NEW

State of Maine

Master Agreement

Effective Date: 01/31/18 **Expiration Date:** 01/30/22

Master Agreement Description: Heavy Duty Transit Bus

Buyer Information

Terry Demerchant 207-624-7334 **ext.** TERRY.L.DEMERCHANT@MAINE.GOV

Issuer Information

KELLY ARATA 207-624-3559 **ext.** kelly.arata@maine.gov

Requestor Information

Kelly Arata 207-624-3559 **ext.** kelly.arata@maine.gov

Authorized Departments

17A TRANSPORTATION

Vendor Information

Vendor Line #: 1

Vendor ID
VS0000011606

Vendor Name
GILLIG LLC

Alias/DBA
GILLIG LLC

Vendor Address Information
25800 Clawiter Road

Hayward, CA 94545
US

Vendor Contact Information
Maribel Gonzalez-Becerra
800-735-1500 **ext.** 5015
sales@gillig.com

Payment Discount Terms

Discount 1:	0.0000 **%**	30 **Days**
Discount 2:	**%**	0 **Days**
Discount 3:	**%**	0 **Days**
Discount 4:	**%**	0 **Days**

Commodity Information

Vendor Line #: 1

Vendor Name: GILLIG LLC

Commodity Line #: 1

Commodity Code: 55600

Commodity Description: Heavy Duty Diesel Powered Low Floor Transit Bus

Commodity Specifications: 35 foot Gillig buses Model G27B102N4
Commodity Extended Description: As per the specifications attached and made part of this MA.

Quantity 0.00000	**UOM**	**Unit Price** $0.00
Delivery Days 0	**Free on Board**	
Contract Amount $0.00	**Service Start Date** 01/31/18	**Service End Date** 01/30/22
Catalog Name	**Discount** 0.0000 **%**	
	Discount Start Date	**Discount End Date**

GILLIG

November 15, 2017

Terry DeMerchant
Procurement Manager
Division of Procurement Services
State of Maine
4th Floor Burton M. Cross Building
#9 State House Station
111 Sewall Street
Augusta, ME 04333-0009

RE: RFQ 17A17091500000000000174 - HEAVY DUTY DIESEL POWERED LOW FLOOR TRANSIT BUS 30FT, 35FT, 40FT REAR ENGINE
DATE DUE: NOVEMBER 3, 2017 AT 4:00PM

Dear Mr. DeMerchant,

GILLIG LLC is pleased to submit the enclosed documentation covering our response to the above solicitation for your review and consideration. We submit the following information in our letter of transmittal:

1. Proposer Information: GILLIG LLC
   451 Discovery Drive, Livermore, CA 94551
   Phone: 800-735-1500 Email: sales@GILLIG.com

   GILLIG is a manufacturer of heavy-duty LOW FLOOR transit buses – we manufacture the entire vehicle and all models at our one (1) location only.

   - We are **100% U. S. owned and operated.**

2. Contact Person authorized to represent the proposer:
   Joseph Policarpio, Vice President Phone: 800-735-1500

3. This letter and all the required certifications are signed by Joseph Policarpio, our Vice President who is authorized to bind GILLIG LLC to the terms of the proposal.

We appreciate this opportunity and look forward to your bid opening and negotiation.

Very truly yours,

Joseph Policarpio
Vice President

CC: Bill Fay, Director of National Sales
Benjamin M. Grunat, Director of Project Sales Management
Jerry Sheehan, Regional Sales Manager

257. Pricing Schedule

NOTE: The following is an example of what a pricing schedule might look like and should be customized by the Agency to reflect the costs for its procurement.

