

**ISSUING DEPARTMENT INPUT DOCUMENT**  
**CONTRACT/PROJECT MEASURE ANALYSIS AND RECOMMENDATION**

☒ New    ☐ OTR    ☐ Sole Source    ☐ Bid Waiver    ☐ Emergency    Previous Contract/Project No. N/A

☐ Contract  
☐ Re-Bid    ☐ Other – Access of Other Entity Contract    LIVING WAGE APPLIES: ☐ YES    ☒ NO

Requisition No./Project No.: RQMT2000007    TERM OF CONTRACT 5 YEAR(S) WITH 0 YEAR(S) OTR

Requisition /Project Title: 60' Battery-Electric Articulated Buses and Charging System

**Description:**

This section includes general requirements applicable for the scope of services to furnish and install one (1) charging station at a location yet to be determined, within Miami-Dade County. The charging station includes but is not limited to the following: utilities infrastructure, labor, permits, completely assembling, erecting and connecting materials, parts, components, supplies and related equipment required for the charging station to meet the functional requirements and operate in accordance with the established performance measures.

Issuing Department: DTPW    Contact Person: Ana Rioseco    Phone: 786-469-5279

Estimate Cost: \$162,555,000    GENERAL    FEDERAL    OTHER

Funding Source: FDOT, PTP    No FTA per I

**ANALYSIS**

<b><u>Commodity Codes:</u></b>	<u>556-10</u>				
Contract/Project History of previous purchases three (3) years Check here <input type="checkbox"/> if this is a new contract/purchase with no previous history.					
	<b><u>EXISTING</u></b>	<b><u>2<sup>ND</sup> YEAR</u></b>	<b><u>3<sup>RD</sup> YEAR</u></b>		
<b>Contractor:</b>					
<b>Small Business Enterprise:</b>					
<b>Contract Value:</b>					
Comments: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>					
Continued on another page (s): <input type="checkbox"/> YES <input type="checkbox"/> NO					

**RECOMMENDATIONS**

	Set-Aside	Subcontractor Goal	Bid Preference	Selection Factor
<b>SBE</b>				<u>X</u>
Basis of Recommendation: <div style="border: 1px solid black; padding: 5px; min-height: 30px;">Please check for Responsible Wages. See Bus &amp; Construction Specs</div>				
Signed: <u>J. Lee</u>		Date sent to SBD: <u>12/18/19</u>		
		Date returned to SPD: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		

## **ATTACHMENT “B”**

### **TABLE OF CONTENTS**

REPLACEMENT OF ARTICULATED BUSES, CHARGERS AND CHARGING FACILITY

CONTRACT NO. RFP-XXX

CONSTRUCTION

GENERAL REQUIREMENTS – DIVISION 01  
AND ADDITIONAL PROJECT REQUIREMENTS

GENERAL CONDITIONS: The divisions and section numbers were taken from the “Master Format 2004 Edition Numbers and Titles” published by the Construction Specifications Institute.

### **GENERAL REQUIREMENTS DIVISION 01**

#### Section

01 11 00	Summary of Work
01 14 13	Site and Work Restrictions
01 23 13	Request for Information (RFI)
01 32 16	Project Schedule
01 32 33	Construction Photographs
01 33 23	Submittals, Shop Drawings, Product Data and Samples Working
01 33 30	Drawings
01 43 00	Quality Assurance Requirements
01 45 23	Testing
01 52 00	Temporary Facilities
01 56 23	Temporary Barriers
01 58 13	Project Construction Signs
01 62 00	Substitution and Product Options
01 71 13	Mobilization
01 73 29	Cutting and Patching
01 74 00	Cleaning
01 78 00	Contract Closeout
01 78 36	Warranties
01 78 39	Project Record Documents

### **ADDITIONAL PROJECT REQUIREMENT**

1. STANDARD CONSTRUCTION GENERAL CONTRACT CONDITIONS AND ATTACHMENTS  
(FORMS ARE TO BE COMPLETED BY SELECTED CONTRACTOR DURING CONSTRUCTION)
1. MIAMI-DADE TRANSIT CONSTRUCTION SAFETY MANUAL AND ATTACHMENTS
2. DTPW ADJACENT CONSTRUCTION MANUAL

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFP-XXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

## **“ATTACHMENT B”**

### **SECTION 01 11 00 SUMMARY OF WORK**

#### **Part 1: GENERAL**

##### **1.01 DESCRIPTION:**

This section includes general requirements applicable for the scope of services to furnish and install one (1) charging station at a location yet to be determined, within Miami-Dade County. The charging station includes but is not limited to the following: utilities infrastructure, labor, permits, completely assembling, erecting and connecting materials, parts, components, supplies and related equipment required for the charging station to meet the functional requirements and operate in accordance with the established performance measures.

##### **1.02 CHARGING SYSTEMS PERFORMANCE MEASURES (PLUG-IN DEPOT BASED CHARGING EQUIPMENT) FOR HEAVY DUTY BATTERY ELECTRIC LOW FLOOR TRANSIT BUSES:**

The charging system shall be plug-in depot-based charging equipment powered by a 3-phase 480 AC to DC voltage. The charging system includes the charging equipment that is connected to a utility's high voltage service to provide electricity to the bus battery system through a charging interface. The charging system consists of all the components needed to convert, control, and transfer electricity from the grid to the vehicle for purpose of charging the bus batteries and may include chargers, controllers, couplers, transformers, ventilation, etc.

The Charging system shall be designed to meet the requirements specified in Attachment A.

Note that the charger is specific to the bus manufacturer and the bus manufacturer shall provide all the requirements needed for integration of the charger and charging system to support their electric transit bus application. The plug-in charging connectors must be standardized to the broad industry of the electric transit vehicles and must be compatible with all existing and future electric DTPW bus fleet known at the time of bid.

##### **1.03 MILESTONE:**

The charging system delivery, installation, testing and final acceptance of all the equipment required to provide the operational functionality at the location, yet to be determined, must be completed at least ninety (90) days prior to the delivery of the first production electric bus. Failure by the contractor to comply with this contractual requirement, will result in liquidated damages for each day's delay in completion of the work. The contractor shall pay Miami-Dade County (MDC) the amount set forth under the liquidated damages section of the contract.

##### **1.4 QUALIFICATIONS OF CONTRACTORS:**

All Contractors must hold a current valid Certificate of Competency for General Building or Specialty Trades Contracting, as required by the Florida Building Code, for the types of Work covered by the Contract at the time of RFP submission and maintain same throughout the duration of the project. The certificate(s) is to be issued by:

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFP-XXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

1. The State of Florida Construction Industry Licensing Board, pursuant to the provisions of Section 489.115 of the Florida Statute and registered with the Miami-Dade County, Building Department or,
  2. The Dade County Construction Trades Qualifying Board, pursuant to the provisions of Section 10-3(a) of the County Code. Holders of Miami-Dade County Certificates of Competency must also hold Certificates of Registration issued by the State of Florida Construction Licensing Board, pursuant to the provisions of Section 489.115 or Section 489.117 of the Florida Statutes.
- B. Proof of such Certificate(s) must be submitted at the time of initial response and maintained current throughout the contract period. The County may request proof of continued certification at any time during the contract period. Failure to provide such proof within five (5) working days from notification by the County shall result in the removal from the contract and the rejection of any current or future bid submissions.
- C. Subsequent to the commencement of the Contract, the County may require specific qualifications based on a Project's scope of work.
- D. Prime Contractor must be able to pull master permit.
- 1.5 RETAINAGE:** a five (5) percent will be held from each progress payment until final acceptance of the construction phase, refer to progress payment section.
- 1.6 PERMITS:** The contractor shall be responsible for obtaining necessary licenses and permits for compliance with applicable Federal, State and Local building codes and regulations in connection with the prosecution of the work. Applicable permits fees must be paid by the selected contractor.

#### **END OF SECTION**

## SECTION 01 14 13

### SITE AND WORK RESTRICTIONS

#### 1.1 DESCRIPTION:

- A. This section includes specifications for the general requirements and procedures for access to the various areas within the site to perform the required construction operations to complete the facilities as depicted in the Contract documents. The Contractor is to coordinate through DTPW on access and coordination issues.

#### 2.1 SUBMITTAL REQUIREMENTS:

- A. The construction schedule for the project needs to take the restrictions described herein into account for the planning of the work. The schedule of work activities needs to take into account the site and work restrictions identified herein demonstrating the sequencing of the work so as not to impact the Contract duration due to the site and work restrictions presented herein.
- B. The Contractor shall submit any required notice, request for access and any other procedural documents, as contained herein or referenced herein per the minimum lead times indicated in these procedures.
- C. Contractor is to ensure that municipalities are properly informed of all work contemplated within their jurisdictions by preparing and submitting all necessary documents and permits to work within their right of way.

1. Definitions: N/A

2. Authority:

The safety of Bus patrons and property shall be a primary consideration during the prosecution of the work. Therefore, any direction given by the duly designated DTPW representative regarding train traffic or train safety shall be considered final and is to be followed immediately. If the Contractor has an objection to the request, the Contractor shall obey the request and subsequently seek relief under the applicable Contract Sections.

3. Delays in Vacating Premises:

It is absolutely essential that work operations are not disrupted. All Contractor personnel (including suppliers, sub-contractors, vendors, etc.) shall cease work within thirty (30) minutes after receipt of directions by DTPW staff or its designee.

4. Special Events:

Certain special events require extended and/or more frequent service (football games, concerts, etc...) and may force work to revise the revenue service schedule and time constraints heretofore cited in this section. The Contractor shall expect and plan for these special events and reflect the impact of these special events in the project schedule and phasing plan.

5. Work Conditions and Access Requirements:

Access to any given site must be accompanied by proper documentation permits and paid fees. This request shall also include written details, including but not limited to, placement of cranes, materials, form work, personnel, and equipment; the sequence and timing of the work, and any other factor which may be construed by the DTPW representative to affect transit safety or revenue service.

6. Special work Protection:

Any work under and/or near the Bus stop , which could potentially cause damage or in any way endanger the safety of the Metro Bus patrons or the public, at the sole discretion of work, shall require protection such as barriers, nets, tarps, plywood, etc. The Special Work Protection must reflect the Contractors work activities and shall be designed by a Professional DTPW staff or its designee and submitted to work for approval. A minimum of six (6) weeks prior to performing any such work, the Contractor shall present this plan for the Special Work Protection to work for approval.

7. Access to Controlled Areas:

Contractor Access to any DTPW bus facility or County property must be coordinated in advance through the DTPW construction management team and the DTPW Office of Safety and Security.

8. Foreign Objects on Existing Guideway: N/A

9. End of Day Inspections and Other Inspections of Site work:

The Contractor with the DTPW representative shall, on a daily basis, conduct an inspection of the active site work after completion of work and immediately remove any foreign objects. No materials, attachments, anchorage systems, formwork or obstructions will be allowed to be left scattered or not cleaned. Contractor is responsible to maintain a clean and organize construction area. Prior to any hurricanes or other major storms, the Contractor and DTPW shall inspect the Contractor's work site and the Contractor shall immediately secure any materials that may pose a danger to DTPW Buses and/or DTPW facilities.

10. Emergencies:

Notwithstanding any of the above, in the event of an emergency, the Contractor maybe instructed to vacate the work area by the DTPW Construction team and/or the DTPW Safety and Security Office team. Any such direction shall require immediate action by the Contractor. Prior to vacating the work area, the Contractor shall clear the work area of all materials, equipment, etc. to the satisfaction of the designated DTPW representative.

11. Working Hour Restrictions:

Working hours: 700 AM - 7:00 PM, Monday - Fridays or as coordinated with DTPW Construction Management staff.

**END OF SECTION**

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFP-XXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

## SECTION 01 26 13

### REQUEST FOR INFORMATION (RFI)

#### PART 1: GENERAL

##### 1.1 DESCRIPTION

- A. This section covers Request for Information (RFI) from the Contractor. RFI in this section is defined as the solicitation by the Contractor for clarifications, interpretations, verifications, etc. related to the Contractor's scope of work during construction.
- B. The Contractor shall comply with this section for all such requests for information. All costs incurred by the Contractor in preparing these requests shall be borne by the Contractor and are part of this contract.
- C. Any delays or impacts caused by the Contractor's failure to conform to the requirements of this section shall be solely the Contractor's responsibility and shall not be cause for any time extension and/or additional compensation.

#### PART 2: PRODUCTS

##### 2.01 MATERIALS:

NONE REQUIRED.

#### PART 3: EXECUTION

##### 3.1 REQUEST FOR INFORMATION REQUIREMENTS:

- A. The Contractor is responsible for reviewing all Contract documents related to a particular work product well in advance of the performance of such work in accordance with Article 2: INTERPRETATIONS of the General Conditions. This review shall be planned to allow sufficient time to obtain resolution of any required RFI, as defined in this section.
- B. RFI Requirements.

All RFI's shall be submitted to the DTPW staff or its designee in the format with this section or in a pre-approved format equivalent to this section inclusive of the information identified on the specified form.

All RFI's shall be signed by the Contractor's Project Manager or by a designated alternate (i.e., the Quality Assurance Representative).

- a. Date submitted.
- b. Contract number and title.

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFP-XXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

- c. Contractor's name.
- d. Description of the request, including any supportive drawings, sketches or additional information.
- e. List of schedule activities which may be impacted by the request and a brief explanation as to why there would be a schedule impact and specific date constraints.
- f. Clear description of what response the Contractor is expecting.

All RFIs shall be signed by the Contractor's project manager.

C. RFI Processing Procedure.

- 1. Upon receipt of the RFI, the DTPW staff or its designee shall promptly date stamp the request. The DTPW staff or its designee is required to keep a log of all RFIs including receipt date and date returned to the Contractor.
- 2. The DTPW staff or its designee shall review the request to determine if further information is required from the Contractor, once the RFI is resubmitted by the Contractor, the RFI shall be re-stamped. The DTPW staff or its designee will coordinate a response and transmit the answer to the RFI to the Contractor.

D. Time allowed for processing RFIs.

Although every attempt will be made to expeditiously resolve all RFIs, MDC shall have ten (10) working days to respond to an RFI, from the date the RFI is received by the DTPW staff or its designee, including all necessary information needed to formulate a response. Failure by the Contractor to allow sufficient time for DTPW staff or its designee to formulate a response to an RFI, as specified in this section, shall not constitute grounds for a delay claim from the Contractor.

PART 4: MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

Work under this Section will not be separately measured for payment.

4.2 PAYMENT

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION



**REQUEST FOR INFORMATION FORM FOR CONSTRUCTION  
TO BE PROVIDED POST AWARD**

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFP-XXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

## SECTION 01 32 16

### PROJECT SCHEDULE

#### 1.1 DESCRIPTION:

- A. This section covers the preparation of a schedule in the Cost Loaded Construction in the Critical Path Method (CPM). The Contractor will be allowed to use his preferred scheduling system, if approved by DTPW staff or its designee. If the Contractor wishes to propose a different system, the Contractor shall so request prior to the required submittal requirements listed in this section.
- B. Final Schedule:
  - 1. A bar chart schedule shall be used by the Contractor to control the progress and time fixed for completion of this project. This system shall be implemented by the Contractor. Prior to approval of the final construction schedule, the Contractor shall provide work with letters from all his sub-contractors and suppliers indicating that they have reviewed the Contractor's schedule and concur with the sequence of events, activity durations and rates of production implied therein.
  - 2. All work shall be done in accordance with the schedule and all costs incurred by the Contractor to correctly implement the schedule shall be borne by the Contractor and are a part of his Contract.
  - 3. The schedule must be updated monthly and submitted with the Contractor's pay request. No payment will be made to the Contractor unless this monthly updated schedule and progress report is submitted with the Contractor's pay request. Even if no invoice is submitted in a particular month, the Contractor shall submit monthly schedule updates and progress reports to the satisfaction of work.

#### 2.1 PREPARATION OF FINAL SCHEDULE:

- A. Within five (5) working days after the date of Notice to Proceed (NTP), the Contractor shall develop and submit a comprehensive and detailed final schedule. Work performed prior to NTP shall not be allowed under this Contract.
- B. When completed, the bar chart diagram shall represent the Contractor's own plan for the project as well as the sequence of each operation and all the involved parties. The schedule shall also identify the project's critical path. It shall be the responsibility of the Contractor to ensure that all of this work is described by the diagram and that the diagram does correctly represent the sequence in which he plans to do his work and the time in which he expects to do it.
- C. As a minimum, the final schedule will cover the following areas:
  - 1. Shop drawing preparation, review and approval
  - 2. Procurement of major equipment or material
  - 3. Permit acquisition activities
  - 4. Material samples
  - 5. Material delivery
  - 6. All major work elements
  - 7. Punch list activities

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFP-XXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

8. Rates of Production
  9. Submittals
  10. Work Elements by others such as Utilities.
- D. The final schedule will be printed on a 11" x 17" sheet suitable for reproduction. The Contractor will submit three (3) copies of this schedule.
- E. A written narrative on separate 8 1/2" x 11" sheets will be included with the Contractor's final schedule. This narrative will describe the Contractor's general approach for performing the work and any additional or unusual requirements not clearly represented in the schedule including, but not limited to, equipment to be used and the time equipment is to be on-site, anticipated delivery dates for material and/or equipment, crews and crew sizes, estimated quantities and rates of production. The narrative shall explain the basis for the Contractor's determination of durations for major work items and describe his approach for meeting the interim and final completion dates in his schedule. The narrative shall also address workdays per week, hours per shift, rain days, holidays or any other non-work periods that the Contractor is assuming in the planning of the work. Activities which may be expedited by the use of overtime or additional shifts shall be identified. Sequencing and other restraints such as manpower, material or equipment shall be identified and explained.
- F. When completed, the final schedule shall be submitted to DTPW staff or its designee for their approval. The Contractor shall incorporate work schedule review comments within ten (10) working days after receipt. DTPW staff or its designee shall be the final authority in deciding the acceptability of the schedule. Upon approval work, this shall become the Final Schedule for the Contract. No deviations from the final schedule will be allowed without the prior written approval of DTPW.
- G. The Contractor shall identify all available float or slack time in his schedule in a format suitable to DTPW. Float or slack time is not for the exclusive use or benefit of either the Contractor or work. Float or slack time is considered project float as it is for the benefit of both parties. As such, it is not to be used exclusively by either party but is to be used by the party that needs it first. No more than 15% to 25% of the activities in the Contractor's schedule may be on or near the critical path ("Near the critical path" is defined as any activity having float of ten (10) days or less).
- 3.1 MONTHLY SCHEDULE UPDATES:
- A. The Contractor shall submit monthly schedule updates to show progress, as applicable, on all activities in progress. Such progress shall be shown in a format suitable to DTPW staff or its designee. Three (3) 11" X 17" copies of the updated schedule shall be submitted by the Contractor.
- B. The Contractor shall submit an updated narrative in the form of monthly progress reports in a format acceptable to work. Such reports shall include sections for describing "progress this period", "planned progress for next period", "problems and solutions" (including a listing of all delayed activities, the reasons for delay and proposed recovery actions) and "changes since last period". Any special concerns and or questions regarding the schedule should also be included in the progress report. Information included in the updated narrative will not relieve the Contractor of the notice requirements contained in the Contract documents. As applicable, signed material delivery tickets indicating when material was delivered on-site or to the fabrication plant will be provided with the narrative on a monthly basis.

- C. The Contractor shall submit on a weekly basis a simplified two-week look-ahead bar chart schedule showing all anticipated work scheduled to take place during the next fourteen (14) calendar days. This two-week look-ahead schedule shall be based on the approved baseline schedule.

#### 4.1 PAY REQUESTS:

- A. The Contractor's pay request shall be based on completed activities and shall include an update of the final schedule. The Contractor will not be eligible to receive payment until his Contract baseline schedule and schedule of values is approved and no payment will be made to the Contractor unless this schedule update and schedule of values is submitted with the pay request.
- B. Five (5) percent of each Contractor's pay request amount will be held as retainage.
- C. All Contractor pay requests will be submitted in a form suitable to DTPW staff or its designee based on the approved schedule of values under the contract.
- D. No payment will be made to the Contractor for incomplete activities.

#### 5.1 MEASUREMENT AND PAYMENT:

- A. Work under this section will be paid for as part of the price for each of the pay items.

**BASELINE NARRATIVE FORM FOR BAR CHART SCHEDULES**

Contract Title: \_\_\_\_\_

Contract No.: \_\_\_\_\_

Contractor: \_\_\_\_\_

Baseline and/or Update No.: \_\_\_\_\_

1. **Contractor's general approach for completing the work:**  
Including but not limited to any additional or unusual requirements not clearly represented in the schedule, the basis for the Contractor's determination of durations for major work items and his approach for meeting the interim and final completion dates in his schedule.  
Use additional sheets if necessary.

2. **Equipment to be used:**  
Including time that the equipment is to be on-site. Use additional sheets if necessary.

--

**BASELINE NARRATIVE FORM FOR BAR CHART SCHEDULES**

Contract Title: \_\_\_\_\_

Contract No.: \_\_\_\_\_

Contractor: \_\_\_\_\_

Baseline and/or Update No.: \_\_\_\_\_

3. Anticipated delivery dates for material/equipment:  
Use additional sheets if necessary.

--

4. Crews and Crew Sizes:  
Use additional sheets if necessary.

5. Rates of Production and Estimated Quantities:  
Use additional sheets if necessary.

**BASELINE NARRATIVE FORM FOR BAR CHART SCHEDULES**

Contract Title: \_\_\_\_\_

Contract No.: \_\_\_\_\_

Contractor: \_\_\_\_\_

Baseline and/or Update No.: \_\_\_\_\_

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFPXXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

6. **Workdays per week/Hours per Shift:**  
Use additional sheets if necessary.

7. **Non-work Periods assumed in the planning of the work:**  
Including holidays, rain days and any other non-work period assumed by the Contractor.  
Use additional sheets if necessary.

8. **Activities which may be expedited by the use of overtime or additional shifts:**  
Use additional sheets if necessary.

### **BASELINE NARRATIVE FORM FOR BAR CHART SCHEDULES**

Contract Title: \_\_\_\_\_

Contract No.: \_\_\_\_\_

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFPXXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01



Contractor: \_\_\_\_\_

Baseline and/or Update No.: \_\_\_\_\_

9. **Sequencing and other restraints affecting the work:**  
Including manpower, material and equipment restraints. Use additional sheets if necessary.

--

## MONTHLY SCHEDULE UPDATE NARRATIVE FORM FOR BAR CHART SCHEDULES

Contract Title: \_\_\_\_\_

Contract No.: \_\_\_\_\_

Contractor: \_\_\_\_\_

Baseline and/or Update No.: \_\_\_\_\_

1. **Progress This Period:**

Including all activities started, completed or in progress and signed material delivery tickets indicating when material was delivered on-site or to the fabrication plant as applicable.

Use additional sheets if necessary.

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFPXXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

2. **Planned Progress for Next Period:**

Use additional sheets if necessary.

**MONTHLY SCHEDULE UPDATE NARRATIVE FORM FOR BAR CHART SCHEDULES**

Contract Title: \_\_\_\_\_

Contract No.: \_\_\_\_\_

Contractor: \_\_\_\_\_

Baseline and/or Update No.: \_\_\_\_\_

i. **Problems and Solutions:**

Including a listing of all delayed activities, the reasons for delay and proposed recovery actions.  
Use additional sheets if necessary.

ii. **Changes Since Last Period:**

Use additional sheets if necessary.

**MONTHLY SCHEDULE UPDATE NARRATIVE FORM FOR BAR CHART SCHEDULES**

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

Contract Title: \_\_\_\_\_

Contract No.: \_\_\_\_\_

Contractor: \_\_\_\_\_

Baseline and/or Update No.: \_\_\_\_\_

iii. **Special Concerns and/or Questions regarding the Schedule:**  
Use additional sheets if necessary.

**END OF SECTION**

**TO PROVIDED POST AWARD**

## SECTION 01 32 33 CONSTRUCTION

### PHOTOGRAPHS

#### PART 1: GENERAL

##### 1.1 DESCRIPTION OF WORK

- A. The Contractor shall provide digital color photographs of all construction areas prior to start of work and take construction record color photographs periodically during the course of the Work.

##### 1.2 PHOTOGRAPHY REQUIRED

- A. Progress photographs shall be submitted to the DTPW staff or its designee with each Application for Payment.
- B. Photographs shall be taken, as a minimum, at each of the major milestones of construction listed below:
  - 1. Prior to commencement of any demolition/removal work.
  - 2. Of existing improvements upon completion of adjacent work.
  - 3. Of existing structures that are to be relocated, both before and after relocation.
  - 4. Upon completion of installation of signage and equipment at each location.
  - 5. Upon substantial completion of all work and finishes.
  - 6. Upon Final Acceptance of all work and finishes.
- C. Views and Quantities Required:
  - 1. Two views of each item listed above.
  - 2. Five views of overall project sites monthly, as directed by the DTPW staff or its designee
  - 3. Provide three (3) prints of each view along with a digital copy.
- D. Digital Files:
  - 1. The Contractor shall provide a CD or portable drive containing the monthly progress photo digital files that shall be cataloged and indexed in chronological order and shall be accompanied by a typed table of contents with the relevant descriptions. This CD or portable drive shall accompany the photographs submitted with the monthly Pay Request.
  - 2. The Contractor shall furnish additional prints to DTPW staff or its designee at commercial rates applicable at time of purchase or digital copies at no cost to DTPW.

##### 1.3 COSTS OF PHOTOGRAPHY

- A. The Contractor shall pay the cost for specified photography and prints; including the cost of digital photos. Parties requiring additional photography or prints will pay photography directly.

#### PART 2: - PRODUCTS

##### 2.1 PRINTS

- A. Color:

1. Paper: Single weight, color print paper.
2. Finish: Smooth surface, glossy.
3. Size: 8-inch x 10-inch. Mount with binder tabs.

B. Identify each print on back, listing

1. Name and number of Project
2. Orientation of view
3. Date and time of exposure

**PART 3: - EXECUTION**

**3.1 TECHNIQUE**

A. Factual Presentation.

B. Correct exposure and focus.

1. High resolution and sharpness
2. Maximum depth-of-field
3. Minimum distortion

**3.2 VIEWS REQUIRED**

A. Photograph from locations to adequately illustrate condition of construction and state of progress.

1. At successive periods of photography, take at least one photograph from the same overall view as previously done
2. Consult with the DTPW staff or its designee at each period of photography for instructions concerning views required.

**3.3 DELIVERY OF PRINTS**

A. Deliver prints to the DTPW staff or its designee to accompany each Application for Payment.

B. Distribution of prints as soon as processed is anticipated to be as follows:

1. DTPW staff or its designee: Two (2) printed set and one (1) digital set.

**PART 4: MEASUREMENT AND PAYMENT**

**3.1 MEASUREMENT:**

Work under this Section will not be separately measured for payment.

**3.2 PAYMENT:**

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

**END OF SECTION**

## SECTION 01 33 23

### SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

#### PART I: GENERAL

##### 1.1 DESCRIPTION:

- A. This section specifies preparing and submitting shop drawings, product data, and samples required under the contract.
- B. Dates for submission, and dates on which approved shop drawings, product data, and samples for each product will be needed, shall be designated in the Contractor's Schedule.

##### 1.2 SHOP DRAWINGS:

Furnish all shop drawings that are necessary to complete the scope of work in compliance with the design shown on the plans. Prepare all shop drawings using the same units of measure as those used in the contract drawings. Prepare or reproduce drawings on permanent material made for that purpose, such as tracing cloth, plastic, mylar, or xerographic bond paper. Shop drawings sheet size shall be 22 by 34 inches. Changes in products, for which shop drawings have been accepted, will not be permitted unless those changes have been accepted, in writing by the DTPW staff or its designee, as provided in Section 01 62 00, SUBSTITUTIONS AND PRODUCT OPTIONS.

##### 1.3 QUALITY ASSURANCE:

Shop drawings shall be prepared to a high standard of quality, and to the satisfaction of the County. Drawing level control shall be established and implemented to ensure documentation is controlled for specified applications on contract.

##### 1.4 PRODUCT DATA:

- A. Provide original documents or clearly legible photographic or xerographic copies of documents other than drawings, such as trade literature, catalogue information, calculations, manuals, etc. Clearly label and number each sheet in the submittal to indicate the total number of sheets in the series (i.e., 1 of 12, 2 of 12, ....12 of 12). Prepare all documents using the same units of measure as those used in the contract drawings. Bind and submit all documents with a cover sheet. List on the cover sheet the complete Contract number, a title referencing the submittal item(s), the name of the firm and person(s) responsible for the preparation of the document, the contractor's approval stamp with the data and initials, and, when applicable, the signature and embossed seal of the Specialty DTPW staff or its designee.
- B. Manufacturers' standard schematic drawings shall be modified to delete information which is not applicable to the project. Standard information shall be supplemented to include additional information applicable to the project.
- C. Manufacturers' standard catalog cuts, brochures, diagram, schedules, performance charts, illustrations, calculations, and other descriptive data shall be modified to delete information which is not applicable to the project. Dimensions, clearances, performance characteristics and capacities, and wiring diagrams and controls shall be shown.

- D. Certificates of Compliance shall be submitted for those products for which no samples and test results are specified. Certificates shall state that the product complies with the requirements of the respective specification section and shall be signed by a representative of the product manufacturer. A copy of the certificate shall accompany the product for which the certificate is prepared.

1.5 SAMPLES:

- A. Samples shall be of sizes and quantities to clearly illustrate full color range and functional characteristics of products and materials and shall clearly show attachment devices. After review and approval by the DTPW staff or its designee, samples may be used in construction of the project if samples are not damaged and are properly dispositioned for use. Changes in products for which samples have been accepted will not be permitted unless those changes have been approved, in writing, by the DTPW staff or its designee.
- B. Samples and sample installation shall be erected at the job site at locations acceptable to the DTPW staff or its designee and shall remain in place or available until completion of the project.

1.6 DADE COUNTY PRODUCT CONTROL APPROVAL:

The Contractor shall submit all required Dade County Product Approvals, as applicable, in accordance with this section and the Florida Building Code.

1.7 CONTRACTOR RESPONSIBILITIES:

Shop drawings, product data, and samples shall be reviewed, stamped and signed as approved, by the Contractor's designated authority prior to submission to the DTPW staff or its designee. Each submittal shall be coordinated with the requirements of the work. Returned marked-up submittals shall be reviewed and those requiring changes shall be changed and shall be resubmitted.

- A. Field measurements, catalog numbers, and similar data shall be verified.
- B. Work, for which submittals are required, shall not be started until submittals bearing the DTPW staff or its designee stamp and signature indicating review and approval has been received.
- C. Before submitting samples, assure that products of which samples will be submitted will be available in the quantities required by the project.
- D. The responsibility for errors and omissions in submittals shall not be relieved by the DTPW staff or its designee review and approval of submittals.
- E. Responsibility for deviations in submittals from requirements of the Contract Documents shall not be relieved by the DTPW staff or its designee review and approval of those submittals, unless the DTPW staff or its designee gives written approval of specific deviations.
- F. The Contractor shall verify that the product or system submitted for review has been approved by Dade County Product Control, if applicable, prior to making the initial submittal. Products which require Dade County Product Control approval and are not so approved shall be rejected by the DTPW staff or its designee. Product approval shall not be requested or initiated during the shop drawing review process but shall be requested and obtained prior to the Contractor's bid submittal.

1.8 SUBMISSION REQUIREMENTS:

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS



Submittals, excepting test results, shall be made in not less than 15 days before work covered by the submittals is scheduled to be performed. Allow ten (10) calendar days for review of shop drawing submittal by the DTPW staff or its designee. Test results shall be submitted within five (5) days after each test has been completed. Office samples shall be shipped prepaid. Submittals require approval of the DTPW staff or its designee prior to work covered by the submittals being scheduled to be performed.

- A. Quantities to be submitted shall be as follows:
  - 1. One (1) reproducible sepia and three (3) prints of shop drawings at each submittal until approved by the DTPW staff or its designee. If shop drawings are not approved, the marked-up sepia and one (1) marked up copy will be returned.
  - 2. Unless otherwise indicated, after approval by the DTPW staff or its designee submit final documents as required by the DTPW staff or its designee
  - 3. Three copies of manufacturers' standard schematic drawings.
  - 4. Three copies of manufacturers' calculations and three copies of manufacturers' standard data.
  - 5. Three samples as specified in each of the specification sections, unless otherwise specified.
  - 6. Three copies of each test result.
  - 7. Three copies of each Certificate of Compliance.
  - 8. Three copies of the Dade County Product Control Notice of Acceptance, if applicable.
- B. Submittals shall be accompanied by two transmittal forms containing the following information:
  - 1. Date submitted to the DTPW staff or its designee;
  - 2. Project title and Contract Number;
  - 3. Supplier's, manufacturer's and subcontractor's name, address and telephone number;
  - 4. Number and title of each shop drawing, product data, and sample submitted;
  - 5. Notification of known deviations from the drawings and the specification sections; and
  - 6. Dade County Product Approval number, if applicable.
  - 7. Other pertinent data.
- C. Submittals shall include a white space, three by four inches, in the lower right corner just above the title block, in which the DTPW staff or its designee may indicate the action taken. Submittals, as applicable, shall show as a minimum the following information:
  - 1. Date and revision dates.

2. Project title, drawing title and number and DTPW Contract Number
3. The names of the Contractor's DTPW staff or its designee, Subcontractor, lower tier Subcontractor, supplier, manufacturer and the name of the detailer or person(s) responsible for the drawing.
4. Consecutively number each sheet in the submittal series and indicate the total number in the series (i.e., 1 of 12, 2 of 12, ...12 of 12).
5. Identification of product by description, model number, style number, serial number, or lot number.
6. Location of the item(s) within the project.
7. Relation to adjacent structure or materials.
8. Field dimensions clearly identified as such.
9. Applicable specification section numbers.
10. Applicable standards, such as ASTM number and Federal Specification number.
11. Identification of known deviations from the drawings and specification sections.
13. Include in submittals a reference to supporting Subcontract drawing.
14. The DTPW staff or its designee will request a re-submittal when any of this minimum information is not included.

1.9 RESUBMISSION REQUIREMENTS:

Resubmittals shall be submitted by the Contractor so as to avoid delays to the project.

- A. Initial Shop Drawings: Shall be revised as required and resubmitted as specified for initial submittal. Changes which are made, other than those requested by the DTPW staff or its designee, shall be so indicated.
- B. New Product Data and Samples: Shall be resubmitted as specified for initial submittal.

1.10 DISTRIBUTION OF SUBMITTALS AFTER REVIEW:

Approved shop drawings and product data bearing the DTPW staff or its designee stamp and signature will be made available by the DTPW staff or its designee for the Contractor to pick up. The Contractor shall distribute copies to concerned lower tier subcontractors, suppliers, and fabricators; and to concerned members of the Contractor's work force.

1.11 DTPW STAFF OR ITS DESIGNEE DUTIES:

- A. Submittals will be reviewed and marked.
- B. Submittals will be reviewed for conformance to the requirements of the Drawings and Specification sections. Review will not relieve the contractor from his responsibility for the accuracy of the

submittals or for the conformity of the submittals to the requirements of the drawings and specification sections.

- C. Review of a separate item will not constitute review of an assembly in which the item functions.
- D. Stamp, date and signature will be affixed, and will certify that the submittal has been reviewed.
- E. The DTPW staff or its designee will return to the Contractor one sepia and one print or one copy of product data within the time frames specified in Article 1.08, SUBMISSION REQUIREMENTS.

## PART 2: PRODUCTS

### 2.01 PRODUCTS:

No products are required except as indicated in PART I: GENERAL.

## PART 3: EXECUTION

### 3.01 EXECUTION:

No execution is required except as indicated in PART I: GENERAL.

## PART 4: MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT:

Work under this Section will not be separately measured for payment.

### 4.02 PAYMENT:

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION

**TO BE PROVIDED POST AWARD**

## SECTION 01 33 30

### WORKING DRAWINGS

#### PART 1: GENERAL

##### 1.1 DESCRIPTION:

This Section specifies the preparation and submission of working drawings and associated calculations required by the specifications sections or to erect temporary structures to facilitate construction.

##### 1.2 WORKING DRAWINGS:

Working drawings shall be identified by reference to drawing page numbers and specification section numbers. Working drawings shall be prepared, seal-stamped, dated and signed by the Contractor's engineer, of the involved discipline, registered as a professional engineer in the State of Florida.

##### 1.3 QUALITY ASSURANCE:

All working drawings shall be prepared to a high standard of quality, and to the satisfaction of the County. Drawing level control shall be established and implemented to ensure documentation is controlled for specified applications on contract.

##### 1.4 ASSOCIATED CALCULATIONS:

Calculations shall be prepared, seal-stamped, dated and signed by the Contractor's engineer, of the involved discipline, registered as a professional engineer in the State of Florida. Calculations shall be identified by reference to Contract Drawing page numbers and specification section numbers.

##### 1.5 CONTRACTOR RESPONSIBILITIES:

Working drawings and associated calculations prepared by any subcontractor shall be reviewed, signed and dated as approved by the Contractor, prior to submission. Each submittal shall be coordinated with the requirements of the work.

- A. Field measurements and field construction criteria shall be verified by the Contractor.
- B. Work, for which working drawings and associated calculations are required, shall not begin until those drawings and calculations bearing the stamp and signature, indicating Contractor engineer's review, have been received.
- C. Submittals shall not relieve the Contractor of the responsibility for safe and effective design of structures for which the working drawings and associated calculations are submitted. DTPW staff or its designee shall in no way be liable to the Contractor and others for any consequences arising from work described in this section and shall not review and/or approve the working drawings.

##### 1.6 SUBMISSION REQUIREMENTS:

- A. Working drawings and associated calculations shall be submitted in sufficient time and not less than 30 calendar days before work represented by those drawings and calculations is scheduled to be performed. DTPW staff or its designee may expedite reviews on a case-by-case basis at the Sole discretion of DTPW staff.

B. Submittals shall be accompanied by two (2) Transmittal Forms containing the following information:

1. Submittal date.
2. Project title and number.
3. Contractor's name and address.
4. Number of each working drawing and associated calculation submitted.
5. Notification of known deviations from Construction Documents.
6. Other pertinent data.

## PART 2: PRODUCTS

### 2.01 PRODUCTS:

No products are required except as indicated in PART 1: GENERAL.

## PART 3: EXECUTION

### 3.01 EXECUTION:

No execution is required except as indicated in PART 1: GENERAL.

## PART 4: MEASUREMENT AND PAYMENT

### 4.1 MEASUREMENT:

Work under this Section will not be separately measured for payment.

### 4.2 PAYMENT:

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION

## **SECTION 01 43 00**

### **QUALITY ASSURANCE REQUIREMENTS**

#### **1.0: QUALITY ASSURANCE**

The Contractor shall develop an effective Quality Assurance Plan (QAP) to assure adequate quality throughout all phases of the Contract Work and shall describe the methods used and means employed for the implementation of the plan. The Contractor's QAP shall, at minimum contain the fifteen (15) quality elements of the FTA Quality Management System (QMS) Guidelines (FTA-PA-27-5194-12.1) as revised. The QAP shall ensure compliance with the requirements of the contract documents within the Contractor's, subcontractor's and supplier's organizations.

A sample QAP template shall be attached to the contract documents to be used as guidance in the development of the Contractors QAP.

#### **2.0: ORGANIZATION**

- 2.1 Personnel performing Quality Assurance/Quality Control (QA/QC) functions shall have sufficient, well-defined responsibility, authority and the organizational freedom to identify and evaluate quality problems, and to initiate, recommend or provide solutions.
- 2.2 The Contractor's QAP shall be subject to the Department of Transportation and Public Works (DTPW) verification at any time. Verification may include but not be limited to:
  - 1. Surveillance of the operations.
  - 2. Auditing of records and activities.
  - 3. Inspection to measure quality of items and/or works to ensure compliance with requirements.
  - 4. Review of Quality Records to ensure proper records keeping of activities affecting quality.These records shall be available for review by the DTPW at any time.

#### **3.0: APPLICABILITY**

The responsibility for providing QA/QC disciplines to verify that the work is performed in accordance with the Contract document rests with the Contractor. The Contractor's QAP shall be used to control quality throughout the duration of the project. Any inspections, audits or tests provided by the DTPW or designee shall not relieve the Contractor of the responsibility of providing work that strictly complies with the Contract requirements.

#### **4.0: REQUIREMENTS**

The Contractor's QAP shall be in-line with the FTA QMS Guidelines (FTA-PA-27-5194-12.1) and shall also include:

- 4.1 An organizational chart indicating lines of authority and reporting relationship including QA/QC personnel.
- 4.2 Detailed Quality Procedures and Inspection Forms.
  - 1. The QAP and associated quality procedures and inspection forms should be submitted to the DTPW five (5) days after Notice to Proceed (NTP) for review and approval.Note: All work undertaken by the Contractor before the approval of the Contractor's QAP by the DTPW QAD will be at the Contractor's risk and expense.
- 4.3 Records for all material tests, audits, and inspections performed, including data on conforming as well as nonconforming items shall be maintained by the Contractor at the job site current, up to date, and available for the DTPW inspection at any time throughout the contract work.

- 4.4 The Contractor's Daily Inspection Reports (DIR) is required by this Section and shall be available for review by the DTPW.
- 4.5 Test Records and Calibration Identification status of testing equipment required for the project shall be maintained by the Contractor and available for inspection by DTPW at any time throughout the contract work.

#### **5.0: NONCONFORMANCE AND REPAIR ACTION**

- 5.1 The Contractor shall maintain an effective system for controlling nonconforming material, including procedures for its identification, segregation, and disposition.
- 5.2 All nonconforming material shall be positively identified to prevent unauthorized use, shipment, or intermingling with conforming material. Disposition for the use or repair of nonconforming material shall require the approval of the DTPW.
- 5.3 The Contractor shall be responsible for all costs associated with the removal of components and/or devices, the shipping charges to and from the Contractor's facilities and the costs associated with their reinstallation and/or repair.

END OF SECTION

**TO BE PROVIDED POST AWARD**

**Project Quality Assurance Plan to be inserted  
(21 Pages)**

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS



## SECTION 01 45 23

### TESTING LABORATORY SERVICES

#### PART 1: GENERAL

- 1.1 REQUIREMENTS INCLUDED: "All tests required to be performed by the Contractor, shall be made at the expense of the Contractor." It is the responsibility of the Contractor to pay for DTPW's independent Testing Laboratory to perform the required testing. The Contractor will ensure all material test reports supplied by the Testing Laboratory are complete, accurate, and document acceptable test results for all material samples selected and tested.
- A. The Contractor shall cooperate with the laboratory to facilitate the execution of the Laboratory required services.
- B. Employment of a laboratory by DTPW shall in no way relieve the Contractor of its obligation to perform the Work.
- 1.2 SCOPE OF WORK:
- The Independent Testing Laboratory shall perform all tests required by the Contract Documents, applicable codes, Manufacturer's recommendations, governing laws, rules and regulations and those tests required for approvals by public agencies and authorities.
- 1.3 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY:
- A. The Laboratory is not authorized to:
- (1) Release, revoke, alter or enlarge on the requirements of the Contract Documents.
  - (2) Approve or accept any portion of the Work.
  - (3) Perform any duties of the Contractor.
- 1.4 CONTRACTOR'S RESPONSIBILITIES:
- A. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
- (1) When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- B. Cooperate with laboratory personnel; provide access to Work, and to Manufacturer's operations.
- C. Secure and deliver to laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- D. Provide to the DTPW staff or its designee a preliminary design mix proposed to be used for concrete, and other materials mixes which require control by testing laboratory as specified in the Contract.

- E. Furnish incidental labor and facilities:
  - (1) To provide access to Work to be tested.
  - (2) To obtain and handle samples at Project site or at source of product to be tested.
  - (3) To facilitate inspections and tests.
  - (4) For storage and curing of test samples.
- F. The Contractor shall review all material test reports received from the Testing Laboratory for completion of testing data with acceptable test results for material samples selected and tested. Ensure that any failures recorded in the test reports are resolved by appropriate methods to assure testing compliance with the contract documents.
- G. The Contractor shall maintain at the job site and throughout the construction project, records for all material samples selected with results by the Testing Laboratory for quality control verification of final test results received from the laboratory. A record control system shall be established for the review, maintenance and filing of all Testing Laboratory Reports received during the construction phase.
- H. Employ and pay for services of a separate, equally qualified independent testing laboratory (approved by DTPW) to perform additional inspections, sampling and testing required:
  - (1) For Contractor's convenience.
  - (2) When initial tests by DTPW's testing Laboratory indicate Work does not comply with Contract Documents and the Contractor wants a second opinion.
- I. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.
- J. Pay for removal costs of rejected materials, reinstallation of new materials and the costs of other corrective action.

## PART 2: PRODUCTS

No Product required.

## PART 3: EXECUTION

See PART 1.

## PART 4: MEASUREMENT AND PAYMENT

The work of DTPW's Testing Laboratory will be paid by Contractor unless additional costs are incurred by the Laboratory due to the DTPW's request.

END OF SECTION

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

## SECTION 01 52 00

### TEMPORARY FACILITIES

#### PART 1: GENERAL

- 1.1 DESCRIPTION: This Section specifies furnishing, installing, operating, maintaining and removing temporary facilities required for the prosecution of the work.
- 1.2 QUALITY ASSURANCE:
  - A. Temporary electrical power and lighting shall be provided in accordance with the applicable requirements of OSHA, Part 1926, Safety and health Regulations for Construction and installed in accordance with the NEC and all other applicable local and National Codes.
  - B. Temporary Sanitary Facilities, first aid services and fire protection shall be provided in accordance with the applicable requirements of OSHA, Part 1926, Safety and Health Regulations for Construction.

#### PART 2: PRODUCTS

- 2.1 ELECTRICAL MATERIALS: As required, UL listed.
- 2.2 SANITARY FACILITIES: As required.
- 2.3 FIRST AID SERVICES:
  - A. Supplies: Not less than one 16-unit first aid kit for each 50 persons, or fraction thereof, employed at the Work site.
  - B. Personnel: Not less than one certified person for each 50 persons, or fraction thereof, employed at the Work site. Provide each member of the first aid staff with a hard hat with the first aid emblem affixed to the rear of the hat. First aid personnel may be assigned other duties not interfering with their duties as first aid personnel.
- 2.4 FIRE PROTECTION MATERIALS: As required.
- 2.5 PROJECT SIGN
  - A. Project signs to be supplied by DTPW. The signs are to be picked-up by the contractor at a location designated by the DTPW staff or its designee.

#### PART 3: EXECUTION

- 3.1 ELECTRICAL POWER AND LIGHTING:
  - A. Locate and arrange electrical components so that they will not interfere with operations. Adequately support and protect from damage.
  - B. Maintain system in an operable condition. Promptly replace burned-out lamps, damaged conduits, defective wiring and other nonoperating or defective components.

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

- C. Remove temporary electrical power and lighting systems when the permanent electrical power and lighting systems have been approved for use in place of the temporary systems.

### 3.2 SANITARY FACILITIES:

- A. Locate the facilities in a manner and at locations to remain accessible, functional and secluded from public observation, insofar as practicable to do so. Relocate portions of the facilities as required as the activity center of the construction advances.
- B. Anchor portable facilities to prevent dislocation.
- C. Service toilet facilities as often as necessary to prevent accumulation of wastes and unsanitary conditions. In no event shall toilet facilities be serviced less frequently than twice each seven days.
- D. Permanent sanitary facilities constructed as a part of the Work shall not be used as temporary facilities. Evidence of use of permanent sanitary facilities by construction personnel shall constitute reason for rejection of such facilities.

### 3.3 FIRST AID FACILITIES:

- A. Instruct construction personnel as to the location of the first aid facilities.
8. Check first aid kits at least weekly and replace expended items.

- 3.4 FIRE PROTECTION: Locate the system in a manner and at locations to remain accessible, functional and readily identifiable during the entire period of construction. Relocate portions of the system as required when the activity center of the construction advances. Instruct construction personnel as to the location and proper use of each item of the temporary fire protection system.

### 3.5 PROJECT SIGNS:

- A. Install, maintain and remove temporary project signs as indicated by the DTPW staff or its designee.
- B. Anchor signs in a manner so as to prevent destruction and overturning due to high winds.
- C. Install temporary project signs at the locations indicated by the DTPW staff or its designee. Maintain signs in a neat and clean condition. Remove and replace damaged or deteriorated signs.

## PART 4: MEASUREMENT AND PAYMENT

### 4.1 MEASUREMENT:

Work under this Section will not be separately measured for payment.

### 4.2 PAYMENT:

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

## SECTION 01 56 23

### TEMPORARY BARRIERS

#### PART 1: GENERAL

- 1.01 DESCRIPTION: This Section specifies furnishing, installation maintenance, relocation and removal of temporary pedestrian barricades.

#### PART 2: PRODUCTS

- 2.01 MATERIALS:  
DTPW staff or its designee.

Temporary pedestrian barricades, as approved by the

#### PART 3: EXECUTION

- 3.1 Submit plan showing number and location of the pedestrian barricades for approval by the DTPW staff or its designee.
- 3.2 Contractor is to assure no public access inside of traffic barricades
- PART 4: MEASUREMENT AND PAYMENT
- 4.1 MEASUREMENT:
- Work under this Section will not be separately measured for payment
- 4.2 PAYMENT:
- Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION

## SECTION 01 58 13

### PROJECT CONSTRUCTION SIGNS

#### PART 1 - GENERAL

##### 1.1 WORK INCLUDED

- A. Pick up signs from the Miami-Dade County GSA Graphics sub-contractor
- B. Transport signs to the site and erect them on a moveable pressure-treated wooden frame as directed by the DTPW staff or its designee.

##### 1.2 QUALITY ASSURANCE

Signs shall be as manufactured by the Miami-Dade County GSA Graphics sub-contractor.

##### 1.3 JOB CONDITIONS

Signs shall be erected on a pressure-treated wooden frame as directed by the DTPW staff or its designee.

#### PART 2 - PRODUCTS (Not Used) PART 3 - EXECUTION

##### 3.1 MAINTENANCE

Maintain signs in a neat and clean condition. Repaint surfaces which exhibit flaking and cracking. Repair or remove and replace damaged or deteriorated signs.

#### PART 4 - MEASUREMENT AND PAYMENT

##### 4.1 MEASUREMENT

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION

## SECTION 01 62 00

### SUBSTITUTIONS AND PRODUCT OPTIONS

#### 1.01 DESCRIPTION:

- A. This Section specifies the procedures to be followed for preparing, submitting, amending and updating of lists of products proposed to be incorporated in the work.

#### 2.01 SELECTED PRODUCTS:

- A. Within ten (10) days after the effective date of NTP, submit five (5) copies of the list of selected products. Arrange the list in the order of each Section's appearance in the specification.
  - 1. For products specified only by reference standards, any product satisfying those standards may be selected. Show name and address of manufacturer; trade name, model number or catalog designation of the product; manufacturer's reference standards and pertinent performance and test data.
  - 2. For products specified by naming one product or by naming several products, this establishes a product standard. Any other product, which is equal in the opinion of DTPW staff or its designee may be furnished. A request must be submitted to the DTPW as required for substitutions, for acceptance of products not specifically named.
  - 3. Approve Equal: Where named products or sources are accompanied by the term "or equal" or other language of similar effect, provide one of the specified products, or submit a request for substitution for a product not named, in accordance with the requirements of Section 01 62 00 – Substitutions and Product Options, which the Contractor judges to be of equal or better quality.
  - 4. Amend and update list as changes concerning the information become known.

#### 3.01 LIST OF SUBSTITUTE PRODUCTS AND METHODS:

- A. Formal requests from the Contractor will be considered by DTPW staff or its designee for substitution of products and methods in place of those specified, but only if these requests are submitted within ten (10) days after effective date of NTP. No substitutions request will be considered after ten (10) days. Acceptance of substitute products and methods shall be only for the characteristics and use named in the acceptance and shall be interpreted neither as a modification to the Specification and Drawing requirements nor to establish acceptance of products and methods for other portions of the Transit System. DTPW staff or its designee shall judge the quality and suitability of the substitute product and method and his decision shall be final. Where use of a substitute product and method involves redesign of other parts of the work, the cost and time required to affect that redesign will be considered in evaluating the suitability of the substitute product and method.
- B. Submit five (5) copies of list of substitute products and methods, including the following information:
  - 1. Complete data substantiating compliance of the proposed substitution with the requirements of the Specifications and Drawings.
  - 2. For products:
    - a. Product identification, including manufacturer's name and address

- b. Manufacturer's literature, including product description, performance and test data and pertinent reference standards
- 3. For construction methods:
  - a. Detailed description of proposed method
  - b. working drawings illustrating methods
- 4. Itemized comparison of proposed substitution with product specified. Comparison shall include cost, differences in estimated life, estimated maintenance, availability of spare parts and repair services, energy consumption, performance capacity, salvage-ability, manufacturer's warranties and other material differences.
- 5. Data relating to changes in construction schedule.
- 6. Accurate cost data on proposed substitution in comparison with product and method specified except that cost data will not be required on substitutes proposed as equal, equivalent or superior to specified brand names and for which no request is made for price adjustment to the sub-contract.
- 7. Equitable adjustment and credit that the Contractor proposes to offer work if the substitutions are not equal, equivalent or superior to specified brand names.
- C. In making request for substitution, Contractor shall verify:
  - 1. That the Contractor has personally investigated the proposed product and method and that to the best of his knowledge, information and belief, the product and method is either equivalent or superior to that product and method specified and that he will update information as new or different data become known to him.
  - 2. That the Contractor will furnish the same guarantee for substitution as he would for the product and method specified.
  - 3. That the Contractor will coordinate installation of the accepted substitution into the work and will make those changes required for the work to be complete and operable.
  - 4. That cost data is complete and includes related costs and excludes cost of engineering redesign.
  - 5. That the Contractor waives claims for additional time and costs related to the substitution, which become apparent.
- D. Amend and update list as changes concerning information on the list become known to him.
- E. Substitutions will not be considered, if indicated or implied on Shop Drawings or Product Data submittal for which no formal request for substitution has been submitted. Requests for substitutions will not be considered if acceptance will require substantial revisions of drawings and specifications or both.
- 4.01 MEASUREMENT:
  - A. Work under this section will not be separately measured for payment.
- 5.01 PAYMENT:

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS



- A. Work under this section will be paid for as part of the pay item unit prices required to perform the work under this contract.

END OF SECTION

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

## SECTION 01 71 13

### MOBILIZATION

#### PART 1: GENERAL

- 1.1 DESCRIPTION: This Section specifies the mobilization of the construction equipment at the worksites for material and supplies necessary for the prosecution of the Work, but not to be incorporated in the work; for temporary storage of equipment and material at the site and for demobilization of the construction equipment. Mobilization also includes the following:
  - A. Costs of bonds and insurance required by the Contract Documents.
- 1.2 SUBMITTALS: Submit within seven days after the effective date of Notice to Proceed, a layout of the proposed construction plan site including fences, parking, and storage areas.

#### PART 2: PRODUCTS

- 2.01 EQUIPMENT: Construction equipment shall be of the capacity, type, quality, function and in the quantity necessary for the timely prosecution of the Work.

#### PART 3: EXECUTION

- 3.01 GENERAL: Construction equipment, material, supplies, and other items necessary for mobilization shall be available at the Work site at the times they are to be built, used, installed or operated.

#### PART 4: MEASUREMENT AND PAYMENT

##### 4.1 MEASUREMENT:

Work under this Section will be separately measured for payment.

##### 4.2 PAYMENT:

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION

## SECTION 01 73 29

### CUTTING AND PATCHING

#### PART 1: GENERAL

##### 1.1 REQUIREMENTS INCLUDED

- A. Contractor responsibility: All cutting, fitting and patching, required to complete the work to:
  - 1. Make its several parts fit together properly.
  - 2. Uncover portions for the work to provide for the installation of ill- timed work.
  - 3. Remove and replace defective work.
  - 4. Remove and replace work not conforming to requirements of Contract Documents.
  - 5. Remove samples of installed work as specified for testing.
  - 6. Remove routine penetrations of non-structural surfaces for installation of piping and electrical conduits.

##### 1.2 SUBMITALS

- A. Submit a written request to the DTPW staff or its designee well m advance of executing any cutting or alteration which affects:
  - 1. Work of the Owner or any separate contractor.
  - 2. Structural value or integrity of any element of the Project.
  - 3. Integrity or effectiveness of weather-exposed or moisture resistant elements or systems.
  - 4. Efficiency, operational life, maintenance or safety of operational elements.
  - 5. Visual qualities of sight-exposed elements.
- B. Include with each request:
  - 1. Identification of the Project.
  - 2. Description of affected work.
  - 3. The necessity for cutting alteration or excavation.
  - 4. Effect on work of Owner or any separate contractor, structural or weatherproof integrity of Project.  
or on
  - 5. Description of proposed work:
    - a. Scope of cutting, patching, alteration, or excavation.

- b. Trades who will execute the work.
- c. Products proposed to be used
- d. Extent of refinishing to be done.
- 6. Alternatives to cutting and patching.
- 7. Cost proposal, when applicable.
- 8. Written permission of any separate contractor whose work will be affected.
- C. Should conditions of Work or the schedule indicate a change of Products from original installation, submit request for substitution.
- D. Submit written notice to the DTPW staff or its designee designating the date the time the work will be uncovered.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Comply with specifications and standards for each specific product involved.

## PART 3 EXECUTION

### 3.1 INSPECTION

- A. Inspection existing conditions of Project, including elements subject to damage or movement during cutting or patching.
- B. After uncovering work, inspect conditions affecting installation of Products, or performance of work.
- C. Report unsatisfactory or questionable conditions to Architect in Writing; do not proceed with work until the DTPW staff or its designee has provided further instruction.

### 3.2 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Provide devices and methods to protect other portions of Project from damage.
- C. Provide protection from elements for that portion of the Project which may be exposed by cutting and patching work and maintain excavations far from water.

### 3.5 PERFORMANCE

- A. Executive cutting and demolition by methods which will prevent damage to other work, and which will provide proper surfaces to receive installation of repairs.
- B. Employ original Installer or Fabricator to perform cutting and patching for:
  - 1. Weather-exposed or moisture-resistant elements.
  - 2. Sight-exposed finished surfaces.
- C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
- D. Restore work which has been cut or removed, install new products to provide complete work in accord with requirements of Contract Documents.
- E. Fit work airtight to pipes, sleeves, ducts, conduit and other penetration through surfaces.
- F. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
  - 1. For continuous surfaces, refinish to nearest intersection.
  - 2. For an assembly, refinish entire unit.

#### PART 4 - MEASUREMENT AND PAYMENT

##### 4.1 Measurement:

Work under this Section will not be separately measured for payment

##### 4.2 Payment:

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION

## SECTION 01 74 00

### CLEANING

#### PART 1: GENERAL

- 1.1 DESCRIPTION: This Section specifies the maintenance of the work site in a clean, orderly hazard-free condition.
- 1.2 QUALITY ASSURANCE:
  - A. Conduct cleaning and disposal operations in accordance with local ordinances and anti-pollution laws. Rubbish, volatile wastes, and other construction wastes shall be neither burned nor buried on the work site, and shall not be disposed of into storm drains, sanitary drains, streams or other waterways.
  - B. Final cleaning shall be accomplished either by workmen experienced in cleaning operations or by professional cleansers.

#### PART 2: PRODUCTS

##### 2.01 CLEANING MATERIALS:

Cleaning material shall be as recommended by the manufacturer of the surface to be cleaned.

#### PART 3: EXECUTION

- 3.1 SAFETY REQUIREMENTS:
  - A. Maintain work site in accordance with local ordinances and anti-pollution laws applicable to work site cleanliness, and in a neat, orderly and hazard-free condition until final acceptance of the work. Catwalks, accessible underground structures, work site sidewalks and walkways adjacent to the work site shall be kept free from hazards caused by construction activities.
  - B. No volatile substances are to be used on the job site.
  - C. Prevent accumulation of waste, which creates hazardous conditions.
  - D. Artificially ventilate spaces, which are not naturally ventilated when noxious substances are being used in those spaces.
- 3.2 INTERIM CLEANING:
  - A. Perform cleaning every workday for duration of the work. Structures, ground, and areas of the work site and public and private properties shall be maintained free from  
  
accumulations of waste materials and rubbish caused by construction operations on the work site. Waste material will be removed from the work site daily.

- B. Remove or secure loose material on open decks and on other exposed surfaces at end of each day's work or more often to maintain work site in hazard-free condition. Prevent dislodgment of materials due to wind and other forces.
- C. Empty on-site waste containers whenever necessary so that trash overflow does not occur. Legally dispose of contents at either public or private dumping areas.
- D. Control the handling of materials, debris and rubbish; do not drop or throw from heights.
- E. Immediately remove spillages of construction-related materials from hauling routes.
- F. Perform cleaning operations dust and other contaminants resulting from cleaning processes will not fall on structures or pedestrian traffic below.

### 3.3 FINAL CLEANING:

- A. In preparation for substantial completion, conduct final inspection of exposed interior and exterior surfaces and of concealed spaces.
- B. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from finished surfaces.
- C. Maintain cleaning operations until project has been finally accepted.
- D. All skylights shall be professionally cleaned on both interior and exterior.

### 3.4 DAMAGE TO EXISTING FINISHES:

- A. Repair any concrete damaged.
- B. Repaint to match existing areas of damaged paint due to Contractors operation. PART 4:  
MEASUREMENT AND PAYMENT

### 4.1 MEASUREMENT:

Work under this Section will not be separately measured for payment.

### 4.2 PAYMENT:

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION

## SECTION 01 78 00

### CONTRACT CLOSE-OUT PART 1: GENERAL

#### 1.1 SUBSTANTIAL COMPLETION

- A. Substantial Completion shall be determined in accordance with the contract documents and this Section. Should a conflict arise between the General Conditions and this Section, the General Conditions shall take precedence.

#### 1.2 FINAL CONSTRUCTION REVIEW

- A. When Contractor considers work is complete, he shall submit a written certification that work is acceptable and that:
  - 1. Contract Documents have been reviewed.
  - 2. Work has been reviewed for compliance with Contract Documents.
  - 3. Work has been completed in accordance with Contract Documents.
  - 4. Equipment and systems have been tested in the presence of the DTPW staff or its designee and are safe for operation.
  - 5. Work is completed and ready for final Construction Review.
- B. The DTPW staff or its designee will make a Construction Review to verify status of completion with reasonable promptness after receipt of such certification.
- C. Failure of the DTPW staff or its designee to Reject Work During Construction: If, during construction operations or during inspections for substantial or final completion, the DTPW staff or its designee should fail to reject defective Work or materials, whether from lack of discovery of such defect or for any other reason, such initial failure to reject shall in no way prevent his later rejection when such defect is discovered, or obligate the Owner to final acceptance, and the Contractor shall make no claim for losses suffered due to any necessary removals or repairs of such defects.

#### 1.3 CONTRACTOR'S CLOSE-OUT SUBMITTALS

- A. Upon receipt of notice of acceptability from the DTPW staff or its designee, the Contractor shall furnish evidence of compliance with requirements of governing authorities and Contract Documents to the DTPW staff or its designee, as follows:
  - 1. As-built drawings and other project record Documents: As specified in Section 01 78 39.
  - 2. Operating and Maintenance Data, Instructions to Owners Personnel: As specified and in accordance with the requirements of the individual Sections of the Specifications.
  - 3. Warranties and Bonds: As specified in Section 01 78 33 and in accordance with the requirements of the individual Sections of the Specifications.
  - 4. Spare parts and Maintenance Materials: To requirements of various Sections.



5. Evidence of Payment to subcontractors, material men and equipment suppliers and releases of liens.

1.4 FINAL ADJUSTMENTS OF ACCOUNTS

A. Final Payment shall be determined in accordance with Article 35 9f the General Conditions.

1.5 FINAL CHANGE ORDER

A. The DTPW staff or its designee will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

PART 2: PRODUCTS

2.01 PRODUCTS:

No products are required except as indicated in PART 1: GENERAL.

PART 3: EXECUTION

3.01 EXECUTION:

Prior to final payment, the Contractor shall complete and execute the Close-Out forms in Attachment "B" to the General Conditions.

PART 4: MEASUREMENT AND PAYMENT

4.1 MEASUREMENT:

Work under this Section will not be separately measured for payment.

4.2 PAYMENT:

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION

WARRANTIES AND BONDS

PART 1: GENERAL

1.1 DESCRIPTION OF WORK

- A. The warranties provided by the Contractor shall be for the longest period, starting on the date of final acceptance, of those specified on paragraphs 1-01 A., 1 through 3 below:
1. Three years from final acceptance on all the work as specified in the General Conditions, or;
  2. Warranty period(s) as specified by the approved material or equipment manufacturers, or;
  3. Longer warranty period(s) as specified in the Technical Specifications.
- B. The Contractor shall provide certifications and other commitments, extended warranties and agreements for continuing services as specified elsewhere in the Contract Documents.
- C. Reinstated warranty as applicable, see 1-04, B.

1.2 DISCLAIMERS AND LIMITATIONS

Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS

Standard product warranties are reprinted written warranties published by the individual manufacturers for particular products and are specially endorsed by the manufacturer to the Owner.

1.4 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner Recourse: Written warranties made to the owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall

warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights or remedies.

- E. Contractor shall provide a written guarantee, to the owner, that proprietary parts and oil absorption material or their generic equal will be made available to the owner at least for 10 years from the date of the system start-up.
- F. Rejection of Warranties: The COUNTY reserves the right to reject warranties and to limit selections to products with acceptable warranties and to limit selections to products with warranties not in conflict with requirements of the contract Documents.
- G. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- H. All warranties including standard three years warranty, shall start at date of substantial completion of the Contract, or when work of an area is substantially completed, accepted and taken over for use by the Owner. Ensure that all warranties comply with this stipulation prior to submission of same.
- I. The Owner will give prompt notice in writing to the Contractor of any defects noted during the warranty periods requesting him to promptly remedy such defects.
- J. Prior to final acceptance, the Contractor shall formally assign to the Owner all extended warranties given by subcontractors for their work on the project, and such subcontractor shall be formally advised of the assignment.

#### 1.5 SUBMITTALS

- A. Submit written warranties to the DTPW staff or its designee prior to the date of the final acceptance inspection
- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the DTPW staff or its designee for approval prior to final execution.
- C. Submit a list of all warranty items within 90 days after notice to proceed. Refer to individual Sections of Division 2 through 16 for specific content requirements, and particular requirements for submittal of specific warranties.
- D. Prior to final acceptance compile two copies of each required warranty, and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual and submit under Section 01 78 39 Project Record Documents.
- E. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 inch by 11-inch paper.

- F. Provide heavy paper dividers with celluloid covered tabs for each separate warranty Mark the tab to identify the product or installation Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
- G. Identify each binder on the front and the spine with the typed or printed title, "WARRANTIES AND BONDS", the project title or name, and the name of the Contractor.
- H. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

## PART 2: PRODUCTS

### 2.01 PRODUCTS:

No products are required except as indicated in PART 1: GENERAL.

END OF SECTION

## SECTION 01 78 39

### PROJECT RECORD DOCUMENTS

#### PART 1: GENERAL

##### 1.1 DESCRIPTION

This Section specifies the maintaining, marking, recording and submitting of project record documents.

##### A. DEFINITIONS:

Conformed Contract Documents: The conformed documents provided to the Contractor at the time the construction contract was executed, prior to the start of construction.

Contractor Document Transmittal (CDT): Drawings, catalog cuts, samples or other documents submitted by the contractor for County and consultant review and approval showing in detail how the contractor proposes to carry out the work.

As-Builts: During construction, two set of conformed drawings and specifications, kept current by marking in red all "as-built" construction conditions and changes arising out of RFIs, clarifications, directed field changes and sketches. At the conclusion of construction activities, the information contained in these blue lines and specifications shall be incorporated into the Compact Disk (CD) containing the latest conformed drawings including revisions made by the DTPW staff or its designee of Record during construction. Prior to Contract completion, DTPW will provide the Contractor with a CD containing the latest conformed drawings. (Changes to specifications are typically only affected through change orders. However, in some occasions clarifications may require a modification to the specifications). The revised CADD drawings which include the information incorporated from the drawings and specifications become As-Builts.

Shop Drawings: See Contractor Document Transmittals.

##### 1.2 SUBMITTALS

Upon completion of the work, the Contractor shall submit the As-Builts to the DTPW staff or its designee in time to be used for the final inspection and acceptance and for verification by the DTPW staff or its designee. Availability of As-Builts shall be prerequisite to scheduling a final inspection of this Contract. Non-availability of As-Builts or inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by the DTPW staff or its designee until such time as the discrepancy has been corrected. Upon completion of the work, the As-Builts shall become the property of DTPW. The Contractor will transmit the As-Builts to the Resident DTPW staff or its designee with an attached Project Records "As- Built" Drawings Index Form uniquely identifying and describing each document.

Specifically, the following documents shall be submitted by the Contractor after construction is completed, but prior to submitting the request for final inspection:

- A. The Contractor shall submit two CDs labeled "As-Builts," one in PDF format and the other in CADD format. The Contractor shall date and mark each drawing as "As-Built" using the revision block, and each drawing should be electronically signed by the Contractor certifying the accuracy and validity of the information contained therein. The Contractor shall also submit two printouts from the CD

containing the As-Builts, and one set of blue lines and specifications to reflect change notices, change orders, requests for information and field changes in red. The information regarding field conditions/changes is to be maintained in the set of blue line record drawings and a set of specifications during construction. Prior to Contract completion, DTPW will provide the Contractor with a CD containing the latest conformed drawings, including revisions made by the DTPW staff or its designee of Record. At the end of construction, the "as-built" conditions are incorporated into the latest conformed drawings provided by DTPW. These final CADD drawings become As-Builts.

- B. The Contractor's DTPW staff or its designee shall sign each blue line drawing certifying the accuracy and validity of the as-built information contained therein.

### 1.3 QUALITY ASSURANCE

Project record documents shall conform to a high standard of quality, similar to that set forth in the National CADD Standard ANSI and ISO, or other relevant lower tier specification defining drafting quality and electronic file formatting.

## PART 2: PRODUCTS

### 2.01 PRODUCTS:

No products are required except as indicated in PART 1: GENERAL.

## PART 3: EXECUTION

### 3.1 ACCESS TO AND RETENTION OF DOCUMENTS

The Contractor shall provide Miami-Dade County, and any of its authorized representatives, subject to entering into Non-Disclosure Agreements, access to any work, books, documents, papers and records of the Contractor which pertain or relate to this Agreement or the Work for the purposes of making audits, examinations, excerpts and/or transcriptions during the performance of the Work and for a period of four (4) years after the date of the issuance of the Acceptance Certificate, except in the event of litigation or settlement of claims regarding or arising from the performance of this Agreement or the Work, in which case the Contractor shall maintain all such documents until all such litigation or settlement of claims have been fully completed and all appeals or exceptions exhausted.

### 3.2 MAINTENANCE OF DOCUMENTS:

The Contractor shall maintain at field office, one copy of each of the following:

- A. Contract Documents
  - 1. Conformed Contract Drawings and Conformed Specifications.
  - 2. Construction Safety Manual.
  - 3. Change Orders, Change Notices and other modifications to the Contract.
  - 4. DTPW staff or its designee Field Order or written instruction.
  - 5. Approved shop drawings, product data and samples.
  - 6. Field test reports/records.
  - 7. Updated set of record drawings (blue lines) marked in red to show field changes.

8. Request for information (RFI).
9. All directed Field Changes and sketches.
- B. Equal Employment and Affirmative Action Records.

### 3.3 RECORDING "AS-BUILT" DRAWINGS

A flowchart explaining this process is included with this section.

- A. Record information concurrently with construction progress on a conformed set of blue lines and specifications. During construction, this set of blue lines and specifications are known as "As-Built" drawings.
- B. Do not conceal any work until the required information is recorded.
- C. Drawings: legibly mark in red to record actual construction depicting the as- constructed configurations resulting from field and/or design changes:
  1. Horizontal and vertical location of underground utilities and appurtenances, referenced by dimensions to permanent, visible and accessible features of the structure.
  2. Location of internal utilities, electrical conduits and appurtenances, referenced by dimensions to permanent, visible and accessible features of the structure.
  3. Field changes of dimension and detail.
  4. Details not on original conformed Contract Drawings.
  5. Changes made by Change Notice or by Change Order.
- D. Legibly mark up each section of specifications to record:
  1. Manufacturer, trade name, catalogue number, and supplier of each product and item of equipment actually installed.
  2. Changes made by Change Notice or by Change Order.
- E. Any changes due to RFIs, clarifications and field sketches shall be incorporated into the record drawings by affixing sketches and other 8 1/2" x 11" sheets to the blue lines. This information will be incorporated into the CD containing the latest conformed drawings once construction is complete.
- F. Do not use the record drawing set for construction progress purposes.

### 3.4 DOCUMENT MAINTENANCE:

- A. Provide files and racks for storage of documents to maintain in clean, dry and legible condition.
- B. Do not use record documents for construction purposes.
- C. Make documents available for inspection by the DTPW staff or its designee, Federal Government and State Government.

#### PART 4: MEASUREMENT AND PAYMENT

##### 4.1 MEASUREMENT:

Work under this Section will not be separately measured for payment.

##### 4.2 PAYMENT:

Work under this Section will be paid for as part of the pay item unit price requiring the work specified in this section.

END OF SECTION

**TO BE PROVIDED POST AWARD**



## **ADDITIONAL PROJECT REQUIREMENTS**

2. STANDARD CONSTRUCTION GENERAL CONTRACT CONDITIONS AND ATTACHMENTS  
(FORMS ARE TO BE COMPLETED BY SELECTED CONTRACTOR DURING  
CONSTRUCTION)
3. MIAMI-DADE TRANSIT CONSTRUCTION SAFETY MANUAL AND ATTACHMENTS
4. DTPW ADJACENT CONSTRUCTION MANUAL

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

STANDARD CONSTRUCTION  
GENERAL CONTRACT CONDITIONS

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

STANDARD CONSTRUCTION  
GENERAL CONTRACT CONDITIONS  
TABLE OF CONTENTS

<u>Article</u>	<u>Title</u>	<u>Page</u>
1.	DEFINITIONS.....	3
2.	INTERPRETATION.....	62
3.	ARCHITECT/ENGINEER .....	64
4.	OWNER.....	65
5.	CONTRACTOR .....	67
6.	SUBCONTRACTORS .....	69
7.	PROSECUTION OF THE WORK.....	22
	A. Workmanship and Unauthorized Work	
	B. Material	
	C. Methods of Sampling and Testing	
	D. Meetings	
	E. Permits and Compliance with Laws	
	F. Coordination and Access	
	G. Rights in Land and Improvements	
	H. Interference with Existing Utilities	
	I. Protection of Existing Facilities, Vegetation, Structures, Utilities and Improvements	
	J. Damage to the Work and Responsibility for Materials	
	K. Emergencies	
	L. Accident Prevention	
	M. Warranty of Work	
8.	CONTRACT TIME.....	34
	A. Notice to Proceed	
	B. Schedules	
	C. Extensions of Time and Classification of Types of Delays	
	D. Substantial Completion and Final Acceptance	
	E. Use and Possession	
	F. Liquidated Damages/Liquidated Indirect Costs	
9.	PROGRESS PAYMENTS.....	43
	A. Payments	
	B. Taxes	
	C. Payments to Subcontractors and Suppliers	
	D. Contract Prices - Bid Form	

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

E. Final Payment	
10. CHANGES.....	51
A. Changes	
B. Allowance Accounts	
C. Deletion or Addition of Work	
D. Increased or Decreased Quantities (Unit Prices)	
E. Extra Work	
F. Differing Site Conditions	
G. Force Account	
H. Contractor Proposals - General	
I. Value Engineering Change Proposals	
11. CLAIMS AND DISPUTES .....	61
A. Notice of Claims	
B. Claim Submittals	
C. Disputes	
D. Termination	
12. MISCELLANEOUS PROVISIONS .....	73
A. No Third Party Beneficiary	
B. Venue	
C. Governing Laws	
D. Successors and Assigns	
E. Written Notice	
F. Indemnification	
G. Audit Rights	
H. Severability	
I. Payment and Performance Bonds	
J. Insurance	
K. Conflict of Interest	
L. Rights in Shop Drawings	
M. Patent and Copyright	
N. Historical, Scientific and Archaeological Discoveries	
O. Use of Owner's Name in Contractor Advertising or Public Relations	
13. ATTACHMENTS .....	81

# 1. DEFINITIONS

(June 12, 2012)

**Addendum/Addenda:** A modification or clarification of the Contract Documents distributed to prospective Bidders prior to the opening of Bids.

**Advertisement for Bids:** The public notice inviting the submission of Bids for the Work.

**Allowance Account (General):** Account in which a stated maximum dollar amount is included in the Contract for the purpose of funding, at the sole discretion of the Owner, unforeseen and/or changed conditions or extra work arising during the prosecution of the Work or any other changes issued by the Owner. The scope and limitations regarding use of the Allowance Account are contained in the Contract Documents. Performance of work, if any, under this Allowance Account shall be authorized by written Work Order issued by the Owner.

**Allowance Account(s) (Dedicated):** Account(s) in which stated maximum dollar amount(s) are included in the Contract for the purpose of funding specific items of work at the sole discretion of the Owner. The scope and limitations regarding use of the Dedicated Allowance Account(s) are contained in the Contract Documents.

**Architect/Engineer:** Owner or its authorized representatives identified in the Notice-to-Proceed letter, including but not limited to the Resident Architect/Engineer, the Construction Manager, the Owner's representatives and the Architect/Engineer of Record. In the event an Architect/Engineer is not employed on the project, the term "Owner" may be substituted for Architect/Engineer.

**Art in Public Places:** Miami-Dade County program established through Ordinance #94-12 and codified in Miami-Dade County Code Section 2-11.15 providing 1.5% of each County project's capital cost to fund a public art component within the Project. Coordination and installation of the Artist's work is included as part of the scope of the Contractor's services to the extent that it is defined in the Bid Documents.

**Artist:** Person(s) chosen through the Art in Public Places program to design and fabricate or specify an integrated work of art for the Project. The term Artist as may be referred to in the Contract Documents means the Artist and/or their authorized representative.

**As-Built Documents:** Documents signed and sealed by an appropriately licensed professional and submitted by the Contractor during and/or upon completion of the Contract reflecting actual installed/built conditions and all changes made in the Contract Documents during the construction process and showing the exact dimensions, geometry, location, identification and such other information as required by the Contract Documents and/or Architect/Engineer for all elements of the work completed under the contract. (Also referred to as As-Built Drawings or As-Built). Final payment is conditional upon the receipt of As-Built Documents.

**BCC:** Board of County Commissioners, the governing board of Miami-Dade County.

**Beneficial Occupancy:** The point at which the Owner or Architect/Engineer determines that the Work or any portion thereof can be occupied from a regulatory and work function

standpoint prior to Substantial Completion of the Work. Beneficial Occupancy will not relieve the Contractor of any of its obligations relative to Substantial Completion or of its responsibility to fully complete the Work in accordance with the Contract Documents.

**Bid:** The written offer of a Bidder to perform the Work.

**Bid Documents:** The Advertisement for Bids, Instructions to Bidders, Bid Form, Bid Security, Construction Contract, all contractual forms, General Conditions, Special Provisions, Technical Specifications and Contract Drawings, together with all Addenda and any other applicable standards, regulations, laws and permits as described within these other documents which may be incorporated by reference.

**Bid Item:** A specific item of work represented by a line item in the Bid Form.

**Bid Form:** The form on which Bids are submitted.

**Bid Security:** The cashier's check, certified check or bid bond, accompanying the Bid and submitted by the prospective bidder, as a guarantee that the prospective bidder will enter into a contract with the Owner for the performance of the Work and furnish acceptable bonds and insurance if the Contract is awarded to him.

**Bidder:** An individual, firm, partnership, corporation or combination thereof, submitting a Bid for the Work.

**Certificate of Substantial Completion:** Certificate issued to the Contractor by the Owner certifying that Substantial Completion has been achieved.

**Certificate of Completion:** Certificate issued by the local building official providing proof that a structure or system is complete and, for certain types of permits, is released for use and may be connected to a utility system. This certificate does not grant authority to occupy a building, such as a shell building, prior to the issuance of a Certificate of Occupancy by the local building official.

**Certificate of Final Acceptance:** Certificate issued to the Contractor by the Owner certifying that Final Acceptance has been achieved in accordance with the definition reflected herein (see Final Acceptance definition).

**Certificate of Occupancy:** Certificate issued by the local building official after the building official inspects the building or structure and finds no violations of the provisions of applicable codes or other laws that are enforced by the local building department.

**Change Notice:** A document issued by the Architect/Engineer or Owner to the Contractor specifying a proposed change to the Contract Documents and requesting a price proposal from the Contractor, if applicable, within a specified time period.

**Change Order:** A written agreement executed by the Owner, the Contractor and the Contractor's Surety, covering modifications to the Contract Documents.

**Construction Staging Area:** Property which may be available for use by the Contractor during the construction period for the purpose of storing products and construction equipment and for the purpose of staging the Work. The construction staging area(s), if applicable, are defined in the Contract Documents.

**Construction Contract:** The agreement executed by the Contractor and the Owner covering the performance of the Work including the furnishing of labor, superintendence, materials, tools and equipment as indicated in the Contract Documents. The term “Contract” shall have the same meaning.

**Consultant:** See Architect/Engineer.

**Contract Documents:** Bid Documents, Change Orders, Payment and Performance Bonds, Work Orders, Approved Schedules, all Contractual Forms, Approved Shop Drawings and Approved Working Drawings.

**Contract Drawings:** The plans, profiles, cross-sections, elevations, schedules, and details which show locations, character, dimensions and details of the Work. Contract Drawings are confidential under the Florida Public Records Act and the Contractor is responsible for maintaining confidentiality during and after the progress of the Work.

**Contractor:** The individual, firm, partnership, or corporation, or combination thereof, private, municipal, or public, including joint ventures, duly licensed under Florida Statutes, which, as an independent Contractor, has entered into a Contract with Miami-Dade County, who is referred to throughout the Contract Documents by singular in number and masculine in gender.

**Contract Time:** The number of days allowed for completion of the Work commencing with the effective date of Notice to Proceed. The Contract Time will be stipulated in the Contract Documents unless extended by a Change Order or by a Work Order.

**County:** See Owner.

**County Manager:** The County Manager of Miami-Dade County, Florida.

**County Mayor:** The Mayor of Miami-Dade County, Florida.

**Critical Path:** Longest sequence of activities in a project’s schedule which defines the project completion date and which must be completed on time in order for the project to be completed on schedule.

**Days:** Unless otherwise designated, days mean calendar days.

**Department Director:** The Director of the Miami-Dade County Department implementing the work.

**Department Director’s Representative:** The person or persons designated by the Department Director to act on his behalf in the administration of the contract within the limits of their respective authorization.

**Direct Costs:** Direct Costs recoverable by the Contractor as a result of changes in the Work shall be limited to the actual additional costs of labor and materials installed as part of the Work and for the reasonable additional cost of rental of any Special Equipment or Machinery. Labor shall be limited to site labor costs, including Employer’s Payroll Burden. Specifically excluded from labor are the costs of general foremen and site office personnel. Materials are limited to permanent materials required by the Contract Documents and materials approved by the Architect/Engineer as necessary to install the permanent materials in an efficient and workmanlike manner. For special equipment or machinery not listed in said document, the Contractor shall be paid a rental rate corresponding to the average

prevailing rental rate for such equipment or machinery in Miami-Dade County, Florida, subject to approval by the Architect/Engineer. No additional payment shall be made to the Contractor for fuel, lubricants, fair wear and tear, transportation, insurance or depreciation. Any equipment or machinery not designated by the Architect/Engineer as special equipment and machinery shall be considered Overhead.

**Extra Work:** Work not provided for in the Contract Documents as awarded or as previously modified by Change Order or Work Order but found to be essential to the satisfactory completion of the Contract within its intended scope.

**Field Representative/Construction Manager:** An authorized representative of the Owner that may provide administrative and construction inspection services during the pre-construction, construction, and closeout phases of the Contract and through which the orders of the Owner shall be given. The Field Representative has no authority to modify or waive any provision of the Contract Documents.

**Final Acceptance:** The formal written acceptance by the Owner of the completed work.

**Final Completion:** Point in time when the Owner determines that all Work has been completed in accordance with the Contract Documents and all deficiencies listed within the Certificate of Substantial Completion and Punch List have been corrected to the satisfaction of the Owner or Architect/Engineer including but not limited to all required final inspections, close-out documents, delivery of all spares and extra materials and activation of warranties as required. A Certificate of Final Acceptance shall be issued to the Contractor by the Owner upon Final Completion.

**Force Account:** A method of payment measured by actual cost of the labor, materials and equipment plus a mark-up for Indirect Costs, as distinct from other payment methods such as lump sum or unit price, for Extra Work ordered by Change Order and/or Work Order.

**Fragment:** A fragment or selected portion of the Schedule network and/or network of proposed changed work activities.

**Furnishing:** Manufacturing, fabricating and delivering to the site of the Work materials, plant, power, tools, patterns, supplies, appliances, vehicles and conveyances necessary or required for the completion of Work.

**General Conditions:** This section of the Contract Documents which specifies, in general, the contractual conditions.

**Green Building Practices:** Environmentally- and socially-conscious practices that emphasize processes and methods of design and construction that reduce exposure to noxious materials, conserve non-renewable energy and scarce materials, minimize life-cycle ecological impact of energy and materials, employ renewable energy or materials that are sustainably harvested, protect and restore local air, water, soils, flora and fauna, and support pedestrians, bicycles, mass transit and other alternatives to fossil-fueled vehicles.

**Indirect Costs: Overhead.**

**Installation, Install or Installing:** Completely assembling, erecting and connecting material, parts, components, supplies and related equipment specified or required for the completion of the Work including the successful passing of all tests so that they are fully functional.



**LEED (Leadership in Energy and Environmental Design):** An ecology-oriented building certification program run under the auspices of the U.S. Green Building Council (USGBC) which concentrates its efforts on improving performance across five key areas of environmental and human health: energy efficiency, indoor environmental quality, materials selection, sustainable site development, and water savings.

**Limit of Work:** Boundary within which the Work is to be performed.

**Liquidated Damages:** The amount that the Contractor accepts, as stipulated in the Contract Documents, that will be deducted from the Contract Sum for each Day of delay due to a Non-excusable Delay.

**Liquidated Indirect Costs Rate:** The amount, stipulated in the Contract Documents, that will be added to the Contract Sum for each Day of delay due to a Compensable Delay. The Contractor accepts this sum as full compensation for the Contractor's and all its Subcontractors' Indirect Costs, for each Day of Compensable Delays. This amount is agreed to include any costs other than Direct Costs incurred by the Contractor and all its Subcontractors of any tier in the performance of this Contract.

**Lump Sum Bid Item:** A bid item in which quantity is not separately measured for payment in units but rather is based on the amount bid by the Contractor as indicated in the Bid Form and made a part of the Contract. Partial payments of Lump Sum Bid Items will be conditionally made, based upon an approved schedule of values, and will be subject to reconciliation in the event that the work of a Lump Sum Bid Item is not fully completed in accordance with the requirements of the Contract Documents.

