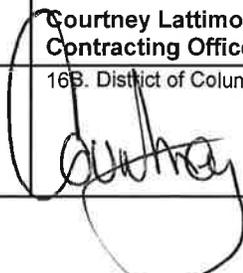


AMENDMENT OF SOLICITATION / MODIFICATION OF CONTRACT			1. Contract Number	Page of Pages 1 2
2. Amendment/Modification Number 003	3. Effective Date See Box 16C	4. Requisition/Purchase Request No.	5. Solicitation Caption Emergency Communication Systems for the Mall Tunnel	
6. Issued by: District Department of Transportation Office of Contracting and Procurement 55 M Street, SE, 7 th Floor Washington, DC 20003		Code	7. Administered by (If other than line 6)	
8. Name and Address of Contractor (No. street, city, county, state and zip code) ALL PROSPECTIVE VENDORS		Code	Facility	9A. Amendment of Solicitation No. DCKA-2014-B-0075
				9B. Dated (See Item 11)
				10A. Modification of Contractor/Order No.
				10B. Dated (See Item 13)
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS				
<input type="checkbox"/> The above numbered solicitation is amended as set forth in item 14. The hour and date specified for receipt of Offers <input checked="" type="checkbox"/> is extended. <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning <u>1</u> copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) BY separate letter or fax which includes a reference to the solicitation and amendment number. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such may be made by letter or fax, provided each letter or telegram makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.				
12. Accounting and Appropriation Data (If Required):				
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTORS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14				
A. This change order is issued pursuant to (Specify Authority): The changes set forth in Item 14 are made in the contract/order no. in item 10A.				
B. The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data etc.) set forth in item 14, pursuant to the authority of 27 DCMR, Chapter 36, Section 3601.2.				
C. This supplemental agreement is entered into pursuant to authority of:				
D. Other (Specify type of modification and authority)				
E. IMPORTANT: Contractor <input type="checkbox"/> is not <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office.				
14. Description of Amendment/Modification (Organized by UCF Section headings, including solicitation/contract subject matter where feasible.) Solicitation DCKA-2014-B-0075 is hereby amended as follows: A. Updated Special Provisions, amended 09/19/2014 B. Bid Package, amended 09/19/2014 C. Certain Detailed Drawings, as follows: 1. E511 – Panel Details, Sheet 44 – See Dashboard for updated document 2. E514 – Tunnel Control Room, Sheet 48 – See dashboard for updated document 3. E516 – Conduit Schedule, Sheet 49 – See dashboard for updated document 4. E209 – Radio System One-Line Diagram Layout – See dashboard for updated document				
15A. Name and Title of Signer (Type or print)		16A. Name of Contracting Officer		
		Courtney Lattimore Contracting Officer		
15B. Name of Contractor	15C. Date Signed	16B. District of Columbia	16C. Date Signed	
(Signature)			9/19/14	
		(Signature of Contracting Officer)		

AMENDMENT OF SOLICITATION / MODIFICATION OF CONTRACT			1. Contract Number	Page of Pages
			2	2
2. Amendment/Modification Number	3. Effective Date	4. Requisition/Purchase Request No.	5. Solicitation Caption	
003	See Box 16C		Emergency Communication Systems for the Mall Tunnel	
<p>D. The Pre-bid conference scheduled for Monday, September 22, 2014 has been rescheduled to Tuesday, September 30, 2014 at 10:00am. The location is unchanged.</p> <p>E. Incorporate General Wage Decision General Decision Number: DC140001 09/05/2014 (HIGHWAY RATES).</p>				

GOVERNMENT OF THE DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE PROJECT MANAGEMENT
ADMINISTRATION



SPECIFICATIONS

INVITATION NO.: DCKA-2014-B-0075

**CAPTION: EMERGENCY COMMUNICATION SYSTEMS FOR THE
MALL TUNNEL**

FAP No.: STP-8888(466)

Bids Will Be Publicly Opened By The Office of Contracting and Procurement, 55 M
Street SE, Washington DC 20003

AMENDMENT NO. 003, DATED 09/19/2014

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The “STANDARD SPECIFICATIONS FOR HIGHWAYS AND STRUCTURES, 2013” and the “Standard Contract Provisions for Use with Specifications for District of Columbia Government Construction Projects” 1973 and amendments thereto are incorporated herein by reference and are made a part of the requirements of this Contract.

1. SCOPE

Work under this contract consists of constructing emergency communication systems in the Mall Tunnel. The work includes but is not limited to the following items:

- a. Installation of AM-FM Channelized Rebroadcast System.
- b. Installation of Emergency Public Address System throughout the Tunnel area.
- c. Installation of Tunnel Radio System compliant with DCFD, MPD, and DDOT radio bands.
- d. Installation of VMS signs and Emergency Pedestrian Egress Routes.
- e. Installation of CCTV cameras.
- f. Installation of Dynamic Message Signs at the Tunnel portals.
- g. Providing a construction schedule for the project and making adjustments to keep the schedule updated.
- h. Implementation and monitoring of vehicular traffic and its maintenance for the construction period.
- i. Mobilization and demobilization, provision and maintenance of work and storage areas, Engineer's Field Facilities and performance of Employee Training.

All above items shall be furnished and installed by the Contractor. Work also includes all other incidentals items required as shown in the contract plans and/or as specified in the Standard Specifications and Special Provisions.

The Contractor is also required to produce all shop/working drawings, material certifications, laboratory test reports, and other required submittals for review by the Chief Engineer in accordance with 105 of the Standard Specifications.

For the duration of the contract, the Contractor shall be fully responsible for protection against damage of all the utility structures within the contract limits and adjacent thereto. The utilities include but are not limited to, public and/or private electricity and communications lines. No separate measurement of payment will be made. Cost of this protective work shall be reflected and distributed among the contract pay items.

2. QUALIFICATIONS OF BIDDERS

This Special Provision supplements 102.01 of Standard Specifications.

Bidders shall demonstrate their experience and capability to perform specified classes of work by providing a certified statement of their organization. The statement shall include the list of projects similar in nature successfully performed by the bidder in the last five (5) years, including reference contact information. The District's Contracting Officer will use his discretion in determining the bidder's competence in performing specified work.

3. PRE-BID CONFERENCE

Prospective bidders are invited to attend a meeting to discuss the proposed work under this contract. The meeting will be held in DDOT's offices at 55 M Street, SE, Washington, D.C. The contractors will be notified about the date and time for the Pre-Bid Conference at a later date.

Representatives of the Department will be available to answer questions relative to the work. Bidders who expect to attend should inform the Department before the meeting date. Any pertinent data or change resulting from the conference will be included in any Addendum issued to all prospective bidders after the conference; however, the importance of attending the meeting is stressed. Any questions or conflicts identified before bid should be brought out during this meeting.

4. CONTRACTOR IDENTIFICATION

This Special Provision supplements 102.01 Article 1 of the Standard Specifications.

All Contractors doing business with the District of Columbia Government shall have a Federal Identification Number.

5. CONTRACT TYPE

In accordance with Title 27 DCMR, Chapter 24, the contract type shall be a fixed price contract.

6. CONTRACT ADMINISTRATION DATA

A. CONTRACTING OFFICER.

Contracts may be entered into and signed on behalf of the District Government only by contracting officers. The contracting officer is the only District official authorized to contractually bind the District. The Contracting Officer is Courtney B. Lattimore, Department of Transportation, Office of Contracting and Procurement, 55 M Street SE, 7th Floor, Washington DC 20003. Telephone (202) 671-2288.

B. AUTHORIZED CHANGES BY THE CONTRACTING OFFICER (ACCO).

1. The Contracting Officer is the only person authorized to approve changes in any of the requirements of this Contract.
2. The Contractor shall not comply with any order, directive or request that changes or modifies the requirements of this contract, unless issued in writing and signed by the Contracting Officer.
3. In the event the Contractor effects any changes at the discretion of any person other than the Contracting Officer, the changes will be considered to have been made without authority and no adjustment will be made in the contract price to cover any cost increase incurred as a result thereof.

SP

Emergency Communication Systems for the Mall Tunnel.
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C. CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE (COTR).

The term COTR is the Program Manager; the name, address and telephone number is:

Name: Mr. Ali Shakeri
Title: Program Manager
Agency: District Department of Transportation
Address: 55 M Street, SE, 4th Floor
Washington, D. C. 20003
Telephone: (202) 671-4612

The COTR will have the responsibility of ensuring that the work conforms to the requirements of this contract and such other responsibilities and authorities as may be specified in the contract. The COTR will act as the contracting officer's representative for technical matters, providing technical direction and discussion, as necessary with respect to the specifications or statement of work, and monitoring the progress and quality of the Contractor's performance. Other responsibilities include the following:

1. Keeping the COTR fully informed of any technical or contractual difficulties encountered during the performance period and advising the ACCO of any potential problem areas under the contract;
2. Coordinating site entry for Contractor personnel, if applicable;
3. Reviewing and approving invoices for fixed-price deliverables to ensure receipt of goods and services. This includes the timely processing of invoices and vouchers in accordance with the District's Payment provisions; and
4. Maintaining a file that includes all contract correspondence, modifications, records of inspections (site, data, and equipment) and invoices/vouchers.

It is understood and agreed, in particular, that the COTR is not a contracting officer and does not have the authority to:

1. Award, agree to, or sign any contract, delivery order or task order. Only the ACCO shall make contractual agreements, commitments, or modifications;
2. Grant deviations from or waive any of the terms and conditions of the contract;
3. Direct the accomplishment of effort, which is beyond the scope of the

statement of work in the Contract;

4. Increase the dollar limits of the contract or authorize work beyond the dollar limit of the contract; or authorize the expenditure of funds by the Contractor;
5. Change the period of performance; and
6. Authorize the furnishing of District property, except as specified under the contract.

When in the opinion of the Contractor, the COTR requests effort outside the existing scope of the contract, the Contractor shall promptly notify the contracting officer in writing. The Contractor under such direction shall take no action until the contracting officer has issued a modification to the contract or until the issue has been otherwise resolved.

D. ORDERING AND PAYMENT.

The Contractor shall not accept orders for items under this contract unless a purchase order has been issued. The participating agency shall be the District Department of Transportation.

Invoices shall be submitted in duplicate to the D.C. Department of Transportation, Office of the Chief Engineer, 55M Street SE, 4th Floor, Washington DC 20003, Telephone (202) 671-2800.

Each invoice must provide the following minimum information:

1. Contractor's name, address, invoice number and date
2. Contract line number (CLIN) being billed for payment and total amount due
3. Purchase order and contract number
4. Addressee's name and address
5. Period of service;
6. Description of services and deliverables provided
7. Name, title, signature and phone number of preparer, and
8. Name of the contracting officer's technical representative.

Payment may be delayed for improperly prepared invoices.

7. PRE-AWARD APPROVAL

Pursuant to Title XXII of the "Fiscal Year 2003 Budget Support Amendment Act of 2002", D.C. Law 14-307, effective June 5, 2003, the Mayor must submit to the Council for approval any

contract action over one million dollars.

8. SPECIFICATIONS AND DRAWINGS

The District of Columbia Department Transportation Standard Specifications (2013) and amendments thereto are incorporated by reference into this contract. In case of discrepancy:

1. The Contracting Officer shall be promptly notified, in writing, of any error, discrepancy or omission, apparent or otherwise.
2. Applicable Federal and D.C. Code requirements have priority over: The Contract Form, General Provisions, Labor Provisions, Change Orders, Addenda, Contract Drawings, Special Provisions and Specifications.
3. The Contract Form, General Provisions and Labor Provisions have priority over: Change Orders, Addenda, Contract Drawings, Special Provisions and Specifications.
4. Change Orders have priority over: Addenda, Contract Drawings and Specifications.
5. Addenda have priority over: Contract Drawings, Special Provisions and Specifications. A later dated Addendum has priority over earlier dated Addenda.
6. Special Provisions have priority over: Contract Drawings and other Specifications.
7. Shown and indicated dimensions have priority over scaled dimensions.
8. Original scale drawings and details have priority over other different scale drawings and details.
9. Large scale drawings and details have priority over small scale drawings and details.

Any adjustment by the Contractor without a prior determination by the Contracting Officer shall be at his/her own risk and expense. The Contracting Officer will furnish from time-to-time, such detail drawings and other information as he may consider necessary, unless otherwise provided.

9. AWARD OF CONTRACT

The Department of Transportation intends to award this contract within ninety (90) calendar days.

10. UTILITY STATUS

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This Special Provision supplements 103.01 Article 17E of the Standard Specifications.

DDOT maintains coordination with the public/private utility companies during the preliminary engineering and construction phases of the project. The Contractor shall continue with this coordination with the public/private utility companies before the start of construction and during all construction phases of the project.

It is understood and agreed that the Contractor has considered in his bid all of the permanent and temporary utility appurtenances in their present or relocated positions. The District will not allow any additional compensation for reasonable delays, inconveniences, or damage sustained by the Contractor due to any interference from the said utility appurtenances or the operation of moving them.

The Contractor shall be responsible for notifying all affected utility companies before performing any work on their utilities, and shall cooperate with them in achieving the desired result. Refer to 107.16 of the Standard Specifications for the list of Utility contacts. The Contractor shall cooperate with the owners of any underground or overhead utility lines in their removal and rearrangement operations. This is in order that the operations may progress in a reasonable manner, that duplication or rearrangement work may be reduced to a minimum, and that services rendered by those parties will not be interrupted.

If utility services are interrupted because of accidental breakage or because of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with the authority in the restoring service. No work shall be undertaken around fire hydrants until the local fire authority has approved provisions for continued service.

11. COORDINATION WITH OTHERS

This Special Provision supplements 103.01, Article 18 of the Standard Specifications.

The Contractor is alerted to the fact that other contracts have been or may be let for work near the project area. These contracts may be associated with this project, or they could be different in scope.

The Contractor shall coordinate his work and cooperate fully with all others in order to eliminate or curtail delays and interference of any kind. Particular attention shall be paid to the proper maintenance of highway traffic through the tunnel. The Contractor shall perform his lane closings and reopening so as not to cause interference with others, or conflict with traffic maintenance by others.

DDOT reserves the right to resolve any conflicts between adjoining Contractors to provide convenience and safety for the traveling public. If the conflict resolution results in delay to the Contractor, only extra non-compensable time will be added to the contract.

12. MAINTENANCE OF HIGHWAY TRAFFIC

SP

Emergency Communication Systems for the Mall Tunnel.
Amendment 003, dated 9/19/2014

This Special Provision supplements 104.02 of the Standard Specifications.

A. TRAFFIC FLOW RESTRICTIONS.

Within the Mall Tunnel and the approaching ramps the full roadway width shall be opened to traffic between the hours of 4:00AM and 8:00PM. The Contractor may perform the work on the project during these restricted hours provided that the full roadway width remains opened to traffic.

The Contractor will be permitted to temporarily close one (1) outside lane of traffic (either left or right lane) and the adjacent shoulder within each tube of the Mall Tunnel between the hours of 8:00PM and 4:00AM, keeping a minimum of two (2) adjacent lanes open in each direction at all times. Two lanes in each direction must be maintained at all times. Refer to 105.11 of the Standard Specifications for Night Work requirements.

The Contractor shall follow the lanes closures within the Construction Staging Drawings of the Contract Documents. The entire lane closure must be in place in accordance with MUTCD standards before any work can begin. The Contractor can close off the shoulders for work with the Chief Engineer's approval provided that shoulder closures meet MUTCD requirements.

The Contractor is not allowed to park vehicles or store equipment along any shoulders or travel lanes, while NOT working.

The Contractor shall contact the COTR, in order to coordinate with the Infrastructure Project Management Administration, Asset Management Division for use of the tunnels variable message boards and overhead lane control signals.

The Contract Drawings contain a suggested Maintenance of Traffic Plans for implementation during construction of the project. The Contractor may use the Maintenance of Traffic Plans in the contract drawings as the Traffic Control Plan (TCP) or submit a Contractor-designed TCP to the Chief Engineer for review and approval. A Contractor-supplied TCP shall comply with 104.02(B) of the Standard Specifications.

The Contractor shall, at all times, maintain an existing vertical clearance within the Mall Tunnel for the duration of construction. No new equipment installed by the Contractor as part of this project shall impede the existing clearance.

B. PEDESTRIAN TRAFFIC REQUIREMENTS.

The Contractor shall at all times maintain and keep accessible an emergency egress for pedestrians within the tunnel for the duration of the project.

C. MEASUREMENT AND PAYMENT.

No direct measurement or payment will be made for the work required by this Special Provision. Payment for work under this Special Provision will be incidental to MAINTENANCE OF HIGHWAY TRAFFIC, Item 612002. Refer to Contract for Measurement and Payment for other maintenance of traffic items, such as:

TEMPORARY CONSTRUCTION SUPPORTS – Item 612010
CONSTRUCTION WARNING AND DETOUR SIGNS – Item 612014
REFLECTORIZED TRAFFIC CONES – Item 612016
FLASHING AMBER WARNING LIGHTS, TYPE B – Item 612018
TRAFFIC DRUMS – Item 612034
TRUCK MOUNTED ATTENUATOR – Item 612092
PORTABLE CHANGEABLE MESSAGE SIGNS – Item 612100
SEQUENTIAL ARROW BOARD - Item 612022
TYPE III PVC BARRICADE – Item 612028

13. CONTRACTOR'S SUBMITTALS

This Special Provision supplements 105.02 (B)(2) of the Standard Specifications. All shop and working drawings, materials certifications, test reports and other required submittals shall be transmitted to the following DC-DDOT office:

**Mr. Abdullahi Mohamed
Infrastructure Project Management Administration
District Department of Transportation
55 M Street, SE, 4th Floor
Washington, DC 20003**

14. INSURANCE

This Special Provision supplements 107.13 of the Standard Specifications.

All policies and certificates shall be sent to the Contracting Officer, DDOT, 2000 14th Street, NW, Washington, DC 20009.

The District of Columbia shall be named as an additional insured on all such policies. All such policies shall specify that the insured shall have no right of subrogation against the District for payments of any premiums or deductibles hereunder and such insurance policies shall be assumed by, be for the account of, and be at the sole risk of the insurer.

Each insurance policy shall contain a binding endorsement stating that: The insurer hereby warrants and agrees that it shall not cancel or alter the insurance coverage afforded by this policy, except after thirty (30) days written notice has been received by the Contracting Officer, from the insurer."

A. GENERAL REQUIREMENTS.

The Contractor shall procure and maintain, during the entire period of performance under this contract, the types of insurance specified below. The Contractor shall submit a Certificate of Insurance giving evidence of the required coverage either before or after contract award but before work commences. All insurance shall be written with

financially responsible companies authorized to do business in the District of Columbia or in the jurisdiction where the work is to be performed; have either an A.M. Best Company rating of AVID or higher, a Standard & Poor's rating of AA or higher, or a Moody's rating of Aa2 or higher. The Contractor shall require all subcontractors to carry the insurance required herein, or the Contractor may, at its option, provide the coverage for any or all subcontractors, and if so, the evidence of insurance submitted shall so stipulate. All policies (excluding Workers' Compensation and Professional Liability, if applicable) shall name the District as an additional insured with respect to work or services performed under the Contract. All policies shall provide that the insurance coverage provided hereunder will be primary and noncontributory with any other applicable insurance. All policies shall contain a waiver of subrogation in favor of the District of Columbia. In no event shall work be performed until the required Certificates of Insurance signed by an authorized representative of the insurer(s) has been furnished. All policies shall provide that the Contracting Officer shall be given thirty (30) days prior written notice via certified mail in the event coverage is substantially changed, canceled or not renewed.

1. Certificate of Insurance Requirement. The policy description on the Certificate of Insurance form shall include the District as an additional insured and a waiver of subrogation in favor of the District.
2. Commercial General Liability Insurance. The Contractor shall provide evidence satisfactory to the Contracting Officer with respect to the operations performed that it carries \$ 2,000,000.00 per occurrence limits; \$ 4,000,000.00 per aggregate limits; and includes coverage for products and completed operations and personal and advertising injury. The policy coverage shall be primary and non-contributory, shall contain the CGL 2503 per project endorsement, and shall include the District of Columbia as an additional insured.

Commercial General Liability Insurance If the Contractor is providing insurance for a subcontractor, the Contractor shall provide evidence satisfactory to the Contracting Officer with respect to the operations performed that it carries \$ 2,000,000.00 per occurrence limits; \$ 4,000,000.00 per aggregate limits; and includes coverage for products and completed operations and personal and advertising injury. The policy coverage shall be primary and non-contributory, shall contain the CGL 2503 per project endorsement, and shall include the District of Columbia as an additional insured.

3. Automobile Liability Insurance. The Contractor shall provide automobile liability insurance to cover all owned, hired or non-owned motor vehicles used in conjunction with the performance of the contract. The policy shall cover the operations performed under the contract with a \$ 2,000,000.00 per occurrence combined single limit for bodily injury and property damage. The policy coverage shall be primary and non-contributory and shall include the District of Columbia as an additional insured.
4. Workers' Compensation Insurance. The Contractor shall provide Workers'

Compensation insurance in accordance with the statutory mandates of the District of Columbia or the jurisdiction in which the contract is performed.

5. Employer's Liability Insurance. The Contractor shall provide employer's liability insurance as follows: \$ 1,000,000.00 per accident for injury; \$ 1,000,000.00 per employee for disease; and \$ 1,000,000.00 for policy disease limit.
6. Umbrella or Excess Liability Insurance. The Contractor shall provide umbrella or excess liability insurance as follows: \$ 5,000,000.00 per occurrence, with the District added as an additional insured.
7. Professional Liability Insurance (Architect & Engineers). The Contractor (including but not limited to architects, attorneys, engineers, environmental consultants, and healthcare professionals) shall provide Professional Liability Insurance (Errors and Omissions) to cover liability resulting from any error or omission caused by the performance of professional services under this Contract.

The policy shall provide limits of \$ 1,000,000.00 per occurrence for each wrongful act and \$ 3,000,000.00 per aggregate for each wrongful act.

The Contractor shall maintain this insurance for five (5) years following the District's final acceptance of the work. The policy shall cover the Contractor and its subcontractors of every tier, and shall identify the District as the Project Owner on the policy.

8. Pollution Liability Insurance. The Contractor shall provide a policy to cover costs associated with pollution incidents including, but not limited to, mold, asbestos or lead removal. The policy shall provide a minimum of \$2,000,000.00 in coverage per occurrence.
9. Crime Insurance. The Contractor shall provide a policy to cover costs associated with the criminal activities of its employees including, but not limited to, robbery, burglary, larceny, forgery, or embezzlement. The policy shall provide a limit of \$ 0.00 per occurrence for each wrongful act and \$ 0.00 per aggregate for each wrongful act.

B. DURATION.

Except as proved in I.5.A.6, the Contractor shall carry all insurance until all contract work is accepted by the District. Each insurance policy shall contain a binding endorsement that: The insurer agrees that the Contracting Officer shall be given thirty (30) days prior written notice via certified mail in the event coverage is substantially changed, canceled or not renewed.

C. CONTRACTOR'S PROPERTY.

Contractors and subcontractor are solely responsible for any loss or damage to their

personal property, including owned and leased equipment, whether such equipment is located at a project site or "in transit". This includes Contractor tools and equipment, scaffolding and temporary structures, and rented machinery, storage sheds or trailers placed on the project site.

D. MEASURE OF PAYMENT.

The District shall not make any separate measure or payment for the cost of insurance and bonds. The Contractor shall include all of the costs of insurance and bonds in the contract price.

15. PROJECT SECURITY

This Special Provision supplements 107.15 of the Standard Specifications.

The Contractor shall be responsible for adequate protection of the project site during the performance of this Contract. The Contractor shall be responsible, on a 24-hour basis, for necessary protection to prevent unauthorized access to any DDOT owned facilities and/or areas to prevent vandalism or injuries. No direct measure or payment will be made. Cost of Project Security shall be incidental to Engineer's Field Facilities, Pay Item 624002.

16. PRE-CONSTRUCTION SCHEDULING CONFERENCE

The Engineer will schedule and conduct a Pre-Construction Scheduling Conference with the Contractor's Project Manager and Construction Scheduler within fifteen (15) working days after the Bidder has received the Contract for execution.

At this meeting, the requirements of 108.03 of the Standard Specifications regarding scheduling will be reviewed with the Contractor. At the Pre-Construction Scheduling Conference, Contractor shall furnish a Preliminary Baseline Schedule as discussed in section C, and be prepared to discuss both its proposed methodologies for fulfilling the scheduling requirements and its sequence of operations.

At the Pre-Construction Scheduling Conference, the Contractor shall be prepared to discuss the requirements for all off-site material testing and submittals applicable to the Contract, discuss their respective preparation, and review durations.

17. WEEKLY PROGRESS MEETINGS

Engineer and the Contractor shall hold weekly progress meetings to discuss, among other things, (i) the near-term schedule activities; (ii) the current status of as-Built documentation, RFI's, Contractor Daily Reports, Quality Control, submittals, correspondence, and Contract Change Orders; and (iii) Jobsite safety, cleanup, traffic control, and coordination issues. Furthermore, the meeting shall address any long-term schedule issues discussion of any relevant technical issues. Contractor shall develop a look-ahead schedule identifying the previous week; current week and a 2-week look ahead. Contractor's look-ahead schedules shall provide sufficient detail to address

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all activities to be performed and to identify issues requiring Owner action or input. Twenty-four hours prior to the weekly progress meetings, the Contractor shall furnish the look-ahead schedule in hard copy and electronic format to the Engineer for review.

No later than 2 days prior to the Weekly Progress Meeting, Contractor shall furnish a list of critical items relating to the look-ahead schedule. During the meeting the parties will jointly determine whether additional items need to be listed, the priority of items, the parties responsible for resolving the critical item and the scheduled resolution date. The updated list will be distributed with the weekly meeting minutes. Nothing herein shall be construed to excuse Contractor's obligation to timely provide either a Notice of Delay or a Notice of Potential Claim.