		All prices are to be in United States dollars	
		Unit Price	**Extension**
35 ft. Heavy Duty Diesel Powered Low Floor Transit buses		$409,983.00	$409,983.00
Manuals		Lump Sum	Included
Training		Lump Sum	See Below
Spare parts package		Quote	Quote
I/O G4 Tools	Test equipment and special tools	$180.00	$180.00
Extended Warranty [Engine]		$5,500.00	$5,500.00
Extended Warranty [Transmission]		$2,899.00	$2,899.00
Extended Warranty [Air conditioning]		$1,851.00	$1,851.00
Extended Warranty [Electric engine Fan]		$1,250.00	$1,250.00
Option	Air Disc brake on all axles	$3,750.00	$3,750.00
Option	Composite Sub floor	$2,500.00	$2,500.00
Option	Proheat X45 Auxiliary Heater	$3,945.00	$3,945.00
Option	Air cooled brushless Alternator	$625.00	$625.00
Option Safety Vision Analog	5 Camera surveillance system	$4,167.00	$4,167.00
Commuter Option	Luggage Racks	$7,925.00	$7,925.00
Commuter Option	LED Reading Lamps	$350.00	$350.00
Commuter Option	High Back Reclining Seats	$12,564.00	$12,564.00
Commuter Option	Over head Air Vents	Included w/ Reading lights	Included w/ Reading lights
Commuter Option	USB and 120 VAC power outlets	$5,750.00	$5,750.00
TOTAL PROPOSED PRICE			$463,239.00
ADA equipment (included in above unit prices)		$15,762.00	$15,762.00

This form is to be completed and included in the Price Package.

Training	
Engine/Emissions Training (Cummins)	$400.00/student/day
Transmission (Distributor)	$400.00/student/day
HVAC (Distributor)	$250.00/student/day
GILLIG Training	$5,000.00/24 hour course

257. Pricing Schedule

NOTE: The following is an example of what a pricing schedule might look like and should be customized by the Agency to reflect the costs for its procurement.

		All prices are to be in United States dollars	
		Unit Price	Extension
	40 ft. Heavy Duty Diesel Powered Low Floor Transit buses	$414,183.00	$414,183.00
	Manuals	Lump Sum	Included
	Training	Lump Sum	See Below
	Spare parts package	Quote	Quote
I/O 64 Tools	Test equipment and special tools	$180.00	$180.00
	Extended Warranty [Engine]	$5,500.00	$5,500.00
	Extended Warranty [Transmission]	$2,899.00	$2,899.00
	Extended Warranty [Air conditioning]	$1,851.00	$1,851.00
	Extended Warranty [Electric engine Fan]	$1,250.00	$1,250.00
Option	Air Disc brake on all axles	$3,750.00	$3,750.00
Option	Composite Sub floor	$2,500.00	$2,500.00
Option	Proheat X45 Auxiliary Heater	$3,945.00	$3,945.00
Option	Air cooled brushless Alternator	$625.00	$625.00
Option	Safety Vision Analog 5 Camera surveillance system	$4,167.00	$4,167.00
Commuter Option	Luggage Racks	$8,821.00	$8,821.00
Commuter Option	LED Reading Lamps	$350.00	$350.00
Commuter Option	High Back Reclining Seats	$14,656.00	$14,656.00
Commuter Option	Over head Air Vents	Included w/ Reading lights	Included w/ Reading lights
Commuter Option	USB and 120 VAC power outlets	$5,750.00	$5,750.00
	TOTAL PROPOSED PRICE		$470,427.00
	ADA equipment (included in above unit prices)	$15,762.00	$15,762.00

This form is to be completed and included in the Price Package.

Training	
Engine/Emissions Training (Cummins)	$400.00/student/day
Transmission (Distributor)	$400.00/student/day
HVAC (Distributor)	$250.00/student/day
GILLIG Training	$5,000.00/24 hour course

257. Pricing Schedule

NOTE: The following is an example of what a pricing schedule might look like and should be customized by the Agency to reflect the costs for its procurement.