**Miami-Dade County (MDC):** A political subdivision of the State of Florida, the Owner.

**Milestone:** A completion date as defined in the Contract Documents.

**Notice to Proceed:** Written notice from the Owner to the Contractor specifying the date on which the Contractor is to proceed with the Work and on which the Contract Time commences to run.

**Notice of Termination:** Written notice from the Architect/Engineer or the Owner to the Contractor to permanently stop work under the Contract on the date and to the extent specified in the notice. The Notice of Termination includes Notices of Termination for Convenience, Default and National Emergencies as set forth in the Contract Documents. Upon receipt of such notice, the Contractor shall comply with the termination provisions of this Contract.

**Overhead (Indirect Costs):** Overhead, also defined as "Indirect Costs", includes any and all costs other than Direct Costs. The term "Overhead" as indicated in this definition shall apply to both Contractors and Subcontractors of any tier. Overhead includes, but is not limited to, all profit and costs associated with: Project bond premiums, Project insurance premiums, costs of supervision, coordination, superintendents, general foremen, consultants, schedulers, cost controllers, accountants, office administrative personnel, time keepers, clerks, secretaries, watch persons, small tools, equipment or machinery, utilities, rent, telephones, facsimile machines, computers, word processors, printers, plotters, computer software, all expendable items, job site and general office expenses, extended jobsite general conditions, interest on monies retained by the Owner, escalated costs of materials and labor, impact cost on unchanged work, inefficiency, decreased productivity, home office expenses or any cost

incurred that may be allocated from the headquarters of the Contractor or any of its Subcontractors, loss of any anticipated profits, loss of bonding capacity or capability losses, loss of business opportunities, loss of productivity on this or any other Project, loss of interest income on funds not paid, costs to prepare a bid, cost to prepare a quote for a Change in the Work, costs to prepare, negotiate or prosecute claims, costs of legal and accounting work, costs spent to achieve compliance with applicable laws and ordinances, loss of Projects not bid upon, loss of productivity or inefficiencies in the Work from any cause.

Owner: Miami-Dade County, whose governing body is the BCC acting in its proprietary capacity. Where applicable, the Owner acts through its Architect/Engineer or Field Representative. When these Contract Documents require the action of individual persons, the documents contain specific references to these persons. In particular, the documents shall refer to the BCC when approval of the BCC is specifically required and to the Architect/Engineer when the Architect/Engineer's approval is specifically required.

Payment and Performance Bonds: Bonds executed by the Contractor and its Surety assuring that the Contractor will, in good faith, perform and guarantee the work in full conformity with the terms of the Contract Documents and will promptly pay all persons supplying the Contractor with labor, materials, or supplies, used directly or indirectly by the Contractor in the prosecution of the Work. These bonds shall be two separate bonds, one bonding payment and one bonding performance. Each bond shall be for no less than 100% of construction amount - to not include the amount for the buses, which is the majority of the entire contract amount.

Project: See definition for Work.

Punch List: A list issued by the Owner to the Contractor of work elements requiring remedial action or completion by the Contractor before Final Completion is issued to the Contractor.

Right-of-Way: A term denoting land and property, and interests therein, owned or acquired by the Owner.

Schedules: All schedules delivered under the Contract including time schedules and schedule of values.

Schedule of Values: A detailed cost breakdown of each lump sum bid item in the bid form, submitted by the Contractor at the beginning of the Work and to be used as a basis to determine monthly progress payments and quantity adjustments within the constraints specified in the Contract Documents.

Shop Drawings: Documents furnished by the Contractor for approval by the Architect/Engineer to illustrate specific portions of the Work. Shop Drawings include drawings, diagrams, illustrations, calculations, schedules, tables, charts, brochures and other data describing design, fabrication and installation of specific portions of the Work.

Site, Project Site, Work Site, Construction Site, Job Site: The location(s) at which the work under this Contract is to be accomplished, as shown in the Contract Documents.

Special Provisions: Section of the Contract which includes specific contractual requirements not covered in the General Conditions that are specific to the Project.

**Subcontractor:** Any person or entity, other than the employees of the Contractor, supplying the Contractor with labor, materials, supplies and/or equipment used directly or indirectly by the Contractor in the prosecution of the Work.

**Substantial Completion:** Substantial Completion of a Project is the date on which the Owner certifies that the construction is sufficiently completed, in accordance with the Contract Documents, as modified by any Change Orders, so that the Owner can occupy the Project for the use for which it was intended. A certificate shall be issued to the Contractor by the Owner upon achievement of Substantial Completion.

**Surety:** The bonding company or companies furnishing the bonds required of a Bidder and of the Contractor.

**Technical Specifications:** The general term comprising all the written directions, provisions and requirements contained herein, entitled "Technical Specifications," those portions of standard specifications to which reference is specifically made in the Technical Specifications, and any Addenda, Work Orders and Change Orders that may be issued for the Contract, all describing the work required to be performed, including detailed technical requirements as to labor, materials, supplies and equipment and standards to which such work is to be performed as well as any reports specifically issued with the Bid Documents and specifically identified in the Instructions to Bidders which may include geotechnical or other technical reports.

**Temporary Construction Easement Line:** A boundary which describes additional areas which may be made temporarily available for construction operations.

**Time Contingency:** The maximum time specifically identified in the Contract Documents by which the Owner may extend the contract time to accomplish the work without a change order. Limitations on the use of the time contingency are set forth in the Contract Documents.

**Unit Prices:** Unit prices shall include all labor, materials, tools, and equipment; all other direct and indirect costs necessary to complete the item of Work and to coordinate the unit price Work with adjacent work; and shall include all overhead and profit. Contractor shall accept compensation computed in accordance with the unit prices as full compensation for furnishing such Work.

**Work:** The construction and services required by the Contract Documents, which includes all labor, materials, equipment, and services to be provided by the Contractor to fulfill the Contractor's duties and obligations imposed by the Contract Documents or, if not specifically imposed by the Contract Documents, which can be reasonably assumed as necessary to fulfill the intent of the Contract Documents to provide a complete, fully functional and satisfactory project.

**Work Order:** A written order, authorized by the Architect/Engineer or Owner, directing the Contractor to perform work under a specific Allowance Account or directing the Contractor to perform a change in the Work that does not have a monetary impact, including but not limited to, extending the Contract Time or subject to the payment of Liquidated Indirect Costs if entitlement is established as required by these Contract Documents. No Work Order may increase the Contract

## **2. INTERPRETATION**

(June 12, 2012)

- A. The intent of the Contract is to include all necessary items for the proper completion of the Work by the Contractor so the Owner may have a fully functioning facility and fully receive the benefits intended under the Contract. The Contractor shall perform, without additional compensation, such incidental work as necessary to complete the Work and fulfill the design intent, in accordance with the requirements set forth in the Contract Documents, so that it will meet the requirements for which the Project was intended, in a satisfactory and workmanlike manner.
- B. The Contract Documents and all referenced standards cited are essential parts of the Contract requirements. A requirement occurring in one is as binding as though occurring in all. The documents comprising the Contract Documents are complementary and indicate the construction and completion of the Work. Anything mentioned in the Contract Documents and not shown on the Contract Drawings or shown on the Contract Drawings and not mentioned in the Contract Documents, shall be of like effect as if shown or mentioned in both. The more stringent shall apply in the case of a conflict.
- C. Site Inspections and Verification of Governing Dimensions: In executing the contract, the Contractor represents that he has, prior to bid, visited the site, become familiar with the conditions under which the work is to be performed and correlated his personal observations with the requirements of the Contract Documents or that he has chosen not to do so, in the event that a mandatory site visit is not specified in the Contract Documents. The Contractor accepts the responsibility for all errors in construction which could have been avoided by such examination and the opportunity to seek timely clarifications during the bidding process. The Contractor, before commencing work, shall verify all governing dimensions at the site, and shall examine all adjoining work on which his work is in any way dependent for its conformance with the intent of the Contract Documents and no disclaimer of responsibility for defective or non-conforming adjoining work will be considered unless notice of same has been filed by the Contractor, and agreed to in writing by the Owner through the Architect/Engineer before the Contractor begins any part of the Work. No disclaimer for defective or non-conforming adjoining work that was clearly foreseeable to the Contractor during a site visit (mandatory or non-mandatory) will be considered by the Owner.
- D. Errors, Inconsistencies and Omissions: The Contractor shall carefully study and compare all drawings, Contract Documents and other instructions; shall verify all figures on the Contract Drawings before laying out the Work; shall notify the Owner or Architect/Engineer of all errors, inconsistencies, or omissions which he may discover; and obtain specific instructions in writing during the bidding process and prior to submitting his Bid. The Contractor shall not take advantage of any apparent error or omission which may be found in the Contract Drawings or Contract Documents, and the Architect/Engineer shall be entitled to make such corrections therein and interpretations thereof as he may deem necessary for the fulfillment of their intent. The Contractor shall be responsible for all errors in construction which

- could have been avoided by such examination and notification, and shall correct, at his own expense, all work improperly priced, scheduled or constructed through failure to notify the Owner or Architect/Engineer and to request specific instructions.
- E. Where "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the Contract Documents unless stated otherwise.
- F. References to Articles or Sections include sub-articles or subsections under the Article referenced.
- G. Referenced Standards: Material and workmanship specified by the number, symbol, or title of a referenced standard shall comply with the latest edition or revision thereof and amendments and supplements thereto in effect on the date of the Invitation to Bid except where otherwise expressly indicated. In case of a conflict between the Contract Documents and the referenced standard, the Contract Documents shall govern.
- H. Order of Precedence of Contract Documents: Unless otherwise provided for in the Special Provisions or required by law, the order of precedence of the Contract Documents will be as follows:
- 1) Change Orders to the Contract
  - 2) Notice to Proceed
  - 3) Construction Contract
  - 4) Addenda
  - 5) Special Provisions
  - 6) General Conditions
  - 7) Technical Specifications
  - 8) Contract Drawings
  - 9) Referenced Codes and Standards
  - 10)Guarantees
  - 11)Instructions to Bidders
  - 12)Invitation to Bid
  - 13)Other documents
- I. In case of differences between small and large scale drawings, the drawings showing greater detail shall govern. Schedules on drawings shall take precedence over conflicting notations on drawings. In the event of discrepancy between any scaled dimensions on drawings and the figures written thereon, the figures shall govern over the scaled dimensions unless otherwise indicated.
- J. Explanations: Should it appear that the Work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Contract Documents, the Contractor shall apply to the Owner or Architect/Engineer in a timely manner to allow sufficient time for such further written explanations as may be necessary and shall conform to the explanation provided as part of the Contract. The Owner or Architect/Engineer's decision shall be final.

- K. Effect of Headings: The headings and titles to provisions in the Contract Documents are descriptive only and shall be deemed not to modify or affect the rights and duties of parties to this Contract.
- L. No acceptance, order, measurement, payment, or certificate of or by the Architect/Engineer and/or the Owner or its employees or agents shall either estop the Owner from asserting any rights or operate as a waiver of any provision hereof or of any power or right herein reserved to the Owner or of any rights to damages herein provided.
- M. Wherever the terms, "as directed", "ordered", "permitted", "designated", "as approved", "approved equal", "or equal", "acceptable" and other words of similar meaning which authorize an exercise of judgment are used in the Contract Documents, such judgment shall be vested only in the Architect/Engineer and/or the Owner and shall be final.
- N. The Contractor shall make available at the job site one copy of each referenced standard and/or Contract Documents for the Contractor's and the Field Representative's use during the time that work covered by the standards and/or Contract Documents is underway.
- O. The Contract Documents provide for a complete work and may have been prepared in divisions of various crafts, trades and other categories of work. The Contractor is responsible for the performance of all work under the Contract regardless of any such divisions and shall ensure that all of the work is performed and completed. The organization of the Contract Documents into divisions, sections and articles and the arrangement of the drawings do not restrict or limit the Contractor into dividing the Work among subcontractors or in establishing the extent of the Work to be performed by any trade.
- P. No deviation from the approved Contract Documents shall be permitted without the prior written approval of the Owner, which approved deviation shall be documented either by Change order or Work Order.
- Q. All Requests for Information by the Contractor per this section shall be in accordance with the Contract Documents.

### **3. ARCHITECT/ENGINEER/FIELD REPRESENTATIVE**

(June 12, 2012)

- A. The Architect/Engineer shall respond to questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work in accordance with the time frames prescribed in the Contract Documents. The Architect/Engineer shall decide all questions which may arise as to the interpretation of the Contract Documents relating to the Work, and the fulfillment of the Contract on the part of the Contractor, and those decisions shall be binding on the Contractor

- B. The Architect/Engineer is not authorized to revoke, alter, or waive any requirement of the Contract.
- C. The Architect/Engineer, Owner or Field Representative shall have free access to the Work and materials at all times to facilitate the performance of his duties.
- D. Subject to concurrence by the Owner, the Architect/Engineer shall have the right to observe and reject any material or work performed which does not meet the requirements of the Contract Documents. When the Architect/Engineer discovers any work in progress or completed that does not meet the requirements of the Contract Documents, the Architect/Engineer shall reject that portion of the Work affected and shall confirm such rejection in writing, as soon as practical, detailing the reasons for the rejection. Work rejected by the Architect/Engineer will not be paid for. Any such observation and/or rejection shall not be construed as undertaking supervisory control of the Work or of means and methods employed by the Contractor or his Subcontractors and shall not relieve the Contractor of any of his responsibilities or obligations under the Contract. The Contractor shall not request or attempt to require the Architect/Engineer to undertake such supervisory control or to administer, supervise, inspect, assist, or act in any manner so as to relieve the Contractor from such responsibilities or obligations.
- E. The fact that the Architect/Engineer has not made early discovery of materials furnished or work performed which does not meet the requirements of the Contract Documents, shall not bar the Architect/Engineer from subsequently rejecting said materials or work.
- F. If either the Architect/Engineer or the Field Representative requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the Contract Documents. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as Extra Work. Should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at no additional cost to the Owner.
- G. Any work done or materials used which are not in compliance with the Contract Documents may be ordered removed and replaced at the Contractor's expense.
- H. The Owner and other agencies having jurisdiction over the work hereunder shall be afforded free access to the site to perform such inspections and tests as may be required to determine conformance of the Work with the Contract Documents.
- I. Neither the Architect/Engineer nor the Field Representative shall be responsible for any safety obligations imposed on the Contractor by applicable industry standards, licensing requirements, laws or regulatory requirements.

## **4. OWNER**

(June 12, 2012)

- A. Unless otherwise specified or excluded elsewhere in the Contract Documents, the records of borings, test excavations and other subsurface investigations, if any, are offered as information only and solely for the convenience of the Contractor. The Owner does not warrant or guarantee either that said records are complete or that the said records will disclose the actual subsurface conditions. The interpretation of the records and the conclusions drawn therefrom as to the actual existing subsurface conditions are the sole responsibility of the Contractor.
- B. Any estimates of quantities of work or materials, based on said borings, test excavations and other subsurface investigations are not warranted by the Owner to indicate the true quantities or distribution of quantities unless the Contractor is expressly directed to rely on such information to prepare and submit his Bid.
- C. If the Contractor is notified by the Owner to correct defective or nonconforming work, and the Contractor fails to promptly proceed with corrective action in a reasonable time, the Owner may, upon written notice, accomplish the redesign, repair, rework or replacement of nonconforming work by the most expeditious means available and backcharge the Contractor for the cost incurred. The cost of backcharge work shall include all reasonable costs associated with the corrective action.
- D. The Owner shall separately invoice or deduct from payments, otherwise due to the Contractor, the costs as provided herein. The Owner's right to backcharge is in addition to any or all other rights and remedies provided in this Contract, or by law. The performance of backcharge work, on behalf of the Owner, shall not relieve the Contractor of any of its responsibilities under this Contract including but not limited to express or implied warranties, specified standards for quality, contractual liabilities and indemnifications, and the Contract Time.
- E. The Field Representative and/or Architect/Engineer will administer the Contract and the orders of the Owner are to be given through the Field Representative and/or Architect/Engineer. The Field Representative and/or Architect/Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for under the Contract.
- F. The Field Representative will observe the Contractor's work for compliance with the Contract Documents. Such observation shall extend to all or any part of the work done and to the preparation, fabrication, or manufacture of the material to be used.
- G. Upon discovery, the Field Representative shall call the Contractor's attention to faulty workmanship or defective materials and shall reject work and materials not conforming to the requirements of the Contract Documents.
- H. When any work in progress or completed does not meet the requirements of the Contract Documents, the Field Representative shall have the authority to order the Contractor to shut down that portion of the work affected until the affected work is corrected to the satisfaction of the Field Representative. The Field Representative shall confirm this order in writing as soon as practicable, detailing the reasons for the shutdown. Work performed in violation of the Field Representative's order to shutdown will not be accepted or paid for.



- I. The Field Representative is not authorized to revoke, alter, or waive any requirements of the Contract. The Field Representative will negotiate and act on behalf of the Owner to the authorized limits of his authority as specified in the Contract Documents.
- J. Whenever the Contractor intends to build, assemble or perform any portions of the Work away from the site, the Contractor shall promptly notify the Field Representative of such intentions, including where and when such work is to be performed, before such work starts. The Contractor shall also make arrangements for access thereto by the Field Representative and/or the Architect/Engineer so that the aforementioned portions of the Work may be inspected as needed.
- K. The fact that the Field Representative has not made early discovery of materials furnished or work performed which does not meet the requirements of the Contract Documents, shall not bar the Field Representative from subsequently rejecting said materials or work and does not relieve the Contractor of his responsibility to meet the requirements of the Contract Documents.
- L. The Field Representative shall not act as a foreman or perform other duties for the Contractor, nor interfere with the management of the work by the Contractor.
- M. The administration, observation of the work, and actions by the Field Representative, as herein provided, shall not be construed as undertaking supervisory control of the construction work or of means and methods employed by the Contractor or his Subcontractors and shall not relieve the Contractor from any of his responsibilities or obligations under the Contract; the Contractor shall not request or attempt to require the Field Representative to undertake such supervisory control or to administer, to supervise, to inspect, to assist, or to act in any manner so as to relieve the Contractor from such responsibilities or obligations.
- N. The Field Representative shall decide all questions relating to the rights of different prime Contractors on the Project or site.
- O. All materials and each part or detail of the work shall be subject to observation by the Field Representative and/or the Architect/Engineer. The Architect/Engineer and the Field Representative shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required.
- P. Miami-Dade County enters into this Contract solely in its proprietary capacity. Nothing in this Contract is intended to bind or otherwise restrict the discretion of Miami-Dade County acting in its regulatory capacity, including but not limited to the regulatory acts of the Departments of Regulatory and Economic Resources (RER), Transportation and Public Works (DTPW), Fire-Rescue (MDFRD) and Water & Sewer (WASD) or their successors.

## **5. CONTRACTOR**

(June 12, 2012)

- A. If the Contractor hereunder is comprised of more than one legal entity, each such entity shall be jointly and severally liable hereunder.

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

- B. The Contractor shall hold valid current certificate(s) of competency for the type of work to be performed, in accordance with the qualifications requirements as set forth in Chapter 489 of the Florida Statutes and Chapter 10 of the Code of Miami- Dade County.
- C. The Contractor shall maintain within Miami-Dade County, Florida, a duly authorized agent to accept service of legal process on its behalf, and shall keep the Owner advised of such agent's name and address, during the duration of the Contract, and for three years after final payment or as long as Contractor has warranty obligations under these Contract Documents, whichever period terminates later. The Contractor shall complete the form titled "Contractor Agent to Accept Service" included in the Contract Documents and submit it to the Architect/Engineer prior to NTP.
- D. The Contractor shall be responsible for the complete performance for all of the work under the Contract, and for the methods, means, and equipment used in performing the Contract and for all materials, tools, apparatus and property of every description used in connection therewith.
- E. Upon approval of the Contractor's schedule by the Owner, the Contractor will submit written confirmation from all his Subcontractors agreeing to work within the timeframes specified in the Contractor's approved schedule.
- F. Contractor's Superintendent: The Contractor shall provide a superintendent at the site at all times who is competent in the type of work being performed to act as the Contractor's agent, and shall give that superintendent the full authority to receive instruction from the Field Representative or Architect/Engineer and to execute the order or directions of the Field Representative or Architect/Engineer, including the prompt supply of all materials, tools, equipment, labor, and incidentals that may be required. The Contractor shall furnish such superintendence regardless of the amount of work that is subcontracted, and the superintendent shall read, speak, write and understand English. The Contractor shall also maintain at least one other employee on the work site during Project working hours who speaks and understands English. This superintendent shall be responsible for keeping written daily logs of the work on the project.
- G. The competency of the superintendent shall be demonstrated through licensure or certification in contracting, engineering, trade or experience as applicable to the work being performed. Proof of licensure, certification or qualification of the superintendent must be provided to the Owner at the pre-construction conference and is subject to the approval of the Architect/Engineer or Field Representative after Contractor receipt of said requirements.
- H. In the event that the Field Representative or Architect/Engineer determines, through the course of the actual work progress, that the superintendent lacks the knowledge or expertise necessary to execute the work in an efficient and competent manner, in keeping with all current codes and best practices, the Field Representative or Architect/Engineer shall notify the Contractor in writing and the superintendent shall be replaced by the Contractor with a person acceptable to the Field Representative or Architect/Engineer within five (5) working days.

- I. The Contractor's failure to replace the superintendent in the time allotted shall be cause for the Owner to suspend work with such delays chargeable to the Contractor as Liquidated Damages as specified elsewhere in this contract.
- J. The Contractor shall maintain a daily accounting of his daily manpower, by trade and position, and provide this information to the Field Representative on a weekly basis.

## **6. SUBCONTRACTORS**

(June 12, 2012)

- A. The Contractor will be permitted to subcontract portions of the Work to competent Subcontractors. Such Subcontractors shall hold valid current certificate(s) of competency for the type of work to be performed, in accordance with the qualifications requirements as set forth in the Florida Statutes and the Code of Miami- Dade County.
- B. Nothing contained herein shall create any contractual relationship between the Owner and any level of Subcontractor, materialman or supplier.
- C. All work performed for the Contractor by a Subcontractor shall be pursuant to an appropriate agreement between the Contractor and the Subcontractor which shall contain provisions that:
  - 1) Preserve and protect the rights of the Owner and any of its authorized representatives under the Contract, including but not limited to, the Architect/Engineer and Field Representative, with respect to the Work to be performed under the subcontract so that the subcontracting thereof will not prejudice such rights;
  - 2) Require that such Work be performed in accordance with the requirements of the Contract Documents including the Contractor's approved schedule;
  - 3) Require submission to the Contractor of applications for payment under each subcontract to which the Contractor is a part, in reasonable time to enable the Contractor to apply for payment in accordance with any and all payment provisions of the Contract Documents;
  - 4) Require that all claims for additional costs, extensions of time, damages for delays or otherwise with respect to subcontracted portions of the Work shall be submitted to the Contractor (via any Subcontractor or Sub-subcontractor or Supplier where appropriate) in sufficient time so that the Contractor may comply in the manner provided in the Contract Documents for like claims by the Contractor upon the Owner;
  - 5) Require specific consent to all relevant provisions of the Contract Documents; and
  - 6) Incorporate all flow-down clauses specifically called for in the Contract, as directed.
- D. Contractor Participation: The Contractor shall perform not less than 25 percent of the Work, not inclusive of materials purchased, with his own organization. If the Contractor is a joint venture, the requirement shall be satisfied by any one, or a

combination of any of the joint venture partners. Where a percentage of a Bid Item is subcontracted, the dollar value of that percentage subcontracted will be based on the estimated cost of such Bid Item, determined from information submitted by the Contractor, subject to approval by the Owner. The materials produced by other than the Contractor's forces shall be considered as being subcontracted. If, during the progress of the Work, the Contractor requests a reduction in such participation percentage, and the Owner determines that, due to the special nature of the conditions of the Work at the time, it would be to the Owner's advantage, the percentage of the Work required to be performed by the Contractor may be reduced, provided written approval of such reduction is obtained by the Contractor from the Owner. The Contractor shall not proceed with any such reductions until his request is approved in writing by the Owner or his authorized designee. Under no circumstances shall less than ten percent (10%) of the Work be performed with the Contractor's own forces.

E. Work Performed by Equipment-Rental Agreement:

- 1) The amount of work performed under equipment rental agreements shall not be considered Subcontractor work. However, for work to be performed by equipment-rental agreement, the Contractor shall notify the Architect/Engineer in writing of such intention before using the rented equipment, and shall indicate whether the equipment is being rented on an operated or non-operated basis. The Contractor's written notice shall contain a listing and description of the equipment and a description of the particular work to be performed with such equipment. As an exception to the above requirements for a written notice to the Architect/Engineer, such notice will not be required for equipment to be rented (without operators) from an equipment dealer or from a firm whose principal business is the renting or leasing of equipment.
- 2) The operators of rented equipment, whether rented on an operated or a non-operated basis, will be subject to wage rate requirements applicable to the Project. If equipment is being rented without operators, the Contractor shall be required to carry the operators on his own payroll. When equipment is rented on an operated basis, the Contractor, when required by the Contract or requested by the Architect/Engineer, shall submit payrolls from the lessor with the names of the operators shown thereon.

F. No work is to be performed at the Work site until the Contractor is in compliance with the Insurance Specifications, has furnished satisfactory evidence of required insurance to the Owner and obtained all required permits.

G. Approval of Subcontractor:

- 1) Prior to entering into any subcontract for Work to be performed on the Project, the Contractor shall secure the approval of the Owner regarding the prospective subcontractor's qualifications, employment data and compliance with CSBE program requirements. The forms used to provide the required information shall be the same as those included in the Forms for Bidding. The Owner will review the submittal from each Subcontractor, and will furnish written notification to the Contractor concerning approval of the award of the subcontract. If the Owner objects to the proposed award or fails to respond to

the Contractor within five (5) business days of the complete submittal of the required information, the Contractor may furnish written notice of another subcontractor for consideration. The Owner may, at its discretion, waive or reduce subcontractor information submittal requirements as it deems appropriate.

- 2) In accordance with Ordinance 97-104, codified in Miami-Dade County Code Sections 2-8.1 and 10-33.01, the Contractor shall not, without written consent of the Owner, either replace any subcontractor or permit any such subcontract to be assigned or transferred, or allow that portion of the Work to be performed by anyone other than the approved subcontractor, except he may perform the work himself with qualified personnel upon written notice to the Owner in accordance with applicable law.

## **7. PROSECUTION OF THE WORK**

(June 12, 2012)

### **A. Workmanship and Unauthorized Work**

- 1) Work under this Contract shall be performed in a skillful and workmanlike manner. Unless otherwise indicated in the Contract Documents, the Contractor shall be solely responsible for means and methods and for the coordination of all trades through completion of the Work and without damage to the existing or newly installed components and surfaces. The Architect/Engineer or Field Representative may, in writing, require the Contractor to remove from the work any employee the Architect/Engineer or Field Representative determines incompetent, careless or otherwise objectionable. Such request shall be at no cost to the Owner.
- 2) Unauthorized Work: Work performed beyond the lines and grades shown on the Contract Drawings and approved Shop Drawings or established by the Owner, and Extra Work done without a Work Order or Change Order, will be unauthorized work and the Contractor will receive no compensation therefor. If required by the Owner, unauthorized work shall be remedied, removed or replaced by the Contractor at the Contractor's expense. Upon failure of the Contractor to remedy, remove or replace unauthorized work, the Owner may at its discretion, remedy, remove or replace the unauthorized work and the Contractor shall bear the responsibility for any and all costs and for delays resulting from such work.
- 3) The entire work and each part thereof, unless otherwise specified in the Contract Documents, shall be placed at the location, elevation, grade and gradient specified, and in proper alignment and adjustment. The Contractor shall provide all frames, forms, falsework, shoring, guides, anchors and temporary structures required to ensure these results.
- 4) No deviation from the approved Contract Documents shall be permitted without the prior written approval of the Architect/Engineer and/or Owner, by Work

Order or Change Order, which approved deviation(s) shall be documented to the extent required by the Contract Documents.

- 5) The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the Contract Documents. All workers shall have sufficient skill and experience to properly perform the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.
- 6) All proposed equipment shall be of sufficient size and in such mechanical condition as to meet requirements of the work, producing a satisfactory quality of work. Equipment used on any portion of the work shall be such that no damage to previously completed work, adjacent property, or existing facilities will result from its use.
- 7) When the Contract Documents specify the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized in writing by the Architect/Engineer by Work Order or Change Order. If the Contractor desires to use a method or type of equipment other than specified in the Contract, he may request permission from the Architect/Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with Contract requirements. If, after trial use of the substituted methods or equipment, the Architect/Engineer determines that the work produced does not meet Contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Architect/Engineer may direct, at no additional cost to the Owner. No change will be made to the Contract price or the Contract Time as a result of authorizing a change in methods or equipment under this article.
- 8) The Contractor shall give constant attention to the work to facilitate the progress thereof, and he shall cooperate with the Architect/Engineer and its Field Representatives and with other Contractors in every way possible.
- 9) The Contractor warrants to the Owner that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that the work will be of good quality, free from faults and defects in materials and workmanship for a period of one year from the date of Substantial Completion, unless otherwise required under this Contract. Work not conforming to these standards may be considered defective. If required by the Architect/Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

**B. Material**

- 1) Unless otherwise indicated in the Contract Documents, equipment, material and products incorporated in the Work covered by this Contract shall be new and of

the grade specified for the purpose intended. Unless otherwise specifically indicated, reference to equipment, material, product, or patented process by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at his option and, subject to the approval of the Architect/Engineer, use any equipment, material, article, or process which is equivalent to that named, subject to the requirements of these Contract Documents or propose a substitute equipment, material, article or process as indicated below. The Contractor shall at all times comply with established Green Building or LEED standards, if applicable, and as established in the Contract Documents. Proposed alternative equipment, material, products, or patented processes shall be considered equivalent if the Architect/Engineer determines that the proposed alternative is functionally equal to and/or sufficiently similar to that specified in the Contract Documents.

- 2) The Architect/Engineer shall be the sole judge of the quality, suitability and cost of the proposed alternative equipment, material, article or process. A proposed alternative shall be considered equivalent and/or functionally equal to that specified in the Contract Documents if, in the exercise of reasonable judgment, the Architect/Engineer determines that the proposed alternative is at least equal in materials of construction, quality, durability, appearance, strength and design characteristics, will reliably perform at least equally well the function and achieve the results imposed by the design concept and has a proven record of performance and availability.
- 3) If the Architect/Engineer determines that a proposed alternative does not qualify as equivalent or functionally equal, the alternative may be proposed for consideration as a substitute subject to the Contractor submitting sufficient information as provided below to allow the Architect/Engineer to determine that the proposed alternative is essentially equivalent to or better than the specified item and is an acceptable substitute for that said specified item.
- 4) The burden of proving the quality, suitability and cost of an alternative shall be borne by the Contractor. All information required by the Architect/Engineer in judging an alternative shall be supplied by the Contractor at the Contractor's expense. The Architect/Engineer's costs in evaluating a proposed alternative, irrespective of its acceptance, will be reimbursed by the Contractor to the Owner. In the case of approved alternatives, the Contractor shall also reimburse the Owner for the Architect/Engineer's costs to revise the Contract Documents.
- 5) The Contractor certifies that, if approved and incorporated into the Work, there will be no increase in cost to the Owner or in Contract Time and the proposed alternative shall conform substantially to the detailed requirements of the item specified in the Contract Documents.
  - a. Where use of an alternative material involves redesign of or changes to other parts of the Work, the cost and the time required to affect such redesign or change will be considered in evaluating the suitability of the alternative material. All costs pertaining to redesign

and changes in other parts of the Work, including remedial work to completed work, shall be at the Contractor's expense.

- b. No action relating to the approval of alternative materials will be taken until the request for approval of the alternative materials is made in writing by the Contractor accompanied by complete data as to the quality, suitability and cost of the materials proposed. Such request shall be made at least 60 days before the early start date of the activity. Any delays in receiving approval shall be the responsibility of the Contractor.
  - c. The Architect/Engineer will examine and review the proposed alternative with the Owner and return it, within twenty-one (21) calendar days from the date of its receipt at the Architect/Engineer's office, to the Contractor noted with the final decision. If the final decision approves either an equal or a substitution, the approval must also contain the Owner's written approval. When requested by the Architect/Engineer, the Contractor shall resubmit such Shop Drawings, descriptive data and samples as may be required.
  - d. Where classification, rating, or other certification by a body such as, but not limited to, Underwriters' Laboratories Inc. (UL), National Electrical Manufacturer's Association (NEMA), or American Railway Engineering Association (AREA) is a part of the specification for any material, proposals for use of alternative materials shall be accompanied by reports from the listed body, or equivalent independent testing laboratory, indicating compliance with Contract Documents requirements. Testing required proving equality of the material proposed shall be at the Contractors expense.
  - e. Approval of an alternative material will be only for the characteristics and use named in such approval, and shall not change or modify any Contract requirement, or establish approval for the material to be used on any other Project for the Owner.
- 6) Source of Supply and Quality of Materials: The Contractor shall furnish all materials and products required to complete the Work except those designated to be furnished by the Owner.
- a. Notwithstanding prior inspection and approval by the Architect/Engineer, only materials conforming to the requirements of the Contract Documents shall be incorporated in the Work.
  - b. The materials shall be manufactured, handled and incorporated so as to ensure completed work in accordance with the Contract Documents.
- 7) Defective Materials: Contractor-furnished materials not conforming to the requirements of the Contract Documents will be rejected, whether in place or not. Rejected material shall be removed immediately from the Work site. No rejected material, the defects of which have been subsequently corrected, shall be used in the Work. The Owner may cause the removal and replacement of



rejected material and the cost thereof will be deducted from any monies due or to become due to the Contractor.

- 8) Handling of Materials: Materials shall be transported, handled and stored by the Contractor in a manner which will ensure the preservation of their quality, appearance and fitness for the Work. Materials shall be stored in a manner to facilitate inspection.
- 9) The Owner will have no responsibility to the Contractor concerning local material sources.
  - a. The Contractor shall make all necessary arrangements with the owners of material sources. The Contractor shall pay all costs in connection with making such arrangements, exploring, developing and using material sources, whether or not indicated, except such costs as the Owner expressly agrees in writing to assume.
- 10) Disposal of Material Outside the Work Site: Unless otherwise specified in the Contract Documents, the Contractor shall make his own arrangements for properly disposing of waste and excess materials outside the Work Site and he shall pay all costs therefore. Contractor shall comply with all local, state and federal requirements when disposing of waste and excess materials.
  - a. Prior to disposing of material outside the Work Site, the Contractor shall obtain written permission from the owner on whose property the disposal is to be made. The Contractor shall file with the Architect/Engineer said permit, or a certified copy thereof, together with a written release from the property owner absolving the Owner from any and all responsibility in connection with the disposal of material on said property.
- 11) Property Rights in Materials: The Contractor shall have no property right in materials after they have been attached or affixed to the Work or the soil, or after payment has been made by the Owner to the Contractor for materials delivered to the site of the Work, or stored subject to or under the control of the Owner, as provided in these Contract Documents. However, the Contractor shall be responsible for the security of the material on-site until Final Acceptance by the Owner.

#### C. Methods of Sampling and Testing

- 1) Sampling and testing of all materials shall be as set forth in the Contract Documents. Except for quality control testing and any other testing that may be the direct responsibility of the Contractor as set forth in the Contract Documents, the testing of samples and materials will be made at the expense of the Owner by the project testing laboratory. The Contractor shall furnish the required samples without charge. Any and all fees for non-conforming materials or work shall be solely borne by the Contractor. The Contractor shall give sufficient notification to the Field Representative of the placing of orders for or receipt of materials to permit testing.

- 2) The Field Representative may inspect, at its source, any specified material or assembly to be used in the Work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the Work and to obtain samples required for its acceptance of the material or assembly

Should the Field Representative conduct plant inspections, the following shall exist:

- a. The Field Representative shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials.
  - b. The Field Representative shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of materials being furnished.
  - c. If required by the Field Representative, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.
- 3) It is understood and agreed that the Owner shall have the right to retest any material which has been tested and approved at the source of supply after it has been delivered to the site. The Field Representative shall have the right to reject only material which, when retested, does not meet the requirements of the Contract Documents. In such an event, the cost of re-testing shall be borne by the Contractor if it results in a rejected material.
  - 4) All inspections and testing of materials, assemblies and equipment will be performed in Miami-Dade County. If the Contractor's material or manufacturing sources are such that inspections or tests cannot be made in Miami-Dade County, all traveling and lodging expenses in connections with such inspections and testing shall be borne by the Contractor.

#### D. Meetings

- 1) A pre-construction conference will be held prior to the issuance of the Notice to Proceed to discuss the work to be performed under this contract. The Contractor and its major Subcontractors shall be required to attend this meeting. The Contractor will be advised of the time, date and location of the meeting.
- 2) The Contractor shall attend weekly construction coordination meetings at a time and place to be designated by the Architect/Engineer. These meetings are intended to determine job progress, identify job problems, assist in solving and preventing job problems, and promote coordination with all entities involved in the Contract and with other Owner Contractors. The Contractor shall cause Subcontractors and suppliers to attend as he deems advisable, or as requested by the Architect/Engineer. Unless otherwise provided for in these Contract Documents, the Contractor shall be responsible for generating and distributing meeting minutes for all such meetings.

E. Permits and Compliance with Laws

- 1) Unless otherwise provided for in these Contract Documents, the Contractor shall be responsible for obtaining necessary licenses and permits and for complying with applicable Federal, State, County and Municipal laws and latest codes and regulations in connection with the prosecution of the Work. (For payment of permit(s), see Special Provisions). No time extensions will be allowed for delays in obtaining the required permits unless revisions directly caused by the Owner or its agents are required to the Contract Drawings due to changes in codes, regulations and applicable contract standards during the contract term. See Special Provisions for additional permit requirements.
- 2) The Owner will not pay or reimburse the Contractor for any penalties relating to his permits or fees as a result of the Contractor's failure to timely obtain all his permits, inspections, approvals, etc.
- 3) The Contractor shall observe and comply with all applicable Federal, State, County and other laws, codes, ordinances, rules and regulations of the Federal, State and County governments, all authorities having jurisdiction, and any and all programs developed in compliance therewith, in any manner affecting the conduct of the Work.
- 4) Dewatering of excavations shall be performed in accordance with the applicable provisions of the Department of Environmental Resources Management (DERM), Florida Department of Environmental Protection (DEP), U.S. Environmental Protection Agency (USEPA) and the South Florida Water Management District (SFWMD) Dewatering Permits and/or any and all authorities having jurisdiction and any other requirements specified in the Contract Documents. The means and methods of dewatering shall be determined by the Contractor who shall bear the full cost of same as part of the contract price.
- 5) All construction activities shall be subject to the pollution prevention requirements established under the National Pollutant Discharge Elimination System (NPDES) program under the Clean Water Act regulating storm water discharge from construction sites.
- 6) Upon completion of all of the work contemplated under the Contract Documents, the Contractor shall obtain and deliver to the Field Representative such Certificate(s) of Occupancy or Certificate(s) of Completion as required by the Florida Building Code and/or authority having jurisdiction.
- 7) The Contractor shall be subject to and comply with all the provisions of Miami-Dade County Code Section 2-8.4.1, which provides that, whenever any individual or corporation or other entity attempts to meet its contractual obligations with the County through fraud, misrepresentation or material misstatement, the County shall, whenever practicable, terminate the Contract. The Contractor is further directed to Section 10-38 of the Miami-Dade County Code which provides for the debarment of County contractors.

F. Coordination and Access

- 1) Other Contracts: The Owner may undertake or award other contracts for additional work, and the Contractor shall fully cooperate and coordinate with other Contractors and the Owner and carefully fit his own work to such additional work. The Contractor shall not perform any act which will interfere with the performance of work by any other contractor or by the Owner. The Contractor shall be responsible for obtaining all necessary scheduling details from other Contractors and these requests must be provided, in writing, to the Owner. The Architect/Engineer shall have the authority to resolve conflicts related to coordination between Contractors.
- 2) In the event of interference between the work of the Contractor and other contractors working concurrently at the Site, the Field Representative will instruct the Contractor as to which work has priority in performance and such instructions shall be binding upon the Contractor.
- 3) Utility companies, railroads, and municipal agencies having facilities within the limits of the Work shall have access to their facilities at all times for inspection and repair.

G. Rights in Land and Improvements

The Contractor shall make no arrangements with any person to permit occupancy or use of any land, structure or building within the Work Site for any purpose whatsoever, either with or without compensation, in conflict with any agreement between the Owner and any property owner, former property owner or tenant of such land, structure or building. The Contractor shall not occupy Owner-owned property outside the Work Site without obtaining prior written approval from the Owner.

H. Interference With Existing Utilities

- 1) Attention of the Contractor is specifically directed to the need for careful control of all aspects of his work to prevent damage to cables, ducts, water mains, sewers, fire mains, telephone cables, fuel lines, radar cables, and any other existing overhead or underground utilities and structures.
- 2) Before commencing work in any given area, the Contractor shall contact utility companies to identify any potential conflicts. Further, the Contractor shall also carefully review the Plans, survey and search the site for utility locations, and determine possible utility conflicts. All known above and underground utilities, including, but not limited to, electrical, telephone, communications, lighting cables, fuel lines, sewer, drainage and water pipes, and other existing structures are shown on the Plans for reference purposes only, but no guarantee is expressed or implied that the information is accurate. It shall be the sole responsibility of the Contractor to ascertain and/or verify the location of any and all such utilities or structures using magnetic and electronic detectors and by hand excavation or other appropriate measures before performing any work that could result in damage to such existing utilities or structures. The Contractor shall make a thorough search of the particular location for underground utilities or structures whether or not shown on the drawings, before excavation work is commenced in any particular location. To this end

the Contractor shall provide and maintain throughout the term of the Contract, electronic and magnetic detecting devices capable of locating underground utilities or structures. The Contractor shall, after locating primary and critical existing utilities, mark their location with indelible material or other means satisfactory to the Field Representative and maintain above ground physical identification during the work.

- 3) In the event of damage to, or accidental disruption of utilities or other facilities as a result of the Contractor's operations, the Contractor shall take immediate steps to repair or replace all damage and to restore all services. Further, the Contractor shall engage any additional outside services which may be necessary to prosecute repairs on a continuous "around the clock" basis until services are restored. The Contractor shall also provide and operate any supplemental temporary services to maintain uninterrupted use of the facilities. All costs involved in making repairs and restoring disrupted service resulting from the Contractor's work shall be borne by the Contractor and the Contractor shall be fully responsible for any and all claims resulting from the damage.

I. Protection of Existing Facilities, Vegetation, Structures, Utilities and Improvements

- 1) The Contractor shall preserve and protect existing vegetation such as trees, shrubs, and grass on or adjacent to the work site which are not indicated to be removed and which do not unreasonably interfere with the construction Work and he shall replace in kind the vegetation, shrubs and grass damaged by him at his own expense.
- 2) The Contractor shall protect from damage all utilities, foundations, walls or other parts of adjacent, abutting or overhead buildings, railroads, bridges, structures, surface and subsurface structures at or near the site of the Work and shall repair or restore any damage to such facilities, except utilities, resulting from failure to comply with the requirements of this Contract or the failure to exercise reasonable care in the performance of the Work. If, after receipt of notification from the Architect/Engineer, the Contractor fails to or refuses to repair any such damage promptly, the Owner may have the necessary Work performed and charge the cost thereof to the Contractor.
- 3) At points where the Contractor's operations are adjacent to utility facilities, damage to which might result in expense, loss, disruption of service or other undue inconvenience to the public or to the owners, Work shall not be commenced until all arrangements necessary for the protection thereof have been made by the Contractor. The Contractor shall be solely and directly responsible to the owners and operators of such utilities for any damage, injury, expense, loss, inconvenience, or delay, caused by the Contractor's operations.
  - a. Where public utilities or their appurtenances interfere with permanent construction, unless otherwise specified, work involved in permanently relocating or otherwise altering such public utilities and their appurtenances will not be a part of this Contract but will be done by utility owners at no cost to the Contractor. If the Contractor wishes to have utilities temporarily relocated, he shall make necessary

arrangements with utility owners and reimburse them at his own expense for cost of the Work. The Contractor shall keep the Architect/Engineer advised of temporary relocation arrangements.

- b. The Contractor shall not repair or attempt to repair utility damage but shall immediately contact the utility owner. The Contractor shall obtain the name, address and telephone number of each utility company that the work will affect and the person in such utility company to contact. He shall submit to the Architect/Engineer said names, addresses and telephone numbers.
- 4) The Contractor shall comply with the latest version of the Florida Building Code or the Code under which the Contract Documents were approved, whichever is applicable at the time the Work is performed.
- 5) In order to safeguard the owners and tenants of abutting property and at the same time prevent unjust or fraudulent claims against the Contractor the Government, State, the Owner and the Architect/Engineer in respect thereto, the Contractor shall cause a detailed examination of abutting property to be made before construction is begun. The owner or tenant of each parcel or structure or his or their duly authorized representative will be invited to be present during the examination by a notice in writing delivered by the Contractor to a person in charge of the premises or structure, or by the mailing of the notice to the owner at the premises. The Architect/Engineer will attend while the Contractor makes the detailed examination. A complete record including photographs of the existing conditions of each parcel or structure shall be made in triplicate, signed by the Contractor, Owner and the Architect/Engineer and one copy will be delivered to the Owner, one to the Architect/Engineer and one will be retained by the Contractor. At such time as the Architect/Engineer may direct, or upon the filing of the verified statement by the owner, tenant, lessee, operator or occupant of the building structure, and in any event, upon the completion of any work that in the opinion on the Architect/Engineer might affect the abutting property, the Contractor will make another detailed examination of such abutting property. A complete record of the then existing conditions of said property will be made in triplicate, signed by the Contractor and one copy will be delivered to the Owner, one to the Architect/Engineer and one will be retained by the Contractor. In any action, which may be brought by any owner, tenant, lessee, operator or occupant of abutting property to recover under the provisions of this article or any paragraph hereof, the record of the existing conditions of each parcel will be prima facie evidence of the conditions thereof at the time of the making of the examination.
- 6) The Contractor shall maintain access to fire hydrants and fire alarm boxes throughout the prosecution of the Work. Hydrants, alarm boxes and standpipe connections shall be kept clear and visible at all times unless approved otherwise. If visibility cannot be maintained, the Contractor shall provide clearly visible signs showing the location of the fire hydrant, fire alarm box or standpipe connection. The Contractor shall promptly notify the authority having jurisdiction of any impairment to any fire systems.

J. Damage to the Work and Responsibility for Materials

- 1) The Contractor shall be responsible for materials delivered and work performed until completion and Final Acceptance of the entire construction thereof, except those materials and work which may have been accepted under the applicable sections of this article and shall take all necessary steps to protect the Work, from all causes, at his expense.
- 2) The Contractor shall bear the risk of injury, loss or damage to any and all parts of the Work for whatever cause, whether arising from the execution or from the non-execution of the Work, except as provided for in this article. The Contractor shall rebuild, repair or restore work and materials which have been damaged or destroyed from any cause before Completion and Acceptance of the Work and shall bear the expense thereof. The Contractor shall provide security including, but not limited to, security guards, temporary drainage systems and erection of temporary structures and temporary fencing as necessary to protect the Work and materials from damage.
- 3) The Contractor shall be responsible for materials not delivered to the site for which any progress payment has been made to the same extent as if the materials were so delivered.
- 4) The Contractor's responsibility for material shall be the same for Owner-furnished material, upon receipt of said material from the Owner, under this Contract as for Contractor-furnished material.
- 5) Relief from Maintenance and Responsibility: The Contractor may request, in writing, from the Owner, that the Owner relieve the Contractor of the duty of maintaining and protecting certain portions of the Work, as described in this paragraph, which have been completed in all respects in accordance with the requirements of the Contract. Such action by the Owner will relieve the Contractor of responsibility for injury or damage to said completed portions of the Work resulting from use by the Owner or the public for any cause, but not from injury or damage resulting from the Contractor's own operations or negligence. Portions of the Work for which the Contractor may be relieved of the duty of maintenance and protection, as provided in this paragraph, include the following:
  - a. Early possession by the Owner of any portion of the Work, in accordance with the Contract Documents.
  - b. This Paragraph 5 does not relieve the Contractor of responsibility for repairing or replacing defective work or materials in accordance with the Contract requirements.

K. Emergencies

- 1) In an emergency affecting the safety of life, the Work, or adjacent property, the Contractor shall notify the Field Representative and the Architect/Engineer as early as possible that an emergency exists. In the meantime, without special instruction from the Architect/Engineer as to the manner of dealing with the emergency, the Contractor shall act at his own discretion to prevent such threatened loss or injury. As emergency work proceeds, the Field

Representative and the Architect/Engineer may issue instructions, which the Contractor shall follow. The compensation to which the Contractor is entitled on account of emergency work, if any, shall be limited to emergencies not caused by actions or inactions of the Contractor determined in accordance with the Contract Documents, where applicable.

- 2) For purposes of this article, an emergency is defined as an act or event that has already occurred, not caused by actions or inactions of the Contractor, which, if no immediate action is taken may affect the safety of life, the work, or adjacent property. This article does not apply to steps taken by the Contractor to protect the Work, adjacent structures, utilities, existing vegetation, etc. under other sections of the Contract Documents. Furthermore, this article does not apply to preparations the Contractor may make prior to storms or hurricanes or other acts of God.

L. Accident Prevention

- 1) Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
  - a. All persons on the Site or who may be affected by the Work;
  - b. All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and other property at the Site or adjacent thereto, including trees, shrubs lawns, walks, pavements, roadways, structures, utilities, and underground facilities not designated for removal, relocation, or replacement in the course of construction.
- 2) Contractor shall comply with all applicable laws and regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection.
- 3) Upon notification from the Owner or its representative(s), the Contractor shall promptly correct any deficiencies affecting the safety and well being of the construction workers and the public that have been identified by the notice.
- 4) Should a situation of imminent danger be identified, work in the affected area must be suspended immediately until the condition has been corrected. Imminent danger is defined as the exposure or vulnerability to harm or risk that is impending or about to occur as defined by the Field Representative or the Architect/Engineer. The Contractor will not be entitled to future claims alleging impacts caused by the Owner stoppage of the Work due to safety reasons.

M. Warranty of Work

- 1) Except where longer periods of warranty are indicated for certain items, the Contractor warrants the Work under the Contract to be free from faulty materials and workmanship for a period of not less than one (1) year from the



date of Substantial Completion. This one-year period shall be covered by the Surety Performance Bond as specified in this Contract, except that in the case of defects or failure in a part of the work which the Owner takes possession of prior to Substantial Completion, such a period shall commence on the date the Owner takes possession. Upon receiving notification from the Owner or any public body, to whom the ownership of the Work has been transferred or who has agreed to maintain the Work, the Contractor shall immediately remedy, repair, or replace, without cost to the Owner or other notifying party and to the entire satisfaction of the notifying party, defects, damages, or imperfections due to faulty materials or workmanship appearing in said Work within said period of not less than one year. Remedial work shall carry the same warranty as the original work starting with the date of acceptance of the replacement or repair. Payment to the Contractor will not relieve him of any obligation under the Contract.

- 2) The Contractor, at no additional expense to the Owner, shall also remedy damage to equipment, the site, or the buildings or the contents thereof, which is the result of any failure or defect in the Work, and restore any Work damaged in fulfilling the requirements of the Contract. Should the Contractor fail to remedy any such failure or defect within ten (10) days after receipt of notice thereof, the Owner will have the right to replace, repair, or otherwise remedy such failure or defect and deduct all costs from the Contractor's pay request or Performance Bond if final payment has been made.
- 3) The Contractor will correct all latent defects discovered within ten (10) years after Substantial Completion provided that the Owner shall notify the Contractor of each latent defect within the time specified by law. The Contractor, without prejudice to the terms of the Contract, shall be liable to the Owner for all damages sustained by the Owner resulting from latent defects, fraud, or such gross mistakes as may amount to fraud, discovered after the stated guarantee and warranty periods have expired. If the Contractor fails to act within ten (10) days, the Owner reserves the right to have the work performed by others at the expense of the Contractor, and the Contractor agrees to pay the Owner the reasonable cost associated with procurement, implementation and management thereof upon demand. The Owner shall also be entitled to reasonable attorney's fees, necessarily incurred upon the Contractor's refusal to pay the above costs.
- 4) Subcontractors', manufacturers' and suppliers' warranties and guaranties, expressed or implied, with respect to any part of the Work and any material used therein shall be deemed obtained and shall be enforced by the Contractor for the benefit of the Owner provided that, if directed by the Owner, the Contractor requires such subcontractors, manufacturers and suppliers to execute such warranties and guaranties, in writing, directly to the Owner.
- 5) The rights and remedies of the Owner provided in this article are in addition to and do not limit any rights and remedies afforded by the Contract or by law.

- 6) Nothing in the above intends or implies that this warranty shall apply to work that has been abused or neglected by the Owner, its agents or other public body, utility or railroad to which ownership has been transferred.

## **8. CONTRACT TIME**

(June 12, 2012)

### **A. Notice to Proceed**

- 1) The Owner may issue authorization to obtain permits to the Contractor after the Contractor has executed the Contract and has delivered the specified bonds and certificates of insurance in forms acceptable to the Owner, for the limited purpose of obtaining all necessary permits to complete the work. If the Contractor is unable to obtain all necessary permits within 30 days, through no fault of the Contractor, the Owner has the option, but not the obligation, to terminate the Contract, without fault to the Contractor or the Owner, effective immediately upon written notice by the Owner or give the Contractor additional time to obtain the permits. Upon the Contractor providing satisfactory evidence of obtaining the permits, the Owner will issue Notice to Proceed. Except as specifically authorized in writing by the Owner, the Contractor is not authorized to perform work (other than obtaining permits) under the Contract until the effective date of the Notice to Proceed, upon which the Contractor shall commence work and shall diligently prosecute the Work to completion within the time limits specified. The Contract time commences on the date shown on the Notice to Proceed.
- 2) Any Work Performed by the Contractor (other than obtaining permits) prior to Notice-To-Proceed shall be at the Contractor's own risk and shall not be considered as the basis for any claim.

### **B. Schedules**

- 1) The Contractor shall provide, maintain, and periodically update schedules in strict accordance with the Contract Documents. The Special Provisions shall contain specific requirements for the form, content and date of submission of the baseline schedule and all schedule updates.
- 2) The Contractor shall prosecute the Work in accordance with the approved baseline Schedule or most recently approved revision to the baseline schedule. In the event that progress along the critical path is delayed, the Contractor shall revise his planning to include additional forces, equipment, shifts or hours as necessary to meet the time or times of completion specified in this Contract at no additional cost to the Owner. In addition, the Contractor shall revise his schedule to reflect these recovery actions and submit it to the Owner for review and approval it being understood that such approval will be as to the format and composition of the schedule and not the Contractor's means and methods. Additional costs resulting therefrom will be borne by the Contractor. Delayed progress is defined as:

- a. A delay in the start or finish of any activity on the critical path (critical path is defined as the path with the least amount of float) of the approved baseline schedule or most recently approved revision to the baseline; or
  - b. A delay in the start or finish of any non-critical activity which consumes more than the available float shown on the approved baseline schedule or most recently approved revision to the baseline, thereby making the activity critical and late; or
  - c. A projected completion date shown on a schedule update which is later than the contractual completion date; or
  - d. Any combination of the above.
- 3) Failure of the Contractor to comply with the requirements under this provision will be grounds for determination that the Contractor is not prosecuting the Work with such diligence as will ensure completion within the Contract Time. Upon such determination, the Owner may terminate the Contractor's right to proceed with the Work, or any separate part thereof, in accordance with the Contract Documents. If in the Contractor's estimation, the cause(s) of delay are beyond the Contractor's control, the Contractor shall adhere to the sections of the Contract Documents related to extensions of time, claims and others as appropriate.
- 4) The Contractor shall be responsible for scheduling and coordinating the work of all crafts and trades, subcontractors and suppliers, required to perform the Work and to complete the Work within the prescribed time. Any inefficiency or loss of productivity in the labor, materials, or special equipment of the Contractor or its subcontractors of any tier, from any cause, shall be the responsibility of the Contractor. No reimbursement of these or any other costs can be requested by or granted to the Contractor or any of its subcontractors of any tier for inefficiency or loss of productivity in labor, materials, or special equipment, except as specified in the paragraph in this article dealing with Liquidated Indirect Costs, for delays in the performance and completion of the Work directly caused by the Owner or its authorized representatives. Other than the exception described above, additional costs may only be paid to the Contractor as a result of additional Work added to the Contract scope of work.

C. Extensions of Time and Classification of Types of Delays

- 1) Once a delay has been identified and it has been established through a scheduling analysis that a delay affects the Project's end date or contractually mandated milestone date, the delay must be classified to determine responsibility and to compute damages, if any. Before the Contractor can submit a request for time extension, claim or any request for additional compensation involving or related to time, the Contractor must classify the delay(s) in accordance with the following classifications. These delay classifications shall be used by the Owner and the Contractor in resolving any

time-related disputes. Delays fall into three basic categories: non-excusable, excusable, and compensable.

- a. Non-excusable delays are those delays to the critical path which were foreseeable at the time of contract award or delays caused by the Contractor due to the Contractor's fault or negligence or his/her own inefficiencies or problems, due to his/her inability to coordinate subcontractors and/or other flaws in his/her planning. In these types of delays the Contractor is not entitled to extra time or compensation and the Owner may be allowed to assess Liquidated Damages or actual damages, depending on the contract provisions.
- b. Excusable delays are those delays to the critical path beyond the Contractor's control and without the active interference of the Owner, such as extreme weather (force majeure), strikes and delays caused by third parties (i.e. not the Contractor or the Owner). Contractors are granted a time extension but no additional compensation for the extended time of performance for excusable delays.
- c. Compensable delays are delays to the critical path caused by active interference or participation of the Owner or Owner's consultant. Examples of compensable delays are failure of the Owner to provide right-of-way, introducing late design changes, late review of shop drawings by the Owner or his Architect/Engineer and failure of the Owner to coordinate the work of various prime Contractors. In the case of a compensable delay, the compensation for the extended period of performance may cover, in addition to the direct cost due as a result of the changes, Liquidated Indirect Costs as specified in the Contract Documents.
- d. Concurrent delays involve two or more delays to the critical path occurring at the same time, either of which, had it occurred alone, would have affected the end date of the Project. In that event, the Contractor's sole remedy is a time extension and relief of Liquidated Damages with no compensation for extended cost for the concurrency delay period.
- e. The compensability of concurrent delays depends on the types of delays involved. The following shall determine the effects of concurrent delays on time extensions and compensable costs:
  - i. EXCUSABLE DELAY CONCURRENT WITH A NON-EXCUSABLE DELAY. For excusable delays concurrent with non-excusable delays, the Contractor is entitled to a time extension only. For example, it rains the day footings are to be excavated (excusable delay) but the excavation equipment was down for repairs (non-excusable delays).
  - ii. NON-EXCUSABLE DELAY CONCURRENT WITH A COMPENSABLE DELAY. For non-excusable delays concurrent with compensable delays, the Contractor is entitled to a time extension only. For example, if the Owner introduces a design change for a beam but the Contractor has failed to

submit the shop drawings for said beam in a timely manner. This would be an example of a non-excusable delay (late shop drawings) concurrent with a compensable delay (Owner introducing design change).

iii. EXCUSABLE DELAY CONCURRENT WITH A COMPENSABLE DELAY. For excusable delays concurrent with compensable delays, the Contractor is entitled to a time extension only. For example, the Owner does not provide the necessary right-of-way to begin construction (compensable delay) but the Contractor's forces are on strike (excusable delay).

2) Time Extensions: The Contractor may be granted an extension of time and will not be assessed Liquidated Damages for any portion of the delay in completion of the Work, arising from acts of God, acts of the public enemy, fires, floods, epidemics, quarantine restrictions, freight embargoes, strikes, labor disputes, or weather more severe than the norm, provided that the aforesaid causes were not foreseeable and did not result from the fault or negligence of the Contractor, and provided further that the Contractor has taken reasonable precautions to prevent further delays owing to such causes, and has given to the Architect/Engineer immediate verbal notification, with written confirmation within 48 hours, of the cause or causes of delay. Within thirty (30) days after the end of the delay, the Contractor shall furnish the Architect/Engineer with detailed information concerning the circumstances of the delay, the number of days actually delayed, the appropriate Contract Document references, and the measures taken to prevent or minimize the delay. All requests for extension of time shall be submitted in accordance with the Contract Documents. Failure to submit such information will be sufficient cause for denying the delay claims. The Owner will ascertain the facts and the extent of the delay and its findings thereon will be final and conclusive subject to the dispute provisions in the Contract Documents. The extensions of time granted for these reasons shall be considered excusable and shall not be the basis for any additional compensation.

a. Weather more severe than the norm shall apply only as it affects particular portions of the Work and operations of the Contractor, as determined by the Architect/Engineer. Weather more severe than the norm is defined as any situation exceeding the mean data as recorded by The National Climatic Data Center, Asheville, North Carolina and published by the National Oceanic and Atmospheric Administration (This data is taken from the table of normals, means, and extremes in the latest version of the "Local Climatological Data, Annual Summary with Comparative Data, Miami, Florida"). For the calculation of delays due to rain, precipitation of 0.01 inches or more a day shall be considered to be a rain day if the rain actually prevented the Contractor from performing work. The effects of

weather less severe than the norm may be taken into account in granting time extensions at the Owner's sole discretion.

- b. An extension of time will not be granted for a delay to the critical path caused by a shortage of materials, except Owner-furnished materials, unless the Contractor furnishes to the Architect/Engineer documentary proof that he has diligently made every effort to obtain such materials from every known source within reasonable reach of the Work. The Contractor shall also submit proof, in the form of a CPM network analysis data, that the inability to obtain such materials when originally planned, did in fact cause a delay in final completion of the Work which could not be compensated for by revising the sequence of his operations. Only the physical shortage of material will be considered under these provisions as a cause for extension of time. No consideration will be given to any claim that material could not be obtained at a reasonable, practical, or economical cost, unless it is shown to the satisfaction of the Architect/Engineer that such material could have been obtained only at exorbitant prices, entirely inconsistent with current rates taking into account the quantities involved and the usual practices in obtaining such quantities.
- 3) Delays Caused by Consultant and/or the Owner: If the Contractor's performance of the Work along the critical path is delayed by any condition or action directly caused by the Owner, and which was not foreseeable by the Contractor at the time the Contract was entered into, the Contractor shall, provide notification in accordance with the Contract Documents, of any such delay and of the anticipated results thereof. The Contractor shall cooperate with the Owner and use its best efforts to minimize the impact on the schedule of any such delay. In instances where a Contract change extends the Contract beyond the completion date, the Contractor may claim Liquidated Indirect Costs as specified in the paragraph in this article dealing with Liquidated Indirect Costs. These delays shall be considered compensable, except for the period in which these delays may be concurrent with Contractor-caused delays. If a delay on the part of the Owner is concurrent, that is, if it occurs at the same time as a Contractor-caused delay, the Owner-caused delay shall be considered an excusable delay for the portion of the Owner-caused delay which is concurrent with the Contractor-caused delay.
- 4) Delays Beyond Contractor's Control Not Caused by Consultant and/ or the Owner: If Contractor's performance of the Work along the critical path is delayed by any conditions beyond the control and without the fault or negligence of Contractor and not caused by the Owner, and which was not foreseeable by Contractor at the time this Contract was entered into, Contractor shall, provide immediate verbal notification with written notification in accordance with the Contract Documents, of any such delay and of the anticipated results thereof. Within two (2) calendars days of the termination of any such delay, Contractor shall file a written notice with the Architect/Engineer specifying the actual duration of the delay. If the Owner

determines that the delay was beyond the control and without the fault or negligence of the Contractor and not foreseeable by the Contractor at the time this Contract was entered into, the Owner will determine the duration of the delay and may extend the time of performance of this Contract provided, however, that Contractor shall cooperate with the Owner and use its best efforts to minimize the impact on the schedule of any such delay. These delays shall be considered excusable and the Contractor shall not be entitled to, and hereby expressly waives recovery of, any damages suffered by reason of the delays contemplated by this paragraph and extension of time shall constitute Contractor's sole remedy for such delays.

- 5) In addition to the delays in the Work specified in this section, delays in the Work directly caused by an act or omission by an owner of an adjoining property will not be considered an Owner-controlled delay. An owner of an adjoining property is a person, firm, corporation, partnership, or other organization who either owns or occupies, or both, structures or parcels or both, immediately adjacent to the Work Site. Extension of time for those delays will be considered excusable and shall be treated as specified in this article, provided that:
  - a. The Contractor has, in accordance with this article, given to the Architect/Engineer immediate verbal justification, with written confirmation within forty-eight (48) hours of the delay; and
  - b. The Contractor establishes, to the satisfaction of the Architect/Engineer, that:
    - i. The delay was caused directly by an act or omission by the owner of the adjoining property; and
    - ii. The Contractor has taken reasonable precautions and has made substantial effort to minimize the delay.
- 6) A Change Order will be furnished to the Contractor within a reasonable period of time, after approval by the BCC, of a request for extension of time, specifying the number of days allowed, if any, and the new dates for completion of the Work or specified portions of the Work. All requests for time extension shall be in accordance with the Contract Documents. With the exception of time extensions covered under the time contingency allowance in the contract, only the BCC shall grant final written approval of all Change Orders, including additional money or extensions of time. All change orders shall be in full accord with the Contract Documents.
- 7) For the proper format to be used in submitting requests or claims for time extensions, refer to applicable sections of the Contract Documents.
- 8) Extensions of time shall be in accordance with Section 9-3 of the Code of Miami-Dade County, as applicable.

**D. Substantial Completion and Final Acceptance**

- 1) The following items must be satisfied before Substantial Completion, as defined in the Contract Documents, will be approved:

- a. All Work must be completed to the satisfaction of the appropriate permitting agencies having jurisdiction over the Work. The Contractor must furnish the Owner with a "Certificate of Occupancy" or a "Certificate of Completion", as applicable, from the permitting agency unless circumstances arise outside the contract scope that prohibits such certificates from being issued (i.e. utility connections).
  - b. All operational systems which may include but not be limited to: electrical systems, security systems, irrigation systems and fire systems, must be completed in accordance with the Contract Documents, tested and approved.
  - c. All plumbing, heating, ventilation, and air conditioning systems must be completed, tested and approved. Whenever the scope of work includes a facility or building, an HVAC test and balance report must be submitted and approved as a condition precedent to Substantial Completion.
  - d. The punch list may not be so extensive or of a nature that the Contractor's completion will significantly interfere with the Owner's beneficial use of the facility.
- 2) When the Contractor believes that all the Work or designated portion thereof required by the contract is substantially completed, the Contractor shall submit to the Field Representative and the Architect/Engineer a request for Substantial Completion inspection. The Contractor, the Field Representative, the Architect/Engineer, sub-consultants, and the Owner shall meet at the Project site for the purpose of making a combined inspection of the Work. During this inspection, any item of work remaining to be done or Work to be corrected shall be noted on a Punch List. If the Field Representative and/or the Architect/Engineer and the Owner indicate on this inspection report that the Work is substantially complete, a Certificate of Substantial Completion will be issued to the Contractor. The Certificate of Substantial Completion shall establish the date of Substantial Completion and shall have attached the Punch List reflecting any items to be completed or corrected, but which do not prevent beneficial use and occupancy, and shall state the date by which the Punch List is to be completed. The completion time for the Punch List shall not be greater than sixty (60) days from the date of issuance of the Certificate of Substantial Completion.
- 3) If any of the conditions listed in this article are not met and the Work has not been completed, or the Contractor determines that the final Punch List cannot be completed within sixty (60) days, a Certificate of Substantial Completion shall not be issued. The Contractor shall continue work, reducing the number of items on the Punch List that were not met. Additional inspections shall be scheduled as necessary until Substantial Completion is declared. However, costs incurred by the Owner for any inspections beyond a second inspection will be charged back to the Contractor.



- 4) In the event the Contractor fails to achieve Substantial Completion within the period specified in the Contract for completion, the Contractor shall be liable for Liquidated Damages and the Owner has, as its option, the right to, after ten (10) calendar days notice to the Contractor, have the work performed by others and backcharge the Contractor for all Direct and Indirect Costs related to performing this work. In the event that the Owner chooses to have the work completed by others, there shall not be any further non-excusable delays charged to the Contractor beyond the ten (10) days following notice to the Contractor. However, the Contractor shall not be relieved of any non-excusable delays incurred through the date of termination. The Punch List and the Contract shall remain open until all the Work is complete and accepted. The current retainage will be used to offset any Liquidated Damages and any backcharges, after which, any surplus retainage will be released to the Contractor. If the retainage is insufficient to cover the Liquidated Damages and any backcharge, the Owner will bill the Contractor for the balance and the Contractor shall promptly remit to the Owner an amount equal to the billing.
- 5) Final Completion: When the Owner or Architect/Engineer considers all Work indicated on the Punch List to be complete, the Contractor shall submit written certification that:
  - a. Work has been inspected for the compliance with the Contract Documents.
  - b. Work has been completed in accordance with the Contract Documents, and that deficiencies listed within the Certificate of Substantial Completion and its attachments have been corrected.
  - c. Work is completed and ready for final inspection.
- 6) Should the Owner and/or Architect/Engineer inspection find that Work is incomplete, he will promptly notify the Contractor in writing listing all observed deficiencies. The Contractor shall be responsible for all Direct and Indirect Costs to the County resulting from the Contractor's failure to complete the Punch List items within the time allowed for completion.
- 7) The Contractor shall remedy deficiencies and send a second certification. Another inspection will be made that shall constitute the final inspection. Provided that work has been satisfactorily completed, the Architect/Engineer will notify the Contractor in writing of Final Acceptance as of the date of this final inspection.
- 8) Prior to Final Acceptance, the Contractor shall deliver to the Field Representative complete As-Builts, all approved Shop Drawings, maintenance manuals, pamphlets, charts, parts lists and specified spare parts, operating instructions and other necessary documents required for all installed materials, equipment, or machinery, all applicable warranties and guarantees, and the appropriate Certificate of Occupancy.
- 9) Upon notification of Final Acceptance to the Contractor, the Architect/Engineer will request and consider closeout submittals from the Contractor including but not limited to the final Contractor's Affidavit and Release of All Claims.

- 10) The Contractor, without prejudice to the terms of the Contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.
- 11) Re-Inspection Fees: Should the status of completion of the Work require re-inspection of the Work by the Owner and the Architect/Engineer due to failure of the Work to comply with the Contractor's representations regarding the completion of the Work, the Owner will deduct from the final payment to the Contractor, fees and costs associated with re-inspection services in addition to scheduled Liquidated Damages.

E. Use and Possession

The Owner shall have the right to beneficially occupy, take possession of or use any completed or partially completed portions of the Work. Such possession or use will not be deemed an acceptance of work not completed in accordance with the Contract. While the Owner is in such possession, the Contractor, notwithstanding the provisions of the Contract Documents, will be relieved of the responsibility for loss or damage to the Work other than that resulting from the Contractor's fault or negligence or breach of warranty. If such prior possession or use by the Owner delays the progress of the Work or causes additional expense to the Contractor, a Contract change in the Contract price or the time of completion will be made and the Contract will be modified in writing accordingly.

F. Liquidated Damages and Liquidated Indirect Costs

- 1) The parties to the Contract agree that time, in the completion of the Work, is of the essence. The Owner and the Contractor recognize and agree that the precise amount of actual damages for delay in the performance and completion of the Work is impossible to determine as of the date of execution of the Contract and that proof of the precise amount will be difficult. Therefore, the Contractor shall be assessed Liquidated Damages on a daily basis for each Day that individual milestones, both interim and cumulative as specified in the Contract Documents, are not timely achieved or that Contract Time is exceeded due to a non-excusable delay. These Liquidated Damages shall be assessed, not as a penalty, but as compensation to the Owner for expenses which are difficult to quantify with any certainty and which were incurred by the Owner due to the delay. The amount of Liquidated Damages assessed shall be an amount, as stipulated in the Contract Documents, per day for each calendar day that individual milestones as specified in the Contract are not timely achieved or that the Project is delayed due to a non-excusable delay.
- 2) The Owner and the Contractor recognize and agree that the precise amount of the Contractor's Indirect Costs for delay in the performance and completion of the Work is impossible to determine as of the date of execution of the Contract, and that proof of the precise amount will be difficult. Therefore, Liquidated Indirect Costs recoverable by the Contractor shall be assessed on a daily basis for each Day the Contract Time is delayed due to compensable delay. These Liquidated Indirect Costs shall be paid to the Contractor in full satisfaction of all costs and damages caused by compensable excusable delays, except for

Direct Costs. There shall be no Liquidated Indirect Costs payable for time directly related to Extra Work for which a Change Order has been issued.

- 3) The amount of Liquidated Indirect Costs recoverable shall be an amount, as stipulated in the Contract Documents per day for each day the Contract is delayed due to compensable excusable delay. For lump sum contracts, the daily amount of Liquidated Indirect Costs will be calculated by dividing the total amount in the Contractor's approved Schedule of Values for General Requirements by the Contract duration (in days) after deducting any general conditions costs directly paid by the Owner during the execution of the Project. The amount of the Liquidated Indirect Costs calculated in accordance with this formula shall be stated in the Notice-to-Proceed. For unit price contracts, the daily amount of Liquidated Indirect Costs will be calculated as defined in the formula below:

(Amount of Bid x 8%) less any General Requirements items paid independently/individually

Original Contract Duration (In Days)

- 4) in the event the Contractor fails to perform any other covenant or condition (other than time-related) of this Contract relating to the Work, the Contractor shall become liable to the Owner for any actual damages which the Owner may sustain as a result of such failure on the part of the Contractor. The Owner reserves the right to retain these amounts from monies due the Contractor.
- 5) Nothing in this article shall be construed as limiting the right of the Owner to terminate the Contract and/or to require the Surety to complete said Project and/or to claim damages for the failure of the Contractor to abide by each and every one of the terms of this Contract as set forth and provided for in the Contract Documents.

## **9. PROGRESS PAYMENTS**

(June 12, 2012)

### **A. Payments**

- 1) The Contractor shall receive and accept compensation provided for in the Contract as full payment for furnishing all materials, for performing all work under the Contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the prosecution thereof.
- 2) The Owner will make progress payments monthly as the work proceeds. Unless the Special Provisions provide for the payment to be determined by using a cost-loaded CPM, the Contractor shall, within 15 days after Notice-to-Proceed, furnish a Schedule of Values for review and approval by the Owner consisting of a detailed cost breakdown of each lump sum bid item in the bid form in such detail as the Architect/Engineer shall request, showing the amount included therein for each principal category of the work, to provide the basis for determining the amount of progress payments. Unit price bid items shall be paid for in accordance with the Bid Form. The Schedule of Values shall

clearly indicate the amount to be paid by the Contractor to each individual Subcontractor.

- a. The unit prices shall be in proper balance and shall be subject to approval by the Owner. In the preparation of estimates, the Owner, at its sole discretion, may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the Work Site may also be taken into consideration under this article when the Contractor furnishes satisfactory evidence that it will be utilized on the work covered by this Contract.
- 3) In making such progress payments, a maximum of ten-percent (10%) or a minimum of five-percent (5%), as may be amended in the Contract Documents, of the estimated amount shall be retained from each progress payment made to the Contractor until Fifty-Percent (50%) Completion of the work has been established. Fifty-Percent (50%) completion is defined as the point in time when at least 50% of the Work under contract has been physically and satisfactorily completed in accordance with the intent of the Contract Documents as determined by the Architect/Engineer. At this point, the retainage amount withheld from each subsequent progress payment shall be reduced by 50% or not to exceed five-percent (5%) and the accumulated excess amount of retainage will be released to the Contractor, unless such amount is the subject of a good faith dispute, the subject of a claim brought pursuant to Florida Statute 255.05, or otherwise the subject of a claim or demand by the Owner or Contractor. If, at the discretion of the Owner, any time after Fifty-Percent (50%) Completion of the work has been established, the Owner finds that satisfactory progress is being made, it may authorize any of the remaining progress payments to be made in full. Also, whenever the Work is Substantially Complete, the Owner, if it considers the amount retained to be in excess of the amount adequate for its protection, may release to the Contractor all or a portion of such excess amount.
- 4) Material and work covered by progress payments shall become the sole property of the Owner. This provision shall not be construed as relieving the Contractor from the sole responsibility for material and work upon which payments have been made, the restoration of damaged work or as waiving the right of the Owner to require the fulfillment of the terms of the Contract.
- 5) Progress payments will be made in accordance with the Miami-Dade County Code, Florida Statute, s. 218.70 Florida Prompt Payment Act, and Florida Statute, s. 218.735.
  - a. The Contractor's attention is directed to Florida Statute, s. 218.735, revising provisions regarding timely payment, revising deadlines for the payment of contractors, subcontractors, sub-subcontractors, material-men and suppliers. The contractor shall remit payment due to subcontractors within ten (10) days after the contractors' receipt of payment. The subcontractor shall remit payment due to sub-subcontractors and suppliers within seven (7) days after the

subcontractors' receipt of payment. Dispute resolution is provided within the Statute.

- 6) No progress payments will knowingly be made for work not in accordance with this Contract.
- 7) Applications for progress payments shall be in the format as prescribed by the Owner. These applications shall be supported by evidence, which is required by this article. Each application for payment shall clearly indicate the amount to be paid to the Contractor as well as the amount to be paid to each of the Contractor's Subcontractors and suppliers. The Contractor shall certify that the work for which payment is requested has been done and that the materials listed are stored where indicated. Those items on the progress payment application that, in accordance with the applicable sections of the Contract Documents, compensate for Force Account Work, for materials not yet incorporated in the work, or for work under change orders negotiated on a cost-reimbursable basis will, under procedures of the Owner, be subject to the Owner's audit review of the Contractor's records supporting the payment application. Audits will be performed so as not to interfere with timely processing of applications for payment. If audit indicates the Contractor has been overpaid under a previous payment application, that overpayment will be credited against current progress payment applications. For a period of five years from Final Acceptance of the Contract, the Contractor shall maintain and make available for audit inspection and copying by the Owner, State and the Government and their authorized representatives, all records subject to audit review.
- 8) The Owner, at its discretion, may authorize payment for materials not yet incorporated into the Work, whether or not delivered to the Work Site. The value of materials on hand but not incorporated into the Work will be determined by the Field Representative, based on actual invoice costs to the Contractor, and such value will be included in a monthly application for payment only if the materials have been properly stored on the Site, provided that such materials meet the requirements of the Contract Documents, and are delivered to acceptable locations on Site or in bonded warehouses that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next application for payment after the following conditions are met:
  - a. The material has been stored and stockpiled in a manner acceptable to the Field Representative at or on the Work site or in a secure storage facility within Miami-Dade County or other location as approved by the Architect/Engineer. If such materials are stored outside Miami-Dade County, the Contractor shall accept responsibility for and pay all personal and property taxes that may be levied against the Owner by any state or subdivision thereof on account of such storage of such material. The Owner will permit the Contractor, at his own expense, to contest the validity of any such tax levied against the Owner and in the event of any judgment or

decree of a court against the Owner, the Contractor agrees to pay same.

- b. The Contractor has furnished the Field Representative with acceptable evidence of the quantity and quality of such stored or stockpiled materials.
- c. The Contractor has furnished the Field Representative with satisfactory evidence that the materials and transportation costs have been paid including but not limited to certified bills of sale for such materials and insurance certificates or other instruments, in writing, and in a form as required by the Owner. The Architect/Engineer may allow only such portion of the amount represented by these bills as, in his opinion, is consistent with the reasonable cost of such materials.
- d. The Contractor has furnished the Owner legal title (free of debts, claims, liens, mortgages, taxes or encumbrances of any kind) to the material so stored and stockpiled and subject only to the Owner's payment for the materials as reflected in the application for payment. All such materials so accepted shall become the property of the Owner. The Contractor at his own expense shall mark such material as the property of the Owner and shall take such other steps, if any, the Owner may require or regard as necessary to vest title in the Owner to such material.
- e. The Contractor has furnished the Owner evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work. The cost of the material included in an application for payment which may subsequently become lost, damaged or unsatisfactory shall be deducted from succeeding applications for payment irrespective of the cause and whether or not due to the negligence, carelessness or fault of the Owner.
- f. It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of its responsibility for furnishing and placing such materials in accordance with the requirements of the Contract Documents and does not waive Owner's right to reject defective material when it is delivered to the Site until such material is delivered to the Site and satisfactorily incorporated into the work.
- g. In no case will the amount in an application for payment for material on hand exceed the Contract price for such material, the Contract price for the Contract item in which the material is intended to be used or the value for such material established in the approved Schedule of Values. Payment for material furnished and delivered as indicated above will be based on 100 percent of the cost to the Contractor and retention will be withheld as specified in the Contract

Documents. In any event, partial payments for materials on hand will not exceed seventy percent (70%) of the item's Bid Price, including taxes and shipping, or the agreed amount within the Schedule of Values.

- h. No partial payment will be made for stored or stockpiled living or perishable plant materials.
  - i. The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this Article.
  - j. Materials may be subject to being purchased by the Owner directly under the County's "Direct Material Purchase Program" and installed by the Contractor, as applicable, in accordance with the Special Provisions.
- 9) Payment of the Contract lump sum price for General Requirements, if applicable, will be made in the following manner:
  - a. The General Requirements Lump Sum amount, including cost for bonds and insurance, shall be paid in proportion to the total percent of completion. The Owner will consider requests for payment for bonds and insurance under the General Requirements after receipt of certified invoices from the Contractor showing that the Contractor has paid them.
  - b. The Owner reserves its right to withhold payment for General Requirements, in whole or in part, at the Owner's sole discretion, in accordance with Paragraph 11 below.
- 10) If any claim is filed against the project for labor, materials, supplies or equipment which the Owner has determined to have been incorporated on the site and the Contractor has not paid for, the Owner will have the right to retain from payments otherwise due the Contractor, in addition to other amounts properly withheld under this article or under other provisions of the Contract, an amount equal to such amounts claimed.
- 11) In addition to the provisions of this article and other relevant sections of the Contract Documents, payment may also be withheld proportionately for the following reasons:
  - a. Reasonable doubt that the Work can be completed for the unpaid balance of the Contract Sum,
  - b. Reasonable indication that the Work will not be completed within the Contract Time,
  - c. Damage to another Contractor,
  - d. Unsatisfactory prosecution of the Work by the Contractor,
  - e. Failure of the Contractor, or his Subcontractors, to pay wage rates, when applicable as required by the Contract.

- f. In the event the Surety on the Performance and Payment Bond provided by the Contractor becomes insolvent, or is placed in the hands of a receiver, or has its right to do business in the State of Florida suspended or revoked as provided by law. In this case, payment will continue when the Contractor provides a good and sufficient Bond(s) as required by the Contract Documents, in lieu of the Bond(s) so executed by such Surety.
- g. If any work or material is discovered which, in the opinion of either the Architect/Engineer or the Field Representative, is defective, or should a reasonable doubt arise on the part of the either the Architect/Engineer or the Field Representative as to the integrity of any part of the work completed previous to the final acceptance and payment. In this case, there will be deducted from the first application for payment subsequent to the discovery of such work, an amount equal in value to the defective or questioned work, and this work will not be included in any subsequent applications for payment until the defects have been remedied or the causes for doubt removed.

12) The Contractor shall submit with each monthly invoice the certified payroll forms for all employees on the job in accordance with applicable Responsible Wages and Benefits (Ordinance No. 90-143 and codified in Miami-Dade County Code Section 2-11.16). Failure to provide this information will cause the Field Representative and/or Architect/Engineer to return the invoice to the Contractor until such time as the Contractor properly submits the information.

13) Failure to comply with the insurance requirements listed in the Contract Documents may result in the Owner's withholding or delaying payment to the Contractor.

#### B. Taxes

- 1) Except as may be otherwise provided for in the Contract Documents, the price or prices bid for the Work shall include full compensation for all federal, state, local and foreign taxes, fees and duties that the Contractor is or may be required to pay and the Contractor shall be responsible for the payment thereof during the prosecution of the work.
- 2) The Contractor's attention is directed to the fact that materials and supplies necessary for the completion of this Contract are subject to the Florida Sales and Use Tax, in accordance with Section 212.08, Florida Statutes, as amended. The Contractor shall not collect taxes upon making delivery to the Owner.
- 3) The Owner, at its sole discretion, upon request of the Contractor and where appropriate, may furnish to the Contractor appropriate evidence to establish exemption from any taxes, fees or duties which may be applicable to the agreement and from which the Owner is exempt.

#### C. Payments to Subcontractors and Suppliers

- 1) The Contractor shall pay all Subcontractors for and on account of work performed by such Subcontractors in accordance with the terms of their



respective subcontracts and in accordance with Ordinance Nos. 94-40, and 02-29, Miami-Dade County Code Section 10-33.02 and Florida Statute s. 218.735.

- 2) Before the Contractor can receive any payment, except the first payment, for monies due him as a result of a percentage of the work completed, he must provide the Architect/Engineer with duly executed release of claim from all subcontractors and suppliers who have performed any work or supplied any material on the project as of the date, stating that said subcontractors or suppliers have been paid their proportionate share of all previous payments. In the event such affidavits cannot be furnished, the Contractor may, at the Owner's sole discretion after the Contractor demonstrates justifiable reasons, submit an executed Consent of Surety to Requisition using the form provided in the Contract Documents identifying the subcontractors and the amounts for which the Statement of Satisfaction cannot be furnished.
- 3) The Contractor's failure to provide a Consent of Surety to Requisition Payment will result in the amount in dispute being withheld until (1) the Statement of Satisfaction is furnished, or (2) Consent of Surety to Requisition Payment is furnished. The Subcontractor(s) shall submit with each monthly invoice the Certified Payroll forms for all employees on the job in accordance with applicable Provisions. Failure to provide this information will cause the Architect/Engineer to return the invoice to the Contractor until such time as the Contractor properly submits the information.

D. Contract Prices – Bid Form

- 1) Payment for the various Bid Items listed in the Bid Form shall constitute full compensation for furnishing plant, labor, equipment, appliances and materials and for performing operations required to complete the Work in conformity with the Contract Documents. All costs for work shown or indicated by the Contract Documents, although not specifically provided for by a Bid Item in the Bid Form, shall be included in the most appropriate Bid Item price for the items listed. Except for the relief provided by the applicable section of the Contract Documents governing Differing Site Conditions, the Contractor will not be entitled to additional compensation for providing an activity or material necessary for the completion of the Work in accordance with the Contract even though the activity or material is not included in a specific Bid Item or indicated in the Contract Documents.

E. Final Payment

- 1) After the Work has been accepted by the Owner, subject to the provisions of the Contract Documents, a final payment will be made as follows:
  - a. Prior to Final Acceptance of the Work, the Contractor shall prepare and submit a proposed final application for payment to the Architect/Engineer showing the proposed total amount due the Contractor, segregated as to Bid Item quantities, force account work, and other bases for payments; deductions made or to be made for prior payment; amounts to be retained; any claims the Contractor intends to file at that time or a statement that no claims will be filed; and any unsettled claims, stating amounts. Prior applications and

payments shall be subject to correction in the proposed final application for payment. Claims filed with the final application for payment must be otherwise timely under these General Conditions.

