardware

1. Voice Gateway Router  
Provide Voice Gateway Router as point of interface for connecting of service provider services to VoIP communication system.  
Shall support multiple analog phone lines and SIP trunks.  
Provide interfaces as required by owner line requirements noted elsewhere in this specification and through coordination with Owner's service provider.  
Shall be Chassis based.  
Voice Gateway shall be located in Owner's Main Data Center.

Product Specification:

- a. Contractor shall submit products for approval, with all requested information above included.

Quantity: Minimum (54) Concurrent SIP trunks and (6) Analog Trunks.

2. Analog Voice Gateway  
Analog handsets or any other analog telecommunication device such as Faxes, etc. shall be connected to the VoIP communication system using analog gateway devices interfaced to the VoIP Telephone System at the Main Data Center. Analog connectivity will be via the Structured Cable Infrastructure backbone provided as part of the overall project under the Structured Cable Specifications.

Features:

- a. Analog Station Loop Limits:  
1) 600 ohm standard, + or - 5%.  
2) 1200 ohm optional (excluding instrument), + or - 5%.  
b. Analog Ringing: 20Hz, 90VAC + or - 5%  
c. Frequency Response: 300 Hz to 3000 Hz.  
d. Crosstalk: Coupling loss shall be greater than 70db.  
e. Idle Channel Noise: Not to exceed 16dBnC.

Product Specification:

- a. Contractor shall submit products for approval, with all requested information above included.

Quantity: Support for 48 ports centralized at Data Center.

PART 3 - EXECUTION

3.1 GENERAL

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- A. Provided below are general requirements and milestones for executing work. Additional requirements may be necessary to complete work.
- B. Overall Execution Requirements
1. Provide a single project team that will install all systems and applications listed above. Any subcontractors must be detailed in the proposal.
  2. Attend multiple client meetings to discuss specific applications and functionality and their applicability to the customer.
  3. Provide a single project manager for duration of project.
  4. Prepare, maintain and update the Project Timeline.
  5. Attend weekly project meetings on-site.
  6. Create meeting minutes for all meetings.
  7. Site survey reviews and inspections. Notify Owner, Construction Manager, and General Contractor of any problems.
  8. Coordinate work with other trades, 3<sup>rd</sup> party resources and/or subcontractors.
- C. Owner Coordination and Review
1. Provide submittals as outlined in this specification and additional information
  2. Design, review, and coordinate system parameters such as DHCP, TFTP, DNS, IP addressing scheme and other parameters with Owner, Users, Tenants, and other building systems being interfaced. Contractor shall recommend changes (in writing) to insure QoS and a robust IP network.
  3. Coordinate equipment availability and procurement dates with Manufacturer. Information shall be submitted in a schedule format for review with Owner.
  4. Review room and area ready dates with Construction Manager and Owner.
  5. Coordinate 3<sup>rd</sup> party applications and integrate into system.
  6. Prepare implementation, phasing, cutover and testing plans.
  7. Prepare design of all equipment, components, and options required.
  8. Coordinate physical and support systems of the proposed and selected data network equipment and components.
  9. Notify Owner of any potential PoE problems with the telephones proposed, including power consumption.
  10. Prepare Visio network diagram of proposed connectivity.
  11. Submit bill of materials for Owner approval.
  12. Review construction schedule with Construction Manager and Owner.
  13. Provide Manufacturer's recommended spare parts list in accordance with the delivery schedule set forth in the contract.
- D. Implementation
1. Order and procure all equipment authorized by Owner.
  2. Receive and inventory equipment.
  3. Record serial numbers and provide to Owner.
  4. Record telephone MAC addresses in an Excel spreadsheet to provide to Owner.
  5. Setup, program, and test all equipment and components offsite at Contractor's labs.
  6. Load and configure implementation-specific call servers, voice mail servers, gateways, 3<sup>rd</sup> party applications, etc.
  7. Coordinate and develop a dialing plan.
  8. Coordinate and develop security levels and access privileges.
  9. Coordinate and develop routing plan.
  10. Coordinate, develop and configure security settings and backup processes.
  11. Coordinate and develop ACD parameters, ACD groups, call processing menus and call flows.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

