

PROJECT BID DOCUMENTS
FIRE ALARM MONITORING NETWORK



OWNER

MARYLAND ZOO IN BALTIMORE
DRUID HILL PARK
1876 MANSION HOUSE DRIVE
BALTIMORE, MARYLAND 21217

ENGINEER

JENSEN HUGHES
3610 COMMERCE DRIVE, SUITE 817
BALTIMORE, MARYLAND 21227

FEBRUARY 15, 2022
JH PROJECT NO. 1WFW00033.000

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SECTION 00050
LIST OF DRAWINGS

The Design Drawings shall be incorporated into the Contract Documents, by reference. The Design Drawings are as follows:

<u>DRAWING NO.</u>	<u>DESCRIPTION</u>
<u>FA001</u>	<u>General Notes and Legend</u>
<u>FA002</u>	<u>Fire Alarm Network Overview</u>
<u>FA101</u>	<u>Overall Network Site Plan</u>
<u>FA102</u>	<u>Network Site Plan – Area A</u>
<u>FA103</u>	<u>Network Site Plan – Area B</u>
<u>FA104</u>	<u>Network Site Plan – Area C</u>
<u>FA105</u>	<u>Network Site Plan – Area D</u>
<u>FA106</u>	<u>Network Site Plan – Area E</u>
<u>FA107</u>	<u>Network Site Plan – Area F</u>
<u>FA108</u>	<u>Network Site Plan – Area G</u>
<u>FA109</u>	<u>Network Site Plan – Area H</u>
<u>FA110</u>	<u>Overall Network Routing Site Plan</u>
<u>FA111</u>	<u>Network Routing Plan – Area A</u>
<u>FA112</u>	<u>Network Routing Plan – Area B</u>
<u>FA113</u>	<u>Network Routing Plan – Area C</u>
<u>FA114</u>	<u>Network Routing Plan – Area D</u>
<u>FA115</u>	<u>Network Routing Plan – Area E</u>
<u>FA116</u>	<u>Network Routing Plan – Area F</u>
<u>FA117</u>	<u>Network Routing Plan – Area G</u>
<u>FA118</u>	<u>Network Routing Plan – Area H</u>
<u>FA500</u>	<u>Details</u>

END OF SECTION

**SECTION 00100
INVITATION TO BID**

Owner: Maryland Zoo in Baltimore
Druid Hill Park
1876 Mansion House Drive
Baltimore, Maryland 21217

Engineer: Jensen Hughes
3610 Commerce Drive, Suite 817
Baltimore, MD 21227

Project: Fire Alarm and Emergency Voice Communication System

The Contractor is invited to bid on a General Contract for the campus-wide fire alarm and emergency voice communication system at the Maryland Zoo in Baltimore in Baltimore, MD.

Bids shall be on a stipulated sum basis.

Owner will receive bids from prospective Contractors, selected by the Owner, until April 1, 2022 at 12:00 PM.

Bids shall be delivered to:

Mr. Karl Kranz.
Druid Hill Park
1876 Mansion House Drive
Baltimore, Maryland 21217

Bids will be opened in private. The Owner will select the Contractor that best meets the Owner's requirements for the project. The Owner reserves the right to reject any and all bids.

END OF SECTION

**SECTION 00200
INSTRUCTIONS TO BIDDERS**

To be considered, Bids must be made in accordance with these Instructions to Bidders. Failure to comply with these instructions or any requirements of the Bidding Documents may be cause for rejection of the bid.

1. CONFIDENTIAL DISCLOSURE AGREEMENT

- A. Each Contractor and all sub-contractors shall be required to sign an Owner's Confidentiality Agreement. Confidentiality Agreements will be provided to the Contractor. It will become the responsibility of the Contractor to obtain all Sub-Contractor signatures and return all to the Owner.

2. CONTRACT DOCUMENTS:

- A. Contract Documents shall include the Project Manual and the Design Drawings. Contract Documents shall be issued only to the Contractor, and not sub-contractors or Vendors in electronic PDF format. Print sets of Contract Documents shall be produced at the Contractor's expense.

3. EXAMINATION OF DOCUMENTS, SITE, AND LOCAL CONDITIONS:

- A. Bidders shall carefully examine the documents and the construction site to obtain a first-hand knowledge of existing conditions. Contractors will not be given extra payment for conditions which can be determined by examining the site and Contract Documents. Specification sections are interrelated. Contractor and sub-contractors must read all sections for proper understanding of project.

4. INTERPRETATION DURING BIDDING:

- A. All questions shall be submitted from the Contractor to the Engineer, in writing. Sub-Contractors or Vendors shall forward any questions to the Contractor, for submittal to the Engineer. All questions shall be forwarded in duplicate to:

Mr. Karl Kranz.
Druid Hill Park
1876 Mansion House Drive
Baltimore, Maryland 21217
Phone: 717-825-0948
e-mail: karl.kranz@marylandzoo.org

and

Mr. Grant Millenburg.
Jensen Hughes
3610 Commerce Drive, Suite 817
Baltimore, MD 21227
Phone: 410-737-8677
e-mail: gmillenburg@jensenhughes.com

Replies will be issued to all bidders by Addenda and will become a part of Contract Documents. The Engineer and the Owner will not make oral clarifications. Questions must be received by the Engineer at least two (2) business days before the bid due date. No Addenda will be issued less than twenty-four (24) hours prior to the Bid due date, except for postponing the date for receipt of bids or withdrawing the request for bids.

5. SUBSTITUTIONS:

- A. Substitutions may be accepted by the Maryland Zoo in Baltimore. The Contractor must submit a proposed installation bid package based on the products specified. Substitutions can be proposed and submitted with bid package.

6. BID TYPE:

- A. Bids shall be on a stipulated sum basis. Any Alternates shall be identified on the Bid Form and shall also be on a stipulated sum basis.

7. PREPARATION OF BIDS:

- A. Refer to the GC RFP for additional requirements related to the preparation of bids.
- B. To be eligible for consideration, bids shall be submitted in accordance with the following instructions:
 - 1. Bids shall be submitted on an unaltered Bid Form, included in this Project Manual, additional copies may be secured from the Owner's office. Submit one copy of the Bid Form.
 - 2. Bids shall be properly executed with all blanks on the form filled in; failure to do so may be cause for rejection. Where so indicated by the makeup of the Bid Form, sums shall be expressed in both words and figures. In case of a discrepancy between the two, the amount written in words shall govern. The Bid Form shall be submitted without interlineations, alterations or erasures. Any additional stipulations on the Bid Form or qualifications in any manner may be cause for rejection.
 - 3. Bids shall not contain any recapitulation of Work to be done.
 - 4. Each Bid must give the full business address of the bidder and be signed by the person or persons legally authorized to bind the Bidder to a contract. Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name by one of the members of the partnership or by an authorized representative, followed by the signature and designation of the corporation, the state of incorporation and bear the signature and designation of the President, Secretary, or other person authorized to bind it in the matter. The name of each person signing shall also be typed or printed below the signature.
 - 5. Submit a separate sheet listing any voluntary Alternates that the Bidder wishes to propose for consideration of the Owner. This includes substitutes to specified manufacturers or supplies.
 - 6. Submit a list, on a separate page, all wages for journeymen and foremen, including hourly and overtime wages, fringe benefits, insurance,

overhead, profit plus taxes for all crafts directly employed by the Contractor involved in this construction package. This excludes subcontractor personnel.

8. BID SECURITY:
 - A. Refer to the GC RRP for information related to bid security/bid bond required for this project.
9. PERFORMANCE/PAYMENT BOND:
 - A. Refer to the GC RRP for information related to performance/payment bonds for this project.
10. SUBCONTRACTOR LISTING:
 - A. Bidder's shall provide, on a separate page, a designation of the work to be performed by the Bidders own forces, and a complete list of all Subcontractors proposed for this project, with the Bid. The list shall include, at a minimum, the name, address, and phone number for each Sub-Contractor. Unless otherwise authorized in writing by the Owner, subcontracts must be awarded to the firms named in the list.
 - B. Acceptance of the proposal does not imply approval of the proposed subcontractors and each subcontractor shall be approved individually.
11. SUBMITTAL OF BIDS:
 - A. The Bid Form, with required attachments, shall be submitted in a sealed envelope.
 - B. It is the Bidder's responsibility, by whatever method, to insure that the bid is received before the time set and at the place identified for receipt of bids. Any bid sent by mail shall be enclosed in a separate envelope clearly marked "Bid Envelope Enclosed".
 - C. Oral, telephonic, or telegraphic bids are invalid and will not receive consideration.
 - D. The Bid Envelope shall be clearly marked with the Owner's name, project name, Bidder's name, and Contractor's Maryland license number.
12. WITHDRAWAL AND MODIFICATION:
 - A. Once the bid is submitted, it may be withdrawn before the scheduled date for receipt of bids only upon receipt of a request signed by a person legally authorized to bind the Bidder to contract. If a bid is withdrawn, it may be resubmitted until the scheduled date for receipt of bids. Bids received after the time and date for receipt of bids will be returned unopened. Modifications to the bid may be made as "add" or "deduct" only, and must be signed by a person legally authorized to bind the bidder to contract. Oral, telephonic or telegraphic modifications to the bid will not be considered. After the time and date designated for the receipt of bids, a bid may not be modified, withdrawn or canceled by the Bidder during the time period stipulated in the Bid Form.

13. DISQUALIFICATION:
 - A. Any Bid received after the scheduled time and date for receipt of bids shall be disqualified and shall be returned to the Bidder unopened.
 - B. Any Bid not prepared in accordance with Paragraph 7.A.1-6 shall be disqualified.
14. APPLICABLE LAWS:
 - A. Bidders shall comply with all Federal, State, and Local laws and regulations.
15. PRE-BID CONFERENCE:
 - A. A pre-bid conference and site walk through will be held (date to be determined). The pre-bid conference will be at the Maryland Zoo in Baltimore in Baltimore, Maryland. Bidders are to meet at the receptionist desk at the Mansion House.
 - B. The lay down area for storage of equipment shall be addressed in the Pre-bid conference.
16. LIQUIDATED DAMAGES AND TIME:
 - A. After substantial completion of the installation of the scope of work identified on the contract documents by the Contractor, the Contractor will have 60 business days to have a complete and operational system. Liquidated damages shall be \$500.00 per calendar day.
 - B. Bidder shall provide, on a separate sheet with the bid, a detailed Project Schedule for the duration of the project, from Notice to Proceed through start-up.
 - C. Project Schedule shall be in a Ghant Chart format with milestones and completion dates.
17. RECEIPT AND OPENING OF BIDS:
 - A. Bids will be received at the time and place identified in the Invitation to Bid. Bids will be opened at the Owner's discretion.
18. CONSIDERATION OF BIDS:
 - A. It is the intent of the Owner to award a contract based upon the needs of the Owner, and the lowest evaluated responsive Bid submitted by a responsible Bidder, with full consideration of any alternates. The Owner shall have the right to accept alternates in any order or combination. The Owner reserves the right to reject any or all Bids and to waive any informalities.

END OF SECTION

SECTION 00400
BID FORM

TO: Maryland Zoo in Baltimore
Druid Hill Park
1876 Mansion House Drive
Baltimore, Maryland 21217

PROJECT: Fire Alarm Monitoring Network Upgrades

1. The Bidder acknowledges by his signature that:
 - A. Bidder has received, read, and understands the Bidding Documents, has visited the site and become familiar with local conditions under which work is to be performed, has correlated observations with requirements of Bidding Documents, and makes his bid in accordance herewith.
 - B. Failure to complete the Bid Form, provide the required attachments, or comply otherwise with the instructions to Bidders, may be cause for rejection of bid.
 - C. The Bidder has received the following Addenda:

Addendum No. _____ Dated: _____
Addendum No. _____ Dated: _____
Addendum No. _____ Dated: _____
Addendum No. _____ Dated: _____
Addendum No. _____ Dated: _____
 - D. The person who signs this bid on behalf of the Bidder is required to be legally empowered to bind the Bidder to the Contract.
2. The Bidder agrees to:
 - A. Honor this bid for a period of ninety (90) days following the date of the scheduled opening of bids.
 - B. Enter into and execute a contract, if presented on the basis of this bid, and furnish certificate(s) of insurance, a Construction Site Specific Health and Safety Plan, and other documents related to the contract as required, including, the Contract Bond.
 - C. Accomplish the Work in accordance with the Contract Documents.
 - D. Achieve Substantial Completion of the Work 240 business days from and including the date stipulated in the Notice to Proceed, in accordance with the Schedule submitted with this bid.
 - E. Provide the Owner with a detailed breakdown of cost in accordance with the Owner's requirements after the award of Contract.
3. The following attachments are required to be submitted with this Bid Form:
 - A. List of wage rates for all trades directly employed by this contractor including wages, taxes, fringe benefits, insurance, workman's compensation, overhead,

profit, etc. All as necessary to establish an hourly wage rate per craft or trade. Provide separate listing of overtime rates.

- B. List of Sub-Contractors.
 - C. Project Schedule.
 - D. Estimated yearly maintenance costs.
 - E. Expected life of equipment.
 - F. Provide list of Bid-Options:
 - 1. Bid-Option 1: Replace all existing addressable initiating devices, notification appliances and modules one for one with Notifier NFS-320 / NFS2-640 compatible devices.
 - 2. Bid Option 2: Provide an enterprise-wide license for DRMNS server software and install on the fire alarm graphic user interface.
 - 3. Bid Option 3: Provide DRMNS fire alarm control panel integration with the Notifier system.
 - 4. Bid Option 4: Provide DRMNS two-way radio text-to-speech (TTS) integration and configuration with the Motorola CM300 Radio system.
 - 5. Bid Option 5: Provide Hypersprike outdoor high-power speaker array(s), Notifier DVC's, and wide area mass notification system as indicated on the Contract Documents.
 - G. The bid shall include unit pricing for each item specified in Section 5 including but not limited to fire alarm initiating devices, addressable monitor and control modules, notification appliances etc.. Price shall include the complete cost to provide, install, program, and test each device.
 - H. The bid option cost shall include unit pricing for each DRMNS device, appliance, software or equipment needed for a fully functional system. Price shall include the complete cost to provide, install, program and test each piece of equipment.
4. The Bidder agrees to complete the Work of the Base Bid for this project for the lump sum of (show amount in both words and figures):

_____ and _____/100ths dollars;
\$ _____

The lump sum was derived utilizing the following cost for each category listed:

Engineering Services Cost		
Item Description	Cost Quote (\$)	Comments
Engineering Design Services- Shop Drawings, Product Data, Contractor Qualifications		

Permits - Electrical and Fire Alarm Permit Fees		
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Equipment Costs		
Item Description	Cost Quote (\$)	Comments
Fire Alarm Control Equipment - FACU's, Amplifiers, Remote Power Supplies, GUI's		
Equipment Costs (Cont'd.)		
Item Description	Cost Quote (\$)	Comments
Fire Alarm Field Devices - Initiating Devices, Notification Appliances, Addressable Modules		
Electrical Installation Materials - Wire, Cable, Fiber-Optic Cable, Raceways, Fittings, and Installation Hardware/Backboxes		
Rentals - Lifts, Scanners, Core Drill, etc.		
Temporary Facilities and Controls - Office Trailer, Storage Shed, Safety Signage, Barricades, etc.		
Demolition/Removals		

Installation Costs and Source		
Service Type	Service Source	Comments
Electrical Installation Completed by		
Patch/Paint Restore Finishes Completed by		

Service Type	Service Cost Quote (\$)	Comments
Electrical Demolition Cost		
Electrical Installation Cost		

Patch/Paint Restore Finishes Cost		
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Bid Option Cost		
Item Description	Cost Quote (\$)	Comments
Bid-Option 1: Replace all existing addressable initiating devices, notification appliances and modules one for one with Notifier NFS-320 / NFS2-640 compatible devices.		
Bid Option 2: Provide an enterprise-wide license for DRMNS server software and install on the fire alarm graphic user interface.		
Bid Option 3: Provide DRMNS fire alarm control panel integration with the Notifier system.		
Bid Option 4: Provide DRMNS two-way radio text-to-speech (TTS) integration and configuration with the Motorola CM300 Radio system.		
Bid Option 5: Provide outdoor high-power speaker array(s) and mass notification system as indicated on the Contract Documents.		
Additional Comments:		

5. The Bidder agrees, upon written request by the owner, to provide, install, program, make fully functional and test the additional devices and equipment listed below for the per unit price listed. Prices shall be held firm throughout the duration of the contract.

ITEM	COMPLETE UNIT COST
Spot-type photoelectric smoke detector	
Spot-type fixed temperature/rate of rise heat detector	
Duct mounted photoelectric smoke detector (include smoke detector head, base, housing, sampling tubes, auxiliary relay and connection to HVAC unit shut down).	
Manual fire alarm station	
Addressable input module	
Addressable control/relay module	
Fire alarm speaker	
Fire alarm horn	
Fire alarm multi-candela strobe	
Fire alarm combination speaker/multi-candela strobe	
Fire alarm combination horn/multi-candela strobe	
Temperature sensor	
Freezer sensor	
Ozone sensor	
Pump fail sensor	
Panic sensor	
Burglar sensor (Door/Window Contacts, Motion Sensor, etc.)	
STI Stopper Button	

Trenching (per linear foot). Including 2" Schedule 80 PVC, backfill and surface repair. Concrete Asphalt Gravel Soil / Landscape	
--	--

Submitted By:

Authorized Signature: _____ Date: _____

Name and title:
(Type or print) _____

On behalf of:
(Type or print) _____

Bidder's address:
(Please give Street and
Mailing address if different) _____

Bidder's
Telephone Number: _____

END OF SECTION

**SECTION 01320
PROJECT MEETINGS**

PART 1 – GENERAL

1.1. DESCRIPTION:

- A. The Owner's Representative in concert with the Contractor shall schedule and administer preconstruction meeting, periodic progress meetings and specially called meetings throughout the progress of the Work.
 - 1. Prepare agenda for meetings.
 - 2. Make physical arrangements for meetings.
- B. The Construction Manager shall be responsible for the following:
 - 1. Record the minutes; include all significant proceedings and decisions.
 - 2. Reproduce and distribute copies of minutes within three days after each meeting.
 - a. To all participants in the meeting.
 - a. To all parties affected by decisions made at the meeting.
 - b. Furnish three copies of minutes to the Owner's Representative.
- C. Representatives of Contractors, Subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.
- D. The Engineer shall attend meetings, as necessary, to ascertain that work is consistent with Contract Documents.