- b. The Owner will review the Contractor's proposed final application for payment and necessary changes or corrections will be forwarded to the Contractor. Within 10 days thereafter, the Contractor shall submit a final application for payment incorporating changes or corrections made by the Architect/Engineer together with additional claims resulting therefrom. Upon approval by the Owner, the corrected proposed final application for payment will become the approved final application for payment.
- c. If the Contractor files no claims with the final application for payment and no claims remain unsettled within 30 days after final inspection of the Work by the Architect/Engineer and the Owner, and agreements are reached on all questions regarding the final application for payment, the Owner, in exchange for an executed release of all claims and properly executed close-out documents specified in Paragraph 3 below, will pay the entire sum found due on the approved final application for payment.
- d. Upon final determination of any and all claims, the Owner, in exchange for properly executed close-out documents specified in Paragraph 3 below, will pay the entire sum found due on the approved final application for payment, including the amount, if any, allowed on claims.
- e. The release from the Contractor will be from any claims arising from the Work under the Contract. If the Contractor's claim to amounts payable under the Contract has been authorized by the Owner for assignment pursuant to the relevant sections of the Contract Documents, a release may be required from the assignee.
- f. Final payment will be made within 30 days after approval of the final notice and resolution of Contractor's claims, or 30 days after Final Acceptance of the Work by the Owner, whichever is later. If a final application for payment has not been approved within 30 days after final inspection of the Work, the Owner shall make payment of sums not in dispute without prejudice to the rights of either the Owner or the Contractor in connection with any disputed items.
- g. Prior to payment of a claim settlement, the claim may be audited by the Owner and may be subject to approval by the funding agencies.
- h. Final payment made in accordance with this article will be conclusive and binding against both parties to the Contract on all questions relating to the amount of work done and the compensation paid therefore.

- 2) With the final application for payment, the Contractor shall return and submit final releases of claim from himself, from each Subcontractor of record and from other Subcontractors or material suppliers who may have notified the Owner that they were furnishing labor or materials for this project. These releases from Subcontractors and suppliers shall be final, originals, notarized and executed on the form provided by the Owner and included in the Contract Documents, all in accordance with all applicable Florida Statutes. In addition, the Contractor shall execute and return to the Owner all the enclosed close-out documents. In the event that all of the above releases cannot be furnished, the Contractor may, at the Owner's sole discretion after the Contractor demonstrates justifiable reasons, submit a Consent of Surety to Final Payment in a form acceptable to the Owner, recognizing lack of such releases of claim. Furthermore, the Contractor and the Surety shall agree in writing, in a form acceptable to the Owner, to indemnify, defend and hold harmless the Owner from any claims of Subcontractors and suppliers who refuse to execute final releases.
- 3) The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:
  - a. Faulty or defective Work appearing after Final Completion;
  - b. Failure of the Work to comply with the requirements of the Contract Documents, discovered after Final Completion;
  - c. The performance of audits to seek reimbursement of any overpayments discovered as a result of an audit as provided in the Contract Documents;
  - d. The enforcement of those provisions of the Contract Documents which specifically provide that they survive the completion of the Work;
  - e. The enforcement of the terms of the Payment and Performance Bonds against the Surety;
  - f. Terms of all warranties/guarantees required by the Contract Documents.
- 4) The acceptance of final payment shall constitute a waiver of all claims by the Contractor.

## **10. CHANGES**

(June 12, 2012)

### **A. Changes**

- 1) The Owner reserves the right to, at any time, without notice to the sureties and without invalidating the Contract, by written notice or order designated as a Change Notice or Change Order, make any change in the Work within the general scope of the Contract including but not limited to changes:
  - a. In the Contract Documents;

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

- b. In the method or manner of performance of the Work;
  - c. In Owner-furnished facilities, equipment, materials, services, or site or;
  - d. Directing acceleration in performance of the Work.
- 2) In the event the Owner exercises its right to change, delete or add work under the Contract, such work will be ordered and paid for as provided for in the Contract Documents.
- 3) Changes in the work may be initiated by the issuance of a Change Notice by the Architect/Engineer. The Contractor shall submit a proposal to the Architect/Engineer and the Owner for their review, in accordance with the Contract Documents, within a reasonable time after receipt of a Change Notice. The Contractor shall maintain this proposal, for acceptance by the Owner, for a minimum of 90 calendar days after submittal. The cost or credit to the Owner for any change in the work shall be determined in accordance with the provisions of the Contract Documents. The Contractor shall not be compensated for effort expended in preparing and submitting price quotes.
- 4) In the event the Contractor fails to provide the full cost and time estimate for the change work or refuses to execute a full accord Change Order, the Owner will, at its sole discretion, (1) determine the total cost and time impacts of the change and compensate the Contractor and/or extend the Contract Time, if applicable, through a unilateral Change Order signed only by the Owner; or (2) direct the Contractor to proceed with the Work under the Force Account provisions of this article. Failure of the Contractor to submit his total and final estimated cost and time impact within the time period specified on the Change Notice form shall constitute a waiver by the Contractor to claim additional costs or time beyond that which has been determined by the Owner. Any disputes arising out of an Owner determination shall be resolved in accordance with the disputes provisions in the Contract Documents. Pending the Owner's final decision, the Contractor shall proceed diligently with the performance of the Work under the Contract.
- 5) Changes in the work covered by Unit Prices, as stated in the Contract Documents shall be all inclusive. These prices will include all Direct and Indirect Costs and means and methods of execution. To be compensable, units must be measured daily by the Contractor and approved in writing by the Owner or his authorized representative.
- 6) The following mark-ups on Extra Work shall apply to all changes in the Work performed under this article:
  - a. For Extra Work performed by the Contractor's own forces, the Contractor agrees that his proposed cost to perform said Extra Work will in no event include a rate for overhead in excess of fifteen percent (15%).
  - b. For Extra Work performed by a Subcontractor's forces, the Contractor agrees that his proposed cost to perform said Extra Work will in no event include Overhead in excess of fifteen percent (15%). The Contractor may then add five percent (5%) times the

Subcontractor's or sub-tier Subcontractor's actual Direct Cost as direct compensation for the Contractor's Overhead and all other costs associated with the Subcontractors Work at all tiers.

- 7) Increases to the Contract Amount shall be authorized by a Change Order executed by the Contractor, the Contractor's Surety and the Owner and approved by the BCC. Decreases to the Contract amount shall be by Change Order or Work Order as determined by the Owner and shall also be subject to BCC approval when the decrease results from a reduction in the scope of the work.
- 8) A cost of bonds for Change Orders that impact the Contract price shall be established by the Contractor's actual reimbursement costs, as approved by the Owner, based on the original Contract Amount and the original amount reimbursed to the Contractor for bonds at the commencement of the Work. This cost of bonds shall be added to all credit amounts allowed by the Owner. For Change Orders paid under the Allowance Account, no additional bond cost will be allowed unless the Allowance Account is not included in the original Contract Amount. In this case, additional bond costs for these Change Orders will be considered.
- 9) Any claim for payment of Extra Work that is not covered by a Change Order or Work Order will be rejected by the Owner.

B. Allowance Accounts

- 1) Certain portions of work which may be required to be performed by the Contractor under this Contract are either unforeseeable or have not yet been designed, and the value of such work, if any, is included in the Contract as a specific line item(s) entitled "Allowance Account(s)".
  - a. The Allowance Account (General) can be used to reimburse the Contractor for (1) furnishing all labor, materials, equipment and services necessary for modifications or Extra Work required to complete the Project because of unforeseeable conditions and; (2) for performing construction changes required to resolve: oversight in design, Owner oversight, unforeseen conditions, revised regulations, technological and product development, operational changes, schedule requirements, program interface, emergencies and delays; and for making final adjustment to estimated quantities shown on the Schedule of Values or amounts bid in the Bid Form to conform to actual quantities installed.
  - b. Other Allowance Account(s) (Dedicated) may be used as specified in the Contract Documents to fund specific items of work at the sole discretion of the Owner. These dedicated allowance accounts shall be used only for the purposes approved pursuant to a written Work Order issued by the Owner or his authorized representative.
- 2) At such time as work is to be performed under the Allowance Account(s), if any, the work shall be incorporated into the Schedule and the Schedule of Values, and shall in all respects be integrated into the construction as a part of the Contract as awarded.

- 3) The Work Order for the required work will be issued by the Owner or Architect/Engineer upon receipt from the Contractor of a satisfactory proposal for performance of the work, and the acceptance thereof by the Architect/-Engineer and the Owner. If the Contractor and the Owner are unable to agree upon an amount of compensation or; if the nature of the work is such that a Unit Price or Lump Sum price is not economically practical or if the change work is deemed essential to the Project and actual conditions require work to be swiftly conducted to avoid or minimize delays, the Work Order may be issued to perform the work on a Force Account basis. In the event that an equitable adjustment for the said change work cannot be arrived at, either by mutual agreement or under the dispute provisions of the Contract Documents, the compensation hereunder will be the total compensation for this work.
- 4) No Work Orders shall be issued against an Allowance Account if such Work Orders in the aggregate exceed the authorized amount of that Allowance Account, provided however that such excess may be authorized by appropriate Change Order.
- 5) The unexpended amounts under the allowance accounts shall remain with the Owner and the Contractor shall have no claim to the same.

C. Deletion or Addition of Work

- 1) In the event the Owner exercises its right to delete any portion(s) of the work contemplated herein, such deletion will be ordered and the Contract Total Amount and Time may be adjusted as provided for in these Contract Documents by Change Order or by Work Order, as appropriate. The Contractor shall be reimbursed for any actual reasonable expenses incurred prior to the notice of deletion of work as a result of preparing to perform the work deleted. In the event of a dispute between Owner and Contractor as to the adjustment to the amount of time, the dispute shall be handled in accordance with these General Conditions.
- 2) Deleted Work - Lump Sum Bid Item(s): The Contractor shall credit the Owner for the reasonable value of the deleted work determined from the approved Schedule of Values, subject to approval by the Architect/Engineer. If the reasonable value of the deleted work cannot be readily ascertained from the Schedule of Values submitted in accordance with these General Conditions, or if requested by the Architect/Engineer, the Contractor shall supply all data required by the Architect/Engineer, including the actual agreements executed by the Contractor with the Subcontractors and suppliers affected by the deleted work, to substantiate the amount of the credit to be given the Owner. The Contractor shall also submit for the Owner's approval a revised schedule of values reflecting the work remaining under the Contract following the deletion.
- 3) No payment(s) shall be made to the Contractor by the Owner for loss of anticipated profit(s) from any deleted work.
- 4) In the event the Owner exercises its right to add to any portion of the work contemplated herein, such addition will be ordered and the Contract Total Amount and Contract Time will be adjusted as provided for in these Contract Documents, by Change Order or by Work Order as appropriate. In the event of

a dispute between Owner and Contractor as to the adjustment to the Amount or the Time, the dispute shall be handled in accordance with the Contract Documents.

D. Increased or Decreased Quantities (Unit Prices)

- 1) This section applies to Owner-initiated additions or deletions from the Work and to the unit prices contained within this contract and controls payments or credits for variations between estimated and actual quantities required to complete the Work, even though the additions or deletions may be distinct or separate structures or activities and regardless of the fact that the addition or deletion is a result of field adjustments, site conditions, a design change or any other cause. Increases or decreases will be determined by comparing the actual quantity required to the Architect/Engineer's estimated quantity in the Bid Form.
- 2) If the actual quantity of Bid Item varies from the Architect/Engineer's quantity estimate by 25% or less, payment for the Bid Item will be made at the Contract unit price. If the actual quantity varies from the Bid quantity by more than 25%, the compensation payable to the Contractor will be the subject of review by the Contractor and the Architect/Engineer and a Contract adjustment will be made by means of a Change Order in accordance with the Contract Documents to credit the Owner with any reduction in unit prices or to compensate the Contractor for any increase in unit price resulting from variations between estimated and actual quantities. The unit price to be re-negotiated shall be only for that quantity above 125% or below 75% of the original bid quantities.
- 3) The Contractor shall submit to the Architect/Engineer all data required to substantiate the amount of compensation requested therefore. In no event shall the Contractor be entitled to compensation greater than the aggregate amount of all the Unit Prices times the original bid quantities of Work reflected in the Bid Form.
- 4) No compensation will be made in any case for loss of anticipatory profits, loss of bonding capacity or consequential damages.

E. Extra Work

- 1) Except as otherwise expressly provided above, all additional work ordered, work changed or work deleted shall be authorized by Work Order(s) or Change Order(s). All changed or added work so authorized shall be performed by the Contractor at the time and in the manner specified.

The Change Order shall include, as a minimum:

- a. Scope of work to be added, deleted or modified;
- b. Cost of work to be added, deleted or modified;
- c. The Contract time extension or reduction in contract time in the case of deleted work required to perform the work to be added, deleted or modified;
- d. Full release of claims associated with the Contract through the date of the change order, or a reservation of claims identified as to each claim

reserved, the scope of the work, the maximum cost of the work, and the maximum number of days of Contract time requested, shall be specified.

The Work Order shall include, at a minimum:

- a. Scope of work to be added, deleted or modified;
  - b. Cost of work to be added, deleted or modified;
  - c. The Contract time extension required to perform the work to be added, deleted or modified;
  - d. Full release of claims associated with the work order work, or a reservation of claims identified as to each claim reserved, the scope of the work, the maximum cost of the work, and the maximum number of days of Contract time requested, shall be specified.
- 2) If Work is ordered, changed, or deleted which is not covered by Unit Prices, then, the Owner and the Contractor shall negotiate an equitable adjustment to the Contract Price for the Direct Costs for the performance of such work in accordance with this article. Indirect Costs for Work ordered, changed or deleted may be reimbursed for Excusable and Compensable Delay as defined in these Contract Documents.
- a. In order to reimburse the Contractor for additional Direct Costs, either by Work Order, Change Order or any other means, the Contractor must have additional work added to the Contract Scope of Work. The additional cost of idle or inefficient labor, from any cause, or the additional cost of labor made idle or inefficient from any cause will not be considered a reimbursable additional Direct Cost. Special equipment or machinery, which is made idle or inefficient by the Work ordered, changed or deleted, may be reimbursable if approved by the Architect/Engineer as an unavoidable cost to the Contractor, caused by the Owner.
  - b. Costs of special equipment or machinery, not already mobilized on the site, approved by the Architect/Engineer, shall be calculated using the current issue of the Associated Equipment Distributors (AED) Manual plus any required mobilization. The selection of which of the AED rates (daily, weekly, monthly) to be used to calculate these costs shall be as follows:
    - i. Between one (1) day and seven (7) days, use the daily rate.
    - ii. Between seven (7) days and thirty (30) days, use the weekly rate.
    - iii. Greater than thirty (30) days, use the monthly rate.
  - c. For less than one (1) day hourly rates, use the daily rate divided by eight (8).



- d. For overtime hourly rates use the daily rate divided by eight (8), the weekly rate divided by forty (40), or the monthly rate divided by one hundred and seventy-six (176) as appropriate.
- e. Costs for Special Equipment and Machinery already mobilized on the site, shall not exceed the monthly rate stated in the AED Manual, divided by one hundred and seventy-six (176), per hour that the Special Equipment and Machinery is in use on the work plus any required re-mobilization.
- f. The cost calculation shall not combine rates within the range of a time extension. It shall use decimals of the time extension rate that the extension falls under. For example, the cost calculation for a piece of Special Equipment with an approved delay of forty five (45) days shall be one and one-half (1.5) months times the monthly rate, not one (1) month at the monthly rate, plus two (2) weeks at the weekly rate, plus one (1) day at the daily rate.
- g. Rental for special equipment and machinery, not already mobilized to the site, shall be an amount equal to the appropriate daily, weekly, or monthly rental rate for such equipment, in accordance with the current issue of Associated Equipment Distributors' (AED) "Compilation of Nationally Averaged Rental Rates and Model Specifications for Construction Equipment" (notwithstanding the caveats contained therein that such rental rates are not for use by government agencies) for each and every rental period (in weeks, days, or months as applicable) that the special equipment or machinery is in use on the work plus any required mobilization. Payment for special equipment and machinery already mobilized to the site shall not exceed the monthly rate stated in the AED standards divided by one hundred and seventy six (176) to establish a per hour rate that the special equipment and machinery is in use on the Work, plus any required re-mobilization.
- h. For indirect costs, the Contractor shall be allowed a percentage mark-up as set forth in Paragraph G. 2 below.

F. Differing Site Conditions

- 1) The Contractor shall immediately, and before such conditions are disturbed, notify the Architect/Engineer in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.
- 2) The Architect/Engineer will promptly investigate the conditions, and if such conditions materially differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under the Contract, a Contract change may be made and the Contract modified in writing in accordance with the Contract Documents.

- 3) No claim of the Contractor under this article will be allowed unless the Contractor has given the notice required in the Contract Documents.
- 4) No claim by the Contractor for a Contract change hereunder will be allowed if asserted after final payment under this Contract.
- 5) If the Owner is not given written notice prior to the conditions being disturbed, the Contractor will be deemed to have waived his right to assert a claim for additional time and compensation arising out of such changed conditions.

G. Force Account

- 1) If the Owner and the Contractor cannot reach agreement on an equitable adjustment to the Contract Price for any work as prescribed above, then the Extra Work will be performed on a Force Account basis as directed by the Architect/Engineer and paid for as specified below.
- 2) The following percentages will be allowed as mark-ups over Direct Costs for all negotiated adjustments to the Contract Amount or for work performed on either a negotiated lump sum basis or a Force Account basis:
  - a. Extra Work Performed directly by Contractor's Own Forces: The Contractor may add up to a maximum fifteen percent (15%) mark-up on the actual Direct Cost of the Extra Work, subject to review and approval by the Architect/Engineer, as direct compensation for Overhead. A 10% mark-up will be added to all negotiated credit amounts for deleted work not performed to cover Overhead.
  - b. Extra Work Performed by a Subcontractor or any Sub-tier Subcontractor: The Subcontractor may add up to a maximum fifteen percent (15%) mark-up on the actual Direct Cost of the Extra Work as direct compensation for Overhead. The Contractor may add a five percent (5%) mark-up on the Subcontractor's actual Direct Cost as Contractor's Overhead. A 10% additional credit will be added to all Subcontractor negotiated credit amounts for deleted work not performed to cover quality control, supervision, coordination, overhead, small tools and incidentals.
- 3) In the event Extra Work is performed on a Force Account basis, then the Contractor and the Subcontractor(s), as appropriate, shall maintain itemized daily records of costs, quantities, labor and the use of authorized Special Equipment or Machinery. Copies of such records, maintained as follows, shall be furnished to the Architect/Engineer daily for approval, subject to audit.
  - a. Comparison of Record: The Contractor, including its Subcontractor(s) of any tier performing the work, and the Architect/Engineer shall compare records of the cost of force account work at the end of each day. Agreement shall be indicated by signature of the Contractor, the Subcontractor performing the work, and the Architect/Engineer or their duly authorized representatives.
  - b. Statement: No payment will be made for work performed on a force account basis until the Contractor has furnished the

Architect/Engineer with duplicate itemized statements of the cost of such force account work detailed as follows:

- i. Name, classification, date, daily hours, total hours, rate and extension for each laborer, tradesman, and foreman.
- ii. Designation, dates, daily hours, total hours, rental rate, and extension of each unit of special machinery and equipment.
- iii. Quantities of materials, prices, and extensions.
- iv. Transportation of materials.

The statements shall be accompanied and supported by a receipted invoice of all materials used and transportation charges. However, if materials used on the force account work are not specifically purchased for such work but are taken from the Contractor's stock, then in lieu of the invoices the Contractor shall furnish an affidavit certifying that such materials were taken from its stock, that the quantity claimed was actually used, and that the price and transportation claimed represent the actual cost to the Contractor.

- c. Authorization of Special Equipment and Machinery: No compensation for special equipment or machinery shall be made without written authorization from the Architect/Engineer. The Architect/Engineer shall review and evaluate any special equipment or machinery proposed by the Contractor for use on a force account basis. As part of its evaluation, the Architect/Engineer shall determine whether any of the special equipment or machinery being proposed by the Contractor will be concurrently used on the Project, including approved changes, or on other force account work on the Project. If the Architect/Engineer determines that such a concurrent use of special equipment or machinery is being proposed by the Contractor, prior to the authorization of such special equipment or machinery, the Architect/Engineer and thereto Contractor shall establish a straight-line prorated billing mechanism based on the actual percentage of time that the equipment or machinery is required to be used on the force account work(s).

Special equipment or machinery which is approved for use by the Architect/Engineer shall be reviewed and accounted for on a daily basis as provided in the Comparison of Record and Statement paragraphs of this section of the Contract.

- d. Inefficiency in the Prosecution of the Work: If in the Owner's or Architect/Engineer's opinion, the Contractor or any of its Subcontractors, in performing Force Account Work, is not making efficient use of labor, materials or equipment or is proceeding in a manner which makes Force Account Work unnecessarily more expensive to the Owner, the Owner or Architect/Engineer may, in whole or part, direct the Contractor in the deployment of labor, material and equipment. By way of illustration, inefficiency may

arise in the following ways, including but not limited to: (1) the timing of the Work, (2) the use of unnecessary labor or equipment, (3) the use of a higher percentage of journeymen than in non-force account Work, (4) the failure to procure materials at lowest price, or (5) using materials of quality higher than necessary.

H. Contractor Proposals - General

- 1) The Contractor may at any time submit to the Architect/Engineer for his review proposed modifications to the Contract Documents, including but not limited to, changes in the Contract Time and/or Contract Amount, supported by a cost/price proposal. Upon acceptance of the proposed modifications by the Owner, a Work Order or Change Order will be issued. Denial of a proposed modification will neither provide the Contractor with any basis for claim for damages nor release the Contractor from contractual responsibilities. A Contract change in the form of a Contract price reduction will be made if the change results in a reduction of the cost of performance and the Contractor will not be entitled to share in said savings unless the proposal is made in accordance with Paragraph I of this article. Except as provided in Paragraph I below, the Contractor will not be compensated for any direct, incidental or collateral benefits or savings the Owner receives as a result of the proposal.

I. Value Engineering Change Proposals: The Contractor may submit to the Architect/Engineer one or more cost reduction proposals for changing the Contract requirements. The proposals shall be based upon a sound study made by the Contractor indicating that the proposal:

- a. Will result in a net reduction in the total Contract amount;
- b. Will not impair any essential function or characteristic of the Work such as safety, service life, reliability, economy of operation, ease of maintenance and necessary standardized features;
- c. Will not require an unacceptable extension of the Contract completion time; and
- d. Will require a change in the Contract Documents and such change is not already under consideration by the Owner.
  - i. The Owner may accept in whole or in part any proposal submitted pursuant to the previous paragraph on Value Engineering Change Proposals by issuing a Change Order which will identify the proposal on which it is based. The Change Order will provide for a Contract change in the Contract price and will revise any other affected provisions of the Contract Documents. The equitable adjustment in the Contract price will be established by determining the net savings resulting from the accepted change. The net savings resulting from the change will be shared between the Contractor and the Owner on the basis of 50 percent for the Contractor and 50 percent for the Owner and will be limited to

one Value Engineering Change Proposal per Change Order. Net savings will be determined by deducting from the proposal's estimated gross savings (1) the Contractor's costs of developing and implementing the proposal (including any amount attributable to a subcontractor) and (2) the estimated amount of increased costs to the Owner resulting from the change, such as evaluation, implementation, inspection, related items, and Owner -furnished material. Estimated gross savings will include Contractor's labor, material, equipment, overhead, profit and bond. The Contract price will be reduced by the sum of the Owner's costs and share of the net savings. For the purposes of this article, the applicable provisions of the Contract Documents shall be used to determine the equitable adjustment to the Contract price.

- ii. The Owner will not be liable for delay in acting upon, or for failure to act upon, any proposal submitted pursuant to of this article. The decision of the Owner as to the acceptance or rejection of any such proposal under the Contract will be final. The submission of a proposal by the Contractor will not in itself affect the rights or obligations of either party under the Contract.
- iii. The Contractor shall have the right to withdraw part or all of any proposal he may make under Paragraph 2 of this article at any time prior to acceptance by the Owner. Such withdrawal shall be made in writing to the Architect/Engineer. Each such proposal shall remain valid for a period of 60 days from the date submitted. If the Contractor wishes to withdraw the proposal prior to the expiration of the 60 day period he will be liable for the cost incurred by the Owner in reviewing the proposal.
- iv. The Contractor shall specifically identify any proposals under Paragraph 2 of this article with the heading "Value Engineering Change Proposal", or the proposal will be considered as made under Paragraph 1 of this article.

- 2) The Contractor, in connection with each proposal for a Contract Change Notice under this article, shall furnish the following information:
  - a. A description of the difference between the existing Contract requirement and the proposed change, and the comparative advantages and disadvantages of each, justification when a function or characteristic of an item is being altered, and the effect of the change on the performance of the end item;
  - b. An analysis and itemization of the requirements of the Contract which must be changed if the Value Engineering Change Proposal is

accepted and a recommendation as to how to make each such change (e.g., a suggested specification revision);

- c. A separate detailed cost estimate for both the existing Contract requirement and the proposed change to provide an estimate of the reduction in costs, if any, that will result from acceptance of the Value Engineering Change Proposal taking into account the costs of development and implementation by the Contractor;
  - d. A prediction of any effects the proposed change would have on collateral costs to the Owner such as government-furnished property costs, costs of related items, and costs of maintenance and operation;
  - e. A statement of the time by which a Contract modification accepting the Value Engineering Change Proposal must be issued so as to obtain the maximum cost reduction, noting any effect on the Contract completion time or delivery schedule; and
  - f. Identification of any previous submission of the Value Engineering Change Proposal to the Owner, including the dates submitted, the numbers of the contracts involved, and the previous actions by the Owner.
- 3) The Contractor waives any and all claims relating to any delay that may arise out of a Value Engineering Change Proposal.

## **11. CLAIMS AND DISPUTES**

(June 12, 2012)

### **A. Notice of Claims**

- 1) The Contractor will not be entitled to additional time or compensation otherwise payable for any act or failure to act by the Owner, the happening of any event or occurrence, or any other cause, unless he shall have given the Architect/Engineer a written notice of claim therefore as specified in this article.
- 2) The Contractor shall provide immediate verbal notification with written confirmation within forty-eight (48) hours of any potential claims and of the anticipated time and/or cost impacts resulting thereof. The written notice of claim shall set forth the reasons for which the Contractor believes additional compensation and/or time will or may be due, the nature of the costs involved and the approximate amount of the potential claim.
- 3) It is the intention of this article, that differences between the parties arising under and by virtue of the Contract shall be brought to the attention of the Architect/Engineer at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action promptly taken.
- 4) The notice requirements of this article are in addition to those required in other articles of these Contract Documents.

- 5) The Contractor shall segregate all costs associated with each individual claim including but not limited to labor, equipment, material, subcontractor and supplier costs, and all other costs related to the claim. In the event that the Contractor has multiple claims, the Contractor will segregate each claim individually including the respective costs associated with each claim. Failure to segregate claims and their respective costs will be grounds for the Owner's rejection of the claim. No "total cost claims" shall be allowed under this Contract.
- 6) The Contractor must maintain a cost accounting system as a condition for making a claim against the Owner. The cost accounting system must segregate the costs of the work under the Contract (non-claims-related) from claims-related and other Contractor costs through the use of a job cost ledger and be otherwise in compliance with general accounting principles.
- 7) If the Owner decides to pay all or part of a claim for which notice was not timely made, the Owner does not waive the right to enforce the notice requirements in connection with any other claim.
- 8) Inasmuch as the notice of claim requirements of this article are intended to enable the Architect/Engineer to investigate while facts are fresh and to take action to minimize or avoid a claim which might be filed thereafter, the Contractor's failure to make the required notice on time is likely to disadvantage the Owner. Therefore, a claim that does not comply with the notice requirements above shall not be considered unless the Contractor submits with his claim proof showing that the Owner has not been prejudiced by the Contractor's failure to so comply and, in the event the Owner has been prejudiced by the Contractor's failure to submit a timely notice of claim, the Owner will reduce any equitable adjustment claimed by the Contractor to reflect the damage.

B. Claim Submittals

- 1) Claims or requests for equitable adjustments filed by the Contractor shall be filed in full accordance with this article no later than 30 calendar days after the act giving rise to the claim and in sufficient detail to enable the Owner to ascertain the basis and amount of said claims. In the case of continuing or on-going claim events, the Contractor shall be allowed to periodically amend his claim to more accurately reflect the impact of said claim, until the end of the claim event. No claims for additional compensation, time extension or for any other relief under the Contract shall be recognized, processed, or treated in any manner unless the same is presented in accordance with this Article. Failure to present and process any claim in accordance with this Article shall be conclusively deemed a waiver, abandonment or relinquishment of any such claim, it being expressly understood and agreed that the timely presentation of claims, in sufficient detail to allow proper investigation and prompt resolution thereof, is essential to the administration of this Contract.
- 2) The Owner will review and evaluate the Contractor's claims. It will be the responsibility of the Contractor to furnish, when requested by the Architect/Engineer, such further information and details as may be required to

determine the facts or contentions involved in his claims. The cost of claims preparation or Change Order negotiations shall not be reimbursable under this Contract.

- 3) Any work performed by the Contractor prior to Notice-to-Proceed (NTP) shall not be the basis for a claim from the Contractor of any kind.
- 4) Each claim must be certified by the Contractor as required by the Miami-Dade Code, False Claims Act (see Code Section 21-255, et seq.), and accompanied by all materials required by Miami-Dade County Code Section 21-257. A "certified claim" shall be made under oath by a person duly authorized by the claimant, and shall contain a statement that:
  - a. The claim is made in good faith;
  - b. The claim's supporting data is accurate and complete to the best of the person's knowledge and belief;
  - c. The amount of the claim accurately reflects the amount that the claimant believes is due from the Owner; and
  - d. The certifying person is duly authorized by the claimant to certify the claim.
- 5) In order to substantiate time-related claims (delays, disruptions, impacts, etc.), the Contractor shall, if applicable and as determined by the Owner, submit, in triplicate, the following information:
  - a. Copy of Contractor's notice of claim in accordance with this article. Failure to submit the notice is sufficient grounds to deny the claim.
  - b. The approved, as-planned Schedule in accordance with the applicable section of the Contract Documents and computer storage media, if applicable.
  - c. The as-built Schedule reflecting changes to the approved schedule up to the time of the impact in question and computer storage media if applicable.
  - d. The basis for the duration of the start and finish dates of each impact activity and the reason for choosing the successor and predecessor events affected in the schedule shall be explained. Also, the basis for the duration of any lead/lags inserted into the schedule and the duration in related activity duration shall be explained.
  - e. A marked-up as-built Schedule indicating the causes responsible for changes between the as-planned and as-built schedule and establishing the required cause and effect relationships.
  - f. After indicating specific time related changes on the as-built schedule, the documentation must be segregated into separate packages with each package documenting a specific duration change identified previously. This documentation package shall include



Change Orders, Change Notices, Work Orders, written directions, meeting minutes, etc., related to the change in duration.

- g. Any loss of efficiency, acceleration, disruption and loss of productivity claims shall be compensated as part of the Liquidated Indirect Costs paid for compensable, excusable delays and mark-up on Direct Cost of changes as allowed by the Contract. Total cost and modified total cost claims will not be accepted and the Contractor agrees to waive the right to seek recovery by these methods. The claimed delay shall not result from a cause specified in the Contract Documents as a non-excusable delay.
- h. The Contractor assumes all risk for the following items, none of which shall be the subject of any claim and none of which shall be compensated for except as they may have been included in the compensation described under Liquidated Indirect Costs: (1) home office expenses or any Direct Costs incurred allocated from the headquarters of the Contractor; (2) loss of anticipated profits on this or any other project, (3) loss of bonding capacity or capability; (4) losses due to other projects not bid upon; (5) loss of business opportunities; (6) loss of productivity on this or any other project; (7) loss of interest income on funds not paid; (8) costs to prepare, negotiate or prosecute claims and (9) costs spent to achieve compliance with applicable laws and ordinances (excepting only sales taxes paid shall be reimbursable expense subject to the provisions of the Contract Documents).
- i. All non-time-related claim items for additional compensation for Direct Costs shall be properly documented and supported with copies of invoices, time sheets, rental agreements, crew sheets and the like.
- j. Cost information shall be submitted in sufficient detail to allow for review. The basis for the budgeted or actual costs shall include man-hours by trade, labor rates, material and equipment costs etc. These costs shall be broken down by pay item and Construction Specification Institute (CSI) Division.
- k. The documentation for budgeted cost shall, as a minimum, include:
  - i. Copies of all the Contractor's bid documents, bid quotes, faxed quotes, etc.
  - ii. Copies of all executed subcontracts.
  - iii. Other related budget documents as requested by the Architect/Engineer.
- l. The documentation for actual cost shall, as a minimum, include:
  - i. Time Sheets.
  - ii. Materials invoices

- iii. Equipment invoices
  - iv. Subcontractors' payments
  - v. Other related documents as required by the Architect/Engineer.
  - m. The Contractor shall make all his books, employees, work sites and records available to the Owner or its representatives for inspection and audit.
  - n. No payment shall be made to the Contractor by the Owner for loss of anticipated profit(s) from any deleted work.
- 6) As indicated above, the Architect/Engineer and the Field Representative shall be allowed full and complete access to all personnel, documents, work sites or other information reasonably necessary to investigate any claim. Within sixty (60) days after a claim has been received, the claim shall either be rejected with an explanation as to why it was rejected or acknowledged. Once the claim is acknowledged, the parties shall attempt to negotiate a satisfactory settlement of the claim, which settlement shall be included in a subsequent Work Order or Change Order. If the parties fail to reach an agreement on a recognized claim, the Owner shall pay to the Contractor the amount of money it deems reasonable, less any appropriate retention, to compensate the Contractor for the recognized claim.
- 7) Failure of the Contractor to make a specific reservation of rights regarding any such disputed amounts in the body of the Change Order which contains the payment shall be construed as a waiver, abandonment, or relinquishment of all claims for additional monies resulting from the claims embodied in said Change Order. However, once the Contractor has properly reserved rights to any claim, no further reservations of rights shall be required and the Contractor shall not be required to repeat the reservation in any subsequent change order. Prior reservation of rights may however be modified, by express reference, in subsequent change orders. Notwithstanding the aforementioned, at the time of final payment under the Contract, the Contractor shall specify all claims which have been denied and all claims for which rights have been reserved in accordance with this section. Failure to so specify any particular claim shall be constructed as a waiver, abandonment, or relinquishment of such claim.

#### C. Disputes

- 1) The following provisions shall govern disputes under this Contract unless the Special Provisions to this Contract contain the requirement for the use of an alternate dispute resolution method. For example, for large projects of great complexity, a Dispute Review Board (DRB) may be employed by the Owner to settle disputes in lieu of the Department Director or OOM designee as specified below. In this case, the DRB alternative shall be specified by the individual department in the Special Provisions and, if utilized, shall supersede this dispute provision.

- a. In the event the Contractor and Owner are unable to resolve their differences concerning any determination made by the Architect/Engineer or Owner on any dispute or claim arising under or relating to the Contract (referred to in this Section as a “Dispute”), either the Contractor or Owner may initiate a dispute in accordance with the procedure set forth in this article. Exhaustion of these procedures shall be a precondition to any lawsuit permitted hereunder.
- b. For contracts with a value of \$5 million or less, all Disputes under this Contract shall be decided by the Department Director or his designee. For contracts valued at more than \$5 million, Disputes shall be decided by a designee appointed by the Office of the Mayor (OOM). Decisions rendered by the Department Director or OOM designee shall not be binding but shall be admissible in a court of competent jurisdiction.
- c. As soon as practicable, the Department Director or OOM designee shall adopt a schedule for the Contractor and Owner to file written submissions stating their respective positions and the bases therefore. The written submissions shall include copies of all documents and sworn statements in affidavit form from all witnesses relied on by each party in support of its position. Within 20 working days of the date on which such written submissions are filed, the Department Director or OOM designee shall afford each party an opportunity to present a maximum of one hour of argument. The Department Director or OOM designee may decide the Dispute on the basis of the affidavits and other written submissions if, in his opinion, there is no issue of material fact and the party is entitled to a favorable resolution pursuant to the terms of this Contract. As part of such decision, the Department Director or OOM designee shall determine the timeliness and sufficiency of each notice of claim and claim at issue as provided in this article. The Department Director or OOM designee shall have the authority to rule on questions of law, including disputes over contract interpretation, and to resolve claims, or portions of claims, via summary judgment where there are no disputed issues of material fact. Furthermore, the Department Director or OOM designee is authorized by both parties to strike elements of claims seeking relief or damages not available under the contract (such as, but not limited to, claims for lost profits, off-site overhead, loss of efficiency or productivity claims or claim’s preparation costs) by summary disposition.
- d. In the event that the Department Director or OOM designee determines that the affidavits or other written submissions present issues of material fact, he shall allow the presentation of evidence in the form of lay or expert testimony directed solely to the issues which he may specifically identify to require factual resolution. The testimonial portion of the process shall not exceed one day in duration per side, including opening statements and closing arguments, if allowed by the Department Director or OOM designee at his reasonable discretion.

- e. No formal discovery shall be allowed in connection with any proceeding under this article. Notwithstanding the foregoing, both parties agree that all of the audit, document inspection, information and documentation requirements set forth elsewhere in this contract shall remain in force and effect throughout the proceeding. The Department Director or OOM designee shall not schedule the hearing until both parties have made all their respective records available for inspection and reproduction and the parties have been afforded reasonable time to analyze the records. The continued failure of a party to comply with the document inspection, examination, or submission requirements set forth in this contract shall constitute a waiver of that party's claims and/or defenses, as applicable. Hearsay evidence shall be admissible but shall not form the sole basis for any finding of fact. Failure of any party to participate on a timely basis, to cooperate in the proceedings, or to furnish evidence in support or defense of a claim shall be a criteria in determining the sufficiency and validity of a claim.
- f. The Department Director or OOM designee shall issue a written decision within 15 working days after conclusion of any testimonial proceeding and, if no testimonial proceeding is conducted, within 45 days of the filing of the last written submission. This written decision shall set forth the reasons for the disposition of the claim and a breakdown of any specific issues or subcontractor claims. As indicated previously, the decision of the Department Director or OOM designee is not binding on the parties, but will be admissible in a court of competent jurisdiction.
- g. If either party wishes to protest the decision of the Department Director or OOM designee, such party may commence an action in a court of competent jurisdiction, within the periods prescribed by law, it being understood that the review of the court shall be limited to the question of whether or not the Department Director or OOM designee's determination was arbitrary and capricious, unsupported by any competent evidence, or so grossly erroneous to evidence bad faith.
- h. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract and in accordance with the Architect/Engineer's interpretation. Any presentation or request by the Contractor under this article will be subject to the same requirements for Submittal of Claims in this article.

#### D. Terminations

##### 1) Termination for Convenience

- a. The Owner may at its option and discretion terminate the Contract, in whole or, from time to time in part, at any time without any default on the part of the Contractor by issuing a written Notice of Termination to the Contractor and its Surety, specifying the extent to which performance of work under the Contract is terminated and the date

upon which such termination becomes effective, at least ten (10) days prior to the effective date of such termination.

- b. In the event of Termination for Convenience, the Owner shall pay the Contractor for all labor performed, all materials and equipment furnished by the Contractor and its Subcontractors, materialmen and suppliers and manufacturers of equipment less all partial payments made on account prior to the date of cancellation as determined by the Field Representative and approved by the Architect/Engineer. The Contractor will be paid for:
  - i. The value of all work completed under the Contract, based upon the approved Schedule of Values and/or Unit Prices,
  - ii. The value of all materials and equipment delivered to but not incorporated into the work and properly stored on the site,
  - iii. The value of all bonafide irrevocable orders for materials and equipment not delivered to the construction site as of the date of cancellation. Such materials and equipment must be delivered to the Owner to a site or location designated by the Department prior to release of payment for such materials and equipment.
  - iv. The values calculated under i., ii. and iii. above shall be as determined by the Field Representative and approved by the Architect/Engineer.
- c. In the event of termination under this article, the Contractor shall not be entitled to any anticipated profits for any work not performed due to such termination.
- d. In the event of termination under this article, the Owner does not waive or void any credits otherwise due the Owner at the time of termination, including Liquidated Damages, and back charges for defective or deficient work.
- e. Upon termination as indicated above, the Field Representative shall prepare a certificate for Final Payment to the Contractor.

2) Termination for Default of Contractor

- a. The Contract may be terminated in whole or, from time to time in part, by the Owner for failure of the Contractor to comply with any requirements of the Contract Documents including but not limited to:
  - i. Failure to perform the work or failure to provide sufficient workers, equipment or materials to assure completion of work in accordance with the terms of the Contract, and the approved Schedule, or
  - ii. Failure to provide the Schedule for the Project by the date due, or

- iii. Failure to provide adequate shop drawings by the dates indicated in the approved Schedule for the Project, or
  - iv. Failure to replace the superintendent in the time allotted, if required, or
  - v. Performing the work unsuitably or neglecting or refusing to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, after written directions from the Field Representative, or
  - vi. Violating the terms of the Contract or performing work in bad faith, or
  - vii. Discontinuing the prosecution of the work, or
  - viii. Failure to resume work which has been discontinued within a reasonable time after notice to do so, or
  - ix. Abandonment of the Contract, or
  - x. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or failure to maintain a qualifier, or
  - xi. Allowing any final judgment to stand against him unsatisfied for a period of 10 days, or
  - xii. Making an assignment for the benefit of creditors, or
  - xiii. For any other cause whatsoever, fails to carry out the work in an acceptable manner or to comply with any other Contract requirement.
- b. Before the Contract is terminated, the Contractor and its Surety will be notified in writing by the Architect/Engineer or the Field Representative of the conditions which make termination of the Contract imminent. The Contract will be terminated by the Owner ten (10) days after said notice has been given to the Contractor and its Surety unless a satisfactory effort acceptable to the Owner has been made by the Contractor or its Surety to correct the conditions. If the Contractor fails to satisfactorily correct the conditions giving rise to the termination, the Owner may declare the Contract breached and send a written Notice of Termination to the Contractor and its Surety.
- c. The Owner reserves the right, in lieu of termination as set forth in this article, to withhold any payments of money which may be due or become due to the Contractor until the said default(s) have been remedied. In the event of Termination for Default, the Owner also reserves the right, in cases where the damages calculated by the Owner are expected to exceed the amount the Owner anticipated recovering from the Surety, to withhold amounts for work already performed.

- d. In the event the Owner exercises its right to terminate the Contract for default of the Contractor as set forth herein, the Owner shall have the option of finishing the work, through any means available to the Owner, or having the Surety complete the Contract in accordance with its terms and conditions. In case that the Owner decides to have the Surety take over the remaining performance of the Work, the time or delay between Notice of Default and start of work by the Surety is a non-excusable delay. If the Surety fails to act promptly, but no longer than thirty (30) calendar days after the Owner notifies the Surety of the Owner's decision to have the Surety complete the work, or after such takeover fails to prosecute the Work in an expeditious manner, the Owner may exercise any of its other options including completing the Work by whatever means and method it deems advisable. No claims for loss of anticipated profits or for any other reason in connection with the termination of the Contract shall be considered.
- e. Payments for the various Bid Items listed in the Bid Form will constitute full compensation for all expenses incurred in consequence of discontinuance of all or any portion of the Work except as provided in this section of the Contract Documents. In no event will compensation be made for anticipatory profits or consequential damages as a result of a discontinuance of all or any portion of the Work.
- f. The Contractor shall immediately upon receipt communicate any Notice of Termination for Default issued by the Owner to the affected Subcontractors and suppliers at any tier.
- g. If, after Notice of Termination of the Contractor's right to proceed under the provisions of this article, it is determined for any reason that the Contractor was not in default under the provisions of this article, or that the Contractor was entitled to an extension of time under the Contract Documents, the rights and obligations of the parties shall be the same as if the Notice of Termination had been issued pursuant to the section of this article dealing with Termination for Convenience.

3) Termination for National Emergencies

- a. The Owner shall terminate the Contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction Contract as a direct result of an Executive Order of the President of the United States with respect to the prosecution of war or in the interest of national defense.
- b. When the Contract, or any portion thereof, is terminated before completion of all items of work in the Contract, payment will be made for the actual number of units or items of work completed at the Contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits or

for any other reason in connection with the termination of the Contract shall be considered.

4) Implementation of Termination

- a. If the Owner cancels or terminates the Contract or any portion thereof, the Contractor shall stop all work on the date and to the extent specified in the Notice of Termination and shall:
  - i. Cancel all orders and Subcontracts, to the extent that they relate to the performance of the work terminated and which may be terminated without costs;
  - ii. Cancel and settle other orders and Subcontracts, except as may be necessary for completion of such portion of the Work not terminated, where the cost of settlement will be less than costs which would be incurred were such orders and subcontracts to be completed, subject to prior approval of the Field Representative;
  - iii. Settle outstanding liabilities and claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Owner, to the extent it may require, which approval or ratification shall be final for the purposes of this Article;
  - iv. Transfer title and deliver to the Owner, in the manner, at the time, and to the extent, if any, directed by it, in accordance with directions of the Field Representative, all fabricated or un-fabricated parts, all materials, supplies, work in progress, completed work, facilities, equipment, machinery or tools acquired by the Contractor in connection with the performance of the work and for which the Contractor has been or is to be paid;
  - v. Assign to the Owner in the manner, at the times and to the extent directed by it, all of the right, title, and interest of the Contractor under the orders and subcontracts so terminated, in which case the Owner will have the right, at its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;
  - vi. Deliver to the Field Representative As-Built Documents, complete as of the date of cancellation or termination, plans, Shop Drawings, sketches, permits, certificates, warranties, guarantees, specifications, three (3) complete sets of maintenance manuals, pamphlets, charts, parts lists, spare parts (if any), operating instructions required for all installed or finished equipment or machinery, and all other data accumulated by the Contractor for use in the performance of the work.



- vii. Perform all work as may be necessary to preserve the work then in progress and to protect materials, plant and equipment on the site or in transit thereto. The Contractor shall also take such action as may be necessary, or as the Architect/Engineer may direct, for the protection and preservation of the property related to this Contract which is in the possession of the Contractor and in which the Owner has or may acquire an interest.
- viii. Complete performance of each part of the work not terminated by the Notice of Termination;
- ix. Use his best efforts to sell, in the manner, at the time, to the extent, and at the price or prices directed or authorized by the Owner, property of the types referred to above; provided, however, that the Contractor (a) shall not be required to extend credit to any purchaser, and (b) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Owner; provided, further, that the proceeds of any such transfer or disposition will be applied in reduction of any payments to be made by the Owner to the Contractor under this Contract or will otherwise be credited to the price or cost of the work covered by this Contract or paid in such other manner as the Owner may direct;
- x. Termination of the Contract or a portion thereof shall neither relieve the Contractor of its responsibilities for the completed work nor shall it relieve its Surety of its obligation for and concerning any just claim arising out of the work performed.
- xi. In arriving at the amount due the Contractor under this article, there will be deducted, (1) any claim which the Owner may have against the Contractor in connection with this Contract and (2) the agreed price for, or the proceeds of sale of materials, supplies or other items acquired by the Contractor or sold, pursuant to the provisions of this article, and not otherwise recovered by or credited to the Owner.

5) Suspension of Work

- a. The Owner reserves the right to temporarily suspend execution of the whole or any part of the Work without compensation to the Contractor.
- b. In case the Contractor is actually and necessarily delayed by any act or omission on the part of the Owner, as determined by the Owner in writing, the time for completion of the Work shall be extended by the amount of the time of such delay as determined by the Owner, and an allowance may be made for actual direct costs, if any, which may have been borne by the Contractor. Such requests for additional time

and/or compensation must be made in accordance with the applicable sections of the Contract Documents.

- c. Only the actual delay necessarily resulting from the causes specified in this Article, shall be grounds for extension of time. In case the Contractor is delayed at any time or for any period by two or more of the causes specified in this Article, the Contractor shall not be entitled to a separate extension for each one of the causes but only one period of extension will be granted for the delay.
- d. In case the Contractor is actually and necessarily delayed in the performance of the Work from one or more of the causes specified in this Article, the extension of time to be granted to the Contractor shall be only for such portion of the Work so delayed. The Contractor shall not be entitled by reason of such delay to an extension of time for the completion of the remainder of the Work. If the Contractor shall be so delayed as to a portion of the Work he shall nevertheless proceed continuously and diligently with the prosecution of the remainder of the Work. No demand by the Contractor that the Owner determine and certify any matter of extension of time for the completion of the Work or any part thereof will be of any effect whatsoever unless the demand be made in writing at least 30 days before the completion date of the Work or any part thereof for which Liquidated Damages are established when meeting those dates is claimed to have been delayed by a suspension under this Article. Owner's determination as to any matter of extension of time for completion of the Work or any part thereof shall be binding and conclusive upon the Contractor.
- e. Permitting the Contractor to finish the Work or any part thereof after the time fixed for completion or after the date to which the time for completion may have been extended or the making of payments to the Contractor after any such periods shall not operate as a waiver on the part of the Owner of any rights under this contract.
- f. The Contractor shall insert in each subcontract a provision that the Subcontractor shall comply immediately with a written order of the Owner to the Contractor to suspend the Work, and that they shall further insert the same provision in each subcontract of any tier.

END OF ARTICLE

## 12. MISCELLANEOUS PROVISIONS

(June 12, 2012)

### A. Third Party Beneficiary

No contractual relationship will be recognized under the Contract other than the contractual relationship between the Owner and the Contractor. There shall be no third party beneficiary to this Contract.

### B. Venue

Any litigation which may arise out of this Contract shall be commenced either in the Eleventh Judicial Circuit Court in and for Miami-Dade County, Florida, or in the United States District Court, Southern District of Florida.

### C. Governing Laws

- 1) The Contractor shall, during the term of this Contract and in the prosecution of the work, be governed by the statutes, regulatory orders, ordinances and procedures of the United States of America, the State of Florida and Miami-Dade County including but not limited to the Florida Building Code and the provisions of the Code of Miami-Dade County governing Community Small Business Enterprises (CSBEs) as applicable.
- 2) Specifically, the Contractor and his Subcontractors shall comply with Miami-Dade County Resolution Nos. R-1386-09 and R-138-10 governing the treatment of CSBE firms.
- 3) In addition the Contractor agrees to abide by all federal, state, and County procedures, as may be amended from time to time, regarding how documents to which the Contractor has access are handled, copied, and distributed, particularly documents that contain sensitive security information.

### D. Successors and Assigns

The Owner and the Contractor each bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Contract or sublet it as a whole without the written consent of the Owner, nor shall the Contractor assign any moneys due or to become due the Contractor hereunder, without the previous written notice to the Owner. Consent will not be given to any proposed assignment which would relieve the Contractor or his Surety of their responsibilities under the Contract.

### E. Written Notice

- 1) Written notice to the Contractor shall be deemed to have been duly served if delivered in person to the individual or member of the firm or to any officer of the corporation for whom it was intended or if delivered at or sent by registered or certified mail to the last business address known to those who give the notice.

- 2) Written notice to the Owner shall be deemed to have been duly served if delivered in person, delivered at or sent by registered or certified mail to the individual identified in the Special Provisions.

#### F. Indemnification

- 1) In consideration of this Agreement, and to the maximum extent permitted by Chapter 725, Florida Statutes, as may be amended, the Contractor agrees to indemnify, protect, defend, and hold harmless the Government, State, County, their elected officials, officers, employees, consultants, and agents from claims, liabilities, damages, losses, and costs including, but not limited to reasonable attorney's fees at both the trial and appellate levels to the extent caused by the negligence, recklessness, or intentionally wrongful conduct of the Contractor and other persons employed or utilized by the Contractor in the performance of the Work.
- 2) The indemnification obligation under this clause shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor and/or any Subcontractor under worker's compensation acts, disability benefit acts, or other employee benefit acts.
- 3) In the event that any claims are brought or actions are filed against the Owner with respect to the indemnity contained herein, the Contractor agrees to defend against any such claims or actions regardless of whether such claims or actions are rightfully or wrongfully brought or filed. The Contractor agrees that the Owner may select the attorneys to appear and defend such claims or actions on behalf of the Owner. The Contractor further agrees to pay at the Contractor's expense the attorneys' fees and costs incurred by those attorneys selected by the Owner to appear and defend such claims or actions on behalf of the Owner. The Owner, at its sole option, shall have the sole authority for the direction of the defense, and shall be the sole judge of the acceptability of any compromise or settlement of any claims or actions against the Owner.
- 4) To the extent this indemnification clause or any other indemnification clause in this Agreement does not comply with Chapter 725, Florida Statutes, as may be amended, this provision and all aspects of the Contract Documents shall hereby be interpreted as the parties' intention for the indemnification clauses and Contract Documents to comply with Chapter 725, Florida Statutes, as may be amended.
- 5) This Section shall survive expiration or termination of this Agreement.

#### G. Audit Rights

- 1) Access to Records
  - a. The Contractor shall, during the term of this Contract and for a period of five years thereafter, allow the Owner and its duly authorized representatives to inspect all payroll records, invoices for materials, books of account, job cost ledgers, Project correspondence and Project-related files and all relevant records pertinent to the Contract.

- b. The Owner retains the right to audit accounts and access all files, correspondence and documents in reference to all work performed under this Contract. The Owner shall be provided full access upon request to all documents, including those in possession of Subcontractors or suppliers during the work and for a period of five years after the completion of the Work. In case of any litigation regarding this Project, such rights shall extend until final settlement of such litigation. Failure to allow the Owner access shall be deemed a waiver of Contractor's claims.
- c. The Contractor shall maintain a banking account within Miami-Dade County for all payments to laborers, Subcontractors and vendors furnishing labor and materials under this Contract. All records shall be maintained in Miami-Dade County for the term of this Contract.

2) Inspector General

- a. According to Section 2-1076 of the Code of Miami-Dade County, Miami-Dade County has established the Office of the Inspector General (IG) which may, on a random basis, perform audits, inspections, and reviews of all, on any County/Trust contracts, throughout the duration of said contracts. This random audit is separate and distinct from any other audit by the County. To pay for the functions of the Office of the Inspector General, any and all payments to be made to the Contractor under this contract will be assessed one quarter (1/4) of one (1) percent of the total amount of the payment, to be deducted from each progress payment as the same becomes due unless this Contract is federally or state funded where federal or state law or regulations preclude such a charge or where such a charge is otherwise precluded by Special Condition. The Contractor shall, in stating its agreed prices, be mindful of this assessment which will not be separately identified, calculated or adjusted in the proposal or Bid Form.
- b. The Miami-Dade Office of the Inspector General is authorized to investigate County affairs and empowered to review past, present and proposed County and Public Health Trust programs, accounts, records, contracts and transactions. In addition, the Inspector General has the power to subpoena witnesses, administer oaths, require the production of witnesses and monitor existing Projects and programs. Monitoring of an existing Project or program may include a report concerning whether the Project is on time, within budget and in conformance with the Contract Documents and applicable law. The Inspector General shall have the power to audit, investigate, monitor, oversee, inspect and review operations, activities, performance and procurement process including but not limited to Project design, bid specifications, (bid/proposal) submittals, activities of the (Contractor/ Vendor/ Consultant), its officers, agents and employees, lobbyists, County and Public Health Trust staff and

elected officials to ensure compliance with the Contract Documents and to detect fraud and corruption.

- c. Upon ten (10) days written notice to the Contractor, the Contractor shall make all requested records and documents available to the Inspector General for inspection and copying. The Inspector General is empowered to retain the services of independent private sector inspectors general to audit, investigate, monitor, oversee, inspect and review operations, activities, performance and procurement process including but not limited to Project design, bid specifications, (bid/proposal) submittals, activities of the (Contractor/ Vendor/ Consultant), its officers, agents and employees, lobbyists, County staff and elected officials to ensure compliance with the Contract Documents and to detect fraud and corruption.
- d. The Inspector General shall have the right to inspect and copy all documents and records in the (Contractor/Vendor/Consultant's) possession, custody or control which in the Inspector General's sole judgment, pertain to performance of the contract, including, but not limited to original estimate files, change order estimate files, worksheets, proposals and agreements from and with successful subcontractors and suppliers, all Project-related correspondence, memoranda, instructions, financial documents, construction documents, (bid/proposal) and contract documents, back-change documents, all documents and records which involve cash, trade or volume discounts, insurance proceeds, rebates, or dividends received, payroll and personnel records and supporting documentation for the aforesaid documents and records.
- e. The Contractor shall make available at its office at all reasonable times the records, materials, and other evidence regarding the acquisition (bid preparation) and performance of this contract, for examination, audit, or reproduction, until three (3) years after final payment under this contract or for any longer period required by statute or by other clauses of this contract. In addition:
  - i. If this contract is completely or partially terminated, the Contractor shall make available records relating to the work terminated until three (3) years after any resulting final termination settlement; and
  - ii. The Contractor shall make available records relating to appeals or to litigation or the settlement of claims arising under or relating to this contract until such appeals, litigation, or claims are finally resolved.
- f. The provisions in this section shall apply to the (Contractor/Vendor/Consultant), its officers, agents, employees, subcontractors and suppliers. The (Contractor/Vendor/Consultant) shall incorporate the provisions in this section in all subcontracts and

all other agreements executed by the (Contractor/Vendor/Consultant) in connection with the performance of this contract.

- g. Nothing in this section shall impair any independent right to the Owner to conduct audits or investigative activities. The provisions of this section are neither intended nor shall they be construed to impose any liability on the Owner by the (Contractor/Vendor/Consultant) or third parties.

#### H. Severability

- 1) In the event any article, section, sub-article, paragraph, sentence, clause or phrase contained in the Contract Documents shall be determined, declared or adjudged invalid, illegal, unconstitutional or otherwise unenforceable, such determination, declaration or adjudication shall in no manner affect the other articles, sections, sub-articles, paragraphs, sentences, clauses or phrases of the Contract Documents, which shall remain in full force and effect as if the article, section, sub-article, paragraph, sentence, clause or phrase declared, determined or adjudged invalid, illegal, unconstitutional or otherwise unenforceable was not originally contained in the Contract Documents.

#### I. Payment and Performance Bonds

- 1) The Contractor shall, as a condition of contract, provide to the County two separate bonds, one bonding payment and one bonding performance. Each bond shall be for no less than 100% of construction amount - to not include the amount for the buses, which is the majority of the entire contract amount. The payment bond and performance bond shall be in the forms requested under Sections 713.23 and 255.05, respectively, of the Florida Statutes. These bonds shall be in substantial compliance with the requirements of the forms attached hereto as \_\_\_\_\_.
  - a. The bonds shall be written through surety insurers authorized to do business in the State of Florida as Surety, with the following qualifications as to management and financial strength according to the latest edition of Best's Insurance Guide, published by A.M. Best Company, Oldwick, New Jersey:

<u>Bond (Total Contract) Amount</u>	<u>Best's Rating</u>
\$500,001 to \$1,500,000.....	B V
\$1,500,001 to \$2,500,000.....	A VI
\$2,500,001 to \$5,000,000.....	A VII
\$5,000,000 to \$10,000,000.....	A VIII
Over \$10,000,000 .....	A IX

- 2) On Contract amounts of \$500,000 or less, the Bond provisions of Section 287.0935, Florida Statutes shall be in effect and surety companies not otherwise qualifying with this paragraph may optionally qualify by:
  - a. Providing evidence that the surety has twice the minimum surplus and capital required by the Florida Insurance Code at the time the Invitation to Bid is issued.
  - b. Certifying that the surety is otherwise in compliance with the Florida Insurance Code, and
  - c. Providing a copy of the currently valid Certificate of Authority issued by the United States Department of Treasury under 31 U.S.C. 9304-9308.

Surety insurers shall be listed in the latest Circular 570 of the U.S. Department of the Treasury entitled "Surety Companies Acceptable on Federal Bonds", published annually. The Bond amounts shall not exceed the underwriting limitations as shown in this circular.

- 3) For Contracts in excess of \$500,000 the provisions of the Contract Documents will be adhered to, plus the surety insurer must have been listed on the U.S. Treasury list for at least three consecutive years, or currently hold a valid Certificate of Authority of at least 1.5 million dollars and listed on the Treasury list.
- 4) Payment and Performance Bonds guaranteed through U.S. Government Small Business Administration or Contractors Training and Development Inc. will also be acceptable.
- 5) The attorney-in-fact or other officer who signs Payment and Performance Bonds for a surety company must file with such Bonds a certified copy of his/her power of attorney authorizing him/her to do so.
- 6) The cost of the Bonds shall be included in the Bid.
- 7) The required Bonds shall be written by or through and shall be countersigned by, a licensed Florida agent of the surety insurer, pursuant to Section 624.425 of the Florida Statutes.
- 8) The Bonds shall be delivered to the Contracting Officer in accordance with the instructions within the Notice of Award.
- 9) In the event the Surety on the Payment and Performance Bonds given by the Contractor becomes insolvent, or is placed in the hands of a receiver, or has its right to do business in its State of domicile or the State of Florida suspended or revoked as provided by law, the Owner shall withhold all payments under the provisions of these Contract Documents until the Contractor has given good and sufficient Bonds in lieu of Bonds executed by such Surety.
- 10) Cancellation of any Bonds, or non-payment by the Contractor of any premium for any Bonds required by this Contract, shall constitute a breach of this



Contract. In addition to any other legal remedies, the Owner at its sole option may terminate this Contract or pay such premiums, and deduct the costs thereof from any amounts that are or may be due to the Contractor.

#### J. Insurance

The Contractor shall maintain the insurance set forth in the Special Provisions throughout the performance of this Contract until the Work has been completed by the Contractor and accepted by the Owner.

#### K. Conflict of Interest

- 1) The Contractor or his employees shall not enter into any Contract involving services or property with a person or business prohibited from transacting such business with Miami-Dade County pursuant to Section 2-11.1 of the Code of Miami-Dade County, Florida, known as the Miami-Dade County Conflict of Interest and Code of Ethics Ordinance.
- 2) In the event the Contractor, or any of its officers, partners, principals or employees are convicted of a crime arising out of, or in connection with, the work to be done or payment to be made under this Contract, this Contract, in whole or any part thereof may, at the discretion of the Owner, be terminated without prejudice to any other rights and remedies of the Owner under the law.
- 3) In accordance with the Code of Miami-Dade County, no officer or employee of Miami-Dade County during his tenure or for two years thereafter shall have any interest, direct or indirect, in this Contract or the proceeds thereof.

#### L. Rights in Shop Drawings

- 1) Shop Drawings submitted to the Architect/Engineer by the Contractor, pursuant to the Work, may be duplicated by the Owner and the Owner may use and disclose, in any manner and for any purpose Shop Drawings delivered under this Contract.
- 2) This paragraph shall be included in all subcontracts hereunder at all tiers.

#### M. Patent and Copyright

- 1) If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, he shall provide for such use by suitable legal agreement with the patentee or owner. The Contractor and the surety shall indemnify and save harmless the Owner, the Field Representative, and the Architect/Engineer from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the prosecution or after the completion of the work.
- 2) The Contractor shall warrant that the materials, equipment or devices used on or incorporated in the Work shall be delivered free of any rightful claim of any third party for infringement of any United States patent or copyright. The Contractor shall defend, or may settle, at his expense, any suit or proceeding

against the Owner or the Architect/Engineer so far as based on a claimed patent or copyright infringement which would result in a breach of this warranty, and the Contractor shall pay all damages and costs awarded therein against the Owner or the Architect/Engineer due to such breach. The Contractor shall report to the Architect/Engineer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this Contract of which the Contractor has knowledge. In the event of any claim or suit against the Owner on account of any alleged patent or copyright infringement arising out of the performance of this Contract or out of the use of any supplies furnished or work or services performed hereunder, the Contractor shall furnish to the Owner when requested, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Contractor.

- 3) The Contractor shall bear all costs arising from the use of patented materials, equipment, devices or processes used on or incorporated in the Work. In such case materials, equipment, devices or processes are held to constitute an infringement and their use enjoined, the Contractor, at his expense shall:
  - a. Secure for the Owner the right to continue using said materials, equipment, devices or processes by suspension of the injunction or by procuring a license or licenses; or
  - b. Replace such materials, equipment, devices or processes with non-infringing materials, equipment, devices or processes; or
  - c. Modify them so that they become non-infringing or remove the enjoined materials, equipment, devices or processes and refund the sum paid therefore without prejudice to any other rights of the Owner.
- 4) The preceding paragraph shall not apply to any materials, equipment or devices, specified by the Owner or the Architect/Engineer or manufactured to the design of the Owner or the Architect/Engineer or in accordance with the details contained in the Contract Documents; and as to any such materials, equipment or devices the Contractor assumes no liability whatsoever for patent or copyright infringement and the Owner will hold the Contractor harmless against any infringement claims arising therefrom.
- 5) Patent rights to patentable invention, item or ideas of every kind or nature arising out of the Work, as well as information, designs, specifications, know-how, data and findings shall be made available to the Government for public use, unless the Owner shall, in specific cases where it is legally permissible, determine that it is in the public interest that it not be so made available.
- 6) The sense of this article shall be included in all subcontracts. The foregoing states the entire liability of the Contractor for patent or copy infringement by use of said materials, equipment or devices.

#### N. Historical, Scientific and Archaeological Discoveries

All articles of historical, scientific or archaeological interest uncovered by the Contractor during progress of the Work shall be preserved and reported immediately to the Architect/Engineer. Further operations of the Contractor with respect to the find, including disposition of the articles, will be decided by the Owner.

O. Use of Owner's Name in Contractor Advertising or Public Relations

The Owner reserves the right to review and approve Owner-related copy prior to publication. The Contractor shall not allow Owner-related copy to be published in Contractor's advertisement or public relations programs until submitting the Owner-related copy and receiving prior approval from the Owner. The Contractor shall agree that published information on the Owner or the Owner's program shall be factual and in no way imply that the Owner endorses the Contractor's firm, service or product. The Contractor shall insert the substance of this provision, including this sentence, in each subcontract and supply Contract or purchase order.

## **13. ATTACHMENTS**

(June 12, 2012)

REPLACEMENT OF ARTICULATED BUSES, CHARGERS AND CHARGING FACILITY

CONTRACT NO. RFP-XXXX

STANDARD GENERAL CONTRACT CONDITIONS

ATTACHMENT “ A “

Certificate of Acceptance for Substantial Completion

Certificate of Final Acceptance

**CERTIFICATE OF ACCEPTANCE FOR SUBSTANTIAL COMPLETION**

**Contract No.:** \_\_\_\_\_

**Date :** \_\_\_\_\_

**Description :** \_\_\_\_\_

**Address :** \_\_\_\_\_

**Contractor :** \_\_\_\_\_

**Consultant :** \_\_\_\_\_

**Surety :** \_\_\_\_\_

*The work performed under the subject Contract has been reviewed, and subject to the Contract requirements of **Article 29, Substantial Completion, Final Inspection and Acceptance**, all remaining work has been found to be Substantially Completed as of \_\_\_\_\_ .*

*A **Punch List** of items to be completed or corrected, is appended hereto.*

*In the event that the Work, including the Punch List items, is not corrected by the Contract Completion date, the Contract stipulations regarding **Liquidated Damages** will be imposed until such time as the work is certified by the County's Resident Engineer or its Consultant and the Director, DTPW to be complete in all respects and a **Certificate of Final Acceptance** is issued.*

( **COMPANY SEAL** )

Signed : \_\_\_\_\_

**Contractor**

Recommended : \_\_\_\_\_

**Resident Engineer/Project Manager**

Recommended : \_\_\_\_\_

**Chief, Construction**

## Certificate of Final Acceptance

Contract No.:

Description:

Address:

Contractor:

Consultant:

Surety:

The **UNDERSIGNED** hereby certify that, to the best of our knowledge and belief, based on observations of the punch list work required under the terms of the Agreement, we have found that the Work items identified in the **PUNCH LIST**, dated \_\_\_\_\_ (**"PUNCH LIST"**) were completed as of \_\_\_\_\_. We therefore recommend that the **FINAL ACCEPTANCE DATE** be established as: \_\_\_\_\_

Notwithstanding the above, this Certificate shall not be construed as a finding regarding whether work performed on this Contract was done in accordance with all applicable Contract requirements, and the County expressly reserves all of its rights and claims under the Contract, or otherwise, to seek recovery or indemnity for any defects in materials, equipment, or workmanship, or for non-conformance with any Contract requirements.

Recommended : \_\_\_\_\_

**Resident Engineer/Project Manager**

Recommended : \_\_\_\_\_

**Chief, Construction**

:

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

REPLACEMENT OF ARTICULATED BUSES, CHARGERS AND CHARGING FACILITY

CONTRACT NO. RFP-XXXX

STANDARD GENERAL CONTRACT CONDITIONS

ATTACHMENT “ B “

Contractor Release

Agreement on Final Quantities and Amounts

Final Affidavit

Labor Standards Provisions Final Certificate

Memorandum of Understanding

Certificate of Sub-Contractor Status

Final Release of Lien

**DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS**

**CONTRACTOR RELEASE**

**Contract No.:**

**KNOW ALL MEN BY THESE PRESENTS :** Pursuant to the terms of the Contract and in consideration of the sum of \_\_\_\_\_ paid by the ***Miami-Dade County*** under the Contract, the undersigned Contractor does, and by the receipt of said sum shall, for itself, its successors and assigns, remise, release and forever discharge MDC, its officers , agents and employees, of and from all liabilities, obligations, and claims whatsoever, in law and in equity, under or arising out of said Contract.

**IN WITNESS WHEREOF**, this release has been executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_

( ***COMPANY SEAL*** )

\_\_\_\_\_  
***Contractor***

\_\_\_\_\_  
***Signature***

WITNESS :

***Print Name :*** \_\_\_\_\_

***Print Title :*** \_\_\_\_\_

**NOTE** : In the case of a corporation, witnesses are not required , but the ***CERTIFICATE*** below must be completed.

**CERTIFICATE**

I, \_\_\_\_\_, certify that I am the ***Secretary*** of the corporation named as Contractor in the foregoing release; that \_\_\_\_\_ who signed said release on behalf of the Contractor, was then \_\_\_\_\_ of said Corporation; that said release was duly signed for and on behalf of said corporation under the authority of its governing body, and within the scope of its corporate powers.

( ***CORPORATE SEAL*** )

\_\_\_\_\_  
***Signature***

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS



**DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS**

**AGREEMENT**

**ON**

**FINAL QUANTITIES AND AMOUNTS**

**Contract No.:**

The Contractor and Resident Engineer agree that the **QUANTITIES** as shown on the **FINAL PAY REQUEST No.** are **EQUITABLY** paid for by application of the agreed **LUMP SUM PRICES**.

It is finally agreed that the right in the Contract clause to request negotiation of a different amount is **WAIVED** by the Contractor and the Authorized Representative of the Contracting Officer.

( *Company Seal* )

\_\_\_\_\_  
***Contractor***

\_\_\_\_\_  
***Signature***

\_\_\_\_\_  
***Date***

\_\_\_\_\_  
***Resident Engineer***

\_\_\_\_\_  
***Date***

\_\_\_\_\_  
***Print Name***

\_\_\_\_\_  
***Print Name***

\_\_\_\_\_  
***Print Title***

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

## FINAL AFFIDAVIT

***Contract No.:***

The undersigned Contractor, \_\_\_\_\_, certifies and warrants to ***Miami-Dade County Department of Transportation and Public Works*** that \_\_\_\_\_ has paid in full and completely discharged any and all claims, demands, obligations and liabilities of in connection with or arising out of ***Contract No.*** \_\_\_\_\_, including without limitation, all claims for labor performed and materials, supplies, equipment and other items furnished or used in connection with performance of said Contract.

( ***COMPANY SEAL*** )

***Contractor :*** \_\_\_\_\_

***Signature :*** \_\_\_\_\_

***Print Name :*** \_\_\_\_\_

***Print Title :*** \_\_\_\_\_

***Date :*** \_\_\_\_\_

**DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS**

**LABOR STANDARDS PROVISIONS**

**FINAL CERTIFICATE**

**Contract No.:**

The undersigned Contractor, \_\_\_\_\_, hereby certifies that all laborers, mechanics, apprentices and trainees employed by him or by any Subcontractor performing work under the Contract on the project have been paid ***wages at rates no less than those required by the Contract provisions***, and that the work performed by each laborer, mechanic, apprentice or trainee conformed to the classifications set forth in the Contract or training program provisions applicable to the wage rate paid.

EXCEPTION (S) :

**Contractor :** \_\_\_\_\_

( **COMPANY SEAL** )

**Signature :** \_\_\_\_\_

**Print Name :** \_\_\_\_\_

**Print Title :** \_\_\_\_\_

**Date :** \_\_\_\_\_

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

**MIAMI-DADE COUNTY**  
**DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS**  
**MEMORANDUM OF UNDERSTANDING**

**Contract No.:**

**WHEREAS,** \_\_\_\_\_, ( hereafter referred to as the " Contractor " ) and the *Department of Transportation and Public Works*, the parties hereto, have mutually agreed to the **total Contract amount** in the sum of \_\_\_\_\_ and a final payment of \_\_\_\_\_ for a **COMPLETE CLOSE-OUT** of *Contract No.*

It is understood and expressly agreed that :

- (1) This Memorandum of Understanding is subject to the recommendations of the Assistant Director and the Director of Department of Transportation and Public Works.
- (2) In consideration of the payment by DTPW of a **total Contract amount** of \_\_\_\_\_, ( inclusive of all finalized Change Orders ), the Contractor hereby withdraws with prejudice all Claims, Disputes, and Appeals of the Contractor or any of its Subcontractors or Suppliers under the subject Contract. DTPW likewise, withdraws with prejudice, all Claims and/or Backcharges it has against the Contractor.
- (3) The retention withheld in *Pay Request No.* \_\_\_\_\_ is \_\_\_\_\_ and will be paid in full. Therefore, the Contractor acknowledges the final payment of \_\_\_\_\_ in *Pay Request No.* \_\_\_\_\_ as the outstanding balance due to date on the Contract.
- (4) DTPW reserves the right to complete an audit upon the request of the Assistant Director, Engineering Services when warranted.
- (5) All terms and conditions of the Contract otherwise remain unchanged including the Contractor's liabilities for warranties, latent defects and the like.
- (6) The execution of this Memorandum and payment in accordance with these terms, and the finalized Contract Change Orders, shall constitute a full accord and satisfaction of all Claims and all rights of the parties against each other, except for claims of the

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

Owner for latent defects discussed after the date of this Memorandum or for warranty items.

Memorandum of Understanding

Page 2

( COMPANY SEAL )

*Contractor :* \_\_\_\_\_

*Signature :* \_\_\_\_\_

*Print Name :* \_\_\_\_\_

*Print Title :* \_\_\_\_\_

*Date :* \_\_\_\_\_

**RECOMMENDED**

By : \_\_\_\_\_

Resident Engineer/Project Manager

By : \_\_\_\_\_

Chief, Construction Division

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

## **DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS**

### **CERTIFICATE OF SUB-CONTRACTOR STATUS**

This is to certify that the following is a complete list of sub-contractors who worked on  
**Contract No.**

Name	Description of work	Original Contract Amount	Paid to date	Amount Owed

( COMPANY SEAL )

---

***Contractor***

---

***Signature***

---

***Print Name & Title***

---

***Date***

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

ALL SUBCONTRACTORS WORKING ON THIS PROJECT MUST COMPLETE THIS FORM.

FINAL RELEASE OF LIEN

KNOW ALL PERSONS BY THESE PRESENTS:

That the undersigned, for and in consideration of the payment of the sum of \_\_\_\_\_ and \_\_\_\_\_ /100 dollars (\$\_\_\_\_\_) paid by the \_\_\_\_\_ receipt of which is hereby acknowledged, hereby releases and quit claims to the said \_\_\_\_\_ it successors and assigns, and \_\_\_\_\_ the owner, all liens, lien rights, claims or demands of any kind whatsoever, which the undersigned now has or might have against the building or premises legally \_\_\_\_\_ described \_\_\_\_\_ as \_\_\_\_\_ on \_\_\_\_\_ account of labor performed and/or material furnished for the construction of any improvements thereon. That all labor and materials used by the undersigned in the erection of said improvements have been fully paid for.

IN WITNESS THEREOF, I have hereunto set my hand seal this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

WITNESSES:

\_\_\_\_\_ (SEAL)

\_\_\_\_\_ By \_\_\_\_\_

State of \_\_\_\_\_)

) ss

County of \_\_\_\_\_)

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ by \_\_\_\_\_ on behalf of \_\_\_\_\_ [ ] who is personally known to me or [ ] who has produced \_\_\_\_\_ as identification and who [ ] did [ ] did not take an oath.

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

Notary Signature: \_\_\_\_\_

Type or Print Name: \_\_\_\_\_

Notary Seal:

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS



REPLACEMENT OF ARTICULATED BUSES, CHARGERS AND CHARGING FACILITY

CONTRACT NO. RFP-XXXX

STANDARD GENERAL CONTRACT CONDITIONS

ATTACHMENT “C”

Sub-Contractor's/Supplier's Release of Claim

Consent of Surety Company to Requisition Payment

MIAMI-DADE COUNTY  
DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS  
SUBCONTRACTOR'S / SUPPLIER'S RELEASE OF CLAIM

NOTE: The General Contractor shall attach this statement, completed by each Subcontractor whose work appears on the prior requisition for payment or has work in place since the last requisition for payment.

CONTRACT NO.: \_\_\_\_\_ Date: \_\_\_\_\_

Project Title: \_\_\_\_\_

Subcontractor:

\_\_\_\_\_

Requisition No.: \_\_\_\_\_ From: \_\_\_\_\_ To: \_\_\_\_\_

Before me, the undersigned authority, authorized to administer oaths and take acknowledgments appeared: \_\_\_\_\_ who, after being first duly sworn, upon oath, deposes and says that pursuant to the provisions of his contract for said project, all money due him under prior requisitions for payment have been paid to him by \_\_\_\_\_, the General Contractor.

(COMPANY SEAL)

\_\_\_\_\_  
Legal Name of Subcontractor

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

State of \_\_\_\_\_)

) ss

County of \_\_\_\_\_)

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ by \_\_\_\_\_ on behalf of \_\_\_\_\_.

[ ] who is personally known to me or [ ] who has produced \_\_\_\_\_ as identification and who [ ] did [ ] did not take an oath. Notary Signature: \_\_\_\_\_

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

Type or Print Name: \_\_\_\_\_

Notary Seal:

**CONSENT OF SURETY COMPANY**



CONTRACT NO. \_\_\_\_\_

PROJECT TITLE: \_\_\_\_\_

PROJECT LOCATION: \_\_\_\_\_

TO: \_\_\_\_\_ Re: PAY REQUEST No. \_\_\_\_\_ DATE: \_\_\_\_\_

IN THE AMOUNT OF: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_ RPQ No. \_\_\_\_\_

THE UNDERSIGNED SURETY COMPANY \_\_\_\_\_,

(INSERT NAME OF SURETY COMPANY)

\_\_\_\_\_, ON BOND OF

(ADDRESS)

THE CONTRACTOR LISTED ABOVE, HEREBY APPROVES THIS PAYMENT TO THE CONTRACTOR AND AGREES THAT THE PAYMENT TO THE CONTRACTOR SHALL NOT RELIEVE THE SURETY COMPANY OF ANY OF ITS OBLIGATIONS TO MIAMI-DADE COUNTY, INCLUDING THE SECURITY FROM ANY AND ALL LIENS, CLAIMS OR DEMANDS WHATSOEVER THAT MAY NOW EXIST OR BE MADE IN THE FUTURE BY ANY SUB-CONTRACTOR OR MATERIAL SUPPLIERS AGAINST THIS PROJECT AND CONTRACT.

THIS CONSENT OF SURETY RECOGNIZES THAT CLAIMS HAVE BEEN MADE BY THE FOLLOWING SUB-CONTRACTORS AND MATERIAL SUPPLIERS AGAINST THE CONTRACT IN THE AMOUNTS LISTED BELOW:

_____	\$ _____
_____	\$ _____
_____	\$ _____
_____	\$ _____
_____	\$ _____
_____	\$ _____
_____	\$ _____

SURETY RECOGNIZES THAT RELEASES OF LIEN OR RELEASES AND ASSIGNMENT OF CLAIM HAVE NOT BEEN REQUESTED OR RECEIVED FROM ALL THE SUB-CONTRACTORS AND MATERIAL SUPPLIERS FOR THIS FACILITY.

IN WITNESS THEREOF,

THE SURETY COMPANY HAS HEREUNTO SET ITS HAND THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_.

DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS  
REPLACEMENT OF ARTICULATED BUSES, CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFP-XXXX

STANDARD GENERAL CONTRACT CONDITIONS

ATTACHMENT “D”

“Contractor Agent to Accept Service”

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS



**DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS**

**CONTRACTOR AGENT TO ACCEPT SERVICE**

RPQ No.: \_\_\_\_\_

DATE: \_\_\_\_\_

CONTRACT TITLE: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

NOTICE TO PROCEED (NTP) DATE: \_\_\_\_\_

CONTRACTOR ADDRESS: \_\_\_\_\_

CONTRACTOR TELEPHONE No.: \_\_\_\_\_

AGENT'S NAME: \_\_\_\_\_

AGENT'S TITLE: \_\_\_\_\_

AGENT'S ADDRESS: \_\_\_\_\_

AGENT'S TELEPHONE No. \_\_\_\_\_

***Contractor Corporate Representative***

Submitted By: \_\_\_\_\_

SIGNATURE

\_\_\_\_\_

CONTRACTOR

STANDARD GENERAL CONTRACT CONDITIONS

ATTACHMENT “E”

Force Account Daily Report:

Labor, Material & Equipment

REPLACEMENT OF ARTICULATES BUSES,  
CHARGERS AND CHARGING FACILITY  
RFP NO. XXX  
PROCUREMENT AND CONTRACTING REQUIREMENTS

**FORCE ACCOUNT DAILY REPORT:**

DATE: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

CONTRACT No. \_\_\_\_\_ REPORT No. \_\_\_\_\_

CONTRACT CHANGE NOTICE / DTPW LETTER: \_\_\_\_\_ PAGE No. \_\_\_\_\_ of \_\_\_\_\_

**IMPORTANT-THIS FORM MUST BE SIGNED AND SUBMITTED NOT LATER THAN THE DAY FOLLOWING DATE WORK WAS PERFORMED.****The following work was performed this date requiring the use of the Labor Force, Materials, Equipment, Special Forces and Services listed hereon:**

Description of work performed: \_\_\_\_\_

LABOR					EQUIPMENT					
NAME	CRAFT	HRRAT	HOURS	TOTALS	MAKE	MODEL	DESCRIPTION	HOURS	RATE	EXT.