12. Coordinate, develop and configure call park ranges, pickup groups, and shared line appearances, messaging configuration, paging and music on hold.
  13. Configure attendant console.
  14. Configure and program voicemail message stores.
  15. Configure time synchronization.
  16. Configure IP address for management interface.
  17. Configure SNMP community names.
  18. Establish, determine, and configure VLAN(s).
  19. Configure 802.1Q VLAN Trunks.
- E. Installation
1. Deliver equipment to secured location at job site.
  2. Configure, test and integrate system with the WAN Data Service Provider and coordinate with Service Provider for additional requirements for a complete and functional system.
  3. Physically install all equipment and components in racks and cabinets.
  4. Connect equipment and components to electrical power and UPS.
  5. Patch all equipment and components within room to backbone infrastructure, inter-equipment connections, and end-point (station) device patching to wall outlets.
  6. Coordinate trunking orders with owner selected carrier(s) and team staff.
  7. Install PSTN, SIP and IXC trunks into system.
  8. Configure DSP farms, codec's, PSTN interfaces, etc.
  9. Install the data network equipment and components as specified by Manufacturer and relevant to construction schedule and phasing plan.
  10. Integrate and test paging and music-on-hold systems.
  11. Coordinate QoS and ensure that service is functioning on all switches to support critical application and systems.
  12. Coordinate, configure and verify QoS settings on LAN infrastructure.
  13. Configure unified messaging integration.
- F. Evaluation
1. Perform a complete VoIP communication system assessment as necessary to guarantee a robust environment of critical applications, systems and custom applications including IP Telephony and attached systems. Work should be performed after the necessary installation. Submit VoIP communication system assessment results to the customer.
  2. Test unified messaging integration.
  3. Test all systems and 3<sup>rd</sup> party integrations.
  4. Test fail-over and redundancy of VoIP communication system.
  5. Test power failure conditions to ensure both the UPS and generator systems operate as planned and maintain VoIP Communications system functionality.
  6. Fail Test System.
  7. Cutover systems.
  8. Troubleshoot and Correct.
- G. Go-Live and Testing
1. Test all systems and 3<sup>rd</sup> party applications.
  2. First 7 days of in-service coverage.
  3. Staff help desk for 7 days.
  4. Technicians and engineers must attend first practice event and first full event.
  5. Troubleshoot and Correct.
- H. Training

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

The cost of all end user training must be included in the quoted purchase price for the voice over IP communications system.

1. End User Training  
Pre-cutover:
  - a. A training area will be provided not less than one week prior to cutover. This room will contain sufficient executive sets for all attendees to have hands-on experience. Pre-cutover training sessions will be conducted in organized classes.
  - b. Precut training should be for not less than 6 attendant/operators. This requirement is based on the design of this portion. This pre-training shall consist of not less than one hour of "hands on" experience (in two sessions for coverage purposes).
  - c. Precut training for end users (all staff with phones and voice mail) should be conducted with groups of 8-10 (depending on training area).
  - d. Coordinate with client to design and prepare customized 1 page "Cheat Sheet" for standard users for non-administration features.
  - e. Coordinate with client to design and prepare customized 1 page "Cheat Sheet" for network administration features.
  - f. Perform system administration training on all systems.
2. ACD Training
  - a. ACD Agent Training: Special training classes shall be set up for ACD agents. These shall be in addition to standard training sessions. A minimum of 2 classes shall be coordinated with MSFA management to ensure call coverage during training.
  - b. ACD Supervisor and Customer Service Manager: Training shall be focused on silent monitor, call recording and ACD reporting.
3. 1st Day of Service:
  - a. For first day of service you will provide a minimum of 3 trainers (two walking the facility and one with the attendant/main answering point) who will be on-site for the entire day (9 hours). State how many additional trainers will be available to help station users on the first day of service as well as walking the facility to provide assistance.
  - b. A Help Desk shall be staffed for the new install. Access to this assistance shall be clearly defined during the training sessions. This Help Desk shall be staffed for a full 9 hours during the first day of operation. Arrangements shall be made for this Help Desk to continue though voice mail with a trainer having remote notification of messages to be able to respond quickly to end-users.
  - c. Provide the cost of this Help Desk on a per day basis to allow MSFA to extend live support for additional days of service should they so choose.
  - d. State how many trainers will remain on-site for the first two days after cutover.
4. Training Materials:



MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- a. A station user's manual will be provided for every installed telephone prior to cutover. A Console attendant manual will be provided for the attendant based on system design.
  - b. Customized training material by phone type is required and should be distributed at training sessions. A 'cheat sheet' shall be designed and available for the casual end users including information on how to access voice mail from any phone.
  - c. On first day of service you will provide on-site support to all personnel.
  - d. State availability of training information available on-line.
  - e. State the availability of video or computer based training material.
5. Post-cutover:
- a. Provide a minimum of four refresher-training sessions for those staff and on-site trainers who have questions. These sessions shall be scheduled 60-90 days post cutover.

I. Finalization

- 1. Turn over complete system documentation to customer.
- 2. Prepare a complete system ready checklist, compliance list, and commission system accordingly.

3.2 EXAMINATION

- A. Contractor shall coordinate with the Construction Manager to ensure that acceptable conditions exist for installation of all equipment and components.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Provide detailed site survey to ensure acceptable conditions exist.
- C. Examine all rooms and areas where equipment and components will be installed. Check all elements for compliance with space allocations, installation tolerances, hazards to equipment installation, and other conditions affecting installation.
- D. Examine walls, floors, roofs, and roof supports for suitable conditions where equipment is to be installed.
- E. Examine all support systems such as air-conditioning, electrical panels, receptacles, UPS, lighting, etc. are installed and functioning correctly.
- F. Examine all equipment racks and cabinets installations to ensure acceptable conditions exist for installation of all equipment and components.
- G. Ensure that all rooms and any areas where equipment and components are installed are physically secured at all times from theft, vandalism, etc.
- H. Report unacceptable installation or unsafe conditions to the Construction Manager.
- I. Under no condition shall the Contractor install any equipment or component that will void Manufacturer warranty or such conditions that will reduce equipment performance, longevity, and life.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

3.3 MAINTENANCE

- A. Maintenance is to be provided on a complete service basis. Maintenance costs, other than those covered under warranty, shall be listed separately from the cost of equipment and shall include the costs of all parts and labor.
- B. Coverage for both 24x7 and 8x5 shall be included. Note that 8x5 coverage will require the addition of immediate response for all major events occurring outside of that 8x5 window.
- C. Maintenance cost shall be itemized for years 2 through 5.
- D. The Contractor's response shall indicate if Contractor plans to provide total system maintenance or subcontract the system maintenance or any part thereof. In the event the use of subcontract maintenance is planned, the Contractor shall indicate what portion(s) of the system maintenance will be provided by the subcontractor and shall furnish proof of an agreement or that a tentative agreement has been negotiated with the subcontractor to provide maintenance on the proposed system. The Contractor shall also provide sufficient documentation that indicates the subcontractor is properly trained and has been certified by the equipment Manufacturer to provide maintenance on the proposed system or any part thereof.
- E. Maintenance will include coordination with Circuits procured from Telecommunication Service Providers network access trunks, WAN circuits, Internet circuits, and access devices. This coordination will include the resolution of problems involving the Telecom Service Provider's circuitry and will be a part of the Provider's warranty service and maintenance contract responsibilities as Owner's agent.
- F. Emergency maintenance on site response time shall be within 1-hour after receipt of an emergency maintenance call from Owner's designated representative. Emergency maintenance is defined as:
  - 1. System Failure
  - 2. Failure of a Common Control Unit
  - 3. Failure of 20% or More Handsets or Connected Devices
  - 4. Failure of a Power Supply
  - 5. Any System or Application Failure that impacts events and/or business operations with no work-around
- G. Routine maintenance response time shall be within 12-hours after receipt of a routine maintenance call from Owner's designated representative. Routine maintenance is defined as any occurrence that does not meet the criteria of emergency maintenance.
- H. For evaluation purposes only, unit prices will be multiplied by Service supplied factors based on equipment lines indicated in Part-2 System Requirements. Furnish the labor rate and escalation factor to be used to provide a 5-year price forecast of equipment changes and relocations.
- I. Emergency/critical requirements above may necessitate shorter time intervals. Manufacturer and Contractor shall submit options for Owner review and approval.
- J. Contractor shall propose spare parts list and training that the Owner's onsite staff can acquire that could benefit response time and reduce maintenance cost. Options shall be proposed for Owner review and approval.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