18. CONSTRUCTION COMPLETION TIME

This Special Provision supplements 108.08 of the Standard Specifications.

The Contractor shall start work on the date specified in a written Notice to Proceed issued by the Contracting Officer and complete the work as followed:

For the Mall Tunnel Work as specified in Section 1- Scope the Contractor shall have ONE HUNDRED AND EIGHTY (180) consecutive calendar days after specified starting date to complete all Work. The Contractor is expected to order equipment with excessively long lead times as early as possible, as not to affect the overall schedule. Additionally, the Contractor is expected to perform work on different items of scope concurrently.

19. REPLACE/REPAIR DAMAGED CEILING PANELS

A. DESCRIPTION.

This item covers removal of ceiling panels damaged during construction, fabrication and installation of replacement panel support members where required, fabrication and installation of tunnel ceiling panels, and repairing surface coating on scratched panels as required and directed by the Engineer.

B. MATERIALS.

The new ceiling panels shall match the existing panels in size, material, finish, color, support type and installation methods.

C. CONSTRUCTION REQUIREMENTS.

Prior to beginning the construction activity within the tunnel, the Contractor shall perform a survey of the tunnel ceiling panels and inventory the panels damaged before any work has begun in the tunnel. The list of damaged panels shall be presented to the Engineer. Any panels found to be damaged during construction due to the Contractor's activities shall be repaired/replaced at the Contractor's expense to the Engineer's satisfaction.

20. DDOT TITLE VI ASSURANCE

During the performance of this Contract, the Contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

A. COMPLIANCE WITH REGULATIONS.

The contractor shall comply with the Regulations relative to Non-Discrimination in Federally Assisted Programs of the Department of Transportation, Title 49, Code of Federal Regulations, Part 21, (hereinafter referred to as the "Regulations"), as they may be amended from time to time, which are incorporated by reference and made a part of this Contract.

B. NON-DISCRIMINATION.

The Contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, gender or national origin in the selection and retention of Subcontractors, including procurements of materials and leases of equipment. A Contractor shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

C. SOLICITATIONS FOR SUBCONTRACTORS, INCLUDING PROCUREMENTS OF MATERIALS AND EQUIPMENT.

In all solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a Subcontract, including procurements of materials or leases of equipment, each potential Subcontractor or Supplier shall be notified by the Contractor of the Contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, gender, or national origin.

D. INFORMATION AND REPORTS.

The Contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto, and shall permit access to its books, records, accounts and other sources of information, and its facilities as may be determined by DDOT or the Federal Highway Administration (FHWA), to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of a Contractor is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to DDOT, or the Federal Highway Administration, as appropriate, and shall set forth what efforts it has made to obtain the information.

E. SANCTIONS FOR NON-COMPLIANCE.

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In the event of the Contractor's non-compliance with non-discrimination provisions of this Contract, DDOT shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:

1. Withholding of payments to the contractor under the contract until the Contractor complies, and/or
2. Cancellation, termination, or suspension of the contract, in whole or in part.

F. INCORPORATION OF PROVISIONS.

The Contractor shall include the provisions of paragraphs (A) through (F) of this Assurance in every Subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto.

The Contractor shall take such action with respect to any subcontract or procurement as DDOT or FHWA may direct as a means of enforcing such provisions including sanctions for non-compliance provided, however, that in the event a Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or Supplier as a result of this direction, the Contractor may request DDOT to enter into such litigation to protect the interests of DDOT, and in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

21. SUBCONTRACTING

This Special Provision supplements 108.01 of the Standard Specifications.

The Subcontractor approval request form included in the Appendices should be used to request approval of subcontractors on this project. The form should be completed for each subcontractor requested for approval and submitted to:

**Attention: Office of Chief Engineer
District Department of Transportation
55 M Street SE, 4th Floor
Washington, D.C. 20003**

Copies of this form are available on request.

Copies of subcontracts shall be made available for review at any time to representatives of the Department of Transportation and the Federal Highway Administration.

22. TUNNEL RADIO SYSTEMS

22.01 GENERAL

The Work under this Section includes:

1. AM and FM radio rebroadcast with voice override system.
2. Multi-agency two-way radio rebroadcast system.
3. Air-interface antennas.
4. In-tunnel distributed antenna system (DAS), including coaxial cables, connectors, AM radiator wire and components, and mounting accessories.
5. Operator Control-room radio consoles.

22.01.01 SUMMARY

All of the designated enclosed tunnel coverage areas, ramps and emergency egress passageways, shall employ an in-tunnel Two-way Radio Rebroadcast system to enable Public Safety first responders, highway police, DDOT and maintenance personnel with bi-directional communications to/from the above ground agencies' network in multiple frequency bands (700 MHz and 800 MHz) for all the designated agencies' FCC-licensed channels. Facilities to enable Tunnel operators with communications capabilities with emergency responders on site and at the tunnel equipment building shall be provided at the Tunnel Control Room.

Additionally, a commercial AM/FM Radio Rebroadcast System with Emergency Voice Override (Break-in) capability shall allow the Tunnel Control Room to broadcast in-tunnel emergency messages to the commuters over the in-car commercial radio receiver for traffic advisories and alerts in case of emergency. An In-tunnel Broadcast Monitoring System (IBMS) shall be installed in order to allow the tunnel operator personnel at the Tunnel Control Room to listen and verify the content and quality of the actual AM/FM rebroadcast transmission within the enclosed tunnel roadways.

The radio systems to be installed shall employ the latest digital signal processing (DSP) and field reconfigurable semiconductor technology to be a future-proof system, compatible with current and new RF digital modulation schemes, reduced risks of technology obsolescence, based on the principles of software defined radio features and functions.

The Contractor shall be responsible for the supply, installation, testing, commissioning, training and documentation of the Tunnel Radio Communications System.

Single-Source Responsibility: The Contractor shall select a Radio Specialist Equipment supplier who shall implement the proposed design, perform site surveys, supply radio and related equipment and specialty materials, integrate the system components purchased with those that are furnished, supervise installation, demonstrate its operation with shop and field acceptance test, commission, document as-built and train the DDOT personnel on the radio systems as detailed in this specification.

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All provided equipment shall be designed and built for the purpose for which it will be used in radio rebroadcast applications.

The Radio Specialist Equipment supplier shall perform an initial site survey and provide a verification of the minimum system signal strength requirements.

The Radio Specialist Equipment supplier shall provide Operations & Maintenance (O&M) manuals, guarantees, warranties, test specifications, test reports and test certificates for all equipment including a recommended list of tools and spares holding.

22.01.02 SCOPE

The Contractor shall install and commission a multi-agency Public Safety two-way radio signal booster system covering 700 MHz and 800 MHz, and an AM/FM radio rebroadcast signal repeater system with emergency override capability. This system must provide radio coverage within the limits of the project.

The radio systems shall include air-interface antennas and their mounting masts; radiating (leaky) coaxial-cable, in-tunnel AM loop-radiator wires; feeder coaxial cable (transmission line), single-mode fiber optic cable, copper multi-conductor cables; multi-channel AM/FM digital rebroadcast head-end equipment; multi-channel 700 MHz and 800 MHz bi-directional RF signal boosters; RF couplers, RF multi-coupling, RF splitter/combiners, RF filters and termination equipment; audio and networking equipment; discrete in-tunnel monitoring pick-up antennas and equipment; electronic equipment cabinets or enclosures; grounding and lightning surge protection devices; panel boards and power lines; support hardware (conduits, cable trays, cable supports, junction boxes, etc).

The donor antennas shall be installed at the Tunnel Equipment Building roof-top to provide an air-interface path for multi-agency two-way radio signals and AM/FM commercial radio reception for re-transmission into the tunnel distributed antenna system.

The two-way radio equipment, AM/FM Rebroadcast/Override Head End Equipment, RF over fiber-optic distribution and AM/FM In-tunnel broadcast monitoring (IBMS) equipment shall be installed at the Tunnel Radio Room. The Remote fiber-fed AM/FM power amplifiers and multi-band bi-directional amplifiers could be installed at the radio room as shown on the drawings, as required by the design. Discrete In-tunnel monitor (pick-up) AM/FM antennas shall be installed for the IBMS operation.

The proposed locations are recommended for the setup and installation of equipment and facilities. The Contractor shall verify the suitability, in terms of installation, operations and maintenance, of the locations for its equipment and facilities and recommend, if necessary, other locations to the Project Engineer's Representative for approval to meet the requirements in this Specification.

22.01.03 AM/FM RADIO REBROADCAST WITH VOICE OVERRIDE SYSTEM

The air-interface multi-channel AM/FM Radio Rebroadcast with voice override system aims at advising vehicular travelers within the tunnel complex of emergency conditions within the Tunnel, ramps and approach roads, and providing instruction for proper actions to be taken. Under normal circumstances, the travelers in the tunnel will receive the FM or AM radio through the car radio. Wherever the situation requires special coordination, the system will

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allow AM and FM radio signals to be overridden within the tunnel for the purpose of dissemination of emergency information.

The air-interface multi-channel AM/FM Radio Rebroadcast with override system is comprised of AM and FM receive antennas, AM and FM digital Receive channelizers (multi-channel on frequency repeaters) with built-in override generators, AM and FM Multi-carrier Power Amplifiers, Digital Recorder and Rebroadcast Controller, and AM/FM console computers.

- a. The tunnel AM radio rebroadcast shall cover the frequency range from 0.53 to 1.7 MHz.

A radio station is considered to be “local” if its off-air reception on top of the Tunnel Equipment Building has signal strength within 40 dB below the average of the stronger stations, or greater than 10 mV/m. The AM radio rebroadcast system shall have provisions to rebroadcast up to 20 channels.

The AM radio rebroadcast system shall conform to the requirements of CFR Title 47 Part 15, Subpart C, Sections 15.211 and 14.221.

- b. The tunnel FM radio rebroadcast shall cover the frequency range from 87.5 to 108 MHz.

An FM radio station is considered to be “local” if its off-air reception on top of the Tunnel Equipment Building has signal strength within 40 dB below the average of the stronger stations, or it is greater than 700 mV/m. The FM radio rebroadcast system shall have provisions to rebroadcast up to 32 channels.

The FM radio rebroadcast system shall conform to the requirements of CFR Title 47 Part 15, Subpart C, Sections 15.211 and 15.239.

The AM/FM system shall provide 95% probability of AM/FM radio rebroadcast in 95% of the tunnel area.

The AM/FM system shall provide coverage of the entire tunnel traffic sections, without radiating outside the enclosed areas above the FCC limits. Therefore, the following minimum field strength requirements apply starting from the insets defined below and into the enclosed areas.

Table 2 AM/FM Bands

	AM band	FM band
Terminating distance from the portals and openings	20 ft	200 ft
Minimum field strength, 95% percentile of the readings over 100ft longitudinal grid sections	-100 dBm	-90 dBm
Measuring test-probe	1 meter whip antenna	98 MHz ¼ wavelength whip

standard	installed on the roof of a car, connected via 50-ohm coaxial cable directly (without coupling or Impedance matching) to the 50-Ohm RF power meter input (narrowband detector)	antenna installed on the roof of a car, connected via 50-ohm coaxial cable directly (without coupling or impedance matching) to the 50-ohm RF power meter input (narrowband detector)
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The system shall be capable of overriding the stations with separate independent content per tunnel or traffic direction, or keeping the normal off/air rebroadcast in one direction while the opposite direction tunnel bore is being overridden. In addition, the system shall be capable of overriding the stations in their normal broadcast language, by having at least two programmable override language groups per traffic direction.

22.01.04 DIGITAL RECORDER AND REBROADCAST CONTROLLER

The Digital Recorder and Rebroadcast Controller shall be fully integrated with the AM & FM Radio Rebroadcast channelizers. The Radio Override subsystem shall be zoned, which means that it has an independent audio source for each tunnel traffic-flow direction and language group. All AM & FM stations within the same tunnel or traffic flow direction will be overridden with the same advisory message; however it shall be capable of different for each tunnel bore. Pre-recorded messages shall be bore-specific since confusion could result if the wording of the announcement may be misunderstood by others for whom the broadcast was not intended. The tunnel operator shall be able to assign playback zones for each new message to be entered into the message registry or database. The Radio Override sub-system shall not allow messages for zones which they are not intended to be broadcast

The AM/FM Digital Recorder and Rebroadcast Controller shall be provided with graphical user interfaces (GUI) either on its local LCD monitor or thru remote client AM/FM radio console computers at the Tunnel Control Room. The functionality provided to the users will include, but not necessarily be limited to the following:

1. Create messages with real voice recordings, use text to speech software.
One demo (basic synthesis quality) voice shall be included for the project. The system shall allow addition of professional synthesized voices licenses at future stages.
2. Provide capability for users to manage existing and future AM/FM Rebroadcast systems.
3. Create AM/FM Rebroadcast messages and message lists.
4. Defining and managing a AM/FM Rebroadcast message schedule.
5. Defining and managing a AM/FM Rebroadcast Message Library.

The user will have the option of creating new messages either by using a voice recorder GUI or by using a text-to-voice GUI.

The AM/FM Rebroadcast subsystem will maintain a library of messages for use in all AM/FM Rebroadcast zones. The user will be able to create message lists for each AM/FM Rebroadcast system from the messages in the AM/FM Rebroadcast Message Library.

AM/FM Rebroadcast systems will be managed from the Tunnel Control Room using an AM/FM radio console computer. The user will be able to log on to the application and make the changes to the AM/FM Rebroadcast systems from any authorized networked workstations with the AM/FM software installed. The application will allow the user to select from a pre-defined message broadcast list, or to create a new broadcast message. All messages can be stored for future use as well. Additionally, the application will track information about this message (who entered it, when it was entered, and who approved it). The messages will be set to run indefinitely or automatically turned off at a certain time.

The AM/FM Rebroadcast GUIs will be responsible for providing command and control capability and displaying the current status of AM/FM Rebroadcast equipment and will be fully integrated into the Graphical User Interface (GUI). The GUIs will allow users to modify all subsystem parameters and make the changes effective without requiring a software restart and allowing normal functions to continue. If a user changes any field device parameter, the GUI will make the user confirm the change before being accepted.

The AM/FM Rebroadcast GUIs will ensure that only users who have proper authorization will be permitted to update the subsystems configuration that include, but are not necessarily limited to the following:

- Add/Modify/Delete messages
- Add/Modify/Delete message lists
- Add/Modify/Delete the AM/FM Rebroadcast subsystem software schedule
- Add/Modify/Delete AM/FM Rebroadcast messages in the AM/FM Rebroadcast Message Library
- Change equipment configuration parameters.

The AM/FM Graphical User Interface will allow a user to add/modify/delete messages to/from the AM/FM Rebroadcast Message Library. When updating the broadcast for an AM/FM Rebroadcast, the messages can be either routine or emergency and the AM/FM Rebroadcast subsystem software will allow the user to create both types of messages to be stored in the AM/FM Rebroadcast Message Library.

The AM/FM Rebroadcast subsystem will provide the user with the capability to schedule certain AM/FM Rebroadcast commands to be executed at a predetermined date/time in the future (such as changing a message within the transmitter, turning off the broadcast) based on the existing command permissions the user has. The schedule entries can be added, modified, or deleted by any user based on the user's permissions. When a user makes any change to the schedule, the action will be recorded as a message with the log, recording the user information and the scheduled command. Similarly, when the AM/FM Rebroadcast subsystem software executes an AM/FM Rebroadcast scheduled command, the action and results of the action will be recorded in the log. Any failure or error condition resulting from a scheduled action will result in an alarm being sent to the log.

Before any scheduled entry has been sent, a user with appropriate permissions will be able to suspend the scheduled command. The command will stay in the list of scheduled entries, but if suspended, will not execute.

The AM/FM Rebroadcast subsystem will maintain a central library of transmitter messages stored in such a way that software does not limit the number of messages created nor limit the length of a message entry. Each message entry will be identified by a unique title that can only exist once in the library. If a user chooses a title that already exists, the user will be given the option to create a new entry or overwrite the existing entry. Each message entry will include, at a minimum, but not necessarily be limited to the following information: the message, date and time of creation based on the operating system clock, message description, whether the message is routine or emergency. The user will be able to select the criteria in a logical fashion (using AND/OR operators) in order to create a smaller subset of messages to choose.

All messages will be stored in a pre-defined voice file format such as a wav file. When creating a message, the user will have the option of creating a message using a voice recorder or manually typing in the message text and then converting the text to the voice file format. If the user chooses to create a message using a voice recorder, a GUI will be displayed that includes a record button, a stop button, and a play button that will allow the user to record and listen to the message. If the user chooses to create a message by typing in the message text, the text will be converted to the voice file format. In order to save the message to the library, the user will be required to listen to a playback of the message to verify the message content.

The Contractor shall request the DDOT Engineer to develop the scripts for a set of initial messages to be included into the message library during the implementation phase for ensuring the initial message library contains a minimum set as approved by the Engineer.

The AM/FM Rebroadcast subsystem will provide the following logging functionality:

As the AM/FM Rebroadcast subsystem software functions, it will record alarms (errors within the subsystem) and messages (commands, requests, changes from users and other subsystems, unauthorized attempts by users, and any other items as defined by the Engineer.

Any user command will register a message in the log, including, but not necessarily limited to, changing the AM/FM Rebroadcast broadcast, changing any configuration within the equipment, within the internal AM/FM Rebroadcast subsystem database, adding, modifying or deleting any message within the AM/FM Rebroadcast Message Library, adding, modifying or deleting any portion of the schedule.

The AM/FM Rebroadcast subsystem will generate alarms to indicate a lack of signal reception within the tunnel.

The AM/FM Rebroadcast subsystem software will provide the user with the ability to display the following summary and detailed reports to the screen, a file, or to a printer, as specified by the user.

- Equipment Configuration – This report will list the current values of all changeable parameters (such as ID, location, description, and type) stored in the device, clearly labeled as approved by the engineer.

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- Current Status – This report will list, at a minimum, equipment ID number, location, equipment type and operational status (such as normal or failed).
- Message Library – This report will list the title and description of each message in the message library. Also lists the transmitters for which the message is applicable and whether the message is routine or emergency. The user will be able to specify that only messages whose names fit a certain pattern are included in this report.
- Schedule – This report will list all information in the AM/FM Rebroadcast subsystem's schedule, clearly labeled. The user will be able to specify that only events between certain times, or pertaining to certain equipment, or pertaining to a certain type of event, or combination of the foregoing be included in this report. Schedule entries will be listed chronologically.
- Recorder/Player memory – This report will list, at a minimum, the transmitter ID and location, the name, description, and all schedule information stored in the recorder/player. All information will be clearly labeled as approved by the designated Project Resident Engineer. The user will be able to specify that this report only cover a particular transmitter or all transmitters. If the AM/FM Rebroadcast subsystem is unable to upload the data from a particular transmitter, it will use the corresponding data from its database, but will indicate in this report that the data is from the database and may not be current.

22.01.05 TUNNEL FM/AM RE-BROADCAST MONITORING SYSTEM

The system shall be also enabled with an AM & FM In tunnel broadcast monitoring system (IBMS) to enable personnel at the Tunnel Control Room to monitor and listen to the actual AM/FM radio rebroadcast signals inside the tunnel.

The AM & FM system shall also be provided with in-tunnel pick-up antennas and broadcast receivers to allow the Operations Control Center to remotely monitor the actual radio signals being broadcast.

The IBMS shall be enabled with at least a dual AM/FM broadcast radio receiver/tuner to allow operator personnel using the primary receiver for monitor and listening to the in-tunnel rebroadcast transmissions on any user-selected station on either AM or FM bands. A demodulated audio output shall be provided to feed the monitoring amplified speakers available on the Digital Recorder and Rebroadcast Controller. IBMS software shall be fully integrated with the other AM/FM Graphical User Interface. The secondary receiver/tuner shall be used as an automated stand-alone silent monitor to scan all pre-programmed stations and activate an alarm whenever the system repeatedly detects failure on multiple radio channels.

AM/FM broadcast radio receiver/tuner shall have a network data port to allow automated access & control from the Digital Recorder and Rebroadcast Controller and/or distant client AM/FM workstations at the Tunnel Control Room.

In tunnel pick-up discrete antennas shall be provided and installed (by others) on key locations to assess proper monitoring. Antennas shall be suitable for wall/ceiling mounting installation. One antenna could be installed per tunnel zone.

The IBMS shall accept sampler RF ports from the head-end AM & FM channelizer outputs. The Graphical User Interface shall allow the user to select monitor (listen) to the head-end sample outputs (before transmission), or the actual in-tunnel signals coming from the in-tunnel pick-up antennas.

By means of the software Graphical User Interface, either on the Digital Recorder and Rebroadcast Controller Server or a distant client workstations at the operations control center, the operator shall be able to perform the following minimum operations:

6. Zone tube selection
7. AM/FM band selection
8. Station selection
9. Pre-set scan
10. Memory pre-set
11. Audio Mute

22.01.06 TWO-WAY RADIO REBROADCAST SYSTEM

The purpose of the two way radio rebroadcast system is to provide radio coverage, within the limits of the project, to the benefit of Public Safety First Responders and operating DDOT personnel.

This system is a repeater system and shall be designed to repeat the radio signals, uplink and downlink from and to the Aboveground DC First Responder System.

There will be discussions among the Contractor, DDOT and OUC.

The Office of Unified Communications is responsible for the Aboveground DC First Responder Radio System. Information about the Aboveground DC First Responder Radio System:

Ten site simulcast Phase 2, 700MHz Motorola system

The radio system gives excellent coverage throughout the entire DC area including in-building coverage with buildings having multiple basement levels.

More information is available at the OUC

The DC contact for detailed information about the Aboveground DC First Responder System is:

Office of Unified Communications
Mr. Teddy Kavaleri
202-715-7557
[Teddy.Kavaleri@dc.gov]

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The Contractor is required to coordinate regularly with Mr., Kavaleri or his designee, at his convenience, for any information necessary concerning this Contract. Each meeting shall be documented by the Contractor and a copy sent to the DDOT Project Manager and Mr. Kavaleri.

The Contractor shall arrange necessary coordination meetings with the Office of Unified Communications through:

Mr. Abdullahi Mohamed
Infrastructure Project Management Administration
District Department of Transportation
55 M Street, SE, 4th Floor
Washington, DC 20003
202-671-4614

A Radio Equipment Room is available for installation of the equipment required for the TWO-WAY RADIO REBROADCAST SYSTEM (see drawings for location).

The Contractor is required to procure and install in the Radio Room a power distribution system to be fed from Panel PPN (reference on sheet 48 of 69 for more Details) to provide feed for the communication and radio equipment systems. The power distribution system shall consist of the following:

30KVA Drytype Transformer

- 480 Delta Primary, 208Y/120 Secondary
- Primary Feeder to be (3) #6 and (1) # 10 in ¾” EMT conduit
- Secondary Feeder to be (4) #3 and (1) # 6 in ¾” EMT conduit

Panelboard

- Nema 1 Enclosure
- 208Y/120 VAC 100Amp Rated 30 –POLE
- Panel shall be label Panel “NES-A2”

The Contractor shall install the required power cabling for the following tunnel remote cabinets from Panel NES-A2:RC-1, RC-2, RC-3, RC-4, RC-5, RC-6, RC-7, RC-8, RC-10 and North Bound PTZ camera.

The remaining tunnel remote cabinets shall be fed from Panel C-5 in the CO Analyzer Room: RC-9, RC-11, RC-12, RC-13, RC-14, RC-15, RC-16 and South Bound PTZ camera.

Signal booster amplifiers with software-defined narrowband filters shall receive, amplify and transmit radio signals in their frequency range. The system shall provide a way in and out to/from the above-ground radio network communications of the designated agencies on selected channels on all specified for tunnel roadways. The digital channelized bi-directional

amplifier shall be provided with integral programmable narrowband filters to meet the class a signal booster definition as per FCC 90.7 to operate as on-frequency repeaters.

ID	Rx (MHz)	Tx (MHz)
1	799.90625	769.90625
2	799.96875	769.96875
3	800.40625	770.40625
4	800.46875	770.46875
5	800.71875	770.71875
6	800.96875	770.96875
7	803.34375	773.34375
8	804.03125	774.03125
9	804.28125	774.28125
10	804.34375	774.34375
11	809.8625	854.8625
12	810.2125	855.2125
13	810.2375	855.2375
14	810.4625	855.4625
15	811.1875	856.1875
16	811.5875	856.5875
17	811.9875	856.9875
18	812.1875	857.1875
19	812.5875	857.5875
20	812.9875	857.9875
21	813.5875	858.5875
22	813.9875	858.9875
23	814.0375	859.0375
24	814.0875	859.0875
25	814.9875	859.9875
26	815.9875	860.9875
27	806.0125	851.0125
28	807.5125	852.5125
29	808.0125	853.0125

The 700MHZ and 800 MHz multi-channel bi-directional signal booster must perform channelization which includes the following operations on a per-channel basis: narrowband

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filtering, center frequency selection, received signal strength detection, automatic gain control with output level equalization and on-frequency (on-channel) retransmission.

The air-interface bi-directional Two-way Radio Rebroadcast System shall be configured to meet the following system signal strength criteria and shall provide 95 percent probability of 2-way radio communication in 95 percent of the tunnel area.

Measured downlink signal strength in the project limits shall be -90 dBm minimum, measured off a 1/4 wave whip antenna tuned to the center of the frequency band under test. The 95% percentile of the readings shall be above this threshold.

For Uplink, the tunnel antenna system must deliver a minimum signal level of -100 dBm measured at the Uplink signal booster system service-side antenna input terminal. The test signal source shall be transmitting +20 dBm Effective Radiated Power at 2 meters above the roadway surface. The 95% percentile of the readings shall be above this threshold.