CERTIFIED CORRECT BY: \_\_\_\_\_

DATE \_\_\_\_\_

MATERIAL INVOICE ON UNIT PRICES TO BE PROVIDED. \_\_\_\_\_

QUAN.	UNIT	DESCRIPTION	MATERIALS	RECAP
				LABOR
				MATERIALS
				EQUIPMENT

CERTIFIED CORRECT BY: \_\_\_\_\_ DATE \_\_\_\_\_

TOTAL THIS SHEET \_\_\_\_\_

**FOR ENGINEER'S USE**

APPROVED AS TO SUBSTANCE

BY: \_\_\_\_\_  
RESIDENT ENGINEER \_\_\_\_\_ DATE \_\_\_\_\_

EXTENSION OF LABOR, MATERIAL &amp; EQUIPMENT VERIFIED BY:

INSPECTOR \_\_\_\_\_

DATE \_\_\_\_\_

MIAMI-DADE TRANSIT CONSTRUCTION SAFETY MANUAL  
(INCLUDES SECURITY ID REQUIREMENTS)

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFPXXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01



INSERT SAFETY MANUAL AND ID REQUIREMENTS

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFPXXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS  
ADJACENT CONSTRUCTION MANUAL

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFPXXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

INSERT ADJACENT SAFETY MANUAL

REPLACEMENT OF ARTICULATED BUSES,  
CHARGERS AND CHARGING FACILITY  
CONTRACT NO. RFPXXX  
CONSTRUCTION TECHNICAL SPECIFICATIONS  
GENERAL REQUIREMENTS – DIVISION 01

**TECHNICAL SPECIFICATIONS**

**HEAVY DUTY**

**SIXTY-FOOT BATTERY-ELECTRIC**

**LOW FLOOR TRANSIT BUSES**

## Contents

TS 1. Scope .....	9
TS 2. Definitions .....	9
TS 2.1 Abbreviations .....	14
TS 3. Referenced Publications.....	15
TS 4. Legal Requirements .....	15
TS 5. Overall Requirements.....	16
TS 5.1 Weight .....	16
TS 5.2 Capacity .....	16
TS 5.3 Service Life .....	16
TS 5.4 Maintenance and Inspection .....	16
TS 5.5 Interchangeability .....	17
TS 5.6 Training .....	17
TS 5.7 Technical/Service Representatives .....	25
TS 5.8 Operating Environment .....	25
TS 5.9 Noise .....	25
TS 5.10 Fire Safety.....	26
TS 5.11 Respect for the Environment .....	27
TS 6. Physical Size .....	28
TS 6.1 Bus Length .....	29
TS 6.2 Bus Width .....	30
TS 6.3 Bus Height.....	30
TS 6.4 Step Height .....	30
TS 6.5 Underbody Clearance .....	30
TS 6.6 Ramp Clearances .....	30
TS 6.7 Ground Clearance .....	31
TS 6.8 Floor Height .....	32
TS 6.9 Interior Headroom .....	33
TS 6.10 Aisle Width .....	33
TS 7. Power Requirements .....	33
TS 7.1 Top Speed.....	33
TS 7.2 Gradability .....	33
TS 7.3 Acceleration .....	33
TS 7.4 Operating Range.....	34
TS 7.4.1 Electric .....	34
TS 8. Fuel Economy (Design Operating Profile) .....	34
TS 9. Propulsion System (Electric) .....	34
TS 10. Cooling Systems .....	40
TS 10.1 Motor Cooling.....	41
TS 10.2 Transmission Cooling .....	41
TS 10.3 Electric Drive System Cooling .....	41
TS 11. Transmission (if required) .....	41
TS 12. Retarder Regenerative Braking .....	42
TS 12.1 Regenerative Braking .....	42
TS 12.2 Braking Resistors .....	43
TS 13. Mounting .....	43
TS 13.1 Service .....	43
TS 14. Hydraulic Systems .....	43
TS 14.1 Fluid Lines .....	44
TS 14.2 Fittings and Clamps .....	44
TS 15. Radiator .....	44
TS 16. Oil and Hydraulic Lines.....	44
TS 17. General .....	45

TS 17.1 Design .....	45
TS 18. Altoona Testing .....	45
TS 18.1 Structural Validation .....	45
TS 19. Distortion .....	45
TS 20. Resonance and Vibration .....	45
TS 20.1 Engine Compartment Bulkheads .....	45
TS 20.2 Crashworthiness .....	46
TS 21. Corrosion .....	46
TS 22. Towing .....	46
TS 23. Jacking .....	47
TS 24. Hoisting .....	47
TS 25. Floor .....	47
TS 25.1 Design .....	47
TS 25.2 Strength .....	48
TS 25.3 Construction .....	48
TS 26. Platforms .....	49
TS 26.1 Driver's Area .....	49
TS 26.2 Driver's Platform .....	49
TS 26.3 Farebox .....	50
TS 26.4 Rear Step Area to Rear Area .....	50
TS 27. Wheel Housing .....	51
TS 27.1 Design and Construction .....	51
TS 28. Suspension .....	52
TS 28.1 General Requirements .....	52
TS 28.2 Alignment .....	53
TS 28.3 Springs and Shock Absorbers .....	53
TS 29. Wheels and Tires .....	54
TS 29.1 Wheels .....	54
TS 29.2 Tires .....	54
TS 30. Steering .....	55
TS 30.1 Steering Axle .....	55
TS 30.2 Wheel .....	55
TS 31. Drive Axle .....	56
TS 31.1 Non-Drive Axle .....	56
TS 32. Turning Radius .....	56
TS 33. Brakes .....	57
TS 33.1 Service Brake .....	57
TS 33.2 Actuation .....	57
TS 33.3 Friction Material .....	58
TS 33.4 Hubs and Discs .....	58
TS 33.5 Parking/Emergency Brake .....	58
TS 34. Interlocks .....	59
TS 34.1 Passenger Door Interlocks .....	59
TS 35. Pneumatic System .....	59
TS 35.1 General .....	59
TS 35.2 Air Compressor .....	60
TS 35.3 Air Lines and Fittings .....	60
TS 35.4 Air Reservoirs .....	60
TS 35.5 Air System Dryer .....	60
TS 36. Overview .....	61
TS 36.1 Modular Design .....	62
TS 37. Environmental and Mounting Requirements .....	62
TS 37.1 Hardware Mounting .....	62
TS 38. General Electrical Requirements .....	63

TS 38.1 Batteries .....	63
TS 38.2 Grounds .....	65
TS 38.3 Low Voltage/Low Current Wiring and Terminals .....	66
TS 38.4 Electrical Components .....	67
TS 38.5 Electrical Compartments.....	67
TS 39. General Electronic Requirements .....	67
TS 39.1 Wiring and Terminals .....	68
TS 40. Multiplexing.....	69
TS 40.1 General .....	69
TS 40.2 System Configuration.....	69
TS 41. Data Communications .....	69
TS 41.1 General .....	69
TS 41.2 Drivetrain Level .....	70
TS 41.3 Multiplex Level .....	70
TS 41.4 Electronic Noise Control .....	71
TS 42. Driver's Area Controls .....	71
TS 42.1 General .....	71
TS 42.2 Glare .....	72
TS 42.3 Visors/Sun Shades .....	72
TS 42.4 Driver's Controls .....	72
TS 42.5 Normal Bus Operation Instrumentation and Controls .....	72
TS 42.6 Driver Foot Controls.....	76
TS 42.7 Brake and Accelerator Pedals .....	77
TS 42.8 Driver Foot Switches.....	77
TS 43. Driver's Amenities.....	77
TS 43.1 Coat Hanger.....	77
TS 43.2 Drink Holder .....	77
TS 43.3 Storage Box .....	77
TS 44. Windshield Wipers and Washers .....	78
TS 44.1 Windshield Wipers .....	78
TS 44.2 Windshield Washers .....	78
TS 45. Driver's Seat.....	78
TS 45.1 Dimensions .....	79
TS 45.2 Seat Belt.....	80
TS 45.3 Adjustable Armrest.....	81
TS 45.4 Seat Control Locations.....	81
TS 45.5 Seat Structure and Materials .....	81
TS 45.6 Pedestal .....	81
TS 45.7 Mirrors.....	81
TS 46. General.....	81
TS 47. Windshield .....	82
TS 47.1 Glazing.....	82
TS 48. Driver's Side Window .....	82
TS 49. Side Windows.....	82
TS 49.1 Configuration.....	82
TS 49.2 Emergency Exit (Egress) Configuration.....	82
TS 49.3 Configuration.....	83
TS 49.4 Materials.....	83
TS 49.5 Rear Window .....	84
TS 50. Capacity and Performance.....	84
TS 51. Controls and Temperature Uniformity .....	86
TS 52. Air Flow.....	86
TS 52.1 Passenger Area .....	86
TS 52.2 Driver's Area .....	87

TS 52.3 Controls for the Climate Control System (CCS)	87
TS 52.4 Driver's Compartment Requirements	87
TS 52.5 Driver's Cooling	87
TS 53. Air Filtration	87
TS 54. Roof Ventilators	88
TS 55. Maintainability	88
TS 56. Entrance/exit area heating	88
TS 57. Floor-Level Heating	88
TS 58. Design	88
TS 58.1 Materials	89
TS 58.2 Roof-Mounted Equipment	89
TS 59. Pedestrian Safety	89
TS 60. Repair and Replacement	89
TS 60.1 Side Body Panels	89
TS 61. Rain Gutters	90
TS 62. License Plate Provisions	90
TS 62.1 Rub rails	90
TS 63. Fender Skirts	90
TS 64. Wheel covers	90
TS 64.1 Splash Aprons	90
TS 65. Service Compartments and Access Doors	90
TS 65.1 Access Doors	90
TS 65.2 Access Door Latch/Locks	91
TS 66. Bumpers	91
TS 66.1 Location	91
TS 66.2 Front Bumper	91
TS 66.3 Rear Bumper	92
TS 66.4 Bumper Material	93
TS 67. Finish and Color	93
TS 67.1 Appearance	93
TS 68. Decals, Numbering and Signing	94
TS 68.1 Passenger Information	114
TS 69. Exterior Lighting	114
TS 69.1 Backup Light/Alarm	114
TS 69.2 Doorway Lighting	115
TS 69.3 Turn Signals	115
TS 69.4 Headlights	115
TS 69.5 Brake Lights	115
TS 69.6 Service Area Lighting (Interior and Exterior)	115
TS 70. General Requirements	116
TS 71. Interior Panels	116
TS 71.1 Driver Area Barrier	116
TS 71.2 Modesty Panels	117
TS 71.3 Front End	117
TS 71.4 Rear Bulkhead	118
TS 71.5 Headlining	118
TS 71.6 Fastening	118
TS 71.7 Insulation	118
TS 71.8 Floor Covering	118
TS 71.9 Interior Lighting	119
TS 71.10 Passenger	120
TS 71.11 Driver Area	120
TS 71.12 Seating Areas	120
TS 71.13 Vestibules/Doors	120



TS 71.14 Step Lighting .....	120
TS 71.15 Ramp Lighting .....	120
TS 71.16 Farebox Lighting .....	121
TS 72. Fare Collection .....	121
TS 73. Interior Access Panels and Doors .....	123
TS 73.1 Floor Panels .....	123
TS 74. Passenger Seating .....	123
TS 74.1 Arrangements and Seat Style .....	123
TS 74.2 Rearward Facing Seats .....	124
TS 74.3 Non-Padded Inserts .....	124
TS 74.4 Drain Hole in Seats .....	124
TS 74.5 Hip-to-Knee Room .....	124
TS 74.6 Foot Room .....	124
TS 74.7 Aisles .....	125
TS 74.8 Dimensions .....	125
TS 74.9 Structure and Design .....	125
TS 74.10 Construction and Materials .....	128
TS 75. Passenger Assists .....	129
TS 75.1 Assists .....	129
TS 75.2 Front Doorway .....	129
TS 75.3 Vestibule .....	130
TS 75.4 Rear Doorway(s) .....	130
TS 75.5 Overhead .....	130
TS 75.6 Longitudinal Seat Assists .....	131
TS 75.7 Wheel Housing Barriers/Assists .....	131
TS 76. Passenger Doors .....	131
TS 76.1 Dimensions .....	133
TS 76.2 Door Glazing .....	133
TS 76.3 Door Projection .....	133
TS 76.4 Door Height Above Pavement .....	134
TS 76.5 Closing Force .....	134
TS 76.6 Actuators .....	134
TS 76.7 Door Interlocks .....	134
TS 76.8 Emergency Operation .....	135
TS 76.9 Door Control .....	135
TS 76.10 Door Controller .....	136
TS 76.11 Door Open/Close .....	136
TS 77. Accessibility Provisions .....	136
TS 77.1 Loading Systems .....	136
TS 77.2 Wheelchair Accommodations .....	137
TS 77.3 Interior Circulation .....	138
TS 78. Destination Signs .....	138
TS 79. Passenger Information and Advertising .....	140
TS 79.1 Interior Displays .....	140
TS 79.2 Exterior Displays .....	140
TS 80. Passenger Stop Request/Exit Signal .....	140
TS 81. Communications .....	140
TS 81.1 Camera Surveillance System .....	140
TS 81.2 Intelligent Vehicle System .....	141

<b>General .....</b>	<b>144</b>
<b>IVS onboard System .....</b>	<b>Error! Bookmark not defined.</b>
<b>Vehicle Logic Unit .....</b>	<b>144</b>
<i>General.....</i>	145
<i>Hardware Characteristics.....</i>	146
<i>Environmental Requirements.....</i>	146
<i>Automated Voice Announcements.....</i>	147
PA Volume Control .....	147
Automated Voice Announcement Triggers.....	147
Manual Announcements .....	148
Integration with Interior Dynamic Message Signs .....	148
Automated Voice Announcement Text Display .....	148
“Stop Requested” Functionality .....	148
<i>External Sign System Control.....</i>	148
<i>Vehicle Monitoring.....</i>	149
Fault Events.....	150
Performance Data.....	150
AVM® Data Format and Availability .....	154
Data Definition .....	154
J1939 Bus System Fault Reporting and Performance Data .....	155
J1587 Performance Data and Fault Reporting .....	155
Multiplex System Monitoring.....	156
Door System Interface.....	156
Advanced technology and hybrid drivetrain systems .....	156
Hard Brake and last stop reporting.....	157
GPS and Dead Reckoning .....	157
<b>Vehicle Communication Antenna .....</b>	<b>158</b>
<b>Transit Control Head (TCH).....</b>	<b>158</b>
<b>Internal Display Sign.....</b>	<b>159</b>
TS 81.3 Automatic Passenger Counter (APC) .....	159
TS 81.4 Radio Handset and Control System .....	159
TS 81.5 Wireless Router .....	161
TS 81.6 Communications Equipment Box.....	162
<b>WARRANTY REQUIREMENTS .....</b>	<b>164</b>
WR 1. Basic Provisions.....	164
WR 1.1 Warranty Requirements.....	164
WR 1.2 Voiding of Warranty .....	165
WR 1.3 Exceptions and Additions to Warranty .....	165
WR 1.4 Fleet Defects .....	166
WR 2. Repair Procedures .....	167
WR 2.1 Repair Performance .....	167
WR 2.2 Repairs by the Contractor.....	167
WR 2.3 Repairs by the Agency .....	167
WR 2.4 Warranty after Replacement/Repairs .....	168
WR 2.5 Forms.....	168
WR 2.6 Return of Parts .....	169
WR 2.7 Timeframe.....	169
WR 2.8 Reimbursements .....	169

<b>QUALITY ASSURANCE</b>	<b>169</b>
QA 1. Contractor's In-Plant Quality Assurance Requirements	169
QA 1.1 Quality Assurance Organization	169
QA 1.2 Quality Assurance Organization Functions	170
QA 2. Inspection	171
QA 2.1 Inspection Stations	171
QA 2.2 Resident Inspectors	172
QA 3. Acceptance Tests	173
QA 3.1 Responsibility	173
QA 3.2 Pre-Delivery Tests	173
QA 4. Agency-Specific Requirements	174
<b>SPARE PARTS AND EQUIPMENT</b>	<b>175</b>
SP 1. GENERAL	175
SP 1.1 Recommended Spare Parts List	175
<b>MANUALS AND PUBLICATIONS</b>	<b>176</b>
MP 1. GENERAL	176
MP 1.1 Changes and Revisions	176
MP 1.2 Service Bulletins	176
MP 1.3 As Built Drawings	176
MP 1.4 Parts Cross Reference List	176
<b>Attachment A: New Bus Manufacturing Inspection Guidelines</b>	<b>177</b>
Pre-production meeting	177
Responsibilities	177
Build schedule	177
Plant tour (if meeting at OEM's location)	178
Prototype/pilot vehicle production	178
Visual and measured inspections	178
Total bus operation	178
Post-delivery tests	179
Prototype/pilot vehicle acceptance	179
Buy America audit	179
Resident inspection process for serial production	180
Inspector responsibilities	180
Inspector rotation/scheduling	180
Resident inspector orientation	180
Audits, inspections and tests	180
Vehicle inspections	181
Audits	182
Communications	183
Documentation	183
Vehicle release for delivery	184
Post-delivery and final acceptance	184
Certificate of Acceptance	184
CER 1. Vehicle Technical Information Questionnaire	185
EXHIBIT 1 – Vehicle Technical Information Questionnaire	185
References	202
Abbreviation and Acronyms	204

## TECHNICAL SPECIFICATIONS

### GENERAL

#### TS 1. Scope

Technical specifications define the requirements for furnishing aesthetically pleasing modern Heavy Duty Sixty Foot (60') Battery-Electric Low Floor Transit Buses and furnishing and installing charging systems (depot-based charging equipment) for Miami Dade County Department of Transportation and Public Works (DTPW) at one (1) location. Installation of the charging equipment and electrical infrastructure shall be the responsibility of the Contractor, including any modifications to the existing facilities and installation from the existing power supply. The buses will be for use in both general service on urban arterial streets and suburban express service. Buses shall have a minimum expected life of twelve (12) years or 500,000 miles, whichever comes first, and are intended for the widest possible spectrum of passengers, including children, adults, the elderly and people with disabilities. The depot-based charging equipment/charging systems must be designed to fully charge the Battery-Electric Low Floor Transit Buses simultaneously in no more than four hours and provide an operating range of at least 220 miles.

DTPW expectation is to purchase buses that are distinguished in appearance (aerodynamic/bullet train look), easily maneuverable in normal and heavy traffic, and reliable. The bus exterior shall appear progressive and modern. These Technical Specifications are not intended to dictate any specific design but rather to indicate the type of transit bus and equipment desired by DTPW and certain standards of bus performance which must be achieved. The buses are to be of durable, heavy-duty construction major suspension components designed to last the life of the bus without major overhaul or replacement.

The quantity of vehicles and parts purchased will be contingent upon the unit cost per vehicle and the total funds programmed for this purchase.

On-Route Charging Stations and bus equipment to accommodate the on route charging

The contractor shall provide option for on-route charging stations and electric bus equipment to accommodate the on route charging. Installation of the on-route charging equipment and electrical infrastructure shall be the responsibility of the Contractor, including the installation from the existing neighboring FPL power supply. The design and locations of the on-route charging stations shall be approved by DTPW prior to award of the contract. The on-route charging stations and electric bus equipment to accommodate the on route charging option shall be priced separately from the bus in the Price Proposal.

#### TS 2. Definitions

**Alternative.** An alternative specification condition to the default bus configuration. The Agency may define alternatives to the default configuration to satisfy local operating requirements. Alternatives for the default configuration will be clearly identified.

**Ambient Temperature.** The temperature of the surrounding air. For testing purposes, ambient temperature must be between 16 °C (50 °F) and 38 °C (100 °F).

**Analog Signals.** A continuously variable signal that is solely dependent upon magnitude to express information content.

**NOTE:** Analog signals are used to represent the state of variable devices such as rheostats, potentiometers, temperature probes, etc.

**Audible Discrete Frequency.** An audible discrete frequency is determined to exist if the sound power level in any 1/3-octave band exceeds the average of the sound power levels of the two adjacent 1/3-octave bands by 4 decibels (dB) or more.

**Battery Compartment.** Low-voltage energy storage, i.e. 12/24 VDC batteries.

**Battery Management System (BMS).** Monitors energy, as well as temperature, cell or module voltages, and total pack voltage. The BMS adjusts the control strategy algorithms to maintain the batteries at uniform state of charge and optimal temperatures.

**Braking Resistor.** Device that converts electrical energy into heat, typically used as a retarder to supplement or replace the regenerative braking.

**Capacity (electrical energy storage device).** Two levels of capacity shall be defined, gross and useable. Gross Capacity shall be the capacity energy (kWh) of the entire battery pack and shall include usable, unusable, and/or reserve capacity energy. Useable Capacity shall be the capacity energy between the design operating range within the battery management system for normal operation.

**Cells.** Individual components ( i.e., battery or capacitor cells).

**Charger.** The equipment required to convert Alternating Current (AC) to Direct Current (DC), for the purpose of charging the battery and/or operating vehicle electrical systems while connected. The Charger may be on-board the vehicle or off-board the vehicle. Off- board Chargers may be built as part of the charging station.

**Charging Interface.** The equipment and/or coupler used to create a connection between the charging equipment and the vehicle for the purpose of recharging a vehicle's batteries.

**Charging Equipment.** The equipment that encompass all the components needed to convert, control, and transfer electricity from the grid to the vehicle for purpose of charging batteries and may include chargers, controllers, couplers, transformers, ventilation, etc.

**Charging Station.** Location that houses the charging equipment that is connected to a utility's high voltage service, to provide electricity to a vehicle's battery system through a charging interface.

**Charging System.** The complete charging infrastructure including the Charging Station, Charging Equipment, Charger and Charging Interface.

**Class of Failures.** Classes of failures are described below.

Class 1: Physical Safety. A failure that could lead directly to passenger or operator injury or represents a severe crash situation.

Class 2: Road Call. A failure resulting in an en route interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.

**Code.** A legal requirement.

**Curb Weight.** Weight of vehicle, including maximum fuel, oil and coolant; and all equipment required for operation and required by this Specification, but without passengers or driver.

**dBA.** Decibels with reference to 0.0002 microbar as measured on the "A" scale.

**DC to DC Converter.** A module which converts a source of direct current (DC) from one voltage level to another.

**Default Configuration Bus.** The bus described if no alternatives are selected. Signing, colors, the destination sign reading list and other information must be provided by the Agency.

**Destroyed.** Physically made permanently unusable.

**Discrete Signal.** A signal that can take only pre-defined values, usually of a binary 0 or 1 nature where 0 is battery ground potential and 1 is a defined battery positive potential.

**Driver's Eye Range.** The 95th-percentile ellipse defined in SAE Recommended Practice J941, except that the height of the ellipse shall be determined from the seat at its reference height.

**Energy Density.** The relationship between the weight of an energy storage device and its power output in units of watt-hours per kilogram (Wh/kg).

**Fire Resistant.** Materials that have a flame spread index less than 150 as measured in a radiant panel flame test per ASTM-E 162-90.

**Fireproof.** Materials that will not burn or melt at temperatures less than 2,000°F.

**Free Floor Space:** Floor area available to standees, excluding the area under seats, area occupied by feet of seated passengers, the vestibule area forward of the standee line, and any floor space indicated by manufacturer as non-standee areas such as, the floor space "swept" by passenger doors during operation. Floor area of 1.5 sq ft shall be allocated for the feet of each seated passenger that protrudes into the standee area.

**GAWR (Gross Axle Weight Rated).** The maximum total weight as determined by the axle manufacturer, at which the axle can be safely and reliably operated for its intended purpose.

**Gross Load.** 150 lbs for every designed passenger seating position, for the driver, and for each 1.5 square feet of free floor space.

**GVW (Gross Vehicle Weight).** Curb weight plus gross load.

**GVWR (Gross Vehicle Weight Rated):** The maximum total weight as determined by the vehicle manufacturer, at which the vehicle can be safely and reliably operated for its intended purpose.

**Heavy Heavy-Duty Diesel Engine (HHDD).** Heavy heavy-duty diesel engines have sleeved cylinder liners, are designed for multiple rebuilds, and a rated horsepower that generally exceeds 250.

**HIC (Head Injury Criteria).** The following equation presents the definition of head injury criteria:

$$\left[ \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} (a) dt \right]^{2.5} (t_2 - t_1)$$

where:

**a =** the resultant acceleration at the center of gravity of the head form expressed as a multiple of g, the acceleration of gravity.

**t1 and t2 = any two points in time during the impact.**

**High Voltage (HV).** Greater than 50 volts (AC and DC).

**Hose:** Flexible line.

**Human Dimensions:** The human dimensions used in Part III: Technical Specifications are defined in Humanscale 1/2/3, N. Diffrient, A. R. Tilley, J. C. Bardagiy, MIT Press.

**Inverter.** A module that converts DC to and from AC.

**Labeled.** Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization, which is acceptable to the authority having jurisdiction and concerned with product evaluation, which maintains periodic inspection of production labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

**Line:** All tubes, flexible and hard, that carry fluids.

**Local Regulations.** Regulations below the state level.

**Low-Floor Bus.** A bus that, between at least the front (entrance) and rear (exit) doors, has a floor sufficiently low and level so as to remove the need for steps in the aisle between the doors and in the vicinity of these doors.

**Low Voltage (LV).** 50 volts or less (AC and DC).

**Maintenance Personnel Skill Levels.** Defined below are maintenance personnel skill levels used in Part III: Technical Specifications.

- a. 5M: Specialist Mechanic or Class A Mechanic Leader  
(equivalent to DTPW – Bus Technician)
- b. 4M: Journeyman or Class A Mechanic  
(equivalent to DTPW – Bus Technician)
- c. 3M: Service Mechanic or Class B Servicer  
(equivalent to DTPW – Bus Technician)
- d. 2M: Mechanic Helper or Bus Servicer  
(equivalent to DTPW – Bus Hostler)
- e. 1M: Cleaner, Fueller, Oiler, Hostler, or Shifter  
(equivalent to DTPW – Bus Hostler)

Note: Whenever a specific time is indicated to access components or complete a task, it is assumed the vehicle is in the location where the work is to be performed. All necessary equipment is in its correct position (tools, jacks, vehicle lifts, lighting, fluid recovery systems, etc.) and ready for use.

**Metallic Hose.** A hose whose strength depends primarily on the strength of its metallic parts; it can have metallic liners or covers, or both.

**Module.** Assembly of individual components

**Motor (Electric).** A device that converts electrical energy into mechanical energy.

**Motor (Traction).** An electric motor used to power the driving wheels of the bus.

**Physical Layer.** The first layer of the seven-layer International Standards Organization (ISO) Open Systems Interconnect (OSI) reference model. This provides the mechanical, electrical, functional and procedural characteristics required to gain access to the transmission medium (e.g., cable) and is responsible for transporting binary information between computerized systems.

**Pipe:** Nonflexible line.

**Power.** Work or energy divided by time

**Power Density.** Power divided by mass, volume or area.

**Propulsion System.** System that provides propulsion for the vehicle proportional to operator commands.

**Real-Time Clock (RTC).** Computer clock that keeps track of the current time.

**Retarder.** Device used to augment or replace some of the functions of primary friction based braking systems of the bus.

**Seated Load.** 150 lbs for every designed passenger seating position and for the driver.

**SLW (Seated Load Weight).** Curb weight plus seated load.

**Serial Data Signals.** A current loop based representation of ASCII or alphanumeric data used for transferring information between devices by transmitting a sequence of individual bits in a prearranged order of significance.

**NOTE:** An example is the communication that takes place between two or more electronic components with the ability to process and store information.

**Solid State Alternator.** A module that converts high-voltage DC to low-voltage DC (typically 12/24 volt systems).

**Special Tools.** Tools not normally stocked by the Agency.

**Specification.** A particular or detailed statement, account, or listing of the various elements, materials, dimensions, etc. involved in the manufacturing and construction of a product.

**Standard.** A firm guideline from a consensus group.

**Standards.** Standards referenced are the latest revisions unless otherwise stated.

**Standee Line.** A line marked across the bus aisle to designate the forward area that passengers may not occupy when the bus is moving.



**State of Charge (SOC).** Quantity of electric energy remaining in the battery relative to the maximum rated Amp hour (Ah) capacity of the battery expressed in percent. This is a dynamic measurement used for the energy storage system. A full SOC indicates that the energy storage system cannot accept further charging from the engine driven generator or the regenerative braking system.

**Stress Loops.** The “pig-tails” commonly used to absorb flexing in piping.

**Structure.** The structure shall be defined as the basic body, including floor deck material and installation, load bearing external panels, structural components, axle mounting provisions and suspension beams and attachment points.

**Usable Battery Capacity.** Usable Battery capacity is measured in kWhr and would be the energy available for normal operations. Usable Battery Capacity would be the usable energy from the ESD as managed through the BMS, Assumed to be less than the gross capacity. It is calculated based on a useful range of something above 0% SOC and something less than 100% SOC, i.e., as an example, if the range was between 10% and 90% SOC, then the usable battery capacity would be 80% of gross battery capacity

**Warrantable End of Life (WEOL).** WEOL is measure of battery degradation determined as the point at which the batteries can no longer provide the energy or power required to meet the design operating profile. It is expressed as a percentage of remaining battery capacity as compared to gross capacity at the beginning of useful life. For purposes of this specification, WEOL shall be a measure of the useful and intended life of the energy storage device. This measure shall be a percentage of remaining useful capacity based on degradation from the beginning capacity, i.e. kWhr and is used in the overall calculation of mileage range. WEOL shall be used as a condition for battery replacement and to potentially initiate warranty claims.

**Wheelchair.** A mobility aid belonging to any class of three- or four-wheeled devices, usable indoors, designed for and used by individuals with mobility impairments, whether operated manually or powered. A “common wheelchair” is such a device that does not exceed 30 in. in width and 48 in. in length measured 2 in. above the ground, and does not weigh more than 600 lbs when occupied.

## TS 2.1 Abbreviations

The following is a list of abbreviations used in these Technical Specifications.

ADA	Americans with Disabilities Act
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EMI	Electromagnetic Interference
EPA	U.S. Environmental Protection Agency
FMEA	Failure Modes and Effects Analysis
FMCSR	Federal Motor Carrier Safety Regulations
FMVSS	Federal Motor Vehicle Safety Standards

FTA	U.S. Federal Transit Administration
IAS	International Approval Services
I/O	Input/Output
ISO	International Organization for Standardization
JIC	Joint Industrial Council
LED	Light Emitting Diode
LEL	Lower Explosive Limit
MAWP	Maximum Allowable Working Pressure
MPH	Miles Per Hour
NAFTP	The National Alternative Fuel Training Program
NATEF/ASE	The National Automotive Technicians Education Foundation/ Automotive Service Excellence
NFPA	National Fire Protection Association
NHTSA	National Highway Traffic Safety Administration
OEM	Original Equipment Manufacturer
OSHA	Occupational Safety and Health Administration
PRD	Pressure Relief Device
RFI	Radio Frequency Interference
SAE	SAE International
SPI	Society of the Plastics Industry
TRC	Texas Railroad Commission
UL	Underwriters Laboratories
USDOT	United States Department of Transportation

### **TS 3. Referenced Publications**

The documents or portions thereof referenced within this specification shall be considered part of the requirements of the specification. The edition indicated for each referenced document is the current edition, as of the date of the issuance of this specification.

### **TS 4. Legal Requirements**

The Contractor shall comply with all applicable federal, state and local regulations. These shall include but not be limited to Federal ADA, as well as state and local accessibility, safety and security requirements. Local regulations are defined as those below the state level.

Buses shall meet all applicable FMVSS and shall accommodate all applicable FMCSR regulations in effect at location of the Agency and the date of manufacture.

The bus shall comply with the most current revision of Florida Department of Transportation (FDOT) Rule 14-90 and most current revision of DOT Part 38--ADA Accessibility Specifications for Transportation Vehicles [Code of Federal Regulations: Title 49, Volume 1) recommended practices.

In the event of any conflict between the requirements of these specifications and any applicable legal requirement, the legal requirement shall prevail. Technical requirements that exceed the legal requirements are not considered to conflict.

Contractor should submit certifications with their bid submittal certifying that they comply with the all the legal requirements listed above in this section.

## **TS 5. Overall Requirements**

The Contractor shall ensure that the application and installation of major bus subcomponents and systems are compliant with all such subcomponent vendors' requirements and recommendations. A detailed description of bus components and systems shall be submitted to DTPW for review and approval prior to production. The application and installation of all major bus sub-components and systems shall be validated by the sub-components and /or system manufacturer prior to the delivery of the first article.

A life cycle cost analysis per bus should be submitted to DTPW for review with the proposal.

Components used in the vehicle shall be of heavy-duty design and proven in transit service.

Whenever a specific trade or product name is used within this specification, the following statement applies "...or approved equal with the same standards of quality, design and performance." All requests for approved equals must be submitted to DTPW for review.

### **TS 5.1 Weight**

It shall be a design goal to construct each bus as light in weight as possible without degradation of safety, appearance, comfort, traction or performance.

Buses at a capacity load shall not exceed the tire factor limits, brake test criteria or structural design criteria.

### **TS 5.2 Capacity**

The vehicle shall be designed to carry the gross vehicle weight, which shall not exceed the bus GVWR.

### **TS 5.3 Service Life**

The minimum useful design life of the bus in transit service shall be at least twelve (12) years or 500,000 miles. It shall be capable of operating at least 40,000 miles per year, including the 12th year.

### **TS 5.4 Maintenance and Inspection**

Scheduled maintenance tasks shall be related and shall be in accordance with the manufacturer's recommended preventative maintenance schedule and must conform to DTPW's standard inspection intervals of 6,000 miles (along with routine daily service performed during the fueling operations).

Contractor shall provide a list of all special tools and pricing required for maintaining this equipment. Said list shall be submitted prior to NTP.

NOTE: Tools such as compartment door keys and other tools that are required for daily maintenance and inspections shall not be included in the special tool list and shall be furnished for each coach.

The contractor should provide a list of the time required for typical repair and servicing of items on the bus at the pre-production meeting.

Test ports shall be provided for commonly checked functions on the bus such as but not limited to hydraulic, pneumatic, HVAC, and cooling systems. Fluid sampling ports (KP Series Pushbutton Sampling Valve) for transmission and hydraulic systems shall be provided.

The coach manufacturer shall give prime consideration to the routine problems of maintaining the vehicle and charging equipment. All coach and charging station components and systems, both mechanical and

electrical, which will require periodic physical work or inspection processes shall be installed so that a minimum of time is consumed in gaining access to the critical repair areas. It shall not be necessary to disassemble portions of the coach structure and/or equipment such as seats and flooring under seats in order to gain access to these areas. Each coach shall be designed to facilitate the disassembly, reassembly, servicing or maintenance, using tools and equipment that are normally available as standard commercial items.

Requirements for the use of unique specialized tools will be minimized. The body and structure of the coach shall be designed for ease of maintenance and repair. Individual panels or other equipment which may be damaged in normal service shall be repairable or replaceable. Ease of repair shall be related to the vulnerability of the item to damage in service.

The proposer should provide a list of all special tools and pricing for maintaining this equipment. Said list should be submitted prior to NTP.

**NOTE:** Tools such as compartment door keys, bellows gauges and other tools that are required for daily maintenance and inspections shall not be included in the special tool list and shall be furnished for each bus.

All shields and removable plates shall have the bus number permanently marked.

All removable caps shall be tethered including the caps for the diagnostic connector ports in the operator's area and in the engine compartment.

The location for checking and adding fluids, or making adjustments to key components and systems, shall be convenient and easily accessible. Access doors for checking vital fluids on the inside of the bus shall be kept to a minimum.

### **TS 5.5 Interchangeability**

Unless otherwise agreed, all units and components procured under this Contract, whether provided by Suppliers or manufactured by the Contractor, shall be duplicates in design, manufacture and installation to ensure interchangeability among buses in each order group in this procurement. This interchangeability shall extend to the individual components as well as to their locations in the buses. These components shall include, but are not limited to, passenger window hardware, interior trim, lamps, lamp lenses and seat assemblies. Components with non-identical functions shall not be, or appear to be, interchangeable.

Any one component or unit used in the construction of these buses shall be an exact duplicate in design, manufacture and assembly for each bus in each order group in this Contract. Contractor shall identify and secure approval for any changes in components or unit construction provided within a Contract.

In the event that the Contractor is unable to comply with the interchangeability requirement, the Contractor must notify the Agency and obtain the Agency's prior written approval, including any changing in pricing.

Agency shall review proposed product changes on a case-by-case basis and shall have the right to require extended warranties to ensure that product changes perform as least as well as the originally supplied products.

### **TS 5.6 Training**

The Contractor shall have at least one qualified instructor who shall be available at the DTPWs property for 120 calendar days between the hours of 7:00 am and 3:00 pm per month for 1 months prior to, and 3 months after, acceptance of the first bus. Instructor(s) shall conduct schools and advise the personnel of the DTPW

on the proper operation and maintenance of the equipment. The Contractor also shall provide visual and other teaching aids (such as manuals, slide presentations and literature) for use by the Agency's own training staff and which become the property of the Agency.

The Contractor shall provide an approved instruction program for designated Transportation and Maintenance personnel in the proper methods of operating, maintaining and servicing buses provided to DTPW by the Contractor. The training program shall be divided into two (2) complete sections, one for Maintenance personnel and the other for Transportation personnel.

Ninety (90) days before the scheduled delivery date of the first bus, schedules and lesson plans shall be provided for DTPW approval for both the Maintenance and Transportation training programs. As part of the lesson plan, the Contractor shall include the name of the instructors. Utilization of vendor presenters is encouraged and supported by DTPW. The Contractor is responsible for scheduling and costs of vendor presenters. As part of the training schedule, Contractor shall inform DTPW of any equipment needed to make the presentation, such as but not limited to audio/visual equipment, blackboards, wipe boards, flip charts, and overhead or slide projectors.

### **Maintenance Training**

The Contractor shall provide a complete training and instruction program for DTPW's designated mechanics, service personnel, and supervisors covering preventative maintenance, troubleshooting, and repair of the buses the Contractor will be providing DTPW. The instruction program shall be in self-contained modules, or subject areas, with each module divided into two (2) phases, a pre-delivery phase and a post-delivery phase. Each module or subject shall be covered at least twice, unless otherwise noted. The pre-delivery training must be completed by the scheduled delivery of the first bus. It is DTPW's intent that the post-delivery phase of each module be designed as hands on troubleshooting on an actual bus. As an example, DTPW may mandate thirty-two (32) hours of training for a particular module or subject area which may be divided into sixteen (16) hours of pre-delivery training and sixteen (16) hours of post-delivery training.

Many of the classes will be held during DTPW's three (3) shifts of operation. Exact schedules will be negotiated between DTPW's training personnel and the Contractor.

DTPW will limit the number of personnel in each class to twenty (20) or less so that class size will be manageable. Personnel attending each module or class will be designated by DTPW with a list of attending individuals available to Contractor. All attendance records will be kept by DTPW's Training Division.

The Maintenance training and instruction program shall cover (but not be limited to) the following areas:

- |                     |   |
|---------------------|---|
| A. Orientation      | I. Suspension, Steering, Axles                  |
| B. Electrical       | J. Body   |
| C. Powertrain       | K. Parts  |
| D. Charging Station | L. Service Instruction                          |
| E. Air Conditioning | M. Ramp Equipment                               |
| F. Doors            | N. Towing                                       |
| G. Brakes           | O. Fire Suppression                             |
| H. Air System       | P. Other systems not herein listed but supplied |

Contractor shall inform DTPW of any special equipment that requires training before the bus is put into revenue service.

## **Maintenance Training Program Content**

### Orientation Module

- Advantages and Strong Points of the Bus.
- Visuals of Production System of the Bus.
- Compartment-by-Compartment Tour of the Bus.
- Special Components or Features of the Bus.

The orientation module will consist only of a pre-delivery session with no post-delivery instruction. DTPW suggests that the orientation module be limited to four (4) hours with one fifteen minute break. The orientation module shall be repeated eight (8) times.

### Electrical/Electronics

- Location of all key electrical components found on the bus.
- Explanation of the wiring diagram and wiring codes with copies of wiring diagrams given to each attendee.
- Explanation of the charging system along with basic troubleshooting of the system.
- Explanation of the Exterior and Interior Lighting system along with basic troubleshooting of the system.
- Explanation of the safety shutdown system, including the warning indicators, along with basic troubleshooting of system.

Contractor shall provide a module consisting of a minimum of ten (10) eight-hour days of pre-delivery classroom instruction, followed by a minimum of twelve (12) eight-hour days troubleshooting on a bus.

### Powertrain and Accessories

- Explanation of the powertrain and the location of key components.
- Explanation of the powertrain driven accessories.
- Explanation of the lubrication, and cooling systems.
- Basic troubleshooting procedures for the powertrain
- Explanation of the electronic control system.

The emphasis of any powertrain module should be basic troubleshooting and preventative maintenance procedures. The basic powertrain course shall consist of ten (10) eight-hour days of pre-delivery classroom instruction and twelve (12) eight-hour days of post-delivery classroom instruction on a bus.

### Charging Station

- Explanation of the Charging Station
- Basic troubleshooting of the Charging Station

The Charging Station training course shall consist of basic troubleshooting and preventative maintenance. The course shall consist of a minimum of four (4) eight-hour days of pre-delivery classroom instruction and five (5) eight-hour days of trouble shooting on the bus.

### Air Conditioning

- Explanation of the Air Conditioning system and the location of all key air conditioning components (handouts required).
- Explanation of the Air Conditioning Electrical System.
- Explanation of the Air Conditioning Compressor, along with basic troubleshooting and preventative maintenance of the air conditioning compressor.
- Basic troubleshooting of the air conditioning system.
- Preventative maintenance of the air conditioning system.

DTPW will require a minimum of four (4) eight-hour days of pre-delivery classroom instruction and six (6) eight-hour days of post-delivery instruction on the troubleshooting.

#### Doors

- Explanation of the door system and the location of all door components.
- Explanation of the door electrical system.
- Proper door adjusting procedures.
- Basic troubleshooting of the door system.
- Rebuilding of the door motors (may be taught as a separate course).

The door module shall consist of four (4) four-hour sessions of pre-delivery classroom instruction and four (4) four-hour sessions of hands-on post-delivery troubleshooting.

#### Brakes

- Explanation of the Brake System.
- Basic brake system repair, including adjustments to brakes.

The brake module shall consist of four (4) four-hour sessions of pre-delivery classroom instruction and six (6) four-hour sessions of post-delivery instruction on the brake system on the bus.

#### Air System

- Explanation of the air system with the location of all air system components.
- Basic troubleshooting of the air system.
- Preventative Maintenance of the air system.

The Contractor shall provide an air system module consisting of four (4) four-hour sessions of pre-delivery classroom instruction and six (6) four-hour sessions of post-delivery troubleshooting instruction on a bus.

#### Suspension, Steering, Axles

- Explanation of the suspension system.
- Basic repair to the suspension system.
- Basic troubleshooting of the suspension system.
- Explanation of the steering system.
- Basic troubleshooting of the steering system.
- Explanation of the axles.
- Explanation of the articulation system.
- Basic troubleshooting of the articulation system.

DTPW requires a minimum of four (4) four-hour sessions of pre-delivery classroom instruction and four (4) four-hour sessions of post-delivery troubleshooting instruction on a bus.

Body

- Explanation of the body and the attachment method of exterior panels.
- Basic repair of the exterior panels.
- Demonstration of windshield and passenger window replacement.

DTPW requires that the body module be a minimum of four (4) four-hour sessions of pre-delivery training and four (4) four-hour sessions of post-delivery instruction on a bus.

Parts

- Explanation of the Parts Manual and how it is divided.
- Explanation of the parts numbering system.
- Orientation to the bus and components on the bus.
- Practice in finding parts in the Parts Manual.

DTPW requires the Parts module to be a minimum of two (2) four-hour sessions of pre-delivery instruction. No post-delivery instruction will be required.

Service Instruction (For Service, and Cleaning Personnel)

- Operator Compartment
  - Controls and Switches
  - Warning Indicators and gauges
  - Seat Adjustment
  - Door Control
  - Wheelchair Ramp Operation
- Walk Around Inspection
  - Compartment by Compartment Explanation of Service Points
  - Battery Charging
  - Mirror Adjustments
  - Climate Control System

DTPW requires that the Service Instruction module be presented at each garage where buses will be assigned. This module shall consist of ten (10) four-hour sessions.

Wheelchair Ramp

- Explanation of the Ramp System, mechanisms and controls.
- Inspection and Periodic Maintenance of the Wheelchair Ramp mechanism.
- Trouble shooting of hydraulic and electrical components.

The Contractor shall provide comprehensive training on this critical system. The training program shall consist of four (4) four-hour sessions of pre-delivery instruction and four (4) eight-hour sessions of post-delivery instruction.

Towing

The Contractor shall provide lifting and towing instruction and demonstration for DTPW's maintenance personnel consisting of four (4) four-hour sessions utilizing DTPW's lifting equipment and an actual bus. The towing equipment shall be provide by the Contractor at its own expense.



### Automatic Fire Suppression

- Location of key components on the bus
- Theory of operation
- Explanation of Electrical Wiring
- Basic Troubleshooting
- Preventative Maintenance

The Fire Suppression System training shall consist of four (4) four-hour sessions of post-delivery instruction.

### **Transportation Training**

#### Training Program

The Contractor shall provide complete training and instruction for DTPW designated Bus Operator Instructors, Street Supervisors and Dispatchers. The program shall include, but not be limited to the following:

#### Operator Compartment

- Controls and Switches.
- Warning Indicators and Gauges.
- Seats Adjustment.
- Door Control.

#### Walk Around Inspection

- Compartment-by-Compartment Explanation
- Mirror Adjustments
- Climate Control system
- Battery Safety

#### Driving Instruction

- Turns
- Braking
- Backing.

#### Wheelchair Ramp Equipment

- Controls
- Safety
- Emergency Procedures
- Securing Wheelchairs and Riders
- Loading and Unloading

The Transportation Training Program shall consist of a four (4) hour module on the bus ten (10) times. Each trainee will be given an opportunity to operate the bus with the Contractor's instructor on board. The Contractor shall provide the Transportation Training Program ten times.

The Contractor shall provide a training video for DTPW instructors to use for training bus operators on the operation of the bus no later than 30 days after delivery of the first bus of the first lot. The video shall include but not be limited to bus startup and shutdown, rear start, battery disconnect, operational characteristics,

instruments and controls, dashboard indicators, wheelchair ramp operation and emergency manual operation, loading and unloading wheelchair passengers, wheelchair passenger securement, pre-trip inspection, safety and emergency procedures. The video content must be approved by DTPW. The Contractor shall give DTPW permission to duplicate the video for DTPW use.

#### Training Program Aids

The Contractor shall provide fifty (50) sets of instructional material hand-outs for each pre-delivery and post-delivery training module as listed in paragraph 8.1 items B through P. The Orientation program shall be supplied with 100 hand-outs. This instructional material will be kept by the individuals to allow them to retain and remember salient areas of training and instruction modules. DTPW will work with the Contractor to help develop this instruction. The Contractor shall write all instructional material in clear, simple English, keeping in mind that many individuals in the training course have minimum literacy skills (6th grade reading level).

The use of slides, view graphs and other visuals is required in the pre-delivery training classes to allow the trainees the opportunity to see the actual location of the components, the size of the components and the physical appearance of the subject.

DTPW reserves the right to duplicate, at its expense, all films, slides, view graphs, tapes and handouts for its sole use in follow-up reinforcement training at the option of DTPW's Training Division. Unless an Instructor objects in writing, DTPW reserves the right to video tape/or audio tape all Contractor and vendor presentations for its sole use without further costs, obligation or liability to DTPW.

#### Training Facilities

All training will be conducted at DTPW facilities or facilities secured by DTPW. The Contractor shall inform DTPW in the lesson plans of any special facilities needed. DTPW will assist the Contractor in the set up and tear down of training aids and models used in the presentations.

#### Training Instructors

All training instructors shall be competent to teach the course area they are instructing. Further, all instructors shall speak English and have a complete understanding of the English language. If the instructor or vendor presenter lacks the skill or knowledge to provide instruction, or cannot communicate with the students, DTPW reserves the right to request that the instructor be replaced and the area of training be repeated.

#### Supervisor Training

In addition to the in-depth training described above, the Contractor shall provide a series of five (5) short courses of four (4) hours each for Maintenance Supervisors. These courses shall be designed to give the Maintenance Supervisors an overview of each system listed in the Maintenance Training Program Content. The class size will be kept to a manageable number. The courses are intended to allow the supervisors to better understand the bus and how to troubleshoot some of the common problems. DTPW will work with the Contractor to develop these supervisory training courses.

#### Data Communications Systems Training

Separate from the Maintenance and Transportation training described above, the Contractor shall provide and arrange for one-hundred (100) hours of training for Systems Maintenance Technicians, to be given by the suppliers of the various Data Communications Equipment provided with the buses. This training shall include in-depth component level repair and programming. Classes and times will be determined by the Chief, Field Engineering and Systems Maintenance.

**Training Hours Summary**

<u>Maintenance Summary</u>	<u>Pre-Delivery</u>	<u>Post-Delivery</u>
Orientation	8 X 4 = 32	---
Electrical	10 X 8 = 80	12 X 8 = 96
Powertrain	10 X 8 = 80	12 X 8 = 96
Charging Station	4 X 8 = 32	5 X 8 = 40
Air Conditioning	4 X 8 = 32	6 X 8 = 48
Doors	4 X 4 = 16	4 X 4 = 16
Brakes	4 X 4 = 16	6 X 4 = 24
Air System	4 X 4 = 16	6 X 4 = 24
Steering, Suspension, Axles	4 X 4 = 16	4 X 4 = 16
Body	4 X 4 = 16	4 X 4 = 16
Parts	2 X 4 = 8	---
Maintenance Service Instruction		10 X 4 = 40
Wheelchair Equipment	4 X 4 = 16	4 X 8 = 32
Towing	---	4 X 4 = 16
Fire Suppression	---	4 X 4 = 16
	-----	-----
Total Maintenance	360 Hours	480 Hours
Transportation		10 X 4 = 40
Supervisory Orientation		5 X 4 = 20
Data Communications Systems Training		100 Hours
<hr/>		
GRAND TOTAL	360 Hours	640 Hours
<hr/>		
COMBINED TOTALS	1000 Hours	

Pricing

The training program provided by the Contractor shall be included in the bus price.

A complete 1000 hours training program shall be provided. DTPW may adjust (increase or reduce) the hours specified for each topic where its work force already possesses adequate knowledge of a particular system or specific equipment.

### **TS 5.7 Technical/Service Representatives**

The Contractor shall be responsible to have a knowledgeable individual, conversant with its bus and componentry, meet no less than once each month at the DTPW offices in Miami, Florida to deal with day-to-day problems which may occur during the "Basic Bus Warranty" period. During the period of "Bus Delivery" this requirement shall be "full time". The Contractor's Representative shall have authority to settle disputes, agree on corrective measures and shall be empowered to bind the Contractor to any and all agreements he makes. This provision shall continue in force until relinquished or amended in writing by DTPW.

In addition, the Contractor shall provide at its own expense, one or more "full-time" competent technical service representatives on site at DTPW facilities, to perform warranty repairs and supply technical support for a period of one year minimum, beginning from the date of acceptance of the last bus delivered.

### **TS 5.8 Operating Environment**

The Bus shall operate normally under all environmental conditions usually occurring in the DTPW's service area. Specific conditions include ambient temperatures which range from 20 degrees F. to 120 degrees F. at relative humidity between five (5) and one hundred (100) percent.

Speed, gradability, and acceleration performance requirements shall be met at, or corrected to 85 degrees F., 29.00 inches Hg, and relative humidity of 65 percent.

Miami-Dade County experiences severe rain conditions and as such, special attention must be given to ensure that no water leaks occur in the bus.

### **TS 5.9 Noise**

#### **Interior Noise**

The combination of inner and outer panels and any material used between them shall provide sufficient sound insulation so that a sound source with a level of 80 dBA measured at the outside skin of the bus shall have a sound level of 65 dBA or less at any point inside the bus. These conditions shall prevail with all openings, including doors and windows, closed and with the engine and accessories switched off.

The bus-generated noise level experienced by a passenger at any seat location in the bus shall not exceed 80 dBA. The driver area shall not experience a noise level of more than 75 dBA.

An exception shall be made for the turntable area (where applicable), which shall be considered a separate environment.

It is DTPW's intent to minimize the noise experienced by passengers, and as such, the Contractor shall offer any optional or additional noise deadening insulation or noise reduction technologies available, as standard on the bus. DTPW will consider any reduction of bus generated interior noise below the maximum specified.

Proposers should submit test information to DTPW with the proposal.

**Exterior Noise**

Airborne noise generated by the bus and measured from either side shall not exceed 80 dBA under full power acceleration when operated 0 to 35 mph at curb weight. The maximum noise level generated by the bus pulling away from a stop at full power shall not exceed 83 dBA. The bus-generated noise at curb idle shall not exceed 65 dBA. If the noise contains an audible discrete frequency, a penalty of 5 dBA shall be added to the sound level measured. The Contractor shall comply with the exterior noise requirements defined in local laws and ordinances identified by the Agency and SAE J366.

Proposers should submit test information to DTPW with the proposal.

**TS 5.10 Fire Safety**

The bus shall be designed and manufactured in accordance with all applicable fire safety and smoke emission regulations including but not limited to FMVSS 302. These provisions shall include the use of fire-retardant/low-smoke materials, fire detection systems, bulkheads and facilitation of passenger evacuation.

The buses shall be equipped with a suitable means of automatically detecting and extinguishing fires. This system shall include a UPS (Uninterruptable Power Supply) capable of sustaining operation for a period of at least 72 hours regardless of the primary energy source SOC and remain uninterrupted regardless of "run" / "ign" position. The system controller shall include a means of data logging and storage such that incident data is recoverable and periodic system health checks. The quantity, location and technology for sensors, suppression, agents, etc. shall be best practice for the intended application and environment. Fire suppression piping located in the immediate area (s) being protected shall be fireproof and capable of surviving gross thermal events, the subject piping shall include the flow path between the fire suppression bottle and nozzles, metalized rigid / flexible, stainless steel preferred. The preferred supplier for the system shall be Amerex.

The system design, hardware location and access shall be such that those items required for periodic inspection are readily available for ease of access and viewing. An inspection door shall be provided by the Contractor on the bus body allowing for visual site inspection of the agent cylinder gauge.

Materials used in the construction of the Passenger Compartment of the bus shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90A, dated October 20, 1993. Materials entirely enclosed from the passenger compartment, such as insulation within the sidewalls, need not comply. In addition, smaller components and items, such as seat grab rails, switch knobs and small light lenses, shall be exempt from this requirement.

**Automatic Fire Suppression**

The vehicle shall be equipped with an Amerex ABC dry chemical fire suppression system model V25, Kidde Fire Suppression System, Fogmaker Fire Suppression System, or approved equal. The system shall be approved and listed for use at -65 degrees F to 150 degrees F by Factory Mutual Research Corporation. The automatic actuation system shall provide 24 hour fire detection of the engine compartment. The system shall include the following features:

- A minimum 25 pound capacity agent cylinder of the stored pressure type shall be furnished and be constructed of welded steel and must conform to DOT specification 4BW, and be rated for 12 year minimum hydrostatic retest. The cylinder shall be outfitted with a gauge and a forged brass valve assembly.

- A minimum of four (4) optical flame sensors shall be located in the engine compartment. The electric control head shall also be activated manually by depressing an electric switch (button w/ pull pin, labeled 'fire') mounted in the driver's dash area.
- A Control Panel shall be provided to electrically supervise the automatic fire suppression system wiring circuits for POWER, HEAT DETECTION, and SYSTEM ACTUATION. The monitor shall provide a display indicating NORMAL, FIRE or FAULT conditions, and the panel will shut the bus down within 15 seconds or less of detecting a fire. A shut down reset button on the panel will be included.
- A minimum of four (4) brass nozzles shall be located in the engine compartment (and/or other locations as recommended), fitted with dust caps that, upon actuation, are displaced to allow full ABC chemical flow.
- Protective sleeves (high temperature resistant material) shall be provided to all the fire suppression system hoses enclosed in the engine compartment area.
- The bus Contractor shall provide a written sign off from the fire suppression manufacturer that all installation requirements have been met on the pilot bus system.
- An inspection door will be provided by the Contractor on the bus body allowing for visual site inspection of the agent cylinder gauge.
- Battery backup for the fire suppression system shall be provided to allow the operation of the system for a minimum of 120 hours.
- A linear heat detection line and an optical flame sensor (heat detector) located just above the AC compressor or adjacent the AC compressor shall be provided.

If a rear mounted air-conditioning system is provided, one detector and nozzle shall be located in the upper a/c compartment. DTPW is to approve location of nozzles, detectors, and canister prior to production.

A documentation proving that the pilot bus or first production bus (if no pilot bus available) meets or exceeds vehicle fire suppression system requirements shall be provided by the bus manufacturer with a written sign off from the fire suppression manufacturer.

### **TS 5.11 Respect for the Environment**

In the design and manufacture of the bus, the Contractor shall make every effort to reduce the amount of potentially hazardous waste. In accordance with Section 6002 of the Resource Conservation and Recovery Act, the Contractor shall use, whenever possible and allowed by the specifications, recycled materials in the manufacture of the bus.

The Contractor should provide a plan for reuse or recycling of replaced battery cells and/or battery packs both during and after the warranty period.

## **DIMENSIONS**

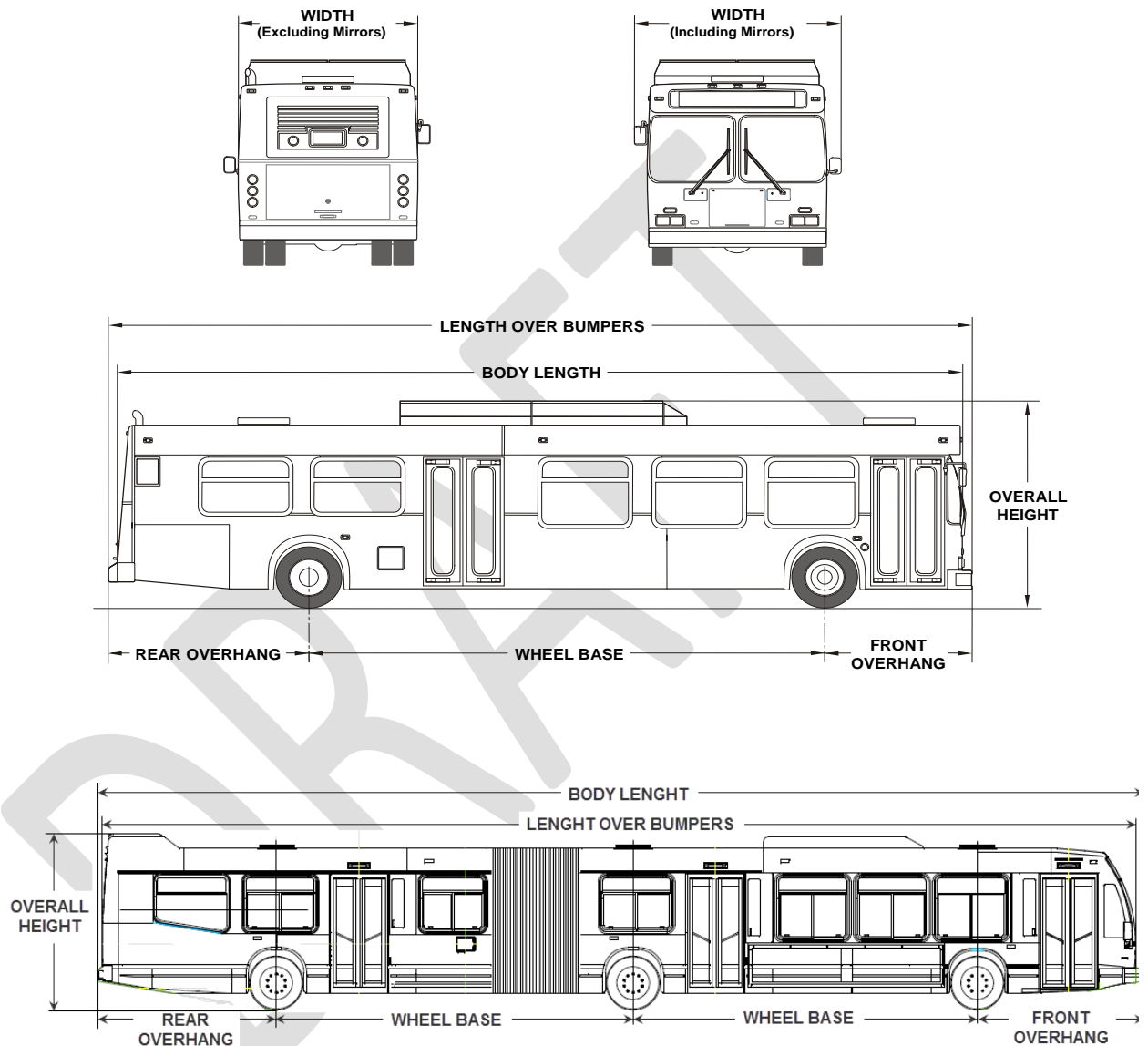
### **TS 6. Physical Size**

With exceptions such as exterior mirrors, marker and signal lights, bumpers, fender skirts, washers, wipers, ad frames, cameras, object detection systems, bicycle racks, feelers and rub rails, the bus shall have the following overall dimensions as shown in Figure 1 at static conditions and design height.

DRAFT

FIGURE 1

## FORTY-FOOT AND SIXTY-FOOT BUS DIMENSIONS

**TS 6.1 Bus Length**

The following tolerances will be allowable for each given bus length. Bus length is determined as the measurement from bumper to bumper.



- **60ft (articulated) bus:** 59ft to 65ft

## TS 6.2 Bus Width

Overall width of buses, excluding mirrors, shall be one-hundred two (102) inches (+0, -1 in.).

## TS 6.3 Bus Height

Maximum overall height of buses, including all rigid roof mounted items such as but not limited to A/C, exhaust, fuel system and cover, etc., shall not exceed one-hundred-thirty-seven (137) inches. Height measurements, including the heights specified below, are on a level surface with air suspension system operating at the design running height, with the bus on the manufacturer's recommended tires correctly inflated.

## TS 6.4 Step Height

The maximum acceptable entry step height shall be 15.5 inches at the entry door and ~~15.5~~17 inches at the exit door. The maximum acceptable entry step height kneeled shall be 13 inches. The maximum acceptable entry step height kneeled at exit door shall be provide to DTPW for review and approval during the preproduction meeting.

## TS 6.5 Underbody Clearance

The bus shall maintain the minimum clearance dimensions as shown in Figure 2 and defined in SAE Standard J689, regardless of load up to the gross vehicle weight rating.

No part of the bus, other than the wheels, tires or mud flaps, shall touch a flat road surface in a stopped condition with a single tire or a dual set fully deflated.

## TS 6.6 Ramp Clearances

The approach angle is the angle measured between a line tangent to the front tire static loaded radius arc and the initial point of structural interference forward of the front tire to the ground.

The departure angle is the angle measured between a line tangent to the rear tire static loaded radius arc and the initial point of structural interference rearward of the rear tire to the ground.

The breakover angle is the angle measured between two lines tangent to the front and rear tire static loaded radius and intersecting at a point on the underside of the vehicle that defines the largest ramp over which the vehicle can roll.

TABLE 2

Angle	60-ft Bus
Approach	8.6 degrees (min.)
Front breakover	10.2 degrees (min.)
Rear breakover	8.7 degrees (min.)
Departure	8.6 degrees (min.)

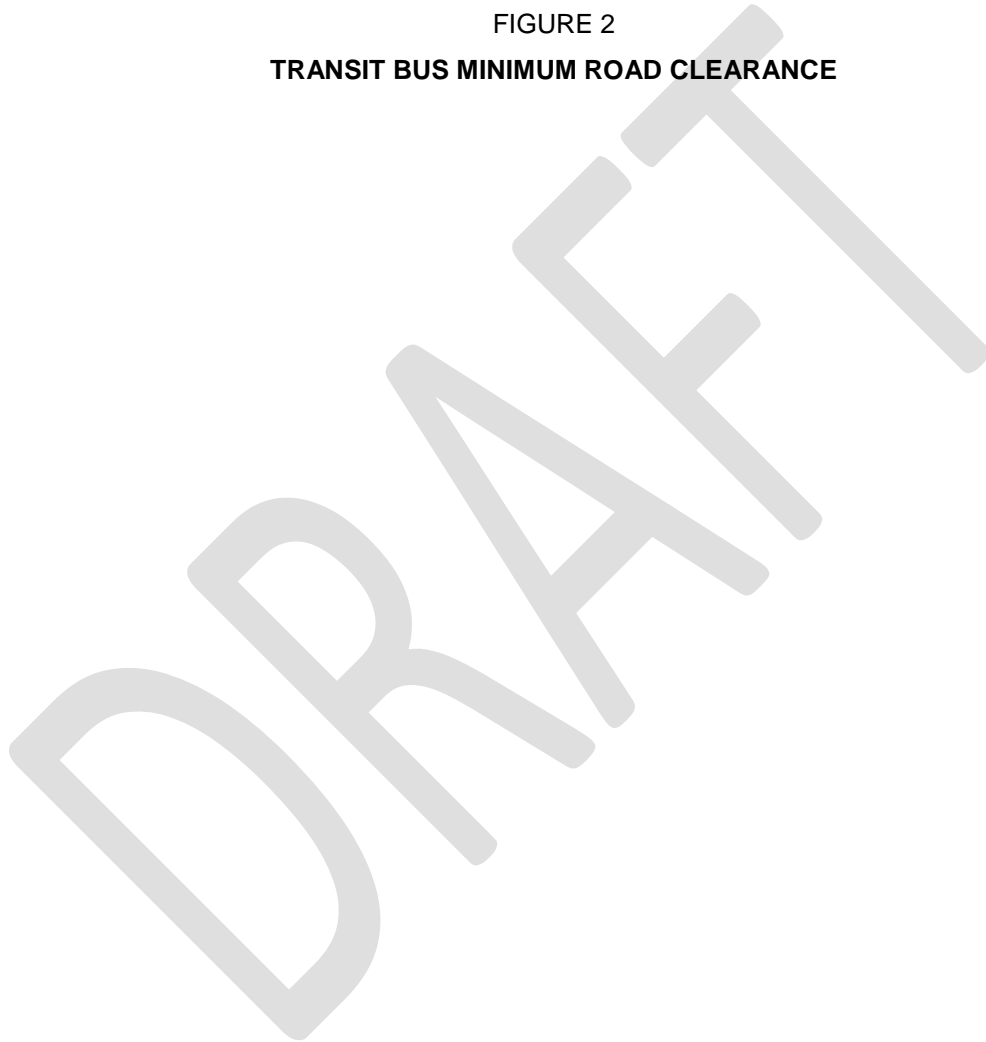
### **TS 6.7 Ground Clearance**

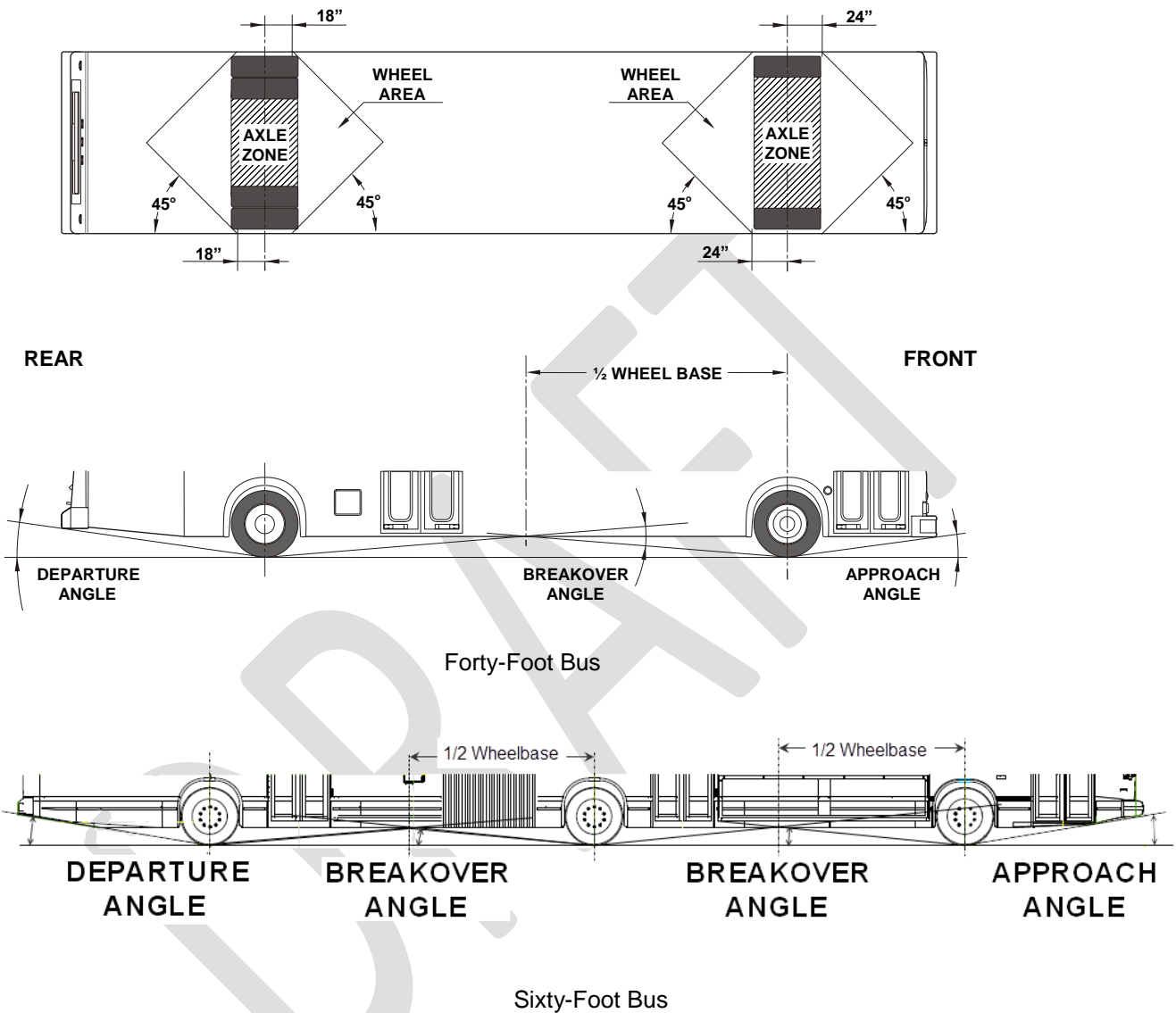
Ground clearance shall be no less than 9 in., (8 in. at jacking pad) except within the axle zone and wheel area.

Axle zone clearance, which is the projected area between tires and wheels on the same axial centerline, shall be no less than five-and-one-half ( $5\frac{1}{2}$ ) inches.

Wheel area clearance shall be no less than 8 in. for parts fixed to the bus body and 6 in. for parts that move vertically with the axles.

FIGURE 2  
**TRANSIT BUS MINIMUM ROAD CLEARANCE**





### TS 6.8 Floor Height

Height of the floor above the street shall be no more than 15½ inches measured at the centerline of the front doorway. The floor may be inclined along the longitudinal axis of the bus, and the incline shall be less than 3½ degrees off the horizontal except locally at the door where a maximum 5 degrees slope toward the door is allowed.

It shall be a design goal to reduce the floor height as low as possible to the street level to aid in the boarding and departure of passengers.

The bus design shall aid at the roadside of the bus the near-level boarding and departure of passengers to a platform level of 12 inches.

### **TS 6.9 Interior Headroom**

Headroom above the aisle and at the centerline of the aisle seats shall be no less than 78 in. in the forward half of the bus tapering to no less than 74 in. forward of the rear settee. At the centerline of the window seats, headroom shall be no lower than 65 in., except for parcel racks and reading lights, if specified. Headroom at the back of the rear bench seat may be reduced to a minimum of 56 in., but it shall increase to the ceiling height at the front of the seat cushion. In any area of the bus directly over the head of a seated passenger and positioned where a passenger entering or leaving the seat is prone to strike his or her head, padding shall be provided on the overhead paneling.

### **TS 6.10 Aisle Width**

The minimum clear aisle width between pairs of transverse seats with all attached hardware shall be at least 22 in.

The aisle width between the front wheelhouses shall be at least 35.5 in., and the entire area between the front wheelhouses shall be available for passengers and mobility aid devices.

## **VEHICLE PERFORMANCE**

### **TS 7. Power Requirements**

The propulsion system shall be sized to provide sufficient power to enable the bus to meet the defined acceleration, top speed, and gradability requirements, and operate all propulsion-driven accessories using actual road test results and computerized vehicle performance data.

The loss of power to the bus shall not cause the driver to lose control of the bus or to lose steering or braking. The bus shall be able to be safely brought to a controlled stop.

#### **TS 7.1 Top Speed**

The bus shall be capable of achieving a top speed of 65 mph on a straight, level road at GVWR with all accessories operating but shall be governed at a top speed of 60 m.p.h. The bus shall be capable of safely maintaining the vehicle speed according to the recommendations by the tire manufacturer.

#### **TS 7.2 Gradability**

Gradability requirements shall be met on grades with a dry commercial asphalt or concrete pavement at GVWR with all accessories operating. The propulsion system and drive train shall enable the bus to achieve and maintain a speed of 40 mph on a 2½ percent ascending grade and 7 mph on a 16 percent ascending grade.

**NOTE:** Values are assumed to be sustained. Manufacturer shall supply Agency with data if there is a variance between peak performance and sustained vehicle performance.

#### **TS 7.3 Acceleration**

The acceleration shall meet the requirements below starting from a stationary condition, on a level grade, all accessories operating, with a seated load weight (SLW) at 150 pound per passenger. Acceleration measurement shall commence when the accelerator is depressed (idle start). The acceleration shall be sufficiently gradual and smooth to prevent throwing standing passengers off-balance.

Braking application and performance shall remain consistent regardless of system State of Charge (SOC) or other variances related to regenerative braking.

Maximum Start Acceleration Times on a Level Surface

Speed (mph)	Maximum time (seconds)
10	5
20	10
30	18
40	30
50	60
Top speed	

## **TS 7.4 Operating Range**

The operating range of the coach shall be designed to meet the operating profile as stated in the “Design Operating Profile” section.

### **TS 7.4.1 Electric**

The operating range of the coach with full state of charge and under full GVWR and auxiliary loads shall be at least 220 miles. The 220 miles minimum range shall be based on a single charge at the depot station.

## **TS 8. Fuel Economy (Design Operating Profile)**

Test results from the Altoona fuel economy tests or other applicable test procedures shall be provided to DTPW. Results shall include vehicle configuration and test environment information. Diesel equivalent fuel economy data shall be provided for the design operating profile. The design operating profile is assumed to be defined by the Altoona fuel duty cycle.

## **POWERPLANT**

### **TS 9. Propulsion System (Electric)**

#### **Propulsion System Description**

The bus shall be powered by a battery electric propulsion system. Function and operation of the bus shall be transparent to the bus operator and passengers. The Contractor shall assure that the bus structure can successfully accept the installation of the propulsion system and be operated on the stated duty-cycle for a period of 12 years without a structural failure. At a minimum, the propulsion system shall comply with applicable local, state, and/or federal emissions and useful life requirements, as a zero emission bus. The propulsion system shall comply with local, state, and federal (maintenance) and other applicable sections.

The Electric Drive System shall be rated for the GVWR or greater of the bus.

#### **Propulsion System Service**

The propulsion system shall be arranged so that accessibility for all routine maintenance is assured. No special tools, other than dollies and hoists, shall be required to remove the propulsion system or any

subsystems. However, the Agency shall recognize that properly rated test equipment and safe electrical work practices are essential when servicing high voltage components. Contractor shall provide all specialty tools and diagnostic equipment required for maintaining the Propulsion System in accordance with Special Tools List.

### **Primary Propulsion Unit and Traction Motor**

The PPU and traction motor(s) may be configured in a variety of methods dependent upon type of drive, i.e. conventional drive rear axle, wheel motors, etc. The definition of motor in the context of this specification assumes the device can provide or consume electrical energy as well as provide or retard mechanical motion.

### **Propulsion System Controller (PSC)**

The PSC regulates energy flow throughout system components in order to provide motive performance and accessory loads, as applicable, while maintaining critical system parameters (e.g., voltages, currents, temperatures, etc.) within specified operating ranges.

The controller shall monitor and process inputs and execute outputs as appropriate to control the operation of all propulsion system components.

The overall propulsion system and PSC shall include and manage support systems such as, steering, air, HVAC, defroster, etc.

The propulsion system shall be managed via a PSC. This PSC is assumed to be the hub for all propulsion system device to device communication, to include traction motors, energy storage, charging equipment and power switching electronics, and interface to other vehicle systems via J1708, J1939, etc. The PSC shall provide the following functionality:

- Storage of the application file necessary to execute propulsion system commands
- Storage of the buses data file generated on a day to day basis, to include:
  - At a minimum, duty cycle information (time stamp, vehicle speed, elevation, location, ambient temperature, etc.), and energy profile information (i.e., voltage and current from the traction motor, auxiliary systems, ESS, power electronics, onboard charging system, etc.) at 1 sec intervals
  - History of charging sessions, energy in, time stamp, SOC, etc.
  - Incidents and alarms
  - Health monitoring and diagnostics information
- Expert level software such that the bus is optimized per duty cycle on the fly, i.e. “adaptive learning” to consider, route, time of day, etc. The objective is to maintain the buses level of expected performance, meanwhile minimize the cost of the electric utility used for charging. If the proposed PSC controller does not have the capability to perform “adaptive learning”, the Contractor must perform parameter tuning to help optimize the efficiency of the vehicle to the given route.
- A means of executing “limp home” instruction such that the bus is able to return to the depot from the furthest point on the route without charge assistance.
- A wireless means of communication to the on route and depot charging stations, and/or if probed via a WLAN in close proximity

- The system is assumed to include current / power sensors at strategic locations throughout the propulsion system components such that real time comparisons can be made between anticipated power flow and actual power. This feature shall facilitate health checking of components to indicate, “open”, “shorted” and/or components that have considerable variance.
- The system is assumed to include the necessary sensor inputs at strategic locations, such as, temperature, voltage, pressure, etc. such that the entire array of devices are monitored in real time. This feature shall be able to execute commands for the self-preservation of component life, health, reliability and safety. The on-board diagnostic system shall trigger a visual and audible alarm to the operator when the motor controller detects a malfunction and the protection systems are activated.
- The system shall protect the traction motor(s) against progressive damage. The system shall monitor conditions critical for safe operation and automatically derate power and/or speed.
- The system shall include a sub-system capable of monitoring the level of connectivity between all propulsion components and associated cabling / connectors to the buses chassis and low (12/24 vdc) systems to insure isolation. The energy storage module shall have at least two automatic means / devices of disconnect and one manual capable of interrupting the positive and negative connections within the module enclosure, and rated for disconnect at maximum current.
- The system shall have an interlock that prevents engagement when the charger is connected to the traction battery.

The PSC shall be equipped with an electronically controlled management system, compatible with multiplex wiring systems and either 12- or 24-volt electrical systems.

### **Power Electronics / Inverter**

The previously mentioned PSC shall execute instructions and system commands to the propulsion system components via a power electronics switching module, assumed to be an “inverter”. This power module shall be the hub for the traction motor, energy storage, charger and all motors / devices necessary for periphery support systems, such as, HVAC, power steering, air system, bus low voltage battery charging, etc. Circuitry for this device (s) shall include all necessary fuses / breakers such that the conductors, components and bus are adequately protected and safe. Connection points shall be keyed / identified such that mismatch is not physically possible. In addition these connection points shall be interlocked, such that a disconnect is automatically accompanied by an interruption at the energy storage module, both + and -. Reconnecting the subject connector (s) will not automatically restore the connection to the energy storage module; a system reset will be required.

### **Traction System**

The traction system shall include the necessary motors, gearing and connection to the drive axle and /or wheel motor driven.

### **Energy Storage System**

Design and performance shall be provided to the Agency. The Energy Storage System (ESS) shall be of a commercial design capable of operating in the Agency transit environment. The ESS shall be designed, sized, and selected to ensure that the vehicle performance specifications, compatibility with charging, and other related requirements are met or exceeded, bearing in mind cost benefit and reliability variables as they relate to the characteristics of the different battery types. The power source for the vehicle shall be derived from established battery technology that has a field-proven track record of safe, reliable, and durable operation in similar traction applications.

The primary charging of the energy storage system shall be accomplished by conductive or inductive charging as needed to meet the required duty cycle. If the primary charging system uses any type of automated service to initiate charging, secondary charging shall be provided from a stationary charging station via a mechanical or manual conductive interface, i.e., plug. The energy storage system shall also make use of regenerative braking. The Energy Storage System shall comply with UN/DOT 38.3 requirements for lithium batteries or similar standards for non-lithium batteries.

The Contractor shall deliver the buses with an installed, fully-charged, functioning ESS. The ESS shall be fully formed, installed and tested in accordance with the battery manufacturer's recommended practices. The ESS design, including containers, module bracing systems, thermal-management systems, battery management systems, watering/venting systems, interconnections, fusing, and traction-controller and charger interfaces should be completely described in the proposal. The batteries shall be warranted for twelve (12) years unlimited mileage. The proposal shall include a detailed analysis of expected battery performance in the Design Operating Profile. The proposal should also include a comprehensive statement of the warranty terms relating to the battery, including explanation of all disclaimers within the warranty. The charge cycle and cycle life should be stated in the proposal and a life cycle cost analysis of the proposed battery system in the specified application should be provided.

The battery system shall be capable of withstanding the high current and voltage profiles necessary to accomplish daily recharge events without reducing the life of the battery. Thermal management will be provided to ensure optimal life and performance of the ESS over the environmental operating range. Battery thermal management system shall be adequate to maintain the battery within the battery manufacturer's recommended temperature range during operation in the specified duty cycle and climatic conditions.

Proposals should include complete descriptions of all life-cycle testing procedures used to validate the life of batteries used this application at the proposed charging rates, charge durations, and expected ambient temperatures and operating profiles. Proposers shall include documented results of life cycle testing.

Proposers should provide documentation and demonstrate the usable battery capacity at 80 percent of gross battery capacity.

Proposers should include certification of battery life cycle testing by independent testing agency.

### **Energy Storage System Safety**

The Energy Storage System shall be placed on the bus to optimize both interior space and vehicle weight distribution. The batteries shall be load distributed within the bus to equalize weight between the wheels on the same axles and to achieve appropriate weight distribution between axles so as not to adversely affect handling of the bus.

The bus body shall be designed and constructed to ensure passengers and the operator will not be exposed to electrical current either in normal operation or in the event of a vehicle accident. Analysis and test data shall be provided to the Agency. The energy storage system shall be designed and constructed to prevent gassing or fumes from the energy storage system from entering the interior of the bus, i.e., a vent path to the exterior, preferably at or above the roof, rearward.

Written confirmation from the battery manufacturer attesting to the safety of the proposed battery system in the specified application and charging profile should be submitted as part of the proposal, and should include full disclosure and discussion of any and all issues or prior incidents relating to safety.

Proposals shall include complete descriptions of all safety standards followed in the design and manufacture of the battery system, safety testing procedures used to validate the safety of battery operation in this application, and documented results of safety testing to confirm that standards have been met. Proposers should include certification of battery safety testing by independent testing agency.



## **Battery Containers**

Battery containers shall be constructed to withstand the rigors of transit service for the design life of the buses. Construction shall be of materials compatible with the battery electrolyte. All electrical connections shall be fully shielded and hand operable. Connector and cabling design shall be such that inappropriate or unsafe connections are not possible. The system shall be designed to allow a single mechanic using a 2-ton capacity forklift to remove and replace the battery within 15 minutes. Vent-and-fill system components for individual packs or containers shall not require any disassembly on removal or installation of the battery packs or containers. Pack design must ensure the protection of battery cabling and vent/watering system components during pack removal and installation. The batteries, when installed, shall be secured to prevent any movement while the vehicle is in operation.

Battery containers shall be supplied by the battery manufacturer. Battery containers supplied by the Contractor are also acceptable provided that such containers are certified by battery manufacturer; such certification shall be submitted to procuring agency concurrent with or prior to delivery of the first bus.

## **Battery Management System**

As a minimum, the battery management system (BMS) must perform the following functions:

- A. The BMS system must be capable of monitoring the voltage level of cells within each battery pack. The BMS must be able to read and store individual battery or block voltages at a frequency of 1 data point per block every 15 seconds. The system must also monitor battery pack temperatures using no fewer than 2 thermocouples placed in and around each battery pack sampled at the same 4 samples per minute frequency.
- B. The BMS system must be capable of communicating when a battery fault (as defined by the battery manufacturer) has occurred and must be able to identify and communicate the faulty battery in order to perform maintenance.
- C. The BMS system must be capable of engaging prudent safety interlocks when an unsafe battery condition has been detected.
- D. The BMS system must be able to monitor the battery state-of charge and update a gauge viewed by the operator at least once every 15 seconds.
- E. The BMS system must be able to communicate all data to the bus level information system for storage and communication.

## **Battery Thermal Management**

Battery thermal management must be powered from an onboard source at all times. Thermal management must be continuously monitored at all times with appropriate safety interlocks installed to react to adverse conditions as stated in SAE J1772.

Battery temperatures must never exceed the manufacturer's recommended range during operation in the design operating profile and specified ambient conditions. Battery cooling must be sufficient to prevent the temperature from exceeding the battery manufacturer's recommended maximum temperature when the ambient temperature is above 105 degrees F for a period of 16 hours.

## **Automatic System Protection/Shutdown Override Feature**

The system shall monitor conditions critical for safe operation and automatically de-rate power and/or speed and initiate system shutdown as needed. The onboard diagnostic system shall trigger an audible alarm and

warning light to signal the operator when a malfunction is detected and the automatic protection system is activated. The system shall protect the traction motor(s) against progressive damage.

### **Throttle Control**

Throttle operation shall be inhibited, through interlocks, whenever:

1. Front or rear door open
2. The vehicle is kneeled
3. Wheelchair ramp is in operation
4. Rear door emergency release

Failure of the throttle control shall not result in an unsafe condition. Loss of air or electrical throttle control shall inhibit throttle.

### **Engine compartment**

Engine compartment lighting shall be provided to adequately illuminate the area for night time service, emergency repairs, or adjustments. Sealed lamp assemblies shall be provided and shall be controlled by a switch located near the rear start controls in the engine compartment. When the rear engine compartment door is closed the compartment lights shall extinguish automatically. The standard configuration in which the motor compartment lights will extinguish shall be provided to DTPW for review and approval during the preproduction meeting.

All removable caps shall be tethered including the caps for the diagnostic connector ports in the operator's area and in the engine compartment.

The Contractor shall furnish a certification before acceptance and delivery of vehicles that the powertrain as being designed, manufactured, and installed in accordance with the powertrain manufacturer's requirements.

### **Special Tools and Equipment for Powertrain Diagnostics and Maintenance**

Proposer should provide a complete listing of All Special Tools and Equipment required for Powertrain Diagnostics and Maintenance with the Bid Submittal.

Each set of Special Tools and Equipment for Powertrain Diagnostics and Maintenance as a minimum shall include a laptop computer, software licenses to support engine diagnostics, and access to the online Technical Support for the twelve (12) years life of the buses. The contractor should submit a detailed description of the laptop computer, software licensing and online Technical Support to DTPW with the proposal.

Sets of Special Tools and Equipment required for Powertrain Diagnostics and Maintenance should be priced separately from the bus in the Price Proposal. DTPW shall have the option to purchase up to twenty (20) Sets of Special Tools and Equipment Required for powertrain diagnostics and maintenance.

### **Spare Powertrain**

Spare Powertrain shall be provided by the Contractor and should be priced separately from the bus in the Price Proposal. DTPW shall have the option to purchase up to thirty (30) Spare Powertrain.

### **Special Training by Powertrain Manufacturer**

Contractor shall provide special Powertrain Training to be conducted by the Powertrain Manufacturer at DTPW or a local facility in South Florida. This special training shall be more in-depth and detailed than the training provided by the bus manufacturer. Training shall include comprehensive diagnostics and repair of the engine system components emissions systems. The Contractor should provide a complete description of the

Powertrain Manufacturer's training program with the proposal. Training classes shall consist of no more than (20) trainees per class.

Special Training Required to Maintain the Powertrain shall be priced separately from the bus and from other specified training in the Price Proposal. DTPW shall have the option to purchase training for up to 50 trainees.

#### Special Tools and Equipment for Cradle or Powertrain Changes

The Proposer should provide a list of special tools and equipment required for cradle or powertrain changes with his proposal. Sets of Special Tools and Equipment required for Cradle or Powertrain Changes should be provided by the Contractor and priced separately from the bus in the Price Proposal. DTPW shall have the option to purchase up to five (5) Sets of Special Tools and Equipment required for Cradle or Powertrain Changes.

#### **TS 9.1. Shop/Depot Charging Connection**

The bus shall be able to interface and receive a charge from shop/depot charging equipment in order to provide a quick full charging of the ESS in no more than four (4) hours. The shop/depot charger connection interface shall be located next to the fuse box on the rear curbside of the bus. The charger interface shall have its own access door.

The shop depot charger connector and bus plug-in connector shall be compatible with current and/or approved DTPW plug-in charger connectors. A detailed description of the proposed shop depot charger connector and bus plug-in connector shall be submitted to DTPW for review and approval prior to pre-production design review meeting.

### **TS 10. Cooling Systems**

The cooling systems shall be of sufficient size to maintain all motor, power electronics and traction batteries at safe continuous operating temperatures during the most severe operations and conditions possible and in accordance with battery and drive system component manufacturers' cooling system requirements and recommendations. The cooling system fan/fans control should sense the temperatures of the operating fluids and intake air and if either is above recommended operating conditions the cooling fan should be engaged. The fan control system shall be designed with a fail-safe mode of "fan on." The cooling system shall have an ambient capacity of at least 120° F with water as coolant at sea level operation.

Operation of required battery thermal management systems shall be automatically controlled under all normally encountered operating and charging conditions and shall be powered by an onboard source at all times. Thermal management shall be continuously monitored during all periods of charge and discharge with appropriate safety interlocks installed to react to adverse conditions as stated in SAE-J1772.

Air intakes shall be properly positioned and configured to minimize the intake of water, road dust, and debris and shall be adequately filtered.

In the event of a failure of the battery thermal management system while charging, the charge system shall be disabled and a visual alert shall be activated on the dashboard, the reset of which shall require the deliberate action of maintenance personnel. In the event of a failure of the battery thermal management system during bus operation, an audible and visual alert shall be activated on the dashboard, the reset of which shall require the deliberate action of maintenance personnel. In the event of a fire onboard a bus, thermal management fans shall be automatically turned off.

A complete description of the battery thermal management systems shall accompany the bid package. Written confirmation from the battery manufacturer attesting to the suitability of the battery thermal management system shall be submitted to the Procuring Agency prior to delivery of the first bus.

The cooling system fan controls should sense the temperatures of the operating fluids and the intake air, and if either is above safe operating conditions, the cooling fan should be engaged. The fan control system shall be designed with a fail-safe mode of "fan on." The cooling system shall meet the requirements stated in Operating Environment, Section 5.7 above. The cooling system is assumed for all temperature control required for the propulsion system, heating and/or cooling, further assuming that heat from this system will also be used to provide thermal energy as required for vehicle functions, as HVAC and defroster. Coolant shall be filtered by an inhibitor free spin-on replaceable filter, further serviced by two quarter turn shut-off valves for ease of replacement. The approved coolant/antifreeze shall have properties equivalent to Texaco Extended Life Prediluted 50/50 Coolant/ Anti-Freeze (Code 7998).

### **TS 10.1 Motor Cooling**

Motor temperature sensors shall be easily accessible for replacement. Motor temperature sensors shall not disable the bus at any time.