3.4 SERVICE

A. Response Targets

1. Major Outages

- a. Contractor shall respond to major outages during the coverage period within 2 hours. If alternative response targets are available, indicate and provide pricing. In the event that vendor does not respond in the 2-hour time frame, the vendor shall state what will be done to compensate MSFA.

2. Minor Outages

- a. Contractor shall respond to minor outages during the coverage period within the following time frame, i.e. 24 hours.

3. Definitions:

- b. A response for major outages shall be defined as a qualified technician on site with adequate supplies to repair the given problem.  
c. Emergencies affecting a widespread user base, i.e. 20% or more voice users, 20% trunks, any attendant console, or predetermined phone as specified by MSFA staff, shall constitute a major outage.  
d. All other outages shall be considered minor.

If vendor offers alternative definitions, indicate and provide pricing.

B. Coverage Period

1. Contractor shall respond to outages during the period as indicated, i.e. 24 hours a day, 7 days a week, including holidays.

3.5 EVALUATION CRITERIA

- A. Maintenance Staffing: Contractor shall provide information on the number of certified technicians on its staff to service the type of the VoIP Network being proposed and the total number of that type of in the Contractor's local service area. Contractor must provide a letter of recommendation for the proposed product from manufacturer.
- B. Escalation Procedures: Contractor shall have in place an "Escalation Process" in the event of a service issue that is not satisfactorily resolved. Contractor shall provide a description of their escalation process and include a list of contacts on the Response Form.
- C. Preventative Maintenance: Contractor shall list the type and frequency of preventative maintenance procedures that will be provided under warranty and included in Contractor's maintenance contract.
- D. Remote Maintenance and Diagnostic Testing: Contractor shall list the type, capabilities and frequency of these procedures.
- E. Technical Support: Contractor shall provide information on the type of technical support, who will provide the technical support and the hours when technical support will be available.
- F. Service Area: Contractor shall supply the name, street address, city, state, zip code, and telephone number of Contractor's local service center and parts depot. Indicate the distance from this local service center to Owner's Premise in road miles and driving time.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- G. Contact for Maintenance: Contractor shall indicate who the Owner's telephone coordinator will contact to obtain service for the Enterprise VoIP Network and Routing System.
- H. Maintenance Response Time: Contractor shall list the response time and the availability of emergency and routine maintenance.
- I. Dispatching of Technicians for Requests for Maintenance: Contractor shall provide the methods used to dispatch technical staff to respond to Owner's calls for service.
- J. Maintenance Records: Contractor shall indicate the type of maintenance records maintained and the location of these records.
- K. Spare Parts: Contractor shall supply information on the geographical location of replacement spare parts and indicate the distance from this parts depot to Owner's facility in road miles and driving time. In addition, list the emergency backup location for spare parts and indicate the distance from that location for spare parts and indicate the distance from that location to Owner's facility in road miles and driving time or the time required to get parts from that depot to Owner's facility.
  - 1. Over and above Contractors Parts Depot, Owner desires to have a 'Spare Parts Kit' on premise which would include common equipment for use in an emergency situation (excluding endpoints as Owner shall have a small inventory of endpoints on hand). Contractor shall provide a recommended list of parts for this kit and state willingness to have this equipment stored on site. Contractor shall include any associated costs for said Spare Parts Kit on Unit Pricing Tab of Response Form.
- L. System Implementation Schedule: Contractor shall provide an Enterprise VoIP Network and Routing System implementation schedule for the project.

### 3.6 SOFTWARE AGREEMENT

Reasonable licensing terms and conditions will be presented to Owner for review and approval related to any proprietary system software and operating systems required to be delivered under the terms of any contract resulting from this RFP.

Bidders must provide cost of the next two versions of firmware and software upgrades.