22.01.07 RF MULTI-COUPLING DEVICES

Passive RF filtering, combiners/couplers, splitters, isolators, shall be included in the design to combine multiple radio frequency sub-bands for all requested radio services.

22.01.08 TUNNEL DISTRIBUTED ANTENNA SYSTEM

The tunnel antenna system shall consist of radiating (leaky) coaxial cables for FM and 700 MHz, and 800 MHz signals. The proposed design shall consider the operational frequency plan for all radio agencies to assess the overall design, determine if separate downlink and uplink cables are needed to provide proper coverage while maintaining adequate levels of isolation between frequency sub-bands.

The Contractor shall review the feasibility of a single radiating cable shared between downlink (Tx) and uplink (Rx) channels. .

The proposed radiating (leaky) cable shall be of nominal outer-conductor diameter of 1-5/8" or bigger. The Contractor shall provide a RF link calculation analysis to demonstrate the minimum requirements.

The AM tunnel radiator shall consist of loops of #8 AWG copper electrical building wire, as depicted in the contract drawings. Each AM radiator-loop has a radiator wire suspended off the ceiling and counterpoise wire installed in an embedded non-metallic conduit on the side barrier as shown on the drawings. One per every two lanes on the ceiling with the radiator wire installed a top the traffic lane divider as shown on drawings

The AM band is rebroadcast by creating an electric or voltage field between two wire conductors and not by conventional RF propagation methods used at higher frequencies. The AM loop tunnel radiators shall employ transformer coupling devices (balun, balance-to-unbalance transformer) to interface with coaxial feeders and provide proper impedance matching to the AM transmitters/amplifiers.

22.01.09 ENVIROMENTAL CONDITIONS

Outdoor equipment shall be rated for continuous operation under the following service conditions:

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- A. Temperature: -10°C to +50°C
- B. Relative Humidity: 5 to 100 percent
- C. Weather: Protect connections and equipment to prevent entry of moisture due to rain or fog

Indoor equipment shall be rated for continuous operation under the following service conditions in environment-controlled communications rooms:

- A. Temperature: 0°C to 40°C
- B. Relative Humidity: 0 to 95 percent

22.01.10 SUBMITTALS

The Contractor shall submit shop drawing, consisting of equipment list and drawings in conformance with the general provisions in 105.02 of the Standard Specifications. The Contractor shall submit complete shop drawings for all proposed products to the Engineer for approval a minimum of 15 work days before ordering or fabrication of equipment.

Manufacturer's technical data for each component in the system, including data on features, ratings, and performance shall be submitted for approval.

Shop drawings for equipment, including plans, elevations, sections, details, and attachments to other work, and plan views of equipment locations and routing of raceway connections, shall be submitted for approval.

Shop wiring diagrams of power and signal wiring, differentiating between manufacturer-installed and field-installed wiring, shall be submitted for approval.

Coordination plans for of radio equipment, including leaky coaxial cable antenna hangers and method of attaching hangers to the building structure, and location of items requiring installation coordination, including lighting, access panels, and other architectural features, shall be submitted for approval.

Signal strength calculations shall be submitted for the path out of the tunnel and the path into the tunnel to verify system performance. Calculations shall be prepared using the signal strength from the nearest base station for Public Safety Agencies, measured near by the off-air antennas site.

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer for each product shipment in conformance with the provisions of 105.03 of the Standard Specifications.

22.01.11 RADIO SYSTEM INSTALLATION

The radio rebroadcast systems installation shall consist of:

1. A RF Field Strength survey for AM and FM commercial radio stations outside the Tunnel Equipment Building.
2. A RF Field Strength Survey for Public Safety Radio “donor” signals.

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3. Initial Site Survey to assess pre-installation requirements and site constraints, conduit paths and interfaces.
4. Installation of AM and FM roof-top receive antennas with coax cables connecting between the roof top antennas and the radio equipment room
5. Installation of two-way radio roof-top transmit/receive antennas with coax cables connecting between the roof top antennas and the Radio Equipment Room
6. Installation layout of conduits and feeder cables (transmission line) for air-interface antennas down to the Radio Equipment Room. Provide isolated/dedicated grounding and surge protection of coaxial feeder cables.
7. Installation of the AM and FM radio equipment cabinets at the radio equipment room Radio Equipment Room.
8. Installation of the two-way radio equipment cabinets at the Radio Equipment Room.
9. Installation of tunnel distributed antenna system (DAS), including radiating (leaky) coax cable for Southbound and Northbound tunnels in traffic areas, cross-passages and emergency egress passageways for coverage of two-way radio signals.
10. Installation of in-tunnel AM loop-radiator wires, coupling devices in traffic areas for Southbound and Northbound tunnels
11. Installation layout of conduits and feeder cables (transmission line) from the radio cabinets down to the Southbound and Northbound Tunnels Distributed antenna system.
12. Installation layout of conduits, single-mode fiber-optic cables and multi-conductor copper cables between radio cabinets in separate buildings between head-end and slave remote sites.
13. Installation of remote control AM/FM console (PC workstation) at the Radio Equipment Room.
14. Installation of IBMS in-tunnel pick-up antennas.
15. Installation of two-way radio transceivers and an operator's console.
16. Installation layout of conduits and power cables from the radio cabinets to the designated power panel and grounding panel.
17. Installation layout of conduits and multi-conductor cables from the radio cabinets to the designated SCADA PLC/RTU cabinet.
18. Installation layout of conduits and networking cables from the radio cabinets to the designated Network backbone switch cabinet.
19. Test and verification of AM and FM radio rebroadcast systems to be fully functional.

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20. Test and verification of Two-way radio rebroadcast systems to be fully functional.

22.01.12 SYSTEM BREAKDOWN

The system breakdown shall include the following items in addition to those listed in the Standard Specifications:

1. Radio Field strength surveys nearby the Tunnel Equipment Building (head-end location), and initial pre-installation design surveys.
2. Furnish and install radiating (leaky) coax cables and AM loop-radiator cables/wires and coupling devices for Southbound and Northbound Tunnels.
3. Furnish and install layout of conduits and cables for Southbound and Northbound Tunnels.
4. Furnish and install air-interface antennas, layout of conduits and cables for AM/FM and two-way radio sub-systems
5. Furnish and Install all required AM/FM and Two-way radio equipment and accessories, at the corresponding locations.
6. Furnish and install layout of conduits and multi-conductor copper cables between head-end at Tunnel Equipment Building and remote slave radio cabinets in tunnel sub-station electrical rooms.
7. Furnish and install panel boards, plus associated layout of conduits and cables towards radio cabinets
8. Furnish and install layout of conduits and cables from Networking cabinet (project backbone switch) towards radio cabinets
9. Test and verification of AM and FM rebroadcast systems.

22.02 PRODUCTS

22.02.01 RF COAXIAL (FEEDER) CABLE (TRANSMISSION LINE)

0.195" Jacket-O.D. BRAIDED COAXIAL CABLE

- Inner Conductor : Solid bare copper
- Outer conductor: Tinned Copper braid over aluminum foil tape (double Shielded)
- Jacket Outer diameter: 0.195 inch
- Typical Insertion Loss (dB/100ft):

50 MHz	150 MHz	450 MHz	900 MHz
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- Dielectric: Foam (PE)
- Low-Smoke, halogen-free fire retardant jacket (PE)
 - UL/NEC CMR, CSA FT4, or better
- Single-turn bend radius: 0.5 inch
- Multiple-turn bend radius: 2 inch
- Bending moment: 0.2 ft-lb
- Tensile strength: 40 lb
- UV resistant

0.400" Jacket-O.D. BRAIDED COAXIAL CABLE

- Inner Conductor : Solid bare copper clad aluminum
- Outer conductor: Tinned Copper braid over aluminum foil tape (double Shielded)
- Jacket Outer diameter: 0.405 inch
- Typical Insertion Loss (dB/100ft):

50 MHz	150 MHz	450 MHz	900 MHz
0.9	1.5	2.7	3.9

- Dielectric: Foam (PE)
- Low-Smoke, halogen-free fire retardant jacket (PE)
 - UL/NEC CMR, CSA FT4, or better
- Single-turn bend radius: 1 inch
- Multiple-turn bend radius: 4 inch
- Bending moment: 0.5 ft-lb
- Tensile strength: 160 lb
- UV resistant

0.600" Jacket-O.D. BRAIDED COAXIAL CABLE

- Inner Conductor : Solid bare copper clad aluminum

- Outer conductor: Tinned Copper braid over aluminum foil tape (double Shielded)
- Jacket Outer diameter: 0.590 inch
- Typical Insertion Loss (dB/100ft):

50 MHz	150 MHz	450 MHz	900 MHz
0.5	1.0	1.7	2.5

- Dielectric: Foam (PE)
- Low-Smoke, halogen-free fire retardant PE jacket
 - UL/NEC CMR, CSA FT4, or better
- Single-turn bend radius: 1.5 inch
- Multiple-turn bend radius: 6 inch
- Bending moment: 2.75 ft-lb
- Tensile strength: 350 lb
- UV resistant

7/8" COAXIAL CABLE (SOLID TRANSMISSION LINE)

- Inner Conductor : Solid Copper Tube
- Outer conductor: Solid (Copper or Aluminum) tube
- Jacket Outer diameter: 1.142 inch
- Typical Insertion Loss (dB/100ft):

50 MHz	100 MHz	150 MHz	450 MHz	894 MHz
0.23	0.33	0.40	0.73	1.08

- Dielectric: Air
- Low-Smoke, halogen-free fire retardant PE jacket
 - IEC332-1, or better
- Single-turn bend radius: 5 inch
- Multiple-turn bend radius: 10 inch
- Bending moment: 26 ft-lb

- Tensile strength: 734 lb
- UV resistant

CABLE TESTING - The ACC shall be tested after installation. The cable found to have faults shall be replaced by the Contractor.

For the purpose of these special provisions, a fault in a length of cable is defined as any of the following:

1. A return loss measurement indicating that there is a short, cut or open in the cable.
2. A visual inspection which reveals exposure or damage to the cable shielding.

22.02.02 RADIATING (LEAKY) COAXIAL CABLE

7/8" RADIATING COAXIAL CABLE (LEAKY)

- Inner Conductor : Solid Copper Tube
- Outer conductor: Slotted Solid (Copper or Aluminum) tube
- Jacket Outer diameter: 1.154 inch
- Typical Insertion Loss (dB/100ft):

150 MHz	450 MHz	900 MHz
0.40	0.78	1.22

- Dielectric: Air
- Low-Smoke, halogen-free fire retardant jacket
 - IEC332-1 Vertical Single Cable Test, or better
- Single-turn bend radius: 5 inch
- Multiple-turn bend radius: 10 inch
- Bending moment: 26 ft-lb
- Tensile strength: 764 lb
- UV resistant

The radiating (leaky) coaxial cables shall start at least 150 feet inside the tubes to prevent leaking-out above FCC allowance, unless otherwise determined by the Resident Project Engineer after preliminary post-installation tests.

They can be installed in the exhaust or fresh air ducts, or in the traffic area out-of-reach of the tunnel washing machines. The system shall be designed, furnished and installed to meet the field strength requirements.

Clicks (self-locking hanger) and Stand-offs Mounting hardware

- One-piece plastic clicks (hanger/clamps)
- Plastic stand-offs
- Material quality Polymer-blend
- Flammability HB according to UL 94
- Fire class B2 according to DIN 4102
- Halogen free as per IEC 754-2
- UV-stabilized
- Corrosion-resistant
- Stainless steel mounting hardware
- The cable hangers shall be installed and spaced per the cable manufacturer's instructions and recommendations

22.02.03 OUTSIDE PUBLIC SAFETY ANTENNAS

OUTSIDE ANTENNAS GROUNDING SYSTEM– The outside antennas shall be grounded as per manufacturer's recommendations. If there is no existing building adequate electrical ground connection point nearby where the antennas are located, the Contractor shall provide approved means to reach the electrical ground point. The proposed antenna grounding method shall be submitted for the Engineer's revision and approval.

LIGHTNING SURGE ARRESTOR – The outside antennas coaxial feeders shall be terminated in lightning surge arrestors prior to entering the radio equipment cabinets. The arrestors shall be installed and connected to the electrical ground following the manufacturers recommendations or as directed by the Engineer.

ANTENNA MOUNTING STRUCTURES – The Contractor shall furnish and install the required antennas' mounting structures (poles or brackets), as required to optimize the signals reception, subject to the Engineer's approval.

ANTENNA - The Contractor shall demonstrate the antennas are tuned and performing as specified by the manufacturer after installation in the presence of the Engineer. The Contractor shall provide all required test equipment for antenna tuning.

22.02.04 MULTI-CHANNEL 800 MHz BAND DIGITAL BI-DIRECTIONAL AMPLIFIER (NARROWBAND SIGNAL BOOSTER)

Signal booster amplifiers with software-defined narrowband filters shall receive, amplify and transmit radio signals in their frequency range. The system shall provide a way in & out to/from the above-ground radio network communications of the designated agencies on selected channels, on all specified tunnels roadways.

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The 800 MHz multi-channel bi-directional signal booster must perform narrowband amplification & processing which includes the following operations on a per-channel basis: narrowband filtering, center frequency selection, received signal strength detection, automatic gain control with output level equalization and on-frequency (on-channel) re-transmission (repeater function)

The 800 MHz channelized bi-directional amplifier (BDA) shall meet the following requirements:

- Downlink Frequency Range: 851-861 MHz
- Uplink Frequency Range: 806-816 MHz
- Number of Narrowband Channels: (will be provided by DDOT) full-duplex.
- On Frequency repeater design with digital filtering technology
- Employ Digital Signal Processing, field reconfigurable.
- Channel frequency shall be programmable by user.
- Filter mask and group-delay: firmware programmable, field reconfigurable
- Channel Spacing: 12.5 or 25 kHz.
- Downlink Multi-carrier Power Amplifier: 20W minimum with output isolator
- Uplink Multi-carrier Power Amplifier: 20W minimum with output isolator
- By-Channel Small Signal Gain: 120 dB max
- Narrowband Automatic Gain Control: 45 dB minimum per channel
- Broadband Gain Control Range: 25 dB minimum programmable in 1 dB digital steps.
- Input Automatic Limit Control: 25 dB minimum, broadband, non-spurious
- Minimum sensitivity for 20 dB audio SINAD: -105 dBm, per channel.
- RSSI Threshold, the channel opens (transmits) only if the receive signal is above the user preset threshold
- Duty Cycle: 100% Continuous
- Donor (base-side) cavity filter duplexer
- Service (mobile-side) filtering
- Input and Output Impedance: 50 ohms
- RF Connectors: N-Type Female
- Non-intrusive RF test (maintenance) ports
- Built-in RF power monitors with forward and reverse power sensors

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- Local LCD display and keypad shall allow stand-alone for basic operation setup and maintenance.
- Discrete Alarm Interfaces: Voltage-free Dry Contact Local Alarm
- Data Ports: Ethernet 10/100 RJ-45
- RS-232 (factory debug)
- Management software support: web server and SNMP v2.
- Power Supply: 120 V AC / 60 Hz
- Enclosure: rack mounted

22.02.05 800 MHz BAND-SELECTIVE BI-DIRECTIONAL SIGNALS AMPLIFIER (BDA), RF SIGNAL-BOOSTERS

The bi-directional amplifiers shall receive, amplify and transmit radio signals in their frequency range.

- Bi-directional amplifiers shall meet the following requirements:
- Downlink Frequency Range: 851-861 MHz
- Uplink Frequency Range: 806-816 MHz
- Downlink Power Amplifier: 20W minimum
- Uplink Power Amplifier: 0.5W minimum
- Gain: Maximum 50 dB. Gain shall be programmable, 25 dB minimum attenuation range (30 dB typ.) in 1 dB digital steps
- Automatic Gain Control: 25 dB minimum (30 dB typ.) in 1 dB digital steps
- Input Automatic Limit control (broadband RF limiter), : 25 dB minimum (30 dB typ.) in 1 dB digital steps
- Noise Figure: 8 dB maximum
- Duty Cycle: Continuous
- Input and Output Impedance: 50 ohms
- Built-in RF power monitors with forward and reverse power sensors
- Local LCD display and keypad shall allow stand-alone for basic operation setup and maintenance.
- Discrete Alarm Interfaces: Voltage-free Dry Contact Local Alarm
- Data Ports: Ethernet 10/100 (RJ-45)

- RS-232 (factory debug)
- Power Supply: 120 V AC 60 Hz
- Mechanical: rack-mount or wall-mount

22.02.06 OUTSIDE AM/ FM RECEIVE ANTENNAS

OUTSIDE ANTENNAS GROUNDING SYSTEM– The outside antennas shall be grounded as per manufacturer’s recommendations. If there is no existing building adequate electrical ground connection point nearby where the antennas are located, the Contractor shall provide approved means to reach the electrical ground point. The proposed antenna grounding method shall be submitted for the Engineer’s revision and approval.

LIGHTNING SURGE ARRESTOR – The outside antennas coaxial feeders shall be terminated in lightning surge arrestors prior to entering the radio equipment cabinets. The arrestors shall be installed and connected to the electrical ground following the manufacturers recommendations or as directed by the Engineer.

ANTENNA MOUNTING STRUCTURES – The Contractor shall furnish and install the required antennas’ mounting structures (poles or brackets), as required to optimize the signals reception, subject to the Engineer’s approval.

ANTENNA - The Contractor shall demonstrate the antennas are tuned and performing as specified by the manufacturer after installation in the presence of the Engineer. The Contractor shall provide all required test equipment for antenna tuning.

22.02.07 MULTI-CHANNEL AM/FM RADIO REBROADCAST WITH VOICE OVERRIDE SYSTEM

The air-interface multi-channel AM/FM Radio Rebroadcast with Override System aims at advising vehicular travelers within the Tunnel complex of emergency conditions within the Tunnel and approach roads and providing instructions for proper actions to be taken. Under normal circumstances, the travelers in the tunnel will receive the FM or AM radio through the car radio. Wherever the situation requires special coordination, the system will allow AM and FM radio signals to be overridden within the Tunnel for the purpose of dissemination of emergency information.

The system shall be capable of overriding the stations with separate independent content per tunnel or traffic direction, or keeping the normal off-air rebroadcast in one direction while the other is being overridden. In addition, the system shall be capable of overriding the stations in their normal broadcast language, by having up to two override language groups per traffic direction (i.e. English, Spanish, or other)

The air-interface multi-channel AM/FM Radio Rebroadcast with Override System is comprised of an AM/FM digital channelizer with override generators (audio modulators), and a Digital Recorder and Rebroadcast Controller Server.

The air-interface multi-channel AM/FM Radio Rebroadcast digital channelizers shall meet the following requirements:

- Antenna inputs: independent AM & FM

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- Separate AM and FM channelizers
- Frequency Response: AM 0.53 – 1.7 MHz, FM 87.5 – 108 MHz
- Number of Channels: 20 AM, 32 FM
- On Frequency repeater design with digital filtering
- Employ Digital Signal Processing and field reconfigurable technology
- In order to avoid signal degradation, and reduce out of phase interference with the above ground signal near the tunnel portals it shall not employ demodulator / modulator devices to perform the repeater function.
- Be of industrial/professional grade quality, designed and built for the intended purpose for which they are to be employed
- AM Channel Spacing: 20 kHz in 10 kHz steps
- FM Channel Spacing: 400 kHz in 100 kHz steps
- Automatic Gain Control: 40 dB min. per channel
- Per channel Gain: 80 dB minimum
- Broadband Gain Control Range 25 dB minimum programmable in 1 dB digital steps.
- Input Automatic Limit Control: 25 dB minimum, broadband, in 1 dB digital steps
- RSSI Threshold, the channel opens (transmits) only if the receive signal is above the user preset threshold
- Override Generator: digital-based AM and FM modulators
- Override Audio inputs: balanced analog, + 4dBu drive level
- Number of override (tunnel) zone outputs: 2
- Duty Cycle: Continuous
- Input and Output Impedance: 50 ohms
- RF Connectors: N-Type Female
- Built-in Non-intrusive RF test (maintenance) ports
- Built-in RF power monitors
- Local LCD display and keypad
- Discrete Alarm Interfaces: Voltage-free Dry Contact Local Alarm
- Data Ports: Ethernet 10/100 and RS-232

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- Management support: web server and SNMP
- Power Supply: 120 V AC, 60 Hz

22.02.08 AM/FM MULTI-CARRIER POWER AMPLIFIERS

The AM/FM multi-carrier power amplifiers shall boost commercial broadcast station signal transmitted from AM/FM Rebroadcast and Override Head-End Equipment. The AM and FM amplifiers are independent of each other. AM/FM power amplifiers shall meet the following requirements:

- Frequency Response: AM 0.53 – 1.7 MHz, FM 87.5 – 108 MHz
- Power Output: 20W minimum
- Gain: 50 dB minimum
- Gain Control Range: 10 dB minimum
- Noise Figure: 10 dB maximum
- Duty Cycle: 100% Continuous
- Input and Output Impedance: 50 ohms
- RF Connectors: N-Type Female
- Non-intrusive RF test (maintenance) ports
- Built-in RF power monitors with forward and reverse power sensors
- Local LCD display and keypad
- Discrete Alarm Interfaces: Voltage-free Dry Contact Local Alarm
- Data Ports: Ethernet 10/100 and RS-232
- Management support: web server and SNMPv2
- Power Supply: 120 V AC
- Enclosure: rack-mount

22.02.09 AM/FM DIGITAL RECORDER AND REBROADCAST CONTROLLER

The Digital Recorder and Rebroadcast Controller shall be fully integrated with the AM/FM Radio Rebroadcast channelizer(s). The Radio Override sub-system shall be zoned which means that it has an independent audio source for each tunnel traffic-flow direction and language group. All AM&FM stations within the same tunnel or traffic flow direction will be overridden with the same advisory message, however it could be different for each tunnel bore, or one bore could be kept re-broadcasting the normal off-air station content while for the other bore all stations are being overridden with a voice break-in. In addition, the system shall be capable of overriding the stations in their normal broadcast language, by having up

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to four override language groups per traffic direction (for example: English, Spanish, Chinese, Japanese).

Pre-recorded messages shall be bore-specific since confusion could result if the wording of the announcement may be misheard or misunderstood by others whom the broadcast was not intended. The tunnel operator shall be able to assign playback zones for each new message to be entered into the message registry or database. The Radio Override sub-system shall not allow messages to play for zones for which they are not intended to be broadcast.

The Digital Recorder and Rebroadcast Controller shall meet the following minimum requirements:

1. PC computer hardware
2. Multi-channel audio playback and voice recording system
3. Independent override zone audio outputs
4. Recording/microphone input
5. Simultaneous multi-zone override capability, with the same or different pre-recorded message
6. Real-time microphone feed-thru (Mic-live) override on any single zone, or combination of multiple zones
7. Pre-recorded or microphone feed-thru (Mic-live) override on any combination of ones
8. Multi-zone override command capability
9. Single or loop playback capability
10. Override Scheduler with date/time calendar
11. Audio Monitor output and local monitoring speakers
12. Management functions: login users with privileges; message database, settings, etc
13. Audio outputs: balanced, + 4dBu drive level
14. Full local control with a local Graphical User Interface (GUI). Remote control from optional client GUI workstations/consoles over the TCP/IP network. Standard input/output devices (LCD display, keyboard, pointing device). Data Ports: (1) Ethernet 10/100, USB ports 4 or more.
15. Integrated IBMS control software
16. Remote Management support: web server and SNMP
17. Discrete Digital I/O ports 16 relay contact outputs and 16 optic-isolated inputs
18. Duty Cycle: Continuous
19. Power Supply: 120 Vac, 60 Hz

20. Enclosure: rack-mount

22.02.10 AM/FM IN-TUNNEL BROADCAST MONITORING SYSTEM (IBMS)

The AM & FM In-tunnel broadcast monitoring system (IBMS) shall also be provided with in-tunnel pick-up antennas and automated broadcast receivers to allow the Tunnel Control Room to remotely monitor (listen to) the actual radio signals being broadcast in the tunnels. An AM/FM broadcast radio receiver/tuner with external PC control shall be installed in the equipment room to monitor the in-tunnel rebroadcast transmissions. A demodulated base-band audio output shall be provided to feed the monitoring amplified speakers available on the Digital Recorder and Rebroadcast Controller and AM/FM console at the Tunnel Control Room. IBMS software shall be fully integrated with the other AM/FM rebroadcast controller functions.

The IBMS shall have at least a dual AM/FM tuner/receiver set. The main (or primary) receiver is under user control for continuous listening of the broadcast signal via Graphical-User-Interface (GUI) commands in the Rebroadcast Controller and/or the AM/FM console at the Tunnel Control Room.

The secondary receiver/tuner shall performed stand-alone automated scan monitoring of all pre-programmed channels in the AM and FM bands. The system shall access the presence, RF level and quality of the rebroadcast signal in each tunnel zone. The IBMS shall drive an alarm output whenever a continuous absence or poor quality of all pre-programmed stations.

The AM/FM broadcast radio receiver/tuner shall have a networked Ethernet data port to allow automated access & control from the Override Controller and/or distant client workstations (AM/FM consoles) at the Tunnel Control Room.

A multi-port RF switch shall be provided in order to feed the AM/FM broadcast radio receiver/tuner. Switch path selection and monitoring shall be controlled by the Digital Recorder and Rebroadcast Override Controller.

In-tunnel pick-up discrete antennas shall be provided and installed on key locations to asses proper monitoring in the traffic area. Antennas shall be rated for exposed outdoor environment.