Motor cooling fans shall be of durable corrosion-resistant construction, bolted-on and designed so a mechanic can gain access, remove and replace fan in fifteen minutes or less. The cooling fan and mounting bracket shall be designed to withstand thermal fatigue and vibration associated with the installed configuration.

The cooling fan shall be temperature controlled, operating only when the motor has reached the manufacturer's maximum allowable temperature.

### **TS 10.2 Transmission Cooling**

The transmission (if required) shall be cooled in order to maintain operating fluids within the transmission manufacturer's recommended parameters of flow, pressure and temperature. The cooling system shall be able to cool the transmission while operating continuously at highway speeds.

### **TS 10.3 Electric Drive System Cooling**

Thermal management system shall maintain electric drive system components within design operating temperature limits in all driving conditions.

## **TS 11. Transmission (if required)**

If multiple speed, the transmission shall be automatic shift with torque converter, retarder and electronic controls. Gross input power, gross input torque and rated input speed shall be compatible with the propulsion system. The transmission shall be designed to operate for not less than 300,000 miles on the design operating profile without replacement or major service. The transmission should be easily removable without disturbing the propulsion system and accessible for service.

The electronic controls shall be capable of transmitting and receiving electronic inputs and data from other drivetrain components and broadcasting that data to other vehicle systems. Communication between electronic drivetrain components and other vehicle systems shall be made using the communications networks. Electronic controls shall be compatible with either 12- or 24-volt power distribution, provide consistent shift quality and compensate for changing conditions such as variations in vehicle weight and engine power.

A nominal brake pedal application of 6 to 10 psi shall be required by the driver to engage forward or reverse range from the neutral position to prevent sudden acceleration of the bus from a parked position.

The electronically controlled transmission shall have on-board diagnostic capabilities, be able to monitor functions, store and time stamp out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. The transmission shall contain built-in protection software to guard against severe damage. The on-board diagnostic system shall trigger a visual alarm to the driver when the electronic control unit detects a malfunction.

An electronic transmission fluid level monitoring and protection system shall be provided.

Transmission filler tube and dipstick shall be accessible from the engine compartment

A remote mounted fluid sampling port (KP Series Pushbutton Sampling Valve) for the transmission shall be provided.

#### **Automatic Neutral Function with Manual Re-engagement**

The transmission shall automatically shift to neutral whenever the door brake interlock is applied for five minutes. The driver shall be required to apply the service brake to re-engage forward range.

The drive unit installation shall be certified in writing by the vehicle manufacturer as being designed, manufactured, and installed in accordance with the transmission manufacturer's requirements before acceptance and delivery of vehicles.

Documentation proving that the pilot bus or first production bus (if no pilot bus available) meets or exceeds the transmission manufacturer's cooling requirements shall be provided by the bus manufacturer prior to delivery of first bus.

If an Allison Drive is provided the unit shall come equipped with Allison TranSynd synthetic fluid (Ref. TES-295)

#### **Special Tools and Equipment for Transmission Diagnostics and Maintenance**

Proposer should provide a complete listing of "All Special Tools and Equipment required for Transmission Diagnostics and Maintenance" with the Bid Submittal.

Special Tools are defined as any wrenches, sockets, transmission unit stands, adaptors, computers, software, diagnostic readers, diagnostic cards and cables needed for connecting to all the related systems utilized on the bus.

Sets of Special Tools and Equipment for Transmission Diagnostics and Maintenance should be priced separately from the bus in the Price Proposal. DTPW shall have the option to purchase up to ten (10) Sets of Special Tools for Transmission Diagnostics and Maintenance.

## **TS 12. Retarder Regenerative Braking**

### **TS 12.1 Regenerative Braking**

The powertrain shall be equipped with regenerative braking designed to improve energy efficiency and extend brake lining service life. The application of regenerative braking shall cause a smooth blending of both regenerative and service brake function.

Actuation of ABS and/or automatic traction control (ATC) shall override the operation of the regenerative brake.

The system shall be designed whereby increasing the pressure on the brake pedal increases the amount of regenerative capability up until a preset point is reached within the brake pedal travel whereby the mechanical brake is engaged. Regenerative braking shall continue to operate during mechanical braking.

The regenerative braking shall be adjustable within the limits of the powertrain and activated when the brake pedal is depressed or upon release of accelerator pedal.

## **TS 12.2 Braking Resistors**

The system shall include a means of maintaining dynamic braking (braking retardation) as the energy storage system approaches 100% SOC, i.e., such as the use of braking resistors to prevent overcharging of the batteries. This same feature may be a component of the overall liquid cooling system loop and offer a means of supplementing heat for use at the main HVAC heater core and/or defroster.

## **TS 13. Mounting**

All powerplant mounting shall be mechanically isolated to minimize transfer of vibration to the body structure and provide a minimum clearance of 0.75 in. Mounts shall control the movement of the powerplant so as not to affect performance of belt-driven accessories or cause strain in piping and wiring connections to the powerplant.

### **TS 13.1 Service**

The propulsion system shall be arranged for ease of access and maintenance. The Contractor shall list all special tools, fixtures or facility requirements recommended for servicing. All components requiring service or replacement shall be easily removable.

Radiator filler caps shall be hinged to the filler neck and closed with spring pressure or positive locks to prevent leakage. All other fluid filler caps shall be hinged or tethered to ensure the filler is closed when filling is completed. All fluid fill locations shall be properly labeled to help ensure that correct fluid is added. All fillers shall be easily accessible with standard funnels, pour spouts and automatic dispensing equipment. All lubricant sumps shall be fitted with magnetic-type drain plugs.

Final configuration of the propulsion system compartments shall be subject to DTPW approval.

## **TS 14. Hydraulic Systems**

Hydraulic system service tasks shall be minimized and scheduled no more frequently than those of other major coach systems. All elements of the hydraulic system shall be easily accessible for service or unit replacement. Critical points in the hydraulic system shall be fitted with service ports so that portable diagnostic equipment may be connected or sensors for an off-board diagnostic system permanently attached to monitor system operation when applicable. A tamper-proof priority system shall prevent the loss of power steering during operation of the bus if other devices are also powered by the hydraulic system.

The hydraulic system shall operate within the allowable temperature range as specified by the lubricant manufacturer.

Sensors in the main hydraulic system shall indicate on the driver's on-board diagnostic panel conditions of low hydraulic fluid level.

A remote mounted fluid sampling port (KP Series Pushbutton Sampling Valve) for the hydraulic system shall be provided.

Diagnostic ports to check the steering system hydraulic pressure shall be provided.

Liquid Tape shall be applied to all pressure and fluid level sensors/switches exposed to water located at various sections of the bus.

Hydraulic lines shall be compatible with the fluid they carry. The lines shall be designed and intended for use in the environment which they are installed. Lines shall be capable of withstanding maximum system pressures and temperatures. Lines within the engine compartment shall be composed of steel tubing where practicable except in locations where flexible lines are specifically required. All hydraulic lines shall meet the requirements of the Technical Specifications.

The oil for hydraulic system shall be Transynd or approved equal.

Sight glass on hydraulic reservoir shall be provided to determine the level of hydraulic fluid in the reservoir.

### **TS 14.1 Fluid Lines**

All lines shall be rigidly supported to prevent chafing damage, fatigue failures, degradation and tension strain. Lines should be sufficiently flexible to minimize mechanical loads on the components. Lines passing through a panel, frame or bulkhead shall be protected by grommets (or similar devices) that fit snugly to both the line and the perimeter of the hole that the line passes through to prevent chafing and wear. Pipes and fluid hoses shall not be bundled with or used to support electrical wire harnesses.

Lines shall be as short as practicable and shall be routed or shielded so that failure of a line shall not allow the contents to spray or drain onto any component operable above the auto-ignition temperature of the fluid.

All hoses, pipes, lines and fittings shall be specified and installed per the manufacturer's recommendations.

### **TS 14.2 Fittings and Clamps**

All clamps shall maintain a constant tension at all times, expanding and contracting with the line in response to temperature changes and aging of the line material. The lines shall be designed for use in the environment where they are installed. For example, high-temperature resistant in the engine compartment, resistant to road salts near the road surface, and so on. All hoses shall be supported approximately every 12 in.

Compression fittings shall be standardized to prevent the intermixing of components. Compression fitting components from more than one manufacturer shall not be mixed, even if the components are known to be interchangeable.

## **TS 15. Radiator**

If equipped with a radiator system, the radiator piping shall be stainless steel or brass tubing and, if practicable, hoses shall be eliminated. All hoses shall be as short as practicable. Necessary hoses shall be impervious to all bus fluids. All coolant hoses shall be 4-ply silicone rubber or Gates blue strip hoses and the coolant hose clamps shall be stainless steel constant torque clamps. The clamps shall provide a complete 360-degree seal maintaining a constant tension at all the times, expanding and contracting with the hose in response to temperature changes and aging of the hose material.

## **TS 16. Oil and Hydraulic Lines**

Oil and hydraulic lines shall be compatible with the substances they carry. The lines shall be designed and intended for use in the environment where they are installed. For example, high-temperature resistant in the engine compartment, resistant to road salts near the road surface, and so on. Lines within the engine compartment shall be composed of steel tubing where practicable, except in locations where flexible lines are required.

Hydraulic lines of the same size and with the same fittings as those on other piping systems of the bus, but not interchangeable, shall be tagged or marked for use on the hydraulic system only.

Protective sleeves (high temperature resistant material) shall be provided to all high pressure hydraulic lines for hydraulic pump and power steering.

## **STRUCTURE**

### **TS 17. General**

#### **TS 17.1 Design**

The structure of the bus shall be designed to withstand the transit service conditions typical of an urban duty cycle throughout its service life. The vehicle structural frame shall be designed to operate with minimal maintenance throughout the 12-year design operating profile.

### **TS 18. Altoona Testing**

As part of the proposal, the structure of the bus shall have undergone appropriate structural testing and/or analysis, FTA Altoona testing or equivalent test, to ensure adequacy of design for the urban transit service. Any items that required repeated repairs or replacement must undergo the corrective action with supporting test and analysis. A report clearly describing and explaining the failure and corrective actions taken to ensure any and all such failures will not occur shall be submitted to DTPW prior to production of the first bus.

#### **TS 18.1 Structural Validation**

##### **Detailed Structural Analysis**

The structure of the proposed bus model shall have undergone structural testing prior to assembly of the first bus. The OEM shall provide the Agency with completed reports of other structural tests as specified by the Agency.

### **TS 19. Distortion**

The bus, loaded to GVWR and under static conditions, shall not exhibit deflection or deformation that impairs the operation of the steering mechanism, doors, windows, passenger escape mechanisms or service doors. Static conditions shall include the vehicle at rest with any one wheel or dual set of wheels on a 6 in. curb or in a 6 in. deep hole or with any one tire or any dual set completely deflated.

### **TS 20. Resonance and Vibration**

All structure, body and panel-bending mode frequencies, including vertical, lateral and torsional modes, shall be sufficiently removed from all primary excitation frequencies to minimize audible, visible or sensible resonant vibrations during normal service.

#### **TS 20.1 Engine Compartment Bulkheads**

The passenger and engine compartment shall be separated by fire-resistant bulkheads. The engine compartment shall include areas where the motor and transmission are housed. This bulkhead shall preclude or retard propagation of an engine compartment fire into the passenger compartment and shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90A, dated October 20, 1993. Only necessary openings shall be allowed in the bulkhead, and these shall be fire-resistant. Any passageways for the climate control system air shall be separated from the engine compartment by fire-resistant material. Piping through the bulkhead shall have fire-resistant fittings sealed at the bulkhead. Wiring may pass through the bulkhead only if connectors or other means are provided to prevent or retard fire propagation through the bulkhead. Engine compartment access panels in the bulkhead shall be fabricated of



fire-resistant material and secured with fire-resistant fasteners. These panels, their fasteners and the bulkhead shall be constructed and reinforced to minimize warping of the panels during a fire that will compromise the integrity of the bulkhead.

## **TS 20.2 Crashworthiness**

The bus body and roof structure shall withstand a static load equal to 150 percent of the curb weight evenly distributed on the roof with no more than a 6 in. reduction in any interior dimension. Windows shall remain in place and shall not open under such a load. These requirements must be met without the roof-mounted equipment installed.

The bus shall withstand a 25 mph impact by a 4000-pound automobile at any side, excluding doorways, along either side of the bus with no more than 3 in. of permanent structural deformation at seated passenger hip height. This impact shall not result in sharp edges or protrusions in the bus interior.

Exterior panels below 35 in. from ground level shall withstand a static load of 2000 lbs applied perpendicular to the bus by a pad no larger than 5 sq in. This load shall not result in deformation that prevents installation of new exterior panels to restore the original appearance of the bus.

Test reports or detailed engineering reports validating the crashworthiness shall be provided prior to assembly of the first bus. If a Finite Element Analysis FEA is provided as proof of crashworthiness for the proposed vehicle, it must include a qualified engineering analysis and report for crashworthiness.

## **TS 21. Corrosion**

The bus shall not corrode from atmospheric conditions and road salts. The bus shall be constructed using only inherently corrosion-resistant materials and fasteners to minimize deterioration. The structure shall not require corrosion-preventive coatings or after-treatments either during construction or throughout the service life of the vehicle. It shall maintain structural integrity and maintain original appearance throughout its service life, provided it is maintained in accordance with the procedures specified in the Contractor's service manual. All joints and connections of dissimilar metals shall be corrosion-resistant and shall be protected from galvanic corrosion. Representative samples of all materials and connections shall withstand a 2-week salt spray test in accordance with ASTM Procedure B-117 with no visual or structural detrimental effects to normally visible surfaces, and no significant structural degradation or weight loss of over 1 percent for other members or components. An anticorrosion undercoat shall be applied under the floor area and other areas requiring greater protection. The Contractor should submit a corrosion protection plan with approved equal submissions.

## **TS 22. Towing**

Towing devices shall be provided on each end of the bus. Each towing device shall withstand, without permanent deformation, tension loads up to 1.2 times the curb weight of the bus within 20 degrees of the longitudinal axis of the bus. If applicable, the rear towing device(s) shall not provide a toehold for unauthorized riders. The method of attaching the towing device shall not require the removal, or disconnection, of front suspension or steering components. Removal of the bike rack is permitted for attachment of towing devices. Towing shall be accomplished by front lift towing.

The front towing devices shall allow attachment of adapters for a rigid tow bar and shall permit the lifting and towing of the bus, at curb weight, while the front wheels are clear off the ground. These devices shall also permit common flat towing. Two (2) front towing adapters shall be provided with each bus.

The rear towing device shall permit recovery of the bus for a short distance, such as in cases of emergency, to allow access to provisions for front towing of the bus. The rear towing shall withstand the associated loads without deformation or damage to the vehicle structure. The method of attaching the tow bar or adapter shall

require the specific approval of DTPW. Each towing device shall accommodate a crane hook with a 1 in. throat.

A plug connector permanently mounted at the front of the bus shall provide for bus tail lamp, marker, stop, and turn signal lamp operation as controlled from the towing vehicle. The connector shall include a spring-loaded, dust- and water-resistant cap.

The towing procedure shall not require removal of any access doors. If a drive shaft or other under floor component is required to be removed for towing, access through the bus floor shall be provided. The towing system shall also be designed so as to no interfere with other bus components. Provisions shall include an air connection at the front and rear of the bus for supply of air to maintain air in the system. The method of attaching the tow bar shall require the specific approval of DTPW. The Contractor should submit the towing procedure with the Requests for Approved Equal submissions and shall demonstrate compliance with the towing procedure at DTPW facility using the Pilot Bus or first delivered bus before the final acceptance.

#### Universal Tow Bar

Universal tow bar for conventional and articulated bus BCW Model UTB-1000 or approved equal shall be provided by the Contractor and priced separately from the bus in the Price Proposal. DTPW shall have the option to purchase up to six (6) Universal tow bars.

The universal tow bar, including demonstration, shall be provided to DTPW with the Pilot Bus or before the final acceptance of the first delivered bus for DTPW approval.

### **TS 23. Jacking**

It shall be possible to safely jack up the bus, at curb weight, with a common 10-ton floor jack with or without special adapter, when a tire or dual set is completely flat and the bus is on a level, hard surface, without crawling under any portion of the bus. Jacking from a single point shall permit raising the bus sufficiently high to remove and reinstall a wheel and tire assembly. Jacking pads located on the axle or suspension near the wheels shall permit easy and safe jacking with the flat tire or dual set on a 6 in. high run-up block not wider than a single tire. The bus shall withstand such jacking at any one or any combination of wheel locations without permanent deformation or damage.

Jacking pads shall be painted safety yellow for easy identification.

### **TS 24. Hoisting**

The bus axles or jacking plates shall accommodate the lifting pads of a two-post hoist system. Jacking plates, if used as hoisting pads, shall be designed to prevent the bus from falling off the hoist. Other pads or the bus structure shall support the bus on jack stands independent of the hoist. All jacking points/plates shall be identified and approved by DTPW.

### **TS 25. Floor**

#### **TS 25.1 Design**

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint. Similarly, a molding or cover shall prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 2 degrees to allow for drainage.

The floor height above the street in the aisle near the entry door, except for platforms, shall be no more than 15½ inches to eliminate steps and facilitate boarding and de-boarding of passengers.

The floor may be either a bi-level design or a flat/sloped floor design.

The bi-level design shall consist of two levels; a forward lower level that includes the entrance door area and an aft raised level extending to the rear settee riser. The forward lower level floor may be inclined up to 1½ degrees off the horizontal along the longitudinal axis of the bus. The aft upper level floor height may be raised to a height approximately 18 inches above the lower level. The upper level floor shall be allowed an increased slope not to exceed 3½ degrees off the horizontal.

The flat/sloped floor design shall consist of a single low sloped floor. The forward portion of the floor including the entrance door area may be inclined up to 1½ degrees off the horizontal along the longitudinal axis of the bus. The aft portion of the floor, beginning approximately two-thirds of the aisle length aft of the entry door and extending to the rear settee riser, the floor may be sloped but shall not exceed 5½ degrees off the horizontal.

All floor measurements have to be with the bus at the design ride height and on a flat, level surface.

The floor shall not have any abrupt level changes except for clearly marked and illuminated steps as described in these Technical Specifications.

The floor in the area of the entrance door shall have proper drainage.

Access openings in the floor shall be sealed to prevent entry of fumes and water into the bus interior. Access covers shall be flush with the floor and floor covering material shall be edge-bound with stainless steel or anodized aluminum to prevent the edges from coming loose. Fasteners shall tighten flush with the floor.

## **TS 25.2 Strength**

The floor shall be designed to last the life of the bus. The floor deck may be integral with the basic structure or mounted on the structure securely to prevent chafing or horizontal movement and designed to last the life of the bus. Sheet metal screws shall not be used to retain the floor, and all floor fasteners shall be serviceable from one side only. Any adhesives, bolts or screws used to secure the floor to the structure shall last and remain effective throughout the life of the coach. Tapping plates, if used for the floor fasteners, shall be no less than the same thickness as a standard nut, and all floor fasteners shall be secured and protected from corrosion for the service life of the bus.

The floor deck shall be reinforced as needed to support passenger loads. At GVWR, the floor shall have an elastic deflection of no more than 0.60 in. from the normal plane. The floor shall withstand the application of 2.5 times gross load weight without permanent detrimental deformation. The floor, with coverings applied, shall withstand a static load of at least 150 lbs applied through the flat end of a ½ in. diameter rod, with 1/32-inch radius, without permanent visible deformation.

## **TS 25.3 Construction**

The floor shall consist of the subfloor and the floor covering that will last the life of the bus. The floor as assembled, including the sealer, attachments and covering, shall be waterproof, non-hygroscopic and resistant to mold growth. The subfloor shall be resistant to the effects of moisture, including decay (dry rot). It shall be impervious to wood-destroying insects such as termites.

If composite flooring is used, the material must be approved by DTPW.

If plywood is used, it shall be certified at the time of manufacturing by an industry approved third-party inspection agency such as APA - The Engineered Wood Association (formerly the American Plywood Association). Plywood shall be ¾ inch thick or of a thickness adequate to support the design loads, manufactured with exterior glue, satisfy the requirements of a Group I Western panel as defined in PS 1-95 (Voluntary Product Standard PS 1-95, Construction and Industrial Plywood) and be of a grade that is

manufactured with a solid face and back. Plywood shall be installed with the highest-grade veneer up. Plywood flooring shall be Alkaline Copper Quaternary (ACQ) pressure treated with preservative retention of .40 lbs./ft.<sup>3</sup>, kiln dried after treatment (KDAT). The treated wood shall conform to the standards set forth by the American Wood Preservers Association (AWPA) and the American Lumber Standards Committee (ALSC). The concentration of preservative chemical shall be equal to or greater than required for ground contact application. Treated plywood will be certified for preservative penetration and retention by a third party inspection agency. Preservative treatments shall utilize no EPA listed hazardous chemicals. Pressure-preservative treated plywood shall have a moisture content at or below fifteen percent. Provide a consumer information sheet for the plywood product to include handling precautions with Requests for Approved Equals submittals.

ACQ pressure treated plywood must not contact steel, galvanized steel, or aluminum body or chassis parts.

All plywood edges shall be sealed, including any edges of cutouts in the floor for mounting special equipment.

Under floor treatment shall be installed to prevent contact of plywood panels by water and road salt.

## **TS 26. Platforms**

### **TS 26.1 Driver's Area**

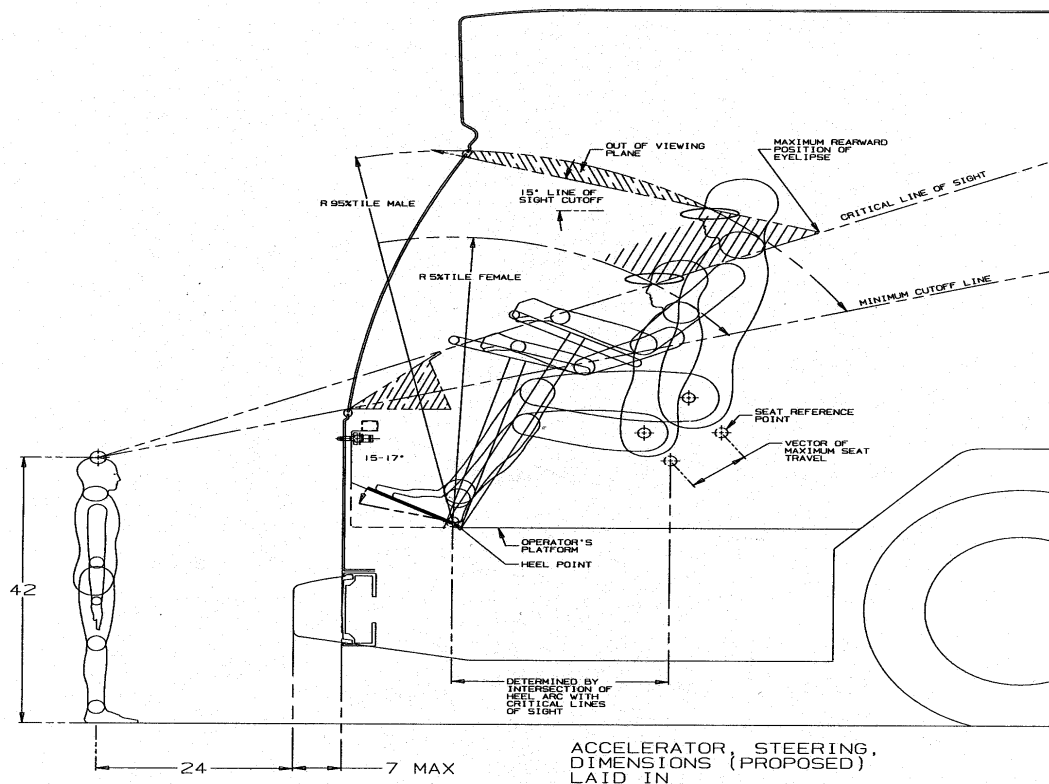
Trim shall be provided along top edges of platforms unless integral nosing is provided. Trim installed along edges of platforms shall be constructed of stainless steel or clear anodized aluminum. Except where otherwise indicated, covering of platform surfaces and risers shall be same material as specified for floor covering.

Raised areas such as for providing space for under-floor installation of components shall be limited. Such raised areas shall be constructed in accordance to these specifications.

### **TS 26.2 Driver's Platform**

The driver's platform shall be of a height such that, in a seated position, the driver can see an object located at an elevation of 42 in. above the road surface, 24 in. from the leading edge of the bumper. Notwithstanding this requirement, the platform height shall not position the driver such that the driver's vertical upward view is less than 15 degrees. A warning decal or sign shall be provided to alert the driver to the change in floor level. Figure below illustrates a means by which the platform height can be determined, using the critical line of sight.

Determining Platform Height



### TS 26.3 Farebox

If the driver's platform is higher than 12 inches, then the farebox is to be mounted on platform of suitable height to provide accessibility for operator without compromising passenger's access. Stainless steel stanchions and grab rails shall be located around the farebox.

### TS 26.4 Rear Step Area to Rear Area

If the vehicle is of a bi-level floor design, a rear step area shall be provided along the center aisle of the bus to facilitate passenger traffic between the upper and lower floor levels. This step area shall be cut into the rear platform and shall be approximately the aisle width, a minimum 12 in. deep and approximately half the height of the upper level relative to the lower level. The horizontal surface of this platform shall be covered with skid-resistant material with a visually contrasting nosing and shall be sloped slightly for drainage. A warning decal or sign shall be provided at the immediate platform area to alert passengers to the change in floor level.

Stepwells shall be constructed of stainless steel or anodized aluminum to prevent corrosion. One piece molded fiberglass construction will be accepted provided that it is shown to be adequately reinforced to eliminate step deflection and warranted to last the life of the bus. Step risers shall not exceed 10 inches in height and tread surface shall be no less than 11 inches deep. All step tread areas must be covered with a non-slip material. Proposer must state which stepwell described above will be furnished. Proposers proposing to utilize stepwells constructed of fiberglass must submit documentation to DTPW for approval on strength, structural integrity and suitability for use in DTPW's service area.

There shall be no entry or exit stepwells.

## **TS 27. Wheel Housing**

### **TS 27.1 Design and Construction**

Sufficient clearance and air circulation shall be provided around the tires, wheels and brakes to preclude overheating when the bus is operating on the design operating profile. Wheel housings shall be constructed of corrosion-resistant and fire-resistant material.

Interference between the tires and any portion of the bus shall not be possible in maneuvers up to the limit of tire adhesion with weights from curb weight to GVWR. Wheel housings shall be adequately reinforced where seat pedestals are installed. Wheel housings shall have sufficient sound insulation to minimize tire and road noise and meet all noise requirements of this specification.

Design and construction of front wheel housings shall allow for the installation of a radio or electronic equipment storage compartment on the interior top surface, or its use as a luggage rack.

The finish of the front wheel housings shall be scratch-resistant and complement interior finishes of the bus to minimize the visual impact of the wheel housing. If fiberglass wheel housings are provided, then they shall be color-impregnated to match interior finishes. The lower portion extending to approximately 10 to 12 in. above floor shall be equipped with scuff-resistant coating or stainless steel trim.

Wheel housings, as installed and trimmed, shall withstand impacts of a 2 in. steel ball with at least 200 ft-lbs of energy without penetration.

Wheel housings not equipped with seats or equipment enclosure shall have a horizontal assist mounted on the top portion of the housing no more than 4 in. higher than the wheel well housing.

All wheelhouse corners must be rounded. No sharp corners will be accepted.

### **TS 27.2 Articulated Joint**

Articulated buses shall be equipped with a turntable that permanently joins the lead unit and trailing unit sections, allows relative motion between the sections about the pitch and yaw axes, and allows a small amount of relative roll between the sections without damage. A rotating turntable connection shall be provided between the lead unit and trailing unit to serve as a floor and allow passenger access between the sections of the bus under all operating conditions. The turntable design shall provide for all horizontal and vertical turns that the bus is capable of making without introducing discontinuities between the turntable and adjacent vehicle floors.

The structures and finishes in the interconnecting section shall be designed to prevent passenger injury under all conditions. The turntable floor cover plate shall be supported so that there will be no honing of the floor plate, making it sharp at the outer edge. The gap between the floor and the turntable shall be minimized in order to prevent a tripping hazard. It shall be designed for ease of access for inspection and repairs of all devices that are part of it or devices that pass through the turntable area. Under-floor turntable components shall be easily accessible. Floor plates must be easily lifted and secured in the open position by one person for inspection and repairs. Turntable seats shall be quickly and easily removable by one person. The under-floor turntable area shall be completely enclosed by the bellows and bulkheads on the lead and trailing units to prevent drafts into the passenger compartment. The area between the turntable floor and the bellows shall be closed to prevent collection of trash in the bottom of the bellows. Closeouts shall be attached with removable fasteners. An access hatch shall be provided for routine maintenance (i.e., greasing, adjusting potentiometer, maintenance items).

An anti-jackknife joint shall be provided. This joint — by sensing vehicle speed, relative angle between the lead and trailing sections, throttle and braking actions, and any other necessary inputs — will control the degree of stiffness in the joint to ensure that the bus does not jackknife or operate in a dangerous or unsafe condition. The Agency shall approve the anti-jackknife joint. The interconnecting structure shall be designed to prevent separation of the lead and trailing units as a result of a road accident with a commercial or private vehicle. A means shall be provided so that the driver can override the control or recover from the situation. The bus shall be equipped with a reverse speed governor that shall apply the brake and accelerator interlocks when bus speed in reverse gear exceeds 1.5 mph, but the bus shall have sufficient power in reverse to back out of wheel locator depressions at a floor hoist. The proposed configuration of these devices and the reverse speed requirements shall be submitted for approval of the Agency prior to pre-production design review meeting.

Easy access shall be provided to overhead lines (electric, air, hydraulic, refrigerant) passing through the turntable. Hydraulic fittings shall be suitable for the given application and must be compatible with other fittings throughout the vehicle.

In order to prevent damage to the structure and electrical, air, hydraulic and refrigerant lines when the vertical or horizontal bending capabilities of the hinge are exceeded, the bus shall be provided with appropriate warning devices, brake interlocks and positive mechanical stops. These devices shall operate when the maximum bend angle is being approached in either plane.

### **TS 27.3 Raceway**

A raceway shall be provided through the turntable area to accommodate to maximum deflection of the turntable. The raceway shall prevent chafing, binding, rubbing, crimping or leakage of all hydraulic, air, fuel and system support lines, as well as all electrical and electronic cabling through or to the turntable area. Lines shall be secured, separated and labeled at the lead and trailing unit bulkheads. Separation shall be maintained on the flexible portion of all lines through the use of a raceway. All electrical terminations and hose fittings shall be easily visible and easily tightened or removed without removing any other component. Lines, routing, securement, and labeling shall be approved by the Agency.

Bulkhead fitting shall be provided for all lines: air coolant, electrical and AC at both ends of the raceway. The bulkhead area shall be easily accessible for servicing.

### **TS 27.4 29.4 Bellows**

Replacement fabric type bellows with draft-free, no-sag bottom closure and water drains shall be provided between the lead and trailing sections to seal the bus interior and keep it free of water, dirt and drafts. Bellows hardware shall be corrosion resistant, and the under-floor area of the bellows shall be easy to clean when necessary. The passageway between the lead unit and trailing unit shall have an inside cross section that is as nearly equal as possible to the inside cross section of the bus bodies, with no tripping or pinching hazards created by the turntable cross section or closeouts. The bellows shall be durable, and its supporting structure and stiffeners shall support the bellows material in a neat, sag-free manner. The Contractor shall supply information on the actual service life achieved by the type of bellows being proposed. A sample of the bellows and attaching hardware may be requested for evaluation at DTPW's option. Bellows shall be approved by DTPW.

## **CHASSIS**

### **TS 28. Suspension**

#### **TS 28.1 General Requirements**

The front and rear suspensions shall be pneumatic type. The basic suspension system shall last the service life of the bus without major overhaul or replacement. Adjustment points shall be minimized and shall not be

subject to a loss of adjustment in service. Routine adjustments shall be easily accomplished by limiting the removal or disconnecting the components.

The suspension system shall include provisions for stabilizing and damping so as to produce an acceptable ride quality. The air suspension shall act to keep the floor height nearly constant under all load conditions.

At least two (2) air springs shall be provided per axle, with heavy duty hydraulic shock absorbers on each side of each axle. Radius rods and other stabilizing devices shall be provided as necessary at the axles to control lateral, longitudinal and torsional movement of the suspension system.

All suspension components shall be of heavy duty design because the bus may be required to operate on uneven surface conditions.

## **TS 28.2 Alignment**

All axles should be properly aligned so the vehicle tracks accurately within the size and geometry of the vehicle.

## **TS 28.3 Springs and Shock Absorbers**

### **TS 28.3.1 Suspension Travel**

The suspension system shall permit a minimum wheel travel of 2.75 in. jounce-upward travel of a wheel when the bus hits a bump (higher than street surface), and 2.75 in. rebound-downward travel when the bus comes off a bump and the wheels fall relative to the body. Elastomeric bumpers shall be provided at the limit of jounce travel. Rebound travel may be limited by elastomeric bumpers or hydraulically within the shock absorbers. Suspensions shall incorporate appropriate devices for automatic height control so that regardless of load the bus height relative to the centerline of the wheels does not change more than ½ in. at any point from the height required. The safe operation of a bus cannot be impacted by ride height up to 1 in. from design normal ride height.

### **TS 28.3.2 Damping**

Vertical damping of the suspension system shall be accomplished by hydraulic shock absorbers mounted to the suspension arms or axles and attached to an appropriate location on the chassis. Damping shall be sufficient to control coach motion to three cycles or less after hitting road perturbations. The shock absorber bushing shall be made of elastomeric material that will last the life of the shock absorber. The damper shall incorporate a secondary hydraulic rebound stop.

### **TS 28.3.3 Lubrication**

All elements of steering, suspension, and drive systems requiring scheduled lubrication shall be provided with grease fittings conforming to SAE Standard J534. These fittings shall be located for ease of inspection, and shall be accessible with a standard grease gun without flexible hose end from a pit or with the bus on a hoist. Each element requiring lubrication shall have its own grease fitting with a relief path. Lubricant specified shall be standard for all elements on the bus serviced by standard fittings. The lubricant specified shall be standard for all elements on the bus serviced by standard fittings and shall be required no less than every 6000 miles.

### **TS 28.3.4 Kneeling**

A kneeling system controlled by the driver shall lower the bus entrance a minimum of two and one half (2.5) inches, measured at the longitudinal center line of the front door, during loading or unloading operations regardless of load up to GVWR. Release of the kneeling control switch at anytime will completely stop the lowering motion and hold height of the bus at that position. Brake and throttle interlock shall prevent bus movement when the bus is kneeled. The kneeling control shall be disabled when the bus is in motion. The bus shall be capable of kneeling in a maximum of 5 seconds from time the control is actuated. After kneeling, the bus shall be capable of rising within 2 seconds to a height permitting the bus to resume service and shall rise to



the correct operating height within 7 seconds regardless of load up to GVWR. Selecting the "Ride Height" position will allow the system to raise the floor to normal ride height without the driver having to hold the switch. During the lowering and raising operation, the maximum acceleration shall not exceed 0.2g and the jerk shall not exceed 0.3g/ sec. measured on the front door step tread. The time to kneel and rise shall be adjustable from outside the bus, and shall require only hand tools.

An indicator visible to the driver shall be illuminated during the kneeling operation and shall remain illuminated until the bus is raised to a height adequate for safe street travel. An audible warning alarm will sound simultaneously with the operation of the kneeling system to alert passengers and bystanders. The audible warning alarm will stop when the bus has reached the kneeled position. An external LED warning light with an amber lens mounted near the entrance door will be provided. It shall flash when the kneel feature is operating. Kneeling shall not be operational while the wheelchair ramp is deployed or in operation.

#### Near-Level Boarding

The Contractor shall provide an option for near-level boarding. The near-level boarding option will allow raise or lower the entire bus to attain near-level boarding for a variety of platform heights. The design and operation of the near-level boarding shall be approved by DTPW prior to production. The option for the near-level boarding shall be priced separately from the bus in the Price Proposal

## **TS 29. Wheels and Tires**

### **TS 29.1 Wheels**

All wheels shall be removable without a puller. Wheels shall be compatible with tires in size and load-carrying capacity. Front wheels and tires shall be balanced as an assembly per SAE J1986.

Wheels shall be hub-piloted, brushed aluminum, and shall resist rim flange wear. Wheels shall have a low maintenance special finish, Alcoa Dura-Bright, Accuride Accu-Shield, or approved equal. Wheels shall be suitable for tubeless type tires and shall be compatible with tire size and tire load-carrying capacity. Wheels and tires shall be balanced as an assembly.

#### Spare Wheels

Two spare wheels per bus shall be provided by the Contractor and shall be included in the bus price. DTPW shall have the option to purchase up to 250 additional spare wheels. The option for the additional spare wheels shall be priced separately from the bus in the Price Proposal.

#### Tire Pressure Monitoring System

The Contractor shall provide an option for tire pressure monitoring system. A description of the system shall be provided to DTPW with the proposal for approval. All equipment location, accessibility, and mounting, shall be approved by DTPW prior to production. The option for the tire pressure monitoring system shall be priced separately from the bus in the Price Proposal.

### **TS 29.2 Tires**

Tires shall be suitable for the conditions of transit service and sustained operation at the maximum speed capability of the bus. The tire size shall be compatible with the wheels, and of a load range adequate for the gross vehicle weight rating of the bus. Load on any tire at GVWR shall not exceed tire supplier's rating. All valve stems shall be readily accessible on the side of the bus for servicing and maintenance.

The proposers shall submit tire information with the proposal.

All tires will be provided under a lease agreement between DTPW and the tire supplier at no cost to the bus manufacturer.

## **TS 30. Steering**

An electrically driven power steering hydraulic pump shall be provided. Hydraulically assisted steering shall be provided to reduce steering effort.

Protective sleeves (high temperature resistant material) shall be provided to all high pressure hydraulic lines for power steering.

### **TS 30.1 Steering Axle**

The front axle shall be solid beam or of an independent suspension design, non-driving with a load rating sufficient for the bus loaded to GVWR and shall be equipped with grease type front wheel bearings and seals.

All friction points on the front axle shall be equipped with replaceable bushings or inserts and, if needed, lubrication fittings easily accessible from a pit or hoist.

### **TS 30.2 Wheel**

#### **TS 30.2.1 Turning Effort**

Steering effort shall be measured with the bus at GVWR, stopped with the brakes released and the engine at normal idling speed on clean, dry, level, commercial asphalt pavement and the tires inflated to recommended pressure.

Under these conditions, the torque required to turn the steering wheel 10 degrees shall be no less than 5 ft-lbs and no more than 10 ft-lbs. Steering torque may increase to 70 ft-lbs when the wheels are approaching the steering stops, as the relief valve activates.

Power steering failure shall not result in loss of steering control. With the bus in operation, the steering effort shall not exceed 55 lbs at the steering wheel rim, and perceived free play in the steering system shall not materially increase as a result of power assist failure. Gearing shall require no more than seven turns of the steering wheel lock-to-lock.

Caster angle shall be selected to provide a tendency for the return of the front wheels to the straight position with minimal assistance from the driver.

#### **TS 30.2.2 Steering Wheel, General**

The steering wheel diameter shall be approximately 18-20 in.; the rim diameter shall be  $\frac{7}{8}$  in. to  $1\frac{1}{4}$  in. and shaped for firm grip with comfort for long periods of time.

Steering wheel spokes and wheel thickness shall ensure visibility of the dashboard so that vital instrumentation is clearly visible at center neutral position (within the range of a 95th-percentile male, as described in SAE 1050a, Sections 4.2.2 and 4.2.3). Placement of steering column must be as far forward as possible, but either in line with or behind the instrument cluster.

#### **TS 30.2.3 Steering Column Tilt**

The steering column shall have full tilt capability with an adjustment range of no less than 40 degrees from the vertical and easily adjustable by the driver.

**TS 30.2.4 Steering Wheel Telescopic Adjustment**

The steering wheel shall have full telescoping capability and have a minimum telescopic range of 2 in. and a minimum low-end adjustment of 29 in., measured from the top of the steering wheel rim in the horizontal position to the cab floor at the heel point.

Steering Wheel Height<sup>1</sup> Relative to Angle of Slope

At Minimum Telescopic Height Adjustment (29 in.)		At Maximum Telescopic Height Adjustment (5 in.)	
Angle of Slope	Height	Angle of Slope	Height
0 degrees	29 in.	0 degrees	34 in.
15 degrees	26.2 in.	15 degrees	31.2 in.
25 degrees	24.6 in.	25 degrees	29.6 in.
35 degrees	22.5 in.	35 degrees	27.5 in.

1. Measured from bottom portion closest to driver.

**TS 31. Drive Axle**

The rear drive axle shall be a heavy-duty axle compatible with synthetic oil and with a load rating sufficient for the bus loaded to GVWR. The axle shall be designed to operate for not less than 300,000 miles on the design operating profile without replacement or major repairs. The axle and driveshaft components shall be rated for both propulsion and retardation modes with respect to duty cycle. The differential gear ratio shall provide a top speed of 60 MPH. Transfer of gear noise to the bus interior shall be minimized. Wheel bearings shall be grease lubricated. Replaceable wheel bearing seals shall run on replaceable wear surfaces or be of an integral wear surface sealed design. The axle breather assembly shall be designed to prevent ingress of water. The drain plug shall be magnetic type.

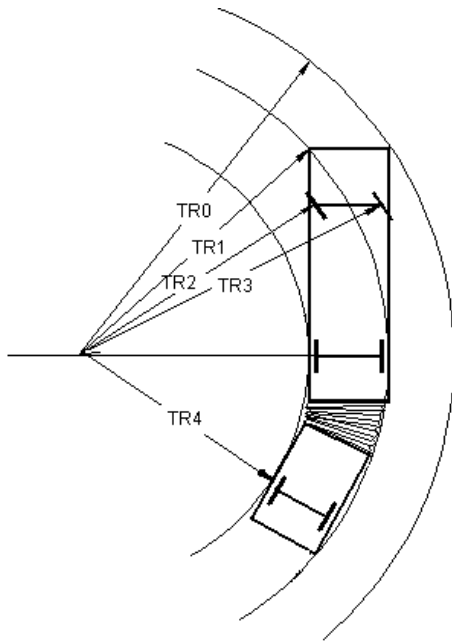
The drive shaft shall be guarded to prevent hitting any critical systems, including brake lines, coach floor or the ground, in the event of a tube or universal joint failure.

**TS 31.1 Non-Drive Axle**

The non-drive axle is the drive axle without the drive gear with a load rating sufficient for the load to GVWR.

**TS 32. Turning Radius**

Bus Length (approximate)	Maximum Turning Radius
60 ft	44.5 ft (outside front axle, TR0) 17 ft (inside rearmost axle, TR4)



## **TS 33. Brakes**

### **TS 33.1 Service Brake**

Service Brakes shall be disc brake. The braking system shall be the heaviest duty available for the vehicle GVWR and shall be provided with electronic brake monitoring system that includes a brake wear sensor and alarm to notify driver and maintenance of unsafe brake conditions.

### **TS 33.2 Actuation**

Service brakes shall be controlled and actuated by an air system meeting the requirements of FMVSS 121, on the date of manufacture. Force to activate the brake pedal control shall be an essentially linear function of the bus deceleration rate and shall not exceed 50 pounds at a point 7 inches above the heel point of the pedal to achieve maximum braking. The heel point is the location of the driver's heel when the foot is rested flat on the pedal and the heel is touching the floor or heel pad of the pedal.

A microprocessor controlled Automatic Braking System (ABS) shall be provided. The microprocessor for the ABS system shall be protected yet in an accessible location to allow for ease of service. ABS diagnostic reader port shall be through the J1939 engine diagnostic port.

The total braking effort shall be distributed between all wheels in such a ratio as to ensure maximum tire mileage and equal friction material wear rate at all wheel locations. Manufacturer shall demonstrate compliance by providing a copy of a thermo dynamic brake balance test with the proposal.

Microprocessor controlled automatic traction control (ATC) shall be provided.

Actuation of ABS and /or ATC shall override the operation of the brake retarder.

Brake hoses shall be provided with spring guard.

### **TS 33.3 Friction Material**

The entire service brake system, including friction material, shall have a minimum overhaul or replacement life of at least 50,000 miles on the design operating profile. Brakes shall be self-adjusting throughout this period.

The bus shall be equipped with disc brakes on the front and rear axles. The brake pads shall be made of non-asbestos material. In order to aid maintenance personnel in determining extent of wear, a provision to indicate the thickness at which replacement becomes necessary, shall be provided on each brake pad.

### **TS 33.4 Hubs and Discs**

Replaceable wheel bearing seals shall run on replaceable wear surfaces or be of an integral wear surface sealed design. Wheel bearing and hub seals shall not leak or weep lubricant for 100,000 miles when running on the design operating profile.

The bus shall be equipped with disc brakes on all axles, and the brake discs shall allow machining of each side of the disc to obtain smooth surfaces per manufacturer's specifications.

The brake system material and design shall be selected to absorb and dissipate heat quickly so that the heat generated during braking operation does not glaze brake linings. The heat generated shall not increase the temperature of tire beads and wheel contact area to more than that allowed by the tire manufacturer.

### **TS 33.5 Parking/Emergency Brake**

The parking brake shall be a spring-operated system, actuated by a valve that exhausts compressed air to apply the brakes. The parking brake may be manually enabled when the air pressure is at the operating level per FMVSS 121.

An emergency brake release shall be provided to release the brakes in the event of automatic emergency brake application. The driver shall be able to manually depress and hold down the emergency brake release valve to release the brakes and maneuver the bus to safety. Once the driver releases the emergency brake release valve, the brakes shall engage to hold the bus in place. Parking brake control and emergency brake release valves shall be located within easy reach of the driver. The parking brake control valve knob shall be yellow, diamond shaped, with written instructions on the knob. The emergency brake release valve knob shall be green, round shaped, with written instructions on the knob.

Application of the parking brake shall automatically put the bus and/or transmission (if applicable) into neutral range.

The buses shall be programmed to sound an alarm if the ignition is turned off and the park brake is not applied. This will alert the operator to set the park brake because the interlocks do not function with the ignition off. A method for cancellation of the parking brake alarm (for Maintenance use only) shall be provided.

Access opening in the floor shall be provide to cage the air brake chambers from the interior of the bus.

A detailed description of the proposed parking/emergency brake system shall be submitted to DTPW for review and approval prior to pre-production design review meeting.

## **TS 34. Interlocks**

### **TS 34.1 Passenger Door Interlocks**

To preclude movement of the bus with the front or rear door(s) open, when the door control is activated an accelerator interlock shall remove throttle control returning the engine to idle speed and a brake interlock shall engage the brakes. The interlocks shall remain on until the door switch is deactivated, the doors are in the fully closed position, and a brake application is made (once the doors are closed, the brakes **MUST BE APPLIED** in order for the brake interlock to disengage and allow the bus to move to prevent the unintentional release of the door interlock when the doors are closed).

Air pressure shall be relieved by means of a quick release air valve to prevent lag in releasing brakes when doors are closed.

The braking effort shall be adjusted to limit deceleration level. The braking effort shall be adjustable with hand tools only. The adjustment device shall be enclosed in tamper proof housing if located inside the bus.

The doors must be wired to a speed sensor so that the interlock cannot be activated and the doors cannot be opened at a speed above 4 mph.

With the master run switch in the off position and the door open, the door, the interlock, and the stop lights must not be energized.

All door systems employing brake and accelerator interlocks shall be supplied with supporting failure mode effects analysis (FEMA) documentation, which demonstrates that failure modes are of a failsafe type, thereby never allowing the possibility of release of interlock while an interlocked door is in an unsecured condition, unless the door master switch has been actuated to intentionally release the interlocks.

A door interlock override switch(s) shall be provided in the front door motor compartment to allow the bus to be moved should the interlock fail to release when the doors are closed.

A detailed description of the proposed passenger door interlocks shall be submitted to DTPW for review and approval prior to pre-production design review meeting.

## **TS 35. Pneumatic System**

### **TS 35.1 General**

The bus air system shall operate the air-powered accessories and the braking system with reserve capacity. New buses shall not leak down more than 5 psi over a 15-minute period of time as indicated on the dash gauge.

Air for the compressor shall be filtered. The air system shall be protected by a pressure relief valve set at 150 psi and shall be equipped with check valves and pressure protection valves to assure partial operation of critical subsystems in case of line failures.

Provision shall be made to apply shop air to the bus air systems. Aeroquip FD 41-1000-06-04 female quick disconnect couplings shall be provided at easily accessible locations in the engine compartment and near the front bumper area for towing. Retained caps shall be installed to protect fittings against dirt and moisture when not in use. A standard tire inflation type Schrader valve shall also be provided in the engine compartment.

Liquid Tape shall be applied to all sensors/switches exposed to water located at various sections of the bus to prevent moisture intrusion.

Test gauge ports for the air system shall be provided.

### **TS 35.2 Air Compressor**

The electrically driven air compressor shall be sized to charge the air system from 40 psi to the governor cut-off pressure in less than 3 minutes.

### **TS 35.3 Air Lines and Fittings**

Air lines, except necessary flexible lines, shall conform to the installation and material requirements of SAE Standard J1149 for copper tubing with standard, brass, flared or ball sleeve fittings, or SAE Standard J844 for nylon tubing if not subject to temperatures over 200 °F. The air on the delivery side of the compressor where it enters nylon housing shall not be above the maximum limits as stated in SAE J844. Nylon tubing shall be installed in accordance with the following color-coding standards:

- **Green:** Indicates primary brakes and supply.
- **Red:** Indicates secondary brakes.
- **Brown:** Indicates parking brake
- **Yellow:** Indicates compressor governor signal.
- **Black:** Indicates accessories.

Line supports shall prevent movement, flexing, tension, strain and vibration. Copper lines shall be supported to prevent the lines from touching one another or any component of the bus. To the extent practicable and before installation, the lines shall be pre-bent on a fixture that prevents tube flattening or excessive local strain. Copper lines shall be bent only once at any point, including pre-bending and installation. Rigid lines shall be supported at no more than 5-ft intervals. Nylon lines may be grouped and shall be supported at 30 in. intervals or less.

The compressor discharge line between powerplant and body-mounted equipment shall be flexible convoluted copper or stainless steel line, or may be flexible Teflon hose with a braided stainless steel jacket. Other lines necessary to maintain system reliability shall be flexible Teflon hose with a braided stainless steel jacket. End fittings shall be standard SAE or JIC brass or steel, flanged, swivel-type fittings. Flexible hoses shall be as short as practicable and individually supported. They shall not touch one another or any part of the bus except for the supporting grommets. Flexible lines shall be supported at 2-ft intervals or less.

Air lines shall be clean before installation and shall be installed to minimize air leaks. Compression fittings shall be used for connecting nylon tubing air lines. Push to connect fittings will not be accepted. All air lines shall be routed to prevent water traps to the extent possible. Grommets or insulated clamps shall protect the air lines at all points where they pass through understructure components.

### **TS 35.4 Air Reservoirs**

All air reservoirs shall meet the requirements of FMVSS Standard 121 and SAE Standard J10 and shall be equipped with drain plugs and guarded or flush type drain valves. Major structural members shall protect these valves and any automatic moisture ejector valves from road hazards. Reservoirs shall be sloped toward the drain valve. All air reservoirs shall have drain valves that discharge below floor level with lines routed to eliminate the possibility of water traps and/or freezing in the drain line.

### **TS 35.5 Air System Dryer**

An air dryer shall prevent accumulation of moisture and oil in the air system. The air dryer system shall include one or more replaceable desiccant cartridges. An electrically heated moisture drain valve is not required. The mounting and location shall allow for easy access and removal. A mechanic shall be able to replace the desiccant in less than 15 minutes.

The system shall include a provision to separate and remove suspended oil from compressed air to prevent damage to, or malfunction of pneumatic system components.

The SKF Brakemaster Dual Turbo 2000 air dryer is an approved air dryer for DTPW buses.

A detailed description of the proposed air dryer shall be submitted to DTPW for review and approval prior to production.

## ELECTRICAL, ELECTRONIC AND DATA COMMUNICATION SYSTEMS

### TS 36. Overview

The electrical system will consist of vehicle battery systems and components that generate, distribute and store power throughout the vehicle. (e.g., generator, voltage regulator, wiring, relays, and connectors).

Electronic devices are individual systems and components that process and store data, integrate electronic information or perform other specific functions.

The data communication system consists of the bi-directional communications networks that electronic devices use to share data with other electronic devices and systems. Communication networks are essential to integrating electronic functions, both onboard the vehicle and off.

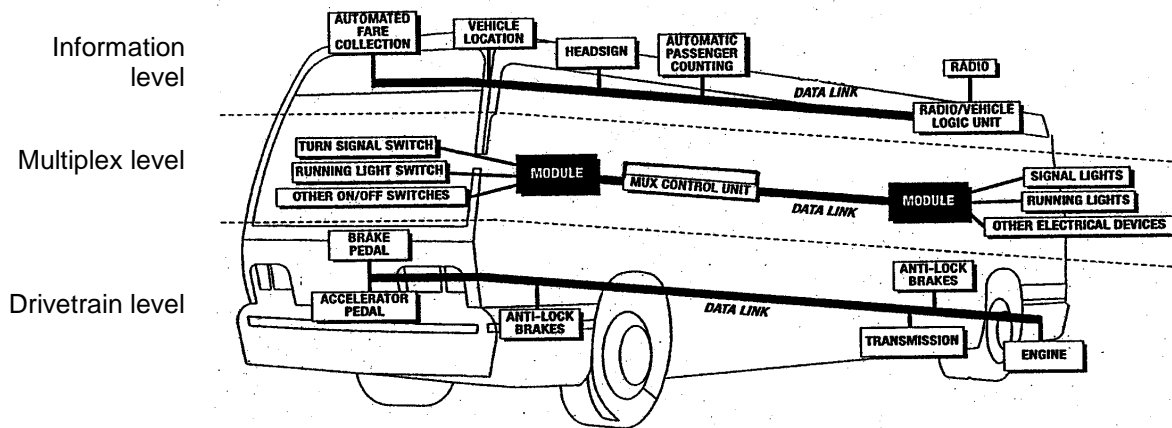
Information level systems that require vehicle information for their operations or provide information shall adhere to J1939 data standard.

Data communications systems are divided into three levels to reflect the use of multiple data networks:

- **Drivetrain level:** Components related to the drivetrain including the propulsion system components and anti-lock braking system (ABS), which may include traction control.
- **Information level:** Components whose primary function is the collection, control or display of data that is not necessary to the safe drivability of the vehicle (i.e., the vehicle will continue to operate when those functions are inoperable). These components typically consist of those required for automatic vehicle location (AVL) systems, destination signs, fare boxes, passenger counters, radio systems, automated voice and signage systems, video surveillance and similar components.
- **Multiplex level:** Electrical or electronic devices controlled through input/output signals such as discrete, analog and serial data information (i.e., on/off switch inputs, relay or relay control outputs). Multiplexing is used to control components not typically found on the drivetrain or information levels, such as lights; wheelchair lifts; doors; heating, ventilation and air conditioning (HVAC) systems; and gateway devices.



**FIGURE 5**  
Data Communications Systems Levels



### TS 36.1 Modular Design

Design of the electrical, electronic and data communication systems shall be modular so that each electronic device, apparatus panel, or wiring bundle is easily separable from its interconnect by means of connectors.

Power plant wiring shall be an independent wiring harness. Replacement of the engine compartment wiring harness(es) shall not require pulling wires through any bulkhead or removing any terminals from the wires.

### TS 37. Environmental and Mounting Requirements

The electrical system and its electronic components shall be capable of operating in the area of the vehicle in which they will be installed, as recommended in SAE J1455.

Electrical and electronic equipment shall not be located in an environment that will reduce the performance or shorten the life of the component or electrical system when operating within the design operating profile. As a recommendation, no vehicle component shall generate, or be affected by, electromagnetic interference or radio frequency interference (EMI/RFI) that can disturb the performance of electrical/electronic equipment as defined in SAE J1113 and UNECE Council Directive 95/54 (R 10).

The Agency shall follow recommendations from bus manufacturers and subsystem Suppliers regarding methods to prevent damage from voltage spikes generated from welding, jump starts, shorts, etc.

#### TS 37.1 Hardware Mounting

The mounting of the hardware shall not be used to provide the sole source ground, and all hardware shall be isolated from potential EMI/RFI, as referenced in SAE J1113.

All electrical/electronic hardware mounted in the interior of the vehicle shall be inaccessible to passengers and hidden from view unless intended to be viewed. The hardware shall be mounted in such a manner as to protect it from splash or spray.

All electrical/electronic hardware mounted on the exterior of the vehicle that is not designed to be installed in an exposed environment shall be mounted in a sealed enclosure.

All electrical/electronic hardware and its mounting shall comply with the shock and vibration requirements of SAE J1455.

All electrical components shall be of Heavy-Duty designs. To the extent practicable, these components shall be designed to last the service life of the bus.

## **TS 38. General Electrical Requirements**

### **TS 38.1 Batteries**

#### **TS 38.1.1 Low-Voltage Batteries (24V) (If Required)**

Four Group 31 Series deep cycling maintenance-free battery units shall be provided. Each battery shall have a minimum of 700 manufacturer's recommended cold cranking amps. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency. Alternative battery configurations may be considered.

Low voltage battery system configuration shall be provided to DTPW for review and approval during the preproduction meeting.

Provide a terminal block in the battery compartment for powering systems, such as but not limited to the DC-DC converter that require constant power when battery cutoff switch is off. Power to the electronic equipment (such as cameras, farebox, radio, CAD/AVL, APC) shall automatically disconnect after approximately one hour after shutting off the ignition.

A permanent vinyl schematic on battery door illustrating configuration shall be provided.

#### **TS 38.1.2 Battery Cables**

The battery terminal ends and cables shall be color-coded with red for the primary positive, black for negative and another color for any intermediate voltage cables. Positive and negative battery cables shall not cross each other if at all possible, be flexible and sufficiently long to reach the batteries with the tray in the extended position without stretching or pulling on any connection and shall not lie directly on top of the batteries. Except as interrupted by the master battery switch, battery and starter wiring shall be continuous cables with connections secured by bolted terminals and shall conform to specification requirements of SAE Standard J1127 – Type SGT, SGX or GXL and SAE Recommended Practice J541.

Battery cables shall be marine grade, Type 3 tinned copper conductor (extra flexible stranding), with insulation resistant to oil, heat, moisture, abrasion, UV and ozone. Battery cables shall be 4/0 cable or greater.

#### **TS 38.1.3 Jump Start**

A jump start plug, Anderson Power Products 350 amp receptacle (SB-350 6320G1) shall be provided in the rear engine compartment. Submit location of jump start plug to DTPW for approval prior to production.

#### **TS 38.1.4 Battery Compartment**

The battery compartment shall prevent accumulation of debris on top of the batteries and shall be well vented, self-draining and located towards the rear of the bus close to the engine. It shall be accessible only from the outside of the vehicle. All components within the battery compartment, and the compartment itself, shall be protected from damage or corrosion from the electrolyte. The inside surface of the battery compartment's access door shall be electrically insulated, as required, to prevent the battery terminals from shorting on the door if the door is damaged in an accident or if a battery comes loose.

The vehicle shall be equipped with a 12VDC and 24VDC quick disconnect switch. The battery compartment door shall conveniently accommodate operation of the 12VDC and 24VDC quick disconnect switch.

The battery quick disconnect access door shall be identified with a decal. The decal size shall not be less than 3.5 × 5 in. (8.89 × 12.7 cm).

The battery hold-down bracket shall be constructed of a non-metallic material (plastic or fiberglass).

This access door shall not require any special locking devices to gain access to the switch, and it shall be accessible without removing or lifting the panel. The door shall be flush-fitting and incorporate a spring tensioner or equal to retain the door in a closed position when not in use.

The batteries shall be securely mounted on a stainless steel tray that can accommodate the size and weight of the batteries. The battery tray shall pull out easily and properly support the batteries while they are being serviced. The tray shall allow each battery cell to be easily serviced. A locking device shall retain the battery tray to the stowed position.

If not located in the engine compartment, the same fire-resistant properties must apply to the battery compartment. No sparking devices should be located within the battery box.

The inside surface of the battery compartment's access door shall be electrically insulated, as required, to prevent the battery terminals shorting on the door if the door is damaged in an accident or if a battery comes loose.

#### **TS 38.1.5 Auxiliary Electronic Power Supply**

If required, gel-pack, or any form of sealed (non-venting) batteries used for auxiliary power are allowed to be mounted on the interior of the vehicle if they are contained in an enclosed, non-airtight compartment and accessible only to maintenance personnel. This compartment shall contain a warning label prohibiting the use of lead-acid batteries.

#### **TS 38.1.6 Master Battery Switch**

A single master switch shall be provided near the battery compartment for the disconnecting of all battery positives (12V and 24V), except for safety devices such as the fire suppression system and other systems as specified. The location of the master battery switch shall be clearly identified on the exterior access panel, be accessible in less than 10 seconds for deactivation and prevent corrosion from fumes and battery acid when the batteries are washed off or are in normal service.

Turning the master switch off with the power plant operating shall not damage any component of the electrical system. The master switch shall be capable of carrying and interrupting the total circuit load.

#### **TS 38.1.7 Low-Voltage Generation and Distribution**

The low-voltage generating system shall maintain the charge on fully charged batteries, except when the vehicle is at standard idle with a total low voltage generator load exceeding 70 percent of the low voltage generator nameplate rating.

Voltage monitoring and over-voltage output protection (recommended at 32V) shall be provided.

Dedicated power and ground shall be provided as specified by the component or system manufacturer. Cabling to the equipment must be sized to supply the current requirements with no greater than a 5 percent volt drop across the length of the cable.

DTPW requires that a constant power shall be provided to the farebox, APC, radio system, CCTV, and fire suppression on the buses with the master run switch in any position and/or when the master battery cutoff

switch is off. Description of the constant power provision to the farebox, APC, radio system, CCTV, and fire suppression shall be provided to DTPW prior to production for approval.

#### Automatic Low Voltage Battery Disconnect

An automatic low voltage battery disconnect shall interrupt selected loads on the constant power side of the master battery switch in order to prevent excessive battery discharge from radio, farebox, APC, and CCTV loads when the bus master run switch is off. All equipment location, accessibility, and mounting shall be provided to DTPW prior to production for approval.

#### **TS 38.1.8 Circuit Protection**

All branch circuits shall be protected by current-limiting devices such as circuit breakers, fuses or solid state devices sized to the requirements of the circuit. The circuit breakers or fuses shall be easily accessible for authorized personnel. Fuses shall be used only where it can be demonstrated that circuit breakers are not practicable. This requirement applies to in-line fuses supplied by either the Contractor or a Supplier. Fuse holders shall be constructed to be rugged and waterproof. All manual reset circuit breakers critical to the operation of the bus shall be mounted in a location convenient to the Agency mechanic with visible indication of open circuits. The Contractor shall show all in-line fuses in the final harness drawings. Any manually resettable circuit breakers shall provide a visible indication of open circuits. Any manually resettable circuit breakers shall provide a visible indication of open circuits.

The windshield wiper and headlamps electric circuit shall be protected by modified auto-reset circuit breakers sized to the requirement of the load.

Rubber Covers shall be provided for all the Electric Post.

Electrical compartments shall be sealed to prevent intrusion of moisture. The components and circuits in electrical compartments shall be identified and their location permanently recorded on a drawing attached to the inside of the access panel or door. The drawing shall be protected from oil, grease, fuel, and abrasion. The front compartment shall be completely serviceable from the operator's seat, vestibule, or from outside. Electrical panels accessed from the exterior of the bus shall be of stainless steel construction.

All junction boxes located in the engine compartment shall be designed to allow thorough steam cleaning of the engine compartment area without intrusion of water.

Circuit breakers or fuses shall be sized to a minimum of 15 percent larger than the total circuit load. The current rating for the wire used for each circuit must exceed the size of the circuit protection being used.

#### High Voltage Devices

All devices that contain circuits or equipment energized or capable of being energized at high voltage shall be contained within protective enclosures or enclosed bus body compartments. All access covers for these compartments shall be permanently labeled with 'DANGER HIGH VOLTAGE' signs.

All conductors carrying voltages of 50 VAC or greater, shall be considered High Voltage (HV). All HV wiring must be installed separately from low voltage wiring and must be installed damage free. Conductors, insulation, cable supports and terminating connections must be designed for the purpose, voltage and operating conditions.

#### **TS 38.2 Grounds**

The battery shall be grounded to the vehicle chassis/frame at one location only, as close to the batteries as possible. When using a chassis ground system, the chassis shall be grounded to the frame in multiple

locations, evenly distributed throughout the vehicle to eliminate ground loops. No more than four ground ring/spade terminal connections shall be made per ground stud. Electronic equipment requiring an isolated ground to the battery (i.e., electronic ground) shall not be grounded through the chassis.

### **TS 38.3 Low Voltage/Low Current Wiring and Terminals**

All main power supply and ground cables size 6 AWG and larger shall be marine grade, Type 3 tinned copper conductor (extra flexible stranding), with insulation resistant to oil, heat, moisture, abrasion, UV and ozone.

Ground cable shall be the same size of the power supply cable in every circuit.

All Branch circuits shall be protected by circuit breakers or fuses at the source end of the circuit, sized to the requirements of the load.

All power and ground wiring shall conform to specification requirements of SAE Recommended Practice J1127, J1128 and J1292. Double insulation shall be maintained as close to the junction box, electrical compartment or terminals as possible. The requirement for double insulation shall be met by wrapping the harness with plastic electrical tape or by sheathing all wires and harnesses with non-conductive, rigid or flexible conduit.

Wiring shall be hot stamped numbered as well as color coded. Wiring harnesses shall not contain wires of different voltage classes unless all wires within the harness are insulated for the highest voltage present in the harness. Kinking, grounding at multiple points, stretching, and exceeding minimum bend radius shall be prevented.

Strain-relief fittings shall be provided at all points where wiring enters electrical compartments. Grommets or other protective material shall be installed at points where wiring penetrates metal structures outside of electrical enclosures. Wiring supports shall be protective and non-conductive at areas of wire contact and shall not be damaged by heat, water, solvents or chafing.

To the extent practicable, wiring shall not be located in environmentally exposed locations under the vehicle. Wiring and electrical equipment necessarily located under the vehicle shall be insulated from water, heat, corrosion and mechanical damage. Where feasible, front to rear electrical harnesses should be installed above the window line of the vehicle.

The instrument panel and wiring shall be easily accessible for service from the driver's seat or top of the panel. The instrument panel shall be separately removable and replaceable without damaging the instrument panel or gauges. Wiring shall have sufficient length and be routed to permit service without stretching or chafing the wires.

Schematics illustrating wiring configuration shall be provided on all electrical compartment doors.

A list of schematics illustrating wiring configuration (provided on the electrical compartments doors) shall be provided to DTPW for review and approval during the preproduction meeting.

All main power supply terminals shall be covered with electric post rubber cover.

All electrical end plugs shall be covered.

The wiring harnesses shall incorporate 10% spare wires.

Wiring located in the engine compartment shall be routed away from high-heat sources or shielded and/or insulated from temperatures exceeding the wiring and connector operating requirements.

All cables and harnesses shall be secured to prevent chafing or shorting against each other or any part of the vehicle. Clamps shall be rubber or PVC clad aircraft type.

Grommets or other protective material shall be installed at points where wiring penetrates metal structures.

All wiring shall start and end at a junction block or component.

All terminal ends shall end on stud/nut or screw type junction blocks. Only tin/lead covered, non-insulated, brazed seam, copper terminals will be used underneath the bus, in the engine compartment, and heater compartment. All terminals and adjoining wire shall be covered with heat shrink tubing that has an inner meltable liner. The heat shrink will also act as a strain relief. The heat shrink shall be applied with a heat gun. A flame is not acceptable.

Multiple pin type connectors shall be provided to permit rapid disconnect of multiple circuits for engine, transmission, and closure door wiring. Directional signal switch shall have inline connectors.

All inline and bulkhead connectors are to be of the weather pack sealed type.

Multi-pin connectors shall be protected internally from corrosion with silicone dielectric grease (Dow Corning #4).

All circuits except the engine emergency shut-off and speedometer circuits must be protected by reset circuit breakers that clearly indicate their position when tripped. Each breaker must be labeled. Circuit breakers must have plastic dust caps.

#### **TS 38.4 Electrical Components**

All electrical components, including switches, relays, flashers and circuit breakers, shall be heavy-duty designs with either a successful history of application in heavy-duty vehicles or design specifications for an equivalent environment.

All electric motors shall be heavy-duty brushless type where practical, and have a continuous duty rating of no less than 40,000 hours (except cranking motors, washer pumps and wiper motors). All electric motors shall be easily accessible for servicing.

#### **TS 38.5 Electrical Compartments**

Electrical compartments shall be sealed to prevent intrusion of moisture. The components and circuits in electrical compartments shall be identified and their location permanently recorded on a drawing attached to the inside of the access panel or door. The drawing shall be protected from oil, grease, fuel, and abrasion. The front compartment shall be completely serviceable from the operator's seat, vestibule, or from outside. Electrical panels accessed from the exterior of the bus shall be of stainless steel construction.

All junction boxes located in the engine compartment shall be stainless steel and designed to allow thorough steam cleaning of the engine compartment area without intrusion of water. "Rear start and run" controls shall be mounted in an accessible location in the engine compartment and shall be protected from the environment.

#### **TS 39. General Electronic Requirements**

If an electronic component has an internal real-time clock, it shall provide its own battery backup to monitor time when battery power is disconnected, and/or it may be updated by a network component. If an electronic component has an hour meter, it shall record accumulated service time without relying on battery backup.

All electronic component Suppliers shall ensure that their equipment is self-protecting in the event of shorts in the cabling, and also in over-voltage (over 32V DC on a 24V DC nominal voltage rating with a maximum of 50V DC) and reverse polarity conditions. If an electronic component is required to interface with other components, it shall not require external pull-up and/or pull-down resistors. Where this is not possible, the use of a pull-up or pull-down resistor shall be limited as much as possible and easily accessible and labeled.

Provide a 24 volt to 13.6 volt DC-DC converter, 30 ampere output, Model 1645-24-12-30, manufactured by Wilmore Electronics Co., Inc., P.O. Box 1329, Hillsborough, N.C. 27278. Telephone: (919) 732-9351. The unit shall be located in the communications equipment box and will provide power to a terminal block for the Radio, VLU, DR700 stop announcement system, CCTV system, Farebox, and Destination sign. The converter will receive power from the batteries before the master battery cutoff switch. Continuous power to the DC-DC converter must be supplied with the master run switch in "off" position.

Provide a 12 volt power supply port in the vicinity diagnostic connector ports in the operator's area and in the engine compartment.

### **TS 39.1 Wiring and Terminals**

Kinking, grounding at multiple points, stretching and reducing the bend radius below the manufacturer's recommended minimum shall not be permitted.

#### **TS 39.1.1 Discrete I/O (Inputs/Outputs)**

All wiring to I/O devices, either at the harness level or individual wires, shall be labeled, stamped or color-coded in a fashion that allows unique identification at a spacing not exceeding 4 in. Wiring for each I/O device shall be bundled together. If the I/O terminals are the same voltages, then jumpers may be used to connect the common nodes of each I/O terminal.

#### **TS 39.1.2 Shielding**

All wiring that requires shielding shall meet the following minimum requirements. A shield shall be generated by connecting to a ground, which is sourced from a power distribution bus bar or chassis. A shield shall be connected at one location only, typically at one end of the cable. However certain standards or special requirements, such as SAE J1939 or RF applications, have separate shielding techniques that also shall be used as applicable.

**NOTE:** A shield grounded at both end forms a ground loop, which can cause intermittent control or faults.

When using shielded or coaxial cable, upon stripping of the insulation, the metallic braid shall be free from frayed strands, which can penetrate the insulation of the inner wires. To prevent the introduction of noise, the shield shall not be connected to the common side of a logic circuit.

#### **TS 39.1.3 Communications**

The data network cabling shall be selected and installed according to the selected protocol requirements. The physical layer of all network communication systems shall not be used for any purpose other than communication between the system components, unless provided for in the network specifications.

Communications networks that use power line carriers (e.g., data modulated on a 24V-power line) shall meet the most stringent applicable wiring and terminal specifications.

#### **TS 39.1.4 Radio Frequency (RF)**

RF components, such as radios, video devices, cameras, global positioning systems (GPS), etc., shall use coaxial cable to carry the signal. All RF systems require special design consideration for losses along the cable. Connectors shall be minimized, since each connector and crimp has a loss that will attribute to attenuation of the signal. Cabling should allow for the removal of antennas or attached electronics without

removing the installed cable between them. If this cannot be done, then a conduit of sufficient size shall be provided for ease of attachment of antenna and cable assembly. The corresponding component vendors shall be consulted for proper application of equipment, including installation of cables.

### **TS 39.1.5 Audio**

Cabling used for microphone level and line level signals shall be 22 AWG minimum with shielded twisted pair. Cabling used for amplifier level signals shall be 18 AWG minimum.

## **TS 40. Multiplexing**

### **TS 40.1 General**

The primary purpose of the multiplexing system is control of components necessary to operate the vehicle. This is accomplished by processing information from input devices and controlling output devices through the use of an internal logic program.

Versatility and future expansion shall be provided for by expandable system architecture. The multiplex system shall be capable of accepting new inputs and outputs through the addition of new modules and/or the utilization of existing spare inputs and outputs. Ten percent of the total number of inputs and outputs, or at least one each for each voltage type utilized (0V, 12V, 24V), at each module location shall be designated as spares. All like components in the multiplex system shall be modular and interchangeable with self-diagnostic capabilities. The modules shall be easily accessible for troubleshooting electrical failures and performing system maintenance. Multiplex input/output modules shall use solid-state devices to provide extended service life and individual circuit protection.

### **TS 40.2 System Configuration**

Multiplexing may either be distributed or centralized. A distributed system shall process information on multiple control modules within the network. A centralized system shall process the information on a single control module. Either system shall consist of several modules connected to form a control network.

#### **TS 40.2.1 I/O Signals**

The input/output for the multiplex system may contain three types of electrical signals: discrete, analog or serial data.

Discrete signals shall reflect the on/off status of switches, levers, limit switches, lights, etc. Analog signals shall reflect numerical data as represented by a voltage signal (0-12V, 10-24V, etc.) or current signal (4-20 mA). Both types of analog signals shall represent the status of variable devices such as rheostats, potentiometers, temperature probes, etc. Serial data signals shall reflect ASCII or alphanumeric data used in the communication between other on-board components.

## **TS 41. Data Communications**

### **TS 41.1 General**

All data communication networks shall be either in accordance with a nationally recognized interface standard, such as those published by SAE, IEEE or ISO, or shall be published to DTPW with the following minimum information:

- Protocol requirements for all timing issues (bit, byte, packet, inter-packet timing, idle line timing, etc.) packet sizes, error checking and transport (bulk transfer of data to/from the device).
- Data definition requirements that ensure access to diagnostic information and performance characteristics.
- The capability and procedures for uploading new application or configuration data.
- Access to revision levels of data, application software and firmware.



- The capability and procedures for uploading new firmware or application software.
- Evidence that applicable data shall be broadcast to the network in an efficient manner such that the overall network integrity is not compromised.

Any electronic vehicle components used on a network shall be conformance tested to the corresponding network standard.

## **TS 41.2 Drivetrain Level**

Drivetrain components, consisting of the engine, transmission, retarder, anti-lock braking system and all other related components, shall be integrated and communicate fully with respect to vehicle operation with data using SAE Recommended Communications Protocols such as J1939 and/or J1708/J1587 with forward and backward compatibilities or other open protocols.

### **TS 41.2.1 Diagnostics, Fault Detection and Data Access**

Drivetrain performance, maintenance and diagnostic data, and other electronic messages shall be formatted and transmitted on the communications networks.

The drivetrain level shall have the ability to record abnormal events in memory and provide diagnostic codes and other information to service personnel. At a minimum, this network level shall provide live/fail status, current hardware serial number, software/data revisions and uninterrupted timing functions.

### **TS 41.2.2 Programmability (Software)**

The drivetrain level components shall be programmable by DTPW with limitations as specified by the sub-system Supplier.

## **TS 41.3 Multiplex Level**

### **TS 41.3.1 Data Access**

At a minimum, information shall be made available via a communication port on the multiplex system. The location of the communication port shall be easily accessible. A hardware gateway and/or wireless communications system are options if requested by DTPW. The communication port(s) shall be located as specified by DTPW.

### **TS 41.3.2 Diagnostics and Fault Detection**

The multiplex system shall have a proven method of determining its status (system health and input/output status) and detecting either active (online) or inactive (offline) faults through the use of on-board visual/audible indicators.

In addition to the indicators, the system shall employ an advanced diagnostic and fault detection system, which shall be accessible via either a personal computer or a handheld unit. Either unit shall have the ability to check logic function. The diagnostic data can be incorporated into the information level network or the central data access system.

### **Multiplexing System Mock-up Board**

An optional mock-up board, where key components of the multiplexing system are replicated on a functional model, shall be provided as a tool for diagnostic, design verification and training purposes. If required, the mock-up board should be priced separately.

**TS 41.3.3 Programmability (Software)**

The multiplex system shall have security provisions to protect its software from unwanted changes. This shall be achieved through any or all of the following procedures:

- password protection
- limited distribution of the configuration software
- limited access to the programming tools required to change the software
- hardware protection that prevents undesired changes to the software

Provisions for programming the multiplex system shall be possible through a PC or laptop. The multiplex system shall have proper revision control to ensure that the hardware and software are identical on each vehicle equipped with the system. Revision control shall be provided by all of the following:

- hardware component identification where labels are included on all multiplex hardware to identify components
- hardware series identification where all multiplex hardware displays the current hardware serial number and firmware revision employed by the module
- software revision identification where all copies of the software in service displays the most recent revision number
- a method of determining which version of the software is currently in use in the multiplex system

**TS 41.4 Electronic Noise Control**

Electrical and electronic sub-systems and components on all buses shall not emit electromagnetic radiation that will interfere with on-board systems, components or equipment, telephone service, radio or TV reception or violate regulations of the Federal Communications Commission.

Electrical and electronic sub-systems on the coaches shall not be affected by external sources of RFI/EMI. This includes, but is not limited to, radio and TV transmission, portable electronic devices including computers in the vicinity of or onboard the buses, ac or dc power lines and RFI/EMI emissions from other vehicles.

**DRIVER PROVISIONS, CONTROLS AND INSTRUMENTATION****TS 42. Driver's Area Controls****TS 42.1 General**

In general when designing the driver's area, it is recommended that SAE J833, "Human Physical Dimensions," be used.

Switches and controls shall be divided into basic groups and assigned to specific areas, in conformance with SAE Recommended Practice J680, Revised 1988, "Location and Operation of Instruments and Controls in Motor Truck Cabs," and be essentially within the hand reach envelope described in SAE Recommended Practice J287, "Driver Hand Control Reach."

An operator's area enclosure shall be provided as described in the Driver Area Barrier section of the specifications.

The Contractor shall furnish and install one (1) general model #TCP5JH, or approved equal, ABC rated, 5 pounds, dry chemical type extinguisher with special non-kink, 12 inch hose assembly. The fire extinguisher shall be located on the roadside of the bus behind the driver's seat if practical. Mounting to be approved by DTPW at the time of bus manufacture. Mounting of the extinguisher shall be rigid and shall prevent vibration and noise. The mounting shall be a Spring-Grip bracket manufactured by Brooks Equipment or approved equal. On the outside of the fire extinguisher there shall be a metal label indicating that the fire extinguisher has been listed and approved by the Underwriter's Laboratories and Factory Mutual Laboratories. A sticker with the date the extinguisher was last inspected shall be placed visibly on the unit.

Provide Three (3) highway warning triangles in a reusable plastic container and an accompanying mounting bracket shall be provided. The Portable Red Reflector warning device (Triangle reflector) shall be in compliance with section 316.300, Florida Statutes. Locate triangles behind the driver seat, if practical. Provide accompanying mounting bracket K.D. part #616-9000.

### **TS 42.2 Glare**

The driver's work area shall be designed to minimize glare to the extent possible. Objects within and adjacent to this area shall be matte black or dark gray in color wherever possible to reduce the reflection of light onto the windshield. The use of polished metal and light-colored surfaces within and adjacent to the driver's area shall be avoided.

### **TS 42.3 Visors/Sun Shades**

An adjustable roller type sunscreen shall be provided over the driver's windshield and/or the driver's side window. The sunscreen shall be capable of being lowered to the midpoint of the driver's window. When deployed, the screen shall be secure, stable and shall not rattle, sway or intrude into the driver's field of view due to the motion of the coach or as a result of air movement. Once lowered, the screen shall remain in the lowered position until returned to the stowed position by the driver. Sunscreen shall be shaped to minimize light leakage between the visor and windshield pillars to the extent possible

### **TS 42.4 Driver's Controls**

Frequently used controls must be in easily accessible locations. These include the door control, kneel control, windshield wiper/washer controls, ramp, and lift and run switch. Any switches and controls necessary for the safe operation of the bus shall be conveniently located and shall provide for ease of operation. They shall be identifiable by shape, touch and permanent markings. Controls also shall be located so that passengers may not easily tamper with control settings.

All panel-mounted switches and controls shall be marked with easily read identifiers. Graphic symbols shall conform to SAE Recommended Practice J2402, "Road Vehicles – Symbols For Controls, Indicators, and Tell Tales," where available and applicable. Color of switches and controls shall be dark with contrasting typography or symbols.

Mechanical switches and controls shall be replaceable, and the wiring at these controls shall be serviceable from a convenient location. Switches, controls and instruments shall be dust- and water-resistant.

### **TS 42.5 Normal Bus Operation Instrumentation and Controls**

The following list identifies bus controls used to operate the bus. These controls are either frequently used or critical to the operation of the bus. They shall be located within easy reach of the operator. The operator shall not be required to stand or turn to view or actuate these controls unless specified otherwise.

Systems or components monitored by onboard diagnostics system shall be displayed in clear view of the operator and provide visual and/or audible indicators. The intensity of indicators shall permit easy determination of on/off status in bright sunlight but shall not cause a distraction or visibility problem at night. All indicators shall be illuminated using backlighting.

The indicator panel shall be located in Area 1 or Area 5, within easy view of the operator instrument panel. All indicators shall have a method of momentarily testing their operation. The audible alarm shall be tamper-resistant and shall have an outlet level between 80 and 83 dBA when measured at the location of the operator's ear.

On-board displays visible to the operator shall be limited to indicating the status of those functions described herein that are necessary for the operation of the bus. All other indicators needed for diagnostics and their related interface hardware shall be concealed and protected from unauthorized access. Table below

represents instruments and alarms. The intent of the overall physical layout of the indicators shall be in a logical grouping of systems and severity nature of the fault.

Consideration shall be provided for future additions of spare indicators as the capability of onboard diagnostic systems improves. Blank spaces shall contain LEDs.

A detailed visual indicator layout with alternatives and audible alarm provision of bus instruments and alarms shall be provided to DTPW for review and approval during the preproduction meeting.

#### Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Master run switch	Rotary, four-position detent	Side console	Master control for bus, off, day run, night run and clearance ID lights	
Drive selector	Touch panel switch	Side console	Provides selection of propulsion: forward, reverse and neutral	Gear selection
HVAC	Switch or switches to control HVAC	Side console	Permits selection of passenger ventilation: off, cool, heat, low fan, high fan or full auto with on/off only	
Driver's ventilation	Rotary, three-position detent	Side console or Dash left wing	Permits supplemental ventilation: fan off, low or high	
Defroster fan	Rotary, three-position detent	Side console or Dash left wing	Permits defroster: fan off, low, medium or high	
Defroster temperature	Variable position	Side console or Dash left wing	Adjusts defroster water flow and temperature	
Windshield wiper	One-variable rotary position operating both wipers	Dash left wing	Variable speed control of left and right windshield wipers	
Windshield washer	Push button	Dash left wing	Activates windshield washers	
Dash panel lights	Rotary rheostat or stepping switch	Side Console or Dash left wing	Provides adjustment for light intensity in night run position	
Interior lights	Three-position switch	Side console	Selects mode of passenger compartment lighting: off, on, normal	
Front door ramp	Three-position momentary switch	Right side of steering wheel	Permits deploy and stow of front ramp	Amber dash indicator. Ext alarm and Amber light

## Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Front kneel	Three-position momentary switch	Front door remote	Permits kneeling activation and raise and normal at front door remote location	Amber dash indicator. Ext alarm and Amber light
Silent alarm	Recessed push button, NO and NC contacts momentary	Side console	Activates emergency radio alarm at dispatch and permits covert microphone and/or enables destination sign emergency message	
Video system event switch	Momentary on/off momentary switch with plastic guard	Side console	Triggers event equipment, triggers event light on dash	Amber light
Left remote mirror	Four-position toggle type	Side console	Permits two-axis adjustment of left exterior mirror	
Right remote mirror	Four-position toggle type	Side console	Permits two-axis adjustment of right exterior mirror	
Mirror heater	Switch or temperature activated	Side console	Permits heating of outside mirrors when required	
Passenger door control	Five-position handle type detent or two momentary push buttons	Side console, forward	Permits open/close control of front and rear passenger doors	Red light
Rear door override	Two-position switch in approved location	Side console, forward	Allows driver to override activation of rear door passenger tape switches	
Shutdown override	Momentary switch with operation protection	Side console	Permits driver to override auto shutdown	
Hazard flashers	Two-position switch	Side console or Dash right wing	Activates emergency flashers	Two green lights
Fire suppression	Red push button with protective cover	Dash left wing or dash center	Permits driver to override and manually discharge fire suppression system	Red light
Mobile data terminal	Mobile data terminal coach operator interface panel	Above right dash wing	Facilitates driver interaction with communication system and master log-on	LCD display with visual status and text messages
Farebox interface	Farebox coach operator interface panel	Near farebox	Facilitates driver interaction with farebox system	LCD display
Destination sign interface	Destination sign interface panel	in approved location	Facilitates driver interaction with destination sign system, manual entry	LCD display

## Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Turn signals	Momentary push button (two required) raised from other switches	Left foot panel	Activates left and right turn signals	Two green lights and optional audible indicator
PA manual	Momentary push button	In approved location	Permits driver to manually activate public address microphone	
Low profile microphone	Low-profile discrete Mounting	Steering column	Permits driver to make announcements with both hands on the wheel and focusing on road conditions	
High beam	Detented push button	In approved location	Permits driver to toggle between low and high beam	Blue light
Parking brake	Pneumatic PPV	Side console or Dash left wing	Permits driver to apply and release parking brake	Red light
Park brake release	Pneumatic PPV	Vertical side of the side console or dash center	Permits driver to push and hold to release brakes	
Master door/ interlock	Multi-pole toggle, detented	Out of operator's reach	Permits driver override to disable door and brake/throttle interlock	Red light
Warning interlocks deactivated	Red indicator light	Dash panel center	Illuminates to warn drive that interlocks have been deactivated.	Red light
Retarder disable	Multi-pole switch detented	Within reach of Operator or approved location	Permits driver override to disable brake retardation/regeneration	Red light
Alarm acknowledged	Push button momentary	Approved location	Permits driver to acknowledge alarm condition	
Rear door passenger sensor disable	Multi-pole toggle, detented	In sign compartment or Driver's barrier compartment	Permits driver to override rear door passenger sensing system	
Indicator/ alarm test button	Momentary switch or programming <sup>1</sup>	Dash center panel	Permits driver to activate test of sentry, indicators and audible alarms	All visuals and audibles
Auxiliary power	110-volt power receptacle	Approved location	Property to specify what function to supply	

## Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Speedometer	Speedometer, odometer, and diagnostic capability, 5-mile increments	Dash center panel	Visual indication of speed and distance traveled, accumulated vehicle mileage, fault condition display	Visual
Air pressure gauge	Primary and secondary, 5 psi increments	Dash center panel	Visual indication of primary and secondary air systems	Red light and buzzer
Fire detection	Coach operator display	Property specific or dash center	Indication of fire detection activation by zone/location	Buzzer and red light
Door obstruction	Sensing of door obstruction	Dash center	Indication of rear door sensitive edge activation	Red light and buzzer
Door ajar	Door not properly closed	Property specific or dash center	Indication of rear door not properly closed	Buzzer or alarm and red light
Low system air pressure	Sensing low primary and secondary air tank pressure	Dash center	Indication of low air system pressure	Buzzer and red light
Low coolant indicator	Low coolant indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects low coolant condition	Amber light
ABS indicator	Detects system status	Dash center	Displays system failure	Amber light
HVAC indicator	Detects system status	Dash center	Displays system failure	Amber or red light
Charging system indicator (12/24 V)	Detect charging system status	Dash center	Detects no charge condition and optionally detects battery high, low, imbalance, no charge condition, and initiates time-delayed shutdown	Red light flashing or solid based on condition
Bike rack deployed indicator	Detects bike rack position	Dash center	Indication of bike rack not being in fully stowed position	Amber or red light

1. Indicate area by drawing. Break up switches control from indicator lights.

## TS 42.6 Driver Foot Controls

Accelerator and brake pedals shall be designed for ankle motion. Foot surfaces of the pedals shall be faced with wear-resistant, nonskid, replaceable material.