### 3.7 INSTALLATION

- A. General:
  - 1. This Section describes the installation locations for the products and materials, as well as methods associated with the VoIP Network system portions of the Project including all equipment, components, and cabling. These Specifications, along with the drawings shall be followed during the course of the installation.
  - 2. Examine areas and conditions under which equipment, components, and cabling are to be installed. Notify Owner, Construction Manager, Architect, and Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.
  - 3. The Contractor shall be knowledgeable of work to be performed by other trades and take necessary steps to integrate and coordinate their work with other trades.
  - 4. The Contractor shall be responsible for furnishing all equipment, components, and cabling as specified herein and as indicated on the drawings.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

5. The Contractor shall verify space requirements and locations before starting installation of equipment, components, and cabling. Inappropriate conditions shall be immediately reported to Construction Manager, Owner, Architect, and Engineer prior to initiating installation.
6. All equipment, components and cabling shall be new.
7. All equipment, components, and cabling shall be installed in a manner neatly and consistent with this type of work.
8. All equipment, components, and cabling shall be installed for optimal performance.
9. All equipment, components, and cabling shall be installed to allow for easy adds, moves, and other changes in the future.
10. Final labeling scheme shall be coordinated with the Owner during the shop drawings process, prior to initiating work. Labeling scheme shall include all equipment, components, and cabling with all appropriate references such as communications rooms, cabinets, racks, cable terminal blocks, patch panels, antennas, outlets, cables, etc.
11. Construction within communication rooms must be substantially complete before the installation of equipment, components, and cabling. This includes, but is not limited to, the installation of plywood backboard, cable tray or ladder rack, electrical outlets, light fixtures, sprinklers and ductwork. All walls shall also be painted by others before the installation.
12. All equipment, components, and cable noted in this Specification and associated drawings shall be provided and completely setup and installed.
13. The Contractor is required to coordinate their efforts with the other trades and sub-contractor who may be working within the same vicinity to avoid conflict and lost time.
14. The Contractor shall supply all necessary tools, equipment, accessories, safety equipment, protective clothing, etc., as customary for the craft and necessary for the installation.
15. The contractor shall not install any component in a manner or condition that will void Manufacturer and/or Contractor warranties. Any such conditions that prevent an acceptable install shall be immediately reported to Construction Manager, Owner, Architect, and Engineer prior to initiating installation. All mis-installed components will be removed and replaced with new at the Contractors expense. No additional cost will be submitted to Owner.
16. All equipment shall be installed in a neat and workmanlike manner, arranged for convenient operation, testing and future maintenance.
17. Communication rooms must be free from dust, dirt, and other foreign materials before the installation of any equipment and components. The door to the communication rooms must be installed and closed during termination.

B. Cable and Patch Cord Installation relating to VoIP System Hardware:

1. **NOTE:** All VoIP Network cable and patch cords shall be provided and installed per Division 27 specifications as part of the Structured Cable Infrastructure bid.
2. All VoIP Network and communications cables and patch cords routed within communications rooms shall be bundled and combed with Velcro to provide a neat and organized appearance. This includes horizontal and vertical cables routed on cable tray, d-rings, vertical cable managers, equipment rack cable managers, etc. Cables shall be bundled using only manufacturer and industry approved Velcro ties with tensions that do not deform and damage cable resulting in loss of transmission or performance. Any bundles and combing methods used shall not exceed manufacturer or industry standards recommendations for that cable type.
3. Within communications rooms, cables and patch cords shall be snugly wrapped using Velcro reusable cable ties, a minimum of every 3'-0" for cable organization.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

Velcro ties shall be tightened so as not to deform cable jackets and thus affect cable performance. Plastic cable tie wraps shall not be used and will prevent system acceptance.