By means of the software Graphical User Interface (GUI), either on the Digital Recorder and Rebroadcast Controller or distant client workstations at the Operations Control Center, the operator shall perform the following minimum operations:

- Radio Input Selection:
 - Tunnel Zone (tube) selection, Southbound or Northbound (from external in-tunnel pick-up antennas)
 - AM /FM head end channelizer sample inputs, per zone
- AM / FM band selection
- Station selection
- Pre-set scan

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- Memory pre-set
- Audio Mute
- The IBMS shall provide numeric quality indicators of Received Signal Strength Indicator (RSSI, in dBm) and Signal-to-noise ratio (SNR, in dB)

General IBMS specifications

- Two tunnel monitoring inputs (AM & FM)
- Dual Monitoring inputs for AM/FM channelizer output sample ports
- Rebroadcast head-end inputs per tunnel zone
- Frequency Response: AM 0.53 – 1.7 MHz, FM 87.5 – 108 MHz
- User-controlled AM/FM main tuner
- Silent AM/FM secondary tuner for automated signal monitoring, with autonomous scan monitoring of radio signals presence and quality.
- Duty Cycle: 100% Continuous
- RF Input Impedance: 50 ohms
- RF Connectors: Type-N Female
- Data Ports: Ethernet 10/100 (RJ-45)
- Alarm output: Visual LED indicator, and Relay-contact output (voltage free)
- Zone Selector Status: Visual LED indicator, and Relay-contact output (voltage free) per tunnel zone
- Power: 120Vac, 60 Hz
- Enclosure: rack-mount

22.02.11 RADIO SYSTEMS ENCLOSURES

The radio system enclosures shall be installed at the location shown on the plans.

INDOOR RF EQUIPMENT ENCLOSURES

The RF equipment enclosures shall have NEMA Type-12 (equivalent or better) rating with their own NEMA Type-12 (equivalent or better) compliant cooling system, either heat-exchanger or air-conditioner, suitable for stand-alone floor-standing.

The radio equipment enclosures shall have brackets for mounting internal EIA 19” rack frame assembly, equipped with front and rear access doors. Doors shall have handles with provisions for padlocking.

OUTDOOR RF EQUIPMENT ENCLOSURES

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Outdoor enclosures shall have NEMA-4X (equivalent or better) rating. Exposed forced ventilation devices, if any, shall be also rated as NEMA-4X. Enclosures can be designed for floor-standing or wall-mounting, depending on the room location and constraints. Such requirement shall be determined during the design phase and/or the initial pre-installation survey.

22.03 TESTING

- A. The Contractor shall prepare test procedures and submit them to DDOT for approval.
- B. The Contractor shall perform all testing and corrective measures to fix any problems identified during installation and testing as required to ensure fully operational Tunnel Radio Systems.
- D. Test procedures shall be submitted to the DDOT for review and approval as specified.
- E. All radio systems shall be tested for proper functioning.
- F. 30-Day Field Operational Test
 - The 30-Day Field Operational Test shall be conducted on the integrated system of which the Radio Systems, described here-in, are a part.
 - All equipment shall be subject to the same 30-day field operation test requirements. Upon completion and acceptance, DDOT will provide final approval.
 - The Contractor shall submit for each site, facility, and subsystem, well documented, witnessed, test reports for each and every test outlined in the test plan for each subsystem.
- G. The test report shall include:
 - 1. A summary listing the overall results of the testing.
 - 2. A list of failures or problems identified during testing, with a plan of action for the resolution of each.
 - 3. A detailed account of testing, keyed to the test procedures followed for the testing, indicating pass or failure in each case.
 - 4. Additional remarks as warranted.
- H. Acknowledgement by the DDOT: DDOT will provide a written acknowledgement of the receipt and acceptance of each submitted test report within ten (10) days of submittal.
- I. The Contractor shall supply a certified Commissioning Authority (CxA). The CxA has overall responsibility for planning and coordinating the testing and commissioning process. The CxA shall certify all test results, reports and documentation.

22.04 MEASUREMENT AND PAYMENT

This work will not be measured for payment, but will be paid at a Lump Sum bid price for each item below:

1. DCFD, MPD, DDOT First Responder Radio Systems – Item 614991 includes:
 - Channelized BDA’s for off the air pickup
 - Antennas
 - Radiating Cable
 - Brackets and miscellaneous hardware
 - Dispatcher console unit in the Control Room
 - BDA’s.

2. ROAD TUNNEL FM/AM RE-BROADCAST SYSTEM – Item 614991 includes:
 - AM/FM Channelizers
 - AM antenna in the tunnel
 - Server AM/FM override (voice break-in) controller
 - Brackets and miscellaneous hardware
 - AM BDA’s
 - Control equipment in the Control Room
 - SCADA LAN server.
 - 30KVA Transformer
 - 208Y/120VAC, 100AMP Rated, 30 –Pole, NEMA 1 Enclosure
 - (1) 50 amp Lockable circuit breaker
 - (2) 30 amp circuit breaker
 - (6) 15 amp circuit breaker

Each item under these Specifications shall include:

- A. Labor costs including furnishing and installing all equipment, production of working and as-built drawings, testing and commissioning and associated management and support activities.
- B. Materials costs including specified equipment, hardware and firmware, licenses, tools, appurtenances, and all other Products specified.
- C. All Labor and Material required for a full functioning system related to this particular section and related specifications not specifically identified in the Bid Items will be considered incidental and included in the Lump Sum bid price.

23. TUNNEL EMERGENCY PUBLIC ADDRESS (PA) SYSTEM

23.01 GENERAL:

- A. This Section includes Specifications for furnishing, installation and testing of the Emergency Public Address (PA) equipment and associated components.
- B. The work shall consist of, but not be limited to, the furnishing of all labor, materials, tools, and equipment specified for the satisfactory installation and completion of all work in conformance with these Contract Documents and the final design approved by the DDOT.

- C. This section includes the requirements for the Mall Tunnel hardware components of the PA system.
- D. Each Speaker shall be connected to the communications power cabinet. Related work specified elsewhere:
 - 1. SECTION 017823 - OPERATION AND MAINTENANCE DATA
 - 2. SECTION 078413 - PENETRATION FIRESTOPPING
 - 3. SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
 - 4. SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES
 - 5. SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
 - 6. SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
 - 7. SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
 - 8. SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
 - 9. SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
 - 10. SECTION 262726 - WIRING DEVICES
 - 11. SECTION 262813 – FUSES

23.01.01 QUALITY ASSURANCE:

- A. All work specified under this section shall be performed per the requirements in this section, applicable sections elsewhere, applicable codes and standards, and industries best practices to ensure a good quality workmanship.
- B. Installation of new equipment shall be done as required herein, following the manufacturer’s instructions and recommendations, industry’s best practices, applicable codes and standards, and as specified elsewhere in the contract documents to ensure good quality product
- C. All components and materials shall be UL listed.

23.01.02 SUBMITTALS:

Submit the following in accordance with 105.02 of the Standard Specifications and with the additional requirements as specified for each:

- A. Submit in accordance with General Provisions for Construction.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Indicate layout of equipment mounted in racks and cabinets, component interconnecting wiring, and wiring diagrams of network equipment.

- C. Product Data: Submit catalog data showing electrical characteristics and connection requirements for each component.
- D. Test Reports: Submit a test plan and acceptance test checklist for DDOT approval.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- F. Manufacturer's Field Reports: Indicate activities on site, adverse findings, and recommendations.
- G. Project Record Documents: Record actual locations of workstations, servers, UPS, network switches and cabling connections.
- H. Operation and Maintenance Manuals: Submit instructions for adjusting, operating, troubleshooting, administrating and extending system, and repair procedures and spare parts documentation.
- J. As-built drawings: The drawings shall depict the installation conditions of the equipment to be provided. These shall clearly show all the equipment, facilities, conduits, hand boxes, junction boxes, Egress Signs, and any information that could be useful for troubleshooting the system. DDOT will review the drawings for approval.
- K. Mockup of the PA system will be installed for final DDOT approval of the product and its installation quality.
- L. An overview document, describing all supervisory monitoring and control software on a subsystem basis, including a brief description of the hardware interfaces. This document shall functionally describe all software with simplified block/flow diagrams. Include the relationship among programs, the database, and the hardware. Provide this document prior to issuance of any individual software documents.
- M. Field Installation Acceptance Test (FIAT) Reports: The Contractor shall submit for the mall tunnel, well documented, witnessed, test reports for each and every test outlined in the test plan for each subsystem.
- N. Bill of Materials (BOM): This document shall be produced to show all material and system sub-components. The Bill of Material shall contain a detailed breakdown for each system showing all parts contained therein, manufacturer, model, and part number of each item where necessary. Bill of Material shall also show all spare parts, manuals, software packages, warranty registration cards supplied. Clearly indicate where each spare part is to be used.
- O. Proof of compliance with NEC requirement to be listed and approved.

23.01.03 ENVIRONMENTAL REQUIREMENTS

- A. All PA equipment and mounting hardware shall not fail under high winds. The PA speaker and ambient noise sensor installations shall meet the latest American Association of State Highway and Transportation Officials (AASHTO) "Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals" for wind loads.
- B. All hardware to be located in public access areas shall be vandal resistant. Station components shall be installed at a height such that the distance between the station platform and the ground, whichever is closer, to the bottom of the device is 10 feet.
- C. All equipment shall withstand vibration generated by trucks, buses and passenger car traffic.
- D. All equipment shall withstand specified environmental conditions without reduction of service life.
- E. Outdoor equipment shall be rated for continuous operation under the following service conditions:
 - 1. Temperature: -20°C to +50°C
 - 2. Relative Humidity: 5 to 100 percent
 - 3. Weather: Protect connections and equipment to prevent entry of moisture due to rain or fog.
- F. Indoor equipment shall be rated for continuous operation under the following service conditions in environment-controlled communications rooms:
 - 1. Temperature: 0°C to 40°C
 - 2. Relative Humidity: 0 to 95 percent

23.01.04 PA AUDIO PERFORMANCE:

- A. The computer generated voice shall be provided in male and female tones and shall be approved by the DDOT personnel and able to communicate with the approved Head-End Software vendor or ATMS system.
- B. It shall be possible, for authorized personnel, to adjust volume of PA at the amplifier.
- C. The Contractor shall not exceed the sound pressure levels (dB) as dictated by all applicable State, County and City laws and ordinances which regulate noise.

- D. The Contractor shall install the speakers at a height that all messages broadcasted by the PA system shall be intelligible in all public areas where coverage is required.
- E. The system shall be completely free from feedback at all operational audio volume levels.
- F. The Contractor shall perform an acoustical analysis before procuring and installing the PA system and shall submit all findings and final reports to DDOT for approval before proceeding with the project.

23.01.05 PRODUCT, DELIVERY, STORAGE, AND HANDLING:

- A. Each unit shall be individually packaged and labeled for shipment and protected against damage and loss during shipping, handling, and storage.
- B. Store equipment in a secure and dry storage facility.

23.01.06 MAINTENANCE SERVICE:

- A. The Contractor shall service and maintain the PA system during construction and for a period of one year after Final Acceptance of the complete Emergency Communication Systems.

23.02 PRODUCTS

23.02.01 GENERAL

Materials furnished shall be standard products of manufacturer regularly engaged in the production of materials specified. The unit shall be a highly vandal-resistant communication module.

23.02.02 PA SYSTEM EQUIPMENT:

- A. Manufacturers: Talk-A-Phone's PA Speaker/System or approved equal:
 - 1. PA model type: WEBS-PA-2A Outdoor Area WEBS Paging Unit
 - a. Minimal Dimensions: (W X D X H): 11.24" L x 8.75" W x 19.72" H
 - b. Weight: 24LBS.
 - c. Construction: 16GA (.0625 in.) brushed stainless steel
 - d. Audio Broadcast: Two 40 watt speaker, 118 dBA @ 1 meter
 - e. Power: Maximum total 32 watts, 120/240 VAC required)
 - f. Network: 10/100 BaseT Ethernet, RJ45 connectors, Cat 5e or better

- g. Programming: Non-volatile Flash Memory programming and configuration through WebGUI
- h. Configuration: Static IP address provisioning and DHCP client. Should be monitored via 3rd party VMS or ATMS system
- i. The unit shall have a NEMA 4X (IP66 compliant) construction with liquid tight cord grips.

23.02.03 PA SYSTEM EQUIPMENT COMMUNICATIONS:

- 1 Communication device shall accept standard copper wire.
- 2 Adheres to communication protocols TCP/IP
- 3 Communication device shall have a 10/100 BaseT Auto-Negotiating Ethernet LAN interface
- 4 Paging unit will be managed through a web browser and will be flash upgradeable
- 5 Unit shall be compatible with a 2.4GHz Radio Frequency Interface, model VOIP-RF, to create a radio frequency emergency paging system.
- 6 Unit shall be compatible with a 900MHz Radio Frequency Interface, model VOIP-RF-900, to create a radio frequency emergency paging system.

23.02.04 PA SYSTEM EQUIPMENT ELECTRICAL:

- A. Manufacturers: Talk-A-Phone's PA Speaker/System or approved equal
 - 1. All wiring and electrical fixtures comply with the standards of the National Electrical Code, UL and C.S.A.
 - 2. Liquid Tight flexible conduit coating shall consist of thermal plastic or thermoset product and meet NFPA 502 standard.

23.02.05 PA SYSTEM EQUIPMENT SOFTWARE:

- A. Manufacturers: Talk-A-Phone's PA Speaker/System or approved equal
 - 1. The selected PA system software shall work with the (ATMS) provided under this contract.
 - 2. The approved equipment shall work with the (ATMS) provided under this contract.

23.02.06 PA SYSTEM EQUIPMENT SERVER:

- A. Manufacturers: Talk-A-Phone's PA Speaker/System or approved equal

1. All wiring and electrical fixtures comply with the standards of the National Electrical Code, UL and C.S.A.
2. The approved equipment will work with an existing or furnished advanced traffic management system (ATMS)

23.02.07 SPARES

- A. The Contractor at the conclusion of the project shall submit to DDOT recommended spare parts list for review.

23.03 EXECUTION

23.03.01 SURVEYS

- A. The Contractor shall perform surveys at the mall Tunnel where work shall be performed to confirm:
 1. Location of speakers and computer equipment.
 2. Adequate speaker coverage.
 3. Existence of conduits or facilities that may be used for this project.
- B. The Contractor shall use information gathered during the site surveys to generate final working As-Built drawings for the mall tunnel project.

23.03.02 INSTALLATION:

- A. The number and placement shall be such that a uniform and intelligible audio coverage is provided in the areas where coverage is required. The Contractor shall refer to drawing (E301-E309) for recommended placement of the PA system and devices and must receive approval of final placement by DDOT.
- B. The Contractor shall adhere to the installation instructions provided by the manufacturers of the equipment.
- C. The contractor shall route all power and communications to the Tunnel Remote Cabinet as shown on the plans.(Sheet-45)
- D. The Contractor shall install the required power cabling, connectors and plugs to provide 120-Vac, 60-Hz to the various PA system as shown on the plans.
- E. All external mounting hardware shall be made of a DDOT approved corrosion resistant material.
- F. Speakers shall utilize the manufactures recommended mounting bracket, which will allow tilting of the speaker for a maximum sound distribution pattern.
- G. The Contractor shall evaluate and implement lightning protection methods for all components in accordance to the guidance of standard IEC 62305: Protection Against Lightning.
- H. All electrical installations shall meet the specification requirements, NFPA 70 and NFPA 502: National Electrical Code (NEC), and all applicable city, county

and/or State regulations.

- I. The Contractor shall restore the tunnels building aesthetics to their original condition after completion of emergency communications system project.
- J. All communications and required power equipment shall be installed in the new remote tunnel communication cabinet in a manner that ensures proper airflow and heat dissipation while maximizing the use of space in the cabinet.
- K. The Contractor shall install all conduits and fittings. The Contractor shall install the required connectors, and inter-rack wiring between the various equipment and make all necessary connections and cross-connections required for a complete installation.

23.03.03 TESTING

- A. The Contractor shall prepare test procedures and submit them to the DDOT for approval.
- B. The Contractor shall perform all testing and corrective measures to fix any problems identified during installation and testing as required to ensure a fully operational and intelligible PA system.
- C. Test procedures shall be submitted to the Engineer for review and approval as specified.
- D. All audio sources shall be tested for proper functioning.
- E. Testing of the electrical integrity (impedance matching, loading, etc.) of the PA system for every audio circuit shall be required.
- F. SPL and sound level measurements shall be performed using a calibrated (certified) meter.
- G. Ambient noise measurements shall be performed using a sound level meter. Ambient noise readings shall be taken at each station in the areas that require coverage for a full 24-hour period. Lowest and highest ambient noise time intervals shall be identified and submitted to DDOT for acceptance.
- H. Sound measurements shall be made:
 - a. In the mall tunnel area one measurement for every 150 square feet. The measurement shall be made in the geometric center of the 150 square ft. area.
 - i. No two measuring points shall be less than 12 feet apart unless there is an obstacle, a platform edge or an incomplete area (less than 150 square feet).
 - ii. For incomplete areas (less than 150 square feet), a measurement shall be made in the geometrical center of such area.
 - iii. If more than 1 row of measurement points is needed at any

location, the rows shall be distributed such that a staggered grid pattern is formed.

- iv. The grid pattern shall be as symmetrical as possible to the centerline of the locale.
 - b. At worst case locations as identified by the Contractor on the survey reports.
 - c. At up to 10 randomly selected points per station chosen by the DDOT personnel at a height of 4 feet from the floor.
- I. Individual loudspeaker SPL readings shall be made along the axis of the loudspeaker.
- J. Intelligibility testing shall be done according to IEC 60849 Sound Systems for Emergency Purposes, IEC 60268- Part 16 Objective Rating of Speech Intelligibility by Speech Transmission Index, and industry best practices. The tests shall demonstrate that the PA system is intelligible in all areas where coverage is required during both the busiest time of the day and off-peak hours.
- K. 30-Day Field Operational Test
 - The 30-Day Field Operational Test shall be conducted on the integrated system of which the Tunnel Emergency PA systems, described here-in, is a part.
 - All equipment shall be subject to the same 30-day field operation test requirements. Upon completion and acceptance, DDOT will provide final approval.
 - The Contractor shall submit for each site, facility, and subsystem, well documented, witnessed, test reports for each and every test outlined in the test plan for each subsystem.
- L. The test report shall include:
 1. A summary listing the overall results of the testing.
 2. A list of failures or problems identified during testing, with a plan of action for the resolution of each.
 3. A detailed account of testing, keyed to the test procedures followed for the testing, indicating pass or failure in each case.
 4. Additional remarks as warranted.
- M. Acknowledgement by the DDOT: DDOT will provide a written acknowledgement of the receipt and acceptance of each submitted test report within ten (10) days of submittal.
- N. The Contractor shall supply a certified Commissioning Authority (CxA). The CxA has overall responsibility for planning and coordinating the testing and commissioning process. The CxA shall certify all test results, reports and documentation.

23.03.04 PA SYSTEM EQUIPMENT:

- A. Installation shall be performed per the approved drawings and all applicable standards and codes.
- B. The Contractor shall adhere to the installation instructions provided by the manufacturers of the equipment. Deviations to the manufacturer's installation instructions shall be justified by the Contractor and shall be pre-approved prior to design approval.

23.03.05 GROUNDING:

- A. Per Section 260526 - Grounding and Bonding for Electrical System and Contract drawings.

23.04 MEASUREMENT AND PAYMENT

This work will not be measured for payment, but will be paid at a Lump Sum bid price for: TUNNEL EMERGENCY PUBLIC ADDRESS SYSTEM – Item 614991, which includes:

- PA speakers
- PA software
- Software licenses
- Fiber cable (6 strand)
- Media converter
- EMT Conduit
- Communication Cable
- Power Cable

This Lump Sum item shall include:

- A. Labor costs including fabrication, installation, configuration, integration, testing, commissioning, software programming, and associated management and support activities.
- B. Materials costs including specified equipment, hardware, firmware, software, software licenses, tools, appurtenances, software integration with the ATMS system and all other Products specified.
- C. All Labor and Material required for a full functioning system related to this particular section and related specifications not specifically identified in the Bid Items will be considered incidental and included in the Lump Sum bid price.

24. PEDESTRIAN EGRESS SIGN CONTROL SYSTEM

24.01 GENERAL

24.01.01 DESCRIPTION:

- A. This section provides specifications for design, furnishing, installing and testing

a new PEDESTRIAN EGRESS CONTROL System.

- B. The design shall include a workstation to permit an operator to control the pedestrian egress system during an emergency situation and other emergencies that require vehicle pedestrian easy egress out of the Mall Tunnel. The Pedestrian Egress system will be controlled from the Tunnel Control Room via the recommended Head-End software as described in Section 26 of this document.
- C. Each pedestrian egress system will consist of a 36" x 24" Running Man sign with "Chevron" arrows from each side of the running man box pointing in direction of the nearest exit. Please refer to drawings (E301-E308) for consistency.
- D. The pedestrian egress system will be a combination of self-illumination and a low power system that will operate by the condition in the Mall Tunnel and areas.
- E. For the powered pedestrian egress system it shall be on a battery backup power.
- F. The Contractor shall be responsible for any work not specifically mentioned in this specification, but which is necessary, either directly or indirectly, for the proper functioning of a complete new Pedestrian Egress system.

24.01.02 RELATED SECTIONS:

- 1. SECTION 017823 - OPERATION AND MAINTENANCE DATA
- 2. SECTION 078413 - PENETRATION FIRESTOPPING
- 3. SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 4. SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES
- 5. SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 6. SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
- 7. SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
- 8. SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
- 9. SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
- 10. SECTION 262726 - WIRING DEVICES
- 11. SECTION 262813 - FUSES

24.01.03 QUALITY ASSURANCE:

- A. All work specified under this section shall be performed per the requirements in this section, applicable sections elsewhere, applicable codes and standards, and industries best practices to ensure a good quality workmanship.
- B. Installation of new equipment shall be done as required herein, following the manufacturer's instructions and recommendations, industry's best practices, applicable codes and standards, and as specified elsewhere in the contract documents to ensure good quality product.

24.01.04 SUBMITTALS

Submit the following in accordance with 105.02 of the Standard Specifications and with the additional requirements as specified for each:

- A. Submit in accordance with General Provisions for Construction.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Indicate layout of equipment mounted in racks and cabinets, component interconnecting wiring, and wiring diagrams of network equipment.
- C. Product Data: Submit catalog data showing electrical characteristics and connection requirements for each component.
- D. Test Reports: Submit a test plan and acceptance test checklist for DDOT approval.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- F. Manufacturer's Field Reports: Indicate activities on site, adverse findings, and recommendations.
- G. Project Record Documents: Record actual locations of workstations, servers, UPS, network switches and cabling connections.
- H. Operation and Maintenance Manuals: Submit instructions for adjusting, operating, troubleshooting, administrating and extending system, and repair procedures and spare parts documentation.
- J. As-built drawings: The drawings shall depict the installation conditions of the equipment to be provided. These shall clearly show all the equipment, facilities, conduits, hand boxes, junction boxes, Egress Signs, and any information that could be useful for troubleshooting the system. DDOT will review the drawings for approval.
- K. Mockup of the pedestrian egress system will be installed for final DDOT approval of the product and its installation quality.
- L. An overview document, describing all supervisory monitoring and control software on a subsystem basis, including a brief description of the hardware interfaces. This document shall functionally describe all software with simplified block/flow diagrams. Include the relationship among programs, the

database, and the hardware. Provide this document prior to issuance of any individual software documents.

- M. Field Installation Acceptance Test (FIAT) Reports: The Contractor shall submit for the mall tunnel, well documented, witnessed, test reports for each and every test outlined in the test plan for each subsystem.
- N. Bill of Materials (BOM): This document shall be produced to show all material and system sub-components. The Bill of Material shall contain a detailed breakdown for each system showing all parts contained therein, manufacturer, model, and part number of each item where necessary. Bill of Material shall also show all spare parts, manuals, software packages, warranty registration cards supplied. Clearly indicate where each spare part is to be used.
- O. Proof of compliance with NEC requirement to be listed and approved.

24.01.05 ENVIRONMENTAL REQUIREMENTS

- A. All hardware to be located in public access areas shall be vandal resistant. Station components shall be installed at a height such that the distance between the Tunnel roadway to the bottom of the device is less than 10 feet.
- B. All equipment shall withstand vibration generated by trucks, buses and cars.
- C. All equipment shall withstand specified environmental conditions without reduction of service life.
- D. All equipment shall meet NFPA 502 requirements
- E. WEED/RoHS Compliant
 - 1. 2002/96/EC WEED Directive
 - 2. 2002/95/EC RoHS
- F. EMC Emissions Compliant
 - 1. EN55015 (CISPR15) Radiated and Conducted Emission
 - 2. IEC/EN 51000-2-3 CLASS C
- G. FR Flame Resistance Compliant
 - 1. EN60695-2-11:2001 in accordance with Paragraph 2. Article EC5 UTE C 12.201
 - 2. Honeywell Barrier Film tested to UL746C and CSA 0.6
 - 3. UL 94VTM-0 Flame resistance
- H. IP68 Rating for Exterior Use
 - 1. EN60529 + A1: 2004
 - 2. EN60598 + A1: 2003
- I. Underwriters Laboratories Approval Testing
 - 1. File number E319670

- J. Outdoor equipment shall be rated for continuous operation under the following service conditions:
 1. Temperature: -40°C to +65°C
 2. Relative Humidity: 5 to 100 percent
 3. Weather: Protect connections and equipment to prevent entry of moisture due to rain or fog
- K. Indoor equipment shall be rated for continuous operation under the following service conditions in environment-controlled communications rooms:
 1. Temperature: 0°C to 40°C
 2. Relative Humidity: 0 to 95 percent

24.01.06 PRODUCT, DELIVERY, STORAGE, AND HANDLING:

- A. Each unit shall be individually packaged and labeled for shipment and protected against damage and loss during shipping, handling, and storage.
- B. Store equipment in a secure and dry storage facility.

24.01.07 MAINTENANCE SERVICE:

- A. The Contractor shall service and maintain the Pedestrian Egress system during construction and a period of one year after Final Acceptance of the complete Emergency Communication System.