1.2. PRE-CONSTRUCTION MEETING:

- A. Schedule within 5 days after Date of Notice to Proceed.
- B. Attendance:
 - 1. Owner's Representative.
 - 2. Owner's Safety Representative.
 - 3. Contractor's Superintendent.
 - 4. Major subcontractors.
 - 5. Contractor's Safety Representative.
 - 6. Representatives of Governmental or other Regulatory Agencies.
- C. Minimum Agenda:

1. Distribute and Discuss:
 - a. List of major Subcontractors.
 - b. Tentative Construction Schedule.
 - c. Temporary Utilities.
 2. Critical Work sequencing.
 3. Relation and coordination of Contractors.
 4. Designation of responsible personnel.
 5. Processing of field decisions, Change Orders and Applications.
 6. Adequacy of distribution of Contract Documents.
 7. Submittal of shop drawings, project data and samples.
 8. Procedures for maintaining Record Documents.
 9. Use of premises:
 - a. Office and storage areas.
 - b. Owner's requirements.
 10. Major equipment deliveries and priorities.
 11. Safety and first-aid procedures.
 12. Security procedures.
 13. Housekeeping procedures.
- 1.3. PROGRESS MEETINGS:
- A. Schedule Regular Meetings weekly.
 - B. Hold Called meetings as progress of Work dictates.
 - C. Location of meetings: Construction Manager's Field Office.
 - D. Attendance:
 1. Construction Manager.
 2. Owner's Representative.
 3. Subcontractors as pertinent to agenda.
 4. Safety Representative.
 5. Representative of Governmental or other Regulatory Agencies.

- E. Minimum Agenda:
1. Review, approve minutes of previous meeting.
 2. Review Work progress since last meeting.
 3. Note field observations, problems, and decisions.
 4. Identify problems which impede planned progress.
 5. Review off-site fabrication problems.
 6. Develop corrective measures and procedures to regain planned schedule.
 7. Revise Construction Schedule as indicated.
 8. Plan progress during next work period.
 9. Coordinate projected progress with other Prime Contractors.
 10. Review submittal schedules, expedite as required to maintain schedule.
 11. Maintaining of quality and work standards.
 12. Review changes proposed by Owner for:
 - a. Effect on Construction Schedule.
 - b. Effect on Completion Date.
 13. Complete other current business.

END OF SECTION

**SECTION 01500
TEMPORARY FACILITIES AND CONTROLS**

PART 1 – GENERAL

1.1. WATER AND ELECTRICITY

- A. Water and electricity will be available for the Contractor's use in construction areas, so long as the quantity of usage does not affect the operation of the facilities. However, in consideration of this privilege, the Contractor shall make a diligent effort not to waste the Owner's water and electricity.
- B. If the Owner feels that the Contractor is abusing this privilege, he may serve a warning in writing to the Contractor through the Engineer that the privilege will be revoked if more diligent conservation measures are not taken.
- C. In the event that this privilege is revoked by the Owner, the Contractor shall be required to furnish at his own expense all electricity and water necessary for construction purposes including all equipment complete.
- D. Contractor shall be responsible for water and electricity at Contractor's construction trailer. Temporary connections shall be the responsibility of the Contractor.

1.2. TEMPORARY OFFICES AND SHEDS

- A. The Contractor shall provide in locations approved by the Owner adequate building and sheds for his office, his Subcontractors, the storage of materials, and to house all other necessary facilities to carry on the work. The Contractor shall provide constant telephone service during the duration of the construction period.

1.3. SIGNS

- A. Provide and maintain danger, warning and safety signs and barricades where necessary or as required by any local authority having jurisdiction.

1.4. MAINTENANCE OF TRAFFIC AND CIRCULATION

- A. It shall be incumbent on the Contractor to maintain circulation of traffic, both foot and vehicle, and access to the various buildings by fire apparatus during the construction of the project.

1.5. DAMAGE AND PATCHING

- A. All damage to sidewalks, streets, alleys, curbs, gutters, existing structures, etc., done during construction shall be restored by the Contractor at his own expense. Repair of sidewalks shall be made by replacing the entire block damaged. Cracked sidewalks shall be considered as damaged.
- B. The Contractor shall be held responsible for damage to the present work or to completed new work that may be caused by his work or workmen and shall

properly patch or remove and replace same at his expense as required by the Engineer.

1.6. TEMPORARY PROTECTION BARRIERS

- A. The Contractor shall provide temporary barriers, as necessary, to prevent dust, vapors, and traffic from reaching the operational areas of the facility.
- B. The temporary protective barriers shall be utilized to seal all areas of construction adjacent to the operational areas of the facility.
- C. The temporary protective barriers shall be constructed in sections, as required, to protect during the different phases of construction. They shall be constructed from nylon-reinforced polypropylene with metal or plastic (no wood allowed) framing. Top, bottom and edge seams shall be secured in such a manner as to contain all dust and prevent same from entering other areas of the Plant.
- D. The geometry size, and location of the temporary protection barriers shall be coordinated with the Owner, prior to erection.
- E. The temporary protective barriers shall be removed from the site, and properly disposed, once no longer required.
- F. All temporary barriers will be constructed during non-production shifts, as directed by Owner. Some may be required to be constructed during weekends.

1.7. UTILITY LINES

- A. The Contractor shall carefully examine the premises for any visible utility lines, including appurtenances for same, which are not indicated on the drawings but which in their present locations and positions will interfere in any way with any of the work called for by the drawings or specifications.
- B. In general, all work outlined in this paragraph shall be done by the trade in whose jurisdiction it falls, but each trade shall fully cooperate so that the work involved will proceed in an orderly manner.
- C. In doing all work under this contract, the Contractor shall carefully protect all existing lines, which shall be maintained temporarily in service, or which shall be changed from any damage or dislocation, and he shall make good at his own expense any damage done to such lines.

END OF SECTION

SECTION 01600 MATERIAL AND EQUIPMENT

PART 1 – GENERAL

1.1. MATERIALS STORAGE

- A. The Contractor will have areas as designated and agreed upon with the Owner, when visiting the site prior to bidding, for storage of his materials and equipment. Any additional area or cover required other than that agreed upon shall be provided by the Contractor. No materials shall be stored directly in contact with earth or other deleterious matter.
- B. The Contractor shall allot suitable and proper space to his Subcontractors for the storage of their materials. All stored material shall be arranged and maintained in an orderly manner on or near the site; and all lime, cement, insulation, etc. and other materials and equipment affected by moisture shall be protected from the weather. Materials stored off the site shall be the responsibility of the respective Contractor.
- C. The Contractor shall be responsible for the storage, care, and protection of his materials to the end that all materials shall be in perfect condition at the time of incorporation in the building.
- D. Any area in the building used as a storeroom or shop shall be put in perfect order before the completion of the work at the expense of the one causing the damage.
- E. The street, sidewalks, etc., shall be left open for traffic or otherwise maintained in accordance with instructions of the authorities.
- F. If it becomes necessary at any time during the erection of the work to move materials which shall enter the construction, which materials have been temporarily placed, the Contractor shall, when so directed by the Engineer, move them or cause them to be moved without additional cost to the Owner.

PART 2 – PRODUCTS

2.1. KIND AND QUALITY OF MATERIALS

- A. All materials, equipment and fixtures shall be in strict accordance with the specification requirements in each case and of the best quality and grade. In case the bidder names in his bid materials or equipment which do not so conform, he shall be held responsible for furnishing materials and equipment which fully conform thereto at no change in his bid price.
- B. All materials and equipment used in carrying out the work identified by these specifications shall be from a domestic manufacturer unless specifically specified otherwise, bearing the UL label when available and/or approval of a National Recognized Testing Laboratory (NRTL) and/or ASME Codes, as required. They shall also comply with local utility, municipal and county requirements as well as other authorities having jurisdiction. The Contractor shall obtain and pay for all necessary mechanical permits and inspections and shall deliver all certificates

free of charge to the Engineer before work is accepted in accordance with SECTION 01700 CONTRACT CLOSEOUT.

- C. It is clearly understood and agreed that the Engineer shall have the authority to reject any material, equipment or workmanship not complying with these specifications and that the Contractor shall replace defective material so rejected and remove it from the job within 24 hours of such rejection; otherwise, the Engineer may have same removed at the Contractor's expense.

PART 3 – EXECUTION

3.1. STARTING OF SYSTEMS

- A. Prior to final inspection, demonstrate operation of Contractor furnished equipment to Engineer and to Owner's representative.
- B. Instruct Owner's personnel in operation, adjustment and maintenance of Contractor furnished equipment, using the operating and maintenance data as the basis of instruction.

END OF SECTION

**SECTION 01700
CONTRACT CLOSEOUT**

PART 1 – GENERAL

1.1. REQUIREMENTS:

- A. Comply with the requirements stated in the General Conditions and in the Specifications of the contract and in the Specifications for administrative procedures, fiscal provisions and legal submittals to close out the Work.

1.2. SUBSTANTIAL COMPLETION:

- A. When the Contractor considers the Work to be substantially complete, he shall submit to the Engineer:
 - 1. A written notice that the Work is sufficiently complete that the Owner may occupy the Work for the use for which it is intended and is therefore substantially complete. The written notice shall include a certificate of occupancy.
 - 2. A list of items to be completed or corrected and dates scheduled for completion or correction of each item.
- B. Within a reasonable time after receipt of such notice, the Engineer will schedule a date with the Owner's Representatives and the Engineer, and his consultants will make an inspection to determine the status of completion.
- C. Should the Engineer determine that the Work is not substantially complete, he will promptly notify the Contractor in writing, stating the reasons. The Contractor shall remedy the deficiencies in the Work and send a second written notice of Substantial Completion to the Engineer. The Engineer will notify the Owner and reinspect the Work.
- D. When the Engineer concurs that the Work is substantially complete, he will prepare a Certificate of Substantial Completion on AIA Document G704-1992 accompanied by the Contractors list of items to be completed or corrected as verified and amended by the Engineer. The Engineer will submit all accounting of any liquidated damages due to the project. The Engineer will submit the Certificate to the Contractor and Owner for their written acceptance.

1.3. FINAL INSPECTION:

- A. When the Contractor determines the work is complete, he shall submit written certification that:
 - 1. Contract Documents have been reviewed.
 - 2. Verification that a testing plan and testing schedule has been accepted.
 - 3. The Work has been inspected by a qualified person authorized by the Contractor for compliance with Contract Documents.

4. The Work has been completed in accordance with the Contract Documents.
 5. Equipment and systems have been tested and demonstrated in the presence of the Owner's Representative and are operational.
 6. Inspections or letters of acceptance for items requiring approval from a governing authority as identified in SECTION 01725 – PROJECT DATA are complete and available.
 7. The Work is completed and ready for final inspection.
- B. Within a reasonable time after receipt of the certification, the Engineer will schedule a date with the Owner's Representatives and the Engineer, and his consultants will make an inspection to verify completion.
 - C. Should the Engineer consider the Work incomplete or defective, he will promptly notify the Contractor in writing listing incomplete or defective work. The Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification that the Work is complete. The Engineer will notify the Owner and reinspect the Work.
 - D. When the Engineer finds the work acceptable under the Contract Documents, he will request the Contractor to make the closeout submittals.
- 1.4. REINSPECTION FEES:
- A. Should the Engineer perform reinspection's due to failure of the Work to comply with the claims of status of completion made by the Contractor:
 1. Owner will compensate Engineer for such additional services.
 2. Owner will deduct the amount of such compensation from the final payment due the Contractor.
- 1.5. CONTRACTORS CLOSEOUT SUBMITTAL TO ENGINEER:
- A. The closeout submittal shall be complete and submitted to the Engineer as a single package.
 1. Project Data as required by SECTION 01725.
 2. Consent of Surety to release retainage and pay Contractor in full.
 3. Release of Liens from all subcontractors and materials suppliers.
 4. Certificate of Occupancy.
- 1.6. FINAL APPLICATION FOR PAYMENT:
- A. The Contractor shall submit to the Engineer the Final Application for payment accompanied by a statement of accounting. The statement shall reflect all adjustments to the Contract Sum.

1. The original Contract Sum.
 2. Additions and deductions resulting from:
 - a. Previous Change Orders.
 - b. Allowances.
 - c. Unit Prices.
 - d. Deductions for non-conforming work.
 - e. Deductions for Liquidated Damages.
 - f. Deductions for reinspection payments.
 - g. Other adjustments.
 3. Total Contract Sum as adjusted.
 4. Previous Payments.
 5. Sum Remaining Due.
- B. When the Engineer has determined that the closeout submittal is complete and correct and has received the final application for payment with the statement of accounting, he will prepare a Change Order reflecting the approved adjustments to the Contract Sum which were not previously made by Change Order.
- C. The Engineer will submit to the Owner the Consent of Surety, Releases of Liens, Final Application for Payment with the Statement of Accounting and signed Change Order - if required - and other documents related to fiscal provisions with a cover letter from the Engineer to certify that, to the best of his knowledge, completion of the project is in compliance with the Contract Documents and the balance shown is due and payable.

END OF SECTION

SECTION 01710 CLEANING

PART 1 – GENERAL

1.1. DESCRIPTION

- A. Maintain premises and public properties free from accumulations of waste and rubbish caused by operations.
- B. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave Project clean and ready for occupancy.
- C. If the Contractor fails to clean up at the completion of the Work, the Owner may do so and the cost thereof shall be charged to the Contractor.
- D. Hazards Control:
 - 1. Store volatile wastes in covered metal containers and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- E. Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws.
 - 1. Do not burn or bury rubbish and waste materials on Project site.
 - 2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.

PART 2 – PRODUCTS

2.1. MATERIALS

- A. Use only cleaning materials recommended by manufacturer on surfaces to be cleaned.

PART 3 – EXECUTION

3.1. DURING CONSTRUCTION

- A. Execute cleaning to ensure that building, grounds and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

- C. At reasonable intervals during progress of Work, clean site, and public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on-site containers for collection of waste materials, debris, and rubbish.
- E. Dispose of waste materials, debris and rubbish at designated dumping areas.
- F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

3.2. FINAL CLEANING

- A. Clean Project site (yard and grounds), including landscape development areas, of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro-chemical spills, and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even-textured surface.
- B. Maintain cleaning until Project, or portion thereof, is occupied by Owner.

END OF SECTION

SECTION 01725 PROJECT DATA

PART 1 – GENERAL

1.1. WORK INCLUDED

- A. The Contractor shall compile and maintain accurate Project Record Documents, Shop Drawings, Product Data, Maintenance and Operations Data, a record of subcontractors and material suppliers, a testing plan, and related information that the Owner may use for maintenance, operation, repair, renovation, or additions to the Work.
- B. Furnish Guarantees/Warranties, Certifications, letters of acceptance, maintenance agreements, bonds and other documents required by the Contract Documents.
- C. Organize the material as required for submittal to and acceptance by the Engineer.

1.2. PROJECT RECORD DOCUMENTS

- A. Maintain at the site, in good condition, one complete set of Contract Documents for use only as Record Documents. These documents shall be marked "Record Documents" and shall not be for general reference or construction use. Make the Documents available for inspection by the Engineer and the Owner. Do not conceal work until information is recorded.

1.3. RECORD DRAWINGS

- A. Keep a set of prints at the job site exclusively for recording deviations from the drawings which are necessary because of job conditions.
- B. Legibly mark the drawings to record actual conditions of construction including location, depth and identification of new and existing underground items, location by dimension and identification of utilities, valves, tap points, equipment, service access, test points and related features, field changes in dimensions and detail, changes by addenda and change orders, description and details of features for maintenance, service, replacement or expansion of the Work.
- C. Mark deviations in colored pencils so that work of various systems can be easily identified.
- D. When work is completed, record all deviations on clean copies of drawings.
- E. Contractor to turn corrected copies over to the Owner as record copies within three weeks of acceptance of the project.

1.4. PROJECT DATA BINDERS

- A. Furnish one (1) complete set of Project Data in commercial quality three ring binders with durable plastic covers and one (1) complete set of Project Data in portable document format (pdf). Identify the project on the face and side of the

binder. If multiple binders are required, identify as consecutively numbered volumes. The original documents shall be identified as set number one.

- B. Provide the information as outlined below in the Project Data Binders.
1. Introductory Information:
 - a. Cover sheet or sheets giving complete project title, Contractor's name, address, phone number, name of project superintendent, project manager and related general information.
 - b. Provide a complete listing of subcontractors and material suppliers, including company name, address, phone number, contact person and local representative.
 - c. Table of Contents for Sections. Section 1 is reserved for the Designer.
 2. Section 2: Certificates and Acceptance:
 - a. Section Table of Contents.
 - b. Contractor's certification as described in Section 01700 Contract Close-out.
 - c. Certificate of Substantial Completion.
 3. Warranties and Bonds:
 - a. Section Table of Contents.
 - b. Contractor's warranty of the work.
 - c. Warranties, bonds and service and maintenance contract, executed by each of the respective manufacturers, suppliers and subcontractors as specified in the respective sections of specifications.
 - d. Complete information for each item:
 1. Product or work item.
 2. Scope.
 3. Name of firm or contractor, with name of responsible principal, address and telephone number.
 4. Beginning date and duration of warranty, bond or service maintenance contract.
 5. Provide information for instances which might affect the validity of warranty or bond, and proper procedure in case of failure.
 4. Operating and Maintenance Data (Contractor Furnished Equipment):
 - a. Section Table of Contents.
 - b. List, with each system or product, the name, address and telephone number of the responsible subcontractor or installer. Give drawing and specification reference, building location, manufacturer and model number, local supplier and maintenance service company for each item.