### TS 42.6.1 Pedal Angle

The vertical angle of the accelerator and brake pedals shall be determined from a horizontal plane regardless of the slope of the cab floor. The accelerator and brake pedals shall be positioned at an angle of 37 to 50

degrees at the point of initiation of contact and extend downward to an angle of 10 to 18 degrees at full throttle.

The location of the brake and accelerator pedals shall be determined by the manufacturer, based on space needs, visibility, lower edge of windshield, and vertical H-point.

#### **TS 42.6.2 Pedal Dimensions and Position**

The floor-mounted accelerator pedal shall be 10 to 12 in. long and 3 to 4 in. wide. Clearance around the pedal must allow for no interference precluding operation.

#### **TS 42.7 Brake and Accelerator Pedals**

Non-adjustable brake pedal.

Brake and accelerator pedals shall be mounted on removable mounting plates to allow easy access for maintenance.

#### **TS 42.8 Driver Foot Switches**

##### **Floor-Mounted Foot Control Platform**

The control switches for the turn signals, hazard warning flashers, high beam and public address (PA) system shall be mounted on an inclined, floor-mounted stainless steel enclosure or metal plate mounted to an incline integrated into the driver's platform, located to the left of the steering column. The location and design of this enclosure shall be such that foot room for the operator is not impeded. The inclined mounting surface shall be skid-resistant. All controls, including high beam and PA system shall be in approved location. The angle of the turn signal platform shall be determined from a horizontal plane, regardless of the slope of the cab floor. The turn signal platform shall be angled at a minimum of 10 degrees and a maximum of 37 degrees. It shall be located no closer to the seat front than the heel point of the accelerator pedal.

The foot switches shall be UL-listed, heavy-duty type, of a rugged, water-resistant, corrosion-resistant metal construction. The foot switches for the directional signals and hazard warning shall be momentary type, while those for the PA system and the high beam shall be latching type. The spacing of the switches shall be such that inadvertent simultaneous deflection of switches is prevented.

A detailed control layout shall be provided to DTPW for review and approval during the preproduction meeting.

#### **TS 43. Driver's Amenities**

##### **TS 43.1 Coat Hanger**

A driver's metal coat hook shall be mounted in a location convenient to the driver (location to be determined by DTPW at time of manufacture).

##### **TS 43.2 Drink Holder**

No drink holder.

##### **TS 43.3 Storage Box**

An enclosed driver storage area shall be provided with a positive latching door and/or lock. The minimum size is 2750 cubic in.



## **TS 44. Windshield Wipers and Washers**

### **TS 44.1 Windshield Wipers**

The bus shall be equipped with a windshield wiper for each half of the windshield. At 60 mph, no more than 10 percent of the wiped area shall be lost due to windshield wiper lift. For two-piece windshields, both wipers shall park along the center edges of the windshield glass. For single-piece windshields, wipers shall park along the bottom edge of the windshield. Windshield wiper motors and mechanisms shall be easily accessible for repairs or service. The fastener that secures the wiper arm to the drive mechanism shall be corrosion-resistant.

The windshield wipers control shall be single-control, electric two-speed intermittent wiper.

### **TS 44.2 Windshield Washers**

The electric windshield washer system, when used with the wipers, shall deposit washing fluid evenly and completely wet the entire wiped area.

The windshield washer system shall have a minimum 3-gallon reservoir, located for easy refilling from outside of the bus. Reservoir pumps, lines and fittings shall be corrosion-resistant and must include a means to determine fluid level.

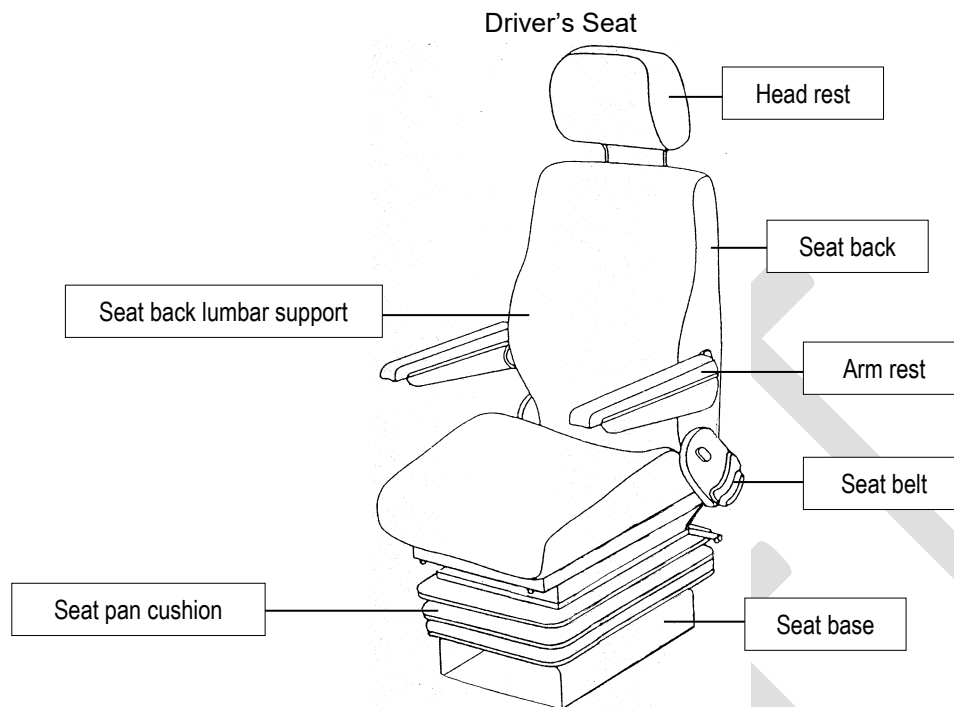
## **TS 45. Driver's Seat**

Operator's seat shall be a USSC 9100 ALX3 pneumatic suspension seat, Recaro Ergo Metro w/ 3 Point Belt, or approved equal. This is a high back model and shall have no armrest. Installation of the seat shall not interfere with any of the adjustment features of the seat. The driver's seat shall be upholstered with black vinyl. The seat frame shall be of satin finish stainless steel, box type, tubular construction, reinforced where necessary to prevent failure due to vibration and shall be readily removable from the base.

With the seat fully lowered and in fully forward position, the horizontal distance measured between the edge of the seat cushion and the fixed steering column housing shall be a minimum of six (6) inches.

### Quietride Operator's Seat

The Contractor shall provide an option for a Quietride Operator's Seat or approved equal. The design and operation of the proposed Quietride Operator's Seat shall be approved by DTPW prior to production. The option for the Quietride Operator's Seat shall be priced separately from the bus in the Price Proposal.



## **TS 45.1 Dimensions**

The driver's seat shall be comfortable and adjustable so that people ranging in size from a 95th-percentile male to a 5th-percentile female may operate the bus.

### **TS 45.1.1 Seat Pan Cushion Length**

Measurement shall be from the front edge of the seat pan to the rear at its intersection with the seat back. The adjustment of the seat pan length shall be no less than 16.5 in. at its minimum length and no more than 20.5 in. at its maximum length.

### **SP 1.1.1 Seat Pan Cushion Height**

Measurement shall be from the cab floor to the top of the level seat at its center midpoint. The seat shall adjust in height from a minimum of 14 in., with a minimum 6 in. vertical range of adjustment.

### **TS 45.1.2 Seat Pan Cushion Slope**

Measurement is the slope of the plane created by connecting the two high points of the seat, one at the rear of the seat at its intersection with the seat back and the other at the front of the seat just before it waterfalls downward at the edge. The slope can be measured using an inclinometer and shall be stated in degrees of incline relative to the horizontal plane (0 degrees). The seat pan shall adjust in its slope from no less than plus 12 degrees (rearward "bucket seat" incline), to no less than minus 5 degrees (forward slope).

### **TS 45.1.3 Seat Base Fore/Aft Adjustment**

Measurement is the horizontal distance from the heel point to the front edge of the seat. The minimum and maximum distances shall be measured from the front edge of the seat when it is adjusted to its minimum seat pan depth (approximately 15 in.). The total travel measured for the operator's seat, from fully retracted to fully

extended position in its guideway, shall be a minimum of 11 inches. It shall adjust no closer to the heel point than 6 in.

#### **TS 45.1.4 Seat Pan Cushion Width**

Measurement is the horizontal distance across the seat cushion. The seat pan cushion shall be 17 to 21 in. across at the front edge of the seat cushion and 20 to 23 in. across at the side bolsters.

#### **TS 45.1.5 Seat Suspension**

The driver's seat shall be appropriately dampened to support a minimum weight of 500 lbs. The suspension shall be capable of dampening adjustment in both directions.

Rubber snubbers shall be provided to prevent metal-to-metal contact.

#### **TS 45.1.6 Seat Back**

##### **Width**

Measurement is the distance between the outermost points of the front of the seat back, at or near its midpoint in height. The seat back width shall be no less than 19 in. Seat back will include dual recliner gears on both sides of the seat.

##### **Height**

Standard height seat back.

#### **TS 45.1.7 Headrests**

Adjustable headrest.

#### **TS 45.1.8 Seat Back Lumbar Support**

Measurement is from the bottom of the seat back at its intersection with the seat pan to the top of the lumbar cushioning. The seat back shall provide adjustable depth lumbar back support with three individual operating lumbar cells within a minimum range of 7 to 11 in.

#### **TS 45.1.9 Seat Back Angle Adjustment**

The seat back angle shall be measured relative to a level seat pan, where 90 degrees is the upright position and 90 degrees-plus represents the amount of recline.

The seat back shall adjust in angle from a minimum of no more than 90 degrees (upright) to at least 105 degrees (reclined), with infinite adjustment in between.

#### **TS 45.2 Seat Belt**

Seat belts shall be provided across the driver's lap and diagonally across the driver's chest. The driver shall be able to use both belts by connecting a single buckle on the right side of the seat cushion. 3-pt seatbelts must be emergency locking retractor (ELR) in design.

The driver's seat must come equipped with the longest retractable safety belt offered by the manufacturer. The driver's seat shall have a seat belt, meeting requirements of Federal Motor Vehicle Safety Standard No. 207 and No.210. The seat belt shall have an automatic ratcheting retractor on the left-hand side, and the mating part on the right-hand side shall be as short as possible. Seat belt shall be black.

An 8-in. (minimum) extension shall be provided for the lap belt assembly with each bus.

**TS 45.3 Adjustable Armrest**

No armrests.

**TS 45.4 Seat Control Locations**

While seated, the driver shall be able to make seat adjustments by hand without complexity, excessive effort or being pinched. Adjustment mechanisms shall hold the adjustments and shall not be subject to inadvertent changes.

**TS 45.5 Seat Structure and Materials****Cushions**

Cushions shall be fully padded with at least 3 in. of materials in the seating areas at the bottom and back.

**TS 45.6 Pedestal**

Stainless steel pedestal shall be provided.

**TS 45.7 Mirrors****TS 45.7.1 Exterior Mirrors**

The bus shall be equipped with 2 exterior mirrors combination of flat and convex mirrors (2-piece glass - upper portion flat, and smaller lower portion convex) referred to as transit-specific. The mirrors shall be corrosion-resistant and have a non-reflective finish. Mirrors shall be installed with stable supports on each side of the bus and shall not vibrate so as to impair drivers' vision. The mirrors shall have spring loaded arms designed to permit mirror to be moved out of the way to preclude damage by automatic bus washing equipment. The mirrors shall be located so as to provide the operator a view to the rear along both sides of the bus, including the rear wheels and shall be adjustable both in the horizontal and vertical directions to view the rearward scene. The mirrors shall be electrically remote controlled.

All mirrors and brackets shall be B & R or approved equal.

All mirror locations must be approved by DTPW prior to production.

**TS 45.7.2 Interior Mirrors**

Mirrors shall be provided for the driver to observe passengers throughout the bus without leaving his seat and without shoulder movement. Interior mirrors shall not be in the line of sight to the right side exterior mirror.

Interior mirrors shall include a 4" x 16" rectangular or 8" x 15" convex flat driver's rearview mirror, a 6" convex front door area mirror at the front right corner near the ceiling, a 6" x 12" convex exit door area mirror, and a 6" round flat rear view relay mirror.

All mirror locations must be approved by DTPW prior to production.

**WINDOWS****TS 46. General**

A minimum of 10,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard forty-foot configuration bus.

A minimum of 16,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard sixty-foot configuration bus.

## **TS 47. Windshield**

The two-piece windshield shall permit an operator's field of view as referenced in SAE Recommended Practice J1050. The vertically upward view shall be a minimum of 14 degrees, measured above the horizontal and excluding any shaded band. The vertically downward view shall permit detection of an object 3½ ft high no more than 2 ft in front of the bus. The horizontal view shall be a minimum of 90 degrees above the line of sight. Any binocular obscuration due to a center divider may be ignored when determining the 90-degree requirement, provided that the divider does not exceed a 3-degree angle in the operator's field of view. Windshield pillars shall not exceed 10 degrees of binocular obscuration. The windshield shall be designed and installed to minimize external glare as well as reflections from inside the bus. A one-piece windshield may be considered if a two-piece windshield is not available for the bus model.

The windshield shall be easily replaceable by removing zip-locks from the windshield retaining moldings. Bonded-in-place windshields shall not be used. Winglets may be bonded.

### **TS 47.1 Glazing**

The windshield glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1 Test Grouping 1A and the Recommended Practices defined in SAE J673.

The upper portion of the windshield above the driver's field of view shall have a dark, shaded band with a minimum luminous transmittance of 5 percent when tested in accordance to ASTM D-1003.

## **TS 48. Driver's Side Window**

The driver's side window shall be the sliding type, requiring only the rear half of sash to latch upon closing, and shall open sufficiently to permit the seated operator to easily adjust the street-side outside rearview mirror. When in an open position, the window shall not rattle or close during braking. This window section shall slide in tracks or channels designed to last the service life of the bus. The operator's side window shall not be bonded in place and shall be easily replaceable.

The driver's view, perpendicular through operator's side window glazing, should extend a minimum of 33 in. (840 mm) to the rear of the heel point on the accelerator, and in any case must accommodate a 95th percentile male operator. The view through the glazing at the front of the assembly should begin not more than 26 in. (560 mm) above the operator's floor to ensure visibility of an under-mounted convex mirror. Driver's window construction shall maximize ability for full opening of the window.

The driver window shall be glazed with THERMO GUARD or approved equal. The driver's glazing shall be ¼" thick laminated safety glazing conforming to FMVSS 205 and applicable requirements of ANSI Z26.1-1997. The total visible light transmittance must not be below 76 percent as measured by ASTM E-424. The LSG (light to solar gain ratio) must be a minimum of 1.28. The relative heat gain must meet a minimum requirement of 150 BTU/hr/sq.ft.

## **TS 49. Side Windows**

### **TS 49.1 Configuration**

Side windows shall not be bonded in place, but shall be easily replaceable without disturbing adjacent windows and shall be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent. All aluminum and steel material will be treated to prevent corrosion.

### **TS 49.2 Emergency Exit (Egress) Configuration**

All passenger windows shall be full fixed egress window assemblies with the exception of the driver window and destination window assemblies.

Each passenger windows shall be glazed with nominal ¼" tempered or laminated safety glass glazing material conforming to FMVSS 205 and applicable requirements of ANSI Z26.1-1997.

The windows should be the "Ricon CityView™" series, seamless in style giving the entire bus a "frameless" single body glazing appearance. All aluminum and steel material will be black powder coated to help prevent corrosion. All passenger windows and driver's window shall be quick-change design manufactured by Riconcorp located in Panorama City, CA. or approved equal.

Window glazing is designed where it can be replaced in three (3) minutes or less by a trained technician. Glazing in the window assembly shall be replaced without removing the window from its installed position on the bus or manipulation of the rubber molding surrounding the glazing. The glazing shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the vehicle. The metal extruded ring shall act as part of the structure of the window and then house the sacrificial liner. The metal extruded ring shall hold in place the 1/16-inch or 1/8-inch sacrificial liner. The sacrificial liner shall mount flush or stand off the exterior glazing to prevent moisture and dust from gathering between the exterior glazing and sacrificial liner. The metal extruded ring shall conceal the edges of the sacrificial liner from the passenger. The mechanic or service worker using simple hand tools should be able to replace the sacrificial liner in 30 seconds or less. Pulling the sacrificial liner upward, then pulling the sacrificial liner from the bottom, releases the sacrificial liner from the metal extruded ring. This acrylic sacrificial liner must be replaced without removing the window from its installed position on the bus, without removing the tempered glazing from the sash, and without the removal or manipulation of the window assembly's rubber molding. No additional parts except the sacrificial liner itself are to be used in the system. The exterior glazing shall be mounted securely in the existing window extrusion with or without the sacrificial liner installed in the window assembly. The removal of the sacrificial liner shall not prevent the vehicle from going back into service. Removal and replacement of the sacrificial liner shall not require the removal or the modification of any other parts or fasteners.

The Contractor shall submit calculations for compliance with emergency exit requirements to DTPW for approval at the pre-production design review.

### **TS 49.3 Configuration**

All windows must meet FMVSS 205, FMVSS 302, and FMVSS 217 requirements. The destination window assembly shall be split fix with the transom glazing clear. All emergency handles shall be located on the right side of the window assemblies. Emergency exit and window release lever operation instructions must be metal and bolted to window frame rail adjacent to each seat. Emergency instructions must be printed in English, Spanish and Creole.

### **TS 49.4 Materials**

Windows on the bus sides and in the rear door shall be tinted a neutral color, complementary to the bus exterior. The maximum solar energy transmittance shall not exceed 37 percent, as measured by ASTM E-424, and the luminous transmittance shall be no less than 16 percent, as measured by ASTM D-1003. Window at the destination/location sign shall not be tinted in the vicinity of the sign.

#### Side Window Glazing Material

The Contractor shall provide an option for THERMOGUARD or approved equal side window glazing Material. The side window glazing material shall be ¼" thick laminated safety glazing conforming to FMVSS 205 and applicable requirements of ANSI Z26.1-1997. The total visible light transmittance must not be below 76 percent as measured by ASTM E-424. The LSG (light to solar gain ratio) must be a minimum of 1.28. The

relative heat gain must meet a minimum requirement of 150 BTU/hr/sq.ft. The THERMOGUARD option shall be priced separately from the bus in the Price Proposal.

### **TS 49.5 Rear Window**

No requirement for rear window. If a rear window is provided the rear window shall be glazed with the same material (including anti-vandalism provision if required) and tint as side windows. The glazing shall be set in rubber channels or be push-out type to meet FMVSS 217. If push-out type, it shall be one-piece, rugged sash design, meeting specifications for side windows.

## **HEATING, VENTILATING AND AIR CONDITIONING**

### **TS 50. Capacity and Performance**

The HVAC unit shall be an AC high-voltage electric-driven system with full hermetic A/C compressor, condenser fan, and evaporator blower motors. The unit furnished shall be supplied by Sutrak, Thermo-King Corporation, or an approved equal.

The HVAC climate control system shall be capable of controlling the temperature and maintaining the humidity levels of the interior of the bus as defined in the following paragraphs.

The HVAC unit may either be roof or rear-mounted.

With the bus running at the design operating profile with corresponding door opening cycle, and carrying a number of passengers equal to 150 percent of the seated load, the HVAC system shall control the average passenger compartment temperature within a range between 65 and 80 °F, while maintaining the relative humidity to a value of 50 percent or less. The system shall maintain these conditions while subjected to any outside ambient temperatures within a range of 10 to 95 °F and at any ambient relative humidity levels between 5 and 50 percent.

When the bus is operated in outside ambient temperatures of 95 to 115 °F, the interior temperature of the bus shall be permitted to rise 0.5° for each degree of exterior temperature in excess of 95 °F.

When bus is operated in outside ambient temperatures in the range of -10 to 10 °F, the interior temperature of the bus shall not fall below 55 °F while the bus is running on the design operating profile.

System capacity testing, including pull-down/warm-up, stabilization and profile, shall be conducted in accordance to the APTA's "Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System."

The recommended locations of temperature probes are only guidelines and may require slight modifications to address actual bus design. Care must be taken to avoid placement of sensing devices in the immediate path of an air duct outlet. In general, the locations are intended to accurately represent the interior passenger area.

Additional testing shall be performed as necessary to ensure compliance to performance requirements stated herein.

The air conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 110 °F to 70 °F +/-3 °F in less than 30 minutes after system engagement for 30, 35 and 40-foot buses. Engine temperature shall be within the normal operating range at the time of start-up of the cool-down test, and the engine speed shall be limited to fast idle at ¾ max governed speed that may be activated by a driver-controlled device. During the cool-down period, the refrigerant pressure shall not exceed safe

high-side pressures, and the condenser discharge air temperature, measured 6 in. from the surface of the coil, shall be less than 45 °F above the condenser inlet air temperature. No simulated solar load shall be used. There shall be no passengers on board, and the doors and windows shall be closed.

The contractor should submit test results with the proposal.

The air conditioning system shall meet these performance requirements using HFC R407C or approved equal.

Documentation proving that the pilot bus or first production bus (if no pilot bus available) meets or exceeds the system capacity testing in accordance to the APTA's "Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System" shall be provided prior to delivery of the first bus.

A safety lanyard on overhead HVAC filter/return air grilles shall be provided.

The Air Conditioning unit installation shall be certified in writing by the vehicle manufacturer as being designed, manufactured, and installed in accordance with the HVAC manufacturer's requirements before acceptance and delivery of vehicles.

#### Special Tools and Equipment to Maintain the Air Conditioning System

Proposer should provide a complete listing of "All Special Tools and Equipment required to Maintain the air conditioning system" along with a complete listing of required tools and equipment needed to maintain the bus with the proposal.

Manufacturer shall supply all "Special Tools" prior to completion and delivery of first lot of buses if multiple bus builds are utilized.

Sets of Special Tools and Equipment required to maintain the air conditioning system should be priced separately from the bus in the Price Proposal. DTPW shall have the option to purchase up to fifteen (15) Sets of Special Tools.

#### Spare Parts and Components to Maintain the Air Conditioning System

Proposer should provide a complete and reasonable listing of all spare parts and components needed to maintain the air conditioning system. The listing shall contain pricing for each individual spare part and component as well as pricing for the complete set of spare parts and components.

All "Spare Parts and Components" shall have all the manufacturers latest improvements or design changes.

Sets of Spare Parts and Components Needed to Maintain the Air Conditioning System shall be priced separately from the bus in the Price Proposal. DTPW shall have the option to purchase up to twenty (20) Sets of Spare Parts and Components Needed to Maintain the Air Conditioning System and/or individual spare parts and components listed.

#### Special Training Required to Maintain Air Conditioning System

Contractor shall provide special Air Conditioning System Training to be conducted by the Air Conditioning system manufacturer at DTPW or a local facility in South Florida. This special training shall be more in-depth and detailed than the training provided by the bus manufacturer. Training shall include comprehensive diagnostics and repair of the air conditioning system components. The Contractor should provide a complete description of the Air Conditioning System manufacturer's training program with the proposal. Training classes shall consist of no more than (20) trainees per class.



Special Training Required to Maintain the Air Conditioning System shall be priced separately from the bus and from other specified training in the Price Proposal. DTPW shall have the option to purchase training for up to 50 trainees.

## **TS 51. Controls and Temperature Uniformity**

The HVAC system excluding the driver's heater/defroster shall be centrally controlled with an advanced electronic/diagnostic control system with provisions for extracting/reading data. The system shall be compliant with J1939 Communication Protocol for receiving and broadcasting of data.

Hot coolant water shall be delivered to the HVAC system driver's defroster/heater and other heater cores by means of an auxiliary coolant pump, sized for the required flow, which is brushless and sealless having a minimum maintenance free service life for both the brushless motor and the pump of at least 40,000 hours at full power. An electric heated defroster may be considered as equal.

The climate control system shall be fully automatic and control the interior average temperature to within  $\pm 2$  °F of specified temperature control set-point.

The temperature control set-point for the system shall be 72 °F.

The driver shall have full control over the defroster and driver's heater. The driver shall be able to adjust the temperature in the driver's area through air distribution and fans. The interior climate control system shall switch automatically to the ventilating mode if the refrigerant compressor or condenser fan fails.

Interior temperature distribution shall be uniform to the extent practicable to prevent hot and/or cold spots. After stabilization with doors closed, the temperatures between any two points in the passenger compartment in the same vertical plane, and 6 to 72 in. above the floor, shall not vary by more than 5 °F with doors closed. The interior temperatures, measured at the same height above the floor, shall not vary more than  $\pm 5$  °F from the front to the rear from the average temperature determined in accordance with APTA's "Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System." Variations of greater than  $\pm 5$  °F will be allowed for limited, localized areas provided the majority of the measured temperatures fall within the specified requirement.

## **TS 52. Air Flow**

### **TS 52.1 Passenger Area**

The cooling mode of the interior climate control system shall introduce air into the bus at or near the ceiling height at a minimum rate of 25 cubic ft per minute (cfm) per passenger based on the standard configuration bus carrying a number of passengers equal to 150 percent of the seated load. Airflow shall be evenly distributed throughout the bus, with air velocity not exceeding 100 ft. per minute on any passenger. The ventilating mode shall provide air at a minimum flow rate of 20 cfm per passenger.

Airflow may be reduced to 15 cfm per passenger (150 percent of seated load) when operating in the heating mode. The fans shall not activate until the heating element has warmed sufficiently to ensure at least 70 °F air outlet temperature. The heating air outlet temperature shall not exceed 120 °F under any normal operating conditions.

The climate control blower motors and fan shall be designed such that their operation complies with the interior noise level requirements.

No "Fresh Air" Requirements. DTPW has an operating profile where the door opening cycle results in effectively providing an adequate "fresh air" mixture.

## **TS 52.2 Driver's Area**

The bus interior climate control system shall deliver at least 100 cfm of air to the driver's area when operating in the ventilating and cooling modes. Adjustable nozzles shall permit variable distribution or shutdown of the airflow. Airflow in the heating mode shall be reduced proportionally to the reduction of airflow into the passenger area. The windshield defroster unit shall meet the requirements of SAE Recommended Practice J382, "Windshield Defrosting Systems Performance Requirements," and shall have the capability of diverting heated air to the driver's feet and legs. The defroster or interior climate control system shall maintain visibility through the driver's side window.

## **TS 52.3 Controls for the Climate Control System (CCS)**

The controls for the driver's compartment for heating, ventilation and cooling systems shall be integrated and shall meet the following requirements:

- The heat/defrost system fan shall be controlled by a separate switch that has an "off" position and at least two positions for speed control. All switches and controls shall preclude the possibility of clothing becoming entangled, and shields shall be provided, if required. If the fans are approved by the Agency, an "on-off" switch shall be located to the right of or near the main defroster switch.
- A manually operated control valve shall control the coolant flow through the heater core.
- If a cable-operated manual control valve is used, the cable length shall be kept to a minimum to reduce cable seizing. Heater water control valves shall be "positive" type, closed or open. The method of operating remote valves shall require the concurrence of the Agency project manager.

## **TS 52.4 Driver's Compartment Requirements**

A separate heating, ventilation and defroster system for the driver's area shall be provided and shall be controlled by the driver. The system shall meet the following requirements:

- The heater and defroster system shall provide heating for the driver and heated air to completely defrost and defog the windshield, driver's side window, and the front door glasses in all operating conditions. Fan(s) shall be able to draw air from the bus body interior and/or the exterior through a control device and pass it through the heater core to the defroster system and over the driver's feet. A minimum capacity of 100 cfm shall be provided. The driver shall have complete control of the heat and fresh airflow for the driver's area.
- The defroster supply outlets shall be located at the lower edge of the windshield. These outlets shall be durable and shall be free of sharp edges that can catch clothes during normal daily cleaning. The system shall be such that foreign objects such as coins or tickets cannot fall into the defroster air outlets. Adjustable ball vents or louvers shall be provided at the left of the driver's position to allow direction of air onto the side windows.

A ventilation system shall be provided to ensure driver comfort and shall be capable of providing fresh air in both the foot and head areas. Vents shall be controllable by the driver from the normal driving position. Decals shall be provided, indicating "operating instructions" and "open" and "closed" positions. When closed, vents shall be sealed to prevent the migration of water or air into the bus.

## **TS 52.5 Driver's Cooling**

Driver's booster blower shall be provided.

## **TS 53. Air Filtration**

Air shall be filtered before discharge into the passenger compartment. The filter shall meet the ANSI/ASHRAE 52.1 requirement for 5 percent or better atmospheric dust spot efficiency, 50 percent weight resistance, and a minimum dust holding capacity of 120 g per 1000 cfm cell. Air filters shall be easily removable for service.

Air filters shall be of disposable type.

### **TS 54. Roof Ventilators**

Two roof ventilators shall be provided in the roof of the bus, one approximately over or just forward of the front axle and the other approximately over the rear axle. The Contractor may propose a single roof ventilator provided that calculations showing that the bus has sufficient egress area is submitted to DTPW for approval.

Each ventilator shall be easily opened and closed manually. When open with the bus in motion, this ventilator shall provide fresh air inside the bus. The ventilator shall cover an opening area no less than 425 sq in. and shall be capable of being positioned as a scoop with either the leading or trailing edge open no less than 4 in., or with all four edges raised simultaneously to a height of no less than 3½ in. An escape hatch shall be incorporated into the roof ventilator. Roof ventilator(s) shall be sealed to prevent entry of water when closed.

A tool shall be provided to manually open and close hatch.

### **TS 55. Maintainability**

Manually controlled shut-off valves in the refrigerant lines shall allow isolation of the compressor and dehydrator filter for service. To the extent practicable, self-sealing couplings utilizing O-ring seals shall be used to break and seal the refrigerant lines during removal of major components, such as the refrigerant compressor. Shut-off valves may be provided in lieu of self-sealing couplings. The condenser shall be located to efficiently transfer heat to the atmosphere and shall not ingest air warmed above the ambient temperature by the bus mechanical equipment, or to discharge air into any other system of the bus. The location of the condenser shall preclude its obstruction by wheel splash, road dirt or debris. HVAC components located within 6 in. of floor level shall be constructed to resist damage and corrosion.

High and low refrigerant pressure electronic gauges to be located in the return air area.

### **TS 56. Entrance/exit area heating**

No requirements for entrance/exit area heating.

### **TS 57. Floor-Level Heating**

No requirements for floor-level heating.

## **EXTERIOR PANELS, FINISHES AND EXTERIOR LIGHTING**

### **TS 58. Design**

The bus shall have a clean, smooth, simple design, primarily derived from bus performance requirements and passenger service criteria. The exterior and body features, including grilles and louvers, shall be shaped to facilitate cleaning by automatic bus washers without snagging washer brushes. Water and dirt shall not be retained in or on any body feature to freeze or bleed out onto the bus after leaving the washer. The body and windows shall be sealed to prevent leaking of air, dust or water under normal operating conditions and during cleaning in automatic bus washers for the service life of the bus.

Exterior panels shall be sufficiently stiff to minimize vibration, drumming or flexing while the bus is in service. When panels are lapped, the upper and forward panels shall act as a watershed. However, if entry of moisture into the interior of the vehicle is prevented by other means, then rear cap panels may be lapped otherwise. The windows, hatches and doors shall be able to be sealed. Accumulation of spray and splash generated by the bus's wheels shall be minimized on windows and mirrors.

**TS 58.1 Materials**

Body materials shall be selected and the body fabricated to reduce maintenance, extend durability and provide consistency of appearance throughout the service life of the bus. Exposed fasteners shall be stainless steel. Detailing shall be kept simple, and add-on devices and trim shall be minimized and integrated into the basic design.

**TS 58.2 Roof-Mounted Equipment**

A non-skid, clearly marked walkway or steps shall be incorporated on the roof to provide access to equipment without damaging any system or bus paneling.

**TS 59. Pedestrian Safety**

Exterior protrusions greater than 1/2 inches and within 80 inches of the ground shall have a radius no less than the amount of the protrusions. The left side rearview mirror and required lights and reflectors are exempt from the protrusion requirement. No part of the right side rear view mirror may be within 80 inches of the ground.

Exterior protrusions shall not cause a line-of-sight blockage for the driver.

Grilles, doors, bumpers and other features on the sides and rear of the bus shall be designed to minimize the ability of unauthorized riders to secure footholds and handholds.

Exterior lights and audible warnings shall conform to the requirements found elsewhere in these Technical Specifications.

**TS 60. Repair and Replacement****TS 60.1 Side Body Panels**

Exterior body panels shall be stainless steel, aluminum, or fiberglass to resist rust and corrosion. Only exterior panels that are above the rubrail level may be structural components. Lower exterior panels shall be repairable or easily replaceable. If offered, lower exterior panels shall be removable resilient, impact resistant panels for protection against minor impacts and scratches.

A repair procedure for minor, medium, and major repair of the bus body shall be provided to DTPW for review and approval during the preproduction meeting.

**Spare Body Parts Sets**

The Proposer should provide a list of the most commonly used body parts with his proposal. The list shall include as a minimum:

- Front and rear bumpers
- Skirt panels
- Front cap
- Rear left and right corner panels
- Compartment doors and hinges
- Engine door
- Windshields
- Door panels and glazing
- Window glazing

DTPW shall review the list and determine the parts and quantities that will be included in each Spare Body Parts Set. Spare Body Parts Sets shall be provided by the Contractor and shall be priced separately from the bus in the Price Proposal. DTPW shall have the option to purchase up to ten (10) Spare Body Parts Sets.

## **TS 61. Rain Gutters**

Rain gutters shall be provided to prevent water flowing from the roof onto the side windows and passenger door. When the bus is decelerated, the gutters shall not drain onto the windshield, or driver's side window, or into the door boarding area. Cross sections of the gutters shall be adequate for proper operation, no less than 0.25 square inches.

## **TS 62. License Plate Provisions**

Provisions shall be made to mount a standard size U.S. license plate per SAE J686 on the rear of the bus. These provisions shall flush mount or recess the license plate so that they can be cleaned by automatic bus washing equipment without being caught by the brushes. License plates shall be mounted at the lower center or lower street side of the rear of the bus and shall not allow a toehold or handhold for authorized riders.

### **TS 62.1 Rub rails**

No requirement for rub rails.

## **TS 63. Fender Skirts**

Features to minimize water spray from the bus in wet conditions shall be included in wheel housing design.

### Fender Skirts

The Contractor shall provide an option for fender skirts. Any fender skirts shall be unbreakable and easily replaceable. They shall be flexible if they extend beyond the allowable body width. Wheels and tire shall be removable without disturbing the fender skirts. The fender skirts shall be priced separately from the bus in the Price Proposal.

## **TS 64. Wheel covers**

### Wheel covers

The Contractor shall provide an option for wheel covers. The wheel covers shall be priced separately from the bus in the Price Proposal.

### **TS 64.1 Splash Aprons**

Splash aprons, composed of 1/4 inch minimum composition rubberized fabric, shall be installed behind each wheel and shall extend downward to within 3 inches of the road surface. Apron widths shall be no less than tire widths. Splash aprons shall be bolted to the bus under structure. Splash aprons and their attachments shall be inherently weaker than the structure to which they are attached. Splash aprons and their attachments shall not be included in the road clearance measurements. Other splash aprons shall be installed where necessary to protect bus equipment.

## **TS 65. Service Compartments and Access Doors**

### **TS 65.1 Access Doors**

Conventional hinged doors shall be used for the engine compartment and for all auxiliary equipment compartments including doors for checking the quantity and adding to the engine coolant, engine oil, and transmission fluid. Access openings shall be sized for easy performance of tasks within the compartment including tool operating space. Access doors shall be of rugged construction, and shall be capable of withstanding severe abuse throughout the life of the bus. They shall close flush with the body surface. All doors shall be hinged at the top or on the forward edge and shall be automatically prevented from coming

loose or opening during transit service or in bus washer operations. All access doors shall be retained in the open position by props or counterbalancing with over center springs or pins. Doors with top hinges shall have safety props stored behind the door, on the door frame, or integral with the gas filled cylinders or springs. Hinges shall be stainless steel or rubber and shall last the service life of the bus. Springs shall be corrosion-resistant and shall last for the service life of the bus. Latch handles shall be flush with or recessed behind the body contour and shall be sized to provide an adequate grip for opening. Access doors, when opened, shall not restrict access for servicing other components or systems. Small access doors shall not incur damage if the door is opened up to 180 degrees so that it is folded flat against the bus body. Large access doors shall hinge up and out of the way or fold flat against the bus body and shall be easily opened by one person. A counter-balance, spring, or gas cylinder system shall assist opening large doors. Gas cylinders shall be used in pairs located on both ends of the door.

If precluded by design, the manufacturer should provide door design information specifying how the requirements are met.

## **TS 65.2 Access Door Latch/Locks**

### **Requirement for Latches on Access Doors**

Major access doors shall be equipped with locks requiring a nominal 5/16 inch, square end tool to open. The locks shall be standardized so that only one tool is required to open all major access doors on the bus. The lock for the engine compartment door shall latch automatically when the door is shut.

## **TS 66. Bumpers**

### **TS 66.1 Location**

Bumpers shall provide impact protection for the front and rear of the bus with the top of the bumper being 27 in.,  $\pm 2$  in., above the ground. Bumper height shall be such that when one bus is parked behind another, a portion of the bumper faces will contact each other.

### **TS 66.2 Front Bumper**

Front bumper shall be black Romeo Rim (or approved equal) "Help" type energy absorbing bumper system with anti-ride slope feature and wrap around ends to protect all corners. Construction shall be a polyurethane elastomer shell material, to provide for high tear resistance, tensile strength puncture resistance, and low temperature flexibility. It shall be filled with a controlled cellular polyurethane foam.

Characteristics shall be:

Flexural Modules	225,000 psi ambient 95,000 psi at 120 degrees C, ASTM method D790.
Tensile Strength	5,000 psi minimum, ASTM method D638, D412.
Elongation	550% minimum, ASTM method D412.
Durometer	85-87 shore minimum, ASTM method D2240.
Tear Strength	1,000 psi minimum
Cold Flex	Minimum 1/4" Mandrel after 12 hours at -60 degrees F.
Puncture Resistance	750 pounds minimum, SAE method J918C.

Bumper height, with the bus at normal ride height, shall be  $28 \pm 2$  inches to the top of the bumper. Bumper height shall be such that when one bus is parked behind another, a portion of the bumper faces will contact each other.

The bumper shall be independent of all power systems of the bus and shall not require service or maintenance in normal operation during the service life of the bus.

Options for Bike Racks shall be provided as described below:

#### Bike Rack

The Contractor shall provide options for bike racks installed on the interior of the bus to accommodate a minimum of four (4) bicycles. Decals containing operating instructions in Creole, Spanish, and English language shall be provided on each rack. A quick release bracket shall be provide to remove and replace the bike rack. The design, location, and operation of bike racks installed on the interior of the bus shall be approved by DTPW prior to production. The interior bike rack options shall be priced separately from the bus in the Price Proposal.

The Contractor shall provide options for exterior bright stainless steel, three position bike rack, Sportworks Apex 3, Mid-West BYK-RAK, or approved equal installed on the front bumper of each bus. Decals containing operating instructions in Creole, Spanish, and English language shall be provided on each rack. A quick release bracket shall be provide to remove and replace the bike rack. The design, location, and operation of the exterior three position bike rack shall be approved by DTPW prior to production. The exterior bike rack options shall be priced separately from the bus in the Price Proposal.

#### Curb Feeler

The contractor shall provide an option for a curb feeler to alert the operator of proximity to the loading platform. The design and location of the curb feeler shall be approved by DTPW prior to production. The curb feeler option shall be priced separately from the bus in the Price Proposal.

### **TS 66.3 Rear Bumper**

Rear bumper shall be black Romeo Rim (or approved equal) "Help" type energy absorbing bumper system with anti-ride slope feature and wrap around ends to protect all corners. Construction shall be a polyurethane elastomer shell material, to provide for high tear resistance, tensile strength puncture resistance, and low temperature flexibility. It shall be filled with a controlled cellular polyurethane foam.

Characteristics shall be:

Flexural Modules	225,000 psi ambient 95,000 psi at 120 degrees C, ASTM method D790.
Tensile Strength	5,000 psi minimum, ASTM method D638, D412.
Elongation	550% minimum, ASTM method D412.
Durometer	85-87 shore minimum, ASTM method D2240.
Tear Strength	1,000 psi minimum
Cold Flex	Minimum 1/4" Mandrel after 12 hours at -60 degrees F.
Puncture Resistance	750 pounds minimum, SAE method J918C.

Bumper height, with the bus at normal ride height, shall be  $28 \pm 2$  inches to the top of the bumper. Bumper height shall be such that when one bus is parked behind another, a portion of the bumper faces will contact each other.

The bumper shall be independent of all power systems of the bus and shall not require service or maintenance in normal operation during the service life of the bus.

## **TS 66.4 Bumper Material**

Bumper material shall be corrosion-resistant and withstand repeated impacts of the specified loads without sustaining damage. Visible surfaces shall be black. These bumper qualities shall be sustained throughout the service life of the bus.

## **TS 67. Finish and Color**

### **TS 67.1 Appearance**

All exterior surfaces shall be smooth and free of wrinkles and dents. Exterior surfaces to be painted shall be properly prepared as required by the paint system Supplier prior to application of paint to assure a proper bond between the basic surface and successive coats of original paint for the service life of the bus. Drilled holes and cutouts in exterior surfaces shall be made prior to cleaning, priming and painting, where possible, to prevent corrosion. The bus shall be completely painted prior to installation of exterior lights, windows, mirrors and other items that are applied to the exterior of the bus. Body filler materials may be used for surface dressing, but not for repair of damaged or improperly fitted panels.

Paint shall be applied smoothly and evenly with the finished surface free of visible dirt and the following other imperfections:

- blisters or bubbles appearing in the topcoat film
- chips, scratches, or gouges of the surface finish
- cracks in the paint film
- craters where paint failed to cover due to surface contamination
- overspray
- peeling
- runs or sags from excessive flow and failure to adhere uniformly to the surface
- chemical stains and water spots
- dry patch due to incorrect mixing of paint activators
- buffing swirls

All exterior finished surfaces shall be impervious to diesel fuel, gasoline and commercial cleaning agents. Finished surfaces shall resist damage by controlled applications of commonly used graffiti-removing chemicals.

Proper adhesion between the basic surface and successive coats of the original paint shall be measured using an Elcometer adhesion tester as outlined in ASTM D4541-85. Adhesion shall be a minimum 300 ft-lbs. The bus manufacturer shall supply test samples of the exterior surface for each step of the painting process that may be subject to adhesion testing per ASTM G4541-87 and ASTM D4145-85. ASTM D4541-93 may be used for inspection testing during assembly of the vehicle.

The bus exterior shall be painted with a PPG epoxy primer, 1-1.5 mils dry film, and a PPG DGHS graffiti resistant topcoat, minimum 2 mils dry film. A comparable Dupont paint system will be accepted as approved equal.

The exterior finish shall meet the following requirements:

#### SPECIFICATION

Salt Spray Resistance -  
Minimum 500 hours

#### TEST METHOD

ASTM B117



Adhesion - 90%	ASTM D3359-93 Method B
Humidity Resistance - 90% after 24 hr. recovery	ASTM D1735
Impact Resistance - No cracking at 40 lbs.	ASTM D2794
Film Hardness by Pencil Test - Minimum HB-F hardness	ASTM D3363
Accelerated Weathering by UV - 85% gloss retention after 500 hours QUV	ASTM D4587
Specular Gloss - 90 plus using 20 degree gloss meter	ASTM D523-89

Proposers should submit Test Reports or Certifications of Compliance for the paint products that will be supplied, with their Requests for Approved Equals.

Proposers are requested to propose dramatic and contemporary color schemes and graphics for the exterior of the bus. Note that at least six (6) different colors shall be provided on the color schemes and graphics for the exterior of the bus and the color schemes and graphics shall include detailed drawings of the front, rear, both sides, and roof of the bus that will be supplied. Striping and graphics shall not be silk-screened.

A detailed description of paints, color scheme and graphics shall be submitted to DTPW for review and approval during the pre-production meeting.

### **TS 68. Decals, Numbering and Signing**

Monograms, numbers and other special signing shall be applied to the inside and outside of the bus as required. Signs shall be durable and fade-, chip- and peel-resistant. They may be painted signs, decals or pressure-sensitive appliques. All decals shall be installed per the decal Supplier recommendations. Signs shall be provided in compliance with the ADA requirements defined in 49 CFR Part, Subpart B, 38.27.

Contractor shall furnish and apply all decals. Final sizes and locations shall be approved by DTPW. Contractor should provide the list of all decals, including samples or drawings of all listed decals, for DTPW approval prior to production. Trilingual (English, Spanish, and Creole) instructions for decals containing identification of windows, hatches, etc., shall be provided.

#### Logo

A "Miami-Dade County" logo must be incorporated into the graphics to be used on the exterior of the bus. The logo must be displayed, at minimum, on the curb side of the bus and the front of the bus. The colors to be used in the logo are blue and green. (PMS numbers for colors to be issued by addendum at a later date). Sample logo to be provided by DTPW prior to production of buses.

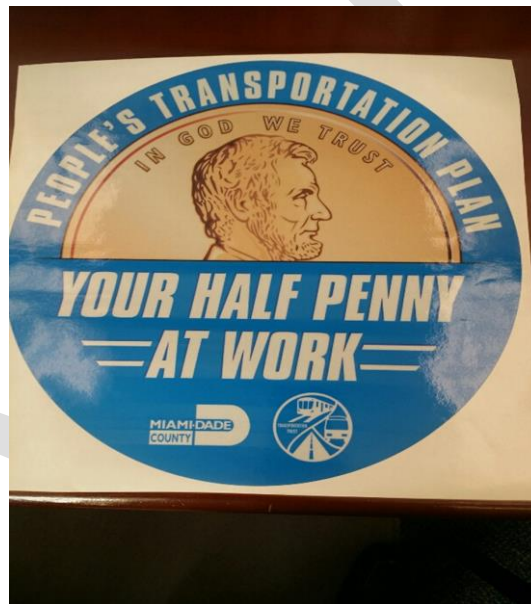
#### Bus Numbering

A five-digit identification number assigned to the vehicle by DTPW will be placed by the Contractor below the front windshield on the right side of the front panel, over front entry door, over driver's window, at the left and right side near the rear of the bus, and on the top curbside of the rear. Decal vehicle numbers shall be 4" high Helvetica Bold black on the sides and front, white on the rear. The vehicle identification number shall be painted on the roof of the bus using black 24" Swis721 Bt numerals.

Decals shall be provided in compliance with the ADA requirements defined in 49 CFR Part 38, Subpart B, 38.27. A "Wheelchair" decal with a blue background and white wheelchair symbol shall be placed on or adjacent to the wheelchair ramp door. A decal with a blue background, white wheelchair symbol, white lettering, and bilingual instructions "Please allow w/c customers passengers to board/exit first" shall be placed by the passenger door. A "Kneeling Bus" bilingual decal with black letters on yellow background shall be placed adjacent to the entry door below the windows.

A "People's Transportation Plan" decal will be required in three locations on the bus. A sample will be provided by DTPW prior to production of buses.

"People's Transportation Plan" decal



A decal indicating the location of the master battery switch shall be located on the exterior access panel.

A detailed signs and decals description shall be submitted to DTPW for review and approval prior to production.

#### Material

Exterior graphics material shall be 3M Scotchlite Reflective Sheeting Series 690 with Controltac adhesive. Film shall be pigmented. Silk-screened decals will not be acceptable.

Application material shall be 3M Application Tape, SCPM-3.

Prespacing material shall be 3M Prespacing Tape, SCPS-2.

#### Other Decals

The contractor shall provide interior signage and mechanical compartment signage. Final wording and exact location and placement will be determined prior to production.

The following is a draft list of informational decals required by DTPW. A final list will be approved prior to production.

---

English - Priority Seating For seniors and riders with disabilities.  
Federal law requires that these seats must be relinquished upon request.

Spanish - Asientos para el uso de personas mayores o incapacitadas.  
La ley federal requiere que estos asientos sean sedidos sobre el pedido.

Creole - Plas Rezève Pou pasaje grandèt ak pasaje enfim yo.  
Lalwa federal egzije ke yo sede syèj sa yo bay moun sou demann.





English- Watch Your Step

Spanish - Precaucion al subir

Creole - Atansyon Eskalye



English - Stand Behind Yellow Line While Bus Is In Motion

Spanish - Permanezca detras de la linea amarilla mientras el autobus este en movimiento

Creole - Rete Kanpe Dèyè Liy Jòn la Lè Bis la ap Deplase





English - This Bus May Be Monitored By Surveillance Cameras

Spanish -Este bus puede estar vigilado por camaras de seguridad

Creole - Bis sa-a Gen Dwa sou Siveyans Kamera



English - Push Button For Next Stop

Spanish - Para indicar su parada oprima el boton

Creole - Peze Bouton an Pou Pwochen Estòp la





English - Wait For Green Light  
Then Touch Door To Open

Spanish - Espere por la luz verde, entonces toque la puerta para abrirla

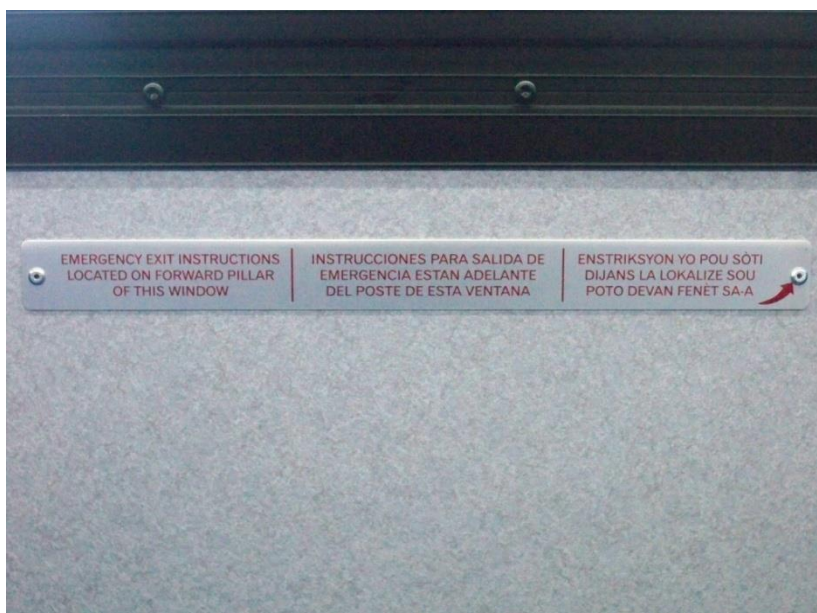
Creole - Tann Limyè Vèt la  
Epi Manyen Pòt la Pou Ouvè li



English - Emergency Exit Instruction

Spanish - Salida de emergencia instruccion

Creole - Enstriksyon Pou Sòti Dijans



English - To Open Door Manually  
Break Cover  
Pull Handle

Spanish - Para Abrir la puerta manualmente  
Romper Cubierta  
Hale la Manija

Creole - Pou Ouvè Pòt la Manyèlman  
Kase Kouvèk la  
Rale Manch la



English - To Open Door Manually  
Break Cover  
Turn Handle

Spanish - Para Abrir la puerta manualmente  
Romper Cubierta  
Gire la Manija

Creole - Pou Ouvè Pòt la Manyèlman  
Kase Kouvèk la  
Tounen Manch la



English - Emergency Exit

Spanish - Salida de emergencia

Creole -Sòti Dijans

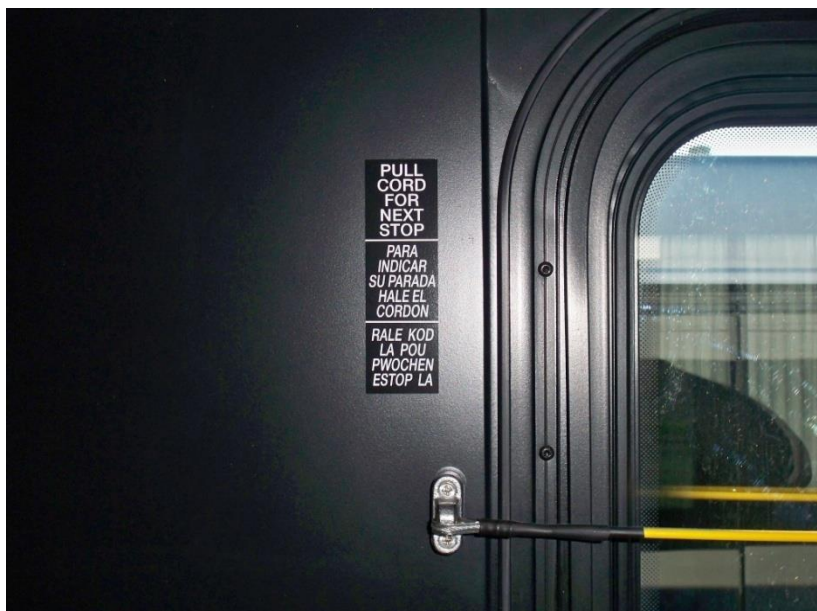




English - Pull Cord For Next Stop

Spanish - Para indicar su parada hale el cordon

Creole -Rale Kòd La Pou Pwochen Estòp la



English - Please allow customers in wheelchairs to board and exit first –

Spanish - Permita que usuarios en sillas de ruedas entren y salgan primero.

Creole -Tanpri kite kliyan ki nan chèz woulant yo monte oswa desann anvan



English – Pull Red Handle Down and Hold While Pushing Window Out at Bottom  
 Spanish – Jale la manija roja y sostengala mientras empuja la parte de abajo de la ventana  
 Creole – Pouse ak kenbe manch wouj la desann pandan wap pouse anba fenet la





English -Kneeling Bus

Spanish- Autobus Inclínable

Creole - Bis ki Desann Ba



English- Caution: Do Not Stand In Designated Area  
Do Not Lean Against Door

Spanish - Cuidado: No Se Pare en el Areadesignada  
No Se Apoye Contra La Puerta

Creole – Atansyon: Pa Kanpe Nan Zon Ki Dezinyen Yo  
Pa Apiye Sou Pòt La



English – Exit Door

Spanish – Puerta de Salida

Creole –Pòt Sòti



---

Curbside Wheelhouse

English only:

No Sitting Or Objects In This Area



Bike Rack Decals :

English:

1. Squeeze And Pull
2. Put Front Wheel Here
3. Rotate Handle, Pull Handle To Stow

Spanish:

1. Apriete y Levante
2. Ponga La Rueda Delantera Aqui
3. Gire La Manija, Jale La Manija Para Guardar

Creole:

1. Peze Epi Tire
2. Mete Wou Devan Yo La A
3. Vire Manch La Tounen, Tire Manch La Pou Ranje Bisiklèt

---

Wheelchair Ramp Metallic Placard:

English only:

RAMP INSTALLATION MEETS STATE OF  
FLORIDA MINIMUM REQUIREMENTS

**TS 68.1 Passenger Information**

ADA priority seating signs as required and defined by 49 CFR, Part 38.27 shall be provided to identify the seats designated for passengers with disabilities.

Requirements for a public information system in accordance with 49 CFR, Part 38.35 shall be provided.

**TS 69. Exterior Lighting**

Exterior lighting and reflectors shall comply, as applicable, with Part 393, Subpart B of the FMCSA and FMVSS 108.

All exterior lights must be of a waterproof design and meet U.S. /DOT requirements. Commercially available LED-type lamps shall be utilized at all exterior lamp locations. Lamps, lenses and fixtures shall be interchangeable to the extent practicable. Two hazard lamps at the rear of the bus shall be visible from behind when the engine service doors are opened. Light lenses shall be designed and located to prevent damage when running the vehicle through an automatic bus washer. Front marker (clearance) lights along with lights located on the roof and sides of the bus shall have protective shields or be of the flush mount type to protect the lens against minor impacts.

All exterior lights with the exception of the headlamps shall be Dialight LED potted, shock protected lamps, or approved equal. The lights shall have a remote ground. The light shall be sealed to prevent entry and accumulation of moisture or dust. Each lamp shall be replaceable in less than 5 minutes. Lamps and fixtures shall be interchangeable to the extent practicable.

Two 4" minimum combination stop and tail lights and two 4" minimum amber directional signal lights, both Dialight LED or approved equal, shall be provided at rear of bus. In addition to the standard rear directional signals, upper directional signals shall be mounted at least eight feet (8') above the street. Upper signals shall be minimum four inches (4") diameter amber LED.

Identification lights (Michigan marker lights, individual type) shall be mounted at the front and rear center of the roof crown panels. Front lights shall be amber LED and rear lights shall be red LED. All marker lights must be designed so that water will not intrude into the interior of the bus.

Four roof marker lights shall be installed. The LED marker lights at the front and rear upper corner of the coach shall be flush mounted type to preclude breakage by the three limbs, coach washer, etc. The two forward lights shall be amber LED, the two rear lights shall be red LED.

Wheelchair ramp service area lights shall be white LED and shall conform to ADA requirements 49 CFR Part 38, Subpart B, Sec.38.31 Lighting (a) Any stepwell or doorway immediately adjacent to the driver shall have, when the door is open, at least 2 foot-candles of illumination measured on the step tread or lift platform b) Other stepwells and doorways, including doorways in which lifts or ramps are installed, shall have, at all times, at least 2 foot- candles of illumination measured on the step tread, or lift or ramp, when deployed at the vehicle floor level.

Exterior lighting configuration shall be provided to DTPW for review and approval during the pre-production meeting.

**TS 69.1 Backup Light/Alarm**

Two (2) white LED back-up lights shall be provided and controlled automatically by the reverse gear selector. Visible and audible warning shall inform following vehicles or pedestrians of reverse operation. Visible reverse operation warning shall conform to SAE Standard J593. Audible reverse operation warning shall

conform to SAE Recommended Practice J994-Type C or D. Back-up lamps shall be Dialight LED, or approved equal.

### **TS 69.2 Doorway Lighting**

Lights at the front and rear passenger doorways and curb lights shall comply with ADA requirements. The lights shall activate only when the doors open and the master run switch is in the "Night Run" or "Lights" positions and shall illuminate the street surface to a level of no less than 1 foot candle for a distance of 3 feet outward from the step tread edge. The lights shall be in accordance with the latest provisions of 49 CFR 609.15. Lights shall be shielded to protect passengers' eyes from glare.

### **TS 69.3 Turn Signals**

Turn-signal lights shall be provided on the front, rear, curb and street sides of the bus in accordance with FMVSS 108 and Part 393, Subpart B of the FMCSA as applicable and shall be of the armored LED type with amber lenses. The side turn signals shall be located opposite each other and in line.

Directional signals shall be operated by self-canceling momentary foot switches (left, right, or both) or pedestal type housing on the left of the steering column. Directional signal tell-tale lights shall be located on dash. Flasher operation shall be controlled by the bus multiplex system. In addition to the momentary foot switch, a heavy duty toggle switch or rocker switch near the door control shall activate the hazard warning lights. Hazard warning lights shall operate automatically with the engine run switch on, when the transmission is in gear and the door is open.

Two hazard lamps at the rear of the bus shall be visible from behind when the engine service doors are opened.

### **TS 69.4 Headlights**

Headlights shall be LED. Headlamps shall be designed for replacement without removing the headlamp bezel. Standard OEM headlight installation shall be provided in accordance with FMVSS 108 and Part 393, Subpart B of the FMCSA as applicable.

Headlamps shall incorporate a daytime running light feature.

### **TS 69.5 Brake Lights**

Brake lights shall be provided in accordance with FMVSS 108 and Part 393, Subpart B of the FMCSA as applicable.

Bus shall include red, high and center mount brake lamp(s) along the backside of the bus in addition to the lower brake lamps required under FMVSS 108. The high and center mount brake lamp(s) shall illuminate steady with brake application.

### **TS 69.6 Service Area Lighting (Interior and Exterior)**

LED lamps shall be provided in the engine and all other compartments where service may be required to generally illuminate the area for night emergency repairs or adjustments. These service areas shall include, but not be limited to, the engine compartment, the communication box, junction/apparatus panels and passenger door operator compartments. Lighting shall be adequate to light the space of the service areas to levels needed to complete typical emergency repairs and adjustments. The service area lamps shall be suitable for the environment in which they are mounted.

Engine compartment lamps shall be controlled by a switch mounted near the rear start controls. All other service area lamps shall be controlled by switches mounted on or convenient to the lamp assemblies. Power to the service area lighting shall be programmable. Power shall latch on with activation of the switch and shall be automatically discontinued (timed out) after 30 minutes to prevent damage caused by inadvertently leaving the service area lighting switch in the on position after repairs are made.

**INTERIOR PANELS AND FINISHES****TS 70. General Requirements**

Materials shall be selected on the basis of maintenance, durability, appearance, safety, flammability and tactile qualities. Materials shall be strong enough to resist everyday abuse and be vandalism and corrosion resistant.

This interior shall be generally pleasing, simple, modern, and free from superficial design motifs. It shall have no sharp depressions or inaccessible areas and shall be easy to clean and maintain. To the extent practicable, all interior surfaces more than 10 inches below the lower edge of the side windows or windshield shall be shaped so that objects placed on them fall to the floor when the bus is parked on a level surface.

Handholds, lights, air vents, armrests, and other interior fittings shall appear to be integral with the bus interior. Trim and attachment details shall be kept simple and unobtrusive. Interior trim shall be secured to avoid resonant vibrations under normal operational conditions. There shall be no sharp, abrasive edges and surfaces and no unnecessary hazardous protuberances.

**TS 71. Interior Panels**

Panels shall be easily replaceable and tamper-resistant. They shall be reinforced, as necessary, to resist vandalism and other rigors of transit bus service. Individual trim panels and parts shall be interchangeable to the extent practicable.

Materials shall be selected on the basis of maintenance, durability, appearance, safety, flammability, and tactile qualities. Materials shall be strong enough to resist everyday abuse and vandalism and shall be resistant to scratches and markings.

All plastic and synthetic materials used inside the bus shall be fire resistant to comply with FMVSS-302.

Materials used in the construction of the Passenger Compartment of the bus shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90A, dated October 20, 1993. Materials entirely enclosed from the passenger compartment, such as insulation within the sidewalls, and smaller components and items, such as switch knobs and small light lenses, shall be exempted from this requirement.

The Contractor shall certify that combustible materials to be used in the construction of these buses have been tested by a recognized testing laboratory and that the results are within the recommended limits as specified by the Federal Transit Administration.

Interior panels may be integral with, or applied to, the basic bus structure. They shall be decorated in accordance with the interior specified. Use of moldings and small pieces of trim shall be minimized, and all parts shall be functional.

Interior panels shall be attached so that there are no exposed edges or rough surfaces. Panels and fasteners shall not be easily removable by passengers. Interior trim fasteners, where required, shall be rivets or cross-recessed head screws.

Where doors open inward (slide glide), barriers shall prevent passengers from standing where they could be struck by an opening door.

**TS 71.1 Driver Area Barrier**

An operator's area barrier shall be provided for the driver's security and personal protection. The barrier shall enclose the driver and prevent passengers from reaching the driver or the driver's personal effects.

A rear barrier between the driver and the left front passenger seat shall extend from the floor level to the ceiling. A side barrier enclosure door shall be located on the right side of the driver's area extending from the rear barrier forward. A door shall allow for easy access into and out of the driver's area. The exterior skin of the barrier shall be constructed of stainless steel with a slight corrugated texture or other architecturally pleasing finish approved by DTPW. The operator's barrier shall be constructed so as to prevent unauthorized entry or intrusion into the driver's area, yet allow the driver to converse with passengers. All passenger seat positions shall be visible to the driver either directly or by mirror. The barrier shall not hinder the driver's performance in any manner. It shall not be a source of any rattling or noise. The enclosure door shall be secured from the inside and the latch to open the door shall be flush mounted so that clothing or other articles cannot be caught on it. A handle shall be provided on the inside of the door to assist the driver in opening and closing the door. The door shall be equipped with a spring or other device to automatically return the door to the closed position. The enclosure door shall be a fixed ½" polycarbonate panel which will not interfere with the driver's view through the front windshield or the rear view mirrors. The door panel shall not reflect glare at the driver or cast glare onto the windshield. The door panel shall be covered on both sides with a removable clear scratch guard, 3M Scotchgard Multi-Layer Protective Film -1004MS or approved equal. Driver's area trim shall be satin black. The barrier shall eliminate glare from interior lighting during night operation. A driver's personal effects box approximately 20" W x 15" H x 10" D shall be incorporated into the operator's barrier. The Contractor should submit concept drawings, for evaluation of the proposed barrier, at the time of Requests for Approved Equals. The Contractor must obtain DTPW's approval of the concept drawings prior to Bid Submittal. Prior to production of the pilot bus, a full scale mockup of the driver's compartment area shall be constructed for DTPW approval of the operator's barrier design.

DTPW is aware that the ArowGuard driver protection system with sliding two piece glass system (one piece, full driver's door with bottom solid and top with sliding window) is known to meet this requirements.

## **TS 71.2 Modesty Panels**

Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior trim shall be provided to act as both a physical and visual barrier for seated passengers. Modesty panels shall be located at doorways to protect passengers on adjacent seats, and along front edge of rear upper level. Design and installation of modesty panels located in front of forward facing seats shall include a handhold/grabhandle along its top edge. These dividers shall be mounted on the sidewall and shall project toward the aisle no farther than passenger knee projection in longitudinal seats or the aisle side of the transverse seats. Modesty panels shall extend no higher than the lower daylight opening of the side windows and those forward of transverse seats shall extend downward to a level between 1-1/2 and 1 inches above the floor. Panels forward of longitudinal seats shall extend to below the level of the seat cushion. Dividers positioned at the doorways shall provide no less than a 2-1/2-inch clearance between the modesty panel and the opened door to protect passengers from being pinched. Modesty panels installed at doorways shall be equipped with grab rails. The modesty panel and its mounting shall withstand a static force of 250 pounds applied to a four-inch by four-inch area in the center of the panel without permanent visible deformation.

Weather shields of clear ½" polycarbonate shall be installed forward of the rear exit door above the seat back. The clear weather shield shall be covered on both sides with a removable clear scratch guard, 3M Scotchgard Multi-Layer Protective Film -1004MS or approved equal.

## **TS 71.3 Front End**

The entire front end of the bus shall be sealed to prevent debris accumulation behind the dash and to prevent the driver from kicking or fouling wiring and other equipment with his feet. The front end shall be free from protrusions that are hazardous to passengers standing or walking in the bus during rapid decelerations. Paneling across the front part of the bus and any trim around the driver's compartment shall be formed metal or plastic material. Formed metal dash panels shall be painted and finished to exterior quality. Plastic dash panels shall be vandal-resistant, replaceable, and reinforced to support dash mounted communications and fare collection equipment required by DTPW. All colored, painted and plated parts forward of the driver's barrier shall be finished with a dull matte black color.



### **TS 71.4 Rear Bulkhead**

The rear bulkhead and rear interior surfaces shall be materials suitable for exterior skin, painted and finished to exterior quality, or paneled with melamine type material or plastic, and trimmed with stainless steel, anodized aluminum, or plastic. Colors, patterns, and materials shall match or coordinate with the balance of the bus interior.

The rear bulkhead paneling shall be contoured in such a way that it shall not have a tendency to collect trash. Any air vents in this area shall be louvered to reduce air flow noise and to reduce the probability of trash or litter being thrown or drawn through the grille. The panel, or sections thereof, shall be removable to service components located on the rear bulkhead.

### **TS 71.5 Headlining**

Headlining panels shall be white melamine or approved equal. Headlining shall be supported to prevent buckling, drumming, or flexing and shall be secured without loose edges. Headlining materials shall be treated or insulated to prevent marks due to condensation where panels are in contact with metal members. Moldings and trim strips, as required to make the edges tamperproof, shall be stainless steel, aluminum, or plastic, colored to complement the ceiling material. Headlining panels covering operational equipment that is mounted above the ceiling shall be on hinges for ease of service, but retained to prevent inadvertent opening.

### **TS 71.6 Fastening**

Interior panels shall be attached so that there are no exposed unfinished or rough edges or rough surfaces. Fasteners should be corrosion resistant. Panels and fasteners shall not be easily removable by passengers. Exposed interior fasteners should be minimized, and where required shall be tamper-resistant.

### **TS 71.7 Insulation**

Any insulation material used between the inner and outer panels shall minimize the entry and/or retention of moisture. Insulation properties shall be unimpaired during the service life of the bus. Any insulation material used inside the engine compartment shall not absorb or retain oils or water and shall be designed to prevent casual damage that may occur during maintenance operations.

The combination of inner and outer panels on the sides, roof, wheel wells and ends of the bus, and any material used between these panels, shall provide a thermal insulation sufficient to meet the interior temperature requirements. The bus body shall be thoroughly sealed so that the driver or passengers cannot feel drafts during normal operations with the passenger doors closed.

Insulation shall meet the requirements of FMVSS 302.

All insulation materials shall comply with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated October 20, 1993.

### **TS 71.8 Floor Covering**

The floor covering shall have a non-skid walking surface that remains effective in all weather conditions and complies with all ADA requirements including Part 38, Subpart B, Sec. 38.25 Doors, steps and thresholds: (a) *Slip resistance. All aisles, steps, floor areas where people walk and floors in securement locations shall have slip-resistant surfaces.* (b) *Contrast. All step edges, thresholds and the boarding edge of ramps or lift platforms shall have a band of color(s) running the full width of the step or edge which contrasts from the step tread and riser, or lift or ramp surface, either light-on-dark or dark-on-light.*

The floor covering shall be vinyl highly slip resistant, durable, resilient, UV and oil resistant, and shall resist abrasion and wear. The floor covering shall be designed for ease of maintenance and cleaning, and shall last the life of the bus with a minimum 12 year warranty.

The floor covering, as well as transitions of flooring material to the main floor and to the entrance and exit area, shall be smooth and present no tripping hazards. Seams shall be sealed/welded per manufacturer's specifications. The floor covering material shall be minimum 2.7mm thick.

The floor covering color and pattern will be selected prior to production. The floor color and pattern shall be consistent throughout the bus except step nosings, step treads, standee line and other areas requiring contrasting markings as noted.

DTPW is aware that the Gerflor - Tarabus Helios NT 8806 Rhodium floor covering is known to meet this requirements.

#### Entry and Exit Door Areas

The outboard edge of the entrance door and exit door area floor covering shall have a yellow step nosing approximately three inches deep and the full width of the entrance door and exit door step treads.

#### Interior Step (if applicable)

The center aisle interior step landing between the lower and upper floors shall be entirely yellow. The step nosing of the upper floor shall be yellow, approximately three inches deep, and the full width of the top step tread

#### Standee Line

A yellow standee line shall extend across the bus aisle immediately aft of the entry vestibule area. The standee line shall be approximately 2½ inches wide and shall extend between the driver's barrier and the front curbside wheelhouse or front door modesty panel.

#### Operator's Platform

A yellow step nosing approximately two inches wide shall extend along the entire edge of the operator's platform.

#### Safety Markings

Any areas on floor, which are not intended for standees, such as but not limited to areas "swept" during passenger door operation, on inward sweeping doors, shall be clearly and permanently marked.

#### **Floor Covering Installation:**

All floor covering edges except level butted/welded edges shall be protected by stainless steel or clear anodized aluminum trim.

The floor covering material shall be free of bubbles, scratches, gouge marks, and discoloration.

#### **TS 71.9 Interior Lighting**

The light source shall be located to minimize windshield glare, with distribution of the light focused primarily on the passengers' reading plane while casting sufficient light onto the advertising display. The lighting system may be designed to form part of or the entire air distribution duct.

The interior lighting system shall be the I/O Control LED based Dinex Lighting System or approved equal.

The lens material shall be translucent polycarbonate. Lenses shall be designed to effectively "mask" the light source. Lenses shall be sealed to inhibit incursion of dust and insects yet be easily removable for service. Access panels shall be provided to allow servicing of components located behind light panels. If necessary, the entire light fixture shall be hinged.

**TS 71.10 Passenger**

The following indications for interior lights shall be used to eliminate glare in the driver's area and on the windows:

Interior lights shall be controlled by a three- position switch. When the switch is in the "OFF" position, all interior lights are extinguished regardless of the master run switch position. When "ON", all interior lights are illuminated regardless of the master run switch position. When in "NORMAL" with the master run switch in "NIGHT RUN", the lamps are all illuminated when the entry door is OPEN. When in "NORMAL" with the master run switch in "NIGHT RUN", the first and second curbside module of interior lights and the first roadside module of interior light shall be designed as to automatically extinguish when the entry door is closed.

A description of the feature used for the first light modules extinguish when the front door opens shall be submitted to DTPW for review and approval prior to production.

The floor surface in the aisle shall be illuminated to no less than 10 foot-candles. Floor surface in the vestibule shall be illuminated to no less than 4 foot-candles with the front door open and to no less than 2 foot-candles with the front door closed. Fluorescent lighting shall not be installed above the driver's side window and the front door. Lamp fixtures and lenses shall be fire resistant and shall not drip flaming material onto seats or interior trim if burned. The fixtures shall be sealed to prevent accumulation of dust and insects, but shall be easily openable on hinges for cleaning and service. The lenses shall be retained in a closed position and, if threaded fasteners are used, they must be captive in the lens with cross recessed type heads.

**TS 71.11 Driver Area**

The driver's area shall have a light to provide general illumination and it shall illuminate the half of the steering wheel nearest the driver to a level of 10 to 15 foot candles. This light shall be controlled by a switch that is convenient to the driver. Power for this light must be turned off when the master switch is in the "off" position.

**TS 71.12 Seating Areas**

The interior lighting system shall provide a minimum 15 foot-candle illumination on a 1 sq ft plane at an angle of 45 degrees from horizontal, centered 33 in. above the floor and 24 in. in front of the seat back at each seat position. Allowable average light level for the rear bench seats shall be 7 foot-candles.

**TS 71.13 Vestibules/Doors**

Floor surface in the aisles shall be a minimum of 10 foot-candles, and the vestibule area a minimum of 4 foot-candles with the front doors open and a minimum of 2 foot-candles with the front doors closed. The front entrance area and curb lights shall illuminate when the front door is open and master run switch is in the "lights" positions. Rear exit area and curb lights shall illuminate when the rear door is unlocked.

**TS 71.14 Step Lighting**

LED step lighting for the intermediate steps between lower and upper floor levels shall be a minimum of 4 foot-candles and shall illuminate in all engine run positions. The step lighting shall be water proof, low-profile to minimize tripping and snagging hazards for passengers, and shall be shielded as necessary to protect passengers' eyes from glare.

**TS 71.15 Ramp Lighting**

LED Exterior and interior ramp lighting shall comply with CFR Part 49, Sections 19.29 and 19.31.

## **TS 71.16 Farebox Lighting**

An LED light fixture shall be mounted in the ceiling above the farebox location. The fixture shall be capable of projecting a concentrated beam of light on the farebox. This light will automatically come on whenever the front doors are opened and the run switch is in the “night run” or “night park” position.

## **TS 72. Fare Collection**

The electronic farebox shall be furnished and installed by the Contractor. The Contractor will provide quotes for different models like the present GENFARE Odyssey, new model Fast Fare or equivalent and DTPW will make the decision which farebox type to be provided to assure compatibility with the present Automated Fare Collection System (AFCS) based on the use of the EASY Card and our branded Barcode products. To be considered a farebox need to interface with Cubic Transportation System (CTS) provided Driver Control Unit (DCU3) or newer model to fully integrate with the NextFare platform.

All necessary hardware including any required modification to the Revenue Island Equipment (Receiver, Probing, Vault, Garage Computer System) to interface with the selected farebox as well as electrical wires shall be included by the Contractor to ensure that the installation is complete and operational. DTPW approval is required for the installation of hardware and electrical wires prior to production. Farebox/EASY Card reader height shall not be more than 48” above the floor, as required by ADA Guidelines 308.3.1. Each farebox should come with two cash boxes, one operational unit and one spare.

### Fare Box Location

Contractor shall provide unencumbered space to accommodate, the CTS/GENFARE Odyssey farebox or the model selected by DTPW, overall dimension of selected farebox will be very similar to the present CTS/GENFARE Odyssey. This space shall be as forward as practicable so that the installed device shall not restrict traffic in the passenger area especially wheelchairs or mobility aids. This space shall not restrict access to the driver's area and/or operation of driver controls. It shall permit easy removal of the cash box from the farebox. The Contractor will use the farebox base designed for the mounting of the farebox type selected by DTPW. The Contractor shall mount farebox base securely. The specific location of the farebox mounting shall require the approval of DTPW.

### Farebox Wiring

The Contractor will utilize a farebox floor mounting plate designed for the model selected by DTPW with terminal strip (see graphic below for Odyssey Farebox Base). Contractor shall provide a 12 volt-DC constant power supply with circuit breaker protection (amps TBD), and wiring to accommodate the alarm function of the farebox. Power shall be provided from the output of the Wilmore 24VDC-13.6VDC converter. Power shall be available with the master run switch in any position including off. The farebox power wiring must be a multi

stranded, two conductor, sheathed, red/black pair, 14 gauge wires.

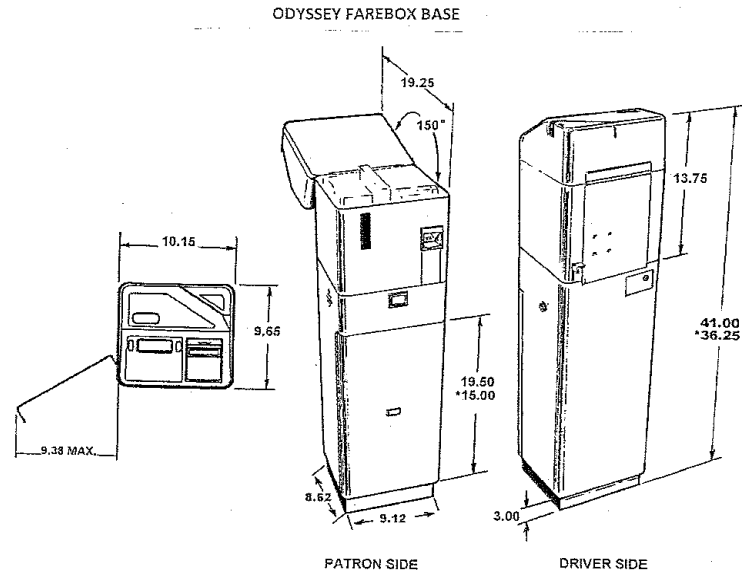


Figure 13-4: Farebox Dimensions

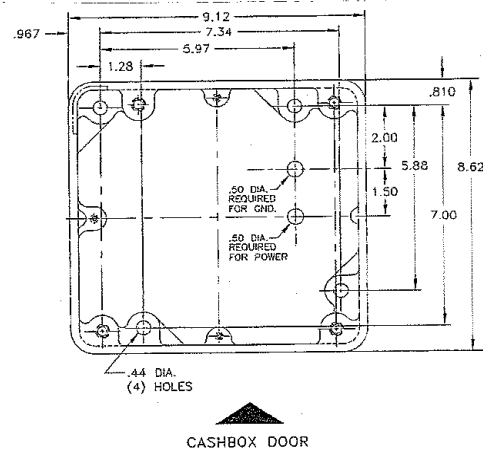


Figure 13-5: Hole positions on Farebox mounting plate

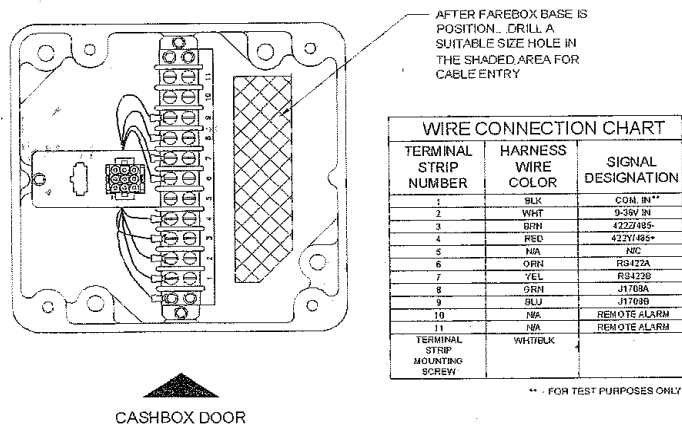


Figure 13-2: Farebox power and connectors

The Contractor shall provide wiring to accommodate the alarm function of the farebox. A 3 pair (6 conductors) color coded cable of 22 gauge stranded wire shall be installed from the farebox alarm output point to the Bus Alarm Termination Block. This cable is not available through Cubic Western. No splices are permitted in power and alarm cables. Farebox wiring (including alarm wiring) must be approved by DTPW prior to production.

#### Exit Door Fare Collection System

The Contractor shall provide an option for fare collection system located at all doors compatible with DTPW existing fare collection system. The design, location, and operation of the proposed fare collection system shall be approved by DTPW prior to production. The option for the fare collection system located at all doors shall be priced separately from the bus in the Price Proposal.

### **TS 73. Interior Access Panels and Doors**

Panels shall be color coordinated, vandal-resistant, able to withstand or repel repeated vandalism from marking pens and similar writing instruments, and shall not be damaged by repeated applications of commonly-used graffiti-removal chemicals. Access doors shall be hinged with gas props or over-center springs, where practical, to hold the doors out of the mechanic's way. Panels shall prevent entry of mechanism lubricant into the bus interior. All fasteners that retain access panels shall be captive in the cover.

Access doors shall be secured with locks. The locks shall be standardized so that only one tool is required to open access doors on the bus.

#### **TS 73.1 Floor Panels**

Access openings in the floor shall be sealed to prevent entry of fumes and water into the bus interior. Flooring material at or around access openings shall be flush with the floor and shall be edge-bound with stainless steel or another material that is acceptable to the Agency to prevent the edges from coming loose. Access openings shall be asymmetrical so that reinstalled flooring shall be properly aligned. Fasteners shall tighten flush with the floor.

Access openings in the floor shall be sealed to prevent entry of fumes and water into the bus interior.

The number of special fastener tools required for panel and access door fasteners shall be minimized.

## **PASSENGER ACCOMMODATIONS**

### **TS 74. Passenger Seating**

#### **TS 74.1 Arrangements and Seat Style**

The seating arrangement in the bus shall be such that seating capacity is maximized. Passenger seats shall be arranged in a transverse, forward facing configuration, except that aisle facing flip-up seats shall be provided at the wheelchair securement areas. Aisle facing seats may be allowed at wheel housings if needed for passenger access and comfort. Stainless steel barriers or modesty panels shall be provided in front of the first forward facing seats on both sides of the bus. If a bi-level floor is used, barriers or modesty panels shall be provided at the elevation change in front of the upper level seats. Weather shields of clear  $\frac{1}{2}$ " polycarbonate shall be installed forward of the rear exit door above the seat back. The clear weather shield shall be covered on both sides with a removable clear scratch guard, 3M Scotchgard Multi-Layer Protective

Film -1004MS or approved equal. The aisle between the seats shall be no less than 20 inches wide at seated passenger hip height.

Rear seat platform (rear settee) shall be hinged to gain access to engine compartment.

All seats shall have similar dimensions, materials, and construction characteristics. Inserts and back panels shall be individual and fully interchangeable between transverse and longitudinal seats.

A detailed seat layout with alternatives shall be submitted to DTPW for review and approval with Requests for Approved Equal submittals.

#### USB Power Outlets

The Contractor shall provide option for USB power outlet for each passenger sitting. The USB unit shall be embedded into a plastic housing and can be located underneath the front portion of the seat or in the rear portion of the seat. For the ADA area the USB unit can be located on the underside of flipseats so that it can be accessible to mobility device users as needed. The USB housing shall be made of robust materials with two ports that are positioned vertically within each USB assembly. Each USB unit shall operate on a 12 or 24 VDC power source with an output voltage of 5VDC and maximum output current of 4.2A. It must include reverse polarity protection along with a status indicator light in blue designating the USB is powered. To the best extent practical all wires for the USB unit need to be routed in a such a way that prevents vandalism and minimizes sight of the wires to the bus structure. The design and locations of the USB power outlets capable of charging mobile devices including phones or tablets shall be approved by DTPW prior to production. The USB power outlets option shall be priced separately from the bus in the Price Proposal.

#### **TS 74.2 Rearward Facing Seats**

Allow rearward facing seats.

#### **TS 74.3 Non-Padded Inserts**

The passenger seats shall be equipped with non-padded, non-upholstered inserts throughout the bus.

#### **TS 74.4 Drain Hole in Seats**

Provision, such as a small hole, to allow drainage shall be incorporated into seat insert. (drain through hole – ¼ in. through hole, bottom seat only, one per seat)

#### **TS 74.5 Hip-to-Knee Room**

Hip-to-knee room measured from the center of the seating position, from the front of one seat back horizontally across the highest part of the seat to vertical surface immediately in front, shall be no less than 28 inches where practicable. In order to maximize seating capacity, minor variations in hip-to knee room may be allowed in limited areas with DTPW approval, but shall not be less than 26.5 inches.