4. Cable bends shall not be less than that recommended by the manufacturer of the cable. Do not exceed manufacturer's minimum bending radii and other cable requirements. Provided below are some examples but all requirements shall be verified.
5. Care shall be taken so as not to damage cable and patch cords during the installation process and that the manufacturer's and industry standard's pull tension specification is not exceeded.
6. Do not install bruised, kinked, scored, deformed, or abraded cable or patch cords. Remove and discard cable if damaged during installation and replace it with new cable.
7. All cables and patch cords shall be installed in vertical and horizontal cable management within cabinets and racks.
8. Cable and patch cords routed outside of racks and cabinets shall be in cable tray and ladder rack. Fiber optic patch cords shall be routed in fiber trough.
9. Provide independent circuit grounding recommended by manufacturer.
10. Under no circumstances shall the cable or patch cords be painted, treated, or covered with other material unless approved by manufacturer, Owner and Engineer.

C. Equipment Installation:

1. Contractor shall evaluate each space prior to equipment installation. Room shall be free from dust and debris; room shall be complete and sealed against further dust and debris. Contractor shall notify Owner, Engineer and Construction manager of any rooms that don't meet this requirement.
2. Install surge suppressors where ac-power-operated devices are not protected against voltage transients by integral surge suppressors specified in UL1449. Install surge suppressors at the devices' power-line terminals. Comply with Division 26 Section "Transient Voltage Suppression."
3. Point of Interface Equipment: Group related items in methodical sequence.
4. Arrange equipment to facilitate access for maintenance and to preserve headroom and passage space.
5. All equipment and interfaces shall be labeled.

D. Handset/Endpoint Placement:

1. Contractor shall evaluate each space prior to handset installation. Areas shall be free from dust and debris; room shall be complete and sealed against further dust and debris. Contractor shall notify Owner, Engineer and Construction manager of any rooms that don't meet this requirement.
2. Install handsets in each location, verifying/providing specified 12' line cords between wall outlet and handset device. Provide extra patch cable for computer workstation, if applicable.
3. Configure handsets, confirming each handset is setup and configured as per coordination with Owner.

E. System Management and Monitoring Software Installation:

1. Install all system management software on Owner provided computers, if not provided as part of this scope of work.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

2. Coordinate computer and VoIP network requirements with Owner's IT Group. This should include MAC and IP addressing, VLAN assignment, bandwidth requirements, class of service (CoS), quality of service (QoS), VPN requirements, etc.
3. The system management and monitoring software shall be fully setup, programmed, and configured including but not limited to the following:
  - a. Date and Time.
  - b. Network end points including but not limited to switches, routers, wireless access points, routers, firewalls, etc.
  - c. Graphical user interface (GUI) including facility maps indicating interactive icons for all equipment locations, wireless antennae points, and uplinks.
  - d. Web portals, user access, and VPN.
  - e. Administrator accounts, passwords, and security levels.
  - f. User accounts, passwords, and security levels.
  - g. Device thresholds, status, alarm points, alerts, and notification.
  - h. Remote diagnostics.
  - i. System Inventory.
  - j. Event reporting protocol.
  - k. System logs including status, performance, alarms, history, and others.
  - l. Maintenance log, schedules, and notification.

F. Security Hardening of the VoIP Communication System

1. Contractor shall review and perform a security audit and assessment in accordance with the Owner's requirements for ensuring that proper internal and external security controls are enabled.
2. Contractor shall review with the Owner any unique requirements for Class of Services (CoS) configuration based on user type, tenant type, or management type.
3. VoIP security hardening and security controls shall be recommended by the Contractor in accordance with the Owner's existing requirements, policies, and procedures. Security hardening shall include but not be limited to:
  - a. Network Infrastructure
    - 1) Encrypt voice streams and call signaling, ideally, end-to-end.
    - 2) Networks should be evaluated for VoIP readiness, pre-assessment, QoS/Network Perf.
    - 3) VLANs should be used to segment voice and data traffic.
    - 4) Secure mechanisms should be used for passing VoIP traffic and collaborative communications packets through firewalls.
  - b. Management
    - 1) Stringent password controls.
    - 2) Remote management via IP-VPNs only.
    - 3) Enable audit logging on call servers and core VoIP systems.
    - 4) Utilize secured connections for web access, SSL/HTTPS.
  - c. Endpoints/IP Phone Sets
    - 1) Software loads should be encrypted and tamper-proof.
    - 2) IP Phone sets should run the minimum of services required.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

- 3) Connection of an IP Phone set to the system must require an initial authentication.

d. Servers (Call Servers, Signaling Servers, etc.)