- c. Data for maintenance and operation of all major systems, equipment and products furnished by the Contractor. For each unit of equipment, system or product, as appropriate, provide:
1. Description of unit and component parts.
 2. Operating and maintenance procedures.
 3. Manufacturer's printed operating and maintenance instructions, supplemented with drawings and written text as necessary to clearly illustrate proper operation and maintenance procedures. Provide a logical sequence of instructions for each procedure.
 4. Manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
 5. As-installed control diagrams by controls manufacturer.
 6. Each Contractor's coordination drawings with as installed color-coded piping diagrams and/or wiring diagrams.
 7. Charts of valve tag numbers with the location and function of each valve.
 8. Circuit directories of panel boards.
 9. Instructions for care, with a list of manufacturer's recommendations for types of cleaning agents and methods.
 10. Product Data: Include information that clearly identifies the specific product or part installed. When manufacturer's cut sheets are used for product identification, plainly mark the specific items included in the work.
 11. List materials and parts furnished for the Owner's use.
 12. Reference any over-size documents that cannot be neatly folded and bound in this binder and furnish separately.
- d. Prior to final inspection, demonstrate operation of all Contractor furnished equipment to the Designer and to Owner's representative.
- e. Prior to final inspection provide an overall testing and commissioning plan for review and acceptance by the Designer and Owner.
- f. Instruct Owner's personnel in operation, adjustment and maintenance of Contractor furnished equipment, using the operating and maintenance data as the basis of the instruction.

END OF SECTION

SECTION 16010 GENERAL PROVISIONS

PART 1 – GENERAL

1.1. WORK INCLUDED

- A. Fire alarm monitoring network upgrade.

1.2. RELATED WORK:

- A. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.

1.3. QUALITY ASSURANCE

- A. Comply with applicable local, state and federal codes.
- B. Comply with applicable requirements of recognized industry associations which promulgate standards for the various trades.
- C. Employ only qualified journeymen for this work. Employ a competent qualified electrician to supervise the work.

1.4. STANDARDS

- A. Perform work specified in Division 16 in accordance with standards listed below including amendments or revisions. When these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Designer.
- B. Applicable codes including, but not limited to the following:
 - 1. Building, Fire and Related Codes of Baltimore City, 2020 Edition.
 - 2. International Building Code (IBC), 2018 Edition.
 - 3. International Fire Code (IFC), 2018 Edition.
 - 4. NFPA 70, National Electrical Code, 2017 Edition.
 - 5. NFPA 72, National Fire Alarm and Signaling Code, 2016 Edition.
 - 6. NFPA 150, Fire and Life Safety in Animal Housing Facilities, 2016 Edition.
 - 7. NFPA 731, Standard for the Installation of Electronic Premises Security Systems, 2020 Edition.
 - 8. The latest published edition of the equipment manufacturers' product datasheets, technical specifications, installation instructions and wiring guidelines.

- C. Contractor to submit and/or file with proper authorities all necessary specifications and drawings as required by governing authorities.

PART 2 – PRODUCTS

- 2.1. **MATERIALS AND EQUIPMENT:** All materials and equipment used in carrying out these specifications to be American made unless approved otherwise by the Owner and to be new and have UL listing or listing by other recognized testing laboratory when such listings are available. Specifications and drawings indicate name, type, and catalog numbers of materials and equipment to be used as "standards" shall not be construed as limiting competition. Contractor may at his option, use materials and equipment when, in the judgment of the Designer, they are equivalent to that specified.

PART 3 – EXECUTION

3.1. COORDINATION

A. Intent:

- 1. These sections of specifications and drawings form a complete set of documents for the electrical work of this project. Neither is complete without the other. Any item mentioned in one shall be as binding as though mentioned in both.
- 2. The intent of these specifications and drawings is to form a guide for a complete electrical installation. Where an item is reasonably necessary for a complete system but not specifically mentioned, such as pull boxes, fittings, expansion fittings, support hangers, etc., provide same without additional cost to Owner.
- 3. Electrical layouts indicated on drawings are diagrammatical only. Exact location of outlets to be governed by project conditions. The Designer reserves the right to make any reasonable changes (approximately 6 feet) in location of junction boxes, or equipment prior to roughing-in of such without additional cost to Owner.

B. Deviations:

- 1. No deviations from specifications and drawings to be made without full knowledge and consent of Designer.
- 2. Should Contractor find during progress of work that existing conditions make desirable a modification of the requirements of any particular item, report such item promptly to Designer for his decision and instructions.

- C. As it is possible to determine in advance, leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should contractor neglect doing this, any cutting and/or patching required to be done is at this contractor's expense.

3.2. TESTS

- A. Prior to final observation and acceptance test, leave in satisfactory operating condition all electrical systems and equipment including but not limited to the following:
 - 1. Electrical distribution system.
 - 2. Ground fault protection system.
 - 3. Emergency power generation system.
 - 4. Transformers.
 - 5. Electric motors for all equipment.
 - 6. Electric safety devices.
 - 7. Any alarm system, including generator, door security, etc.

- 3.3. INSPECTION FEES AND PERMITS: Obtain and pay for all necessary permits and inspection fees required for electrical installation.

- 3.4. IDENTIFICATION OF EQUIPMENT: Properly identify all starters, contactors, relays, safety switches and panels with permanently attached black (normal power) or red (essential systems) phenolic plates with 1/4" white engraved lettering on the face of each attached, with two sheet metal screws. Starters and relays connected by the electrical tradesman to be identified by him whether furnished by him or others.

- 3.5. DEMOLITION
 - A. Contractor shall visit the site before submitting a bid to acquaint himself with existing conditions.
 - B. Demolition work shall not commence until the new work is completed, accepted by the Owner, and approved by the AHJ.
 - C. Work in existing buildings shall be scheduled well in advance with the Owner. Work shall be performed at such times and under such conditions as suit the convenience of the Owner. Plan the work to minimize disruption of normal operations.
 - D. In renovated areas, remove wiring devices, fixtures, components, electrical equipment, conductors, boxes, and conduits not required to remain in service when this project is complete.
 - E. Remove existing conduit and wire from areas to be remodeled, back to panelboard, cabinet or junction box.
 - F. Where a circuit is interrupted by removal of a device or fixture from that circuit, the contractor shall install wire, conduit, etc., as required to restore service to the remaining devices and fixtures on that circuit.
 - G. Lighting fixtures, wiring devices, panelboards, and conductors removed shall be offered to the Owner. If he chooses to retain these items or a part of these items,

turn those chosen over to him. Items rejected by the Owner shall be removed from the project site by the contractor.

3.6. WARRANTY-GUARANTEE

- A. Designer reserves right to accept or reject any part of installation which does not successfully meet requirements as set out in these specifications.
- B. Contractor shall and hereby does guarantee all work installed under this division shall be free from defects in workmanship and materials for a period of two (2) year from date of final acceptance. The above parties further agree that they will repair and replace any defective material or workmanship which becomes defective within the terms of this warranty-guarantee.

END OF SECTION

**SECTION 275116
WIDE AREA MASS NOTIFICATION SYSTEM**

PART 1 – GENERAL

1.1 Scope of Work

- A If Bid Option 5 in specification Section 00400 is exercised, this specification section shall apply to this project.
- B The scope of work for this project shall consist of providing one complete wide area mass notification system (WAMNS) for the MZB. The WAMNS shall provide the capability for both pre-recorded and live voice messaging.
- C This project shall install a complete WAMNS that includes amplifier/control units, high power speaker array (HPSA), integration with the MZB fire alarm and emergency communication system (FAECS) via a Notifier Digital Voice Command (DVC) unit, and the installation and mounting materials necessary to provide a complete system.
- D Provide and install, at a minimum, the following equipment, materials and features:
 - 1. Hyperspike Encompass model amplifier/control units with pedestal mount.
 - 2. Hyperspike HPSA's. Proposed model shall provide intelligible (0.9 STI) voice messages throughout the MZB facility under all expected atmospheric conditions. Manufacturer shall justify the proposed model by means of acoustic modeling software. Provide results of the modeling with bid.
 - 3. Notifier FMM-1 monitor module to monitor the Hyperspike control unit general trouble output.
 - 4. Notifier FRM-1 addressable relay module to switch the 24 vdc activation signal provided by the local FACU.
 - 5. The contractor shall provide 2-inch diameter poles where indicated on the contract drawings. Pole speaker mounting hardware where specified on the contract drawings.
 - 6. Batteries necessary to provide of the standby power as specified in 2.3 herein.
 - 7. Installation and miscellaneous materials necessary for a complete system.
- E The scope of work includes training the onsite Maintenance Contractor, facilities engineering team, Operations, Security and MZB personnel. One (1) on-site training session should be provided to train the Owner on any new equipment not installed under previous phases. Training shall be provided by a representative of the manufacturer. Where not packaged with on-site operator training sessions, a "refresher" training session shall be provided.

1.2 System Description

- A The system shall be based on a Hyperspike model Encompass control units with either a model MA-1 or MA-2 HPSA(s) mounted on 2-inch diameter poles at the locations identified on the contract drawings.
- B The control units shall receive audio signals from the Notifier DVCs installed at locations identified on the contract drawings.
- C Voice commands will originate from the GUI located in the Mansion House and Maintenance and Commissary building.
- D The WAMNS shall be seamlessly integrated with the MZB FAECS. This system installation shall include all equipment necessary to provide a fully functional, reliable, and maintainable WAMNS.

- E The system shall be capable of providing live voice and pre-recorded messages to the exterior areas over the entire MZB facility.

1.3 Quality Assurance

- A Control unit(s), amplifier(s), speaker mounting assemblies, and HPSA(s) shall be as manufactured by Hyperspike® and under the appropriate category for the intended use by Underwriters Laboratories, Inc. (UL) and shall bear the “UL label.” Partial listings, or multiple listings for various major sections of the control equipment, shall not be acceptable.
- B Electrical components, devices, and accessories shall be Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the AHJ.
- C All equipment supplied shall be first quality and the manufacturer’s best type and latest model capable of complying with all requirements of this specification and shall have been in continuous production and in continuous service in commercial applications for at least five years.
- D The installation and wiring of all devices in accordance with the latest published edition of the manufacturer’s installation instructions to achieve the system operation and function as specified herein.
- E All equipment and devices shall be labeled and listed for the intended use in Underwriters Laboratories, Inc. (UL).
- F If a UL listing for a specific device is unavailable, approval by FM Global (FM) or other nationally recognized testing laboratory (NRTL) acceptable to the AHJ shall be acceptable.

1.4 Contractor’s Responsibilities

- A The Contractor’s responsibilities are as follows:
 1. The supply and installation of a complete, ready and operational wide area mass notification system.
 2. The Contractor shall work in a collaborative and iterative approach with MZB to develop the appropriate user interfaces including equipment, indicators, controls, configurations, labels, and messages. The configuration of user control interfaces for ease of use, intuitiveness, clarity, and capability to users of minimal experience is a high priority for the MZB.
 3. Extensive factory training shall take place at the project site. O&M Contractor and MZB personnel to attend. The system manufacturer shall provide onsite training session(s) equal to the training provided at the manufacturer’s factory but shall be hands-on the installed system. Refer to Section 3.5 herein for detailed training requirements.
 4. Coordinate the installation and testing of associated equipment and circuits with all related trades, contractors, equipment maintenance and testing representatives, and the MZB. Where applicable, work and/or equipment provided in other sections and related to the WAMNS shall include, but not be limited to all testing, wiring and connection to the following equipment, systems, and devices:
 - a. Fire alarm and emergency communication system.
 5. Provide all required documentation (As-built drawings, training materials, Operating and Maintenance (O&M) manuals, Test Plan, warranty, etc.), as specified in this specification.

6. Coordinate the Acceptance Test of the WAMNS with the MZB. The system must be fully tested and accepted by the MZB.
7. Restore, patch, paint, and firestop ceilings, walls, and floors damaged by the installation or demolition.

1.5 Qualifications

A Installation Contractors, herein after called Contractor:

1. The Contractor shall have been in the business of installing wide area mass notification or outdoor public address systems of the for at least five (5) years, acceptable to the MZB.
2. The Contractor shall be licensed and experienced in the installation of WAMNS's, or outdoor emergency communications systems in facilities similar to this project and have obtained design and inspection approvals for similar projects from authorities having jurisdiction.
3. The Contractor shall have on-staff a NICET (National Institute for Certification in Engineering Technologies) Level III, or equivalent acceptable to the MZB, certified technician who is legally qualified to practice and is experienced in the design and installation of WAMNS's, or outdoor emergency communications systems that are similar in size and complexity.

B Manufacturers or Authorized Manufacturer's Distributors; hereafter called Manufacturer's Representative.

1. Distributors of acceptable manufacturer's equipment shall provide documentation indicating that they are authorized by the manufacturer to distribute and service the equipment and that the manufacturer has stated that they have satisfactorily completed all training courses offered by the manufacturer in relation to the equipment provided.
2. The Manufacturer's Representative shall have been in the business of providing equipment system programming and commissioning wide area mass notification or outdoor public address systems of the for at least 5 (5) years, acceptable to the MZB.
3. The Manufacturer's Representative shall be an authorized Hyperspike representative and be experienced in the design, installation and maintenance of Hyperspike® systems and products proposed for use on this project.
4. The Manufacturer's Representative shall be licensed and experienced in the installation of WAMNS's in facilities similar to this project and have obtained design and inspection approvals for similar projects from authorities having jurisdiction.
5. The Manufacturer's Representative shall have on-staff a Manufacturers certified technician who is legally qualified to practice and is experienced in the design and installation of WAMNSs that are similar in size and complexity.

C Nonconformance to the Qualification of Bidders requirements outlined in this specification shall be cause for immediate dismissal of the Bidder's proposal documents without comment.

1.6 Codes and Standards

- A Design, equipment, and installation shall be made in accordance with the applicable provisions of the following:
 - a. Applicable codes including, but not limited to the following:
 - i. Building, Fire and Related Codes of Baltimore City, 2020 Edition.
 - ii. International Building Code (IBC), 2018 Edition.
 - iii. International Fire Code (IFC), 2018 Edition.
 - iv. NFPA 70, National Electrical Code, 2017 Edition.
 - v. NFPA 72, National Fire Alarm and Signaling Code, 2016 Edition.
 - vi. NFPA 150, Fire and Life Safety in Animal Housing Facilities, 2016 Edition.
 - vii. NFPA 731, Standard for the Installation of Electronic Premises Security Systems, 2020 Edition.
 - viii. The latest published edition of the equipment manufacturers' product datasheets, technical specifications, installation instructions and wiring guidelines.
 - 6. Underwriters' Laboratories, Inc. (UL) Standard No. 96, Standard for Lightning Protection Components, 5th Edition, 12 May 2005;
 - 7. UL 96A, Standard for Installation Requirements for Lightning Protection Systems 12th Edition, 23 May 2007; and
 - 8. Architectural Barriers Act Accessibility Guidelines (ABA), 2015 Revisions; and
 - 9. The latest published edition of the equipment manufacturers' product datasheets, technical specifications, installation instructions and wiring guidelines.
- B The systems shall be tested in accordance with the following:
 - 1. NFPA 72, National Fire Alarm and Signaling Code, latest edition.
 - 2. NFPA 731, Standard for the Installation of Electronic Premises Security Systems, 2020 Edition.
 - 3. The latest published edition of the equipment manufacturers' testing procedures and guidelines.

1.7 Related Documents

- A Drawings and general provisions of the Contract, including General and Supplementary, apply to this Section.
- B Drawings supplied with this specification shall be used by the Contractor as a reference for the requirement and location of system components.

1.8 Order of Precedence

- A Should conflicts arise out of discrepancies between documents referenced in this specification, the most stringent requirement shall apply.

- B Should a level of stringency be indeterminable, the discrepancies shall be resolved as follows:
1. Applicable code requirements shall take precedence over this specification.
 2. The National Fire Protection Association Standards shall take precedence over this specification.
 3. This specification shall take precedence over the drawings.

1.9 Submittals

All submittals shall be completed for each Package. Combined submittals shall not be permitted.

- A Coordinate submittal requirements with site's specifications on submittal procedures, and closeout procedures.
1. The MZB shall review these documents for the limited purposes of checking for general conformance with this specification and the Contract Drawings and not to determine accuracy or completeness of other details such as dimensions and quantities. The MZB shall not approve means, methods or procedures of construction or installation; nor shall they review for safety precautions.
 2. If submittals are found not to conform to all of the requirements of this specification and the Contract Drawings, the Contractor shall be required to revise and re-submit the package with modifications.
 3. Each submittal package shall be prepared and presented in a professional manner, be bound, and shall include a title page and index. Each section of the submittal shall be numbered. Submittal packages shall be complete.
 4. System working plans (Contractor shop drawings) and calculations must be prepared, stamped, and submitted for approval, by a registered professional fire protection engineer or a NICET Level III certified technician who is legally qualified to practice in their State of business licensure.
- B Pre-Construction Submittal. Submit electronic/pdf copies, unless otherwise specified, of the following in accordance with site's specification on submittal procedures (provided by others). Submit all items required by this article at one time as a complete package. Contractor may submit a phased submittal plan to the MZB for consideration.
1. The Manufacturer's Representative's name, qualifications, and authorization. Once approved, the representative shall not be changed without approval in writing by the MZB.
 2. A letter from the equipment manufacturer stating that the equipment to be supplied is not at or near the end of its life cycle, and replacement components for all control equipment shall be available from the manufacturer for a minimum of 15 years from the date of system acceptance by the MZB.
 3. A preliminary Equipment List identifying the type, quantity, make and model number of each piece of equipment to be provided under this submittal. The Equipment List shall include the type, quantity, make and model of spare equipment, as specified in this specification.
 4. Product Data: Manufacturer's original product datasheets, specifications, installation instruction sheets, and descriptive information for all major

components of the system. All equipment and devices to be furnished under this contract shall be clearly marked and/or highlighted on the product datasheets to include identification of specific options or selections.