		All prices are to be in United States dollars	
		Unit Price	**Extension**
30 ft. Heavy Duty Diesel Powered Low Floor Transit buses		$404,058.00	$404,058.00
	Manuals	Lump Sum	Included
	Training	Lump Sum	See Below
	Spare parts package	Quote	Quote
I/O G4 Tools	Test equipment and special tools	$180.00	$180.00
	Extended Warranty [Engine]	$5,500.00	$5,500.00
	Extended Warranty [Transmission]	$2,899.00	$2,899.00
	Extended Warranty [Air conditioning]	$1,851.00	$1,851.00
	Extended Warranty [Electric engine Fan]	$1,250.00	$1,250.00
Option	Air Disc brake on all axles	$3,750.00	$3,750.00
Option	Composite Sub floor	$2,500.00	$2,500.00
Option	Proheat X45 Auxiliary Heater	$3,945.00	$3,945.00
Option Niehoff C803	Air cooled brushless Alternator	$625.00	$625.00
Option Safety Vision Analog	5 Camera surveillance system	$4,167.00	$4,167.00
Commuter Option	Luggage Racks	Not Available	Not Available
Commuter Option	LED Reading Lamps	Not Available	Not Available
Commuter Option	High Back Reclining Seats	Not Available	Not Available
Commuter Option	Over head Air Vents	Not Available	Not Available
Commuter Option	USB and 120 VAC power outlets	$5,750.00	$5,750.00
	TOTAL PROPOSED PRICE		$436,475.00
	ADA equipment (included in above unit prices)	$15,762.00	$15,762.00

This form is to be completed and included in the Price Package.

Training	
Engine/Emissions Training (Cummins)	$400.00/student/day
Transmission (Distributor)	$400.00/student/day
HVAC (Distributor)	$250.00/student/day
GILLIG Training	$5,000.00/24 hour course

GILLIG

PRICING CLARIFICATION

PRICING CLARIFICATION

All the following general comments and clarifications may not apply to your specific procurement, but they are included so as to avoid misunderstandings, so they should not be construed as making this a conditional bid. These comments do not change the quoted pricing for the initial order and build.

TAX/FEE STATEMENT

The prices quoted for this procurement are for the specified deliverables only and **exclude** (unless specifically noted by buyer or seller) any Local, City, County, State, Franchise or Income or Value Added(VAT) taxes, tariffs, fees, business licenses, or other licenses, that may need to be paid as part of the performance of this contract, or any option of it. If any additional fees are required, they will be noted and added to the appropriate invoice.

PAYMENT

All Prices are in U.S. Dollars and payments are only accepted on U.S. bank checks or via electronic funds transfers, (no credit, debit or bank cards) and any applicable transaction fees would be the responsibility of the buyer.

EMISSIONS AND OTHER REGULATED OR MANDATED CHANGES

The prices quoted for the initial build quantity are for vehicles meeting all applicable Federal and State regulations (including EPA, CARB, or NHTSA requirements) **currently known to be in effect at the time of delivery of those vehicles.** Changes caused by or related to future regulations, any subsequently enacted regulations, or technologies necessitating revisions from the currently proposed vehicle configuration (e.g. component change/availability due to emission or other regulations, requirements or mandates), may require a price adjustment, which would be subject to negotiation and agreement by both GILLIG and the buyer. This latter statement applies to future builds only that may need to use different components or currently unknown or unavailable technology, to meet regulations or requirements in effect at the time(s) of those optional deliveries.

OPTIONAL BUILD PRICING

Most bids include a PPI adjuster to determine pricing for future builds, and this is to clarify that bus pricing for such future build quantities may be different from the PPI adjusted price because of the above regulated/mandated changes and/or due to customer initiated change notices.

GILLIG LLC

By: _____

JOSEPH POLICARPIO

Title: VICE PRESIDENT

Date: NOVEMBER 15, 2017

GILLIG LLC

LOW FLOOR TRANSIT COACH

STANDARD LIMITED WARRANTY & EXTENDED COVERAGE FOR

State of Maine – Augusta, ME
RFQ # 17A 17091500000000000174 – November 2017

GILLIG LLC warrants to the original purchaser, that its transit coaches, save and except for those major component assemblies and other parts described below which are separately warranted by their respective manufacturer's (OEM's), will be **FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP UNDER NORMAL USE AND SERVICE**, for the distance or time periods specified in the attached, and agrees to REPAIR or REPLACE the defective parts AT NO COST TO THE PURCHASER. This is a limited warranty subject to the provisions stated below and is referred to as GILLIG's Standard Limited Warranty.

This warranty **DOES NOT COVER** malfunction or failure resulting from the purchaser's or its agents or employees alteration, misuse, abuse, accident, neglect or failure to perform normal preventive maintenance as outlined in GILLIG's Service Manual, nor does it cover components or assemblies not originally provided by GILLIG. Further, this warranty **DOES NOT APPLY** to normal replacement items such as light bulbs, seals, filters or bushings, nor to consumable items such as belts, tires, brake linings or drums.