- 1) Servers should be managed with stringent OS and software patch management and anti-virus systems.
- 2) All telephony equipment and servers should be located in a location with maximum physical security (e.g. Data Center) and deep within the core network with VLANs and firewalls.
- 3) Sufficient back-up power, generator or redundant servers in distributed locations may be required as part of a BCP\_DRP plan.

e. Wireless

- 1) Use WiFi Protected Access and/or WPA2 versus WEP.
- 2) Enable WPA/WPA2 IEEE 802.1X authentication (RADIUS).

f. PSTN Threats

- 1) Appropriate measures such as Class of Restriction should be in place to prevent toll fraud.
- 2) Account codes when needed.
- 3) CDR/SMDR records should be enabled and utilized to monitor call usage.

4. The Contractor will be required to work with the Data Network provider in enabling security hardening for the VoIP communication system throughout the communication infrastructure.

### 3.8 CONSTRUCTION PHASING

- A. The VoIP communication system and communications infrastructure installation shall be provided, installed and phased as necessary to meet construction schedule.
- B. The contractor shall meet with the Construction Manager and Owner to review the construction schedule and associated areas of work.
- C. All necessary labor, cable, terminations, components, equipment, and components shall be provided to accommodate temporary, phased, and final conditions and requirement.
- D. Coordinate project schedule, installation schedule, phasing and any other requirements deemed necessary with Owner, Construction Manager and all necessary Trades to ensure successful completion of work.

### 3.9 COORDINATION

- A. Design Coordination: All components proposed by the Contractor shall be coordinated with the Owner. Provided below is a general list of major items that shall be documented in a table and coordinated. The list provided below is to be used as an example and not intended to be all inclusive or limit items required to be reviewed and coordinated.

1. Equipment Type, Physical Size, and Weight.
2. Rack Units required per location.



MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

3. Electrical Power (voltage, amp, loads, and receptacle types).
4. UPS (connectivity and runtime).
5. HVAC (heat dissipation and equipment operating temperature range).
6. Handset Types, Configuration and Locations.

B. Wireless Coordination:

1. The drawing indicates wireless LAN (WLAN) and access points (WAPs) preferred wireless access point locations.
2. The contractor shall verify the operation of any wireless VoIP handsets including IP Mobile phone communications and connectivity through extensive field testing and verification. Contractor shall coordinate any deficiencies in the WLAN infrastructure such as "Clipping" or "Dropped Calls" regarding the use of IP Mobile phones and handsets that may traverse through the WLAN infrastructure (e.g., beyond a single WLAN Zone) with the WLAN system provider.

C. Installation Coordination: The Contractor shall field coordinate all work with Construction Manager and other Sub-Contractors and Trades as necessary to minimize conflicts. This shall include reviewing each Trades' and Sub-Contractor's shop drawings and resolving conflicts.

D. Schedule: The Contractor shall coordinate the project schedule with the Owner and Construction Manager including but not limited to the following:

1. RFP Response
2. Submittals
3. Construction and Phasing
4. Room Ready Dates
5. Installation
6. Substantial Completion
7. Final Completion
8. System Acceptance

3.10 IDENTIFICATION

A. General Label Requirements:

1. The labeling scheme provided by the Contractor and coordinated with the Owner prior to finalizing and initiating any work. A sample scheme shall be submitted for approval.
2. Mechanically print and install all labels.
3. Format: Select font size to be readable and to fit all information required without overlap of text.
4. Use all capital letters.
5. All labels shall be consistent font type, size, and color throughout project.
6. Labels shall be white with black text.
7. Clean all surfaces prior to attachment of any label. Follow manufacturer's recommendations for cleaning and affixing labels.
8. Method: Brady cable labels appropriately sized or approved equal.

B. Cable for Interconnection of VoIP System Hardware:

1. Label Location: Within 0.5 inches (25 mm) of each termination.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

2. Near-End Label Information: Cable No. XXX. Where XXX is the inter-equipment port number.
3. Far-End Label Information: Cable No. XXX. Where XXX is the inter-equipment port number.
4. Inventory control devices.
5. Device type, number, user type (group), special functions.