24.02 PRODUCTS

24.02.01 GENERAL

Materials furnished shall be standard products of manufacturer regularly engaged in the production of materials specified. The unit shall be a highly vandal-resistant system module.

24.02.02 PEDESTRIAN EGRESS CONTROL SYSTEM EQUIPMENT

- A. Manufacturers: Electro-LuminX® Lighting Corporation Running Man Power Sign with Micro-Prismatic film or approved equal.
- B. Pedestrian Egress System model type: Electro-LuminX® Lighting Corporation Running Man Power Sign with Micro-Prismatic film.
 1. Minimum Dimensions: (W X H): 36"x 24"
 2. The system will weigh less than 1 pound per square foot
 3. Construction: 2" Light-tape with Pol Carbonate profile with directional chevron arrow

4. Power: 120/240 VAC - connected power to the remote control cabinet as specified on drawings. Each Running man sign will connect to the SMART ballast located in the remove cabinet
5. Mounting: (OPTION-A) Mounts to a wall in any direction using supplied mounting grommets and brackets.
6. (OPTON-B) Industrial strength adhesive.

24.02.03 PEDESTRIAN EGRESS SYSTEM EQUIPMENT ELECTRICAL:

- A. The Egress system shall use a combination of reflective devices (self-illumination) and a 120/240VAC power source for emergency illumination with a battery backup supply.
- B. A programmable logic controller module (PLC) will interface with the egress system to allow software communication to the Tunnel Control center.
- C. All wiring and electrical fixtures comply with the standards of the National Electrical Code, UL and C.S.A. and meet requirements of the following :
NFPA-502 Sections:
 - 7.14.1.1 for Emergency egress.
 - 7.14.1.2 for Exist Identification
 - 7.14.2 Tenable Environment
 - 7.14.6 Emergency Exits
 - 7.14.7 Cross-Pass ways in any Direction

24.02.04 SPARES:

- A. The Contractor at the conclusion of the project shall submit to DDOT a recommended spare parts list for review.

24.03 EXECUTION

24.03.01 SURVEYS

- A. The Contractor shall perform surveys at the mall Tunnel where work shall be performed to confirm:
 1. Location of pedestrian (Running Man) sign and reflective material and installation equipment.
 2. Adequate pedestrian egress coverage.
 3. Existence of conduits or facilities that may be used for this project.
- B. The Contractor shall use information gathered during the site surveys to generate final working drawing for the mall tunnel project.

24.03.02 WIRING AND CONDUIT:

- A. The Contractor shall install all conduits and fittings. The Contractor shall install the required connectors, and low voltage wiring between the various egress ballasts and NEMA enclosures and make all necessary connections and cross-connections required for a complete installation.
- B. All Pedestrian Egress conduits shall be a minimum of 1-in. The Contractor is encouraged to utilize existing empty conduits if the conduits meets the minimum standards set for the in this specification.
- C. All wiring for the Pedestrian Egress equipment shall be new and it shall be labeled according to Section 271500.
- D. All conduits shall be provided with a pull string to facilitate their use on future installations. These strings shall be additional to the cables run in the conduits.

24.03.03 INSTALLATION:

- A. The number and placement shall be such that the egress system provides adequate coverage that will allow the progression of pedestrian traffic exit the Mall Tunnel during an emergency situation. The preliminary number of egress display signs specified on the drawings must be confirmed during final design as performed by the Contractor.
- B. The Contractor shall adhere to the installation instructions provided by the manufacturers of the equipment.
- C. The Contractor shall install the required power cabling, connectors and plugs to provide 120/240VAC circuit to each designated PLC module and to the Egress ballast system, which will be installed inside the remote cabinet.
- D. All external mounting hardware shall be made of approved corrosion resistant material.
- E. Run all conduits in a raceway above the drop ceiling of the tunnel. All conduits will terminate as per the approved drawing details.
- F. Install a single 200-300VAC circuit in the egress conduit which will terminate in a remote cabinet as designated on drawings.
- G. Install the Smart Driver™ DC ballasts inside the remote cabinet
- H. There are two means of installations that are options to the contractor.
OPTION-A- Mounting Brackets as indicated on drawings
OPTION-B- Double-sided Adhesive tape-3M™ VHB™ Acrylic Foam Tapes
Pedestrian Egress system shall be mounted in a way not to impede the flow of vehicular traffic in the tunnel and sidewalk area.
- I. The Contractor shall evaluate and implement lightning protection methods for all components in accordance with the guidance of standard IEC 62305: Protection Against Lightning.

- J. All electrical installations shall meet the specification requirements, NFPA 70: National Electrical Code (NEC), NFPA 502, and all applicable DDOT regulations.
- K. The Contractor shall restore the tunnels building aesthetics to their original condition after completion of emergency communications system project.
- L. All communications and required power equipment shall be installed in the new remote tunnel communication cabinet in a manner that ensures proper airflow and heat dissipation while maximizing the use of space in the cabinet.
- M. All PED signs will display actual (Feet in distance) to nearest exit. The table below details each distance.

PED Number#	Distance to Nearest Exit						
PED-5N	250'	PED-18N	1350'	PED-9S	800'	PED-23S	850'
PED-6N	250'	PED-19	1650'	PED-8S	800'	PED-22S	850'
PED-7N	500'	PED-20	1650'	PED-11S	1050'	PED-25S	650'
PED-8N	500'	PED-21N	1400'	PED-10S	1050'	PED-24S	650'
PED-9N	800'	PED-22N	1400'	PED-13S	1150'	PED-27S	400'
PED-10N	800'	PED-23N	1100'	PED-12S	1150'	PED-26S	400'
PED-11N	1020'	PED-24N	1100'	PED-1S	300'	PED-29S	200'
PED-12N	1050'	PED-25N	950'	PED-2S	600'	PED-28S	150'
PED-1N	300'	PED-26N	950'	PED-3S	850'		
PED-2N	250'	PED-27N	700'	PED-15S	1400'		
PED-3N	350'	PED-28N	700'	PED-14S	1400'		
PED-4N	550'	PED-29N	500'	PED-17S	1650'		
PED-14N	1200'	PED-30N	500'	PED-16S	1650'		
PED-13N	800'	PED-5S	250'	PED-19S	1400'		
PED-15N	1050'	PED-4S	250'	PED-18S	1400'		
PED-16N	1050'	PED-7S	500'	PED-21S	1150'		
PED-17N	1350'	PED-6S	500'	PED-20S	1150'		

24.03.04 TESTING:

- A. The Contractor shall prepare test procedures and submit them to DDOT for approval.
- B. The Contractor shall perform all testing and corrective measures to fix any problems identified during installation and testing as required to ensure a fully operational Pedestrian Egress System

- C. The Contractor shall perform all testing and corrective measures to fix any problems identified during installation and testing as required to ensure a fully operational and Pedestrian Egress System.
- D. Test procedures shall be submitted to the DDOT for review and approval as specified.
- E. All egress signage shall be tested for proper functioning.
- F. Testing of the reflective material will be performed on all egress clusters, with final approval from the Engineer.
- G. Electrical integrity of the Pedestrian Egress system for every circuit shall be required.
- H. 30-Day Field Operational Test
 - The 30-Day Field Operational Test shall be conducted on the integrated system of which the Pedestrian Egress Sign System, described here-in, is a part.
 - All equipment shall be subject to the same 30-day field operation test requirements. Upon completion and acceptance, DDOT will provide final approval.
 - The Contractor shall submit for each site, facility, and subsystem, well documented, witnessed, test reports for each and every test outlined in the test plan for each subsystem.
- I. The test report shall include:
 1. A summary listing the overall results of the testing.
 2. A list of failures or problems identified during testing, with a plan of action for the resolution of each.
 3. A detailed account of testing, keyed to the test procedures followed for the testing, indicating pass or failure in each case.
 4. Additional remarks as warranted.
- J. Acknowledgement by the DDOT: DDOT will provide a written acknowledgement of the receipt and acceptance of each submitted test report within ten (10) days of submittal.
- K. The Contractor shall supply a certified Commissioning Authority (CxA). The CxA has overall responsibility for planning and coordinating the testing and commissioning process. The CxA shall certify all test results, reports and documentation.

24.03.05 PEDESTRIAN EGRESS SYSTEM EQUIPMENT

- A. Installation shall be performed per the approved drawings and all applicable standards and codes.

- B. The Contractor shall adhere to the installation instructions provided by the manufacturers of the equipment. Deviations to the manufacturer's installation instructions shall be justified by the Contractor and shall be pre-approved prior to design approval.

24.03.06 GROUNDING:

- A. Grounding and Bonding for Safety and Security per Contract drawings.

24.04 MEASUREMENT AND PAYMENT

This item will not be measured for payment and will be paid in a lump sum bid price, which price shall include:

PEDESTRIAN EGRESS SIGN CONTROL SYSTEM – Item 614991 including:

- Exterior, Media White, 28 Piece(s), 24 in. x 36 in., LIT AREA, Add 0.25 in. To Each Side for Finished Area, Power Short Side.
- Custom Light Tape Panel Preparation for measuring and attaching 2 in. tab.
- Exterior Light Tape Connection, potted with waterproof epoxy for IP68 seal.
- Connector for 0.50 in. Light Tape & Wider Includes Caps with 6 ft. Lead DIRECTIONAL ARROW SYSTEM.
- Exterior, Extreme Green, 56 Piece(s), 2 in., 100 ft. each piece, Factory Seal.
- Exterior Light Tape Connection, potted with waterproof epoxy for IP68 Seal.
- Connector for 0.50 in. Light Tape & Wider Includes Caps with 6 ft. Lead.
- Custom Light Tape Connection Covering Connector / Extrusion.
- (3) Shrink Sleeve for 2.0 in. for Connector / Extrusion.
- Snap-N-Light for Light Tape installation inside mounting channel.
- Mount-Clip 200.
- 2.0 in. mounting clips to secure 2 in. channel to structure.
- Application of double sided adhesive to rear of Light Tape to facilitate installation.
- Double Sided Adhesive Tape - Ideal for Shock, Vibration and Noise Absorption. 1.0 in. X 36 Yds POWER SYSTEM
- Power Supply, 120/240 Volt AC, Illuminates 4700 8000 square inches.
- NEMA Single Door Medium Wall Mount 20x16x6in
- UPS Backup Battery with Invertor.
- Communication cable – CAT 6 sign to fiber drop.
- Power cable – 12 awg. 120 vac. 3 conductor cable.
- 1” EMT conduit.

The price for this Lump Sum item shall include:

- A. Labor costs include fabrication, installation, configuration, integration, testing, commissioning, and other necessary support activities.
- B. Materials costs include specified equipment, hardware, firmware, software, software licenses, tools, appurtenances, and all other Products specified herein.

- C. All Labor and Material required for a full functioning system related to this particular section and related specifications not specifically identified in the Bid Items will be considered incidental and included.

25. DYNAMIC MESSAGE SIGNS

25.01 GENERAL

Dynamic Message Sign (DMS) equipment to be furnished at each field site shall include, but not be limited to LED DMS, sign controller, and other systems such as DMS Controller Cabinet and Communications Equipment specified elsewhere in these Special Provisions. The DMS message display, including character and interline spacing, shall be in conformance with the Manual on Uniform Traffic Control Devices (MUTCD) 2009. To ensure overall system compatibility, all DMS signs shall be from the same manufacturer.

- A. DMS to be supplied under this contract shall be the following:

1. Product Description: The DMS shall be LED Full-Matrix DMS (18 x 125 pixels, 46 mm pitch), Outdoor, 30-degree viewing angle, capable of displaying up to two lines, with 15 12-inch characters per line, cantilever or pedestal mounted, and front access for installation on city streets. Nominal dimensions for cabinet shall be 6ft H x 18ft W x 2ft D and 2,000 lbs.

- B. Operation Specifications:

1. Character Height: 12"
2. Maximum Lines/Characters: 2/21
3. Pixel Pitch: 1.75" inch (46mm).
4. Cabinet Enclosure: NEMA 3R
5. Face Panel: Aluminum mask over polycarbonate face panel
6. Input Power: 120 Vac.
7. Viewing Distance: 600' using 12" characters
8. Maximum Power Consumption: 486 W.
9. Ambient Operating Temperature: -30 to 165 degrees F.
10. Display Software: Third party integrators.
11. Communications: RS232, RS422, and Ethernet
12. Viewing angle: 30 degrees horizontal x 30 degrees vertical

- C. Definition:

Full-Matrix is defined as a type of DMS without fixed lines, columns or characters and the entire display area contains equally spaced pixels. The DMS and controller shall have the ability to display characters using proportional spacing on the full-matrix configuration. Any graphic, symbol, character or font

can be placed in any location within the display area of the DMS without regard to lines or columns.

D. Test Certificate:

The DMS manufacturer shall submit a test certificate from an independent laboratory to certify compliance with the cone-of-vision requirement. The cone of vision shall be measured at the front of the sign in its final position with any component that could impede or otherwise affect the light output (such as the front face, mask, and polycarbonate) in place. An LED component manufacturer certificate shall not satisfy this requirement, since the test shall consider the mounting of display boards within the sign and the front face.

E. DMS Manufacturer Pre-qualification:

The DMS manufacturer shall have been in the successful business of the DMS design and manufacture of multi-unit, multi-line State or Interstate Highway overhead, permanently-mounted DMS systems; installation and maintenance of State or Interstate Highway, permanently-mounted, overhead DMS electronics and control systems for highway use at least 10 years prior to the advertisement date. The DMS manufacturer shall provide documentation and references of manufacturing history.

The DMS manufacturer shall have supplied and/or installed DMS systems similar to that required by the Project Specifications on a project of similar size and scope in the past three (3) years. Untried or prototype units shall not be considered for acceptance. The DMS manufacturer shall submit three (3) references for work similar in size and scope to the work specified in the Scope of Work that it has completed successfully in the past three (3) years, including a walk-in housing highway LED full-matrix NTCIP-compliant DMS system, supplied by this manufacturer under the current corporate name, which otherwise meets this specification, and that has been operational for a period of no less than one year. At least one of these references shall be from a U.S. State Department of Transportation.

The DMS manufacturer shall design, manufacture, and test its LED module boards and controller. These may not be sub-contracted or 3rd-party products. The manufacturer shall have its own lab environment on the North American continent for continual sample testing of production line products, including temperature, humidity, corrosion, and accelerated life testing programs.

The DMS manufacturer shall have a USA-based sales and distribution point of operation. This operation shall have been present for at least 5 years and the manufacturer shall keep such operation present for the life of the contract. At no time shall shipments to or from the manufacturer be subject to customs processing, delays, or other international shipping issues. Any parts or pieces that are fabricated from outside the country shall be stocked in ample supply at the USA-based operation such that no delays in the shipment or delivery of such parts are experienced by the customer.

The DMS manufacturer shall have USA-based technical staff with minimum 5 year experience available to assist with the project for duration of the contract.

The DMS manufacturer shall be ISO 9001 or equivalent, formally-documented Quality System certified.

F. Terminology:

Due to the varying definitions used in Dynamic Message Sign technology, this section defines specific terms as they apply to this specification.

Sign: The sign housing and its contents.

Sign Controller: Located in a cabinet (as detailed in this specification), the sign controller manages all aspects of the sign operation including: specifying the message to be displayed, diagnostics, and remote communications. Messages can be selected either remotely from the central controller, locally from a laptop computer or from the front panel of the sign controller.

Central Controller: The Microsoft Windows Server computer system and related software, which operates the system from a remote control site.

Workstation: The Microsoft Windows workstation computer and related software that operates as a remote client over a computer network to the central controller. A workstation operator can access the central controller and gain access to the functions of the central by using the appropriate access codes.

LED (Light Emitting Diode): The DMS display lighting technology.

Pixel: Any of the small discrete elements that, when arranged in a pixel matrix, create a character. A pixel contains a cluster of LEDs.

Pitch: Distance measured from center to center of adjacent pixels within a matrix. This distance is measured both horizontally and vertically.

Poll: The central controller and laptop computer are said to “poll” a sign when they request the sign’s status information. The term is derived from the periodic status polling, which a central controller can perform, but is loosely used to refer to any status request.

Message: Text; the information displayed on the sign.

Display: The message seen by the motorist. A display may include more than one page of text (an alternating display). Any character or set of characters of a display may be flashed (a flashing display).

Neutral State: Sign is blank, or displaying a predefined message that is displayed regularly.

G. The Contractor shall register with the manufacturer(s) all equipment in the name of the Department. Photocopies of the registration forms shall be forwarded to the Chief Engineer.

- H. The Contractor shall store and handle all materials and equipment in a clean, dry location; free from construction dust, precipitation and excess moisture, so as not to degrade quality, serviceability or appearance.
- I. The Contractor shall contact the DMS manufacturer for information on proper storing and installation of the DMS equipment.

25.02 MATERIALS

25.02.01 GENERAL

All materials furnished, assembled, fabricated or installed under this item shall be new and of the latest design and recent manufacture, corrosion resistant, and in strict accordance with this specification. No used or refurbished hardware is permitted. Furthermore, firmware and software shall be tested and in working order. Neither prototype firmware, nor prototype software is permitted. Failure to meet all details and functionality detailed in this specification shall be grounds for rejection of the equipment.

All parts shall be of high-quality workmanship, and no part or attachment shall be substituted or applied contrary to the manufacturer's recommendations and standard practices.

All external screws, nuts, and locking washers shall be stainless steel. Self-tapping screws shall not be used on the exterior of the sign. All nuts shall be nyloc nuts or similar. All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, aluminum or brass. All materials used in construction shall be resistant to fungal growth and moisture deterioration. All dissimilar metals shall be separated by an inert dielectric material.

25.02.02 PHYSICAL CHARACTERISTICS

- A. The latest available techniques shall be utilized in equipment design and construction of the LED DMS with a minimum number of different parts, subassemblies, circuits, cards and modules to maximize standardization and commonality.
- B. The equipment shall be designed for ease of maintenance with all component parts readily accessible for inspection and maintenance. Test points for checking essential voltages shall be provided.
- C. All DMS equipment components, modular assemblies, and other materials located in the DMS housing shall be removable, transportable, and capable of being installed by a single technician.
- D. Solid-state display elements and modules shall be provided. Mechanical or electromechanical elements or shutters shall not be used.
- E. The DMS, including the sign housing and all modules and assemblies, shall be designed and manufactured by company certified by ISO 9001 or equivalent formal Quality Systems, and shall comply with the provisions of NEMA Standard TS 4-2005, latest revision.
- F. The LED DMS shall be designed for a minimum life of 10 years.

- G. The signs shall be designed and constructed to present a clean and neat appearance. Poor workmanship will be cause for rejection of the sign.
- H. If cable attachments are used in the sign housing, the cables shall be securely clamped in a manner as approved by DDOT. No adhesive attachments shall be allowed.
- I. The complete sign housing of the LED DMS shall be designed and manufactured in-house by the LED DMS Sign Manufacturer.
- J. The presence of power transients or electromagnetic fields, including those created by any components of the system, shall have no deleterious effect on the performance of the system. The system shall not conduct or radiate signals which will adversely affect other electrical or electronic equipment including, but not limited to, other control systems, data processing equipment, audio, radio, and industrial equipment.

25.02.03 ELECTRICAL COMPONENTS

- A. All electronic equipment shall be of solid-state design and modular construction. Individual electronic modules shall provide easy service access and shall be field replaceable. The design shall be such as to prevent incorrect assembly or installation of connectors, fasteners, etc., where possible malfunction or personnel hazards might occur. Each item of equipment shall be designed to protect personnel from exposure to high voltage during equipment operation, adjustments, and maintenance.
- B. All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods. All electronic assemblies shall meet or exceed IPC 610A workmanship standards.
- C. The sign and its sign controller shall be capable of operating with 240/120 VAC, 40 amp per leg, 60 hertz, single-phase power.
- D. The system shall be protected by transient voltage suppression devices, including MOVs, RIS and spark gap arrestor. Resettable surge protection shall be provided. Tripping of the surge protection shall prevent power from reaching any components of the sign until the surge protection has been reset. Tripping of the surge protection shall cause the sign controller to call the TMC and report the error condition.
- E. Each DMS provided shall consist of internal wirings, terminal strips for interconnecting wire, duplex outlets for maintenance equipment, photosensors, and heating strips.

25.02.04 SIGN HOUSING

- A. The equipment within the sign housing shall be protected from moisture, dust, dirt and corrosion.
- B. The sign housing shall be constructed of .125” (3 mm) high-quality aluminum alloy 5052-H32 or 3003-H14 (AlMg3) and capable of withstanding a wind

loading of 120 mph at a minimum, without permanent deformation or other damages. At a minimum, the DMS housing, structural frame, face covering, and mounting members shall be capable of withstanding the environmental loadings specified in AASHTO's Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 5th Edition.

- C. Framing structural members shall be constructed from aluminum alloy 6061-T6 or 6063-T5.
- D. All welding shall be by an inert gas process in accordance with the American Welding Society (AWS) Standards, ANSI/AWS D1.2-97. The LED DMS manufacturer's welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the 1997 ANSI/AWS D1.2-97 Structural Welding Code for Aluminum. Proof of certification of all the LED DMS manufacturer's welders and applicable welding procedures shall be supplied with the submittals. The name, phone number and address of the ANSI/AWS Certified Welding Inspector that certified the LED DMS manufacturer's welders and procedures shall also be provided with the submittals.
- E. The number of seams shall be minimized and all exterior seams and joints shall be sealed to form a rain-tight enclosure.
- F. The skin material shall be stitch-welded to the internal structural members to form a unitized structure.
- G. The performance of the LED DMS, including the visibility and legibility of the display, shall not be impaired due to continuous vibration caused by wind, traffic or other factors.
- H. The housing shall be designed to accommodate mounting on the rear vertical plane only.
- I. The sign housing shall be designed so that the angular alignment is adjustable in the vertical direction from zero (0) degrees to ten degrees down in one-degree increments to optimize the viewing angle.
- J. The serial number and model number shall be etched, stamped, or molded on the housing.
- K. The sign housing shall be designed to protect all inside equipment from dust, water, and any other environmental exposure.
- L. A minimum of 3 photocells shall be installed on each sign. These devices shall permit automatic light intensity measurement of light conditions at each sign location. These photocells shall be of sufficient quantity and mounted in a manner to fully measure ambient light conditions to set the sign brightness levels.
- M. Mounting devices shall be provided for the photoelectric cells, allowing full adjustment of the cell orientation.
- N. Photocells shall be mounted so that they may be serviced from inside the sign enclosure or from the front face and/or catwalk.

- O. Automatic adjustment of the LED brightness shall occur in small enough increments so that the brightness of the sign changes smoothly, with no perceivable brightness change between adjacent levels. Provision shall be made to prevent perceivable brightening of the sign due to stray headlights shining upon the photo sensors at night.

25.02.05 HOUSING FACE

- A. The housing face shall be of three-piece construction, consisting of internal structural members, external face panels and lens panel assemblies.
- B. The interior structural members shall be fabricated from 6061-T6 or 6063-T6 aluminum alloy extrusions and shall:
 - 1. Accommodate both display module mounting and air distribution.
 - 2. Retain the display modules in a manner to facilitate easy and rapid removal of each display module without disturbing adjacent display modules.
- C. There shall be no exposed fasteners or welds on the housing face.
- D. The external face panels shall be designed to minimize heat conduction between the exterior surfaces and the interior components.
- E. The external face panels shall be made of UV stabilized high-impact resistant polycarbonate material with a UV silk-screened mask that provides a high level of contrast and readability. The Panel shall absorb greater than 80% of UVA and UVB.
- F. The border and therefore, the external fascia perimeter panels shall be a minimum of 12 inches wide.
- G. The external face panels shall be thermally isolated from the rest of the sign housing.
- H. The housing face shall be finished with a matte black, licensed factory-applied KYNAR 500 Resin, fluoropolymer based coating system. Certification shall be provided from the licensed factory KYNAR 500 coater for all aluminum face materials. All other exterior and interior surfaces shall be a natural aluminum mill finish. Surfaces shall not be painted.
- I. The Lens Panel Assembly shall consist of a KYNAR 500 coated aluminum mask over a clear glazing and shall be modular in design, interchangeable with no misalignment with the LED pixels and sealed with a closed-cell resilient gasket.
- J. The lens panel shall be heated to prevent fogging and condensation.
- K. No manufacturer and/or vendor logos shall be allowed on the housing face. Logos, preapproved by the Chief Engineer, may be allowed on the sides and/or rear of the sign housing.

25.02.06 SIGN DISPLAY

- A. The signs shall be capable of displaying ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9), up to 32 user-defined graphic characters, and all standard Manual on Uniform Traffic Control Devices (MUTCD) traffic symbols or icons at any size and location on the display.
- B. The signs shall be capable of supporting customized fonts using variable-width or proportional spacing, modifying the ASCII space character to achieve 3 pixels width, modifying the inter-character spacing to achieve 2 pixels between characters and the interline spacing to achieve 3 pixels between lines within the fonts.
- C. The sign shall be capable of displaying alphanumeric text only, graphics only, or a combination of both.
- D. The sign shall be capable of displaying from one to six messages in sequence.
- E. The LED DMS shall enable the display of text, consisting of a string of alphanumeric and other characters and programmed and customized graphics. Each character shall be formed by a matrix of luminous pixels. The matrix of a standard character shall consist of 35 pixels over 5 columns and 7 rows.
- F. The rectangular display modules shall have an identical horizontal and vertical pitch between pixels.
- G. The separation between the last column and row of one module and the first column and row of the next shall be equal to the horizontal distance between the columns and rows of a single display module.
- H. The characters shall be legible under all light and normally-encountered weather conditions up to the rated distance within a 30-degree cone of vision centered on the optical axis of the pixel. It shall be bright enough to have a good target value, but not to the point where the pixels bloom, especially in low ambient light level conditions. Its 50% intensity points shall define the cone perimeter.
- I. The brightness and color of each pixel shall be uniform over the entire face of the sign within the 30-degree cone of vision up to the rated distance in all lighting conditions. Non-uniformity of brightness or color over the face of the sign under these conditions shall be cause for rejection of the sign.
- J. Each display shall have the necessary light output intensity to meet or exceed the legibility requirements. Each pixel shall have an initial luminous intensity of 35 candelas or greater on the optical axis when the sign is operating in the overbright mode. Light output shall be measured at a distance of 100 ft. from a test character in a fully instrumented optical testing chamber.
- K. The DMS shall be capable of changing from one message to another without visual disturbance or high-speed scrolling of messages.
- L. DMS messages shall be legible within a distance range of 200 ft. to 700 ft. from the DMS display face under the following conditions:
 - 1. When the DMS is displaying alphanumeric text that is 12-inches high.
 - 2. 24 hours per day and in most normally encountered weather conditions.