#### **TS 74.6 Foot Room**

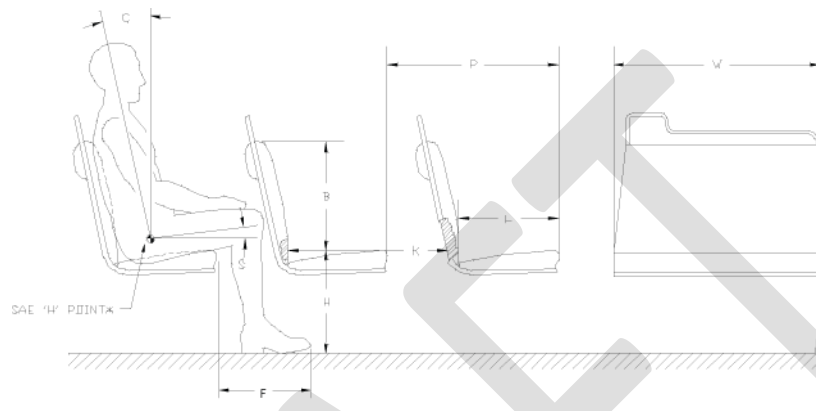
Foot room, measured at the floor forward from a point vertically below the front of the seat cushion, shall be no less than 14 in. Seats immediately behind the wheel housings and modesty panels may have foot room reduced provided the wheelhouse is shaped so that it may be used as a footrest or the design of modesty panel effectively allows for foot room.

## TS 74.7 Aisles

The aisle between the seats shall be no less than 20 in. wide at seated passenger hip height. Seat backs shall be shaped to increase this dimension to no less than 24 in. at 32 in. above the floor (standing passenger hip height).

## TS 74.8 Dimensions

Seating Dimensions and Standard Configuration



Seat dimensions for the various seating arrangements shall have the dimensions as follows (refer to Figure above):

- The width, W, of the two-passenger transverse seat shall be a minimum 35 in.
- The length, L, shall be 17 in.,  $\pm 1$  in.
- The seat back height, B, shall be a minimum of 15 in.
- The seat height, H, shall be 17 in.,  $\pm 1$  in. For the rear lounge (or settee) and longitudinal seats, and seats located above raised areas for storage of under-floor components, a cushion height of up to 18 in.,  $\pm 2$  in., will be allowed. This shall also be allowed for limited transverse seats, but only with the expressed approval of the Agency.
- Foot room = F.
- The seat cushion slope, S, shall be between 5 and 11 degrees.
- The seat back slope, C, shall be between 8 and 17 degrees.
- Hip to knee room = K.
- The pitch, P, is shown as reference only.

## TS 74.9 Structure and Design

The passenger seat frame and its supporting structure shall be constructed and mounted so that space under the seat is maximized and is completely free of obstructions to facilitate cleaning.

Passenger seats shall be of a cantilever design with vandal resistant removable inserts, 4ONE passenger seats - Aries 4MA SST seats, Kiel seating "Intra" seat, or approved equal with stainless steel grab rails and un-upholstered inserts. The seats design shall be submitted to DTPW for review and approval with the proposal.

The general design of the seat shall offer superior product and functional values with features providing optimum comfort and safety for the passenger. The design of the seat shall be based on requirements defined to obtain a structure which will conform to the strength, performance, and dynamic tests specified in the Testing and Strength Requirements Section. The passenger seat, frame, and its supporting structure shall be constructed and mounted so that space under the seat is maximized to increase wheelchair maneuvering room and is completely free of obstructions to facilitate cleaning. The lowest part of the seat assembly that is



within 12 inches of the aisle shall be at least 10 inches above the floor. The underside of the seat and the sidewall shall be configured to prevent debris accumulation.

The two-passenger transverse seats shall be fixed, forward-facing cantilever type, designed, engineered and installed in accordance with layout drawings. The use of pedestals shall be limited to areas which cannot be supported by the side wall of the bus. Longitudinal, flip-up, and rear settee seats shall conform to the same general design and width as the two-passenger transverse seats. Longitudinal and rear settee backs shall be individual to correspond in configuration to transverse seat backs and are to be mounted on a common frame. All visible steel (cantilever frame and pedestals if applicable) and mounting hardware shall be stainless steel. No wood shall be used in the seats. All materials used in the seat assembly shall meet the flammability requirements of Federal Motor Vehicle Safety Standard No. 302 and the fire performance criteria within FTA Docket 90-A.

Seat installation procedures and required torque values shall be provided to DTPW prior to production. Seat mounting fasteners shall be marked with torque paste after being properly torqued.

The seatback of each transverse seat shall have an energy absorbing grab rail or handhold. The handhold shall extend above the seat back near the aisle so that standees shall have a convenient vertical assist, no less than 4 inches long, that may be grasped with the full hand. This handhold shall not cause a standee using this assist to interfere with a seated 50th-percentile male passenger. The handhold shall also be usable by a 5th-percentile female, as well as by larger passengers, to assist with seat access/egress for either transverse seating position. The seat back handhold may be deleted from seats that do not have another transverse seat directly behind and where vertical assist is provided. Seat back handholds shall not be included in the design of longitudinal seats. The handhold shall not be a safety hazard during severe decelerations. The handhold shall be readily replaceable but attached securely to provide adequate and firm support. The overall design of the handhold shall be aesthetically pleasing and shall enhance the general appearance of the seat.

Armrests shall be included on the ends of each set of longitudinal seats except on the forward end of a seat that is immediately to the rear of a transverse seat, a modesty panel, a wheelchair barrier, or the operator's barrier, when these fixtures perform the function of restraining passengers from sliding forward off the seat. Armrests are not required on longitudinal seats located in the wheelchair parking area that fold up when the armrest on the adjacent fixed longitudinal seat is within 1-1/2 to 3-1/2 inches of the end of the seat cushion. Armrests shall not be included in the design of transverse seats. Provide tubular stainless steel armrests on the rear ends of any longitudinal seats immediately in front of the rear cross-seats. Armrests shall be located from 7 to 9 inches above the seat cushion surface and shall be free from sharp protrusions that form a safety hazard.

Panels shall be stainless steel, vandal-resistant, able to withstand or repel repeated vandalism from marking pens and similar writing instruments, and shall not be damaged by repeated applications of commonly-used graffiti-removal chemicals

The back panel shall be made of stainless steel. The back panel shall cover the rear of the seat back frame, and shall be free of sharp corners and protrusions. Back panel may be separate or integral with seat shell. The rear areas shall be recessed for increased passenger knee clearance.

#### Technical Data

The contractor should submit, at the time of Requests for Approved Equals, Certified Test Reports as evidence of compliance with the specifications and test requirements contained herein. The data shall substantiate the performance, reliability, and compliance with the safety performance established by the Transportation industry as a required level of excellence in seating. The test reports shall contain a record of the Static Load Tests, the Performance Tests, and Dynamic Tests. The reports must show test diagrams, photos of the tests, and load results on representative seats completely assembled and fastened to a fixture

simulating the vehicle attachment. The test data for each test shall describe the test procedure and test equipment, the resultant deflection, the permanent deformation, and statement of inspection and compliance with specification requirements. The analysis shall indicate values relating to energy absorption and moderation of the magnitude of energy to the passengers. The analysis shall also substantiate the seat structure crash-worthiness relating to deformation characteristics and the strength required to prevent disintegration.

### **Testing and Strength Requirements**

All testing shall be conducted on a representative transverse seat using a simulated bus floor, cantilever mounting device, and pedestal mounting device to correlate the results with conditions expected in normal usage of the seat.

#### **Static Load Tests**

##### **Seat**

The seat assembly shall withstand static vertical forces of 500 pounds applied to the top of the seat cushion in each seating position with less than 1/4-inch permanent deformation in the seat or its mountings.

##### **Seat Back**

The seat assembly shall withstand static horizontal forces of 500 pounds, forward and rearward, evenly distributed along the top of the seat back with less than 1/4-inch permanent deformation in the seat or its mountings.

##### **Handhold and Armrest**

Seat back handhold and armrests shall withstand static horizontal (forward and rearward) and vertical (downward) forces of 250 pounds applied anywhere along their length with less than 1/4-inch permanent deformation.

#### **Performance Test**

##### **Drop Impact Test**

Seats at both the aisle and window seating positions shall withstand 4,000 vertical drops of a 40-pound sandbag without visible deterioration. The sandbag shall be dropped 1,000 times each from heights of 6, 8, 10, and 12 inches.

##### **Swinging Impact Test**

The seat backs at the aisle position and at the window position shall withstand repeated impacts of two 40-pound sandbags without visible deterioration. One sandbag shall strike the front 40,000 times and the other sandbag shall strike the rear 40,000 times. Each sandbag shall be suspended on a 36-inch pendulum and shall strike the seat back 10,000 times each from distances of 6, 8, 10, and 12 inches.

##### **Handhold and Armrest Impact Test**

Seat back handhold and armrests shall withstand 25,000 impacts in each direction of a horizontal force of 125 pounds with less than 1/4-inch permanent deformation and without visible deterioration.

#### **Dynamic Tests**

### Knee Injury Protection

All transverse objects, including seat backs, modesty panels, and longitudinal seats in front of forward facing seats, shall not impart a compressive load in excess of 1,000 pounds onto the femur of passengers ranging in size from a 5th-percentile female of a 95th-percentile male during a 10g deceleration of the bus. This deceleration shall peak at  $.05 \pm .015$  seconds from initiation.

### Occupant and Frontal Crash Protection

Permanent deformation of the seat resulting from two 95th-percentile males striking the seat back during this 10g deceleration shall not exceed 2 inches, measured at the aisle side of the seat frame at height H. Seat back should not deflect more than 14 inches, measured at the top of the seat back, in a controlled manner to minimize passenger injury. Structural failure of any part of the seat or sidewall shall not introduce a laceration hazard.

### Head Injury Protection

The upper rear portion of the seat back and the seat back handhold immediately forward of transverse seats shall be constructed of energy absorbing materials. During a 10g deceleration of the bus, the HIC number (as defined by SAE Standard J211a) shall not exceed 400 for passengers ranging in size from a 6 year old child through a 95th percentile male.

<u>Specification for High Impact Thermoplastic</u>		
<u>Physical Property</u>	<u>Specification</u>	<u>Test Method</u>
Tensile Yield Strength	4400 – 6000 PSI	ASTM D-638
Flexural Modulus	220,000 – 333,000 PSI	ASTM D-790
Flexural Yield Strength	6200 – 97000 PSI	ASTM D-790
Izod Impact Resistance	3 – 8 ft/lb/ 1/8Notch	ASTM D-256
Specific Gravity	1.04 – 1.40	ASTM D-792
Hardness (Rockwell)	R 81 – 105	ASTM D-785

### TS 74.10 Construction and Materials

Selected materials shall minimize damage from vandalism and shall reduce cleaning time. The seats shall be attached to the frame with tamper-resistant fasteners. Coloring shall be consistent throughout the seat material, with no visually exposed portion painted. Any exposed metal touching the sides or the floor of the bus shall be stainless steel. The seat and inserts shall be contoured for individuality, lateral support and maximum comfort and shall fit the framework to reduce exposed edges.

The minimum radius of any part of the seat back, handhold or modesty panel in the head or chest impact zone shall be a nominal ¼-in. The seat back and seat back handhold immediately forward of transverse seats shall provide passenger protection and, in a severe crash, allow the passenger to deform the seating materials in the impact areas. Complete seat assemblies shall be interchangeable to the extent practicable.

DTPW may request a production 2-passenger transverse seat from any prospective seat supplier, to be delivered to DTPW during the Approved Equals process prior to technical proposal evaluation. Seat will then

be dismantled to determine life cycle costs and evaluate necessary repair techniques. Upon request, DTPW shall reassemble and return to the supplier.

Proposers are requested to propose an interior color scheme that is practical and coordinates with the proposed exterior paint scheme.

DTPW will make final selection of seat insert colors prior to production.

## **TS 75. Passenger Assists**

Passenger assists in the form of full closed grip vertical stanchions or handholds shall be provided for the safety of standees and for entering and exiting of passengers. Passenger assists shall be convenient in location, shape and size for both the 95th percentile male and the 5th percentile female standee. Starting from the entrance door and moving anywhere in the bus a vertical assist shall be provided either as the vertical portion of seat back assist or as a separate item so that a 5th percentile female passenger may easily move from one assist to another using one hand or the other without losing support. Excluding those mounted on the seats and doors, the assists shall be between 1-1/4 and 1-1/2 inches in diameter with radii no less than 1/4 inch and shall permit a full closed hand grip with no less than 1-1/2 inches of knuckle clearance around the assist. A crash resulting in a one-foot intrusion shall not produce sharp edges, loose rails or other potentially dangerous conditions associated with a lack of structural integrity of the supporting brackets. Assists shall be securely clamped to prevent passengers from moving or twisting the assists. All areas of the passenger assists that are handled by passengers including functional components used as passenger assists, shall be stainless steel with fittings and fasteners to match the tubing. Stanchions at center aisle stairs, which shall be high contrast yellow powder coated or nylon coated.

Assists shall withstand a force of 300 pounds applied over a 12 inch lineal dimension in any direction normal to the assist without permanent visible deformation. Brackets, clamps, screw heads and other fasteners used on the passenger assists shall be flush with the grabrails and stanchions located throughout the bus. The number, mounting, location and arrangement of all passenger assists shall require concurrence of the DTPW.

### **TS 75.1 Assists**

Excluding those mounted on the seats and doors, the assists shall have a cross-sectional diameter between 1¼ and 1½ in. or shall provide an equivalent gripping surface with no corner radii less than ¼ in. All passenger assists shall permit a full hand grip with no less than 1½ in. of knuckle clearance around the assist. Passenger assists shall be designed to minimize catching or snagging of clothes or personal items and shall be capable of passing the NHTSA Drawstring Test.

Any joints in the assist structure shall be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assists. Seat handholds may be of the same construction and finish as the seat frame. Door mounted passenger assists shall be of anodized aluminum, stainless steel or powder-coated metal. Connecting tees and angles may be powder-coated metal castings. Assists shall withstand a force of 300 lbs applied over a 12-in. lineal dimension in any direction normal to the assist without permanent visible deformation. All passenger assist components, including brackets, clamps, screw heads and other fasteners used on the passenger assists shall be designed to eliminate pinching, snagging and cutting hazards and shall be free from burrs or rough edges.

### **TS 75.2 Front Doorway**

Front doors, or the entry area, shall be fitted with ADA-compliant assists. Assists shall be as far outward as practicable, but shall be located no farther inboard than 6 in. from the outside edge of the entrance step and shall be easily grasped by a 5th-percentile female boarding from street level. Door assists shall be functionally

continuous with the horizontal front passenger assist and the vertical assist and the assists on the wheel housing or on the front modesty panel.

### **TS 75.3 Vestibule**

The aisle side of the driver's barrier and the modesty panels or wheel housings shall be fitted with vertical passenger assists that are functionally continuous with the overhead assist and that extend to within 36 inches of the floor. These assists shall have sufficient clearance from the barrier to prevent inadvertent wedging of a passenger's arm. A horizontal passenger assist of stainless steel metal tubing shall be located across the front of the bus, around the farebox, and shall prevent passengers from sustaining injuries on the farebox or windshield in the event of a sudden deceleration. Without restricting the vestibule space, the assist shall provide support for a boarding passenger from the front door through the fare collection procedure. Passengers shall be able to lean against the assist for security while paying fares. The assist shall be no less than 36 inches above the floor or the average step tread surface. The assist at the front of the bus shall be arranged to permit a 5th percentile female passenger to easily reach from the door assist, to the front assist, to vertical assists on the driver's barrier, front modesty panel, or wheel house. The passenger assist around the farebox shall not interfere with opening of farebox access doors.

Unless passenger seating is provided on top of wheel housing, passenger assists shall be mounted across and around the exposed sides of the wheel housings which shall be designed to prevent passengers from sitting on wheel housings and effectively retain items, such as bags and luggage, placed on top of wheel housing.

Except for seats that flip up to accommodate wheelchair securement, assists shall extend from near the leading edge of longitudinal seats and shall be functionally continuous with the overhead assist. Assists shall be staggered across the aisle from each other where practicable.

A 1/8" diameter hole, 42" above floor level, shall be provided in the vertical stanchion adjacent to the entrance door to be used a maximum height indicator for children's fares. The hole shall be oriented to face the driver.

### **TS 75.4 Rear Doorway(s)**

Vertical assists that are functionally continuous with the overhead assist shall be provided at the aisle side of the transverse seat immediately forward of the rear door and on the aisle side of the rear door modesty panel(s). Passenger assists shall be provided on modesty panels that are functionally continuous with the rear door assists. Rear doors, or the exit area, shall be fitted with assists having a cross-sectional diameter between 1¼ and 1½ in. or providing an equivalent gripping surface with no corner radii less than ¼ in., and shall provide at least 1½ in. of knuckle clearance between the assists and their mounting. The assists shall be designed to permit a 5th-percentile female to easily move from one assist to another during the entire exiting process. The assists shall be located no farther inboard than 6 in. from the outside edge of the rear doorway step.

Passenger assists will be provided to aid in the transition between the front and rear sections of the bus.

### **TS 75.5 Overhead**

Except forward of the standee line and at the rear door locations a continuous, full closed grip, overhead assist shall be provided. This assist shall be convenient to standees anywhere in the bus and shall be located over the center of the aisle seating position of the transverse seats on both sides of the aisle. The assist shall be no less than 72 inches above the floor. No more than five percent of the full closed grip feature shall be lost due to assist supports. Four nylon web straphangers shall be provided on the overhead assists over the wheelchair securement areas on both sides of the aisle.

Location of the straps shall be submitted to DTPW for review and approval prior to production.

Overhead assists shall simultaneously support 150 lbs on any 12-in. length. No more than 5 percent of the full grip feature shall be lost due to assist supports.

### **TS 75.6 Longitudinal Seat Assists**

Longitudinal seats shall have vertical assists located between every other designated seating position, except for seats that fold/flip up to accommodate wheelchair securement. Assists shall extend from near the leading edge of the seat and shall be functionally continuous with the overhead assist. Assists shall be staggered across the aisle from each other where practicable and shall be no more than 52 in. apart or functionally continuous for a 5th percentile female passenger.

### **TS 75.7 Wheel Housing Barriers/Assists**

Unless passenger seating is provided on top of wheel housing, passenger assists shall be mounted around the exposed sides of the wheel housings (and propulsion compartments if applicable), which shall also be designed to prevent passengers from sitting on wheel housings. Such passenger assists shall also effectively retain items, such as bags and luggage, placed on top of wheel housing.

### **TS 76. Passenger Doors**

Two (2) doors shall be provided in the bus for passenger ingress and egress. The front door shall be located on the curbside in the front of the bus such that the driver is able to collect and monitor the collection of fares. The second door shall be located on the curbside between the articulation joint and the third axle (rear axle). The doors and doorways shall comply with the most recent revision of ADA requirements.

#### Out swing plug door(s)

The Contractor shall provide options for out swing plug doors for all curbside and streetside (roadside) passenger doors. In the open position, the entire door panel(s) of the swing plug door(s) shall be on the exterior of the bus and in the closed position, the door panel(s) shall be flush with the bus body. The doors shall comply with the specifications for the passenger doors including the most recent revision of ADA requirements. The design, location, and operation of the out swing plug doors shall be approved by DTPW prior to production. The out swing plug doors options shall be priced separately from the bus in the Price Proposal.

#### Streetside Exit Door(s)

The Contractor shall provide options for one and two street-side exit doors (one in the forward unit and one in the trailing unit). The doors shall comply with the specifications for the passenger exit door. The design, location, and operation of the street-side exit door(s) shall be approved by DTPW prior to production. The street-side exit doors options shall be priced separately from the bus in the Price Proposal.

In cases where street-side and curbside doors are chosen, provisions shall be made for operating the front door, curbside rear door(s) and street-side rear door(s) independently or in the combinations shown in the table below while providing positive tactile feedback to the operator identifying the door control selection.

Door Operating Combinations Table

<b>Front</b>	<b>Curbside Rear</b>	<b>Street-Side Rear</b>
Closed	Closed	Closed
Open	Closed	Closed
Open	Open	Closed

Open	Closed	Open
Open	Open	Open
Closed	Open	Closed
Closed	Closed	Open
Closed	Open	Open

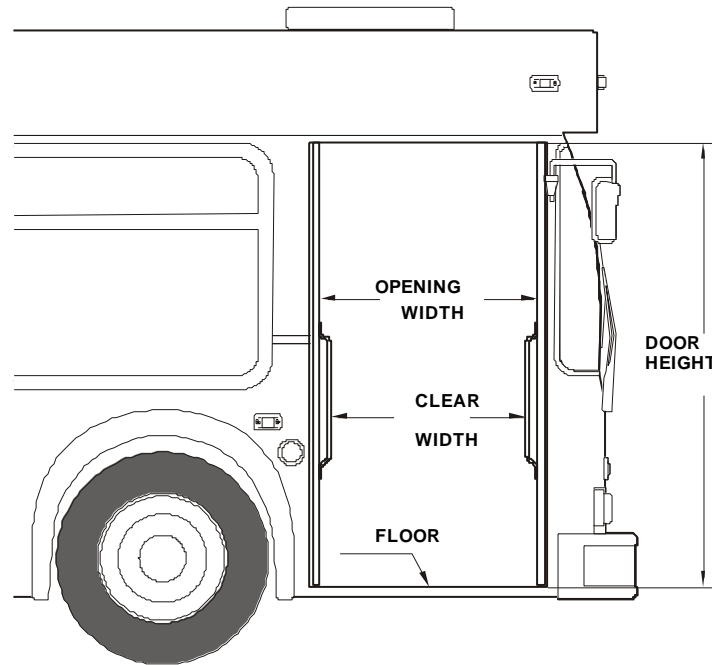
#### Materials and Construction

Structure of the doors, their attachments, inside and outside trim panels, and any mechanism exposed to the elements, shall be durable and corrosion-resistant. Door panel construction shall be of aluminum, stainless steel, or reinforced non-metallic composite materials. Fasteners shall be stainless steel. Fasteners shall be designed to permit multiple replacements of parts. Sheet metal screws shall not be used to fasten objects to the doors. Stainless steel passenger assist handles shall be installed on the door panels. The doors, when fully opened, shall provide a firm support and shall not be damaged if used as an assist by passengers during ingress or egress. Doors shall be non-rattling in closed position. Door edges shall be sealed to prevent infiltration of exterior moisture, noise, dirt and air elements from entering the passenger compartment, to the maximum extent possible based on door types.

The closing edge of each door panel shall have no less than 2 in. of soft weather stripping. The doors, when closed, shall be effectively sealed, and the hard surfaces of the doors shall be at least 4 in. apart. The combined weather seal and window glazing elements of the front door shall not exceed 10 degrees of binocular obstruction of the driver's view through the closed door.

## TS 76.1 Dimensions

**FIGURE 8**  
Transit Bus Minimum Door Opening



Front door clear width shall be no less than thirty-two (32) inches and rear door clear width shall be no less than thirty (30) inches with the doors fully opened. Clear width shall be measured between door-mounted passenger assists. The door opening height shall be no less than seventy-six (76) inches. Projections on doors and in entry area shall not form a hazard to passengers.

## TS 76.2 Door Glazing

The upper section and the lower section of the front door shall be glazed for no less than one half the respective door opening area of each section. The edge of a 6 inch high curb shall be visible to the seated driver through the closed door when the bus is more than 12 inches from the curb.

The upper section of the rear door shall be glazed for no less than one half the respective door opening area of each section. Bottom half of door panel shall be metal and not have a window.

The front and rear door panel glazing material shall be a nominal  $\frac{1}{4}$  inch laminated safety glass conforming to the requirements of ANSI Z26.1 Test Grouping 2 and the Recommended Practices defined in SAE J673.

## TS 76.3 Door Projection

### Exterior

The exterior projection of the front doors beyond the side of the bus shall be minimized and shall not block the line of sight to the rear curbside of the bus via the curbside mirror when the doors are fully open. The exterior projection of both doors shall be minimized and shall not exceed 13 inches during the opening or closing cycles or when doors are fully opened. Projection inside the bus shall not exceed 21 inches. The closing edge of each door panel shall have no less than 2 inches of soft weather stripping. The hard surfaces of the



doors shall be at least four (4) inches apart. The door, when closed, shall be effectively sealed to prevent the entrance or exit of air and water. The front panel edge shall lap over rear panel edge by a minimum of one-half (1/2) inch.

#### **Interior**

Projection inside the bus shall not cause an obstruction of the rear door mirror or cause a hazard for standees.

### **TS 76.4 Door Height Above Pavement**

It shall be possible to open and close either passenger door when the bus loaded to gross vehicle weight rating is not knelt and parked with the tires touching an 8-in.-high curb on a street sloping toward the curb so that the street side wheels are 5 in. higher than the right side wheels.

### **TS 76.5 Closing Force**

The closing force shall be limited to avoid injury to a passenger caught in a closing door. Closing door edge speed shall not exceed 19 inches per second. All doors shall be equipped with sensitive edges, including the rear doors with the Vapor "Class" system, such that if an obstruction is struck by a closing door edge, the doors will stop and/or reverse direction prior to imparting a 10-pound force on 1 square inch of that obstruction. It shall be possible to withdraw a 1-1/2 inch diameter cylinder from between the center edges of a closed and locked door with an outward force not greater than 35 pounds.

### **TS 76.6 Actuators**

Door actuators shall be Vapor or approved equal, using electric door actuator adjustable so that the door opening and closing speeds can be independently adjusted from 2 seconds to 4 seconds. Actuators and the complex door mechanism shall be concealed from passengers, but shall be easily accessible for servicing. Actuators shall provide smooth even door operation and prevent door slamming at the end of its travel.

The rear doors must close in two (2) seconds from the full open position when the bus is on an 8-degree slope toward the curb (right side).

The rear doors shall be passenger-controlled. The vehicle operator shall unlock and enable the opening mechanism, which shall be annunciated by illumination of a green light near the door. After enabling and unlocking, the doors shall be opened by a powered mechanism actuated by passenger activation of a contactless sensing system.

A switch located within reach of the seated operator shall, when actuated, restore rear door function to complete operator control, as described in the "Default."

Locked doors shall require a force of more than 300 lbs to open manually. When the locked doors are manually forced to open, damage shall be limited to the bending of minor door linkage with no resulting damage to the doors, actuators or complex mechanism.

### **TS 76.7 Door Interlocks**

To preclude movement of the bus with the front or rear door open, when the door control is activated an accelerator interlock shall remove throttle control returning the engine to idle speed and a brake interlock shall engage the brakes. The interlocks shall remain on until the door switch is deactivated and the doors are in the fully closed position and a service brake application is made.

Air pressure shall be relieved by means of a quick release air valve to prevent lag in releasing brakes when doors are closed.

The braking effort shall be adjusted to limit deceleration level. The braking effort shall be adjustable with hand tools only. The adjustment device shall be enclosed in tamper proof housing if located inside the bus.

The doors must be wired to a speed sensor so that the interlock cannot be activated and the doors cannot be opened at a speed above 4 mph.

With the master run switch in the off position and the door open, the door, the interlock, and the stop lights must not be energized.

A detailed description of the door interlock function shall be submitted to DTPW for review and approval prior to pre-production design review.

### **TS 76.8 Emergency Operation**

In the event of an emergency, it shall be possible to open the door manually from inside the bus using a force of not more than 25 pounds after actuating an unlocking device at the door. The unlocking device shall be clearly marked as an emergency-only device and shall require two distinct actions to actuate. Trilingual instructions, approved by DTPW, shall be installed at the device. When the door emergency device is actuated, the brake and accelerator interlocks shall be activated, thereby removing throttle control and stopping the bus. The brakes shall not be applied until the bus speed falls below 4 MPH. Doors that are required to be classified as "Emergency Exits" shall meet the requirements of FMVSS 217.

A handle or assist shall be provided on the door panel at a convenient location to assist manual operation of the door after the emergency handle has been pulled.

### **TS 76.9 Door Control**

Front and rear doors shall be controlled by the operator from a door control switch located on the driver's left hand side. The handle shall be removable and can be utilized for use in opening access panels.

The opening and closing of the front door shall be activated directly by the operator by means of the door control switch.

The rear door shall be equipped with a Vapor CLASS acoustic sensor system or approved equal to allow passengers to activate the opening of the door after the operator, by means of the door control switch, has unlocked it. A green L.E.D. light above the door will indicate that the door is unlocked. The door shall close automatically when the door area is clear of passengers.

A switch located convenient to the driver shall allow the driver to select whether rear door opening is activated by the passenger using the Vapor CLASS system or opening and closing is activated directly by the driver using the door control switch.

A control or valve in the driver's compartment shall dump the air from the door mechanism to provide manual operation of the doors with the bus shut down. When the power is cut to the door, either by this control or by shutting the bus off through the run switch, the doors shall not slam closed.

Front and rear doors shall have independent electrical circuits so a failure or short in one door circuit will not affect operation of the other doors. Provide separate door master power switches to cut off power to each door and deactivate its interlock circuit. Door master power switches shall be permanently labeled and located in the door motor compartment or other approved location. The door master power switches shall be accessible without the use of tools.

## **TS 76.10 Door Controller**

### **Five-Position Driver's Door Controller**

The control device shall be protected from moisture. Mounting and location of the door control device handle shall be designed so that it is within comfortable, easy arm's reach of the seated driver. The door control device handle shall be free from interference by other equipment and have adequate clearance so as not to create a pinching hazard.

Position of the door control handle shall result in the following operation of the front and rear doors:

- **Center position:** Front door closed, rear door(s) closed or set to lock.
- **First position forward:** Front door open, rear door(s) closed or set to lock.
- **Second position forward:** Front door open, rear door(s) open or set to open.
- **First position back:** Front door closed, rear door(s) open or set to open.
- **Second position back:** Front door open, rear door(s) open or set to open.

## **TS 76.11 Door Open/Close**

### **Operator-Controlled Front and Passenger-Controlled Rear Doors with Provision for Driver Override**

Operation of, and power to, the front passenger doors shall be completely controlled by the operator. Power to rear doors shall be controlled by operator. After enabling, the rear doors shall be opened by the passenger. A switch shall be provided to enable the driver to obtain full control of the rear doors.

A control or valve in the operator's compartment shall shut off the power to, and/or dump the power from, the front door mechanism to permit manual operation of the front door with the bus shut down. A master door switch, which is not within reach of the seated operator, when set in the "off" position shall close the rear/center doors, deactivate the door control system, release the interlocks, and permit only manual operation of the rear/center doors.

## **TS 77. Accessibility Provisions**

Space and body structural provisions shall be provided at the front door of the bus to accommodate a wheelchair loading system.

### **TS 77.1 Loading Systems**

A self-contained fold-out type wheelchair ramp system, compliant with requirements defined in most recent revision of 49 CFR Part 38, Subpart B, §38.23c, shall be provided. The ramp system shall be a Lift-U model LU-18 electrically powered or approved equal. Bi-fold ramps will not be accepted.

The ramp shall provide ingress and egress for a passenger in a wheelchair from a level street or curb. The wheelchair loading system shall be located at the front door. The ramp shall be of a simple hinged, flip-out type design. When the ramp is in the stored position no tripping hazards shall be presented and any resulting gaps shall be minimized. There shall be no obstructions, obstacles, edges, or gaps on the ramp or the adjacent floor surface, greater than ¼ inch in height or width, except for ramp side barriers specifically required by the A.D.A.

The loading platform shall be covered with a replaceable or renewable, nonskid material and shall be fitted with devices to prevent the wheelchair from rolling off the sides during loading or unloading. A passenger or attendant, standing on the ramp platform, shall be able to easily obtain support during the entire loading or unloading operation by grasping passenger assists provided for this purpose.

The controls shall be simple to operate and the ramp operation shall be under the control of the operator. The ramp shall be electrically controlled and operated without any hydraulic assist. The ramp controls shall be

clearly marked and consist of spring-loaded momentary switches which when released by the operator, shall cause the ramp motion to stop in any position while deploying or stowing. The ramp shall not be capable of operation until the bus parking brake is on, the transmission is in neutral, and the doors are in the fully open position. When the doors are open the bus throttle and brake interlocks shall be activated. The bus shall be prevented from moving while the ramp is deployed by the throttle and brake interlock. The bus shall not be able to move until the ramp is fully stowed. In the event of a failure, the interlocks shall be released by setting the door master power switch in the "OFF" position. The ramp shall be inhibited from folding when a passenger is on the ramp. The bus shall be inhibited from kneeling with the ramp in the deployed position.

Submit proposed ramp system to DTPW for approval.

Warning lamps and audible alarms shall meet all Federal and State of Florida requirements. In addition, the bus hazard warning flashers shall activate when the ramp is deployed.

The wheelchair ramp shall conform to ADA standards and be legibly and permanently marked by the manufacturer or installer with the following information:

1. The manufacturer's name and address.
2. The month and year of manufacture.
3. A certificate that the wheelchair ramp securement devices, and their installation, conform to State of Florida requirements applicable to accessible buses.

The manufacturer must certify ramps to meet or exceed all A.D.A. and F.T.A. requirements, including D.O.T.-T-93-03. The ramp shall have a label indicating that it meets the requirements of the State of Florida.

#### Street-side Exit Doors Wheelchair Loading System

The Contractor shall provide options for wheelchair loading system located at the street-side exit doors. The design, location, and operation of the wheelchair loading systems located at the street-side exit doors shall be approved by DTPW prior to production. The option for the wheelchair loading systems located at the street-side exit doors shall be priced separately from the bus in the Price Proposal.

DTPW is aware that bridge plates are known to meet this requirements.

#### Spare Wheelchair Ramps

Pricing for Spare Wheelchair Ramps (Complete Assembly) shall be provided by the Contractor. DTPW shall have the option to purchase up to ten (10) Spare Wheelchair Ramps.

### **TS 77.2 Wheelchair Accommodations**

Two forward-facing locations, as close to the wheelchair loading system as practical, shall provide parking space and securement system compliant with ADA requirements for a passenger in a wheelchair. Parking space shall be compliant with ADA requirements in 49 CFR Part 38, Subpart B. The wheelchair securement and occupant restraint system must be tested and conform to SAE J2249 and must meet the requirements of FMVSS 222 and the ADA. A documentation proving that the pilot bus or first production bus (if no pilot bus available) meets or exceed SAE J2249, FMVSS 222, and ADA requirements need to be provided by the bus manufacturer.

A 3-point securement system compliant with requirements defined in most recent revision of 49 CFR 38.23 (d) (1) shall be provided. A convenient retractable belt storage system is to be incorporated in the overall securement system so that all belts are easily stored out of the way when not in use. An integral retractable

lap/shoulder belt passenger restraint shall be provided for each of the two securement locations. Systems known to meet these requirements include, but are not limited to the Q'Straint Q'Pod and American Seating Reliant, systems.

#### Self Securing Wheel Chair Parking Area

The Contractor shall provide options for self securing wheel chair parking area. The design, location, and operation of the self securing wheel chair parking area shall be approved by DTPW prior to production. The option for the self securing wheel chair parking area shall be priced separately from the bus in the Price Proposal.

DTPW is aware that the Quantum automatic rear facing securement is known to meet this requirements.

### **TS 77.3 Interior Circulation**

Maneuvering room inside the bus shall accommodate easy travel for a passenger in a wheelchair from the loading device and from the designated securement area. It shall be designed so that no portion of the wheelchair protrudes into the aisle of the bus when parked in the designated parking space(s). When the positions are fully utilized, an aisle space of no less than 20 in. shall be maintained. As a guide, no width dimension should be less than 34 in. Areas requiring 90-degree turns of wheelchairs should have a clearance arc dimension no less than 45 in., and in the parking area where 180-degree turns are expected, space should be clear in a full 60-in.-diameter circle. A vertical clearance of 12 in. above the floor surface should be provided on the outside of turning areas for wheelchair footrest.

### **SIGNAGE AND COMMUNICATION**

#### **TS 78. Destination Signs**

A destination sign system shall be furnished on the front, on the rear, and on the right side near the front door. All destination signs must be multi-color LED display.

#### General

An electronic destination sign system shall be furnished and installed by the Contractor.

All necessary hardware, brackets and electrical wires shall be included by the Contractor to ensure that the installation is complete and operational.

A wiring schematic showing the proposed electrical hook up to the bus electrical system and vehicle area network must be supplied to DTPW prior to pre-production design review.

A list of the routes to be displayed will be supplied by DTPW for programming the memory of the computer and transfer unit.

The sign boxes shall inhibit entry of dust, water and insects during normal operation of cleaning with a cyclone cleaner. Easy access shall be provided to clean the inside of the destination sign windows and to remove or replace the sign mechanism.

The bus manufacturer shall comply with the destination sign manufacturer's recommended mounting configuration and installation procedures to assure optimum visibility of all the sign displays.

#### Description

The destination sign system shall be Twin Vision Smart Series III LED Display System (with Color LED front, [Side, and Rear signs, wireless download](#)) or approved equal. The front sign shall be a Luminator Titan Gen 4 Spectrum LED ([Luminator Spectrum 24 x 200](#)) or approved equal. The sign system will interconnect with the Clever Devices VLU which will furnish the sign system and the stop announcement system with destination

and route information. The destination sign system's driver's code panel shall be capable of providing destination and route information to the sign if the bus VLU or TCH fails.

#### Spare Destination Sign Sets

Spare Destination Sign Sets (Complete system) shall be provided by the Contractor and priced separately from the bus in the Price Proposal. DTPW shall have the option to purchase up to five (5) Spare Destination Sign Sets.

#### Programming Equipment

Programming equipment shall be provided at no additional cost to DTPW.

#### Documentation Requirements

All documentation should be submitted directly to DTPW, Field Engineering; 3300 N.W. 32 Avenue, Miami, FL 33142

Provide five (5) copies of parts and maintenance manuals.

The contractor should provide a list of all special or custom tools or instruments required to maintain or adjust any components within the system.

A complete bill-of Materials giving a unique part number, description, generic name and generic part number for each and every component shall be required. Every part of the destination sign system shall be identified and quantified, even down to a specific diode, capacitor or screw.

Diagrams and drawings shall identify each and every component in the Destination Sign System and call out each component with the unique part number.

Provide manuals in electronic format viewable in a WEB browser with HTML pages by Assemblies (drawings) in JPG with "hot links" to all the vendor parts per assembly (Bill of Materials) and a listing or table of each vendor part number with the associated HTML hot link.

The Contractor should provide a layout for every printed circuit board specially calling out each component, be it mechanical or electrical, and showing its exact location.

The Contractor should provide drawings showing the location of all the traces on the top and bottom of each printed circuit board.

Each type of maintenance manual shall contain but not be limited to: a description of operation; installation procedures; a complete parts identification diagram and list; trouble shooting procedures; inspection procedures; preventive maintenance procedures and program; wiring diagrams; electrical schematics with board and cable identification; and adjustment procedures.

#### Additional Street and curbside Side Signs

The Contractor shall provide options for additional street side and curb side signs. The design, location, and operation of the street side and curb side sign shall be approved by DTPW prior to production. The option for the street side and curb side signs shall be priced separately from the bus in the Price Proposal.

## **TS 79. Passenger Information and Advertising**

### **TS 79.1 Interior Displays**

Provisions shall be made on the rear of the driver's barrier or equipment box located on the wheel well for a frame to retain information such as routes and schedules.

Advertising media 11 in. high and 0.09 in. thick shall be retained near the juncture of the bus ceiling and sidewall. The retainers may be concave and shall support the media without adhesives. The media shall be illuminated by the interior light system.

#### Internal Dynamic Message Signs

Clever Device Intelligent Vehicle Network (IVN) 4 with Clever Vision 2 or latest version digital signage shall be provided. The Clever Vision (Infotainment 37') system shall include two internal 37" Ultrawide signs to provide real-time information and public service announcements using signs functionality which includes next stop text, stop request text, advertising text, lift requested text, date and time text, and multilingual texts.

### **TS 79.2 Exterior Displays**

No exterior display provisions shall be provided.

## **TS 80. Passenger Stop Request/Exit Signal**

### **Pull Cord Passenger Signal**

A passenger "stop requested" signal system that complies with applicable ADA requirements defined in 49 CFR, Part 38.37 shall be provided. The system shall consist of a heavy-duty pull cable, chime and interior sign message. The pull cable shall be located the full length of the bus on the sidewalls at the level where the transom is located. If no transom window is required, the height of the pull cable shall approximate this transom level and shall be no greater than 63 in. as measured from the floor surface. It shall be easily accessible to all passengers, seated or standing. Pull cable(s) shall activate one or more solid state or magnetic proximity switches. At each wheelchair passenger position and at priority seating positions, additional provisions shall be included to allow a passenger in a mobility aid to easily activate the "stop requested" signal.

An auxiliary passenger "stop requested" signal shall be installed at the rear door to provide passengers standing in the rear door/exit area convenient means of activating the signal system. The signal shall be a heavy-duty push button type located in the rear door vicinity. Button shall be clearly identified as "passenger signal."

A single "stop requested" chime shall sound when the system is first activated. A double chime shall sound anytime the system is activated from wheelchair passenger areas.

Exit signals located in the wheelchair passenger area shall be no higher than 4 feet above the floor. Instructions shall be provided to clearly indicate function and operation of these signals.

## **TS 81. Communications**

The CCTV Surveillance System specification outline in this section are based on minimum operational requirements. DTPW will consider newer surveillance technology as along as the minimum requirement are satisfied.

### **TS 81.1 Camera Surveillance System**

The CCTV Surveillance system shall consist of a MobileView 7000 Series Network Video Recorder (NVR) or approved equal.

Minimum 2TB dual hard drive on-board video storage, capable of recording at up to 30 frames per second (FPS) for all connected cameras. Also the on board video storage must comply with the State of Florida General Records Schedule GS1-SL for State and Local Government Agencies Item #302 for Surveillance Recordings, which stipulates minimum retention period of 30 days. The 30 day retention period shall be met based on the following operational criteria:

1. The DVR shall record video and audio for 24 hours per day
2. The DVR shall record audio and video for 7 days per week
3. The number of cameras to be recorded shall be as specified in this section
4. The recording rate (FPS) per camera shall be as specified in this section
5. The cameras' resolution shall be as specified in this section

Connection to vehicle discrete signals for metadata recording. DTPW will specify which discrete signals are to be recorded.

Wireless capabilities for downloads and system diagnostics. Wireless antenna to be mounted on the rooftop of the buses.

Regulated 13.6 volts DC power shall be provided for the DVR system by the output of the dedicated electronics systems power supply.

Tamperproof Torx screws shall be provided for all camera housings and access covers.

Loom for the facing forward camera wires located below the destination sign compartment near the top of the windshield shall be provided.

All cameras outline within this document must contain the ability for at least seven (7) days of localized storage utilizing a storage Micro SDHC card or newer technology.

A system status indication shall be provided on the dashboard through the I/O Controls multiplex (or approved equal) warning indicator LED display.

The sixty-foot bus shall be equipped with 15 CCTV cameras with a minimum resolution of 2MP or approved equal; with the exception of the forward facing camera which shall be a minimum 8MP or greater; as follows:

1. A wide dynamic range camera mounted below the destination sign compartment near the top of the windshield, forward facing. The camera shall be a color camera with the capability to capture images in ambient lighting at night. If necessary, the camera may switch to black and white under very low lighting conditions. The field of view shall include the street in front of the bus, overhead traffic signal while stopped at an intersection, and pedestrians on the sidewalk or at the curb approximately 8 feet in front of the bus. (4.0mm if practicable) The mounting shall be such as to prevent camera vibration, water intrusion, interference with the driver's visibility, and shall minimize color shift due to the tinting at the top of the windshield. A flexible rubber glare shield (hood) shall be provided on



the camera. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. (A plastic dome housing is not acceptable.)

2. A color camera with infrared capability flush mounted in the panel above the driver facing the farebox and entry door. The camera dome housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall wide angle (2.9mm if practicable) and include the driver, the farebox, and the entire entry door opening. The vestibule area shall be illuminated by an infrared emitter under low light conditions.
3. A color camera flush mounted in the panel above the front door facing the driver and farebox. The camera dome housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall wide angle (2.9mm if practicable) and include the driver, driver compartment, and the farebox.
4. A color camera shall be flush mounted in the front destination sign compartment door facing rearward. The camera shall be housed in a shallow, waterproof box that will not interfere with the destination sign. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the front bus body section interior and the articulated joint area (6.0mm if practicable).
5. A color camera shall be surface mounted on the centerline of the bus ceiling or bulkhead at the rear of the front bus body section. The camera shall be front facing. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the front bus body section interior (4.0mm if practicable).
6. A color camera shall be surface mounted on the centerline of the bus ceiling or bulkhead at the front of the rear bus body section. The camera shall be facing rearward. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the rear bus body section interior (4.0mm if practicable).
7. A color camera shall be surface mounted on the bus ceiling facing the rear door. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall wide angle (2.9mm if practicable) and include the entire rear door opening.
8. A color camera shall be surface mounted on the centerline of the bus ceiling at the rear bulkhead of the rear bus body section. The camera shall be forward facing. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the rear bus body section interior and the articulated joint area (6.0mm if practicable).
9. A color camera shall be surface mounted on the bus exterior over the driver's window near the roofline. The camera shall be facing rearward. The housing shall be waterproof and sealed from the exterior environment to prevent formation of condensation on the housing interior. The housing must be rugged to resist damage from tree limbs. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the bus exterior and the traffic lane adjacent to the bus travel lane (6.0mm if practicable).
10. A color camera shall be surface mounted on the bus exterior over the front passenger door near the roofline. The camera shall be facing rearward. The housing shall be waterproof and sealed from the exterior environment to prevent formation of condensation on the housing interior. The housing must be rugged to resist damage from tree limbs. The housing window shall be glass or a material resistant

to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the bus exterior and the traffic lane adjacent to the bus travel lane (6.0mm if practicable).

11. A color camera shall be surface mounted on the bus exterior forward of the rear door near the roofline. The camera shall be facing rearward. The housing shall be waterproof and sealed from the exterior environment to prevent formation of condensation on the housing interior. The housing must be rugged to resist damage from tree limbs. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the rear door exterior and the ground adjacent to the rear door (2.9mm if practicable).
12. A color camera shall be surface mounted on the bus exterior at the rear above the engine compartment. The camera shall be facing rearward. The housing shall be waterproof and sealed from the exterior environment to prevent formation of condensation on the housing interior. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the rear bumper and the ground behind the bus (2.9mm if practicable).
13. A color camera shall be surface mounted on the bus exterior over the rear roadside window near the roofline. The camera shall be facing forward. The housing shall be waterproof and sealed from the exterior environment to prevent formation of condensation on the housing interior. The housing must be rugged to resist damage from tree limbs. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the bus exterior and the traffic lane adjacent to the bus travel lane (6.0mm if practicable).
14. A color camera shall be surface mounted on the bus exterior over the rear curbside window near the roofline. The camera shall be facing forward. The housing shall be waterproof and sealed from the exterior environment to prevent formation of condensation on the housing interior. The housing must be rugged to resist damage from tree limbs. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the bus exterior and the traffic lane adjacent to the bus travel lane (6.0mm if practicable).
15. A color camera with infrared capability flush mounted in the panel above or behind the driver facing the farebox and DCU. The camera dome housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall wide angle (2.9mm if practicable) and include the driver, the farebox and the DCU area. The vestibule area shall be illuminated by an infrared emitter under low light conditions.

All cameras shall have sufficiently high resolution to allow recognition of faces and to read roadside signs.

A complete description of the CCTV Surveillance system, including installation, shall be presented to DTPW for approval prior to production of the pilot bus or first production bus.

#### Additional Cameras

The Contractor shall provide options for additional cameras. The design, location, and operation of the additional cameras shall be approved by DTPW prior to production. The option for the additional cameras shall be priced separately from the bus in the Price Proposal.

## **TS 81.2 Intelligent Vehicle System (Computer Aided Dispatch/Automatic Vehicle Location System)**

### **General**

The Contractor shall supply a bus with an Computer Aided Dispatch/Automatic Vehicle Location System CAD/AVL) . This will provide accurate, reliable and timely bus performance and fault information and improve vehicle and passenger safety and security. CAD/AVL will be integrated with the onboard microprocessor controlled systems and with the DTPW Wireless and Ethernet LAN to create a fully intelligent vehicle that will increase vehicle performance, optimize fleet utilization, and increase operational efficiency.

The CAD/AVL is primarily constituted of bus onboard system and a depot system. The bus onboard system will have the main function to deliver the passenger friendly functionalities, interface to the vehicle operator, and collect the fault and performance data from all of the microprocessor based systems.

The depot system is required to download system updates and DTPW data, and collect fault and performance data uploaded from the buses through the wireless link (this system is not part of this procurement).

The bus builder shall supply the CAD/AVL system in accordance with the requirements outlined in this document. The bus builder shall develop a scope of supply, system integration and implementation.

The Bus Manufacturer shall be responsible for proving the installation of the CAD/AVL in the bus, the functional interfaces between this equipment and the bus, and to ensure that bus systems comply with the requirements of this document. The supply and proper functioning of all interfaces shall be provided in accordance with the requirements of this Specification. Also the bus manufacture shall ensure that the proposed CAD/AVL system seamlessly integrates with DTPW current CAV/AVL system manufactured by Clever Devices.

## **Computer Aided Dispatch/Automatic Vehicle Location System**

The onboard system is a key element of the Computer Aided Dispatch/Automatic Vehicle Location system and will consist of components necessary to enable DTPW to track and monitor the status and activity of systems located on the bus. Some of the components are but not limited to: Vehicle Logic Unit, Mounting Bracket, Bus Interface Harness, Internal Sign, Multi-Band Roof-Mount Antenna (used for Wireless LAN, Cellular Communication and GPS), Wireless LAN Antenna Cable and GPS Antenna Cable.

Each bus shall be provided with one Vehicle Logic Unit that will be wired for and capable of delivering the functions of the on board System. Some of the main functions are listed below:

- Automatic Vehicle Annunciation
- External and Internal Sign System Control
- Mobile Data Terminal
- GPS and Dead Reckoning
- Automatic Passenger Counting
- Automatic Vehicle Monitoring
- Hard Brake and Last Stop Reporting

The bus builder is required to present the complete implementation of the CAD/AVL system its features and its provisions for technical compliance review.

## Vehicle Logic Unit

### **General**

The VLU (Vehicle Logic Unit) shall be an open-standards based PC controller installed on the bus. The VLU shall employ a vast array of connections and interfaces to all on-board systems via standard PC and Transit system communication standards. This shall allow for growth for future onboard ITS systems and many years of service.

The VLU system shall provide integration to bus systems via proven transit and PC communication standards with SAE J1708/J1939/J1587, SAE J1939/CAN, RS232, and RS485 with busy line, TTL, USB, Ethernet, TCP/IP, discrete inputs and outputs, odometer, spare I/O, audio inputs and outputs, and full IDE capability for PC-type devices.

The VLU shall use RS232, J1939 and J1708 to transmit information to the in-vehicle electronic display signs.

The VLU shall be capable of integrating with camera systems to support security setups such as CCTV via standard SAE Vehicle Area Network Interfaces such as J1939/J1708.

VLU system shall be capable of handling GPS data in all areas.

The VLU shall employ advanced location algorithms that utilize the GPS, gyroscopic heading, and odometer pulse to accurately report where the bus is along the route.

The VLU shall employ these advanced location algorithms to ensure precise ADA compliant announcements as well as ridership data collection.

The VLU system functionalities shall include but not be limited to AVA (Automatic Vehicle Annunciation), WLAN (Wireless Local Area Network), Vehicle Health Monitoring, Predictive Arrival, APC (Automatic Passenger Counter) and CAD/AVL (Computer Aided Dispatch/Automatic Vehicle Location).

The VLU shall employ integration that enables the necessary subsystems access to transmission of data through a single secure wireless LAN, which shall have the capability to integrate with a real time communications network.

In the event of an emergency causing a vehicle to lose communication links to the network VLU shall allow all on-board data to be retained locally on the bus.

The VLU shall be designed with forward looking, state-of-the-art technology and modularity.

The VLU shall be designed to support easy installation and replacement. This design shall allow the VLU to withstand the harsh elements of the public transportation environment. A strong body casing shall protect against falling dirt, rain, sleet, snow, wind blow dust, vibration, pressurized hose-directed water, corrosion, extreme temperature variations, and external formation of ice.

The VLU shall have a secure lock on the access door requiring a unique key to help protect the VLU from theft.

The VLU systems minimum functions, power management, environmental, and capability requirements are summarized below and in the VLU Compatibility Table.

The VLU, or approved equal, shall provide the hardware and software necessary to:

- Provide a single-point operator login for connected equipment
- Coordinate audio announcements and sign displays
- Accept data generated by CleverWorks or equivalent database management software applications
- Support Wireless Data Transfer for software, configuration, announcement data, and route data updates
- Off-load data and accept updates via USB data Key and/or WLAN

- Integrate with Clever Devices Transit Control Head (TCH)
- Integrate with internal LED signs for internal announcements
- Integrate with external sign systems for external signs and announcements
- Interface with J1587/J1939 engine controllers, transmissions, and other onboard devices
- Allow for future hardware and software expansion
- Supports all features and functions associated with the Clever Devices CleverCAD computer aided dispatch system

### ***Hardware Characteristics***

At a minimum, the VLU shall have the following hardware and characteristics:

- Overall size: 8.50" long, 8.38" wide, and 3.87" high.
- 4 audio outputs, 25W each (2 internal, 1 external, 1 driver monitor speaker).
- 1 Driver Microphone Input
- 3 Ambient Sensing Inputs
- 16 discrete inputs
- 3 discrete outputs
- 2 x SAE J1708
- 2 x SAE J1939 (CAN 250K)
- 5 x RS232
- 2 x RS485
- 1 x RS232 or RS485 (selectable)
- 7 x USB
- 4 x RJ45 Ethernet
- 1 x DVI
- 1 x HDMI
- Integrated 20-channel GPS with dead-reckoning, and Gyro-meter
- Integrated Wi-Fi capability supporting IEEE 802.11a, b, g, n
- Integrated cellular wireless capability
- Heavy-duty connectors
- Hardware & software feature expansion
- Built-in real-time clock

### ***Environmental Requirements***

At a minimum, the VLU shall be tested to the following requirements:

- Temp: SAE J1455 4.1.3.1, 4.1.3.2 (-30°C to +60°C)
- Humidity: SAE J1455 4.2
- Splash: SAE J1455 4.4

- Vibration: SAE J1455 4.9.4.1, 4.9.4.2
- Shock: SAE J1455 4.10.3.1, 4.10.3.4
- Load Dump: SAE J1455 4.11.2.2.1
- Ind. Switching: SAE J1455 4.11.2.2.2
- Mutual Coupling: SAE J1455 4.11.2.2.3
- Radiated Emissions: SAE J1113/41, SAE J1455 4.11.3.3.1
- Conducted Emissions: SAE J1113/41
- Radiated Interference Susceptibility: SAE J1455 4.11.3.3.2, SAE J1113/22/24
- Conducted Interference Susceptibility: SAE J1113/2
- ESD Handling: SAE J1455, J1113, J1211
- ESD in Vehicle: SAE J1455, J1113
- FCC CERTIFICATION: Emission FCC Part 15 Class A

### ***Automated Voice Announcements***

The VLU shall provide audio and visual announcements to on-board riders and those waiting to board. As each fixed-route vehicle approaches a stop or other designated location, a digitally-recorded announcement shall be automatically made in English and/or Spanish languages over the existing on-board public address (PA) system speakers and displayed on Dynamic Message Signs inside the vehicle to inform passengers about upcoming stops, major intersections and landmarks.

The VLU shall be capable of making time-based, location-based and vehicle operator-initiated announcements/displays.

The VLU shall make an exterior announcement of the current route number and destination when doors open at a stop. At other locations (e.g., major intersections), the VLU shall make preset location-based interior announcements.

The location information announced/displayed shall provide the stop name and transfer opportunities.

### **PA Volume Control**

The volume of the internal announcements shall be automatically adjusted according to the noise level on the vehicle at the time, and the vehicle operator shall not be able to lower the announcement volume.

The VLU shall provide the capability to adjust external speaker volume levels based on time and location settings, as pre-configured by the Transit Agency (e.g., maximum volume at the downtown transfer center between 6am and 9am).

The VLU shall provide the capability to adjust the minimum and maximum volume levels separately for interior and exterior announcements.

The VLU announcements and PA volume level controls shall also allow the operator to separately adjust the volumes for the driver and handset speakers.

### **Automated Voice Announcement Triggers**

The VLU shall use the vehicle location information to trigger the appropriate announcements on-board the vehicle whenever the vehicle enters a “trigger zone.” A trigger zone is a user-defined area that is located just prior to each stop location. For example, the trigger zone may begin 800 feet before a stop as well as at selected other announcement locations.

Trigger zones shall be pre-defined by the central software for VLU trigger management and downloaded to the controller over WLAN.

Time-based announcements/displays shall be programmed to be made on-board the vehicle at specific times of the day or at a set frequency within specified time periods, on specific days of the week.

Location-based announcements/displays shall be programmed to be made on-board the vehicle when that vehicle passes any designated location(s).

Automated announcements shall continue to operate normally when the Mobile Data Computer is in silent alarm mode.

In the event that a vehicle is operating off-route, the automated announcements/displays shall not be made. Once the route is reacquired, the system shall automatically determine and announce the next valid bus stop or other designated location.

Off-route and on-route detection and recovery shall be automatic and not require vehicle operator intervention or action.

### **Manual Announcements**

The vehicle operator shall have the ability to manually trigger the activation of any pre-recorded announcements if needed.

Vehicle operator-initiated announcements/displays (e.g., safety-related announcements) shall be programmed to be made at the vehicle operator's discretion.

Vehicle operator use of the on-board PA system shall override any automated announcements.

Dispatchers shall be able to activate the announcements simultaneously on a group of buses.

### **Integration with Interior Dynamic Message Signs**

The Contractor shall install new interior Dynamic Message Signs that shall communicate with Automated Voice Announcement controller over the J1708/1587 network.

### **Automated Voice Announcement Text Display**

The VLU shall provide text announcements for configurable duration, which will be set using the central recording software.

As any fixed-route vehicle approaches a stop or other designated location, the VLU shall provide a stored text announcement at the same location as interior audio next stop announcement.

The VLU shall provide stored text for location triggered, periodic or operator-activated announcements.

The Dynamic Message Signs shall display the current date/time when not displaying a triggered announcement.

### **“Stop Requested” Functionality**

The Dynamic Message Signs shall display the “stop requested” message when stop requested or the wheelchair area stop request is activated by a customer.

If stop request signal is received while another message is being displayed on the Dynamic Message Signs, the VLU shall show stop requested message after current message is completed.

If the next stop announcement begins while the stop requested message is displayed, the stop requested message shall be interrupted.

### **External Sign System Control**

The VLU shall control the destination text to be displayed on the head-signs.

The Transit Agency shall provide and install any upgrades to the head-sign or head-sign controller firmware needed to implement this interface.

The operator shall continue to be able to use all features of the existing head-sign controller, regardless of whether or not the operator has logged into a run using the Transit Control Head (TCH) or whether the TCH/VLU are operational.

At an agency configurable distance before the start of each trip, the VLU shall change the head-sign message to display a message that can be configured by the Transit Agency.

When the vehicle is logged into a run using the TCH but operating on deadhead from the garage to the first trip of the run, the VLU shall automatically command the head-sign to display a message that can be configured by The Transit Agency. This message could be "OUTBOUND", "INBOUND", "OUT OF SERVICE", "FROM GARAGE" or the message that will be displayed during the first trip.

When the vehicle is logged into a run using the TCH but operating on deadhead to the garage from the final trip of the run, the DTPW shall automatically command the head-sign to display a message that can be configured by the Transit Agency. This message could be "OUT OF SERVICE", "TO GARAGE" or the message that will be displayed during the final trip.

When the vehicle is logged into a run using the TCH but operating on deadhead for interlining between trips in the course of a run, the VLU shall automatically command the head-sign to display a message that can be configured by the Transit Agency. This message could be "OUT OF SERVICE" or the message displayed during either the previous or upcoming trip.

When the vehicle is logged into a "special" run using the TCH, the VLU shall automatically command the head-sign to display a message that can be configured by the Transit Agency for that run (e.g., "OUT OF SERVICE", "IN TRAINING").

When the vehicle is logged into any run using the TCH, the operator shall be able to manually command the head-sign to display one of a set of preconfigured messages that can be configured by the Transit Agency (e.g., "OUT OF SERVICE", "IN TRAINING").

When the vehicle is in covert alarm mode, the VLU shall automatically command the head-sign to display one of a set of preconfigured messages that can be configured by the Transit Agency (e.g., "CALL POLICE").

### ***Vehicle Monitoring***

The vehicle monitoring system shall automatically collect selected bus systems' faults and operational performance data that will be transmitted simultaneously to the controller via the on board communication protocols (SAE J1939 Network, SAE J1708/J1587 Network, RS-232/485).

The system shall be capable of verifying active communication between all monitored systems and the system controller, and be capable of using multiple communication protocols simultaneously (SAE J1939 Network, SAE J1708/J1587 Network, RS232/485).

As system equipped vehicles come into range of the wireless LAN at the depot, all collected data (vehicle ID, all fault codes, and selected operational performance data defined in but not limited to Tables 2-1 to 2-6) shall be automatically transmitted to the Server and loaded into a format compatible with the depot system server.

All data shall be presented in US or Metric units as the Transit Authority desires. All data shall be capable of being presented using manufacturers fault and SAE definitions. Bus and sub-component manufacturers should provide all necessary documentation/support to ensure that all points are monitored properly with the actual fault/performance data point descriptions as they appear in all respective bus/sub-component maintenance manuals.

Manufactures should provide online access to Clever Devices On Board Integration Group to ensure that over the life of the bus, the most up to date configuration possible is provided to the Transit Agency. This shall include electronic copies of manuals, network topology diagrams, ladder logic, and gateway configurations as well as regular updates or access to an online hosted server. The OEM shall facilitate support from the parent company for all sub-component manufactures as needed and based upon the request of the Transit Agency. All faults and performance information shall be provided and shall be the functional equivalent of the any hand held or laptop based diagnostic unit unless approved by the Transit Agency. In addition to all standard SAE vehicle area network data points, all data point visualized on the operators' dashboard and in any respective



bus/sub-component diagnostic software shall be broadcast on a SAE complaint vehicle area network making it available for monitoring by the IVS system.

When a gateway or an interface is used between controller and the onboard communication systems, the gateway shall output all data to the controller in the format that's compliant with section 3.2. A CANalyzer test and a data review shall be performed by the bus manufacturer to confirm all data availability. The OEM should provide a complete list of all available data points on the vehicle area network to support this process, this includes standard and proprietary data point addresses. The test result should be submitted to the Transit Agency for review prior to bus configuration audit.

The following documents should be submitted to the Transit Agency for technical review.

- List of all performance points that are capable of being monitored (for example, power train temperature and climate control compressor discharge pressure).
- List of all fault codes that are capable of being monitored (for example, engine code "2963", climate control fault code "6").
- Information above should be grouped by the system that is reporting the data (for example, Engine, HVAC, Multiplex, ABS and Door Control).
- Denote how each system communicates (for example, J1939, J1708, RS232/RS485).

### **Fault Events**

All fault codes on the bus networks (SAE J1939, J1708/J1587, or RS232/RS485) shall be monitored, reported and stored in a non-volatile flash memory drive of the controller. Fault codes shall remain available indefinitely or as onboard memory storage permits. Data will be purged on a first in first out (FIFO) basis. Fault code data shall remain available after disconnecting the 24V batteries if disconnection occurs not less than 10 seconds after turning off the master run switch.

The system shall not collect faults when the engine is not running. The system shall not collect any data when the bus master switch is in the off position. Diagnostic fault codes (DM1, BAM or PID194, Multi-Section Parameter) from each system are to be monitored and the frequency of collection shall be configurable. Utilizing proprietary or reserved PGNs, SPNs, MIDs, FMIs, and PIDs are will not be accepted as they are not complaint with SAE J1587 or J1939 or the intention of this specification. Conditions or parameters for collecting fault codes based on either time delay or number of events in a time period shall be user definable. Condition or parameter changes will be made by supplier.

### **Performance Data**

All performance data stored by IVS shall be stored in non-volatile flash memory of the controller. Performance data shall remain available indefinitely or as onboard memory storage permits. Data will be purged on a First In First Out basis. Performance data shall remain available after disconnecting the 24V batteries if disconnection occurs not less than 10 seconds after turning off the master run switch.

The transmitted performance data to be monitored, the frequency of collection, and the stamped count format will be defined in the technical proposal. Conditions or parameters for collecting fault codes based on either time delay or number of events in a time period shall be user definable. Condition or parameter changes will be made by supplier.

In addition, the system shall monitor the available performance data and diagnostic fault codes of the Methane Detection System, Alternative Fuel Storage/Delivery System (CNG, LNG, Propane, Hydrogen, Electric, Fuel Cell, Hybrid, etc...) and the Fire Suppression System.

Tables 2-1 through 2-8 list the minimum performance data signals that each system is required to output to the controller and complete list of all fault/performance data points shall be provided to the Transit Agency as part of the technical design review described herein.

The Contractor shall verify the diagnostic fault and performance signals referenced in this section since they depend on the model of engine, transmission and other systems that will be supplied in the bus. Utilizing

proprietary or reserved PGNs, SPNs, MIDs, FMIs, and PIDs will not be accepted as they are not compliant with SAE J1587 or J1939 or the intention of this specification. Any proprietary or reserved PGN may be rebroadcast on a compliant with SAE as described within this document.

Table 2-1 : Vehicle Signals			
No.	Signal Name	No.	Signal Name
1	Air Compressor Status (Duty Cycle)	16	Kneeling cycle count
2	Hard brake depression percent and computation of event counting. Comparison to throttle and break depression % with MPH/KPH at the time of the event. Tracking of the same data is required before and after the event. (See Section 3.3.4)	17	Rear Door Open Signal
3	Brake depression percent	18	Throttle depression percent
4	Odometer pulse (Square Wave). Must be delivered as a discrete Voltage signal to IVS	19	Total Vehicle Miles (or Kilometers) Traveled
5	Hydraulic tank level low indicator	14	Differential fluid low indicator
6	Hydraulic tank level high indicator	15	Front Door Open Signal
7	Transmission oil level low indicator	20	Trip distance in miles (or kilometers)
8	Transmission oil level high indicator	21	Vehicle speed (MPH or KPH)
9	Tail lamp out monitor	22	Wheel Chair Cycle Counts
10	Brake lamp out monitor	23	Bus Battery Voltage (12V, 24V and High Voltage system if applicable)
11	Headlight out monitor	24	All Available Diagnostic fault codes
12	Wheelchair – rate of deployment or system health (for example, amp draw of motor)	25	Air Compressor Pressure (Per individual tank and system pressure)
13	Charging system monitor – low charge indication (for example, < 25 VDC)		

T2-2: Engine			
No.	Signal Name	No.	Signal Name
1	All Diagnostic fault codes	9	Hours
2	Wheel-Based Vehicle Speed	10	Electrical Potential (Voltage)
3	Vehicle Identification Number	11	Date
4	Unit Number (Power Unit)	12	Number of Emergency Stops

T2-2: Engine			
No.	Signal Name	No.	Signal Name
5	Trip Distance	13	Software Identification (Calibration Version)
6	Total Vehicle Distance	14	Road Speed PGN65265 SPN84 at a consistent 100ms broadcast rate
7	Software Identification	15	Component Identification (Serial Number)
8	Maximum Vehicle Speed Limit		

Table 2-3: Transmission	
No.	Signal Name
1	All Diagnostic fault codes
2	Battery Potential (Voltage)
3	Engine Requested Speed/Speed Limit
4	Hydraulic Retarder Oil Temperature
5	Software Identification
6	Transmission Input Shaft Speed
7	Transmission Output Shaft Speed
8	Transmission Oil Temperature
9	Transmission Oil Level High/Low
10	Transmission Oil Life Remaining
11	Transmission Shift Position

Table 2-4: Multiplex System			
<p>Performance data shall consist of but is not limited to current draw, electrical arcing to ground, system shutdown alerts and input and output status. At a minimum the multiplexer shall report the performance data given in the table below. The final list of the performance data will be finalized when the system configuration is made available by the Bus builder. The maximum number of signals required will depend on the multiplexer's capabilities. The system shall be able to add delay or persistency to these data points as required. Condition or parameter changes will be made by system supplier. For example, Low Air Fault can be generated and reported after a 15 second <u>persistent</u> with the engine running.</p> <p>NOTE: The J1939 compliant multiplexer system shall interface with the controller and transmit diagnostic fault codes (DM1, BAM or PID194, Multi-Section Parameter) available on the network. If a gateway is required for monitoring of the IVS system then a gateway shall be provided by the contracted bus builder.</p>			
No.	Signal Name	No.	Signal Name
1	Reverse	16	Engine Start Cycles
2	Network Failure	17	Air Dryer/Drain Valve
3	Fuel Filter Service	18	Parking Brake
4	Engine Air Filter Service	19	Front door fully open

5	ABS Indicator	20	Front door fully closed
6	Alternator Charge Indicator	21	Fire Suppression System Alarm
7	Low Air Pressure	22	Fire-Engine Shutdown
8	Stop Engine	23	Fire System Ok
9	Kneel Down SW	24	Stop Requested (does not include wheel chair stop request)
10	Throttle Malfunction	25	Software Identification
11	A/C Failure	26	Transmission Shift Position
12	Wheel Chair Stop Request	27	Hazard Switch
13	Left Turn Signal	28	Seat Belt Status
14	Right Turn Signal	29	Climate Control Switch
15	Wheel Chair Ramp Deployed		

Table 2-5: ABS System

No.	Signal Name
1	All diagnostic fault codes (DM1, BAM)
2	Road Speed
3	ABS Active
4	Software Identification
5	Wheel Speed PGN65215 SPN904 at a consistent 100ms broadcast rate

Table 2-6 : Door Systems

No.	Signal Name
1	Diagnostic fault codes
2	Rear Door Count
3	Front Door Count
4	Wheelchair Cycles
5	Kneel Cycle Count
6	Emergency Override Switch Count

Table 2-7 : Climate Control System

No.	Signal Name	No.	Signal Name
1	Ambient Air Temperature	10	Discharge Pressure
2	Application File	11	Suction Pressure
3	Discharge Air Temperature (Interior Cabin Air)	12	Operating Mode
4	Discharge Pressure	13	Evaporator Hours

Table 2-7 : Climate Control System			
No.	Signal Name	No.	Signal Name
5	Zone 1 Return Air Temperature	14	Condenser Hours
6	Zone 2 Return Air Temperature (only apply to articulation buses)	15	Configuration File
7	Zone 3 Return Air Temperature (only apply to articulation buses)	16	All diagnostic fault codes
8	Performance Data	17	Software Identification
9	Water Inlet Temperature	18	Compressor Hours
Note: Climate Control unit data shall be transmitted only when the operator's climate control switch is in the "ON" position. When the operator's climate control switch is in the "OFF" position, only software ID of the climate control unit would be transmitted to the system controller. If a second unit is installed on the bus, this shall broadcast the signals available.			

Table 2-8 : IVS	
No.	Signal Name
1	All IVS diagnostic fault codes (DM1, BAM)
2	All IVS software versions

### AVM® Data Format and Availability

The automatic vehicle monitoring controller shall send and receive messages from all bus systems actively communicating and connected to the J1708 or J1939 networks.

#### Data Definition

Regardless of the communication protocol used, each bus sub-system supplier should provide an interface specification and data definition consistent with the provided interface. Manufacturers of systems to be monitored should provide documentation for the data to be transmitted for each system, the interface protocol to be used and the data definition of the externalized data. Bus Manufacturer should provide each system vendors with this appendix.

The bus manufacturer is responsible for monitoring bandwidth utilization to insure sufficient throughput for network traffic and must assure that there are no network collisions, frame errors, etc.

The bus manufacturer must ensure that any bus system supplier that makes programming changes keep the existing data available. If any new faults or performance data is added during any program change it must be made available as per the J1939, J1708/J1587, and RS-232/485 requirements. If changes do occur, the bus system supplier and the sub-system supplier must notify the Transit Agency of changes in writing. The bus system supplier and the sub-system supplier shall perform any necessary campaigns to ensure consistency by implementing changes across the entire fleet.

## **J1939 Bus System Fault Reporting and Performance Data**

All bus system non-diagnostic application layer messages must be formatted and transmitted in conformance with SAE J1939-71, "Vehicle Application Layer". All performance data not made available through a broadcast must be available to system controller via the Request PGN (59904), as described in SAE J1939-21, "Data Link Layer". Utilizing proprietary or reserved PGNs or SPNs are will not be accepted as they are not complaint with J1939 or the intention of this specification.

All IVS monitored devices on SAE J1939 must respond to request for PGN 65242(Software Identification).

### **Bus System Fault Reporting (DM1 Diagnostic Messages)**

All diagnostic (fault) application layer messages must conform to the requirements described in SAE J1939-73 "Application Layer – Diagnostics".

At a minimum, all active bus system faults must be formatted and transmitted in accordance with paragraph 5.7.1 ("Active Diagnostic Trouble Codes (DTC)" – Message Type DM1 [PGN 65226]). These messages are to be broadcast, but shall also be available on request using the Request Message PGN [59904]. The Request PGN is described in J1939-21, "Data Link Layer". The response to the DM1 request must be in accordance with paragraph 5.7.1 with regard to the formatting of DM1 messages. See "Transport Protocol", below for details regarding transmission of multiple packets (containing DTCs) using the Broadcast Announce Message (BAM).

The DM1 message involves the use of Suspect Parameter Numbers (SPNs) to identify a particular element, component or parameter associated with a J1939 network device Diagnostic Trouble Code (DTC). Where possible, bus systems shall use SPNs defined in the SAE J1939 specification when reporting faults. If there is no correlation to an existing SPN, values in the proprietary range must be used. These are the SPN values which span from 520192 (7F000 hex) to 524287 (7FFFF hex), inclusive.

### **Transport Protocol - Broadcast Announce Message (BAM)**

In all cases where a response or broadcast message will require greater than 8 data bytes, the capabilities of the Transport Protocol must be employed.

Specifically, the Broadcast Announce Message Transport Protocol, as described in SAE J1939-21, "Data Link Layer", paragraph 5.10; provides for the transmission of messages which encompass multiple packets of data. An example of such a transmission would be a DM1 message with more than one Diagnostic Trouble Code (DTC) being reported.

## **J1587 Performance Data and Fault Reporting**

### **J1587 Performance Data**

All non-diagnostic or fault application layer status messages must be formatted and transmitted in conformance with SAE J1587, "Electronic Data Interchange Between Microcomputer Systems in Heavy Duty Vehicle Applications" and SAE J1708, "Serial Data Communications Between Microcomputer Systems in Heavy Duty Vehicle Applications". All performance data is expected to be available via appropriate Message ID (MID), Parameter ID (PID), SID, Fault ID (FMI), assignments in accordance with these specifications. Utilizing proprietary or reserved FMIs, MIDs, and PIDs are will not be accepted as they are not complaint with SAE J1587 or the intention of this specification.

All IVS monitored devices on SAE J1708/J1587 must respond to request for PID 234 (Software Identification).

### **J1587 Fault Reporting**

All diagnostic (fault) application layer messages must be formatted and transmitted in conformance with SAE J1587, "Electronic Data Interchange Between Microcomputer Systems in Heavy Duty Vehicle Applications" and SAE J1708, "Serial Data Communications Between Microcomputer Systems in Heavy Duty Vehicle Applications". Specific attention shall be devoted to the use of PID 194 (Transmitter System Diagnostic Occurrence Count Table) to report the diagnostic condition of a device on the network. All fault reporting data is expected to be available via appropriate Message ID (MID), Parameter ID (PID), SID, Fault ID (FMI), assignments in accordance with these specifications.

### **J1587 Multi-Section Parameter**

PID 192 (Multi-section Parameter) is used to transmit parameters that are longer than what is limited by SAE J1708. A specified parameter can be broken into sections with each section being transmitted in a different message. This shall be used as appropriate.

### **J1939 Compliant Devices Data Definition**

All bus systems shall externalize all data including fault codes and performance data in a standard, non-proprietary J1939 format. All systems shall be assigned with a Source Address on the J1939 network. Specific detail for all Parameter Group Numbers (PGNs) supported (down to the individual parameters supported within the PGN) shall be provided to IVS supplier.

Details for each fault the device is capable of generating (using the DM1 message) shall include the Source Address (SA), Suspect Parameter Number (SPN), Fault ID (FMI), OEM Description and OEM Flash Code or Fault Code, if it exists. All bus systems shall also broadcast its software identification level to system controller.

### **J1587 Compliant Devices**

All bus systems shall externalize all data including fault codes and performance data in a standard, non-proprietary J1587 format. MID on the J1587 (J1708) network and specific detail for all PIDs shall be provided to the automatic vehicle monitoring controller. Details for each fault the device is capable of generating (using the PID 194 message) shall include the MID, PID/SID, Fault ID (FMI), OEM Description and OEM Flash Code or Fault Code, if it exists. All bus systems shall also broadcast its software identification level to the automatic vehicle monitoring controller.

### **Multiplex System Monitoring**

Multiplex systems shall be monitored via J1708/J1939 and/or RS232/485 and must be equipped with all necessary gateways and programming required to externalize data in a manner compatible with the automatic vehicle monitoring controller. Multiplex system sleep mode time shall be set to fifteen (15) minutes. The J1939 compliant multiplexer system shall interface with the IVS controller and transmit diagnostic fault codes (DM1, BAM or PID194, Multi-Section Parameter) available on the network. Interfacing may require a J1939 multiplexer gateway if a gateway is required it shall be provided by the contracted bus builder. Performance data to be supplied by bus manufacturer shall consist of but is not limited to current draw, electrical arcing, system shutdown alerts and input and output status.

### **Door System Interface**

The IVS shall monitor the door system which may include door sensors that independently measure fully-open and fully-closed door positions. The bus must be equipped with open and close sensors on all doors. The system shall record all necessary fault codes broadcasted by door controller over the network used (J1939, J1708/J1587 or RS232/RS485).

The system shall be able to detect, calculate and record the opening and closing speed of all bus doors. The system will record and report a door open/close speed fault when the front door open/close speed is exceeding the speed and time defined.

### **Advanced technology and hybrid drivetrain systems**

All advanced technology and hybrid drivetrain systems shall broadcast information in compliance specified SAE J1939 and J1708/J1587 vehicle area network communication standards contained within this appendix. All equivalent data points specified above by component system from standard diesel drivetrains shall be made available utilizing non-proprietary protocols.

The final list of fault and data points shall be subject to the Transit Agency review prior to final contract acceptance. Any required changes to firmware, harnessing, and other required interfaces shall be implemented fleet wide. If necessary the awarded contractor shall perform fleet wide upgrade campaigns as necessary to ensure compliance with this appendix.

### **Hard Brake and last stop reporting**

The IVS should provide Hard Brake and Last Stop detection and reporting. The system shall utilize the most accurate available vehicle speed signal on the bus for Hard Brake and Last Stop. The system shall be able to use brake and acceleration signals from odometer pulse, ABS, transmission, etc. Hard Brake and Last Stop functionality is an investigative tool for use primarily for accident investigation. Hard Brake/Last Stop shall monitor, collect and report the following data while the bus is running:

- Event Time and Date
- Vehicle Speed (mph)
- Deceleration Rate (ft/sec<sup>2</sup>)
- Engine Speed (rpm)
- Antilock Brake System Status (ABS Active)
- Bus ID
- Brake pedal position (applied or not-applied )
- Engine Load (%)
- Torque Commanded (Hybrid Vehicles)
- Throttle (%)

All the above data signals shall be externalized by the applicable system in a manner compatible and recognizable by the IVS controller. These signals will be consistently broadcast every 100ms. The collected data shall be stored when either a Hard Brake or Last Stop event occurs.

Hard brake detection shall be defined as vehicle decelerations that exceed a threshold of 15 ft/sec<sup>2</sup> for more than 300ms. The thresholds shall be configurable by the Transit Agency.

A Last Stop occurs whenever the bus comes to a full stop. Stored Hard Brake data remains in IVS controller until it is wirelessly transferred from the bus to a depot server or be manually copied from the bus. Stored Last Stop data shall be encrypted and only be manually copied from the bus.

A last stop event is defined as change in the vehicle's speed from forward motion to zero miles per hour. A hard brake will be considered as a last stop event if the hard brake event ends with 0 mph. The most recent five (5) last stop events shall be collected and stored on the IVS controller memory. Any last stop event other than the most recent five (5) last stop events will be deleted in the controller. Data collected for a last stop shall be the event itself and the data around the event which is called the snapshot data. The snapshot window shall be configurable from a minimum of two minutes before the event and one minute after the event. The most recent five (5) last stop events and associated snap shot data shall be continuously collected during the course of the day.

Hard brake and last stop accuracy shall be determined by comparing deceleration test results from the intelligent vehicle system and deceleration test equipment such as Vericom VC4000 or accelerometer. The error shall be within 5 percent.

Included with the Hard Brake/Last Stop functionality is the software tools required to upload and report Hard Brake and Last Stop events. For the Last Stop report generation, software shall be provided to the Transit Agency that allows authorized personnel to generate the report from the data that is copied from the bus. On the last stop reports, the time interval for each reading shall be one second minimum, preferably 500 milliseconds.

### **GPS and Dead Reckoning**

The IVS shall have an onboard GPS unit. The GPS shall be comprised of self-contained hardware and software which includes a GPS receiver, gyrocompass and an interface to the odometer (available from the bus transmission).



## Vehicle Communication Antenna

Wireless communication shall be IEEE 802.11 compliant. The system shall contain a multi-band antenna with cable that will allow the controller to have at a minimum GPS satellite communication, WIFI communication via IEEE 802.11, cellular communication. There shall be one antenna per bus. Antenna and cable shall have a service life equal to the design life of the bus. The bus manufacturer will install the antenna and the cable in conformance to this specification.

## Transit Control Head (TCH)

The Transit Control Head (TCH), in conjunction with the VLU, should provide a single operator log-on for electronic devices on the transit vehicles, at the Authority's discretion, and be the sole driver interface for CleverCAD functions.

The TCH should provide a display and keypad which are specifically adapted for transit operations, and shall use a full color, touch screen, backlit display, readable by the vehicle operator from the seated position under the full range of ambient illumination conditions. This includes capability such as vehicle operator-controlled brightness/contrast control, anti-glare coating and adjustable orientation mounting. The color combination to be used on the TCH should provide legibility for the color blind.

The operator terminal shall be operated using touch screen programmable buttons with visual and audible feedback. The TCH speaker should provide audible feedback when a function key or on-screen key is pressed.

The operator shall not be able to manually shut off or disconnect the operator terminal power or manually shut down the Mobile Data Computer application software. Exposed antenna or other connections will be tamper-proof. If non-compliant, please provide information on how they will be made tamper-evident.

The TCH shall have the functionality to control both the destination signs and the voice annunciation system.

At a minimum, the TCH shall have the following hardware and characteristics:

- Overall size 10.00" long, 7.50" wide, and 1.80" in depth
- Weight: 3.5 lbs.
- VGA LCD screen, that is
  - 9 inch Wide Screen
  - 800 x 480 Resolution
  - R.G.B. Stripe Color Configuration
  - Daylight Readable
- VGA Touch Screen, that is
  - 3H Hard Coat, Film Glass
  - 83% Transparency with Anti-Glare and Anti-Smudge
  - Finger or Stylus Activated with maximum force of 80 Gf
  - Resistance Activated Touch
  - 10,000,000 Touch Lifespan
- Audio: speaker and microphone
- Brightness control via panel buttons
- Environmental
  - Temp: SAE J1455 4.1.3.1, 4.1.3.2 (-30°C to +70°C)

- Humidity: SAE J1455 4.2
- Vibration: SAE J1455 4.9.4.1, 4.9.4.2
- Shock: SAE J1455 4.10.3.1, 4.10.3.4
- FCC CERTIFICATION: Emission FCC Part 15 Class A

The Contractor shall install the Transit Control Head as close to the driver's instrument panel as possible. The TCH has to be mounted in such a way that the driver will have a full view of the TCH display and the mounting of this unit will not impede the view of the road. The proposed mounting location is to be reviewed and approved by DTPW prior to production.

### **Internal Display Sign**

The internal display sign shall display coordinating text for next stop and other audio announcements. The sign shall meet all ADA requirements for internal signage.

The internal LED display sign shall be used to display the words "Stop Requested" and shall be visible to passengers. When the passenger chime is activated and shall remain on until the front or rear door is opened. The internal LED display sign shall also be used to display "Lift Requested" when the passenger chime is activated provided there are separate outputs on the vehicle to designate different chimes for Stop Requested and Lift Requested.

Enclosure shall be aluminum with welded and sanded seams, black powder paint finish and acrylic fascia with matte finish for reduction of reflected glare. Sign shall be constructed to withstand the harsh environmental conditions found in transit applications.

### **Speakers**

Contractor shall provide a minimum of ten (10) interior speakers in the ceiling or lighting panels and one (1) exterior weather proof speaker at the front door. The speakers shall be compatible with the Clever Devices IVN system and be capable of producing clear, high quality announcements. A 3-way selector switch must be provided for the manual P.A. system (inside/both/outside) so that the driver may select inside or outside or inside/outside announcements.

## **TS 81.3 Automatic Passenger Counter (APC)**

The Hella Urban Transportation Associates (UTA) Automatic Passenger Counter (APC) shall be furnished and installed by the Contractor. The APC shall include features for all curbside and roadside doors, wheelchair ramp and bike rack deployment.

DTPW approval is required for the installation of hardware and electrical wires prior to production.

## **TS 81.4 Radio Handset and Control System**

The Contractor shall install the complete radio system. The radio shall be a Harris M7300 Radio with OpenSky Trunking feature package, Control Unit, and an antenna system operating in 700/800 MHz range. () The Contractor shall provide and install a handset and cab speaker to work with the radio system. The Contractor shall provide wiring and specialized cables for the Clever Devices interface. The Contractor shall be responsible for coordinating radio interface details with Clever Devices. The Contractor shall provide all antennas and antenna cables, terminal blocks, filters, relays, and all wiring, connectors, brackets, and incidental hardware to install the complete system. All radio equipment location, accessibility, mounting, and cable routing must be approved by DTPW prior to production.

At time of fabrication DTPW will have the option to either purchase the Harris M7300 mobile radio system or provide the unit for installation by the contractor.

Regulated 13.6 volts DC power shall be provided for the radio system by the output of the dedicated electronics systems power supply.

Contractor should provide and install a 2-1/2 inch ID conduit or an equivalent inner wall channel space from the radio box to the radio control head mounting location. Conduit or channel design shall facilitate installation of the radio control cable by the "pull through" method in both initial and future installations to facilitate repair and replacement. Conduit shall be rust and water proof.

All antenna cables must be run in 1 inch diameter conduit to the radio box. Removable locking access covers shall be provided in the ceiling of the bus in order to allow access to the antenna and conduit. Antenna access cover locks must be approved by DTPW. The Contractor shall be responsible for the proper location and installation of all required antennas. Antenna locations shall be as close as possible to the centerline of the bus and have a separation of approximately 3 feet. All mounting locations must be approved by DTPW prior to bus manufacture.

#### Harris M7300 Radio System

The Contractor shall provide options for DTPW to purchase the Harris M7300 mobile radio system and for DTPW to provide the Harris M7300 mobile radio unit for installation by the contractor. The design, location, and operation of the Harris M7300 mobile radio system shall be approved by DTPW prior to production. The options for DTPW to purchase the Harris M7300 mobile radio system and for DTPW to provide the Harris M7300 mobile radio unit for installation by the contractor shall be priced separately from the bus in the Price Proposal.