5. Two (2) samples of each of the following types of materials and equipment:
 - a. Field device mounting and/or backboxes.
 - a. Specialty installation hardware and materials.

6. Shop Drawings and Calculations: Electronic/pdf copies of detailed shop drawings of the system on uniform size sheets no smaller than 24 inches by 36 inches. Calculations shall be neatly organized and bound to compliment the shop drawings. System design by the field installation crew is not permitted. Information shall include but not be limited to:
 - a. System riser diagram of the complete WAMNS.
 - b. Complete plans showing all device and equipment locations and including point to point wire and raceway runs.
 - c. A complete set of point-to-point control equipment installation diagrams; typical wiring diagrams are not acceptable. Speaker coverage must be clearly identified on the drawings to confirm compliance with this specification and the Contract Drawings.
 - i. All devices and appliances on each circuit shall be labeled with the circuit type and appliance/device number.
 - ii. Percentage of circuit loading for all speaker notification appliance circuits shall be provided at the end of each circuit.
 - d. Diagram of all user control interfaces and panels, including remote microphones, indicators, buttons, switches, and proposed labels.
 - e. A complete list of current requirements during normal, trouble, and alarm conditions for each component of the system.
 - f. Screen shots of the proposed maintenance screens indicating optional 'macros' for inspection, testing and maintenance activities.
 - g. A complete sequence of operation matrix that describes how the system responds during an alarm, and trouble condition including control unit light emitting diodes (LEDs), audible and visible indications; initiating devices, notification appliances, and auxiliary functions. The description shall provide sufficient information so that the exact function of each installed device and appliance is known.
 - h. A complete sequence of operation matrix that describes how the WAMNS responds during non-fire emergency and non-emergency event via live paging and pre-recorded messages. The description shall provide sufficient information to identify the hierarchy of Mass Notification events in comparison to fire alarm events.
 - i. Preliminary battery calculations showing total standby power and total alarm power required on a fully (100% capacity) loaded system.
 - j. Preliminary amplifier load calculations.
 - k. Preliminary conduit fill calculations.
 - l. Preliminary device labels.

7. Coordination Drawings. Four (4) copies of drawings including plan, elevation and section views at not less than ¼ inch = 1-foot scale showing both new equipment to permit MZB review to assure spatial relationships and

coordination. Show all new equipment including but not limited to equipment cabinets, amplifier cabinets, terminal cabinets, risers, electrical panel boards, transformers, and wire ways. Provide drawings of the areas where new equipment is to be provided.

- C Interim Construction Submittal: The Contractor shall submit electronic/pdf copies of the following, for approval by the MZB, a minimum of thirty (30) days prior to system programming:
1. Copy of working as-built drawings with device addresses.
 2. Device labels.
 3. Emergency and alert messages.
 4. Electronic files of all alert tones and messages.
- D Pre-Demonstration Testing Submittal: The Contractor shall submit electronic/pdf copies of the following, for approval by the MZB, a minimum of thirty (30) days prior to system Demonstration Testing:
1. Complete system programming.
 2. Final device labels addressing MZB comments in the Interim Construction Submittal.
 3. Final emergency and alert messages addressing MZB comments in the Interim Construction Submittal.
 4. Final electronic files of all alert tones and messages addressing MZB comments in the Interim Construction Submittal.
 5. A Test Plan describing how the system shall be tested. The Test Plan shall include a step-by-step description of all tests and shall indicate type and location of all test apparatus to be employed.
- E Submittals required prior to Acceptance Test: The Contractor shall submit the following a minimum 30 days prior to the Acceptance Test:
1. Electronic/pdf sets of current working "As-built" drawings. Size of drawings shall be consistent with shop drawing submittal.
 2. Electronic/pdf copies of a written summary of the Demonstration Test including all devices and circuits tested and including the letter attesting to the satisfactory completion of the Demonstration Test, signed by the Contractor's job foreman and the Manufacturer's Representative.
 3. Electronic/pdf copies of Draft Operating and Maintenance manuals.
 4. Electronic/pdf copies of revised system calculations (primary and secondary power and amplifier load) using "As -built" information to provide final system loading and spare capacity information.
 5. Acceptance testing shall not be scheduled until approval of these submittals.
- F Record submittal. The Contractor shall submit the following after AHJ Acceptance of system:
1. Electronic/pdf copies of Record Drawings.
 2. Electronic/pdf copies of Record Operating and Maintenance Manuals.
 3. USB drive containing the final system programming. CDs shall be labeled and dated.

4. USB drive containing the AutoCAD files of the Record Drawings and the electronic files of the GUI screen shots. USB shall be labeled and dated.
5. Completion and warranty statement.

1.10 Scheduling

- A The Contractor shall provide a schedule to the MZB indicating the installation sequence and time frame prior to beginning work. No installation work shall begin until shop drawings and submittals are approved by the MZB. The Contractor shall provide weekly updates to the MZB. It is the Contractor's responsibility to have all wiring, circuit testing and device installation completed in time for the equipment supplier to make all final connections and conduct all tests as outlined in these specifications.
- B The Contractor shall be responsible for coordinating the Acceptance Test for the system with the MZB.

1.11 Spare Parts

- A The Contractor will provide a schedule of values with the submitted bid. Included in the schedule of values will be the cost of materials for spare part procurement (no labor included). Schedule of values shall be firm until project closeout.
- B During project closeout, the MZB reserves the right to purchase spares at the price documented in the schedule of values.
- C Spare parts will be delivered at closeout of the project.
- D All spare parts shall be neatly and protectively packed in one or more cartons. The quantity, manufacturer, and model of each unit in the carton shall be identified on the outside of the carton. In addition, the name, address, and telephone number of the Contractor and of the Manufacturer's Representative, plus the date of delivery, shall be neatly identified on the cover of each carton.

1.12 As-built Drawings

- A During the course of the project, the Contractor shall maintain electronic versions of the shop drawings to serve as working as-built drawings in AutoCAD 2013 or other format approved by the MZB.
- B The Contractor shall keep all working as-built drawings updated on a monthly basis.
- C The Contractor shall be required to show the following on these floor plans for as-built drawings:
 1. The exact locations and installation details of all equipment installed.
 2. Conduit fill, wattage, and battery calculations.
 3. The installed wiring and color-coding and wire tag notifications for the exact locations of all installed junction boxes and terminal cabinets.
 4. Specific point-to-point interconnections between all equipment and internal wiring of the equipment. Typical point-to-point wiring diagrams are not acceptable.
 - a. All devices and appliances on each circuit shall be labeled with the circuit type and appliance/device number. Addressable devices shall use the unique address code provided for the device.

- b. Percentage of circuit loading for all speaker notification appliance circuits shall be provided at the end of each circuit.

- 5. Coordination Drawings.
- 6. Installation details.

- D The Contractor shall show the equipment and addresses associated with each device, as listed in this specification, on a separate layer(s) and provide copies of only this layer(s) shown on the floor plans as part of the set of as-built drawings.

1.13 Record Drawings

- A Following the MZB Acceptance Testing, the Contractor shall update the Working As-Built drawings to incorporate comments from the MZB review, to reflect the final as-built configuration, and to incorporate any additional information gained from the Acceptance Test. Copy and bind into sets for distribution.
- B On the bottom right corner of each drawing sheet, the Contractor shall stamp in red letters 1-inch high, the wording "RECORD DRAWINGS."

1.14 Operation and Maintenance Manual

- A The Contractor shall provide complete indexed bound sets of the Operation and Maintenance (O&M) manual, as outlined in NFPA 72 Chapter 7:
 - 1. The final Equipment List identifying the quantities and types of equipment listed by manufacturer's part number.
 - 2. An equipment datasheet (or specification sheet) on every piece of FAECS equipment installed.
 - 3. Standby power calculations and amplifier load and speaker dB loss calculations that coincide with the equipment that has been installed in the building.
 - 4. A point ID list referencing the signaling line circuit loops and the devices on those loops.
 - 5. Complete System Programming
 - 6. Device labels
 - 7. Evacuation, alert, and Mass Notification messages.
 - 8. The control unit configuration, serial number, access passwords, and a description of remote functions.

1.15 Warranty

- A The Contractor shall guarantee all new equipment installed and new raceways, new wiring, and connections to existing wiring and equipment from defects in workmanship and inherent mechanical and electrical defects for a period of two (2) years from the date of written Final Acceptance by the MZB. Warranty shall include Parts and Labor.
- B The Manufacturer's Representative shall guarantee all new system equipment for a period of two (2) years from the date of written acceptance by the MZB.
- C Upon completion of the installation of the WAMNS equipment including Acceptance Testing, and delivery of all record submittals and spare parts, the Contractor shall provide the MZB with a signed Completion and Warranty Statement, substantially in the form as follows:
"The undersigned, having been engaged as the Contractor on the MZB WAMNS

Project, confirms that the fire alarm and emergency voice communication system equipment was installed in accordance with the system manufacturer's wiring diagrams, installation instructions and technical specifications provided to us by the manufacturer and the AHJ and that the installed system is warranted for a period of two (2) years effective <insert date of AHJ acceptance>. The warranty includes parts and labor to repair or replace (at the AHJs discretion) any and all defects in workmanship or inherent electrical and/or mechanical defects. The installed system includes all new equipment installed and new raceways, new wiring and connections to existing wiring."

PART 2 – PRODUCTS

2.1 Acceptable Products

- A Acceptable fire alarm and emergency voice communication system control/communications equipment WAMNS equipment and products shall be Hyperspike® by Ultra Electronics and Digital Voice Command (DVC) by Notifier.
- B All equipment shall be capable of distributing signals from the new Notifier fire alarm and emergency communication.

2.2 Minimum Components

- A The WAMNS shall consist of, but not be limited to:
 - 1. Digital Voice Command (DVC) by Notifier as shown on the contract drawings.
 - 2. Control Unit(s), containing an amplifier, customer interface board including a 25/70/100-volt audio interface board, power supply, batteries and batteries.
 - 3. Segment high power speaker array(s).
 - 4. Distributed digital audio amplifiers (AMPs). One primary and one backup.
 - 5. Mounting pole and hardware.
 - 6. Mounting and installation materials.
 - 7. Addressable monitor module.
 - 8. Addressable relay module.
 - 9. Transient surge suppressors.

2.3 Secondary Power

- A Storage batteries shall be sized to provide seventy-two (72) hours of standby and subsequent sixty (60) minutes of full alarm load battery backup.

PART 3 – EXECUTION

3.1 Installation

- A Installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with NFPA 72, except as modified herein.
- B The Contractor shall provide and install all required equipment, labels, and accessories necessary for the proper operation of the system.
- C All work shall be performed in accordance with the best and the most modern practices of the trade. The entire system shall be installed in a neat and workmanlike manner, in accordance with the standard instructions and recommendations of the manufacturer and in accordance with the approved

manufacturer's wiring diagrams unless otherwise specifically permitted by the AHJ.

- D The system shall be installed under the supervision of a qualified, trained, authorized Manufacturer's Representative. The Manufacturer's Representative is expected to be on site with the Contractor during the entire time of final connections and during all testing of the WAMNS.
- E The supervisory work of the Manufacturer's Representative shall include, but not necessarily be limited to, checking all the system wiring connections; advising the Contractor regarding technical details of the installation; and the adjustment and testing of all components of the system in order to ensure a complete and satisfactorily operable system. The Manufacturer's Representative shall be on site, during the entire installation and connection of the new control equipment. The Manufacturer's Representative shall monitor all wiring changes and assist the Contractor to ensure a smooth transition to the new control equipment.
- F The Manufacturer's Representative shall also be required to instruct designated building and management personnel in the general operation of the system and to give the designated personnel an overview of the system functions when the system is in normal, supervisory mode, alarm mode, and trouble mode, as specified in this Specification.

3.2 Wiring

- A All wiring shall comply with this section and with the site's specifications on electrical installations.
- B All AC power shall be supplied from normal power panels. MZB shall identify available panels for each location.
- C Wiring installed in walls and exposed in indoor dry locations shall be within electrical metallic tubing (EMT), minimum $\frac{3}{4}$ inch diameter.
- D Conduit on exterior of building must be installed with weatherproof compression type fittings using best industry practices.
- E The Contractor shall furnish all metal raceway, wiring, outlet boxes, junction boxes, cabinets, labels and similar devices necessary for the complete installation of the WAMNS. All wiring shall be of the type as specified herein and recommended by the manufacturer.
- F Terminal cabinets with hinged, lockable covers, supplied by Space Age Electronics, or approved equal, shall be provided at all junction points. All conductor splices shall be made on screw-type terminal blocks – wire nuts, butt, crimp, or screw type connectors shall not be used. All terminals within a terminal cabinet shall be properly and permanently labeled. All terminal cabinets, junction boxes and their associated covers shall be painted red and yellow with a diagonal separation to comply with site standards.
- G Raceways containing conductors identified as "Fire Alarm and Emergency Voice Communication System" or "Wide Area Mass Notification System" conductors shall not contain any other conductors.
- H The conductors for the notification appliance circuits shall not be installed in the same raceway as the conductors for signaling line circuits unless written certification from the manufacturer is supplied to the AHJ indicating that the inclusion of these circuits in the same raceway is acceptable and that no additional consideration is needed for these circuits.
- I All wiring for the initiating devices, and notification shall be solid copper and shall comply with the appropriate sections of the NEC. All system wiring size shall be as determined suitable by the manufacturer and in compliance with the NEC, yet they shall not be any smaller than as specified herein.

- J Class B signaling line circuits shall be used, with devices equally distributed on each circuit. Each signaling line circuit shall be loaded to no more than 75% of its manufacturer specified capacity.
- K A minimum of one fault isolator module shall be provided on each signaling line circuit, installed at the point the SLC leaves the FACU. Additional fault isolator modules shall be provided such that, in all cases, no more than 25 devices shall be installed on a circuit between fault isolators.
 - 1. Fault isolator modules have not been shown on the design drawings.
 - 2. The Contractor shall field locate isolator modules.
 - 3. All locations shall be submitted to the AHJ for approval prior to installation.
- L NAC's shall conform to the following:
 - 1. Each HPSA shall be an independent notification zone.
 - 2. Notification appliance circuits shall be provided as follows:
 - a. 25% Spare capacity shall be specified/required on each circuit and power supply/amplifier. Notification appliance circuit (NAC) loading must not exceed 75% of its rated output. Voltage drop on visible NAC's shall not exceed 15% based on a power supply output of 20.4 volts.
- M Initiating Device Circuits (IDC's) shall conform to the following:
 - 1. IDCs use shall be limited to monitoring the control units for general trouble .
- N Unless otherwise indicated on the Contract Drawings, the following minimum sizes of conductors shall be used for all new wiring:
 - 1. Power Supply Conductors (Primary and Secondary) No. 14 AWG
 - 2. WAMNS Speaker Circuits No. 12 AWG
- O Color coding of conductors shall be approved by the AHJ. Unless otherwise indicated, the color code for all FAECS conductors shall be as follows:
 - 1. Audible NAC – Red jacket, no stripe.
 - 2. 120VAC Power – Black, White and Green.
 - 3. Bond wires – Green without stripe.
- P All raceways shall be run parallel and perpendicular to the walls and ceilings and as high as possible. Wherever practical, exposed raceways shall be run on the ceiling as close as possible to a wall or as high as possible on a wall.
- Q All WAMNS circuits shall be separated from other system cables/circuits by 2 in., minimum.
- R All wiring within the control unit shall be neatly served in the panel gutters and be secured by means of Thomas & Betts "Ty-Raps" or by other approved means.
- S All wiring (without conduit) above the suspended ceiling shall be run parallel and perpendicular to the walls and ceilings and as high as possible.
- T Where penetrations of floor slabs, fire-resistance rated walls and/or smoke barrier walls are made, the wiring shall be sleeved in metal raceway and the penetrations shall be fire-stopped with approved or UL Listed through-penetration firestop assembly material acceptable to the AHJ. Fire resistance barriers

include floors, shafts (spanning two or more floors), stairways and the boundaries between public spaces and more hazardous areas (i.e., warehouse, kitchens, etc.).

3.3 Demonstration Tests

- A The tests shall demonstrate that the entire control system functions as intended. This test shall be coordinated and performed by the Contractor with support from the Manufacturer's Representative. All circuits devices and functions shall be tested. In addition, supervision of each circuit shall be tested.
- B Testing shall include adjustments, as required, of building interior speakers for intelligibility
- C Upon satisfactory completion of the Demonstration Test, the Contractor shall leave the system operating for a minimum of 30 days prior to the Acceptance Test.
- D If unsatisfactory results occur during or after the Demonstration Test, the Contractor shall be responsible for any and all additional charges incurred by the MZB with respect to corrective action including but not limited to test monitoring and engineering services during the time it takes to obtain Final Acceptance by the MZB.
- E When the testing has been completed to the satisfaction of the Contractor's job foremen and the Manufacturer's Representative, a letter co-signed by each, attesting to the satisfactory completions of said testing shall be forwarded to the MZB.

3.4 MZB Final Acceptance Tests

- A Before the installation shall be considered completed and acceptable to the MZB, the Final Acceptance Test shall be performed. This test shall be coordinated and performed by the Contractor with support from the Manufacturer's Representative and will be witnessed by the MZB and/or the MZB's third-party inspector. Each representative scheduled to witness the test, shall be provided reasonable notification of the test date by the Contractor (at least five (5) weeks). The test shall not be conducted until all parties agree on the scheduled test date.
- B The Contractor shall provide all the necessary personnel and equipment to conduct the tests.
- C At a minimum, the Contractor shall perform the following:
 - 1. All tests and procedures as required by NFPA 72 for Initial Acceptance Testing.
 - 2. Operate both the pre-recorded and live messaging.
- D Upon satisfactory completion of the tests, the Contractor shall leave the WAMNS in proper working order and shall be permitted to begin demolition/removal of the existing fire alarm.