3. During dawn and dusk hours when sunlight is shining directly on the display face or when the sun is directly behind (silhouetting) the DMS.
 4. When viewed by motorists that have 20/20 corrected vision.
 5. When the motorist eye level is 3 to 12 feet above the roadway surface.
- M. Replacement of a complete display module shall be possible without the use of any tools.
- N. The DMS shall have a power distribution system connecting each display module to all power supplies and minimizing the voltage drop over the face of the sign. The voltage measured at the display modules shall not vary more than 50 millivolts over all the display modules in the sign with 17 pixels on at 100% intensity in each and every display module.
- O. The time required to clear any display and post any new display shall not exceed 500 milliseconds.

25.02.07 LED AND PIXEL CHARACTERISTICS

- A. The LEDs will be AlInGaP technology. The diodes will have a 30-degree viewing angle, amber color of dominant wavelength between 585 and 595 nm, with all LED pixels in a sign having the same dominant wavelength.
- B. All pixels in all signs in this project, including the spare parts, will have equal color and on-axis intensity.
- C. The LEDs shall be mounted directly to a printed circuit board and be easily replaceable and individually removable using conventional electronics repair methods.
- D. The sign display using LED shall consist of a continuous full-matrix format consisting of smaller matrices of pixels. Each pixel shall consist of a high-intensity LED cluster. The LED lamps shall run at a minimum voltage to provide extended life. Each pixel shall be either square in shape with a minimum of two-inch (2") sides or round in shape with a minimum two-inch (2") diameter.
- E. LED boards and daughter boards that are fully interchangeable and do not require any address switches or adjustment when interchanged or placed in service shall be provided.
- F. All LEDs shall be mounted so that their mechanical axes are normal ± 1.00 degree to the face of the sign to ensure brightness uniformity over the face of the sign.
- G. The LEDs shall be protected from the outside environmental conditions, including moisture, snow, ice, wind, dust, dirt and UV rays.
- H. Pixel brightness shall be controlled by pulse-width modulation of the DC current. Brightness shall be manually settable from the front panel of the sign controller and remotely from the central controller in 1% increments. Brightness control shall be able to be returned to automatic from the sign controller front panel and the central computer.

- I. Dimming circuitry that does not reduce the LED rated life shall be used.
- J. The operational status of the LEDs in each pixel string shall be tested and then transmitted to the central controller or laptop computer.
- K. The state of the LEDs (full on, half on or off) in each pixel of the sign shall be read by the sign controller to allow the central controller or laptop computer to show the actual message, including static, flashing and alternating messages, that is visibly displayed on the sign in a WYSIWYG format, including any half-out, full-out, half stuck-on or fully stuck-on pixels. This pixel status reading will take place while a message is displayed on the sign without disturbing the message in any way. Any flashing, flickering, blinking, dimming, or other disturbance of the message during this pixel status reading will be cause for rejection of the sign. A list of defective pixels, listing pixel status, line number, module number, column number and row number shall be provided for each defective pixel.
- L. All printed circuit boards, except the LED circuit board, shall be conformal coated. The LED board shall be conformal coated except at the pixels.
- M. All printed circuit boards shall be provided with a solder mask and a component identifier silk screen.
- N. The voltage to the LED modules and associated electronics shall not exceed 25 VDC. The power supplies shall be paralleled in a diode OR configuration such that if one supply completely fails, the sign will still be supplied with enough power to run 50% of all pixels at 100% duty cycle. Functioning supplies shall current share to within 10%. The combined effect of line (95 to 135 VAC) and load (10% to 100%) on the power supplies shall not exceed 1.0%. The efficiency of the power supplies shall be 80% or greater at 120 VAC 50% to 100% of maximum load. Power supplies having a power factor of 0.95 or greater at 120 VAC from 50% to 100% of maximum load shall be provided.
- O. The LED shall be rated for 100,000 hours continuous operation, at 30 mA drive current, with less than 30% lumen depreciation.

25.02.08 ENVIRONMENTAL

- A. The sign shall operate without malfunction and without any decrease in performance over an ambient temperature range of -30° F to +140° F and with a relative humidity of up to 95% non-condensing.
- B. The DMS sign controller shall automatically shut down the LED modules to prevent damaging the LEDs if the measured internal cabinet air temperature exceeds a 140° F threshold temperature.

25.02.09 DMS SIGN CONTROLLER

- A. The controller shall meet NTCIP requirements and shall be provided with resident software stored in non-volatile memory. The sign controller shall be programmed to receive sign control commands from the central controller or laptop computer, transmit responses as requested to the central controller or laptop computer via the

communication system, monitor sign and message status and control sign operation and message displays.

- B. The controller shall be a software-driven microprocessor-type DMS controller with printed circuit boards and front panel indicators.
- C. The controller shall continuously monitor the display of the sign independent of any external commands, and cause the signs to display all the appropriate characters
- D. The controller shall incorporate an audible tone that sounds about every 15 minutes when messages are displayed to alert the operators that a message or messages is/are running during an incident clearing activity, a stationary or roving work crew, etc. The sound will alert the operators to check on the message status so that they may update the message or blank out as needed.
- E. The controller shall accumulate data about the sign status (to be transmitted upon request), and receive commands from the central computer, maintenance laptop computer, and a local panel.
- F. The controller shall have the ability to control the brightness level, using the photosensor controls in the DMS cabinet. The controller shall have the ability to achieve an "overbrightness" mode operation in fog or intense sunlight.
- G. The operator shall be able to select independent display times for alternating, flashing messages and blank-out time between messages in one-tenth (0.1) second increments. Upon terminating the display time for a message, the controller shall either blank the sign or place the sign in a neutral condition.
- H. A fail-safe mechanism shall be provided to automatically blank the sign upon encountering an error, or improper information display in the case of malfunction, or communication and/or power failure.
- I. The controller shall have power-up and auto-restart capabilities with automatic sign blanking when recovering from a power off condition. A watchdog circuit shall be utilized to provide automatic reset to the controller. The central controller shall be capable of remotely commanding a sign controller reset.
- J. The controller shall be 19-inch rack mounted in the DMS Controller Cabinet.
- K. The controller will communicate with the display modules via fiber-optic cable.
- L. The controller shall include a local/remote control switch and LED indicator, allowing a local operator to override central operations and take over local control of the sign. A timeout feature will force the controller to revert to central operations after a configurable timeout or inactivity period.
- M. A controller shall be provided that is able to read the internal temperature sensors, external ambient temperature sensor and the humidistat. The controller shall use these readings in an algorithm that turns on the heat at the appropriate times to reduce both frost on the face of the sign and condensation on the display modules and other display system circuitry.

- N. A temperature reading greater than a user selectable critical temperature shall cause the sign to go to blank and the sign controller shall report this error message to the central computer.
- O. The controller shall continuously measure all LED module power supply voltages. The controller will provide these voltage readings to the central controller or laptop computer when the central controller or laptop computer polls the sign controller.
- P. The controller shall be easily replaceable/interchangeable in case of any failures.
- Q. The controller shall provide a library with a minimum of 50 permanent messages, consisting of 30 or fewer characters per line, stored in PROM. The controller shall also be able to accept a downloaded library from the central or laptop computer containing at least 25 changeable messages stored in non-volatile RAM. These messages may be displayed on the sign from the keypad on the front panel of the controller. The RAM shall be backed up by a long life battery allowing power outages of a minimum of 12 months without loss of data.
- R. The controller shall also be capable of displaying messages on the sign that are downloaded from the central controller or laptop computer, but are not located in the library stored in non-volatile memory of the sign controller.
- S. The full matrix display shall also be capable of displaying other sized characters and other number of lines depending on the height of the character utilized. The interline spacing shall be variable.
- T. The DMS controllers shall be housed in the existing enclosure.
- U. Central Communications
 - 1. Exchanges between the DMS sign controller and central controller shall be made only upon the central controller request inviting the DMS sign controller to send (select) or receive (poll) data. The three modes of operation shall be:
 - a. Central Mode: The central controller controls and monitors the sign.
 - b. Local Mode: The sign controller LCD panel and keypad are used for direct sign operations and diagnostics.
 - c. Remote Mode: A local laptop computer is used to control and monitor the sign.
 - 2. The communications between the sign controller and the central controller or laptop computer shall comply with the NEMA National Transportation Communication for ITS Protocol (NTCIP) as detailed in this specification. Unless otherwise stated, the software shall comply with the versions of the relevant NTCIP standards that are current at the date of this document.
- V. Communications Interfaces:

1. The controller will include separate RS-232/422/485 serial interface and an RJ45 Ethernet 10/100 Base T interface for communication with the central controller.
2. The controller will include a separate RS-232 serial interface for communication with the laptop computer. A minimum 6-foot long serial cable will be supplied to connect the laptop computer to the sign controller.
3. The controller will contain 8 digital inputs, 4 analog inputs, and 4 digital outputs to support external alarm and contact closure monitoring.

25.02.10 DMS CONTROLLER WIRING

- A. The communication and control cables between DMS controller and sign housing shall be fiber optic. The cables shall terminate in a fiber patch panel at both ends. Fiber patch cords, meeting the same specifications of the fiber cable and 3 ft. length, shall be used to connect local equipment to the patch panel.
- B. The fiber optic cable shall meet the following requirements:
 1. A 6-fiber optic 62.5/125 cable shall meet the specifications of Corning OM1 fiber type multimode, or equal, at a minimum. The duplex fiber optic cable shall have a nominal fiber OD of 2 x 4 mm and shall be orange in color. The fiber optic cable shall have a maximum attenuation of 3.75dB/km @ 850 nm and 1.5 dB/km @ 1300 nm. The fiber optic cable shall have a minimum gigabit Ethernet capability of 220 meters @ 850 nm and 550 meters @ 1300 nm. The fiber shall have a maximum tensile load capability of 48 lb-ft short term and 15 lb-ft long term with a minimum installed bend radius of 2.5 cm (1 inch). Maximum insertion loss shall be less than 0.4 dB with a maximum back reflection of less than -25 dB.
 2. The fiber optic cable shall be terminated with “ST” connectors on all ends within the fiber patch panel. The “ST” connectors shall be Corning Glass Insert Connectors (GIC) Anaerobic (95-101-52 SP multimode 62.5/125 um) or equal.

25.02.11 DMS SIGN CONTROLLER SOFTWARE

Sign Controller software and firmware shall be NTCIP 1203 v.2 compliant and support the following minimum functions:

- A. Report errors and failures, including, but not limited to:
 1. Power recovery
 2. Power Failure
 3. Pixel string failure

4. Fan failure
 5. Over user selectable critical temperature
 6. Power supply failure
- B. Message and status monitoring – The sign controller will respond to the central controller whenever it receives a request for status. The return message will be capable of providing the following information:
1. Actual message that is visibly displayed on the sign on an individual pixel basis
 2. Current sign illumination level
 3. Local Control Panel switch position (central or local)
 4. Error and failure reports
 5. Temperature readings
 6. Power supply voltage levels
 7. Origin of display message transmission (laptop or central)
 8. Heater status
 9. Uninterruptible power supply status
- C. Severe error condition response:
1. In multi-drop mode, the sign controller will report severe error conditions to the central controller during the next polling. In network communication mode (UDP/IP), the sign controller will automatically send the diagnostic information to the Traffic Management Center (TMC) to notify the technicians of any reported errors.
 2. The severe error conditions are:
 - a. AC power failure
 - b. AC power recovery
 - c. Surge protection has tripped
 - d. Temperature reading over a user selectable critical temperature
 - e. The sign housing and controller cabinet door is open
- D. Display Control:
1. Displays static, flashing, and alternating messages
 2. Supports amber monochrome alphanumeric characters and graphics messages
 3. Has the ability to control any size character, line, or full matrix DMS
 4. Scheduling is based on to-the-minute time-of-day, day-of-week, holiday or special days, one-time or recurring scenarios

5. Photo sensor override and manual brightness control
- E. DMS Messaging:
1. Includes message-creating editing tool with preview
 2. Manages DMS font database
 3. Has the ability to create, save, and adjust message duration and priority settings
 4. Configures flash rates, scrolling and other message attributes
 5. Can create and save banned words list (white and black lists)
 6. Spell checks messages before display and can edit one line (or word) of text without having to retype the entire message
 7. Supports multi-phase (3-phase minimum) messages
 8. Supports beacon activation by message
 9. Has the ability to create and save default messages for each DMS
- F. Utilities and Diagnostics:
1. Has the ability to view status, errors, and any error codes of all DMS subsystems in real time and historical date/time stamped logs.
 2. Has the ability to locate pixel failures and verify the error
 3. Has a built-in pre-programmed common pixel test patterns and diagnostics
 4. Has the ability to monitor the DMS environmental conditions based on DMS sensors
 5. Has the ability to accept remote firmware upgrades
- G. Security:
1. Has the ability to restrict each user's functional areas (read/write restrictions) with user accounts containing unique user names and passwords.

25.03 CONSTRUCTION AND INSTALLATION

Installation of the DMS cabinet and all utility and DMS sign connections shall be in accordance with the approved final design plans and all applicable DDOT standards.

A. Conduit

1. The Contractor shall install new conduit from the DMS Controller Cabinet to the Dynamic Message Sign (DMS) and from the DMS Controller Cabinet to the utility service pedestal and meter.
2. Liquid Tight flexible conduit coating shall consist of thermal plastic or thermoset product and meet NFPA 502 standard.

3. New electrical and fiber optic wire or cable shall be installed in existing conduit or raceway as shown on the plans. Electrical cable and communications cable shall be installed in separate conduit or raceway.
4. All conduit wire/cable pulls shall have a pull rope installed beside installed conductors.
5. Construction and materials – refer to DDOT Standard Specification Sections 614.12 – 614.14.

B. Wire & Cable –

1. DMS Controller Cabinet to Service Pedestal: The Contractor shall install the power cables from the service pedestal to the cabinet in existing conduit. Power and communications cables shall be routed in separate conduits where conduits are required as shown on the plans.
2. DMS Controller Cabinet to Sign: The Contractor shall install cables from the DMS to the Controller Cabinet through existing conduits as indicated on the plans.
3. The Contractor shall install waterproof connectors where the cables enter into the cabinet. All cables shall be clearly marked or tagged. A minimum of 3 ft. of cable shall be left coiled in the cabinet.
4. Panelboard (Breaker Box) enclosure:
 - a. Tag conductors with new sleeve tag using the sign number as the conductor label identification. Affix wire tag at panelboard and sign ends for each conductor.
 - b. Refer to the Plans as a basis for specific sign / circuit assignment (wire tag) labels.
 - c. New sign power wiring from panelboard circuit breaker shall be 10AWG.
5. Wire insulation class shall be THHW minimum.

C. Electrical Power

1. The Contractor shall connect installed equipment to the Power Distribution Panel within the cabinet as indicated in the approved design plans. Prime operating power to each site shall be supplied from nominal 240/120 VAC power.
2. All conductors entering and leaving the cabinet shall be protected by surge protectors and lightning arrestors to protect against damage resulting from voltage surges.

D. Mounting

1. DMS signs will be mounted on the face of the Mall Tunnel portals.
2. The Contractor shall perform field investigation of the portal structures to ensure the signs can be securely installed.

3. The Contractor shall develop mounting details including brackets, anchorage, and methods of installation and submit them to the Engineer for review and approval along with calculations demonstrating the adequacy of attachments.

25.03.01 RELATED SECTIONS:

1. SECTION 017823 - OPERATION AND MAINTENANCE DATA
2. SECTION 078413 - PENETRATION FIRESTOPPING
3. SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
4. SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES
5. SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
6. SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
7. SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
8. SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
9. SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
10. SECTION 262726 - WIRING DEVICES
11. SECTION 262813 – FUSES

25.03.02 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
 1. ANSI/IEEE C2 – National Electrical Safety Code.
 2. ANSI/IEEE C62.41 – Guide for Surge Voltages in Low-Voltage AC Power Circuits.
 3. ANSI/IEEE C62.45 – Guide on Surge Testing for Equipment Connected to Low- Voltage AC Power Circuits.
- B. International Electrical Testing Association:
 1. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems. C. Telecommunications Industry Association/Electronic Industries Alliance.
 2. ANSI/EIA 310-D – Cabinets, Racks, Panels, and Associated Equipment.

- C. National Fire Protection Association:
 - 1. NFPA-70 – National Electrical Code.
 - 2. NFPA-502 - Standard for road Tunnels, Bridges, and Other Limited Access Highways.

25.03.03 TESTING

A. System Integration Test

The system integration test shall demonstrate that all equipment is fully integrated and operational. This test shall verify that all equipment installed at each location is installed properly and that all functions are in conformance with the Contract Documents.

B. 30-Day Field Operational Test

- The 30-Day Field Operational Test shall be conducted on the integrated system of which the Pedestrian Egress Sign System, described here-in, is a part.
- All equipment shall be subject to the same 30-day field operation test requirements. Upon completion and acceptance, DDOT will provide final approval.
- The Contractor shall submit for each site, facility, and subsystem, well documented, witnessed, test reports for each and every test outlined in the test plan for each subsystem.

C. Test Documentation

The Contractor shall submit to DDOT for approval appropriate documentation related to each phase of testing. No testing shall commence without appropriate documentation approval. Test procedures and test data forms shall be submitted. The Contractor shall submit Test Reports for all testing levels. The Test Reports shall verify that the approved test procedures were conducted. All Test Reports shall be presented and organized in logical groups of equipment and shall be signed by the Contractor.

D. The Contractor shall supply a certified Commissioning Authority (CxA). The CxA has overall responsibility for planning and coordinating the testing and commissioning process. The CxA shall certify all test results, reports and documentation.

25.03.04 DOCUMENTATION

The following shall accompany all electrical and mechanical components supplied:

- A. Operator Manuals

Operator Manuals shall be provided for all equipment and components supplied as part of the cabinet. The manuals shall be comprehensive, easy to use and understand, and completely descriptive of the product.

B. Maintenance Procedures Manuals

1. A service manual containing detailed preventive and corrective maintenance procedures shall be provided for each different type or model of equipment. The manual shall cover as a minimum the proper method of adjusting and otherwise maintaining each item, a concise statement of the necessary operating functions in proper sequence, and a detailed description of the component function in relation to the various operation steps.
2. Systematic field and bench trouble shooting procedures shall be included, as shall normative waveforms and test voltages as applicable.
3. A detailed parts list shall be included. For each part, its circuit or pictorial identifications shall be shown, as shall all necessary rating information and a manufacturer and associated model or part number. The list shall also include cross-references to parts numbers of other manufacturers who make the same replacement part.

C. As-Built Drawings

1. A complete set of as-built shop drawings including equipment layout, assembly drawings, electrical schematic, wiring diagram and a logic diagram shall be provided for each cabinet. All connections, conduits, wiring, function and I/O information shall be detailed. A stage-by-stage explanation of the circuit theory shall be provided with the circuit wiring diagrams. All drawings shall be identified by cabinet location.
2. Schematics shall include a list of tests points detailing the nominal operating voltage, wave form and all pertinent information regarding the wave form at each test point.
3. The as-built drawings shall provide a complete record of the final installation by location. The Contractor shall incorporate all design modifications, change orders and field installation changes.

D. Media

1. The Contractor shall provide one (1) complete set of all Manuals, Drawings and other documentation in bounded paper format to be stored in the equipment cabinet documentation holder.
2. Three (3) additional complete sets of all documentation, bound, loose-leaf copies of a booklet, 8-1/2 inches x 11 inches in size, and One (1) reproducible electronic copy in .pdf format shall be

delivered to the District Engineer prior to DMS System Integration Testing.

25.03.05 NTCIP COMPLIANCE

A. The sign controller and central computer software shall comply with the National Transportation Communications for ITS Protocol (NTCIP) Standards when installed. The Contractor shall be responsible for furnishing DMS equipment that is compliant with NTCIP standards as defined below. The Department reserves the right to define conformance groups to be supported. The Contractor shall provide a detailed description of how the system shall conform to the following minimum NTCIP requirements at the time of bid.

B. NTCIP References

The DMS shall comply with all applicable NTCIP standards that are current at the date of this document, including all Recommended or Approved Amendments. Under this contract, the Contractor shall ensure that each NTCIP component covered by these technical specifications implements the most recent version of the standard at the development stage of "Recommended" or higher, including any and all Approved or Recommended Amendments to these standards. It is the responsibility of the Contractor to monitor NTCIP activities to discover any recent additional documents. The following is a list of these Standards:

1. NTCIP 1101:1996 (V01.12) Simple Transportation Management Framework, December, 2001 with Amendment 1 v08
2. NTCIP 2104:2003 (V01.11) Ethernet Sub network Profile, September, 2005
3. NTCIP 2202:2001 (V01.05) Internet (TCP/IP and UDP/IP) Transport Profile, December, 2001
4. NTCIP 2301:2001 (V01.08) Simple Transportation Management Framework Application Profile
5. NTCIP1203 (V2.35a): Object Definitions for Dynamic Message Signs (DMS) Information Profile, March 2007
6. NTCIP 1201:2005 (V02.32) Global Object (GO) Definitions - Version 02, Information Profile October 2005

C. NTCIP Framework

The software shall comply with NTCIP 1101 (NEMA TS 3.2, Amendment #1) the Simple Transportation Management Framework, and shall meet the requirements for Conformance Level 1 as clarified by Amendment #1.

D. NTCIP Communications, Subnet Level –

1. Each NTCIP Component that communicates remotely shall conform to all mandatory NTCIP 2104 (Ethernet) subnet profile

requirements. Each NTCIP component shall support the receipt of application data packets at any time.

2. NTCIP Components may support additional Subnet Profiles at the vendor's option. At any one time, only one Subnet Profile shall be active on a given serial port of the NTCIP Component. If the NTCIP Component has a serial port that supports multiple Subnet Profiles, the NTCIP Component shall be configurable to allow the field technician to activate the desired Subnet Profile and shall provide a visual indication of the currently selected Subnet Profile.

E. Transport Level

Each NTCIP Component shall comply with NTCIP 2202 (TCP/IP and UDP/IP). Each NTCIP component shall support the receipts of datagrams conforming to the DMS configured TCP/IP and UDP/IP Transport profiles. NTCIP Components may support additional Transport Profiles at the manufacturer's option. Each NTCIP Component shall support the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

- F. Application Level – Each DMS controller shall comply with NTCIP 2301, (NEMA TS 3.AP-STMF), as a Managed Agent and shall meet the requirements for Conformance Level 1. SNMP shall be required and STMP shall not be required. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Responses shall use the sample Application Profile used by the request. Each NTCIP Component shall support the receipt of Application data packets at any time allowed by the subject standards.

25.04 MEASUREMENT AND PAYMENT

This item of Work will not be measured for payment, but shall be paid for on a Lump Sum basis. The price shall include:

DYNAMIC MESSAGE SIGNS – Item 614991 including:

- Variable Message Sign I Line 32 characters, tri-color display in NEPA 4X enclosure with mount.
- Media converter Fiber –Ethernet.
- Communication cable – CAT 6 sign to fiber drop.
- Power cable – 12 awg. 120 vac. 3 conductor cable.
- 6-strand outdoor-rated MM fiber cable.
- 1" EMT conduit.
- DMS control software for sign message management.
- DMS control unit work station for sign management.

This price shall be full compensation for:

- A. Labor costs including fabrication, installation, configuration, integration, testing, commissioning, and other necessary support activities.
- B. Materials costs including specified equipment, hardware, firmware, software, software licenses, tools, appurtenances, and all other Products specified herein.
- C. All Labor and Material required for a full functioning system related to this particular section and related specifications not specifically identified in the Bid Items will be considered incidental and included.
- D. The cost of developing attachment details including mounting details and calculations for the portal mounting.

26 ADVANCED TRAFFIC MANAGEMENT SYSTEM (ATMS) PA AND DMS/LED/EGRESS SIGNS - CONTROL DETAILS

26.01 GENERAL

26.01.01 DESCRIPTION:

- A. This section provides specifications for design, furnishing, installing and testing of a new Head-End Control System for the PA, and DMS/LED Sign / Pedestrian Egress System using the Advanced Traffic Management System (ATMS).
- B. The design shall include a workstation and other computer, network peripherals to allow an operator to use text to speech technology and at the same time control direction of the egress system during emergencies and non-emergencies situation.
- C. Department of Labor- Washington D.C. – Tunnel Control Room
- D. Servers and workstation clocks will be synchronized via a network connection to a Network Time Protocol (NTP) server.
- E. The ATMS server shall house a database for archival of PA/LED /DMS Sign/Egress system data and associated software applications. The database, used to archive PA and sign messages, schedules, statistics, etc., shall be by the Scheduler software, GUI functions, Redundancy and Status reporting software.
- F. The Contractor shall be responsible for any work not specifically mentioned in this specification, but which is necessary, either directly or indirectly, for the proper functioning of a complete, new ATMS for control and monitoring of the

PA speakers /DMS Sign/Egress systems and is part of the scope of work, at no additional cost to the Administration.