C. Equipment:

1. Label all major equipment and components.
2. Label Information: Equipment No., Type (or Short Description), and Manufacturer part number or equipment series.

3.11 FIELD QUALITY CONTROL

- A. Per sections 3.08 and 3.09, all coordination and phases must be closely controlled between the Contractor, Owner and Construction Manager to ensure that all quality is tightly monitored.

3.12 FAIL TESTING

A. General:

1. An Equipment Fail Test of all major equipment and components shall be performed by the Contractor and observed by the Owner. The system Manufacturer shall have appropriate personnel onsite to assist with testing.
2. Real-time visual proof shall be provided using all installed handsets connected to the core switch and access layer.
3. Intent of Equipment Fail Test is to confirm system availability, uptime, redundancy, and failover vital to system operation. All redundant VoIP communication system equipment and equipment with redundant components shall be failed test to validate failover.
4. Fail testing shall be completed on the fully functioning VoIP communication system after Contractor and Manufacturer has completed all system setup, programming, configuration, standard testing, troubleshooting, replaced all faulty components, and validated system performance and operation.
5. The Contractor shall coordinate Equipment Fail Testing schedule with Owner.

- B. The installed VoIP communication system must demonstrate its capability of providing the services enumerated in the contract. Test equipment required for demonstration will be Contractor provided. Contractor will also provide documented test results.

C. Component Failure Tests:

1. Power Cord (each, separately)
2. Power Supply (each, separately)
3. Uplinks (each, separately)

- D. Equipment and Components: Fail testing shall be completed on each of the following components:

1. Call Processor
  - a. Primary Processor
  - b. Redundant Processor
2. PSTN Router

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

3. Endpoints
  - a. Unplug and plug
  - b. Local communications closet uplinks

3.13 CLEANING

- A. Contractor shall clean all equipment and components using methods and materials recommended by manufacturer.
- B. Equipment cleaning shall be completed prior to final site observation by Owner and final system acceptance.

3.14 DEMONSTRATION AND TRAINING

- A. Provide (20) hours of onsite administrative and user training on the live VoIP communications system.
- B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain equipment.
  1. Conduct training as specified in instructions to Owner's employees in Division 1 Section "Contract Closeout" or Division 26 Section "General Electrical Requirements." This shall include training with System Maintenance and Monitoring Software System.
  2. Review the system architecture, setup, configuration, connectivity, and location of all equipment and components.
  3. Provide general description of function for each individual equipment and component.
  4. Train Owner's maintenance personnel on procedures and schedules for system administration, routine use, troubleshooting, servicing, and maintaining equipment.
  5. Demonstrate methods of determining optimum setup, configuration, and adjustment of equipment and components for system controls and function.
  6. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data", Division 26 Section "General Electrical Requirements" and Division 27 Section "General Technology Requirements".
  7. Schedule training with Owner with at least 14-days advance notice.
- C. Provide costs and options for Manufacturer training from System Manufacturer for the following types of courses:

1. Introduction to Converged Networks.
2. Network Administration, Maintenance, and Troubleshooting.
3. VoIP Telephony Administration, Maintenance, and Troubleshooting.
4. Voice Messaging Administration and Maintenance.
5. Other Applications proposed by Owner such as E911, ACD, XML, etc.

3.15 RECORD DOCUMENTATION

- A. Record documentation shall be submitted to the Owner by the Contractor at the completion of the VoIP Communications System installation. The contractor shall submit all information necessary to operate and maintain system including but not limited to the following:
  1. As-Built Documents.
  2. Operations and Maintenance Manuals.

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

3. Maintenance Schedule.
  4. Maintenance Company Contact Information.
  5. Trouble Shooting Guide.
  6. Product Data and Manufacturer Cut-Sheets.
  7. Warranty Information and Contact.
  8. Manufacturer's Product and Installation Certificate.
  9. Log (troubleshooting, replacement, expansion, and replacements).
  10. Labeling Scheme.
  11. Spare Parts Lists.
- B. Maintain current record documents at the construction site.
- C. Refer to Submittal Section of this Specification for additional requirements.

END SECTION