3.6 Cleaning and Adjusting

- A Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish.
- B Clean unit(s) internally using methods and materials recommended by manufacturer.

3.9 Final Acceptance by the MZB means that the WAMNS is:

- A Completely operational and in conformance with this specification and applicable codes and standards.
- A All demolition and removal of existing equipment and materials has been satisfactorily completed.
- B All documentation has been submitted, reviewed, and approved by the MZB as required by these specifications, including:
 - 1. Demonstration testing certification letter
 - 1. Record Submittal
 - 2. Warranty
- C All training as required by these specifications has been completed to the satisfaction of the AHJ.

END OF SECTION

**SECTION 283111
FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM**

PART 4 – GENERAL

4.1. Scope of Work

- A. The base scope of work for this project shall consist of the demolition and replacement of the existing wireless fire alarm monitoring network at The Maryland Zoo in Baltimore (MZB) with a fiber optic-based network.
- B. The scope of work shall include the installation of a complete Notifier® High Speed NOTI-FIRE-NET™ fire alarm monitoring network that includes fire alarm control units (FACUs, or fire alarm nodes) and Notifier® ONYXWorks® graphic user interfaces (GUIs) at MZB. All system head-end equipment shall be connected via existing and new fiber optic cable.
 - 1. Network communication pathway shall be via existing and new 9/125 6-strand single mode fiber optic cable as detailed herein and shown on the contract drawings.
 - 2. Spare single mode fibers in existing Corning® fiber patch panels will be utilized, where possible.
 - 3. Where new fiber is provided, it shall be pre-terminated 9/125 6-strand single mode fiber optic cables with 2" pulling sock.
 - 4. Horizontal fiber runs in buildings shall be installed above the ceiling on minimum ¾" EMT.
- C. The scope of work includes the demolition/removal of the existing fire alarm systems as detailed herein and shown on the contract drawings. Existing systems shall be maintained operational as detailed in 1.3 herein. The scope includes all associated restoration, patching, painting, and firestopping of ceilings, walls, and floors damaged by the installation or demolition of this fire alarm system. Upon Commissioning and final acceptance of the new Notifier system, the contractor shall remove all existing Keltron Head-end equipment located at the Mansion House and all existing Keltron Transmitters specified on the contract drawings. Removed Keltron equipment shall be turned over to the MZB.
- D. Provide and install, at a minimum, the following equipment, materials and features:
 - 1. FACUs shall have no command capabilities or notification controls over the network. FACU's shall be minimally configured to provide network communications. All FACUs shall be the Notifier® Onyx Series NFS-320 or NFS2-640 provided at the locations detailed in Section 1.5 herein and as shown on the contract drawings.

2. Two (2) Notifier ONYXWorks® GUIs. One GUI shall be located at the Mansion House and one GUI shall be located at the Maintenance and Commissary buildings. The GUIs will be provided for overall system maintenance, troubleshooting and programming.
- E. The Contractor shall provide STI stopper buttons at the locations identified on the contract drawings for snake bite notification. Monitor activation of the button via fire alarm monitor module and report as an emergency/non-fire alarm input.
- F. The Contractor shall submit a detailed sequence of operations for the entire fire alarm network and mass notification system. Sequence of operations shall be as follows:
 1. Fire alarm initiation devices in each building shall initiate general evacuation within the respective building of alarm. All alarms, troubles and supervisory signals shall be annunciated to the two Onyx Works workstations and the Central Station via Noti-Fire-Net Network.
 2. Snake bite manual call switches shall be annunciated at the two Onyx Works workstations. Central station reporting not required.
 3. Other non-fire alarm input signals including temperature alarms shall be annunciated at the two Onyx Works workstations as non-alarm events. Central Station reporting not required.
 4. Wide area mass notification messaging shall be manually actuated via pre-recorded messages (to be submitted, reviewed and approved by the Zoo) or by live voice messaging at microphones located at both of the two Onyx Works workstations.
- G. If Bid Option 1 in specification Section 00400 is exercised, the Contractor shall replace all existing addressable initiating devices, notification appliances and modules one for one with Notifier NFS-320 / NFS2-640 compatible devices.
- H. If Bid Option 2 in specification Section 00400 is exercised, the Contractor shall provide an enterprise-wide license for DRMNS server software and install it on the fire alarm graphic user interface.
- I. If Bid Option 3 in specification Section 00400 is exercised, the Contractor shall provide DRMNS fire alarm control panel integration with the Notifier system.
- J. If Bid Option 4 in specification Section 00400 is exercised, the Contractor shall provide DRMNS two-way radio text-to-speech (TTS) integration and configuration with the existing MZB Motorola CM300 radio system.
- K. If Bid Option 5 in specification Section 00400 is exercised, the Contractor shall provide a wide area mass notification system (WAMNS) and Hyperspike outdoor high-power speaker arrays.

4.2. System Description

- A. The system shall be a Notifier® Onyx series addressable fire alarm system as described herein and as shown on the Contract Drawings. All FACUs shall be the Notifier Onyx series NFS-320 or NFS2-640.
- B. The network shall be a high-speed NOTI-FIRE-NET (HSNFN) based on a fiber optic backbone including all connections from/to FACUs and GUIs.
- C. A seamless user interface capability between network nodes including both fire alarm and emergency communication is required for the FAECS network.
- D. Conceptual network routing is provided on the Contract Drawings. All interconnections between buildings will be made via existing and new fiber from patch panel to patch panel. Continuation from patch panel to FACU and from FACU to patch panel is included in the scope of work.
- E. The system replacement shall include all equipment necessary to provide a fully functional, reliable, and maintainable monitoring network.
- F. Where applicable, work and/or equipment provided in other sections and related to the fire alarm system shall include, but not be limited to all testing, wiring and connection to the existing equipment, systems, and devices noted herein.
- G. The fire alarm systems shall be an independent, stand-alone system. The fire alarm systems shall be permitted to monitor the security systems, but in no way should the security system rely on any components of the fire alarm system for operation.
- H. If one or all of Bid Options 2-4 in specification Section 00400 is exercised, the FAECS shall include distributed recipient mass notification system (DRMNS) capabilities. These capabilities shall include, but not be limited to:
 - 1. SMS and/or MMS messages via cellular phones or pagers.
 - 2. Automated voice calls or faxes.
 - 3. Email alerts, web postings on social media sites.
 - 4. Desktop notifications.
 - 5. Two-way mobile radio integration.

4.3. Phasing Requirements

- A. The recommended upgrade approach consists of installing a fire alarm backbone and head-end control network that will serve as the site-wide fire alarm system.
- B. The existing fire alarm systems shall be maintained fully operational until the successful final acceptance of each new or existing fire alarm system is connected to the network and 100% tested for proper operation of all functions.
- C. The general installation sequence is suggested to be as follows:
 - 1. Phase 1 – FAECS Network.

- a. Sub-Task 1 – Test existing fiber optic cables scheduled to be dedicated to the FAECS network.
 - b. Sub-Task 2 – Install and test new fiber optic cable between FACU locations, GUI location and IT fiber demarcation points within each building.
 - c. Sub-Task 3 – Install fiber patch cables at each fiber patch panel such that the fiber optic network is one continuous “loop”. Test the fiber “loop” to assure continuity throughout the network.
 - d. Sub-Task 4 – Install and program new GUIs in the Mansion House and Maintenance and Commissary Building.
 - e. Connect GUI’s to the fiber optic network.
 - f. Sub-Task 5 – Install new Building FACUs at the locations indicated on the Contract Drawings.
 - g. Where an existing FACU is being replaced or removed, install the new FACU and/or devices maintaining the existing system in operation.
 - h. Where the existing FACU is being retained and modified and where new devices or appliances are to be replaced, replace the existing devices.
 - i. Interconnect existing voice evacuation panels with FACU’s where indicated on the contract drawings.
 - j. Connect one FACU at a time to the network. Perform a 100% test of each fire alarm system as it is connected to the network. Upon successful test, remove the existing system or components no longer needed. Patch and paint.
 - k. Sub-Task 6 – Upon successful installation and testing of all FACU’s/systems at MZB, perform a 100% test of each system to assure proper operation and reporting across the network.
2. Phase 2 – Provide a complete and fully functional wide area mass notification system (WAMNS) and Hyperspike outdoor high-power speaker arrays in accordance with Specification Section 275116 if Bid Option 5 in specification Section 00400 is exercised.
 3. Phase 3 – Provide a complete and fully functional DRMNS System if one or all of Bid Options 2-4 outlined in specification Section 00400 are exercised.
 4. Phase 4 – Upon Commissioning and final acceptance of the new Notifier system, the contractor shall remove all existing Keltron Head-end equipment located at the Mansion House and all existing Keltron Transmitters specified on the contract drawings. Removed Keltron equipment shall be turned over to the MZB.

4.4. Quality Assurance

- A. Each component, except those identified in Section 275116 as being of different manufacture, of the FAECS shall be manufactured by Notifier® and under the appropriate category for the intended use by Underwriters Laboratories, Inc. (UL) and shall bear the “UL label.” Partial listings, or multiple listings for various major sections of the control equipment, shall not be acceptable.

- B. The FACUs shall be tested and approved for UL standards UL 864, and UL 2572 compliance.
- C. Electrical components, devices, and accessories shall be Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction (AHJ).
- D. All FAECS control equipment shall have transient protection devices that comply with the requirements outlined in UL 864, Standard for Control Units for Fire-Protective Signaling Systems.
- E. All equipment supplied shall be first quality and the manufacturer's best type and latest model capable of complying with all requirements of this specification and shall have been in continuous production and in continuous service in commercial applications for at least five years.
- F. The installation and wiring of all devices shall be in accordance with the latest published edition of the manufacturer's installation instructions to achieve the system operation and function as specified herein.
- G. All FAECS, except as noted in Section 275116, equipment and devices shall be labeled and listed for the intended use in Underwriters Laboratories, Inc. (UL), UL FPED Fire Protection Equipment Directory.
- H. If a UL listing for a specific device is unavailable, approval by FM Global (FM) or other nationally recognized testing laboratory (NRTL) acceptable to the AHJ and the Owner shall be acceptable.

4.5. Contractor Scheduling

- A. MZB staff shall be assigned to coordinate contractor work on a daily basis.
- B. All areas near animals or inside MZB exhibits are considered sensitive areas. Contractors shall coordinate directly with the MZB's Capital Projects Director at least two days prior to any work in these areas.
- C. Due to animal schedules and emergencies, Contractor must be prepared to reschedule work to avoid downtime. The MZB is not responsible for contractor downtime.

4.6. Contractor's Responsibilities

- A. The fire alarm system Contractor's responsibilities are as follows:
 - 1. The supply and installation of a complete, ready and operational 24 VDC closed-circuit, electrically supervised, addressable, Notifier[®] automatic fire alarm monitoring network.
 - 2. The Contractor shall connect the existing Notifier[®] NFS2-640 FACUs currently serving the following locations to the fiber optic network as indicated on Contract Drawings:
 - a. Animal Medical Building;
 - b. Bird Barn/Old Sitatunga;

- c. Construction Trailer;
 - d. Crane Barn;
 - e. Elephant House;
 - f. Giraffe House (Panel to be re-located to Mechanical Shed);
 - g. Maintenance and Commissary;
 - h. Mansion House;
 - i. Maryland Building;
 - j. Meeting Barn;
 - k. Otter/Bobcat Holding;
 - l. Polar Bear Holding;
 - m. Polar Bear Trailer;
 - n. Rhino/Zebra Barn;
 - o. Formerly Sidetrack Café and Restrooms, and
 - p. Wild Things Gift Shop Building.
3. The Contractor shall connect the existing Notifier® NFS2-320 FACUs currently serving the following locations to the fiber optic network as indicated on Contract Drawings:
 - a. Africa Barn, and
 - b. Penguin Coast Interpretive Center.
4. The Contractor shall demolish the existing Notifier® NFS2-640 FACUs that are currently serving the following locations as indicated on the Contract Drawings:
 - a. Antelope/Warthog Barn;
 - b. Box Turtle Exhibit;
 - c. Cow Barn;
 - d. Donkey Barn;
 - e. Goat Barn;
 - f. Grain Barn;
 - g. Herp Holding;
 - h. Keeper/HR Trailer;
 - i. Leopard Holding;
 - j. Lion Holding;
 - k. Lower Barn
 - l. Mammal House;
 - m. Old Elephant Building;
 - n. Polar Bear LSS #1;
 - o. Polar Bear LSS #2;
 - p. Tundra Buggy, and
 - q. Whistle Stop.
5. The Contractor shall demolish the existing Notifier® NFS2-320 FACU that is currently serving Penguin Holding as indicated on the Contract Drawings.
6. The Contractor shall demolish the existing Notifier® FireWarden NFW2-100 fire alarm control panels (FACPs) that are currently serving the following locations as indicated on Contract Drawings:

- a. Bat Cave/Maryland Wilderness;
 - b. Cheetah Holding;
 - c. Chimpanzee Forest Restrooms;
 - d. Eagle Exhibit (Old Artic Fox Holding);
 - e. Giraffe Feeding Station;
 - f. Hay Barn;
 - g. Maintenance Barn;
 - h. Maryland Wilderness Sewage Lift Station;
 - i. Marsh Aviary LSS;
 - j. Membership Building;
 - k. Oasis Restrooms;
 - l. Schaefer Restrooms;
 - m. Stone Shed;
 - n. Ticket Booths;
 - o. Tree & Slide, and
 - p. Wading Bird Building.
7. The Contractor shall demolish the existing FireLite® MS-9600UDLS FACP currently serving the Chimpanzee Forest Building as indicated on the contract drawings. The Contractor shall provide a new Notifier NFS2-640 panel in the Chimpanzee Forest Building as indicated on the contract drawings.
8. The Contractor shall re-locate the existing Notifier NFS2-640 panel currently serving the Giraffe House to the Mechanical Shed as indicated on the contract drawings.
9. The Contractor shall interface the existing very early warning air aspirating smoke detection (VESDA) systems installed in the following buildings with the appropriate FACU as indicated on the contract drawings:
- a. Chimpanzee Forest Building;
 - b. Elephant House, and
 - c. Zebra Holding.
10. The Contractor shall demolish the existing very early warning air aspirating smoke detection systems currently installed in the following locations as indicated on the contract drawings:
- a. Hay Barn, and
 - b. Rhino Holding.
11. The Contractor shall provide a new very early warning air aspirating smoke detection (VESDA) system in the following buildings as indicated on the contract drawings:
- a. Giraffe House, and
 - b. Rhino Holding.

The new VESDA systems shall be interfaced with the appropriate FACU as indicated on the contract drawings.

12. Addressable initiating devices, modules and visible notification appliances located in buildings without a FACU or in a building with a FACU that is set to be demolished shall be fed from an existing to remain Notifier panel specified on the Contract Drawings.
13. If Bid Option 1 in specification Section 00400 is exercised, the Contractor shall replace all existing addressable initiating devices, notification appliances and modules one for one with Notifier NFS-320 / NFS2-640 compatible devices.
14. The Contractor shall interconnect all network nodes (GUIs and FACUs) utilizing new and existing fiber optic cables.
15. The Contractor shall provide all necessary fire alarm pathways, above and below ground where applicable, between buildings to serve the fire alarm network as indicated on the contract drawings.
16. If one or all of Bid Options 2-4 outlined in specification Section 00400 are exercised, the Contractor shall provide all necessary DRMNS pathways and circuits where applicable to serve the DRMNS system as indicated on the contract drawings.
17. If Bid Option 5 outlined in specification Section 00400 is exercised, the Contractor shall provide all necessary WAMNS pathways and circuits where applicable to serve the WAMNS system as indicated on the contract drawings.
18. Coordinate the installation and testing of associated equipment and circuits with all related trades, contractors, equipment maintenance and testing representatives, and MZB. The Contractors scope of work shall include, but not be limited to all testing, wiring and connection to the following existing equipment, systems, and devices:
 - a. Sprinkler waterflow, pressure and valve supervisory switches. The Contractor shall coordinate requirements with the existing fire protection devices.
 - b. HVAC Fan control circuits, including all conduit, wire and devices necessary for shutdown of HVAC fans as described herein and shown on the Drawings. Coordinate requirements with existing mechanical systems.
 - c. Monitoring of emergency generators, pump status, water levels, and temperature.
 - d. Security Intrusion Detection Supervision: Provide addressable monitor modules to monitor new and existing security intrusion detection control units for alarm and trouble signals. Modules shall be programmed to annunciate at the GUI with the specific building of the event.
 - e. Building Temperature Supervision and Provision: Provide modules to monitor the existing building temperature sensors and annunciate at the GUI when the temperature falls outside of the preset range.

- f. Building Automation Monitoring: Provide addressable monitor modules to monitor status of animal life support systems and report abnormal conditions at the GUIs.
 - g. Supervision of kitchen hood systems.
 - h. Animal habitat water ozone level supervision.
 - i. DRMNS system components if one or all of Bid Options 2-4 outlined in specification Section 00400 are exercised.
 - j. WAMNS system components if Bid Option 5 outlined in specification Section 00400 is exercised.
19. The contractor shall work in a collaborative and iterative manner with MZB staff to develop appropriate messages for the emergency voice evacuation and mass notification system.
 20. Remove any unused existing fire detection and alarm system control equipment, components, wiring, conduit, and related equipment that are not specified as being part of the new system. Demolished conduit and penetrations shall be plugged, patched and sealed with mortar.
 21. Provide all required documentation (As-built drawings, training materials, Operating and Maintenance (O&M) manuals, Test Plan, warranty, etc.).
 22. Coordinate the Demonstration Test and the Acceptance Test of the system with the MZB representative.
 23. Restore, patch, paint, and firestop ceilings, walls, and floors damaged by the installation or demolition.