26.01.02 OBJECTIVE:

The following is a list of general objectives of an ATMS:

- A. Control of DMS /LED Signage, PA speakers, Egress system and future ITS devices from a single platform.
- B. View the status of DMS /LED Signage, PA speakers, Egress system and future ITS devices on a single GIS-based map
- C. Ability to add devices by DDOT staff without input from the vendor
- D. Provide for automated travel times to be displayed on DMS /LED Signage.
- E. Provide text to speech technology with pre-scanned messaging and allow “Live” messaging to be displayed on the DMS /LED Signage, and all audio through the PA speaker system.
- F. Control, receive, and distribute video images from CCTV cameras installed along designated highway sections.
- G. Allow for automated and planned messages (Text to Speech) to be displayed on DMS /LED Signage, PA System in response to anticipated events. Responses will include predetermined messages and appropriate group notifications.
- H. Provide browser-accessible data to authorized personnel over the DDOT Fiber network. Such data will include DMS /LED Signage, PA speakers, Egress system and future ITS devices information.
- I. Provide for a “lite” Web-based version for use by DDOT staff when out of the facility as well as for use by approved external agencies.
- J. Provide ability to set operator priorities for device operations.

26.01.03 RELATED SECTIONS:

- 1. SECTION 017823 - OPERATION AND MAINTENANCE DATA
- 2. SECTION 078413 - PENETRATION FIRESTOPPING
- 3. SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 4. SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES
- 5. SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 6. SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL

- 7. SYSTEMS
SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
- 8. SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
- 9. SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
- 10. SECTION 262726 - WIRING DEVICES
- 11. SECTION 262813 – FUSES

26.01.04 QUALITY ASSURANCE:

- A. All work specified under this section shall be performed per the requirements in this section, applicable sections elsewhere, applicable codes and standards, and industries best practices to ensure a good quality workmanship.
- B. Installation of new equipment shall be done as required herein, following the manufacturer’s instructions and recommendations, industry’s best practices, applicable codes and standards, and as specified elsewhere in the contract documents to ensure good quality product.

26.01.05 SUBMITTALS:

Submit the following in accordance with Section 105.02 of the Standard Specifications, and with the additional requirements as specified for each:

- A. Submit in accordance with General Provisions for Construction and integration.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Indicate layout of equipment mounted in racks and cabinets, component interconnecting wiring, and wiring diagrams of network equipment.
- C. Product Data: Submit catalog data showing electrical characteristics and connection requirements for each component.
- D. Test Reports: Indicate procedures and results for specified field testing and inspection.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer's Field Reports: Indicate activities on site, adverse findings, and recommendations.
- G. Project Record Documents: Record actual locations of workstations, servers, UPS, network switches and cabling connections.
- H. Operation and Maintenance Manuals: Submit instructions for adjusting, operating, troubleshooting, administrating and extending system, and repair procedures and spare parts documentation.
- I. As-built drawings: The drawings shall depict the installation conditions of the

equipment to be provided. These shall clearly show all the equipment, facilities, conduits, hand boxes, junction boxes, DMS/LED signs, Egress Signs, poles, wires, cables, speakers, rack, other rack equipment, computer equipment, computer switches and any information that could be useful for troubleshooting the system. DDOT will review the drawings for approval.

J. PA and DMS/LED /Egress Signs System Software Design Specification (SDS):

An overview document, describing all supervisory monitoring and control software on a subsystem basis, including a brief description of the hardware interfaces. This document shall functionally describe all software with simplified block/flow diagrams. Include the relationship among programs, the database, and the hardware. Provide this document prior to issuance of any individual software documents.

K. PA and DMS/LED/ Egress Signs Control System Display Overview:

The Contractor shall submit a document and prototype console displays and Overview display for the ATMS Control System GUI. The overview shall include the displays and a document containing the displays and display design guidelines related to use of Icons for each possible state, colors, labels display attributes, menus bars, pop ups and prompt and messages.

L. Field Installation Acceptance Test (FIAT) Reports:

The Contractor shall submit for each site, facility, and subsystem, well documented, witnessed, test reports for each and every test outlined in the test plan for each subsystem.

26.01.06 PRODUCT, DELIVERY, STORAGE, AND HANDLING:

- A. Each unit shall be individually packaged and labeled for shipment and protected against damage and loss during shipping, handling, and storage.
- B. Store equipment in a secure and dry storage facility.

26.02 PRODUCTS

The requirements specified below are minimum requirements. The contractor shall submit in their proposal all latest Hardware and Software technology related to this specification to ensure that the product proposed for installation can function successfully.

26.02.01 GENERAL

All Hardware and Software materials furnished shall be standard products of manufacturer regularly engaged in the production of materials specified.

26.02.02 ATMS CONTROL SYSTEM EQUIPMENT:

- A. Manufacturers: Transdyne Corp. Advanced Traffic Management System (ATMS) or approved equal

1. Transdyne model type: DYNAC™ ES ATMS Features:
 - a. Traffic Monitoring
 - b. Incident Detection
 - c. Incident Response Management
 - d. Video Management
 - e. Advanced Travel Information
 - f. Dynamic Message Sign Management
 - g. Bridge and Tunnel Facilities Management
 - h. HOV, HOT, and Reversible Roadway Management
 - i. PA Speaker integration interface
 - j. Complete CCTV functionality

26.02.03 ATMS CONTROL SYSTEM SOFTWARE :

1. Real-time monitoring and control.
2. GIS Map and schematic based GUI.
3. Integrated Incident Response Management with on-line decision support.
4. Seamless digital and analog video management.
5. WYSIWYG Electronic Sign control.
6. Historical data recording system.
7. Traffic and Equipment Maintenance Reports.
8. Alarm paging.
9. Multi-vendor and legacy equipment support.

26.02.04 ATMS CONTROL SYSTEM ARCHITECTURE:

1. True client-server software using a Windows based or other approved system that is standards based open architecture and COTS (Computer off the shelf) compliant.
2. ITS Architecture and NTCIP compliant.
3. ATMS architecture uses proven three tier architecture (Client, Business, and Enterprise Information System) for dependency and functional isolation.
4. ATMS client applications run on any enabled computer. No special workstation software or hardware is required.
5. Compatible with standard RDBMS products such as PostgreSQL, Oracle, Sybase and MS SQL Server.

26.02.05 ATMS SYSTEM EQUIPMENT- HARDWARE:

- A. SERVER: Manufacturers: Dell or approved equal.
 1. Dell System model types (T5600,T5610)
 - a. Intel SR52612UR 2U 12x SATA RAID Hot Swap with SAS Expander
 - b. Intel Xeon Quad-core + DDR3 DIMM

- c. SAS/SATA RAID +SATA Hard Drive
- d. RAID Configuration & Video File Capacity

B. WORKSTATION:

1. Manufacturers: Dell OptiPlex 980 32-bit Dual Processor workstations or approved equal.
 - a. Processor: Intel® Core™ i5 Dual Core Processor 650 with VT (3.20GHz, 4M)
 - b. Windows® 7 Professional to XP Professional,SP3,Media,English
 - c. Small Form Factor
 - d. 250GB 7,200 RPM 3.5" SATA, 3.0Gb/s Hard Drive with NCQ and 8MB Cache
 - e. 512MB NVIDIA Quadro NVS 420 (Quad DVI Adapter), Low Profile
 - f. 4GB DDR3 Non-ECC SDRAM, 1333MHz, (4 DIMM)
 - g. 250GB SATA 3.0Gb/s with NCQ and 8MB DataBurst Cache™
 - h. 8X Slimline DVD+/-RW Roxio Creator™ CyberlinkPowerDVD™
 - i. USB Standard Keyboard
 - j. USB optical scroll mouse
 - k. Resource DVD with Diagnostics and Drivers
 - l. OptiPlex 980 Documentation in English
 - m. Internal speakers
 - n. 5 Year ProSupport for IT and 5 Year NBD Onsite Service

C. MONITORS:

Manufacturers: Dell or approved equal.

- a. Viewable area - 22" wide
- b. Native resolution of 1680 x 1050
- c. Approximate 16 - 9 perspective
- d. Pixel Pitch - 0.282 mm
- e. Brightness (Typical) - 280 cd/m2
- f. Response Time (Typical) - 5ms (GTG)
- g. Detachable base

26.02.06 STANDARDS AND REPORTS:

- A. National ITS Architecture that have been approved and published for use in ATMS.
- B. Ethernet and TCP/IP networking standards.
- C. ODBC and SQL database standards. Generic support for any relational database.

- D. HTML, DHTML, HTML5 Javascript, JSP, etc. standards for web based application servers and documentation.
- E. Modbus protocol for data acquisition devices using both serial and TCP/IP communications.
- F. Lightweight Directory Access Protocol (LDAP) and integration with Microsoft Active Directory.
- G. Simple Network Management Protocol (SNMP) – the system shall support basic polling of all network devices for status information.
- H. All reports shall be created as pdf format files.
- I. Database and configuration files shall be in a standard XML format.

26.03 EXECUTION

26.03.01 SURVEYS

- A. The Contractor shall perform hardware and software assessments with the client, identify needs and existing infrastructure. General assessment development should at least include the following:
 1. Location of all new and existing ATMS equipment.
 2. Identify main control room and server and workstation placements.
 3. Meet with Client to develop an implementation plan and Concept of Operations (CONOPS) methodology.
- B. The Contractor shall use information gathered during the site surveys to generate final working plans for the mall tunnel project.

26.03.02 INSTALLATION:

- A. Utilize a fault tolerant architecture which minimizes the impact of a single point of failure and provides for central system expansion and upgrades.
- B. Provide a seamless integration between all subsystems and programs.
- C. Utilize a fully integrated graphical user interface that provides the operator with real time information and control through the use of maps and schematic displays containing dynamic objects.
- D. Provide multi-user and multi-workstation capability without operator restrictions other than password and access rights.
- E. Install (1) workstation with (2) desktop monitors in the new Mall Tunnel Control Room area. A definite placement location will be provided by DDOT personnel.
- F. Provide standard interfaces to monitor and control a variety of Intelligent Transportation System (ITS) field devices (lane control signals, variable speed limit signs, changeable message signs, blank-out signs, over height vehicle detectors, etc.) from a variety of manufacturers.

- G. Provide industry standard protocols to support communications with Programmable Logic Controllers and other facilities management devices.
- H. Provide access to real time and historical data through on-line applications as well as logging, report generation and charting.
- I. Provide real-time monitoring and logging of equipment status and state.
- J. Control and monitor dynamic message signs using free-format, local library and master (server) library messages.
- K. Provide table driven and dynamically created response plans that can incorporate any type of field device, operator input, and response.
- L. Provide an interface to manage audio devices such as PA, emergency telephones and PBX systems.
- M. Provide an interface both electrical and software to the Pedestrian Egress System.
- N. Provide the Hardware and Software interface to the CCTV component.
- O. The ability to add and modify traffic devices using data entry templates while the system is online and operational.
- P. Support continuous operation with availability of at least 99.99%.

26.03.03 TESTING:

- A. The Contractor shall perform all testing and corrective measures to fix any problems identified during installation and testing as required to ensure a fully operational ATMS solution.
- B. Test procedures shall be submitted to DDOT for review and approval as specified.
- C. The operator shall be able to start any application on the workstation within five (5) seconds of logging in.
- D. Acknowledge entered commands within one second of command entry.
- E. Update the appropriate transaction data in the database within two seconds of the command entry.
- F. All graphic displays shall be updated once per second without redrawing the entire screen. All displays shall allow smooth scrolling, panning and zooming (mays may be zoomed to fixed zoom levels) functions with barely perceptible redrawing of the image on the screen.
- G. All alarm conditions shall be displayed to the operator within two (2) seconds after they are received at the server or are generated by the server.
- H. Prepare and display report information to the requestor within 60 seconds of request.
- J. 30-Day Field Operational Test

- The 30-Day Field Operational Test shall be conducted on the integrated system of which the ATMS, described here-in, is a part.
 - All equipment shall be subject to the same 30-day field operation test requirements. Upon completion and acceptance, DDOT will provide final approval.
 - The Contractor shall submit for each site, facility, and subsystem, well documented, witnessed, test reports for each and every test outlined in the test plan for each subsystem.
- K. The test report shall include:
1. A summary listing the overall results of the testing.
 2. A list of failures or problems identified during testing, with a plan of action for the resolution of each.
 3. A detailed account of testing, keyed to the test procedures followed for the testing, indicating pass or failure in each case.
 4. Additional remarks as warranted.
- L. Acknowledgement by the DDOT: DDOT will provide a written acknowledgement of the receipt and acceptance of each submitted test report within ten (10) days of submittal.
- M. The Contractor shall supply a certified Commissioning Authority (CxA). The CxA has overall responsibility for planning and coordinating the testing and commissioning process. The CxA shall certify all test results, reports and documentation.

26.03.04 ATMS SYSTEM SOFTWARE :

- A. The ATMS software shall use a client-server architecture based on J2EE or other similar technologies to support a three-tier system of database server, application server and client.
- B. Clients shall use a web browser to access the system and download applications from the server that will offload processing to the client.
- C. All graphics intensive processing shall be performed on the client workstation with no limit to the number of workstations that may be connected to the server.
- D. The software shall be written in C++, Java or other standard object-orientated programming language that is fully supported by the operating system used for the servers and workstations.
- E. The software shall be scalable and have no artificial (license-based) limits on the addition of additional devices, workstations, graphics, reports, etc.
- F. All system functions shall be available to a DDOT operator on any workstation with functionality limited only by the password protected access level and

workstation configuration. Any additional functions (e.g., AVL, HAR, etc.) shall be integrated into the software and available on all workstations.

- G. Workstations shall not require the installation of any proprietary ATMS software to support the functions described in this specification.
- H. There shall be no per-seat licensing cost associated with viewing clients nor shall there be any limit to the number of client workstations that can access the server.

26.03.05 GROUNDING:

- A. Per Section 260526 - Grounding and Bonding for Electrical System and Contract drawings.

26.04 MEASUREMENT AND PAYMENT

This item will not be measured for payment and will be paid in a lump sum bid price, which price shall include:

ADVANCED TRAFFIC MANAGEMENT SYSTEM – Item 614991 including:

- Development of ATMS software.
- ATMS hardware – server.
- Software licenses.
- Network router – communication port
- ATMS workstation, operator monitors and CPU.
- Network cabling – interconnecting cables, Ethernet, fiber.
- Maintenance and on-call support including software upgrades.
- Interoperability connection to provide integration support for outside agencies.

The Lump Sum item shall include:

- A. Labor costs including fabrication, installation, configuration, integration, testing, commissioning, software programming, and associated management and support activities.
- B. Materials costs including specified equipment, hardware, firmware, software, software licenses, tools, appurtenances, and all other Products specified herein.
- C. All Labor and Material required for a full functioning system related to this particular section and related specifications not specifically identified in the Bid Items will be considered incidental and included in the lump sum bid price.

27 CLOSED CIRCUIT TELEVISION (CCTV) – EQUIPMENT SPECIFICATIONS

27.01 GENERAL

27.01.01 DESCRIPTION:

- A. The Contractor shall provide the labor, tools, equipment, and materials necessary to install a CCTV System with all necessary enclosures and appurtenances in accordance with the plans and as specified herein.
- B. Work in this Section includes, but is not limited to:
 - 1. Video cameras.
 - 2. Lenses (fixed and telephoto)
 - 3. Camera housings
 - 4. Digital video recorders
 - 5. Video monitors
 - 6. Video switcher/control system
 - 7. Receiver/drivers
 - 8. Mounting hardware
 - 9. Equipment cabinets and enclosures.
 - 10. Surge protection devices.
 - 11. Digital video management system
- C. All CCTV servers and recorders will terminate in the designated equipment rack located in Department of Labor- Washington D.C. – New Tunnel Control Room area.
- D. Servers and workstation clocks will be synchronized via a network connection to a Network Time Protocol (NTP).
- E. The CCTV Hardware and Software system shall integrate with the proposed ATMS as outlined in the previous section.
- F. The CCTV Hardware and Software system will have the capabilities of storing and archiving all CCTV video with the capabilities of retrieving all alarm events as deemed necessary by DDOT personnel.
- G. The Contractor shall be responsible for any work not specifically mentioned in this specification, but which is necessary, either directly or indirectly, for the proper functioning of a complete, new CCTV system and is part of the scope of work, at no additional cost to the Administration.

27.01.02 OBJECTIVE:

The following is a list of general objectives of a CCTV system:

- A. A robust system that is able to detect unlawfull vehicle access, assist with emergency operations and record any and all events.

- B. This system must be capable of 24/7 operations with the ability to monitor, record and archive all video streams in compliance with requirements of NFPA 502 (2014 Edition), Section 7.4.
- C. Industrial CCTV surveillance system shall be capable of monitoring vehicles and unauthorized persons.
- D. Megapixel cameras shall be suitable in areas where fine details are required for future enhancements to the DDOT -CCTV system.
- E. The Network Video Recorder (NVR) shall be the central server for all the cameras. It shall provide for recording, storage, retrieval, and facilitates viewing of all video feeds.
- F. The cameras shall be directly wired to the NVR through Ethernet/Fiber cables.
- G. The NVR shall control, receive, and distribute video images from CCTV cameras installed inside the both the Northbound and Southbound Mall Tunnels.
- H. The NVR shall contain the management software and the Hard Disk space for management and viewing of the video footage from all cameras.
- I. This is our advanced state of the art surveillance system solution that supports IP technology.
- J. All cameras shall be IP based.
- K. The IP cameras shall be connected to a multiport switch on the LAN. Power over Ethernet (PoE) support reduces cable connections for wired cameras as the same Ethernet cable provides power to the cameras where applicable.
- L. The NVR shall interface to the network through an Ethernet port.
- M. Configuration of the NVR shall be done through the LAN via a static IP address on normal browser.
- N. Monitoring shall be done on any computer in the LAN provided with a secure access, or shall be done remotely over the Internet.
- O. The NVR shall provide all the indexing storage, retrieval, playback of video footage while the monitors allow configuration and viewing.

27.01.03 RELATED SECTIONS:

1. SECTION 017823 - OPERATION AND MAINTENANCE DATA
2. SECTION 078413 - PENETRATION FIRESTOPPING
3. SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
4. SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES
5. SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
6. SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL

- SYSTEMS
7. SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
 8. SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
 9. SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
 10. SECTION 262726 - WIRING DEVICES
 11. SECTION 262813 – FUSES

27.01.04 QUALITY ASSURANCE:

- A. All work specified under this section shall be performed per the requirements in this section, applicable sections elsewhere, applicable codes and standards, and industries best practices to ensure a good quality workmanship.
- B. Installation of new equipment shall be done as required herein, following the manufacturer's instructions and recommendations, industry's best practices, applicable codes and standards, and as specified elsewhere in the contract documents to ensure good quality product.
- C. Codes and Standards: Perform all work associated with the CCTV System in compliance with applicable requirements of governing agencies having jurisdiction and in accordance with these plans and as specified herein.
 1. National Electrical Code (NEC).
 2. Underwriters' Laboratories, Inc. (UL) Compliance: Provide CCTV system components which are UL-listed and UL-labeled.
 3. National Electrical Manufacturers Association (NEMA) Compliance: Comply with NEMA Standards for enclosures.

27.01.05 SUBMITTALS:

Submit the following in accordance with Section 105.02 of the Standard Specifications, and with the additional requirements as specified for each:

- A. Shop Drawings: Indicate electrical characteristics and connection requirements. Indicate layout of equipment mounted in racks and cabinets, component interconnecting wiring, and wiring diagrams of network equipment.
- B. Product Data: Submit catalog data showing electrical characteristics and connection requirements for each component.
- C. Test Reports: Indicate procedures and results for specified field testing and inspection.

- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Field Reports: Indicate activities on site, adverse findings, and recommendations.
- F. Project Record Documents: Record actual locations of workstations, servers, UPS, network switches and cabling connections.
- G. Operation and Maintenance Manuals: Submit instructions for adjusting, operating, troubleshooting, administrating and extending system, and repair procedures and spare parts documentation.
- H. As-built drawings: The drawings shall depict the installation conditions of the equipment to be provided. These shall clearly show all the equipment, facilities, conduits, hand boxes, junction boxes, mounting brackets and other rack equipment, computer equipment, computer switches and any information that could be useful for troubleshooting the system. DDOT will review the drawings for approval.
- I. CCTV System Software Design Specification (SDS):
An overview document, describing all supervisory monitoring and control software on a subsystem basis, including a brief description of the hardware interfaces. This document shall functionally describe all software with simplified block/flow diagrams. Include the relationship among programs, the database, and the hardware. Provide this document prior to issuance of any individual software documents.
- J. CCTV Control System Display Overview:
The Contractor shall submit a document and prototype console displays and Overview display for the ATMS Control System GUI. The overview shall include the displays and a document containing the displays and display design guidelines related to use of Icons for each possible state, colors, labels, display attributes, menus bars, pop ups and prompt and messages.
- K. Maintenance data for CCTV systems shall be included in the Operation and Maintenance Manual. Include data for each type of product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.

27.01.06 PRODUCT, DELIVERY, STORAGE, AND HANDLING:

- A. Deliver CCTV System components properly packaged in factory-fabricated-type containers.
- B. Handle CCTV System components carefully to avoid breakages, impacts, denting, and scoring finished. Do not install damaged equipment; replace and return damaged units to equipment manufacturer.
- B. Store CCTV System components in original packaging and in a clean, dry space;

protect from weather and construction traffic.

27.01.07 SEQUENCING AND SCHEDULING :

- A. Coordinate installation of CCTV System components and enclosures with installation of wires/cables and other electrical work.
- B. Coordinate installation of CCTV System components and enclosures with installation of other emergency control sub-systems as detailed in this specification.

27.02 PRODUCTS

27.02.01 GENERAL

All Hardware and Software materials furnished shall be standard products of manufacturer regularly engaged in the production of materials specified.

27.02.02 CCTV EQUIPMENT (FIXED CAMERA DESCRIPTION):

Fixed and Thermal cameras shall be provided to meet the video coverage. At a minimum the cameras provided shall meet the following requirements:

- A. The camera shall capture video using a 1 / 2.7” SD progressive scan CMOS, 1 Megapixel sensor that supports Wide Dynamic Range (WDR), with a SNR of better than 39dB and an effective TVL of 690 (horizontal).
- B. The camera shall capture video at up to 720p resolution (1280 x 720).
- C. In day mode, the camera shall operate down to 0.7 Lux (color).
- D. In night mode, the camera shall operate down to 0.035 Lux (mono).
- E. The cameras shall be a true day/night cameras with mechanical IR cut filter.
- F. The camera shall support an option for Back Light Compensation (BLC).
- G. The camera shall support auto or fixed white balance.
- H. The video compression shall be carried via dedicated hardware compression; software compression via DSP is not acceptable.
- I. The camera shall support H.264 (ISO 14496-10) compression algorithm and should guarantee the compression at 25/30 frames per second.
- J. The camera shall have a RJ-45 connector and comply with IEEE802.3 and ETF standards: 10/100 Base-T Ethernet5.2.
- K. The camera shall support the following network protocols: TCP, UDP, IGMP, SNMP, HTTP, CMP, IGMP, SNMP, HTTP, NTP, Telnet, FTP.
- L. The camera shall support Power over Ethernet (802.3af Class 0); 24V AC/DC @ 0.45A.
- M. Meets NEMA Type 4X and IP66 Standards.

27.02.03 CCTV EQUIPMENT (PAN ,TILT, ZOOM CAMERA DESCRIPTION):

1. The PTZ camera shall support 360° continuous movement at a speed of 200° per second
2. The PTZ camera shall support up to 200 presets at an accuracy of 0.05°.
3. The PTZ camera shall support up to 24 independently configurable privacy zones.
4. The PTZ camera shall respond to commands with a latency no greater than 150ms
5. The camera shall contain an embedded real-time clock as well as acting as an NTP client.
6. The camera shall have 2 opto-isolated inputs and 1 solid state opto-isolated relay output for the transmission and receiving of binary outputs/inputs.
7. The camera shall support the following network protocols: TCP, UDP, IGMP, SNMP, HTTP, GlobalCMP, IGMP, SNMP, HTTP, NTP, Telnet, FTP.
8. The camera shall have a RJ-45 connector and comply with IEEE 802.3 and IETF standards: 10/100 Base-T Ethernet5.2.
9. The camera shall support H.264 (ISO 14496-10) compression algorithm and should guarantee the compression at 25/30 frames per second.
10. The camera shall support ACF (Activity Controlled Frame rate) so that the frame rate can be reduced when there is little or no motion in the scene.
11. The camera shall capture video using a 1/3” HD progressive scan CMOS, 2 Megapixel sensor that supports Dynamic Range > 50dB.
12. The camera shall capture video at up to 720p resolution (1280 x 720p).
13. In day mode, the camera shall operate down to 1.0 Lux (color), F1.8.
14. In night mode, the camera shall operate down to 0.1 Lux (mono), F1.8.
15. The camera shall be a true day/night.
16. The camera shall support an option for Back Light Compensation (BLC).
17. The camera shall support auto or fixed white balance.
18. The camera shall support native image stabilization to reduce shake during zoom.
19. Meets NEMA Type 4X and IP66 Standards.