##### **TS 81.4.1 Drivers Speaker**

The Cab speaker must be mounted so the driver can hear an announcement when the volume has been lowered.

Mounting locations must be approved by DTPW prior to production.

##### **TS 81.4.2 Handset**

The Handset must be mounted at waist level (driver seated) requiring minimal body movement, located in front of the driver, and requiring minimal eye movement when locating the handset.

Mounting locations must be approved by DTPW prior to production.

##### **TS 81.4.3 Transit Control Head**

Contractor shall install a driver display unit as close to the driver's instrument panel as possible.

The TCH has to be mounted in such a way that the driver will have a full view of the TCH display and the mounting of this unit will not impede the view of the road. The proposed mounting location is to be reviewed and approved by DTPW prior to production.

##### **TS 81.4.4 Emergency Alarm**

Contractor shall provide and install a Silent Alarm switch. The switch shall activate the Silent Alarm function of the radio system and destination sign. The switch shall be a red push button double pole switch with guard ring, manufactured by OTTO Engineering, part P/N P4-624122. The push button must be red and have a

protective collar to prevent accidental activation. The installation and location of the switch must be approved by DTPW prior to production.

An emergency anti-highjack function shall be provided which will activate the throttle interlock and the transmission auto neutral features when inputs are provided by the radio system. (The transmission "auto neutral" feature is activated when the transmission "auto neutral" input wire is grounded.) The radio VLU will utilize two of its normally open dry contacts to provide ground inputs to the I/O Controls (or approved equal) programmable logic system. One contact will provide the signal to activate the anti-highjack function to disable the bus. The bus will remain disabled until the other contact provides a signal to de-activate the anti-highjack function.

The intent of these specifications is to have the Contractor provide and install a complete and functional radio system.

## **TS 81.5 Wireless Router**

WiFi Equipment (In-Motion Mobile Gateways Including Both Internal and External Antennas)

The contractor shall provide for one integrated, modular wireless bus system with both 802.11n and the highest speed available wireless cellular data packet technology available at the time of design. The system shall include, but is not limited to an Sierra Wireless Airlink MG90 High Performance Multi-Network Vehicle Router (Dual Wi-Fi, USB/Express, Dual Cellular-ready) compatible with AT&T's network in addition to Miami-Dade Transit's standard requirement of GPS radio, Wi-Fi card for public use, Wi-Fi card for backhaul use, and slots for additional modems. The contractor shall provide one onboard Mobility Core Server Software License per Gateway. The overall wireless system description shall be provided to DTPW for review and approval prior to production.

### Modularity

The Wireless Router system must be of modular design so as to allow for the upgrade and replacement of wireless and cellular cards via a card swap. The Wireless routers software must be capable of being upgraded via a software modification to be covered under the equipment maintenance in the event that 802.11n is not available at the time of design.

### Wireless Router Antennas

The Wireless router shall have antennas installed on the bus and positioned for optimal data coverage and transfer from the bus. The antennas must support MIMO type design as is being used currently on advanced 802.11g systems and will be the standard on 802.11n type systems. Antennas must be rated for mobile applications and be built and designed strong enough to be used through a vehicle wash without any problems. Proper gaskets and sealing of antennas will be made on the bus structure to prevent leaks through antenna placements.

The cellular antenna shall be for 4G LTE service.

### Security

A minimum of WPA2-AES security will be required on the Wireless Router. If at the time of design, security flaws have been found in WPA2. DTPW will require an DTPW approved security scheme. Router will be configured so only key systems will be allowed to transfer off the cellular link with the use of a built in system firewall.

### Traffic Prioritization

Selected Wireless Router system must be capable of tagging traffic with prioritization levels as defined in 802.11e QoS. Prioritization levels will need to be different for the 802.11n and the cellular links. Levels will be chosen based on the application needs during design review.

#### Bandwidth/Coverage

##### 802.11n

Wireless router shall provide at a minimum 100Mbps full duplex connectivity at a distance of 100FT from the antenna. The baseline 802.11n product that must be used to test the reference design will be composed of a similar wireless router without the use of amplification technology and with the use of omni antennas with more than 2.5dbi. Bandwidth/Coverage shall be tested by sending bit patterns over the link with no more than 1% packet errors and 0% packet loss.

#### Cellular

At a distance of 400FT from the 802.11n antenna or greater the Wireless Routers will seamlessly switch to use the cellular technology. Coverage of the system must provide for at a minimum of 85-90% coverage area along current DTPW bus routes at the time of design. Coverage will be determined by use of providers wireless coverage maps.

#### Interconnectivity

Wireless Router system selected must be capable of bridging or routing to another similar wayside device to bring communications back to the Government Center servers. MobileIP or approved mobility protocols shall be used to provide seamless transition from 802.11n to the wireless cellular network and back when in 802.11n coverage.

#### Description of Current DTPW Wireless Infrastructure:

Mobile Access Routers are currently used to support Mobile-IP for connection persistence as a device roams from one area to another. It is the intention of DTPW to implement a system that will allow DTPW to utilize the IEEE 802.16 standard in conjunction with vertical cellular handoffs. IEEE802.16 is currently implemented using a Cisco based VPN/Home Agent/FW and ACS server infrastructure.

#### Onboard Device Connectivity

Wireless system must have sufficient Ethernet 10/100 ports required to support all subsystems that require communications to wayside equipment via wireless or cellular. In addition there must be a minimum of 4 Ethernet ports left available for future growth.

A network cable shall be provided between the In-Motion mobile gateway and the DVR.

### **TS 81.6 Communications Equipment Box**

Provide a lockable communications equipment box in the forward most streetside compartment. The box shall accommodate radio (including VLU), CCTV, Clever Devices voice annunciator/PA, DC-DC converter, and other electronic equipment. The equipment shall be mounted in the box on a minimum of five (5) slide-out trays or racks. The trays or racks shall slide out so that the equipment is completely out of the radio box and access to wires, cables, and hard drive is easily accessible. The trays or racks must lock in the stowed position. Provide a terminal block with 16 terminal posts on the radio tray (location to be approved by DTPW Communications). Terminal lugs 1 and 2 must have constant 12VDC. Lugs 4 must have switched 12VDC-

ignition voltage. Terminal lug 6 must be power ground. Lugs 7 through 16 will be used as needed. Equipment shall be mounted with sufficient room to easily secure cables and so that securing the cable to the equipment requires orienting the screwdriver from above or toward the bus centerline. The box shall be sealed to prevent intrusion of dust and water. The box must have an access door that is lockable with a ChicagoLOCK 1454 key. The design of the communications equipment box must be approved by DTPW prior to production.

Provide a 24VDC power outlet in the compartment, powered only when the engine is running, for use with a 24VDC to 120VAC-15AMP inverter.

A permanent vinyl schematic on the communications equipment box door illustrating configuration shall be provided.

An open back interior 22" X 21" clear aluminum finish advertisement frame attached to the communications equipment box shall be provided. Design, location, mounting, and description of the advertisement frame shall be provided to DTPW for review and approval during the preproduction meeting.

DRAFT

## WARRANTY REQUIREMENTS

### WR 1. Basic Provisions

#### WR 1.1 Warranty Requirements

##### WR 1.1.1 Contractor Warranty

Warranties in this document are in addition to any statutory remedies or warranties imposed on the Contractor. Consistent with this requirement, the Contractor warrants and guarantees to DTPW each complete bus, and specific subsystems and components as follows.

##### WR 1.1.2 Complete Bus

The complete bus, propulsion system, components, major subsystems, and body and chassis structure, are warranted to be free from Defects and Related Defects for three years / unlimited miles beginning on the date each bus is put into service. Items with progressive wear characteristics such as but not limited to belts, wiper blades, friction materials, etc. are not excluded from warranty and should not be of poor quality that requires frequent change. The warranty shall not apply to scheduled maintenance items such as filters and consumable items. Consumable items are only oil and lubricants. The warranty is based on regular operation of the bus under the operating conditions prevailing in Miami, Florida. Specific warranties for subsystems and components that exceed the three years / unlimited miles complete bus warranty are listed in subsequent Sections. During this warranty period, the bus shall maintain its structural and functional integrity.

##### WR 1.1.3 Subsystems and Components

Specific subsystems and components are warranted and guaranteed to be free from defects and related defects for the time and/or mileages given.

The following warranty periods and/or mileage shall apply:

**MAJOR SUBSYSTEM AND COMPONENT WARRANTY TABLE**

<b><u>Item</u></b>	<b>Whichever occurs first</b>	
	<b><u>Years</u></b>	<b><u>Mileage</u></b>
Powertrain	5	Unlimited
Air Compressor	5	Unlimited
Air Dryer	5	Unlimited
Batteries	12	Unlimited
Charging Equipment	12	Unlimited
Push Button Shift Selector (PBBS)	5	Unlimited
Drive Shaft	2	Unlimited
Drive Axle	3	Unlimited
Suspension Components	3	Unlimited
Brake System	2	Unlimited
All Electric HVAC	3	Unlimited
Passenger Door System	3	Unlimited
Wheelchair Ramp System	3	Unlimited
Fire Suppression System	3	Unlimited
Passenger Seating	3	Unlimited

Paint System	3	Unlimited
Windows Frame (Water leak and Condensation)	7	Unlimited
Floor (Including floor cover)	12	Unlimited
Basic Body Structure	12	Unlimited
Body Structure Corrosion	12	Unlimited

Extended Warranties terms and prices of all major subsystems and components greater than those listed above shall be provided by the Contractor and priced separately from the bus in the Price Proposal. DTPW shall have the option to purchase the extended warranty for all major subsystems and components.

#### **WR 1.1.4 Serial Numbers**

Upon delivery of each bus, the Contractor shall provide a complete electronic list of serialized units installed on each bus to facilitate warranty tracking. The list shall include, but is not limited to:

- Powertrain
- Charging Station
- A/C compressor and condenser/evaporator unit
- drive axle
- power steering unit
- air compressor
- wheelchair ramp

The Contractor shall provide updated serial numbers resulting from warranty campaigns. The format of the list shall be approved by the Agency prior to delivery of the first production bus.

#### **WR 1.1.5 Extension of Warranty**

If, during the warranty period, repairs or modifications on any bus are made necessary by defective design, materials or workmanship but are not completed due to lack of material or inability to provide the proper repair for thirty (30) calendar days, the applicable warranty period shall be extended by the number of days equal to the delay period.

#### **WR 1.2 Voiding of Warranty**

The warranty shall not apply to any part or component of the bus that has been subject to misuse, negligence, accident, or that has been repaired or altered in any way as to affect adversely its performance or reliability, except insofar as such repairs were in accordance with Contractor's maintenance manuals and the workmanship was in accordance with recognized standards of the industry. The warranty shall also be void if DTPW fails to conduct normal inspections and scheduled preventive maintenance procedures as recommended in the Contractor's maintenance manuals. This clause shall be effective upon the receipt of all the contractor's maintenance manuals by DTPW.

#### **WR 1.3 Exceptions and Additions to Warranty**

The warranty shall not apply to scheduled maintenance items and items furnished by DTPW such as radios except if such equipment may be damaged by the failure of a part or component for which the Contractor is responsible.



**WR 1.3.1 Pass-Through Warranty**

Should the Contractor elect to not administer warranty claims on certain components and wish to transfer this responsibility to the sub-Suppliers, or to others, the Contractor shall request this waiver.

Contractor shall state in writing that the Agency's warranty reimbursements will not be impacted. The Contractor also shall state in writing any exceptions and reimbursement including all costs incurred in transport of vehicles and/or components. At any time during the warranty period, the Contractor may request approval from the Agency to assign its warranty obligations to others, but only on a case-by-case basis approved in writing by the Agency. Otherwise, the Contractor shall be solely responsible for the administration of the warranty as specified. Warranty administration by others does not eliminate the warranty liability and responsibility of the Contractor.

**WR 1.3.2 Superior Warranty**

The Contractor shall pass on to the Agency any warranty offered by a component Supplier that is superior to that required herein. The Contractor shall provide a list to the Agency noting the conditions and limitations of the Superior Warranty not later than the start of production. The Superior Warranty shall not be administered by the Contractor.

**WR 1.4 Fleet Defects****WR 1.4.1 Occurrence and Remedy**

A Fleet Defect is defined as cumulative failures of twenty-five (25) percent of the same components in the same or similar application in a minimum fleet size of twelve (12) or more buses where such items are covered by warranty. A Fleet Defect shall apply only to the base warranty period in sections entitled "Complete Bus," "Propulsion System" and "Major Subsystems." When a Fleet Defect is declared, the remaining warranty on that item/component stops. The warranty period does not restart until the Fleet Defect is corrected.

For the purpose of Fleet Defects, each option order shall be treated as a separate bus fleet. In addition, should there be a change in a major component within either the base order or an option order, the buses containing the new major component shall become a separate bus fleet for the purposes of Fleet Defects.

The Contractor shall correct a Fleet Defect under the warranty provisions defined in "Repair Procedures." After correcting the Defect, DTPW and the Contractor shall mutually agree to and the Contractor shall promptly undertake and complete a work program reasonably designed to prevent the occurrence of the same Defect in all other buses and spare parts purchased under this Contract. Where the specific Defect can be solely attributed to particular identifiable part(s), the work program shall include redesign and/or replacement of only the defectively designed and/or manufactured part(s). In all other cases, the work program shall include inspection and/or correction of all of the buses in the fleet via a mutually agreed-to arrangement. The Contractor shall update, as necessary, technical support information (parts, service and operator's manuals) due to changes resulting from warranty repairs. DTPW may immediately declare a Defect in design resulting in a safety hazard to be a Fleet Defect. The Contractor shall be responsible to furnish, install and replace all defective units.

**WR 1.4.2 Exceptions to Fleet Defect Provisions**

The Fleet Defect warranty provisions shall not apply to DTPW-supplied items, such as radios, fare collection equipment, communication systems and tires.

## **WR 2. Repair Procedures**

### **WR 2.1 Repair Performance**

The Contractor is responsible for all warranty-covered repair Work. To the extent practicable, DTPW will allow the Contractor or its designated representative to perform such Work. At its discretion, DTPW may perform such Work if it determines it needs to do so based on transit service or other requirements. Such Work shall be reimbursed by the Contractor.

### **WR 2.2 Repairs by the Contractor**

If DTPW detects a Defect within the warranty periods defined in this section, it shall, within thirty (30) days, notify the Contractor's designated representative. The Contractor or its designated representative shall, if requested, begin work on warranty-covered repairs within five calendar days after receiving notification of a Defect from DTPW. DTPW shall make the bus available to complete repairs timely with the Contractor's repair schedule.

The Contractor shall provide at its own expense all spare parts, tools and space required to complete repairs. At the DTPW's option, the Contractor may be required to remove the bus from the DTPW's property while repairs are being affected. If the bus is removed from the DTPW's property, repair procedures must be diligently pursued by the Contractor's representative.

### **WR 2.3 Repairs by the Agency**

#### **WR 2.3.1 Parts Used**

If the Agency performs the warranty-covered repairs, it shall correct or repair the Defect and any Related Defects utilizing parts supplied by the Contractor specifically for this repair. At its discretion, the Agency may use Contractor-specified parts available from its own stock if deemed in its best interests.

#### **WR 2.3.2 Contractor-Supplied Parts**

DTPW may require that the Contractor supply parts for warranty-covered repairs being performed by the Agency. Those parts may be remanufactured but shall have the same form, fit and function, and warranty. The parts shall be shipped prepaid to the Agency from any source selected by the Contractor within fourteen (14) days of receipt of the request for said parts and shall not be subject to an DTPW handling charge.

#### **WR 2.3.3 Defective Component Return**

The Contractor may request that parts covered by the warranty be returned to the manufacturing plant. The freight costs for this action shall be paid by the Contractor. Materials should be returned in accordance with the procedures outlined in "Warranty Processing Procedures."

#### **WR 2.3.4 Failure Analysis**

The Contractor shall, upon specific request of DTPW, provide a failure analysis of Fleet Defect or safety-related parts, or major components, removed from buses under the terms of the warranty that could affect fleet operation. Such reports shall be delivered within 60 days of the receipt of failed parts.

#### **WR 2.3.5 Reimbursement for Labor and Other Related Costs**

DTPW shall be reimbursed by the Contractor for labor. The amount shall be determined by multiplying the number of man-hours actually required to diagnose and correct the defect by the current rate per hour, first class mechanic, straight wage rate, plus seventy percent (70%) fringe benefits, plus the cost of towing the bus if such action was in the normal service area. These wage and fringe benefit rates shall not exceed the rates in effect in DTPW's service garage at the time the defect correction is made. Labor required to correct fleet defects shall be reimbursed at one and one-half (1 1/2) the actual rate in effect at the time the campaign is made, plus seventy percent (70%) fringe benefits.

**WR 2.3.6 Reimbursement for Parts**

The Agency shall be reimbursed by the Contractor for defective parts and for parts that must be replaced to correct the Defect. The reimbursement shall be at the current price at the time of repair and shall include taxes where applicable, plus fifteen (15) percent handling costs. Handling costs shall not be paid if part is supplied by Contractor and shipped to Agency.

**WR 2.3.7 Reimbursement Requirements**

The Contractor shall respond to the warranty claim with an accept/reject decision including necessary failure analysis no later than sixty (60) days after DTPW submits the claim and defective part(s), when requested. Reimbursement for all accepted claims shall occur no later than sixty (60) days from the date of acceptance of a valid claim. DTPW may dispute rejected claims or claims for which the Contractor did not reimburse the full amount. The parties agree to review disputed warranty claims during the following quarter to reach an equitable decision to permit the disputed claim to be resolved and closed. The parties also agree to review all claims at least once per quarter throughout the entire warranty period to ensure that open claims are being tracked and properly dispositioned.

**WR 2.4 Warranty after Replacement/Repairs**

If any component, unit or subsystem is repaired, rebuilt or replaced by the Contractor or by DTPW with the concurrence of the Contractor, the component, unit or subsystem shall have the unexpired warranty period of the original. Repairs shall not be warranted if the Contractor-provided or authorized parts are not used for the repair, unless the Contractor has failed to respond within five days, in accordance with "Repairs by the Contractor."

If an item is declared to be a Fleet Defect, the warranty stops with the declaration of the Fleet Defect. Once the Fleet Defect is corrected, the item(s) shall have three (3) months or remaining time and/or miles of the original warranty, whichever is greater. This remaining warranty period shall begin on the repair/replacement date for corrected items on each bus if the repairs are completed by the Contractor or on the date the Contractor provides all parts to DTPW.

**WR 2.4.1 Warranty Processing Procedures**

The following list represents requirements by the Contractor to the Agency for processing warranty claims. One failure per bus per claim is allowed.

- bus number and VIN
- total vehicle life mileage at time of repair
- date of failure/repair
- acceptance/in-service date
- Contractor part number and description
- component serial number
- description of failure
- all costs associated with each failure/repair (invoices may be required for third-party costs):
  - towing
  - road calls
  - labor
  - materials
  - parts
  - handling
  - troubleshooting time

**WR 2.5 Forms**

The Agency's forms will be accepted by the Contractor if all of the above information is included. Electronic submittal may be used if available between the Contractor and Agency.

**WR 2.6 Return of Parts**

When returning defective parts to the Contractor, the Agency shall tag each part with the following:

- bus number and VIN
- claim number
- part number
- serial number (if available)

**WR 2.7 Timeframe**

Each claim must be submitted no more than thirty (30) days from the date of failure and/or repair, whichever is later. All defective parts must be returned to the Contractor, when requested, no more than forty-five (45) days from date of repair.

**WR 2.8 Reimbursements**

Reimbursements are to be transmitted to Miami-Dade County.

**QUALITY ASSURANCE****QA 1. Contractor's In-Plant Quality Assurance Requirements**

The Contractor shall develop and submit an effective Quality Assurance Plan (QAP) and associated quality procedures for review and approval. The Contractor's QAP shall, at a minimum, adhere to and contain elements corresponding to the FTA Quality Management System (QMS) Guidelines (FTA-PA-27-5194-12.1) or in line with the ISO 9001 QMS guidelines

The QAP shall ensure compliance with the requirements of the contract documents within the Contractor's, subcontractor's and supplier's organizations. A QAP template that follows the FTA QMS Guidelines shall be attached to the contract documents for further guidance in the development of the Contractors QAP.

**QA 1.1 Quality Assurance Organization****QA 1.1.1 Organization Establishment**

The Contractor shall establish and maintain an effective in-plant quality assurance organization. It shall be a specifically defined organization and should be directly responsible to the Contractor's top management.

The Contractor shall designate a Quality Assurance Representative (QAR) experienced in the quality requirements of the Contract. The QAR shall be Quality Assurance Professional with experience in quality management of capital projects in accordance with the FTA QMS Guidelines and/or ISO 9001series standards. The QAR shall be given sufficient authority to ensure that the quality is consistently maintained. The Contractor shall provide DTPW with the organizational chart and resume of the QAR for review and approval as part of the QAP submittal requirements. The QAR shall not be replaced by the Contractor without prior approval of DTPW.

**QA 1.1.2 Control**

The quality assurance organization shall exercise quality control over all phases of production, from initiation of design through manufacture and preparation for delivery. The organization shall also control the quality of supplied articles.

### QA 1.1.3 Authority and Responsibility

The quality assurance organization shall have the authority and responsibility for reliability, quality control, inspection planning, establishment of the quality control system, and acceptance/rejection of materials and manufactured articles in the production of the transit buses.

## QA 1.2 Quality Assurance Organization Functions

### QA 1.2.1 Minimum Functions

The quality assurance organization shall include the following minimum functions:

- **Work instructions:** The quality assurance organization shall verify inspection operation instructions to ascertain that the manufactured product meets all prescribed requirements.
- **Records maintenance:** The quality assurance organization shall maintain and use records and data essential to the effective operation of its program. These records and data shall be available for review by the resident inspectors. Inspection and test records for this procurement shall be available for a minimum of one year after inspections and tests are completed.
- **Corrective action:** The quality assurance organization shall detect and promptly ensure correction of any conditions that may result in the production of defective transit buses. These conditions may occur in designs, purchases, manufacture, tests or operations that culminate in defective supplies, services, facilities, technical data or standards.

### QA 1.2.2 Basic Standards and Facilities

The following standards and facilities shall be basic in the quality assurance process:

- **Configuration control:** The Contractor shall maintain drawings, assembly procedures, and other documentation that completely describe a qualified bus that meets all of the options and special requirements of this procurement. The quality assurance organization shall verify that each transit bus is manufactured in accordance with these controlled drawings, procedures, and documentation.
- **Measuring and testing facilities:** The Contractor shall provide and maintain the necessary gauges and other measuring and testing devices for use by the quality assurance organization to verify that the buses conform to all specification requirements. These devices shall be calibrated at established periods against certified measurement standards that have known, valid relationships to national standards.
- **Production tooling as media of inspection:** When production jigs, fixtures, tooling masters, templates, patterns, and other devices are used as media of inspection, they shall be proved for accuracy at formally established intervals and adjusted, replaced, or repaired as required to maintain quality.
- **Equipment use by resident inspectors:** The Contractor's gauges and other measuring and testing devices shall be made available for use by the resident inspectors to verify that the buses conform to all specification requirements. If necessary, the Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

### QA 1.2.3 Maintenance of Control

The Contractor shall maintain quality control of purchases:

- **Supplier control:** The Contractor shall require that each Supplier maintains a quality control program for the services and supplies that it provides. The Contractor's quality assurance organization shall inspect and test materials provided by Suppliers for conformance to specification requirements. Materials that have been inspected, tested, and approved shall be identified as acceptable to the point of use in the manufacturing or assembly processes. Controls shall be established to prevent inadvertent use of nonconforming materials.
- **Purchasing data:** The Contractor shall verify that all applicable specification requirements are properly included or referenced in purchase orders of articles to be used on transit buses.

### QA 1.2.4 Manufacturing Control

- **Controlled conditions:** The Contractor shall ensure that all basic production operations, as well as all other processing and fabricating, are performed under controlled conditions. Establishment of these controlled conditions shall be based on the documented Work instructions, adequate production equipment and special working environments if necessary.
- **Completed items:** A system for final inspection and test of completed transit buses shall be provided by the quality assurance organization. It shall measure the overall quality of each completed bus.
- **Nonconforming materials:** The quality assurance organization shall monitor the Contractor's system for controlling nonconforming materials. The system shall include procedures for identification, segregation and disposition.
- **Statistical techniques:** Statistical analysis, tests and other quality control procedures may be used when appropriate in the quality assurance processes.
- **Inspection status:** A system shall be maintained by the quality assurance organization for identifying the inspection status of components and completed transit buses. Identification may include cards, tags or other normal quality control devices.

### QA 1.2.5 Inspection System

The quality assurance organization shall establish, maintain and periodically audit a fully documented inspection system. The system shall prescribe inspection and test of materials, Work in process and completed articles. As a minimum, it shall include the following controls:

- **Inspection personnel:** Sufficient trained inspectors shall be used to ensure that all materials, components and assemblies are inspected for conformance with the qualified bus design.
- **Inspection records:** Acceptance, rework or rejection identification shall be attached to inspected articles. Articles that have been accepted as a result of approved materials review actions shall be identified. Articles that have been reworked to specified drawing configurations shall not require special identification. Articles rejected as unsuitable or scrap shall be plainly marked and controlled to prevent installation on the bus. Articles that become obsolete as a result of engineering changes or other actions shall be controlled to prevent unauthorized assembly or installation. Unusable articles shall be isolated and then scrapped. Discrepancies noted by the Contractor or resident inspectors during assembly shall be entered by the inspection personnel on a record that accompanies the major component, subassembly, assembly, or bus from start of assembly through final inspection. Actions shall be taken to correct discrepancies or deficiencies in the manufacturing processes, procedures or other conditions that cause articles to be in nonconformity with the requirements of the Contract specifications. The inspection personnel shall verify the corrective actions and mark the discrepancy record. If discrepancies cannot be corrected by replacing the nonconforming materials, then the Agency shall approve the modification, repair or method of correction to the extent that the Contract specifications are affected.
- **Quality assurance audits:** The quality assurance organization shall establish and maintain a quality control audit program. Records of this program shall be subject to review by the Agency.

## QA 2. Inspection

### QA 2.1 Inspection Stations

Inspection stations shall be at the best locations to provide for the Work content and characteristics to be inspected. Stations shall provide the facilities and equipment to inspect structural, electrical, hydraulic and other components and assemblies for compliance with the design requirements.

Stations shall also be at the best locations to inspect or test characteristics before they are concealed by subsequent fabrication or assembly operations. These locations shall minimally include underbody structure completion, body framing completion, body prior to paint preparation, water test, engine installation completion, underbody dress-up and completion, bus prior to final paint touchup, bus prior to road test and bus final road test completion.

## **QA 2.2 Resident Inspectors**

### **QA 2.2.1 Resident Inspector's Role**

The Agency shall be represented at the Contractor's plant by resident inspectors, as required by FTA. Resident inspectors may be Agency employees or outside contractors. The Agency shall provide the identify of each inspector and shall also identify their level of authority in writing. They shall monitor, in the Contractor's plant, the manufacture of transit buses built under the procurement. The presence of these resident inspectors in the plant shall not relieve the Contractor of its responsibility to meet all of the requirements of this procurement. The Agency shall designate a primary resident inspector, whose duties and responsibilities are delineated in "Pre-Production Meetings," "Authority" and "Pre-Delivery Tests," below. Contractor and resident inspector relations shall be governed by the guidelines included as Attachment A to this "Section 8: Quality Assurance."

### **QA 2.2.2 Pre-Production Meetings**

The primary resident inspector may participate in design review and pre-production meetings with the Agency. At these meetings, the configuration of the buses and the manufacturing processes shall be finalized, and all Contract documentation provided to the inspector.

No less than thirty (30) days prior to the beginning of bus manufacture, the primary resident inspector may meet with the Contractor's quality assurance manager and may conduct a pre-production audit meeting. They shall review the inspection procedures and finalize inspection checklists. The resident inspectors may begin monitoring bus construction activities two weeks prior to the start of bus fabrication.

### **QA 2.2.3 Authority**

Records and data maintained by the quality assurance organization shall be available for review by the resident inspectors. Inspection and test records for this procurement shall be available for a minimum of one year after inspections and tests are completed.

The Contractor's gauges and other measuring and testing devices shall be made available for use by the resident inspectors to verify that the buses conform to all specification requirements. If necessary, the Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

Discrepancies noted by the resident inspector during assembly shall be entered by the Contractor's inspection personnel on a record that accompanies the major component, subassembly, assembly or bus from start of assembly through final inspection. Actions shall be taken to correct discrepancies or deficiencies in the manufacturing processes, procedures or other conditions that cause articles to be in nonconformity with the requirements of the Contract specifications. The inspection personnel shall verify the corrective actions and mark the discrepancy record. If discrepancies cannot be corrected by replacing the nonconforming materials, the Agency shall approve the modification, repair or method of correction to the extent that the Contract specifications are affected.

The primary resident inspector shall remain in the Contractor's plant for the duration of bus assembly Work under this Contract. Only the primary resident inspector or designee shall be authorized to release the buses for delivery. The resident inspectors shall be authorized to approve the pre-delivery acceptance tests. Upon request to the quality assurance supervisors, the resident inspectors shall have access to the Contractor's quality assurance files related to this procurement. These files shall include drawings, assembly procedures, material standards, parts lists, inspection processing and reports, and records of Defects.

### **QA 2.2.4 Support Provisions**

The Contractor shall provide office space for the resident inspectors in close proximity to the final assembly area. This office space shall be equipped with desks, outside and interplant telephones, Internet access, file cabinet and chairs.

### **QA 2.2.5 Compliance with Safety Requirements**

At the time of the Pre-Production meeting, the Contractor shall provide all safety and other operational restrictions that govern the Contractor's facilities. These issues will be discussed and the parties will agree which rules/restrictions will govern the Agency's inspector(s) and any other Agency representatives during the course of the Contract.

## **QA 3. Acceptance Tests**

### **QA 3.1 Responsibility**

Fully documented tests shall be conducted on each production bus following manufacture to determine its acceptance to the Agency. These acceptance tests shall include pre-delivery inspections and testing by the Contractor and inspections and testing by the Agency after the buses have been delivered.

### **QA 3.2 Pre-Delivery Tests**

The Contractor shall conduct acceptance tests at its plant on each bus following completion of manufacture and before delivery to DTPW. These pre-delivery tests shall include visual and measured inspection, as well as testing the total bus operation. The tests shall be conducted to ensure that the completed buses have attained the desired quality and have met the requirements in the Technical Specifications. The tests shall be conducted in accordance with written tests plans and shall be recorded on appropriate test forms provided by the Contractor. The pre-delivery tests shall be scheduled with sufficient notice so that they may be witnessed by the Resident Inspectors, who may reject the results of the tests. The results of pre-delivery tests, or any other tests, shall be filed with the assembly inspection records for each bus. The underfloor equipment shall be made available for inspection by the Resident Inspectors using a pit or bus hoist provided by the Contractor. A hoist, scaffold, or elevated platform shall be provided by the Contractor to easily and safely inspect bus roofs. Delivery of each bus shall require written authorization of a Resident Inspector. Authorization forms for the release of each bus for delivery shall be provided by the Contractor. An executed copy of the authorization shall accompany the delivery of each bus. Failure to provide adequate inspection facilities for the Resident Inspectors will result in no-shipment of buses from the production plant without relief from liquidated damages due to schedule delays.

All buses shall be subjected to water tests simulating the severe rain conditions experienced in the South Florida environment. Windows, escape hatches, doors, etc. are subject to an approved water test to be conducted at the manufacturers facility by the manufacturer and shall be observed by the Resident Inspector(s). Water testing may be verified by further testing at Miami Dade County's Maintenance Facility prior to the acceptance of each vehicle if test observation or verification of leak repair is missed on or not observed by the Resident Inspector on any bus built for Miami Dade County. Any bus that fails to pass the water test shall be corrected by the contractor. The retest/corrective repair cycle shall repeat until the leak(s) have been eliminated to Miami Dade County's satisfaction.

The Agency may, prior to commencement of production, demand that the Contractor demonstrate compliance with any requirement in that section if there is evidence that prior tests have been invalidated by the Contractor's change of Supplier or change in manufacturing process. Such demonstration shall be by actual test, or by supplying a report of a previously performed test on similar or like components and configuration. Any additional testing shall be recorded on appropriate test forms provided by the Contractor and shall be conducted before acceptance of the bus.

#### **QA 3.2.1 Visual and Measured Inspections**

Visual and measured inspections shall be conducted with the bus in a static condition. The purpose of the inspection testing includes verification of overall dimension and weight requirements, that required components are included and are ready for operation, and that components and subsystems designed to operate with the bus in a static condition do function as designed.



### **QA 3.2.2 Total Bus Operation**

Total bus operation shall be evaluated during road tests. The purpose of the road tests is to observe and verify the operation of the bus as a system and to verify the functional operation of the subsystems that can be operated only while the bus is in motion.

Each bus shall be driven for a minimum of fifteen (15) miles during the road tests. If requested, computerized diagnostic printouts showing the performance of each bus shall be produced and provided to the Agency. Observed Defects shall be recorded on the test forms. The bus shall be retested when Defects are corrected and adjustments are made. This process shall continue until Defects or required adjustments are no longer detected.

## **QA 4. Agency-Specific Requirements**

### Water Test Description

The roof, roof hatches, front cap, rear cap, sidewalls, passenger windows, driver's windows, destination sign windows, windshields, wheel wells and all doors of all coaches shall be water tested prior to the delivery of each unit to DTPW as follows:

1. The water test shall consist of a series of nozzles which are strategically located around the perimeter of the vehicle so as to spray water over the entire surface of the vehicle.
2. The nozzles shall eject a volume of water no less than 2.6 gallons per minute per nozzle under a pressure of no less than 22 lbs. per minute measured at the nozzle tip.
3. The contractor shall be required to water test each vehicle under the conditions described above for no less than 30 minutes (15 minutes with A/C off, then 15 minutes with A/C on) to ensure there are no water leaks in the bus.
4. Bus road testing shall be conducted immediately after the water test.

Contractor shall take the necessary steps of corrective action to repair any leaks found as a result of the described test and shall repeat the 30 minute water test to ensure that corrective steps have been successful. This process shall be repeated until no leaks are found. Documentation of each bus shall be kept by the manufacturer as to the location of the leak, what caused the leak to occur and shall describe the repair action taken to prevent the leak from reoccurring.

If the Contractor's bus manufacturing process water test differs from the water test process and criteria described above, then any deviations must be approved by DTPW.

### Air Conditioning Test

The Contractor shall conduct a test of the air conditioning system on the first production bus with representatives from DTPW present to verify the performance of the air conditioning system. The air conditioning system must be capable of meeting the performance standards stated in the Air Conditioning, Heating and Ventilation, section of the technical specifications. The contractor shall be responsible for providing the necessary test equipment for this and all other system tests.

The pre-delivery air conditioning test shall be scheduled with sufficient notice to allow the test to be witnessed by the Resident Inspector and other personnel selected by DTPW. Within twelve hours of the completion of the air conditioning test DTPW will notify the contractor if the bus passed the air conditioning test. If the bus fails the test the contractor shall be required to make modifications to all buses as necessary to ensure the buses meet the air conditioning specifications. After the modifications are complete the contractor shall repeat the test with DTPW's representatives present to verify the success of the modifications. No bus may

leave the contractor's plant until the first production bus passes the air conditioning test and until the modifications are incorporated into the following buses. DTPW reserves the right to randomly select other production buses for testing of the air conditioning system if it believes the contractor has changed the system or the insulation in the bus.

## **SPARE PARTS AND EQUIPMENT**

### **SP 1. GENERAL**

The Contractor shall guarantee the availability of replacement parts for the acquired buses for at least twelve (12) years after the date of acceptance of the last bus delivered to DTPW. Spare parts shall be interchangeable with the original equipment and shall be manufactured in accordance with the highest quality assurance practices in the industry. Spare parts shall be obtainable through commercial distribution channels to the maximum extent practicable, minimizing captive sole-source distribution practices.

#### **SP 1.1 Recommended Spare Parts List**

The Contractor shall prepare and submit to DTPW not less than sixteen (16) weeks prior to delivery of the first bus, a recommended spare and replacement parts list. This listing will become a working document to be used by DTPW in the procurement of spare and replacement parts. The spare and replacement parts list shall group parts by the sub-system of the vehicle system. The listing for each item shall give complete ordering and procurement information for that item. Long lead-time items shall be specifically noted. Each item listing shall contain at least the following information: item name, description, rating, price, manufacturer's name, part number, and drawing reference number. Items that are common to more than one (1) sub-system shall be suitably cross referenced. The Contractor shall recommend the absolute minimum essential quantity of spare parts required to perform normal routine maintenance and to maintain the operation of the fleet assuming standard failure rates of component units. The Contractor shall state the expected failure rate of major components to the extent practicable.

#### **SP1.1.1 Spare Parts, Special Tools and Ancillary Items Provisioning**

The Contractor shall include in the Price Proposal pricing for the following spare parts and equipment:

- Spare Wheels - Up to two hundred fifty (250) Spare Wheels (Tire Rims)
- Spare Powertrain up to thirty (30) Powertrains
- Spare Air Conditioning System Parts Sets - up to twenty (20) Sets
- Spare Wheelchair Ramps (Complete Assembly) - up to ten (10) Spare Wheelchair Ramps
- Spare Destination Sign Sets (Complete system) - up to five (5) Spare Destination Sign Sets
- Spare Body Parts Sets - up to ten (10) Sets
- Special tools for powertrain diagnostics and maintenance - up to ten (10) sets
- Special tools for charging station diagnostics and maintenance - up to ten (10) sets
- Special tools for air-conditioning system diagnostics and maintenance - up to ten (10) sets
- Special Tools and Equipment for Cradle or powertrain Changes - up to five (5) Sets
- Multiplexing System Mock-up Board - up to one (1) Mock-up Board
- Universal Tow Bars - up to six (6) Universal Tow Bars

## **MANUALS AND PUBLICATIONS**

### **MP 1. GENERAL**

The Contractor shall provide an electronic copy and fifteen (15) printed current maintenance manual(s) to include preventative maintenance procedures, diagnostic procedures or troubleshooting guides and major component service manuals; an electronic copy and fifteen (15) printed current parts manual(s); and an electronic copy and fifty (50) printed standard operator's manual(s) as part of this Contract. The Contractor also shall exert its best efforts to keep maintenance manuals, operator's manuals and parts books up to date for a period of fifteen (15) years. The supplied manuals shall incorporate all equipment ordered on the buses covered by this procurement. DTPW reserves the right to duplicate, at its expense, all electronic and printed manuals and publications. In instances where copyright restrictions or other considerations prevent the Contractor from incorporating major components information into the bus parts and service manuals, separate manual sets as published by the subcomponent Supplier will be provided.

Draft manuals shall be furnished to DTPW for review and approval no less than sixty (60) days prior to the release of the first bus or commencement of official training, which occurs first.

#### **MP 1.1 Changes and Revisions**

Following the publication of each manual required herein, the Contractor shall provide revisions covering any changes, whether required by change of design or procedures or due to error, and these revisions shall be kept current during the entire basic warranty period. Manual revisions shall be furnished to DTPW before or coincidental with the arrival of any altered parts or components. Upon expiration of the basic warranty period, revisions shall be furnished to DTPW, free of charge, as required over the 15 year life of the vehicle.

#### **MP 1.2 Service Bulletins**

Service bulletins shall be provided by the Contractor. Updates and revisions shall be provided at no cost to DTPW and shall be provided over 15 year life of the vehicle.

#### **MP 1.3 As Built Drawings**

The Contractor shall provide a complete set of "As-Built" drawings in electronic format (AutoCAD or other DTPW approved format) with the delivery of each lot of buses. A complete set of draft "As-Built" drawings shall be furnished to DTPW for review and approval no less than thirty (30) days prior to the delivery of the first bus of each lot of buses. A complete set of final "As-Built" drawings shall be furnished to DTPW no later than sixty (60) days after the delivery of the last bus of each lot of buses.

#### **MP 1.4 Parts Cross Reference List**

The Contractor shall furnish a complete bill of materials of all parts/components used in the assembly of the bus. This list shall include as minimum, bus manufacturer's part number, part description, name of original part manufacturer and manufacturer's part/identifying number. The Parts Cross Reference List shall be furnished to DTPW no later than sixty (60) days after the delivery of the last bus of each lot of buses.

## **ATTACHMENT A: NEW BUS MANUFACTURING INSPECTION GUIDELINES**

### **Pre-production meeting**

#### **Responsibilities**

##### **Agency**

- Provides conformed copy of technical requirements.
- Recommended staff to be involved may include the following:
  - Project manager
  - Technical engineer
  - Contract administrator
  - Quality assurance administrator
  - Warranty administrator
- Process for inspector's role (to deal with agency) for negotiated changes after freeze date.
- Contractual requirements:
  - Milestones
  - Documentation
  - Title requirements
  - Deliverables
  - Payments
  - Reliability tracking

##### **Manufacturer**

- Identifies any open issues.
- Recommended staff to be involved may include the following:
  - Project manager
  - Technical engineer(s)
  - Contract administrator
  - Quality assurance administrator
  - Warranty administrator
- Production flow (buses/week, shifts).
- Delivery schedule and offsite component build-up schedule.
- Bus QA documentation (including supplier application approvals and/or any certifications required for the specific production).
- Communication flow/decision making.

##### **Inspector**

- Agree on decisions inspectors can and cannot make.
- Primary contact for problems, etc.
- Production flow process (description of manufacturing by station).
- Factory hours (manage inspection schedule based on production hours).
- Plant rules.
- Safety requirements.
- Orientation requirements.
- Work environment.
- Inspector's office space (per contract).

**NOTE:** As a result of this meeting, documentation should be produced detailing final production requirements and the planned configuration of the bus.

##### **Build schedule**

The bus manufacturer's contract administrator shall supply a fleet build production schedule based on the dates in the Notice to Proceed, and a description of the manufacturer's schedule for plant operations.

The production schedule should contain specific milestone dates, such as:

- First vehicle on production line (date on which any work will begin);
- First vehicle off production line;
- First vehicle through manufacturer's quality assurance inspections;
- First vehicle shipped to the agency;
- Last vehicle on production line;
- Last vehicle off production line; and
- Last vehicle shipped to the agency.

#### **Plant tour (if meeting at OEM's location)**

The agency will review the entire process from start to finish and review the work completed at each line station, including quality control measures

#### **Prototype/pilot vehicle production**

The contractor shall conduct acceptance tests at its plant on each bus following completion of manufacture and before delivery to the agency. These pre-delivery tests shall include visual and measured inspections, as well as testing the total bus operation. The tests shall be conducted and documented in accordance with written test plans approved by the agency. The underfloor equipment shall be available for inspection by the resident inspectors, using a pit or bus hoist provided by the contractor. A hoist, scaffold or elevated platform shall be provided by the contractor to easily and safely inspect bus roofs. Delivery of each bus shall require written authorization of the primary resident inspector. Authorization forms for the release of each bus for delivery shall be provided by the contractor. An executed copy of the authorization shall accompany the delivery of each bus.

Additional tests may be conducted at the agency's discretion to ensure that the completed buses have attained the required quality and have met the requirements in the APTA "Standard Bus Procurement Guidelines RFP," Section 6: Technical Specifications. The agency may, prior to commencement of production, demand that the contractor demonstrate compliance with any requirement in that section if there is evidence that prior tests have been invalidated by the contractor's change of supplier or change in manufacturing process. Such demonstration shall be by actual test, or by supplying a report of a previously performed test on similar or like components and configuration. Any additional testing shall be recorded on appropriate test forms provided by the contractor and shall be conducted before acceptance of the bus.

The pre-delivery tests shall be scheduled and conducted with 30 days' notice so that they may be witnessed by the resident inspectors, who may accept or reject the results of the tests. The results of pre-delivery tests, and any other tests, shall be filed with the assembly inspection records for each bus.

#### **Visual and measured inspections**

Visual and measured inspections shall be conducted with the bus in a static condition. The purpose of the inspection testing includes verification of overall dimension and weight requirements, that required components are included and are ready for operation, and that components and subsystems designed to operate with the bus in a static condition do function as designed.

#### **Total bus operation**

Total bus operation shall be evaluated during road tests. The purpose of the road tests is to observe and verify the operation of the bus as a system and to verify the functional operation of the subsystems that can be operated only while the bus is in motion.

Each bus shall be driven for a minimum of 15 miles during the road tests. If requested, computerized diagnostic printouts showing the performance of each bus shall be produced and provided to the agency. Observed defects shall be recorded on the test forms. The bus shall be retested when defects are corrected

and adjustments are made. This process shall continue until defects or required adjustments are no longer detected.

### **Post-delivery tests**

The agency shall conduct acceptance tests on each delivered bus. These tests shall be completed within 15 days after bus delivery and shall be conducted in accordance with the agency's written test plans. The purpose of these tests is to identify defects that have become apparent between the time of bus release and delivery to the agency. The post-delivery tests shall include visual inspection and bus operations. No post-delivery test shall apply new criteria that are different from criteria applied in a pre-delivery test.

Buses that fail to pass the post-delivery tests are subject to non-acceptance. The agency shall record details of all defects on the appropriate test forms and shall notify the contractor of acceptance or non-acceptance of each bus, after completion of the tests. The defects detected during these tests shall be repaired according to procedures defined in the contract.

### **Prototype/pilot vehicle acceptance**

In order to assess the contractor's compliance with the Technical Specifications, the agency and the contractor shall, at the pre-production meeting, jointly develop a Configuration and Performance Review document for review of the pilot vehicle. This document shall become part of the official record of the pre-production meeting.

Potential dimensional/performance tests that may be included in the Configuration and Performance Review include the following:

- Complete electrical system audit
- Dimensional requirements audit
- Seating capacity
- Water test
- Water runoff test
- Function test of systems/subsystems and components
- Sound/noise level tests
- Vehicle top speed
- Acceleration tests
- Brake stop tests
- Airflow tests
- PA function tests
- Air/brake system audit
- Individual axle weight
- Standee capacity
- Body deflection tests
- Silent alarm function test
- Interior lighting
- Exterior lighting
- Gradability test
- Kneeling system function
- HVAC pulldown/heat
- Speedometer
- Outside air infiltration (smoke)
- Wheelchair ramps

### **Buy America audit**

A post-delivery Buy America audit is required for federally funded bus procurements (see 49 CFR Part 663 for additional information). The onsite resident inspectors are to monitor the production processes to verify

compliance with final assembly requirements identified by the Buy America pre-award audit. This audit is to verify compliance with final assembly requirements and final documentation of Buy America compliance and must be completed prior to title transfer.

**NOTE:** If there is not a pilot/prototype bus, then the Buy America post-delivery audit should be performed following completion of the first serial production bus. In addition to monitoring of the production processes, the agency must verify compliance that more than 60 percent of the costs of all components are produced in the United States. Finally, the agency must execute the required certificates.

### **Resident inspection process for serial production**

At the discretion of the agency, a decision is made to perform resident inspection using the agency's personnel, a contract inspector, or a combination of both. The decision is based on factors such as the availability of personnel, knowledge/expertise in bus build project management, the size of the bus order, etc.

**NOTE:** The decision to have the resident inspection performed by agency personnel results in a firm understanding and knowledge of the bus and affords the opportunity to identify parts that will be needed for general maintenance down the road.

### **Inspector responsibilities**

The resident inspection process for the serial production of the buses begins following the completion and acceptance of the prototype or pilot vehicle if required, or according to the serial bus production schedule. Resident inspectors should represent the agency for all build-related issues (quality, conformance, etc.). Resident inspectors can also address contractual type issues but should only do so under the consult of the agency's contracts administrator. Resident inspectors are sent to the manufacturer's facility according to a Resident Inspection Schedule. Typically, one or two inspectors arrive on site at the manufacturing facility about one week prior to actual production to set up the resident inspection process and to begin preliminary quality assurance inspections for items such as power plant build-up and wire harness production, and to inspect incoming parts, fasteners, fluids, etc., that will be used in the production of the buses. During the serial production of the buses, the resident inspectors should monitor the production of each bus, verifying the quality of materials, components, sub-assemblies and manufacturing standards. In addition, the configuration of each vehicle should be audited using the vehicle manufacturer's Build Specification and other documents to ensure contract compliance and uniformity.

### **Inspector rotation/scheduling**

During the resident inspection phase, a single inspector or multiple inspectors could be used. If it is decided to use multiple inspectors, then the inspectors could be rotated on a biweekly to monthly basis as required. During the rotation of inspectors, a sufficient period of overlap should be provided to guarantee the consistency of the resident inspection process.

### **Resident inspector orientation**

A resident inspector orientation by the bus manufacturer should take place upon the arrival of the initial inspection team. The orientation should include expectations for the use of personal protective equipment (safety shoes, safety glasses, etc.), daily check-in and check-out requirements, lines of communication, use of production documents such as speed memos and line movement charts, inspector/production meetings, inspector office arrangements, and anything else pertinent to the inspection team's involvement during the build. Many of the above items should already be formalized during the pre-production meeting.

### **Audits, inspections and tests**

The resident inspection process monitors the production of each vehicle. Inspection stations should be strategically placed to test or inspect components or other installations before they are concealed by subsequent fabrication or assembly operations. These locations typically are placed for the inspection of underbody structure, body framing, electrical panels and harnesses, air and hydraulic line routings,

installation of insulation, power plant build-up and installation, rust inhibitor/undercoating application, floor installation, front suspension alignment, and other critical areas.

### **Vehicle inspections**

Each bus is subjected to a series of inspections after the bus reaches the point of final completion on the assembly line. Typically, the vehicle manufacturer performs its own quality assurance inspections following assembly line completion before releasing each bus to the resident inspectors. The inspections for each vehicle are documented, signed off upon passing and included in the vehicle record.

These are the typical inspections performed on each bus by the resident inspectors:

- Water test inspection
- Road test inspection
- Interior inspection (including functionality)
- Hoist/undercarriage inspection
- Exterior inspection (including roof)
- Electrical inspection
- Wheelchair ramp/lift inspection

### **Water test inspection**

The water test inspection checks the integrity of the vehicle's body seams, window frame seals and other exterior component close-outs for their ability to keep rainwater, road splash, melting snow and slush, and other exterior water from entering the inside of the vehicle. The vehicle's interior is inspected for signs of moisture and water leaks. To perform the leak inspection, interior ceiling and side panels are removed, and access doors are opened. If any moisture or water is detected, then the source of the leak will be located and repaired by the manufacturer, and the vehicle will be tested again.

### **Road test inspection**

The road test inspection checks all the vehicle's systems and sub-systems while the vehicle is in operation. Typically, the road test inspection is performed immediately following the water test inspection to reveal any standing water that may be present due to a leak, but was not noticed during the "static" water test. Objectionable vibrations, air leakage and other factors that affect ride quality are recorded and reported to the vehicle manufacturer for resolution. Vehicle stability, performance, braking and interlock systems, HVAC, and other critical areas are checked to ensure that the vehicle is complete and ready to provide safe and reliable service.

The following tests may be performed and recorded during the road test:

- Acceleration test
- Top speed test
- Gradability test
- Service brake test
- Parking brake test
- Turning effort test
- Turning radius test
- Shift quality
- Quality of retarder or regenerative braking action

During the road test, a vehicle may be taken to a weigh station to record the vehicle's front axle weight, rear axle weight and total vehicle (curb) weight.

### **Interior inspection**

The interior inspection checks the fit and finish of the interior installations.



In addition, the inspection also verifies the installation and function of systems and subsystems according to the Build Specification. All systems and functions accessed from the interior are inspected for functionality, appearance and safety.

Examples of systems/functions inspected include the following:

- Interior and exterior lighting controls
- Front and rear door systems
- Flooring installation
- Passenger and operator's seat systems
- Wheelchair securement and ramp systems
- Fire suppression system
- Electrical installations (multiplex, tell-tale wiring, panels, etc.)
- Window systems and emergency escape portals
- Operator dash/side panel controls/indicators

### **Hoist/undercarriage inspection**

The hoist/undercarriage inspection checks the installation of components, wiring, air lines, presence of fluid leaks, etc., located under the vehicle. Typically, this inspection is performed following the road test. The vehicle is lifted onto a hoist or pulled over a pit for the inspection. Areas inspected are the front suspension, air bags, air line routings, electrical connections and routings, drive-train components, linkages, and any other system or component that may be prone to early failure due to inadequate installation techniques. All lines, cables, hoses, etc., are inspected for proper securement and protection to prevent rubbing, chafing or any other condition that could result in a failure. The engine/powerplant and HVAC compartments are also inspected during this time.

### **Exterior inspection**

The exterior inspection checks the fit and finish of components installed on the exterior of the vehicle. Access panels are opened and accessories are inspected for proper installation. In addition, vehicle paint, graphics and proper decals are also inspected. Acceptable paint finish quality (orange peel, adhesion, etc.) should be agreed on with the vehicle manufacturer prior to production to ensure consistency of inspections.

### **Electrical inspection**

The vehicle's main electrical panels and other sub-panels are inspected for proper components, to include relays, fuses, modules, terminal strips, decals, etc. In addition, electrical harnesses are inspected for proper wiring and termination techniques, bulkhead protection, looming and other items that could result in future electrical failure. Onboard vehicle compartment schematics are verified for accuracy.

### **Wheelchair ramp inspection**

The wheelchair ramp assembly is inspected for proper installation and performance. Clearances critical to the operation of the ramp are verified, and the ramp's electrical systems are inspected to ensure appropriate wire routings and protection. The successful integration of the ramp assembly into the vehicle is verified, and the vehicle interlocks are checked during automatic and manual ramp operation.

### **Audits**

During serial production of the bus's quality assurance inspection, tests may be performed to ensure that the manufacturer's quality standards are being followed. These inspection audits could be on items such as torque wrench calibrations, proper techniques for fastener installations, proper use and type of adhesives, use of correct installation drawings on the production line, etc.

## Communications

The lines of communications, formal and informal, should be discussed and outlined in the pre-production meeting. As previously discussed, resident inspectors should represent the agency for all bus-build related issues (quality, conformance, etc.). Resident inspectors can relay communications addressing contractual type issues but should do so only under the consult of the agency's contracts administrator. Actual personnel contacts for the manufacturing facility should be established during resident inspector orientation. These contacts could include quality assurance, production, material handling, engineering, and buy-off area personnel.

## Documentation

The following documents/reports are typically generated during the bus build process:

- Vehicle Build Specification
- Sales Order
- Pre-production meeting notes
- Prototype and production correspondence (vehicle build file)
- Manufacturer's Vehicle Record (Warranty file)
  - Vehicle line documents
  - Serialization documents (Warranty file)
  - Alignment verification
  - Brake testing
  - HVAC testing and checkout
  - Manufacturer's QA checklist and signoff
- Weight Slip (Prototype & Warranty file)
- Prototype Performance Tests document (vehicle build file)
  - Acceleration Test
  - Top Speed Test
  - Gradability Test
  - Interior Noise Test A – Stationary
  - Interior Noise Test B – Dynamic
  - Exterior Noise Test A – Pull Away
  - Exterior Noise Test B – Pass-By
  - Exterior Noise Test C – Curb Idle
  - Turning Radius Test
  - Turning Effort Test
  - Parking Brake Test
  - Service Brake Test
- Vehicle Acceptance Inspections – Production (Warranty file)
  - Water Test Inspection Report
  - Road Test Inspection Report
  - Interior Inspection Report
  - Hoist/Undercarriage Inspection Report
  - Exterior Inspection Report
  - Electrical Inspection Report
  - Wheelchair Inspection Report
- Speed Memos (Warranty file)
- Agency Vehicle Inspection record (Warranty file)
- Release for Delivery documentation (Warranty file)
- Post-Production Acceptance – Certificate of Acceptance (Accounting)
- Post-Delivery Inspection Report – (Fleet Management & Warranty files)

**Vehicle release for delivery**

Upon satisfactory completion of all inspection, audit and test criteria, and resolution of any outstanding issues affecting the purchase of any or all buses, proper documentation (the Release for Delivery) is signed by the designated resident inspector authorizing the bus manufacturer to deliver the vehicle to the agency's facility, where it will undergo a post-delivery inspection process and final acceptance. The satisfactory sign-off of the Release for Delivery should complete the resident inspector's duties for each bus. In final preparation for delivery, the bus manufacturer may request the resident inspector to do a final walk-through of the bus after it has been cleaned and prepped for shipping.

**Post-delivery and final acceptance**

The agency shall conduct acceptance tests on each delivered bus. These tests shall be completed within 15 days after bus delivery and shall be conducted in accordance with the agency's written test plans. The purpose of these tests is to identify defects that have become apparent between the time of bus release and delivery to the agency. The post-delivery tests shall include visual inspection, along with a verification of system(s) functionality and overall bus operations. No post-delivery test shall apply new criteria that are different from criteria applied in a pre-delivery test.

Buses that fail to pass the post-delivery tests are subject to non-acceptance. The agency shall record details of all defects on the appropriate test forms and shall notify the contractor of acceptance or non-acceptance of each bus within five days after completion of the tests. The defects detected during these tests shall be repaired according to procedures defined in the contract after non-acceptance.

**Certificate of Acceptance**

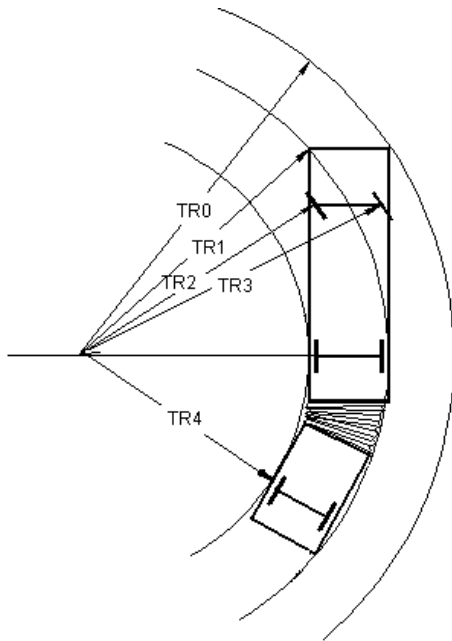
- **Accepted**
- **Not accepted:** In the event that the bus does not meet all requirements for acceptance. The agency must identify reasons for non-acceptance and work with the OEM to develop a timeline of addressing the problem for a satisfactory resolution and redelivery.
- **Conditional acceptance:** In the event that the bus does not meet all requirements for acceptance, the agency may conditionally accept the bus and place it into revenue service pending receipt of contractor furnished materials and/or labor necessary to address the identified issue(s).

**CER 1. Vehicle Technical Information Questionnaire****EXHIBIT 1 – Vehicle Technical Information Questionnaire**

The following questionnaire is required to be furnished with the technical proposal.

- A. BUS MANUFACTURER \_\_\_\_\_  
Bus Model \_\_\_\_\_
- B. UNDERSTRUCTURE MANUFACTURER \_\_\_\_\_  
Model Number \_\_\_\_\_
- C. BASIC BODY CONSTRUCTION
1. Type \_\_\_\_\_
  2. Tubing or frame member Thickness & Dimensions
    - a. Overstructure \_\_\_\_\_
    - b. Understructure \_\_\_\_\_
  3. Skin Thickness and Material
    - a. Roof \_\_\_\_\_
    - b. Sidewall \_\_\_\_\_
    - c. Skirt Panel \_\_\_\_\_
    - d. Front End \_\_\_\_\_
    - e. Rear End \_\_\_\_\_
- D. DIMENSIONS
1. Overall Length
    - a. Over Bumpers \_\_\_\_\_ Ft. \_\_\_\_\_ In.
    - b. Over Body \_\_\_\_\_ Ft. \_\_\_\_\_ In.
  2. Overall Width
    - a. Over Body excluding Mirrors \_\_\_\_\_ In.
    - b. Over Body including Mirrors - driving position \_\_\_\_\_ In.
    - c. Over Tires Front Axles \_\_\_\_\_ In.
    - d. Over Tires Rear Axles \_\_\_\_\_ In.
  3. Overall Height
    - a. Over all Height (maximum) \_\_\_\_\_ In.
    - b. Overall Height (main roof line) \_\_\_\_\_ In.
  4. Angle of Approach \_\_\_\_\_ Deg.
  5. Breakover Angle
    - a. Front \_\_\_\_\_ Deg.
    - b. Rear (60' only) \_\_\_\_\_ Deg.
  6. Angle of Departure \_\_\_\_\_ Deg.





14. Wheelbase \_\_\_\_\_ In.

15. Overhang, Centerline of Axle Over Bumper

- a. Front \_\_\_\_\_ Ft. \_\_\_\_\_ In.  
 b. Rear \_\_\_\_\_ Ft. \_\_\_\_\_ In.

16. Floor

- a. Interior Length \_\_\_\_\_ Ft. \_\_\_\_\_ In.  
 b. Interior Width (excluding coving) \_\_\_\_\_ Ft. \_\_\_\_\_ In.  
 c. Total Standee Area \_\_\_\_\_ Sq. Ft.  
 d. Minimum distance between Wheelhouses:  
     Front: \_\_\_\_\_ In.  
     Center: \_\_\_\_\_ In.  
     Rear: \_\_\_\_\_ In.  
 e. Maximum interior floor slope

(from horizontal) \_\_\_\_\_ Deg.

## 17. Passenger Capacity Provided

- a. Total Maximum Seating \_\_\_\_\_
- b. Free Floor Space \_\_\_\_\_ sqft.  
(Free floor Space calculation and drawing shall be attached with this form)
- c. Standee Capacity \_\_\_\_\_  
(Standee Capacity calculation shall be attached with this form)
- d. Minimum Knee to Hip Room \_\_\_\_\_ In.
- e. Minimum Foot Room \_\_\_\_\_ In.

## E. WEIGHT OF BUS

	No. of People	Front Axle			Center Axle			Rear Axle			Total Bus
		Left	Right	Total	Left	Right	Total	Left	Right	Total	
Empty Bus Full Fuel and Farebox	0										
Fully Seated Full Fuel and Farebox	_____ + Driver										
Fully Loaded Standee and Fully Seated Full Fuel and Farebox	_____ + Driver										
Crush Load (1.5xFully Loaded)	_____										
GVWR											
GAWR											

## F. POWER TRAIN

1. Manufacturer \_\_\_\_\_

2. Motor Type \_\_\_\_\_

2. Max Power \_\_\_\_\_
4. Max Torque \_\_\_\_\_
5. Battery Type \_\_\_\_\_
6. Battery Capacity \_\_\_\_\_
7. Charging Capacity \_\_\_\_\_
8. Charging Time \_\_\_\_\_
9. Range \_\_\_\_\_
10. Transmission \_\_\_\_\_

G. AIR COMPRESSOR

1. Manufacturer & Model No. \_\_\_\_\_
2. Type \_\_\_\_\_
3. Rated Capacity \_\_\_\_\_ cfm
4. Frequency \_\_\_\_\_ Hz

H. AXLE, FRONT

1. Manufacturer \_\_\_\_\_
2. Type \_\_\_\_\_
3. Model Number \_\_\_\_\_
4. Gross Axle Weight Rating \_\_\_\_\_ lbs.
5. Axle Load \_\_\_\_\_ lbs.

I. AXLE, CENTER

1. Manufacturer \_\_\_\_\_
2. Type \_\_\_\_\_
3. Model Number \_\_\_\_\_
4. Gross Axle Weight Rating \_\_\_\_\_ lbs.
5. Axle Load \_\_\_\_\_ lbs.



## J. AXLE, REAR

2. Manufacturer \_\_\_\_\_
2. Type \_\_\_\_\_
3. Model Number \_\_\_\_\_
4. Gross Axle Weight Rating \_\_\_\_\_ lbs.
5. Axle Load \_\_\_\_\_ lbs.
6. Axle Ratio \_\_\_\_\_

## K. SUSPENSION SYSTEM

1. Manufacturer \_\_\_\_\_
2. Type: Front \_\_\_\_\_  
Rear \_\_\_\_\_
3. Springs: Front \_\_\_\_\_  
Rear \_\_\_\_\_

## L. WHEELS AND TIRES

1. Wheels
- a. Manufacturer \_\_\_\_\_
  - b. Size \_\_\_\_\_
  - c. Capacity \_\_\_\_\_ lbs.
  - d. Material \_\_\_\_\_
2. Tires
- a. Manufacturer \_\_\_\_\_
  - b. Type \_\_\_\_\_
  - c. Size \_\_\_\_\_
  - d. Load Range/Air Press. \_\_\_\_\_ lbs/p.s.i
  - e. Speed Rating \_\_\_\_\_
  - f. Load Index \_\_\_\_\_
3. Lug Nut Torque Specifications
- a. Front Axle \_\_\_\_\_ ft lbs
  - b. Center Axle \_\_\_\_\_ ft lbs
  - c. Rear Axle \_\_\_\_\_ ft lbs

## M. STEERING, POWER

1. Pump
- a. Manufacturer & Model No. \_\_\_\_\_
  - b. Type \_\_\_\_\_
  - c. Relief Pressure \_\_\_\_\_ psi
2. Booster/Gear Box
- a. Manufacturer & Model No. \_\_\_\_\_

- b. Type \_\_\_\_\_
- c. Ratio \_\_\_\_\_
- d. Relief Pressure \_\_\_\_\_ psi
- 3. Power Steering Fluid Capacity \_\_\_\_\_ gals
- 4. Maximum Effort at Steering Wheel \_\_\_\_\_ lbs.  
(unloaded stationary coach on dry asphalt pavement)
- 5. Steering Wheel Diameter \_\_\_\_\_ in.

## N. BRAKES

- 1. Manufacturer of Fundamental Brake System \_\_\_\_\_
- 2. Brake Chambers Manufacturer, Size, & Part No.
  - a. Front \_\_\_\_\_
  - b. Center \_\_\_\_\_
  - c. Rear \_\_\_\_\_
- 4. Brake Operation Effort \_\_\_\_\_
- 4. Slack Adjuster's Vendor's Type & Part No.
  - a. Front
    - 1) Right \_\_\_\_\_
    - 2) Left \_\_\_\_\_
  - b. Center
    - 1) Right \_\_\_\_\_
    - 2) Left \_\_\_\_\_
  - c. Rear
    - 1) Right \_\_\_\_\_
    - 2) Left \_\_\_\_\_
  - d. Length
    - 1) Front Take-up \_\_\_\_\_ in.
    - 2) Center Take-up \_\_\_\_\_ in.
    - 3) Rear Take-up \_\_\_\_\_ in.
- 5. Brake Drums/Discs
  - a. Front
    - 1) Manufacturer \_\_\_\_\_
    - 2) Part Number \_\_\_\_\_
    - 3) Diameter \_\_\_\_\_ in.
  - b. Center
    - 1) Manufacturer \_\_\_\_\_
    - 2) Part Number \_\_\_\_\_
    - 3) Diameter \_\_\_\_\_ in.

- c. Rear
- 1) Manufacturer \_\_\_\_\_
  - 2) Part Number \_\_\_\_\_
  - 3) Diameter \_\_\_\_\_ in.

6. Brake Lining Manufacturer \_\_\_\_\_  
Type \_\_\_\_\_

#### 1. Brake Lining Identification

- a. Front
  - 1) Forward \_\_\_\_\_
  - 2) Reverse \_\_\_\_\_
- b. Center
  - 1) Forward \_\_\_\_\_
  - 2) Reverse \_\_\_\_\_
- c. Rear
  - 1) Forward \_\_\_\_\_
  - 2) Reverse \_\_\_\_\_

#### 8. Brake Linings Per shoe

- a. Front \_\_\_\_\_
- b. Center \_\_\_\_\_
- c. Rear \_\_\_\_\_

#### 9. Brake Lining Widths

- a. Front \_\_\_\_\_ In.
- b. Center \_\_\_\_\_ In
- c. Rear \_\_\_\_\_ In

#### 10. Brake Lining Lengths

- a. Front \_\_\_\_\_ In.
- b. Center \_\_\_\_\_ In
- c. Rear \_\_\_\_\_ In

11. Brake Lining Thickness \_\_\_\_\_ In.

#### 12. Brake Lining Area Per Axle

- a. Front \_\_\_\_\_ Sq. In.
- b. Center \_\_\_\_\_ Sq. In.

c. Rear \_\_\_\_\_ Sq. In

O. AIR RESERVOIR CAPACITY

1. Supply Reservoir \_\_\_\_\_ Cu. In.
2. Primary Reservoir \_\_\_\_\_ Cu. In.
3. Secondary Reservoir \_\_\_\_\_ Cu. In.
4. Parking Reservoir \_\_\_\_\_ Cu. In.
5. Accessory Reservoir \_\_\_\_\_ Cu. In.
6. Other Reservoir Type \_\_\_\_\_ Cu. In.
7. Air Reservoir Total Capacity \_\_\_\_\_ Cu. In

P. HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

1. Manufacturer \_\_\_\_\_
2. Model \_\_\_\_\_
3. Type \_\_\_\_\_
4. Refrigerant Type \_\_\_\_\_
  - a. Refrigerant Capacity \_\_\_\_\_ Lbs
5. Electric Power Requirements \_\_\_\_\_
6. Physical Description
  - a. Weight \_\_\_\_\_ Lbs
  - b. Construction \_\_\_\_\_
  - c. Height \_\_\_\_\_
  - d. Width \_\_\_\_\_
  - e. Length \_\_\_\_\_
7. Heating System Capacity \_\_\_\_\_ B.T.U.
8. Air Conditioning Capacity \_\_\_\_\_ B.T.U.
9. Ventilating Capacity \_\_\_\_\_ cfm
10. Compressor
  - a. Manufacturer \_\_\_\_\_
  - b. Model \_\_\_\_\_
  - c. No. of Cylinders \_\_\_\_\_
  - d. Drive Ratio \_\_\_\_\_
  - e. Maximum Warranted Speed \_\_\_\_\_ r.p.m.
  - f. Operating Speed \_\_\_\_\_ r.p.m.
  - g. Weight \_\_\_\_\_ lbs.

- h. Oil Capacity  
     1) Dry \_\_\_\_\_ gals.  
     2) Wet \_\_\_\_\_ gals.
- i. Refrigerant \_\_\_\_\_ Type \_\_\_\_\_ Lbs.
11. Condenser  
     a. Manufacturer \_\_\_\_\_  
     b. Model \_\_\_\_\_  
     c. No. of Rows \_\_\_\_\_  
     d. No. of Fins/In. \_\_\_\_\_  
     e. O.D. of Tube \_\_\_\_\_ In.  
     f. Fin Thickness \_\_\_\_\_ In.
12. Condenser Fan  
     a. Manufacturer \_\_\_\_\_  
     b. Model \_\_\_\_\_  
     c. Fan Diameter \_\_\_\_\_ In.  
     d. Speed Maximum \_\_\_\_\_ RPM  
     e. Flow Rate (maximum) \_\_\_\_\_ CFM
13. Receiver  
     a. Manufacturer \_\_\_\_\_  
     b. Model \_\_\_\_\_  
     c. Capacity \_\_\_\_\_ Lbs
14. Condenser Fan Drive Motors  
     a. Manufacturer \_\_\_\_\_  
     b. Model \_\_\_\_\_  
     c. Type \_\_\_\_\_  
     d. Horse Power \_\_\_\_\_ HP  
     e. Operating Speed \_\_\_\_\_ r.p.m.
15. Evaporator Fan Drive Motors  
     a. Manufacturer \_\_\_\_\_  
     b. Model \_\_\_\_\_  
     c. Type \_\_\_\_\_  
     d. Horse Power \_\_\_\_\_ HP  
     e. Operating Speed \_\_\_\_\_ r.p.m.
16. Evaporator(s)  
     a. Manufacturer \_\_\_\_\_  
     b. Model \_\_\_\_\_  
     c. Number of Rows \_\_\_\_\_  
     d. No. of Fins/In. \_\_\_\_\_  
     e. Outer Diameter of Tube \_\_\_\_\_ In.  
     f. Fin Thickness \_\_\_\_\_ In.  
     g. Number of Evaporator \_\_\_\_\_
17. Expansion Valve  
     a. Manufacturer \_\_\_\_\_  
     b. Model \_\_\_\_\_
18. Filter-Drier  
     a. Manufacturer \_\_\_\_\_

b. Model \_\_\_\_\_

19. Heater Cores

- a. Manufacturer \_\_\_\_\_
- b. Model \_\_\_\_\_
- c. Capacity \_\_\_\_\_ B.T.U.
- d. Number of Rows \_\_\_\_\_
- e. Number of Fins/In. \_\_\_\_\_
- f. Outer Diameter of Tube \_\_\_\_\_ In.
- g. Fin Thickness \_\_\_\_\_ In.
- h. Number of Heater Cores \_\_\_\_\_

20. Controls

- a. Manufacturer \_\_\_\_\_
- b. Model \_\_\_\_\_
- c. Type \_\_\_\_\_

21. Driver's Heater

- a. Manufacturer \_\_\_\_\_
- b. Model No. \_\_\_\_\_
- c. Capacity \_\_\_\_\_ B.T.U.

22. Ventilation System

- a. Type \_\_\_\_\_

23. Generator

- a. Type \_\_\_\_\_
- b. Rated Speed (maximum) \_\_\_\_\_
- c. Drive Mechanism \_\_\_\_\_
- d. Voltage \_\_\_\_\_
- e. Capacity \_\_\_\_\_

Q. PASSENGER INTERIOR LIGHTING

- 1. Manufacturer \_\_\_\_\_
- 2. Type \_\_\_\_\_
- 3. Number of Fixtures \_\_\_\_\_
- 4. Size of Fixtures \_\_\_\_\_
- 5. Power Pack \_\_\_\_\_

R. DOORS

1. Front

- a. Manufacturer of Operating Equipment \_\_\_\_\_
- b. Type of Door \_\_\_\_\_
- c. Type of Operating Equipment \_\_\_\_\_

2. Rear

- a. Manufacturer of Operating Equipment \_\_\_\_\_
- b. Type door \_\_\_\_\_
- c. Type of Operating Equipment \_\_\_\_\_

#### S. PASSENGER WINDOWS

- 1. Manufacturer \_\_\_\_\_
- 2. Model \_\_\_\_\_
- 3. Type \_\_\_\_\_
- 4. Number: (Side) \_\_\_\_\_  
(Rear) \_\_\_\_\_
- 5. Sizes: \_\_\_\_\_
- 6. Glazing:
  - a. Type \_\_\_\_\_
  - b. Thickness \_\_\_\_\_
  - c. Color of Tint \_\_\_\_\_
  - d. Light Transmission \_\_\_\_\_

#### T. MIRRORS

	<u>Size</u>	<u>Type</u>	<u>Manufacturer</u>	<u>Mfg. Part #</u>	<u>Model No.</u>
Right Side Exterior	_____	_____	_____	_____	_____
Left Side Exterior	_____	_____	_____	_____	_____
Center Rearview	_____	_____	_____	_____	_____
Front Entrance Area	_____	_____	_____	_____	_____
Upper-Right Hand Corner	_____	_____	_____	_____	_____
Rear Exit Area	_____	_____	_____	_____	_____

#### U. SEATS

- 1. Manufacturer \_\_\_\_\_
- 2. Model \_\_\_\_\_
- 3. Type \_\_\_\_\_

#### V. PAINT

- 1. Manufacturer \_\_\_\_\_
- 2. Type \_\_\_\_\_

#### W. WHEELCHAIR RAMP EQUIPMENT

- 1. Manufacturer & Model No. \_\_\_\_\_
- 2. Type \_\_\_\_\_
- 3. Capacity \_\_\_\_\_ Lbs.
- 4. Dimensions
  - a. Width of Platform \_\_\_\_\_ In.

b. Length of Platform \_\_\_\_\_ In.

5. System Fluid Capacity \_\_\_\_\_ Qts.

6. Type Fluid Used \_\_\_\_\_

7. Operating Hydraulic Pressure \_\_\_\_\_

8. Hydraulic Cylinders \_\_\_\_\_ psi

a. Size \_\_\_\_\_

b. Number \_\_\_\_\_

#### X. WHEELCHAIR SECUREMENT EQUIPMENT

1. Manufacturer \_\_\_\_\_

2. Model No. \_\_\_\_\_

#### Y. DESTINATION SIGNS

1. Manufacturer \_\_\_\_\_

2. Type \_\_\_\_\_

3. Character Length

a. Front Destination \_\_\_\_\_ In.

b. Front Run Number \_\_\_\_\_ In.

c. Side Destination \_\_\_\_\_ In.

d. Rear Route \_\_\_\_\_ In.

4. Character Height

a. Front Destination \_\_\_\_\_ In.

b. Front Run Number \_\_\_\_\_ In.

c. Side Destination \_\_\_\_\_ In.

d. Rear Route \_\_\_\_\_ In.

5. Number of Characters

a. Front Destination \_\_\_\_\_ In.

b. Front Run Number \_\_\_\_\_ In.

c. Side Destination \_\_\_\_\_ In.

d. Rear Route \_\_\_\_\_ In.

6. Message Width

a. Front Destination \_\_\_\_\_ In.

b. Front Run Number \_\_\_\_\_ In.

c. Side Destination \_\_\_\_\_ In.

d. Rear Route \_\_\_\_\_ In.

#### Z. ELECTRICAL

1. Multiplex System

a. Manufacturer \_\_\_\_\_

b. Model No. \_\_\_\_\_

2. Batteries



- a. Manufacturer \_\_\_\_\_
- b. Model No. \_\_\_\_\_
- c. Type \_\_\_\_\_
- d. CCA \_\_\_\_\_
- e. Number of batteries \_\_\_\_\_

#### AA. COMMUNICATION SYSTEM

##### 1. GPS

- a. Manufacturer \_\_\_\_\_
- b. Model No. \_\_\_\_\_

##### 3.P.A. System

- |                  | <u>Manufacturer</u> | <u>Model No.</u>    |
|------------------|---------------------|---------------------|
| a. Amplifier     | _____               | _____               |
| b. Microphone    | _____               | _____               |
| c. Int. Speakers | _____               | _____ (number ____) |
| d. Ext. Speaker  | _____               | _____ (number ____) |

#### BB. CCTV SYSTEM

1. DVR Manufacturer \_\_\_\_\_

2. Model No. \_\_\_\_\_

##### 3. Cameras - Manufacture/Model

- |    |               |
|----|---------------|
| 1  | _____ / _____ |
| 2  | _____ / _____ |
| 3  | _____ / _____ |
| 4  | _____ / _____ |
| 5  | _____ / _____ |
| 6  | _____ / _____ |
| 7  | _____ / _____ |
| 8  | _____ / _____ |
| 9  | _____ / _____ |
| 10 | _____ / _____ |
| 11 | _____ / _____ |
| 12 | _____ / _____ |

#### CC. BICYCLE RACK

1. Manufacturer \_\_\_\_\_

2. Model No. \_\_\_\_\_

#### DD. OPERATOR'S SEAT

1. Manufacturer \_\_\_\_\_

2. Model No. \_\_\_\_\_

#### EE. FLOOR COVERING

1. Manufacturer \_\_\_\_\_
2. Model No. \_\_\_\_\_
3. Color \_\_\_\_\_
4. Standee Line Color \_\_\_\_\_

FF. ROOF VENTILATORS

1. Manufacturer \_\_\_\_\_
2. Model No. \_\_\_\_\_
3. Quantity \_\_\_\_\_
4. Location(s) \_\_\_\_\_

GG. BUMPER

1. Manufacturer \_\_\_\_\_

HH. ARTICULATION JOINT

1. Manufacturer \_\_\_\_\_
2. Model No. \_\_\_\_\_
3. Weight \_\_\_\_\_ lbs.

**CER 2. FDOT 14-90 Certification**

**BID NO.: -----**

**MIAMI-DADE COUNTY DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS**

**CERTIFICATION OF COMPLINACE WITH  
FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT) RULE 14-90.007**

The undersigned [Contractor/Manufacturer] certifies that the vehicle offered in this procurement complies with Chapter 341.061(2), Florida Statutes and the current revision of Rule 14-90.007 – Vehicle Equipment Standards and Procurement Criteria, Florida Administrative Code (FAC).

SIGNATURE: \_\_\_\_\_

PRINT NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

COMPANY: \_\_\_\_\_

DATE: \_\_\_\_\_

DRAFT

## References

SAE #	Title	Date Published
J10	Methods of Test for Paints - Part J10: Determination of Deposition Efficiency of Coating Powders	Sep 15, 1998
J211	Instrumentation for Impact Test—Part 2: Photographic Instrumentation	May 1, 2001
J287	Driver Hand Control Reach	Feb 1, 2007
J366	Exterior Sound Level for Heavy Trucks and Buses	Feb 1, 1987
J382	Windshield Defrosting Systems Performance Requirements - Trucks, Buses, and Multipurpose Vehicles.	Jan 1, 1994
J534	Lubrication Fittings	May 1, 2008
J537	Storage Batteries	Sep 1, 2000
J541	Voltage Drop for Starting Motor Circuits	Oct 1, 1996
J587	License Plate Illumination Devices (Rear Registration Plate Illumination Devices)	Sep 1, 2003
J593	Backup Lamps (Reversing Lamps)	Sep 1, 2005
J673	Automotive Safety Glasses	Oct 1, 2005
J680	Location and Operation of Instruments and Controls in Motor Truck Cabs, Recommended Practice	Sep 1, 1988
J686	Motor Vehicle License Plates	Oct 1, 1999
J689	Curbstone Clearance, Approach, Departure, and Ramp Breakover Angles—Passenger Car and Light Truck	Aug 1, 2009
J833	Human Physical Dimensions	May 1, 2003
J844	Nonmetallic Air Brake System Tubing	Nov 1, 2004
J941	Motor Vehicle Drivers' Eye Locations	Mar 1, 2010
J994	Alarm—Backup—Electric Laboratory Performance Testing	Mar 1, 2009
J1050	Describing and Measuring the Driver's Field of View	Jan 1, 2003
J1113	Electromagnetic Compatibility Component Test Procedure Part 42, Conducted Transient Emissions	Oct 1, 2006
J1127	Low Voltage Battery Cable	Mar 1, 2010
J1128	Low Voltage Primary Cable	Dec 1, 2005
J1149	Metallic Air Brake System Tubing and Pipe	Aug 1, 2007
J1292	Automobile and Motor Coach Wiring	Jan 1, 2008
J1455	Recommended Environmental Practices for Electronic Equipment Design in Heavy-Duty Vehicle Applications	Jun 1, 2006
J1587	Joint SAE/TMC Electronic Data Interchange between Microcomputer Systems in Heavy-Duty Vehicle Applications, Recommended Practice	Jan 1, 1996
J1708	Serial Data Communications Between Microcomputer Systems in Heavy-Duty Vehicle Applications	Oct 1, 2008
J1986	Balance Weight and Rim Flange Design Specifications, Test Procedures, and Performance Recommendations	Jan 1, 2006
J1939	Data Link Layer	Dec 1, 2006
J1995	Engine Power Test Code - Spark Ignition and Compression Ignition - Gross Power Rating, Standard;	Jun 1, 1990

J2402	Road Vehicles—Symbols for Controls, Indicators, and Tell-tales	Jan 1, 2010
J2711	Recommended Practice for Measuring Fuel Economy and Emissions of Hybrid-Electric and Conventional Heavy-Duty Vehicles	Sept 1, 2002

DRAFT

**Abbreviation and Acronyms**

<b>A/C</b>	air conditioning
<b>ABS</b>	anti-lock braking system
<b>AC</b>	alternating current
<b>ACQ</b>	alkaline copper quaternary
<b>ADA</b>	Americans with Disabilities Act
<b>Ah</b>	amp hour
<b>ALR</b>	auto-locking retractor
<b>APA</b>	The Engineered Wood Association, formerly the American Plywood Association
<b>APC</b>	automatic passenger counter
<b>APTA</b>	American Public Transportation Association
<b>ASTM</b>	ASTM International, formerly the American Society for Testing and Materials
<b>ATC</b>	automatic traction control
<b>AVL</b>	automatic vehicle location
<b>AWG</b>	American Wire Gauge
<b>BAFO</b>	Best and Final Offer
<b>BMS</b>	Battery Management System
<b>BRT</b>	bus rapid transit
<b>CARB</b>	California Air Resources Board
<b>CCS</b>	climate control system
<b>CCTV</b>	closed-circuit television
<b>cfm</b>	cubic feet per minute
<b>CGA</b>	Compressed Gas Association
<b>CNG</b>	compressed natural gas
<b>dB</b>	decibel
<b>DBE</b>	disadvantaged business enterprise
<b>DC</b>	direct current
<b>DDU</b>	driver display unit
<b>DEF</b>	diesel exhaust fluid
<b>DOT</b>	Department of Transportation
<b>DPF</b>	diesel particulate filter
<b>ECM</b>	Engine Control and Monitoring
<b>ECS</b>	emission control system
<b>ELR</b>	emergency locking retractor
<b>EMI</b>	electromagnetic interference
<b>EPA</b>	Environmental Protection Agency
<b>ESS</b>	energy storage system
<b>FEA</b>	Finite Element Analysis
<b>FEMA</b>	failure mode effects analysis
<b>FMCSA</b>	Federal Motor Carrier Safety Administration
<b>FMCSR</b>	Federal Motor Carrier Safety Regulations
<b>FMVSS</b>	Federal Motor Vehicle Safety Standards
<b>FTA</b>	Federal Transit Administration
<b>GAWR</b>	gross axle weight rated
<b>GPS</b>	global positioning system
<b>GVW</b>	gross vehicle weight
<b>GVWR</b>	gross vehicle weight rated
<b>H-point</b>	hip-point
<b>HDS</b>	hybrid drive system
<b>HMI</b>	human-machine interface
<b>HSC</b>	hybrid system controller
<b>HV</b>	high voltage
<b>HVAC</b>	heating, ventilation and air conditioning
<b>I/O</b>	input/output

<b>IEEE</b>	Institute of Electrical and Electronics Engineers
<b>ISO</b>	International Standards Organization
<b>LEL</b>	LED emergency light
<b>LV</b>	low voltage
<b>mA</b>	milliamperere
<b>MDT</b>	mobile data terminal
<b>MPa</b>	mega-Pascal
<b>NC</b>	normally closed
<b>NFPA</b>	National Fire Protection Association
<b>NGV</b>	natural gas vehicle
<b>NOx</b>	nitrogen oxide
<b>NO</b>	normally open
<b>NTP</b>	notice to proceed
<b>OEM</b>	original equipment manufacturer
<b>OSI</b>	Open Systems Interconnect
<b>PA</b>	public address
<b>PMO</b>	project management oversight
<b>PPU</b>	primary propulsion unit
<b>PPU</b>	prime power unit
<b>PPV</b>	price per vehicle
<b>PRD</b>	pressure relief device
<b>psi</b>	pounds per square inch
<b>RF</b>	radio frequency
<b>RFI</b>	radio frequency interference
<b>RTC</b>	real-time clock
<b>SAE</b>	SAE International, formerly the Society of Automotive Engineers
<b>scf</b>	standard cubic feet
<b>SLW</b>	seated load weight
<b>SOC</b>	state of charge
<b>UL</b>	Underwriters Laboratories
<b>UNECE</b>	United Nations Economic Commission for Europe
<b>VDC</b>	volts of direct current
<b>Wh</b>	watt-hours
<b>VIN</b>	vehicle information number