4.7. Qualifications

A. Contractors:

1. The Contractor shall qualify with the requirements set forth in the GC RRP.
2. The Contractor shall have a minimum of ten (10) years' experience in the design, installation and maintenance of fire detection, alarm, and control systems similar in scope and function as that specified herein and shown on the Drawings.
3. The Contractor shall have a minimum of five (5) years' experience as a Notifier® authorized representative in the design, installation and maintenance of Notifier® systems and products proposed for use on this project
4. The Contractor shall be licensed in the State of Maryland and shall have at least five (5) years' experience within the local code jurisdiction in the installation of fire alarm and emergency communication systems in buildings similar to this project and shall have obtained design and inspection approvals for similar projects from the local AHJ.
5. The Contractor shall have on-staff a professional engineer (or minimum NICET Level III certified technician) who is legally qualified to practice in

the State of Maryland and is experienced in providing fire protection engineering services and is factory trained in the engineering, design and programming of the manufacturer's system and products proposed for use on this project. Engineering services are defined as those performed for installations of fire alarm and emergency communication systems that are similar to those indicated herein in material, design, and extent.

6. The Contractor shall maintain a factory trained certified commissioning staff and shall have complete offsite training facilities.
7. The Contractor shall have the necessary facilities to provide the Owner with a complete maintenance, periodic inspection and service contract. This service contract shall include 24-hour emergency service, seven days per week. Warranty service shall be provided on a 24-hour, 7 day per week basis during the warranty period. Response time of service personnel shall not exceed one hour from the time of the service call. Repairs under warranty shall be completed within 72 hours of the service call.

- B. Nonconformance to the Qualification of Bidders requirements outlined in this specification shall be cause for immediate dismissal of the Bid Documents without comment.

4.8. Codes and Standards

- A. The Maryland Zoo in Baltimore is accessible to the disabled or impaired and shall comply with the provisions of Federal Standard FED-STD-795, Uniform Federal Accessibility Standard (UFAS) and the Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- B. All FAECS equipment and devices shall be labeled and listed for the intended use in Underwriters Laboratories, Inc. (UL), UL FPED Fire Protection Equipment Directory. If a UL listing for a specific device is unavailable, approval by FM Global (FM) or other nationally recognized testing laboratory (NRTL) acceptable to the local AHJ shall be acceptable.
- C. Design, equipment, and installation shall be made in accordance with the applicable provisions of the following:
 1. Building, Fire and Related Codes of Baltimore City, 2020 Edition.
 2. International Building Code (IBC), 2018 Edition.
 3. International Fire Code (IFC), 2018 Edition.
 4. NFPA 70, National Electrical Code, 2017 Edition.
 5. NFPA 72, National Fire Alarm and Signaling Code, 2016 Edition.
 6. NFPA 150, Fire and Life Safety in Animal Housing Facilities, 2016 Edition.
 7. NFPA 731, Standard for the Installation of Electronic Premises Security Systems, 2020 Edition.

8. The latest published edition of the equipment manufacturers' product datasheets, technical specifications, installation instructions and wiring guidelines.

D. The systems shall be tested in accordance with the following:

1. NFPA 72, National Fire Alarm and signaling Code, 2016 edition.
2. NFPA 731, Standard for the Installation of Electronic Premises Security Systems, 2020 edition.
3. The latest published edition of the equipment manufacturers' testing procedures and guidelines.
4. As required by the local AHJ.

4.9. Related Documents

- A. Drawings and general provisions of the Contract, including General and Supplementary, apply to this Section.
- B. Drawings supplied with this specification shall be used by the Contractor as a reference for the requirement and location of system components. It shall be the responsibility of the Contractor to visit the site, observe the existing conditions, and confirm the required quantities of devices and specific options for locations of the same. It shall be the responsibility of the Contractor to coordinate all work with other trades and to comply with the applicable local, State, Federal and National Codes, standards, ordinances and regulations.

4.10. Order of Precedence

- A. Should conflicts arise out of discrepancies between documents referenced in this specification, such discrepancy shall be brought to the attention of the Owner's fire protection engineering representative in writing. As a guide, where conflicts occur, the most stringent requirement shall apply; however, should a level of stringency be indeterminable, the discrepancies shall be resolved as follows:
 1. BCC requirements shall take precedence over this specification.
 2. Owner's requirements shall take precedence over this specification.
 3. The National Fire Protection Association Codes and Standards shall take precedence over this specification.
 4. This specification shall take precedence over the drawings.

4.11. Submittals

- A. General
 1. If submittals are found not to conform to all of the requirements of this specification and the applicable referenced local, state and national Codes, Standards and Regulations, the Contractor shall be required to revise and re-submit the package with modifications.

2. In the event that the Contractor's submittal package is required to be revised and re-submitted due to nonconformance with this specification, illegibility of the submittal, incomplete submittals, noncompliance with the referenced local, state, and national Codes, Standards and Regulations or nonconformance with pertinent documentation relative to the project, the Contractor shall pay all fees associated with the additional submittal review. Payment of the fee shall be solely the Contractor's responsibility.
3. Each submittal package shall be prepared and presented in a professional manner, be bound and shall include a title page and index. Each section of the submittal shall be numbered. Submittal packages shall be complete.
4. System working plans (contractor shop drawings) and calculations must be prepared and submitted for approval, by a registered professional engineer or a minimum NICET Level III certified technician who is legally qualified to practice in the State of Maryland prior to the start of work on site.

B. Submittal to be included with Bid:

As a minimum, the contractor shall submit electronic/portable document format (pdf) copies of the following with their bid for the captioned project. The award of the contract shall be based on the submitted information and all considerations in the best interests of the MZB. Once the contract is awarded, no requested changes for equipment, suppliers or subcontractors shall be accepted unless justification is made in writing. Once assigned, the Contractor's foreman and the fire alarm technicians shall not be changed without the approval of the MZB. Upon written request from the Contractor, the MZB may authorize changes, but at their sole choice and discretion. The Contractor shall be at risk for any attempt to substitute the equipment suppliers or subcontractors accepted. All cost for removal, relocation, or replacement of a substituted item shall be at the risk of the Contractor.

1. The names and qualifications of the Contractor's and the equipment supplier's foreman, project manager and project engineer who shall be in responsible charge during the entire project installation. Contractor's and supplier's qualifications shall include years in business, service policies, warranty definitions and prior experience with installations that include the type of equipment that is to be supplied.
2. A list of at least three (3) installations of similar size and scope to this project, with addresses of properties, contact names and types of system equipment installed.
3. The price for the systems as specified, the prices for required and recommended alternatives for equipment, training as specified in Section 3.5 herein, service work not included in the warranty and prices for a service contract. The prices for engineering, fabrication and on-site installation of each system shall include all subcontractor and manufacturer's on-site representative labor costs. The Contractor shall list all deviations and/or exceptions to these specifications as proposed alternatives.

4. Equipment manufacturer's product data sheets for all components of the proposed system (fire alarm control unit, initiating devices, notification appliances, etc.).
5. Per unit costs for additional devices and appliances. Prices shall be firm and maintained for one year beyond the duration of the manufacturer's warranty period as specified herein.
6. A suggested spare parts list for long lead replacement items, with firm unit prices maintained for one year beyond the duration of the manufacturer's warranty period as specified herein.
7. Firm costs for program changes.

C. Pre-Construction Submittal:

Submit electronic/pdf copies of the following. Submit all items required at one time as a complete package. Partial submittals will not be accepted and will be returned without review.

1. The manufacturer's technical representative's name and qualifications. Once approved, the representative shall not be changed without approval in writing by the MZB.
2. A schedule indicating the delivery dates of the equipment to be supplied; installation sequence; time frame and the total amount of on-site technical assistance time (in man-hours) the supplier of the equipment has included in their bid, including demonstration test and final test/acceptance dates to meet the scheduled project completion dates. This schedule is to be approved by the MZB before start of work.
3. Written confirmation of how the manufacturer/supplier plans to comply with the performance operational design of the system and all pertinent information regarding the reliability and operation of the equipment to be supplied.
4. A letter from the equipment manufacturer stating that the equipment to be supplied is not at or near the end of its life cycle, and that replacement components for all control equipment shall be available from the manufacturer for a minimum of 15 years from the date of system acceptance, in writing, by the local AHJ, and the MZB.
5. Provide a description of the system operation which includes the method of operation and supervision of each type of circuit (alarm initiation, signaling, control, annunciation, etc.), operation of manual controls, and sequence of automatic and manual operation. The system description shall be written specifically for this project. The manufacturer's standard descriptions which refer only to general operation are not acceptable.
6. A comprehensive fire alarm monitoring system matrix. The matrix shall indicate all devices by type; and the associated fire alarm system response. The matrix shall also reflect the operational response of all equipment listed herein under "system operation". All Division 15

equipment shall be listed by tag number. All elevators shall be listed by cab number. The matrix shall reflect all specification, NFPA 72, and local Fire Marshal's office requirements. Matrix shall be sufficiently detailed to be used as the basis of the contractor's testing and owner demonstration test procedures.

7. Product Data: Manufacturer's original product datasheets, specifications, installation instruction sheets and descriptive information for all major components of the system. Copies shall not be acceptable. All equipment and devices to be furnished under this contract shall be clearly marked (highlighted) on the product datasheets.
8. Samples of each of the following types of materials and equipment:
 - a. Wiring and cables proposed for use in the installation including, but not limited to: Fiber Optic Cable, Signaling Line Circuits, Initiating Device Circuits, Notification Appliance Circuits, Primary (120 VAC) and Auxiliary power (24 VDC) wiring.
 - b. Thermal and Smoke sensors of each type specified.
 - c. Air aspirating smoke detectors
 - d. Addressable monitor and control modules with cover plates
 - e. Field device mounting and/or back boxes
 - f. Specialty installation hardware and materials
9. Shop Drawings: Information shall include but not be limited to: All drawings shall be submitted in AutoCAD 2013, or later if approved by the Engineer.
 - a. Diagram of the complete fire alarm monitoring system.
 - b. Method of interconnection between all FACUs, GUIs and DRMNS.
 - c. A complete set of point-to-point wiring diagrams. Diagrams shall show the method of wiring for each type of device to be provided and for each function being performed. Typical wiring diagrams are not acceptable. Each diagram shall indicate (as appropriate):
 1. Method of fusing and location of fuses on the circuit.
 2. Wiring type and size, method of grounding or shielding, and size of conduit.
 3. Terminal identification at control equipment and remote devices.
 4. Each component's address.
 5. End of line device, type, rating and location.
 - d. A complete set of control diagrams. Diagrams shall include each type of device or building system being controlled or monitored.
 - e. A complete list of current requirements during normal, supervisory, trouble, and alarm conditions for each component of the system.
 - f. Battery calculations showing total standby power and total alarm power required to meet the specified system requirements. If NAC circuit extender panels are proposed, submit battery calculations for each proposed panel.

- F. Pre-Demonstration Test Submittal: The Contractor shall submit the following a minimum of two (2) weeks prior to the Demonstration Test:
 - 1. Electronic/pdf copies of "As Built" drawings in accordance with 1.13 herein.
 - 2. Electronic/pdf copies of a Test Plan describing how the system will be tested. The Test Plan shall include a step-by-step description of all tests and shall indicate type and location of all test apparatus to be employed. All tests shall be conducted in the presence of the MZB's fire protection engineering representative and shall not be conducted until the "Test Plan" is approved.
 - 3. Electronic/pdf copies of Operating and Maintenance manuals in accordance with 1.15 herein.
- G. Record Submittal: The Contractor shall submit the following after acceptance of the system:
 - 1. Electronic/pdf copies of Record Drawings.
 - 2. Electronic/pdf copies of Record Operating and Maintenance Manuals.
 - 3. USB drive containing the final system programming. Label and date USB.
 - 4. Computer aided design (CAD) copies of Record Drawings.
 - 5. Completion and Warranty Statement.

4.12. Spare Parts

- A. The Contractor shall furnish an additional 5% of the detectors and addressable bases as spares.
- B. The Contractor shall furnish an additional 5% of all types of visible notification appliances installed as spares.
- C. The Contractor shall furnish an additional 5% of the STI stopper buttons (snake bite) as spares.
- D. All spare parts shall be neatly and protectively packed in one or more cartons. The quantity, manufacturer, and model of each unit in the carton shall be identified on the outside of the carton. In addition, the name, address, and telephone number of the Contractor and of the manufacturer's local representative, plus the date of delivery, shall be neatly identified on the cover of each carton.
- E. The Contractor shall furnish a minimum of four (4) sets of keys for access to locked and tamper resistant components.

4.13. As-built Drawings

- A. During the course of the project, the Contractor shall develop both hard copy sets and electronic versions (pdf, CAD) of the working as-built drawings. The

Contractor shall be required to show the following on these floor plans for as-built drawings:

1. The exact locations and installation details of all equipment installed including, but not limited to, FACUs, equipment cabinets, all initiating devices, monitor modules, and control modules with the address of each addressed device and all notification appliances.
 2. The installed wiring and color-coding and wire tag notifications for the exact locations of all installed junction boxes and terminal cabinets.
 3. Specific point-to-point interconnections between all equipment and internal wiring of the equipment. Typical point-to-point wiring diagrams are not acceptable.
- B. The Contractor shall show the equipment and addresses associated with each device, as listed in this specification, on separate layers and provide copies of only the layers shown on the floor plans as part of the set of as-built drawings.
- C. During the fire alarm systems and monitoring network installation, the working as-built drawing shall be updated every 24 hours. The on-site as-built drawings shall be available for inspection and review on request by the MZB's fire protection engineering representative.
- D. The as-built drawings shall be in a final form for submission for final approvals. Once the as-built drawings are approved, the Contractor shall submit three (3) copies and the updated AutoCAD files to the MZB's representative for distribution.

4.14. Record Drawings

- A. Following submittal of the current Working As-Built drawings for the Demonstration Test and following review and approval, the Contractor shall update the current As-Built drawings as noted in the Owner's review and to reflect the final as-built configuration (pdf and hard copy). Copy and bind into sets.
- B. On the bottom right-hand corner of each drawing sheet, the Contractor shall stamp in red letters 1-inch high, the wording "RECORD DRAWINGS."

4.15. Operation and Maintenance Manual

- A. The Contractor shall provide one electronic set (pdf) and one complete indexed bound sets of the Operating and Maintenance (O&M) manual, as outlined in NFPA 72, Annex A. These O&M manuals shall include the following:
1. The final Equipment List identifying the quantities and types of equipment listed by manufacturer's part number.
 2. A detailed narrative description of the system inputs, evacuation signaling, ancillary functions, annunciation, intended sequence of operations, expansion capability, application considerations, and limitations.

3. An equipment datasheet (or specification sheet) on every piece of fire alarm and emergency communication system equipment installed.
4. Operator instructions for basic system operations, including alarm acknowledgement, system reset, interpretation of system output, operation of manual evacuation signaling and ancillary function controls, and changing of printer paper.
5. Standby power calculations and voltage drop calculations that coincide with the equipment that has been installed in the building.
6. A point ID list referencing the signaling line circuit loops and the devices on those loops.
7. A sensitivity report for all smoke detectors at the time of acceptance.
8. Complete system programming.
9. Device labels.
10. The results of the testing of all wiring free from faults, as specified in this specification.
11. A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contract, including testing and maintenance instructions for each type of device installed.
 - a. This information shall include manuals that outline inspection, testing and cleaning procedures for all detectors and control equipment, as well as any other special maintenance procedures for any other pieces of fire alarm and monitoring system equipment installed in the building.
12. Detailed troubleshooting instructions for each trouble condition generated from the monitored field wiring, including opens, grounds, and loop failures.
 - a. These instructions shall include a list of all trouble signals annunciated by the system, a description of the condition(s) that causes such trouble signals, and step-by-step instructions describing how to isolate such problems and correct them (or how to call for service, as appropriate).
13. A service directory, including a list of names and telephone numbers of those who provide service for the system.

4.16. Warranty

- A. The Contractor shall guarantee all new equipment installed and new raceways, new wiring and connections to existing wiring and equipment from defects in workmanship and inherent mechanical and electrical defects for a period of one

(1) year from the date of substantial completion of the system. Warranty shall include Parts and Labor.

B. The Manufacturer or the authorized representative shall guarantee all new system equipment for a period of one (1) year from the date substantial completion of the system.

C. Upon completion of the installation of the fire alarm and monitoring network equipment, the Contractor shall provide the MZB with a signed written Completion and Warranty statement, substantially in the form as follows:

“The undersigned, having been engaged as the Contractor on The Maryland Zoo in Baltimore Fire Alarm Project, confirms that the fire alarm and monitoring network equipment was installed in accordance with the system manufacturer’s wiring diagrams, installation instructions and technical specifications.”

D. Emergency Warranty Calls: Provide a 24-hr emergency phone number to the MZB.

1. Warranty Calls: Warranty service shall be provided on a 24-hour, 7 day per week basis during the warranty period. Response time of service personnel shall not exceed one hour from the time of the service call. Repairs under warranty shall be complete within 72 hours of the service call.

2. Written report of corrective action(s) taken to correct the trouble with the fire alarm system shall be forwarded to the MZB’s representative within two days of completion of repairs.

3. The Contractor’s Fire Alarm Maintenance Personnel Qualification: Maintenance Personnel must have three years’ experience in the installation of fire alarm and monitoring network systems, certified by the system manufacturer, and possess a minimum LEVEL II certificate from the National Institute for Certification in Engineering Technologies (NICET) in the subfield of Fire Protection Engineering Technology (Fire Alarm Systems).

PART 5 – PRODUCTS

5.1. Acceptable Products

A. Acceptable fire alarm and monitoring network control/communications equipment and products shall be Notifier® by Honeywell – Onyx Series.

5.2. Minimum Components

A. The FAECS shall consist of, but not be limited to:

1. Addressable FACU’s, containing a Central Processing Unit (CPU), power supply, LED indicators, control switches and relays.