27.02.04 CCTV EQUIPMENT (THERMAL CAMERA DESCRIPTION):

1. Advanced thermal imaging system designed for video security applications.
2. At a minimum the camera shall meet the following:
 - A. Uncooled, Sun-Safe, Amorphous Silicon Microbolometer
 - B. Long Wave Infrared (LWIR)
 - C. IP and Analog Capability
 - D. 640 x 480, 384 x 288, or 240 x 184 Resolution Options
 - E. 17 μm Pixel Size (640 x 480 model)
 - F. 25 μm Pixel Size (384 x 288 and 240 x 184 models)
 - G. Sensitivity Below NETD <50 mK at f/1.0
 - H. 24 VAC/24 VDC
 - I. H.264 and MJPEG Compression
 - J. Up to 2 Simultaneous Video Streams
 - K. Built-in Analytics
 - L. Multiple Lens Options
 - M. Designed for Maximum Environmental Protection
 - N. Compact, Lightweight Aluminum Construction
 - O. Meets NEMA Type 4X and IP66 Standards
 - P. Complete with Sun Shroud and Heater/Defroster
 - Q. Adaptive Motion Detection
 - R. ONVIF v1.02 Conformant

27.02.05 CCTV- CAMERA HOUSING:

1. Housings shall be steel or 6061 T6 aluminum enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.
2. At a minimum the camera housings provided shall meet the following:
 - A. Meets NEMA Type 4X and IP66 standards
 - B. Adjustable light shield (“Y” models)
 - C. Hinged wall mount allows for easy installation
 - D. Standard wall / pole mount
 - E. PoE or 12/24v input model

27.02.06 CCTV- NETWORK VIDEO RECORDER(NVR):

1. All equipment and materials used shall be standard components that are regularly manufactured and used in the manufacturer's system.
2. All systems and components shall have been tested and proven in real installations.
3. All components shall be provided with a two-year warranty. Additional warranty can be obtained by purchasing a specific warranty package via an approved system integrator.
4. Each distributor/integrator/installer and end users shall have access to technical assistance as well as the ability to download software updates, datasheets, manuals and FAQs.
5. At a minimum the NVR shall meet the following:
 - A. The NVR shall provide the function of recording video and audio streams directly from IP cameras and/or encoders.
 - B. The NVR shall be codec agnostic and support a number of standard codecs.
 - C. The NVR shall provide the function of reviewing video and audio streams on-demand Control Center workstations.
 - D. The NVR shall provide the function of storing alarms generated by any supported device on the system.
 - E. The NVR shall provide the function of notifying workstations on the system of any alarms.
 - F. The NVR shall support the function of indexing recordings for rapid display of time, alarm or motion based thumbnails.
 - G. The NVR shall provide the function of notifying Recording and logging of bookmarks in association with recordings.
 - H. The NVR shall support recording and playback of motion analysis data from supported cameras.
 - I. The NVR shall have a policy-based management option to control space and/or time-based reaping of old recordings as well as having the ability to ignore the reaping of protected recordings.
 - J. The NVR shall have the option to digitally sign recordings at the moment of recording and automatically verify this signature on export.
 - K. The NVR shall have a Linux operating system.
 - L. All configuration of the NVR-AS shall be done via HTML interface via web browser.

- M. The NVR shall provide self-diagnostics including: Disk status, CPU usage, motherboard temperature, network status, fan status.
- N. The NVR shall have two RJ-45 connectors and comply with IEEE 802.3 and IETF standards: 10/1000 Base-T Ethernet5.2.
- O. The NVR shall support a maximum video throughput of 64Mb/s.
- P. The NVR shall support the following network protocols: TCP, UDP, IGMP, SNMP, HTTP, IGMP, SNMP, HTTP, NTP, Telnet, FTP.
- Q. The NVR shall contain an embedded Linux firewall, salted passwords and MD5 encryption.
- R. The NVR shall contain an embedded real-time clock as well as an NTP client.
- S. The operating voltage: shall be 100-240V, ~ 47-63Hz, with a maximum current of 1A.
- T. The NVR shall have an additional connector for redundant external power supply.
- U. The operating temperature shall be 0°C (32°F) to 45°C (113°F).
- V. The storage temperature shall be -20°C (-4°F) to +70°C (158°F).
- W. The NVR shall utilize SATA Seagate SV35 Series drives.
- X. The NVR shall support 4 drives.
- Y. The drives shall have a 3-year warranty independent of the NVR.
- Z. The NVR shall support 1, 2 and 3TB drives.
- AA. The NVR shall have options for RAID 6.
- BB. The NVR shall support a maximum of 64 recorded streams and 20 playback streams with a maximum playback bitrate of 40Mb/s.
- CC. DDOT requires at a minimum of 30days of video storage for all cameras defined in this specification. DDOT is requiring that all new cameras will record in the 8-15 frames per second (fps) mode.

27.02.07 STANDARDS AND REPORTS:

- 1. EN 55022 ITE emission standard – Class A
- 2. EN61000-3-2 Mains Harmonics – Class A
- 3. EN61000-3-3 Voltage Fluctuation
- 4. EN55024 ITE immunity standard
- 5. UL 60950-1, Information Technology Equipment

6. Safety Part 1: General Requirements
7. CFR47: 2002 Part 15 Sub Part B (US federal code of regulations)
8. ITE - Safety - Part 1 General Requirements CSA C22.2 No. 60950 - 1 - 07
9. EN 60068-2-30 Humidity up to 95% Non-condensing
10. EN 60068-2-1 & 2 (1993) Low & High temp
11. EN 60068-2-6 & 64 (2008) Sinusoid & Random vibration
12. EN 60068-2-29 (1993) Bump
13. EN 60068-2-30 Humidity up to 95% Non Condensing

27.03 EXECUTION

27.03.01 SURVEYS

- A. The Contractor shall perform hardware and software assessments with DDOT, identify needs and existing infrastructure. General assessment development should at least include the following:
 1. Location of all new and existing CCTV equipment.
 2. Identify main control room and server placements.
 3. The Contractor shall use information gathered during the site surveys to generate As-Built drawings.

27.03.02 INSTALLATION:

- A. Review all plans and specifications to ensure proper installation techniques per the DDOT provisions.
- B. Conduct site surveys and field studies and provide coordination schedule with other contractors that are involved in this project.
- C. Develop a plan for deinstallation of existing CCTV system and submit the plan to the DDOT Project Manager for review and authorization.
- D. All deinstalled equipment shall be packaged and labeled accordingly and submitted to the DDOT Project Manager for acceptance and acknowledgement.
- E. A deinstalled equipment schedule shall be submitted to the DDOT Project Manager for review and acknowledgement.
- F. Install all new CCTV equipment as per manufacturer's instructions.
- G. Install all new CCTV equipment in locations as indicated in the plans and specifications.
- H. CCTV cameras will be hard –wired for both power and communications to

dedicated RC cabinet boxes that are located in designated areas of both the North- and South-Bound tubes of the Mall Tunnel per the plans herein.

- I. All conduit runs, raceways, junction boxes, and associated hardware fittings will be included with this item of work.
- J. All wiring to each camera junction box will be included with this item of work.
- K. All final testing and acceptance testing will be included with this item of work.
- L. Liquid Tight flexible conduit coating shall consist of thermal plastic or thermoset product and meet NFPA 502 standard.
- M. The contractor shall abide by all government, state and local jurisdictional codes and regulations during construction, testing and final acceptance of the CCTV system.
- N. The Contractor shall comply with DDOT's requests to suspend all work in the Mall Tunnel due to some unforeseen circumstances with no added cost to the project.
- P. Install all new CCTV equipment only using qualified and trained personnel.
- Q. Install electrical devices in accordance with local electrical codes.
- R. Ensure area is clear of any adverse electromagnetic interference.
- S. Protect all devices from damage during construction.
- T. Test correct torque of all screws in accordance with manufacturer's specifications.
- U. Ensure video quality at both live monitoring stations and video recording.
- V. Ensure that all NVR's are working within manufacturer's specified tolerances.
- W. Report all problems to appropriate manufacturer via an approved support system.

27.03.03 TESTING:

- A. Make proper adjustments of the system according to manufacturer's recommended settings.
- B. Ensure that all recorded video is retained for the appropriate period.
- C. Ensure that the full function of the system has been demonstrated to confirm that the entire system is working correctly.
- D. Perform 30-Day Field Operational Test.
 - The 30-Day Field Operational Test shall be conducted on the integrated system of which the ATMS, described here-in, is a part.

- All equipment shall be subject to the same 30-day field operation test requirements. Upon completion and acceptance, DDOT will provide final approval.
 - The Contractor shall submit for each site, facility, and subsystem, well documented, witnessed, test reports for each and every test outlined in the test plan for each subsystem.
- E. The Contractor shall submit for each site, facility, and subsystem, well documented, witnessed, test reports for each and every test outlined in the test plan for each subsystem.
- G. Test procedures shall be submitted to DDOT for review and approval as specified.
- H. The test report shall include:
1. A summary listing the overall results of the testing.
 2. A list of failures or problems identified during testing, with a plan of action for the resolution of each.
 3. A detailed account of testing, keyed to the test procedures followed for the testing, indicating pass or failure in each case.
 4. Additional remarks as warranted.
- I. The Contractor shall perform all testing and corrective measures to fix any problems identified during installation and testing as required to ensure a fully operational CCTV solution.
- J. Acknowledgement by the DDOT: DDOT will provide a written acknowledgement of the receipt and acceptance of each submitted test report within ten (10) days of submittal.
- K. The Contractor shall supply a certified Commissioning Authority (CxA). The CxA has overall responsibility for planning and coordinating the testing and commissioning process. The CxA shall certify all test results, reports and documentation.

27.03.04 GROUNDING:

- A. Per Section 260526 - Grounding and Bonding for Electrical System and Contract drawings.

27.04 MEASUREMENT AND PAYMENT

This item will not be measured for payment and will be paid in a lump sum bid price, which price shall include:

CCTV SYSTEM – Item 614991 including:

- HD Fixed CCTV Cameras - environmental vandal-resistant Fixed Dome cameras.

- ONVIF software license per device.
- HD PTZ CCTV Cameras – environmental pendant PTZ, 30X lens.
- HD CCTV Network Video Recorder, NVR-40TB windows, 12 disk RAID 6, 2U rack mount, plus hardware and support.
- PTZ dome pole mount adaptor.
- CCTV software.
- Thermal camera.
- Camera wall-mount hardware, enclosure.
- Enhanced management software license per device.
- NEMA single door wall-mount housing.
- Communication cable – camera to fiber drop.
- Power cable – 12 awg. 120 vac. 3 conductor cable.
- 1” EMT conduit.
- De-installation of existing CCTV equipment.

These Lump Sum items shall include:

- A. Labor costs including fabrication, installation, configuration, integration, testing, commissioning, software programming, and associated management and support activities.
- B. Materials costs including specified equipment, hardware, firmware, software, software licenses, tools, appurtenances, and all other Products specified herein.
- C. All Labor and Material required for a full functioning system related to this particular section and related specifications not specifically identified in the Bid Items will be considered incidental and included in the lump sum bid price.

28 DOCUMENTATION AND TRAINING

28.01. MANUALS.

Manuals shall be provided in accordance with the following:

1. Manufacturer's standard manuals will be acceptable, subject to the approval of DDOT personnel. Each manual must contain specific identification of products by model and part and number supplied under this contract. A detailed list of manuals to be provided is listed in the Table-1(see below).
2. Documentation shall be provided for all system software, utilities, compilers, assemblers, linkers, editors, maintenance software, and other packages used to develop, debug and load software, with the exception of COTS products.
3. Revisions to any manual shall be reflected in a revision index that is part of each handbook or manual and is revised according to a revision control method approved by DDOT. Revisions shall be made for all design changes, retrofits, and errors.

4. Maintenance and Repair Manuals: These manuals shall provide sufficient information, including schematics, layout drawings, test and alignment procedures, inter-cabling diagrams, and parts lists, to permit quick and efficient maintenance and repair of the equipment by a qualified technician.

4. Manual Types and Quantity: The Contractor shall supply complete documentation of the entire system provided. The following Table No. 1 indicates the level and quantities required, the Contractor shall amend this table to meet the actual equipment and components provided. In addition to hard copy versions of the manuals, provide five (5) CD-R copies in Microsoft Word 2010 format of every manual supplied.

Item.	Document Title or Description	Quantity Required
1	Operator Manual (quick guide)	50
2	System Administrator Guide	10
3	Data Administrator Guide	10
4	Data Communications Guide	10
5	Component or sub-system Manuals	10 (each component)
6	Operations and Maintenance Manual	20
7	Other Manuals (as appropriate)	10

28.02. TRAINING.

Provide a program to train DDOT personnel in all aspects of the operation and maintenance (O & M) of the systems and equipment provided, as follows:

1. Design the program such that the DDOT may assume control and accomplishment of the training.
2. Submit five (5) complete sets of printed training program materials on two CDs and five complete hard copies. In addition, provide copies required for implementation of the training program. For example, if there are eight (8) in the class, then supply thirteen (13) hard copies and two (2) CD-Rs in Microsoft Word 2010 format.
3. All training course program materials, including training manuals and audio/video tapes or disks, shall become the property of the MTA and for use by the MTA for internal training purposes.

28.02.01 TRAINING PROGRAM.

Develop a detailed training program plan to be submitted to DDOT for approval as follows:

1. Provide an overview description of instructor and student materials, and schedules necessary to provide system operations and maintenance courses for operations personnel and maintenance technicians. The schedule is contained in the plan and shall address the availability of operations and maintenance manuals and shall show all training program milestones for the development of training materials and manuals for the schedule of classes.
2. Instructor Material: Develop course outlines, lesson plans, classroom notes, video recordings, films, slides, printed materials, and mock-ups or models. Course outlines for each class shall be submitted sixty (60) days prior to the beginning of training classes and lesson plans shall be submitted no later than thirty (30) days prior to the beginning of training classes. Final course material shall be delivered to DDOT no later than ten (10) days prior to the commencement of the training.
3. Student Materials: The primary source of instructional material shall be applicable operations and maintenance manuals. In addition, the Contractor shall develop notebooks, drawings, and procedures to supplement these manuals to ensure that all learning objectives are met in an orderly and timely manner.
4. Facilities: Space for classroom lectures and practical training on equipment will be furnished at the DDOT(Mall Tunnel) facilities. The Contractor will provide projectors, screens, easels, testing equipment and other training aids as needed.
5. Installed equipment, such as operator positions, may be used to demonstrate the practical function and operation of the system.

28.02.02 TRAINING COURSES

The following table lists the required training courses.

Table 2 Training Courses			
#	Course Title	Description	Recipients, class size/sessions/hours
1	Management	High level system overview	DDOT senior personnel
2	Operator	Operations (train the trainer)	Operators, DDOT training staff.

3	System Administrator	Host administration, Statistics and data capabilities	System Administrator
4	Maintenance	Technician training	Technicians
5	Data Administration	Reporting capabilities	Department Managers, Planners
6	Report Generation	Management Report generation	Planning staff

(Note 1): The operator training should be based on a course assuming that the operators know nothing about the operation of the emergency communication systems in the Mall Tunnel.

28.03 MEASUREMENT AND PAYMENT

The items described in this Section will not be measured and paid for separately, but the cost for providing required Manuals and Training shall be included in the Lump Sum bid price for the pertinent items.

29 DISPUTES

- A. All disputes arising under or relating to this contract shall be resolved as provided herein.
- B. Claims by a Contractor against the District.

Claim, as used in Section B of this clause, means a written assertion by the Contractor seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to this contract. A claim arising under a contract, unlike a claim relating to that contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant.

- (a) All claims by a Contractor against the District arising under or relating to a contract shall be in writing and shall be submitted to the Contracting Officer for a decision. The contractor's claim shall contain at least the following:
 - (1) A description of the claim and the amount in dispute;
 - (2) Any data or other information in support of the claim;
 - (3) A brief description of the Contractor's efforts to resolve the dispute prior to filing the claim; and
 - (4) The Contractor's request for relief or other action by the

contracting officer.

- (b) The Contracting Officer may meet with the contractor in a further attempt to resolve the claim by agreement.
- (c) For any claim of \$50,000 or less, the Contracting Officer shall issue a decision within sixty (60) calendar days from receipt of a written request from a Contractor that a decision be rendered within that period.
- (d) For any claim over \$50,000, the Contracting Officer shall issue a decision within ninety (90) calendar days of receipt of the claim. Whenever possible, the Contracting Officer shall take into account factors such as the size and complexity of the claim and the adequacy of the information in support of the claim provided by the Contractor.
- (e) The Contracting Officer's written decision shall do the following:
 - (1) Provide a description of the claim or dispute;
 - (2) Refer to the pertinent contract terms;
 - (3) State the factual areas of agreement and disagreement;
 - (4) State the reasons for the decision, including any specific findings of fact, although specific findings of fact are not required and, if made, shall not be binding in any subsequent proceeding;
 - (5) If all or any part of the claim is determined to be valid, determine the amount of monetary settlement, the contract adjustment to be made, or other relief to be granted;
 - (6) Indicate that the written document is the contracting officer's final decision; and
 - (7) Inform the Contractor of the right to seek further redress by appealing the decision to the Contract Appeals Board.
- (f) Any failure by the Contracting Officer to issue a decision on a contract claim within the required time period will be deemed to be a denial of the claim, and will authorize the commencement of an appeal to the Contract Appeals Board as authorized by D.C. Official Code § 2-309.04.
- (g)
 - (1) If a Contractor is unable to support any part of his or her claim and it is determined that the inability is attributable to a material misrepresentation of fact or fraud on the part of the Contractor, the Contractor shall be liable to the District for an amount equal to the unsupported part of the claim in addition to all costs to the District attributable to the cost of reviewing that part of the Contractor's claim.
 - (2) Liability under this paragraph (f) shall be determined within six (6) years of the commission of the misrepresentation of fact or fraud.

- (h) The decision of the Contracting Officer shall be final and not subject to review unless an administrative appeal or action for judicial review is timely commenced by the Contractor as authorized by D. C. Official Code § 2-309.04.
- (i) Pending final decision of an appeal, action, or final settlement, a Contractor shall proceed diligently with performance of the contract in accordance with the decision of the Contracting Officer.

C. Claims by the District against a Contractor

- (a) Claim as used in Section C of this clause, means a written demand or written assertion by the District seeking, as a matter of right, the payment of money in a sum certain, the adjustment of contract terms, or other relief arising under or relating to this contract. A claim arising under a contract, unlike a claim relating to that contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant.
- (b)
 - (1) All claims by the District against a Contractor arising under or relating to a contract shall be decided by the Contracting Officer.
 - (2) The Contracting Officer shall send written notice of the claim to the Contractor. The Contracting Officer's written decision shall do the following:
 - (a) Provide a description of the claim or dispute;
 - (b) Refer to the pertinent contract terms;
 - (c) State the factual areas of agreement and disagreement;
 - (d) State the reasons for the decision, including any specific findings of fact, although specific findings of fact are not required and, if made, shall not be binding in any subsequent proceeding;
 - (e) If all or any part of the claim is determined to be valid, determine the amount of monetary settlement, the contract adjustment to be made, or other relief to be granted;
 - (f) Indicate that the written document is the Contracting Officer's final decision; and
 - (g) Inform the Contractor of the right to seek further redress by appealing the decision to the Contract Appeals Board.
 - (3) The decision shall be supported by reasons and shall inform the Contractor of his or her rights as provided herein.
 - (4) The authority contained in this clause shall not apply to a claim or dispute for penalties or forfeitures prescribed by statute or regulation

which another District agency is specifically authorized to administer, settle, or determine.

(5) This clause shall not authorize the Contracting Officer to settle, compromise, pay, or otherwise adjust any claim involving fraud.

(c) The decision of the Contracting Officer shall be final and not subject to review unless an administrative appeal or action for judicial review is timely commenced by the District as authorized by D.C. Official Code §2-309.04.

(d) Pending final decision of an appeal, action, or final settlement, the Contractor shall proceed diligently with performance of the contract in accordance with the decision of the Contracting Officer.

30 WEEKEND WORK

This Special Provision supplements 105.10:

Most scheduled work will be initiated and completed between the hours of 7:30 a.m. and 4:00 p.m., Monday through Friday. However weekend work may be required as determined by the Engineer in congested areas where serious traffic difficulties would result if the repairs were performed during the normal work week.

It is estimated that the amount of weekend work will not exceed fifteen percent (15%) of total work to be performed under the contract.

31 APPLICABLE WAGE DECISION/WAGE RATES

In accordance with the applicable provisions of 29 CFR Part 1, which require that the correct wage determination and the appropriate wage rates therein be incorporated into this contract, General Wage Decision No. DC030001 AND Wage Determination No.: 2005-2103 is bound herein and contains the specific applicable wage rates, which are:

HIGHWAY CONSTRUCTION RATES And SERVICE CONTRACT RATES

In accordance with 29 CFR, Part 1, Section 1.6(c)(3)(IV), if the intent to award letter is not issued within ninety (90) days of bid opening, the executed contract will include all intervening modifications. The Contractor will be reimbursed this added labor cost.

32 FAILURE TO COMPLETE ON TIME

Replace 108.07 with the following:

SP
Emergency Communication Systems for the Mall Tunnel
Amendment 003, dated 9/19/2014

For each calendar day that contract work remains incomplete after expiration of the specified construction completion time, or main part thereof, the sum of \$ 2000.00 has been set by the Contracting Officer as liquidated damages from any money due the Contractor. The Contractor's operation after expiration of construction completion time as extended will in no way waive the District's rights under the contract. A memorandum justifying these amounts will be placed in the Contract file.

33 BID GUARANTY

This Special Provision supplements Article 12.A., of the **INSTRUCTIONS TO BIDDERS, STANDARD CONTRACT PROVISIONS, 2005, Revised 2007**

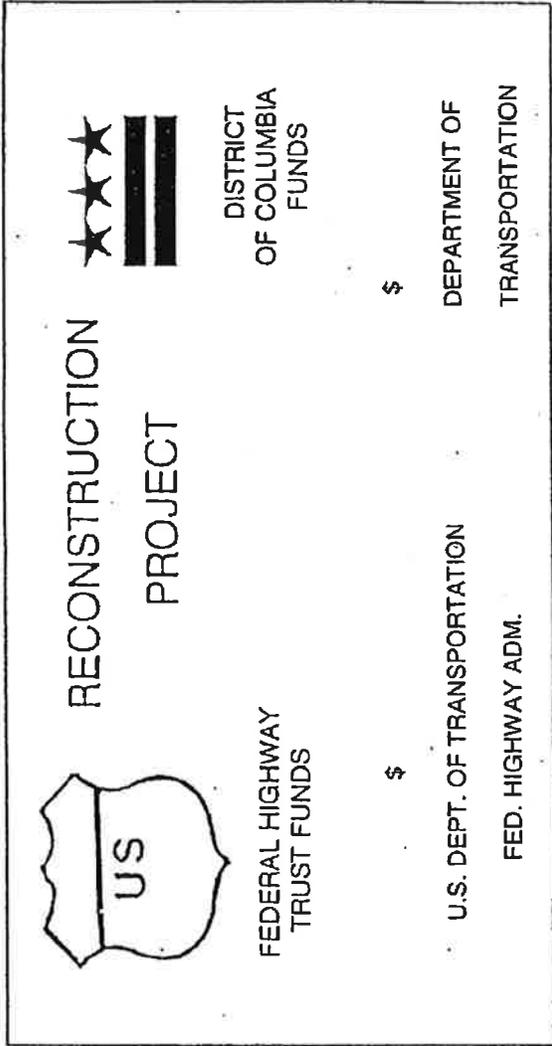
The bid guaranty period shall be **ninety (90) calendar days** after bid opening.

An Irrevocable Letter of Credit or United states government securities that are assigned to the District which pledge the full faith and credit of the United States are acceptable.

APPENDIX A: STANDARD SPECIFICATIONS

SUBCONTRACTOR APPROVAL REQUEST

(1) Project Name		(2) Invitation No.	
Prime Contractor's Name		(4) Address	
(5) Estimated Starting Date		(6) Estimated Completion Date	(7) F.A.P. #
(8) Subcontractor's Name, Address & Phone No.		(9) Number of Subcontractor Employees in Workforce	(10) Number of DC Residents employed
(11) Pay Item	Item Description	Dollars	Cents
Check items listed below (13-16) that are included in subcontract agreement		(12) See Attached For Additional Descriptions or Remarks	
(13) (All Projects)		Yes	No
Contract Wage Schedule		<input type="checkbox"/>	<input type="checkbox"/>
DBE/MBE Policy Statement		<input type="checkbox"/>	<input type="checkbox"/>
(Federal-Aid Projects) Form FHWA-1273 (Required Contract Provisions)		<input type="checkbox"/>	<input type="checkbox"/>
(Non-Federal Aid Projects) (Required Contract Provisions)		<input type="checkbox"/>	<input type="checkbox"/>
(15) (Federal-Aid Projects When Subcontractor Will Receive Over \$10,000) On-Site Work Force Affirmative Action Requirements for Women and Minorities-Special Conditions		<input type="checkbox"/>	<input type="checkbox"/>
(16) Subcontractor's Certification of Nondiscrimination in Employment (Form Included in Bid Proposal)		<input type="checkbox"/>	<input type="checkbox"/>
(17) FHWA On-The-Job Training (To Be Provided by Subcontractor)		<input type="checkbox"/>	<input type="checkbox"/>
(18) I Request the Contracting Officer's Approval of this Subcontract and Certify that the Organization which will Perform this Work is Capable, has not been Debarred and that the Work will be Performed in Accordance with the Contract Specifications. I Further Certify that all Required Contract Provisions are Physically Included as Part of the Subcontract Agreement.			
PRIME CONTRACTOR'S REPRESENTATIVE _____		TITLE _____	DATE _____
THE INFORMATION BELOW IS COMPLETED BY THE DEPARTMENT			
<u>REVIEW AND DISTRIBUTION AFTER APPROVAL</u>		<u>APPROVAL OF SUBCONTRACT IS HEREBY GIVEN</u>	
CONTRACT COMPLIANCE _____	DATE _____	CONTRACTING OFFICER _____	DATE _____
PROJECT ENGINEER/MANAGER _____	DATE _____	DC DEPARTMENT OF PUBLIC WORKS	



NOTE: BOARD SIZE APPROX.
4' x 6'

FEDERAL AID PROJECT SIGN

D.C. DEPARTMENT OF TRANSPORTATION

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under

this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are

applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar

with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor

will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions

of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b.(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or

will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-

Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly

rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is

evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this

covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.