2. GUIs.

3. Input Devices (waterflow switches, tamper switches, and air sampling smoke detection systems).
4. Addressable, photoelectric smoke detectors, with standard bases.
5. Addressable duct smoke detectors.
6. Addressable spot-type heat detectors.
7. Addressable manual fire alarm stations.
8. Addressable monitor modules and control relay output modules.
9. Visible and audible notification appliances.
10. Very early warning air aspirating smoke detection system and components.
11. STI Stopper buttons.

5.3. Fire Alarm Control Units (FACUs)

- A. FACUs (otherwise referred to as control units) shall be installed in accordance with the Contract Drawings and as needed to meet the intent of this specification.
- B. All new FACUs shall be Notifier NFS-320 or NFS2-640. Each FACU shall be customized to meet specific design intent for each building or group of buildings including but not limited to loop cards, network cards, and power supplies.
- C. Cabinets shall be all D-size cabinets unless otherwise approved in writing by the Engineer. All cabinets shall be capable of expansion via a 25% spare capacity.
- D. Batteries shall be sized to accommodate future expansion by performing calculations with the assumption the control unit is fully loaded.

5.4. Graphic User Interface (GUI)

- A. GUIs shall be Notifier ONYXWORKS workstation with newest revision offered by the Manufacturer installed.
- B. GUIs shall not include floor plans of the buildings on site but shall provide detailed description of all devices.
- C. The GUIs shall consist of the following:
 1. Workstation;
 2. UL-Listed 22-inch widescreen HD LED color monitor with integrated speakers; and
 3. High-speed NOTI-FIRE-NET gateway PC card for single-mode fiber.

5.5. Addressable Photoelectric Smoke Detectors

- A. Detectors shall be addressable smoke detectors compatible with the Notifier[®] Onyx series.
- 5.6. Spot-type Heat Detectors
- A. Heat detectors shall be compatible with the Notifier[®] Onyx series.
- 5.7. Detector Bases
- A. Detector bases shall be compatible with the Notifier[®] Onyx series.
- 5.8. Addressable Photoelectric Duct Smoke Detectors
- A. Duct detectors shall be addressable and have duct housing and detectors compatible with the Notifier[®] Onyx series.
- 5.9. Addressable Manual Fire Alarm Stations
- A. Manual fire alarm stations shall be compatible with the Notifier[®] Onyx series.
 - B. Faceplates shall be red with raised white identification lettering.
 - C. Stations shall mechanically latch after operation, with a key operated reset feature, keyed the same as FACU.
- 5.10. Addressable Monitor Modules
- A. Addressable monitor modules shall be compatible with the Notifier[®] Onyx series.
 - B. Each addressable monitor module shall monitor only one non-addressable device on any particular input point. Wiring to the device(s) being monitored shall be Class B supervised (Style B). Module status (normal, alarm, supervisory, trouble) shall be transmitted to the FACU.
 - C. Addressable monitor modules shall include a mounting plate for installation in a junction box or shall be mounted in a locked cabinet or approved box, as shown on the manufacturers recommended specifications.
 - D. An LED shall be provided which shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control unit.
- 5.11. Addressable Control/Relay Modules
- A. Control/relay modules shall be compatible with the Notifier[®] Onyx series.
 - B. Relay output modules shall include a mounting plate for installation in a junction box.
 - C. Provide transient suppressors for inductive loads.
- 5.12. Notification Appliances
- A. General

1. Visible notification appliances shall be rated at 24 VDC and shall be powered by supervised notification appliance circuits originating from the FACU or remote NAC extender panels listed for this purpose.
 - B. Notification appliance circuits
 1. Notification appliance circuits and control equipment shall be arranged and installed so that loss of any one (1) notification appliance circuit shall not cause the loss of any other notification appliance circuit in the system.
 - C. Visible (strobe) notification appliances
 1. Visible strobe-only appliances shall be compatible with the Notifier® Onyx series.
 2. All visible notification appliance circuits shall be synchronized.
 3. Visible notification appliances shall have lens colors specified on the contract drawings.
 - D. Weatherproof appliances.
 1. Weatherproof visible appliances shall be compatible with the Notifier® Onyx series.
- 5.13. Very Early Warning Smoke Detection System Software
- A. Provide all software necessary to configure, commission, maintain and monitor the systems installed at the MZB.
 - B. Contractor bid shall include cost to provide dedicated laptop with all applicable VESDA software to be stored at the MZB.
- 5.14. Addressable Early Warning and Very Early Warning Smoke Detectors
- A. Addressable early warning and very early warning smoke detectors (EWSD/VEWSD) shall be VESDA-E Series VEP single or four pipe (as appropriate) aspirating smoke detectors (ASD) or MZB and MZB's technical representative-approved equivalent.
 - B. For maintenance purposes, the sample tubing shall be routed such that a valved end cap sample port is located at working level for annual functional/reference point testing. This sampling point shall be maintained valved in the closed position during normal operations.
 - C. Valved endcap locations shall be approved by the MZB and MZB's technical representative prior to installation. End cap locations can be submitted during the shop drawing submittal or in an interim construction submittal.
 - D. The ASD shall be capable of connection to the ONYX series Fire Alarm Control Units (FACU) NFS-320, NFS2-640 and NFS2-3030 via a Signaling Line Circuit (SLC) using the communications protocol native to the system, without the use of any additional hardware.

- E. The FACU shall be capable of monitoring and annunciating up to four smoke event thresholds on the ASD and several trouble conditions.
- F. Each event threshold shall be capable of being assigned a discrete type of ID at the FACU, including Aspiration Alarm, Aspiration Pre-Alarm, Aspiration Supervisory, Aspiration Non-Fire, and Aspiration Air Reference, which will determine how the event will be annunciated at the FACU.

5.15. Locks and Keys

- A. All cabinets, including but not limited to FACU, battery cabinets and equipment cabinets shall be provided with lockable, hinged doors.
- B. All locks, including, but not limited to cabinets, and manual pull stations shall be keyed alike.

5.16. Fiber-optic Interface

- A. All network interconnections shall be made via fiber-optic cable unless otherwise identified. The fiber optics interface card shall provide Class X connections. It shall be possible to convert from fiber optic cable to copper wiring or from copper wiring to fiber-optic cable at any network panel node, if necessary.
- B. The fiber optics interface card shall have provisions for an external power source input to permit continuous network and audio data to flow through a network node while primary node power is removed for servicing purposes. The fiber optics interface card shall provide a constant output test signal for maintenance and troubleshooting purposes. The fiber optics interface module shall utilize single -mode fiber with LC style connectors.
- C. New fiber-optic cable shall be single-mode cable or approved equal. Cables shall be pre-terminated with MTP style connectors at the existing fiber demarcation panel and LC type connectors for connection to the FACU's fiber optic interface card. FACU-to-FACU fiber cables shall be pre-terminated with LC type connectors at both ends.
- D. All fiber optic cabling shall be tested for continuity and end-to-end loss. To ensure all cabling meets this requirement, each strand shall be tested by the Contractor. The testing results shall be recorded, signed by the Contractor and forwarded to the equipment supplier and the MZB. No connections to the network nodes shall be made until the system cabling has been accepted by the equipment supplier.

5.17. Transient Surge Protection

- A. Where any signal and/or power conductors (including conductors connected to power supplies), connected to the fire alarm system are routed beyond the footprint of the building(s), surge protection devices shall be provided.

5.18. Secondary Power

- A. Storage batteries shall be sized to provide twenty-four (24) hours of standby power with no active load and subsequent fifteen (15) minutes of full alarm load.
- 5.19. DRMNS Components if one or all of Bid Options 2-4 outlined in specification Section 00400 are exercised.
- A. The DRMNS components shall be from an approved manufacturer.
 - 1. If Bid Option 2 in specification Section 00400 is exercised, the Contractor shall provide an enterprise-wide license of DRMNS server software and install it on the fire alarm graphic user interface.
 - 2. If Bid Option 3 in specification Section 00400 is exercised, the Contractor shall provide DRMNS fire alarm control panel integration with the Notifier system.
 - 3. If Bid Option 4 in specification Section 00400 is exercised, the Contractor shall provide DRMNS two-way radio text-to-speech (TTS) integration and configuration with the existing MZB Motorola CM300 radio system.
 - 4. Provide the ability to disseminate SMS and/or MMS text messages and paging to select or groups of users via no less than three (3) workstations on the MZB LAN.
 - 5. Provide centralized system to disseminate emergency messages and pop-ups to all computers authorized to be connected to the MZB LAN.
 - 6. Provide authorized MZB staff with the ability to customize distribution lists, recipients, and messages without contractor involvement.
 - 7. Provide automated National Weather Service (or similar) alerts and message activation.
 - 8. Provide automatic message activation capability by the fire alarm system via dry contact closure or direct network integration. This activation shall also correspond to FACU user pre-programmed annunciator buttons that will activate pre-recorded messages or live emergency announcements.
- 5.20. DRMNS Server
- A. Provide a Windows® based enterprise-class server to manage the DRMNS system.
 - B. Provide redundant server in the event of primary server failure.
 - C. Provide backup power via auxiliary power supply adequate to maintain the DRMNS server components and switches for 24 hours of standby operation and 15 minutes of emergency event management.
 - D. Provide remote system interface allowing authorized (password protected) user to log-in and maintain an active desktop enabling users to activate and disseminate emergency and non-emergency messages.

- E. Resident software shall manage all aspects of DRMNS specified in Part 1 of this specification.
- 5.21. WAMNS components if Bid Options 5 outlined in specification Section 00400 are exercised. Provide all components specified in specification Section 275116.
- 5.22. Not all devices needed for a complete and working fire alarm system are shown on the contract drawings. The Contractor shall provide equipment as necessary for a fully operational system.
- 5.23. The number of existing fire alarm devices to be replaced under the scope of this project are estimates only. Exact number of device to be replaced shall be confirmed by the contractor and discussed with the MZB. The Contractor bid shall indicate cost per each specific device in the event more or less devices are required/desired.

PART 6 – EXECUTION

6.1. Installation

- A. Installation, workmanship, fabrication, assembly, erection, examination, inspection and testing shall be in accordance with NFPA 72, except as modified herein.
- B. The Contractor shall provide and install all required equipment, labels and accessories necessary for the proper operation of the system.
- C. All work shall be performed in accordance with the best and the most modern practices of the trade. The entire system shall be installed in a neat and workmanlike manner, in accordance with the standard instructions and recommendations of the manufacturer and in accordance with the approved manufacturer's wiring diagrams unless otherwise specifically permitted by the Local AHJ.
- D. The system shall be installed under the supervision of a qualified, trained, NICET (minimum Level III) Certified manufacturer's representative. The technical representative is expected to be on site with the Contractor during the installation of wiring and during the entire time of final connections and testing of the fire alarm system and emergency communication systems. The system shall be demonstrated to perform all of the functions as specified.
- E. The supervisory work of the qualified manufacturer's technical representative shall include, but not necessarily be limited to, checking all the system wiring connections; advising the Contractor regarding technical details of the installation; and the adjustment and testing of all components of the system in order to ensure a complete and satisfactorily operable system. The manufacturer's technical representative shall be on site, during the entire installation and connection of the new control equipment. The technical representative shall monitor all wiring changes and assist the Contractor to ensure a smooth transition to the new control equipment. The cost of the technical representative shall be paid by the Contractor and shall be included in the bid price. The minimum amount of man-hours for this technical representative to be carried is 40 hours. The Contractor shall identify the amount of manufacturer's technical representative's man-hours that shall be provided and the per-hour cost (including the cost for possible overtime hours) for the technical representative's time.

- F. The manufacturer's technical representative shall also be required to instruct designated building and management personnel in the general operation of the system and to give the designated personnel an overview of the system functions when the system is in normal, supervisory mode, alarm mode, and trouble mode, as specified in this specification.

6.2. Wiring

- A. All wiring shall comply with this section.
- B. The entire wiring and raceway system for the fire alarm and detection system shall be in full accordance with NFPA 70, National Electrical Code.
- C. All conduit/raceway in or near animal holding areas shall be routed to avoid tampering or damage resulting from animal contact.
- D. The Contractor shall furnish all metal or non-metallic Listed raceway, wiring, outlet boxes, junction boxes, cabinets, labels and similar devices necessary for the complete installation of the fire alarm system and emergency communication systems. All wiring shall be of the type as specified herein and recommended by the manufacturer and shall be installed in metal raceway throughout.
- E. In areas subject to harsh environmental conditions or areas where direct water spray is probable (as indicated on the Contract Drawings), the Contractor shall furnish all metal or non-metallic Listed raceway, junction/back boxes, cabinets, and similar devices necessary for the complete installation of the fire alarm system and emergency communication systems in a water-tight manner.
- F. Cables run between buildings shall be installed underground in schedule 80 rigid PVC conduit. The installation shall be in accordance with NFPA 70, Articles 300, 760, 770, and 800 as applicable.
- G. Terminal cabinets with hinged, lockable covers shall be provided at all junction points. All conductor splices shall be made on screw-type terminal blocks – wire nuts, butt, crimp or screw type connectors shall not be used. All terminals within a terminal cabinet shall be properly and permanently labeled.
- H. In areas subject to harsh environmental conditions or areas where direct water spray is probable (as indicated on the Contract Drawings), the contractor shall provide NEMA 4X (IP-66) enclosures as needed to provide the highest level of long-term system reliability.
- I. Raceways containing conductors identified as "Fire Alarm" conductors shall not contain any other conductors, and no AC carrying conductors shall be allowed in the same raceway with the DC fire alarm detection and signaling conductors. All fire alarm raceways shall be labeled as "Fire Alarm" at a minimum of 10-foot increments.
- J. The conductors for the notification appliance circuits shall not be installed in the same raceway as the conductors for signaling line circuits unless written certification from the manufacturer is supplied to the Owner indicating that the inclusion of these circuits in the same raceway is acceptable and that no additional consideration is needed for these circuits.

- K. All wiring shall test free from grounds and short circuit faults. To ensure all wiring meets this requirement, the wiring shall be tested by the Contractor. The testing results shall be recorded, signed by the Contractor, and forwarded to the supplier and the Owner. No connections to the FACU shall be made until the system wiring has been accepted by the equipment supplier.
- L. All wiring for initiating devices, notification appliances and remote LCD displays shall be solid copper and shall comply with the appropriate sections of the National Electrical Code. All system wiring size shall be as determined suitable by the manufacturer and in compliance with the National Electrical Code, yet they shall not be any smaller than as specified herein.
- M. Signaling line and notification appliance circuits shall each have an outer jacket color which differs from the other and all other jacketed low voltage cable provided within the building.
- N. Unless otherwise indicated on the Contract Drawings, the following circuit Class and Styles shall be used for all new wiring:
 - 1. Signaling Line Circuits Class B
 - 2. Notification Appliance Circuits Class B
 - 3. Initiating Device Circuits Class B
 - 4. NOTI-FIRE-NET Class A
- 14. Unless otherwise indicated on the contract drawings, the following minimum sizes of conductors shall be used for all new wiring:
 - 5. Power Supply Conductors (Primary and Secondary) No. 14 AWG
 - 6. Signaling Line Circuit Conductors No. 18 AWG
 - 7. Notification Appliance Circuits No. 14 AWG
- B. Exposed raceways shall be run parallel and perpendicular to the walls and ceilings. Wherever practical, exposed raceways shall be run on the ceiling as close as possible to a wall or as high as possible on a wall. Where exposed raceways cross under a structural beam or rib, they shall be run down on one side of the beam or rib, across its bottom, and up to the ceiling on the other side of the beam or rib. No spanning from beam to beam or rib to rib shall be permitted. The use of a raceway body on one side of a beam or rib shall be permitted provided it shall be readily accessible.
- C. The power employed to operate the fire alarm and detection system shall be obtained from available building AC power as identified on the Contract.
- D. The electrical supply to the FACU shall be equipped with a dedicated fused disconnect with a handle that can be locked in the "power on" position. This disconnect is to be provided at the connection to the UPS power supply serving the FACU. Circuit disconnecting means shall have a red marking, shall be accessible to authorized personnel, and shall be identified as "FIRE ALARM

CIRCUIT CONTROL.” The location of the circuit disconnecting means shall be permanently identified on a nameplate installed on the inside of the FACU.

- E. All wiring within the control unit shall be neatly served in the panel gutters and be secured by means of Thomas & Betts "Ty-Raps" or by other approved means.
- F. Where penetrations of floor slabs, fire-resistance rated walls and/or smoke barrier walls are made, the wiring shall be sleeved in metal raceway and the penetrations shall be fire-stopped with approved or UL Listed through-penetration firestop assembly material acceptable to the Owner.

6.3. Demonstration Tests

- A. Upon completion of the installation of the fire alarm systems and monitoring network, the Contractor shall provide a minimum of two (2) weeks' notice to the MZB that the fire alarm system and emergency communication systems have been satisfactorily tested by the Contractor and the manufacturer's representative and is ready for the Demonstration Test.
- B. At the time of notification, the Contractor shall submit one copy of the approved as-built drawings and the approved Test Plan. The tests shall demonstrate that the operating and installation requirements of this specification have been met.
- C. At the Demonstration Test, the manufacturer's technical representative shall deliver to the MZB an Inspection and Test Report, which shall be completed in conjunction with the Demonstration Test and shall indicate the following:
 - 1. Building information, including name, address, and city.
 - 2. The Contractor's name, address, city and telephone number.
 - 3. The control unit configuration, serial number, access passwords, extent of battery backup, locations of remote annunciators, a description of remote functions, and type of fire department notification.
 - 4. The total quantity of notification appliances, initiating devices, addressable modules, etc.
 - 5. The quantity of alarm signal units, fire alarm boxes, and each type of detector in each area. In addition, the connection position of each device shall be indicated, and, further, indicate the test result of each device and any subsequent action taken.
 - 6. Pertinent comments regarding the installation, operation, testing, inspecting, or other aspects of the system.
 - 7. The manufacturer's technical representative shall print his/her name and affiliation and sign and date the document.
- D. The tests shall demonstrate that the entire control system functions as intended. All existing and new circuits and devices shall be tested, including equipment shutdown, alarm signaling devices, strobes and auxiliary functions (including elevator recall and AHU shutdown). In addition, supervision of each circuit shall be tested.

- E. At a minimum, the Contractor shall perform the following in each building:
 - 1. Operate every building fire alarm device to ensure proper operation, correct annunciation at each remote annunciator and at the control unit and proper operation of all alarms and auxiliary functions. Where applying heat would destroy any detector, they may be manually operated.
 - 2. The signaling line circuits and the notification appliance circuits shall be opened in at least two locations per circuit to check for the presence of correct supervisory circuitry.
 - 3. One-half of all tests shall be performed on battery standby power.
 - 4. The contractor shall test all new and existing very early warning air aspirating smoke detection systems in accordance with the Manufacturer's latest published information.
- F. Upon satisfactory completion of the Demonstration Test, the Contractor shall leave the system operating for a minimum of two (2) weeks prior to the Acceptance Test.
- G. If unsatisfactory results occur during or after the Demonstration Test, the Contractor shall be responsible for any and all additional charges incurred by the MZB with respect to corrective action including but not limited to test monitoring and engineering services during the time it takes to obtain Final Acceptance by the AHJ.
- H. When the testing has been completed to the satisfaction of the Contractor's job foremen, the manufacturer's representative, and the MZB's third party inspector, a letter co-signed by each, attesting to the satisfactory completions of said testing, shall be forwarded to the MZB.

6.4. Acceptance Tests

- O. Before the installation shall be considered completed and acceptable by the MZB, the Final Acceptance Test shall be performed. This test shall be coordinated and performed by the Contractor's job foreman, with support from the manufacturer's representative and shall be witnessed by the Owner's representative. Each representative scheduled to witness the test, shall be provided reasonable notification of the test date by the Contractor (at least two (2) weeks). The test shall not be conducted until all parties agree on the scheduled test date.
- P. The Contractor shall provide all the necessary personnel and equipment to conduct the tests.
- Q. At a minimum, the Contractor shall perform the following:
 - 1. Operate every existing and new building fire alarm device and appliance to ensure proper operation, correct annunciation at the control unit, and proper operation of all alarm detection and control devices, strobes and auxiliary functions. Where applying heat would destroy any detector, they may be manually operated.

2. The contractor shall test all existing voice evacuation alarm panels in accordance with the Manufacturer's latest published information and applicable NFPA standards.
 3. The contractor shall test all new and existing very early warning air aspirating smoke detection systems in accordance with the Manufacturer's latest published information.
 4. All new and existing signaling line circuits and the notification appliance circuits shall be opened in at least two locations per circuit to check for the presence of correct supervisory circuitry.
 5. One-half of all tests shall be performed on battery standby power.
 6. All tests and procedures as required by NFPA 72 for initial acceptance testing.
- B. If unsatisfactory results occur during or after the Demonstration Test, the Contractor shall be responsible for any and all additional charges incurred by the MZB with respect to corrective action including but not limited to test monitoring and engineering services during the time it takes to obtain Final Acceptance by the AHJ.
- C. Upon satisfactory completion of the tests, the Contractor shall leave the fire alarm and emergency communication system in proper working order.
- D. Final Acceptance by MZB means that the fire alarm systems and monitoring network is completely operational and in conformance with this specification and applicable codes and standards, all demolition and removal of existing equipment and materials has been satisfactorily completed, all documentation has been submitted as required by these specifications, and all training as required by these specifications has been completed to the satisfaction of the MZB's representative and the AHJ.

6.5. Training Requirements

- A. The Contractor and the Manufacturer's Representative system Supplier shall provide training on the operation, design, installation, maintenance and programming of the installed system as detailed below. Training sessions shall be custom tailored to specifically address the specific equipment, its selection criteria and application for this project.
- B. The Contractor shall provide costs of additional training sessions, if requested.

6.6. Cleaning and Adjusting

- A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit(s) internally using methods and materials recommended by manufacturer.
- B. Contractor is responsible for continuous cleaning of work areas. Contractor shall provide containers for trash removal and stop work early each session to inspect

work area for miscellaneous construction debris to be removed before turnover of work area back to MZB staff for use.

6.7. Patching and Painting

- A. Upon completion of equipment removal in an area, affected surfaces shall be repaired and painted to match original existing conditions.
- B. All painting shall be seam-to-seam or corner to corner to lessen impact of repainting.

6.8. Servicing

- A. The Contractor shall provide cost estimates for annual service contract options. The annual service contract options shall include, but not limited to, annual inspections, troubleshooting and service of the both the FAECS, WAMNS, and DRMNS.
- B. The Contractor shall provide the manufacturer's warranty included with the new fiber optic cable that is being installed.

6.9. Additional Responsibilities

- A. The Contractor shall comply with the MZB Capital Projects Contractor Policy included in Appendix A.
- B. The Contractor shall comply with the MZB Contractor Covid 19 Policy included in Appendix B.

END OF SECTION 283111

SECTION 310000 EARTHWORK

PART 1 – GENERAL

1.1. RELATED DOCUMENTS

The Contract Documents are complementary. Drawings and contract clauses of the Construction Contract, including referenced Division-01 Specifications Sections, apply to this Section.

1.2. SUMMARY

- A. General: Provide earthwork in accordance with requirements of the Contract Documents.
- B. This Section includes the following:
 - 1. Excavating and backfilling for buildings and structures
 - 2. Subsurface drainage backfill for walls and trenches.
 - 3. Excavating and backfilling for utility trenches.
 - 4. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
- C. Contractor will engage, if not already engaged, a Structural Designer licensed in Maryland to design all temporary or permanent structural foundations. All geotechnical and earthwork requirements stated in the design(s) shall also be followed.

1.3. DEFINITIONS

- A. Backfill: Satisfactory soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- D. Controlled Low-Strength Material: A controlled low-strength material (CLSM) is a self-consolidating, cementing material used primarily as a backfill as an alternative to compacted fill (ACI 229R). Several terms have been used to describe this material, including flowable fill, unshrinkable fill, controlled density fill, flowable mortar, plastic soil-cement, and soil-cement slurry; however, the

correct terminology is controlled low-strength material. CLSM is intended to result in a compressive strength of 1200 psi (8.3 MPa) or less.

- E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by MZB. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
 - 2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by MZB. Unauthorized excavation, as well as remedial work directed by MZB, shall be without additional compensation.
- F. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 - 1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp (103-kW) flywheel power with bucket-curling force of not less than 28,090 lbf (125 kN) and stick-crowd force of not less than 18,650 lbf (83 kN); measured according to SAE J-1179.
 - 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp (157-kW) flywheel power and developing a minimum of 48,510-lbf (216-kN) breakout force with a general-purpose bare bucket; measured according to SAE J-732.
- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- H. Subgrade: Surface or elevation remaining after completing excavation or trench excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- I. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4. SUBMITTALS

- A. Product Data: For the following:

1. Each type of plastic warning tape.
 - B. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.
 - C. Excavation Plan: Submit complete plan for excavation and dewatering, including drawings, descriptions, equipment cut sheets, etc.
 - D. Utility Location Drawing – dimensioned plan indicating location of all known utilities.
- 1.5. QUALITY ASSURANCE
- A. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
- 1.6. PROJECT CONDITIONS
- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by MZB or others unless permitted in writing by MZB and then only after arranging to provide temporary utility services according to requirements indicated.
 1. Engage utility-locator service for area where Project is located before excavating.
 - B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 – PRODUCTS

2.1. SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or AASHTO M 145 Soil Classification Groups A-1, A-2-4, A-2-5, and A-3, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, de-bris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
 2. Soils GC, SC, CL or ML could be considered satisfactory soils if the soils are tested and approved by a Geotechnical Designer licensed in Maryland.

2.2. ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 – EXECUTION

3.1. PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

- B. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.2. FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
 - 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.3. EXCAVATION, GENERAL

- A. General: Encountering rock material is possible. If the excavation of rock is required, Contractor shall notify the MZB.
- B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by MZB. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract time may be authorized for rock excavation.
 - 1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation are considered as earth excavation methods
 - 2. Rock excavation includes removal and disposal of rock. Remove rock to lines and sub-grade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches (600 mm) outside of concrete forms other than at footings.
 - b. 12 inches (300 mm) outside of concrete forms at footings.

- c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
- d. 6 inches (150 mm) beneath bottom of concrete slabs on grade.
- e. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

3.4. EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: 12 inches (300 mm) each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other un-yielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
 - 1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other un-yielding bearing material to allow for bedding course.

3.5. SUBGRADE INSPECTION

- A. Notify MZB when excavations have reached required subgrade.
- B. If Geotechnical Designer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed. Additional work to be based on unit price.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by MZB, without additional compensation.

3.6. UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Contact Designer before extending bottom elevation of foundation or footing to determine if structural design is necessary. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by MZB to fill unauthorized excavation under foundations or footings.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by MZB.

3.7. STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without inter-mixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.8. BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.9. UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings

- D. Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase.
- E. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the utility pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches (300 mm) over the utility pipe or conduit.
- G. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- H. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- I. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- J. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.10. SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.11. COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 95 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.12. FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Designer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than 3 tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet (30 m) or less of wall length, but no fewer than 2 tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet (46 m) or less of trench length, but no fewer than 2 tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth re-quired; recompact and retest until specified compaction is obtained.

3.13. PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Designer; re-shape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.14. DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off MZB's property.

END OF SECTION 31 0000

APPENDIX A
MARYLAND ZOO CAPITAL PROJECTS CONTRACTOR POLICY

Maryland Zoo in Baltimore

ZOO CONTRACTORS POLICY

Revised 8/14/08

1. SHIRTS WITH SLEEVES AND LONG PANTS WILL BE WORN AT ALL TIMES (SHORTS ARE NOT PERMITTED).
2. PERSONAL PROTECTIVE EQUIPMENT WILL BE WORN WHEN NECESSARY (I.E., GOGGLES, HARD HATS, GLOVES, WELDING HOOD, EAR PLUGS, ETC.)
3. NO RADIOS, CASSETTE OR CD PLAYERS ARE ALLOWED.
4. NO PETS, ALCOHOL, ILLICIT DRUGS, GAMBLING, FIRE ARMS OR WEAPONS PERMITTED.
5. CONTRACTORS ARE NOT PERMITTED TO BRING FRIENDS OR FAMILY MEMBERS WITH THEM ON TO THE JOB SITE.
6. SMOKING OR CHEWING OF TOBACCO PERMITTED ONLY IN AREAS DESIGNATED BY SUPERINTENDENT.
7. CONTRACTORS ARE NOT PERMITTED TO USE TOBACCO PRODUCTS NEAR ANIMAL ENCLOSURES OR IN THE VIEW OF THE PUBLIC.
8. EATING AREAS AND WORK AREAS WILL BE CLEANED DAILY AND MATERIALS STACKED/STORED SECURELY.
9. CONTRACTORS ARE REQUIRED TO SECURE AND REMOVE ALL TRASH AND LOOSE CONSTRUCTION DEBRIS DAILY DURING THE COURSE OF CONSTRUCTION. CONTRACTORS TO PROVIDE THEIR OWN CONTAINERS FOR TRASH REMOVAL.
10. CONTRACTORS ARE NOT PERMITTED TO VERBALLY OR PHYSICALLY INTERFERE WITH ZOO EMPLOYEES AND/OR GUESTS.
11. CONTRACTORS ARE NOT PERMITTED TO ACCESS AREAS OF THE ZOO THAT ARE BEYOND THEIR SCOPE OF WORK.
12. CONTRACTORS ARE NOT PERMITTED TO FEED THE ANIMALS OR LOITER AROUND ANIMAL ENCLOSURES.
13. ALL AREAS NEAR ANIMALS OR INSIDE OF THE EXHIBIT ARE CONSIDERED SENSITIVE AREAS. IN ORDER FOR CONTRACTORS TO WORK IN THESE AREAS, A MINIMUM OF 2 DAYS NOTICE MUST BE GIVEN TO THE ZOO'S CAPITAL PROJECTS DIRECTOR.
14. CONTRACTORS ARE TO PARK INSIDE AREAS THAT ARE DESIGNATED FOR CONTRACTOR PARKING. NO EXCEPTIONS.
15. CONTRACTORS ARE TO USE THE RESTROOMS (PORTALETTS, PORTABLE POTTIES, ETC) THAT ARE DESIGNATED FOR CONTRACTOR USE. NO EXCEPTIONS.
16. CONTRACTORS ARE TO BE AWARE THAT THE PLANTS ARE A PART OF THE ZOO'S COLLECTION AND THAT ALL PLANT MATERIAL SHOULD BE RESPECTED.

17. IN THE EVENT OF AN ANIMAL ESCAPE OR OTHER EMERGENCY, CONTRACTORS WILL IMMEDIATELY STOP WORK AND MOVE TO A SAFE LOCATION AS DIRECTED BY ZOO STAFF.
18. ON A QUARTERLY BASIS THE ZOO MAY CONDUCT AN ANIMAL ESCAPE DRILL. CONTRACTORS ON SITE ARE RESPONSIBLE FOR COMPLYING WITH ALL INSTRUCTIONS/DIRECTIONS FROM ZOO STAFF ABOUT HOW TO CONDUCT THEMSELVES DURING THE DRILL INCLUDING STOPPING WORK AND/OR LEAVING THE JOB SITE. DRILLS USUALLY LAST NO LONGER THAN 30 MINUTES.
19. CONTRACTORS MAY NOT TAKE PICTURES OF ANY ANIMALS, GUESTS, OR STAFF, EVEN WITH CELL PHONE CAMERAS.
20. THE CONTRACTOR SHOULD BE AWARE THAT ALTHOUGH THE ZOO WILL ENDEAVOR TO PROVIDE ACCESS TO ALL AREAS AS REQUIRED, ANIMAL AREA'S MAY BE LIMITED TO SHORTER PERIODS OF TIME BASED ON ANIMAL SCHEDULES.
21. CONTRACTORS MUST PRESENT AN APPROACH AND SCHEDULE TO INSTALL SYSTEMS FOR ALL AREAS. ZOO FACILITY STAFF WILL BE ASIGNED TO COORDINATE WORK ON A DAILY BASES.
22. NO MISCELLANEOUS CONSTRUCTION DEBRIS (WIRE ENDS, TIES, ETC.) CAN BE LEFT IN ANIMAL AREAS, CONTRACTORS MUST STOP WORK EARLY EACH DAY AND FULLY CAMPUS THE AREA PRIOR TO TURNING IT BACK TO THE ZOO FOR USE.

APPENDIX B
MARYLAND ZOO CONTRACTOR COVID 19 POLICY

COVID-19 Guidance for CONTRACTOR

CONTRACTOR accepts its responsibility to comply with the guidelines of the City of Baltimore, the State of Maryland, and the United States of America relating to COVID-19.

CONTRACTOR agrees that it is personally responsible for its safety and actions while visiting ZOO.

CONTRACTOR agrees to comply with all ZOO policies and rules, including but not limited to all ZOO policies, guidelines, signage, and instructions. Because the ZOO is open for use by other individuals, CONTRACTOR recognizes that it is at higher risk of contracting COVID-19. With full awareness and appreciation of the risks involved, CONTRACTOR, for itself and on behalf of its families, spouses, estates, heirs, executors, administrators, assigns, and personal representatives, hereby forever releases, waives, discharges, holds harmless, and covenants not to sue ZOO, its board members, directors, officers, agents, servants, independent contractors, affiliates, employees, volunteers, successors, and assigns (collectively, the "Released Parties") from any and all liability, claims, demands, actions, and causes of action whatsoever, directly or indirectly arising out of or related to any loss, damage, or injury, including death, that may be sustained by CONTRACTOR related to COVID-19 whether caused by the negligence of the Released Parties, any third-party using the ZOO, or otherwise, while participating in any activity while in, on, or around the ZOO and/or while using any ZOO facilities, exhibits, programs, materials, or amenities.

CONTRACTOR agrees to indemnify, defend, and hold harmless the Released Parties from and against any and all costs, expenses, damages, claims, lawsuits, judgments, losses, and/or liabilities (including attorneys fees) arising either directly or indirectly from or related to any and all claims made by or against any of the Released Parties due to bodily injury, death, property damage, loss of use, monetary loss, or any other injury caused by the negligence of the Released Parties from or related to its use of the ZOO facilities, exhibits, programs, materials, or amenities, except as provided in Paragraph 5 (Representations & Warranties) of the Agreement.

CONTRACTOR must take preventive measures including:

- **A cloth face covering or mask must be worn within 6 feet of another person. CONTRACTOR must wear face coverings inside all ZOO buildings;**
- **In conjunction to wearing a cloth mask, it is critical to practice six foot social distancing with other workers and ZOO staff whenever possible;**
- **Avoiding touching eyes, nose, or mouth with unwashed hands;**
- **Covering their mouth and nose with a tissue when coughing or sneezing, immediately disposing of the tissue in the trash and washing their hands;**
- **Frequent hand washing with soap and water for at least 20 seconds. We ask that you provide alcohol-based sanitizers at the job site where soap and water are not readily available;**

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- **CONTRACTOR** should not enter any buildings without expressed permission from the ZOO and should only use restrooms/Portable restrooms specifically designated for **CONTRACTOR** use;
- If any member of **CONTRACTOR**'s party is feeling ill (*In accordance with current CDC standards – symptoms include fever- at or above 100.4 degrees, cough, or shortness of breath, chills, repeated shaking with chills, muscle pain, headache, sore throat, new loss of taste or smell*), they should not report to work at ZOO and must follow appropriate guidelines for monitoring their illness and COVID19 testing;
- If **CONTRACTOR** presents with flu/COVID19 symptoms while at the ZOO, he or she must immediately leave the job site and be sent home.
- Please immediately inform Karl Kranz (443-552-3350 or Karl.Kranz@marylandzoo.org) if any member of **CONTRACTOR**'s team becomes ill or tests positive for COVID19.