PURCHASER'S SOLE REMEDIES FOR LIABILITY OF ANY KIND WITH RESPECT TO THE PRODUCTS FURNISHED UNDER THIS WARRANTY AND ANY OTHER PERFORMANCE BY GILLIG UNDER OR PURSUANT TO THIS WARRANTY, OR WITH RESPECT TO PURCHASER'S USE THEREOF, INCLUDING NEGLIGENCE, SHALL BE LIMITED TO THE REMEDIES PROVIDED IN THIS WARRANTY AND SHALL IN NO EVENT INCLUDE ANY INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSS OF USE, REVENUE OR PROFIT. IN NO EVENT SHALL GILLIG'S LIABILITY FOR DAMAGES WITH RESPECT TO ANY OF THE PRODUCTS COVERED UNDER THIS WARRANTY EXCEED THE AMOUNT PAID BY THE PURCHASER TO GILLIG FOR SUCH PRODUCTS.

GILLIG **DOES NOT WARRANT** some major component assemblies (such as the engines, transmissions and air conditioning systems) which are warranted by their respective manufacturers (OEM's) and identified as Category 3 items on page three (3) of this Warranty. **Warranty coverage for these items is as defined in those manufacturer's own warranty documents** and per their terms and conditions, and as administered by their own support networks.

GILLIG makes **NO OTHER WARRANTIES,** except as stated herein, and GILLIG's obligation under this warranty is **LIMITED AND FULLY DESCRIBED HEREIN**. Determination of warrantable defects is at GILLIG's (or the OEM's) discretion and will require inspection of failed components. Correction or compensation under this warranty for Category 1 and Category 2 items cannot be made unless requested on a GILLIG Application for Warranty Claim form and in accordance with the claim procedure established by GILLIG.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTY EXPRESSED OR IMPLIED, but if such has legal status, it **CANNOT EXCEED THE DURATIONS STATED HEREIN**. This warranty gives the purchaser specific legal rights and some state statutes may include other rights.

This is GILLIG's sole warranty with respect to its transit coaches. **GILLIG MAKES NO OTHER WARRANTY OF ANY KIND WHATEVER, EXPRESS OR IMPLIED; AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE AFORESAID OBLIGATION ARE HEREBY DISCLAIMED BY GILLIG AND EXCLUDED FROM THIS AGREEMENT.**

GILLIG LLC

LOW FLOOR TRANSIT COACH

STANDARD LIMITED WARRANTY & EXTENDED COVERAGE FOR

State of Maine – Augusta, ME
RFQ # 17A 17091500000000000174 – November 2017

GILLIG's Standard Limited Warranty which covers Category 1 and Category 2 parts, components and assemblies, covers the following systems, components or assemblies for the period specified, and includes 100% PARTS AND LABOR to repair or replace the defective components as determined by GILLIG. (See Page 3 for explanation of notes (1)-(7).)

CATEGORY 1

Includes GILLIG manufactured or assembled components and systems as well as some purchased assemblies. Warranty and warranty claims administration provided by GILLIG.

	Coverage Period [1]	
	Months	Miles
FULL COACH WARRANTY [2] [3] [7]	12	50,000
BODY STRUCTURE WARRANTY [4]	36	150,000
CORROSION & STRUCTURAL INTEGRITY WARRANTY [5]	84	350,000

CATEGORY 2

Includes major components purchased and installed by GILLIG. Warranty provided by component OEM's. Warranty claims administration provided by GILLIG.

AXLE		
Meritor Front Steering	60	300,000
Meritor Rear Driving	60	300,000
BRAKE SYSTEM		
(Excludes Friction Material)		
Bendix Valves	24	100,000
Meritor Brakes	24	100,000
RADIATOR & CHARGE AIR COOLER		
Modine	36	100,000

GILLIG LLC

LOW FLOOR TRANSIT COACH

STANDARD LIMITED WARRANTY & EXTENDED COVERAGE FOR

State of Maine – Augusta, ME
RFQ # 17A 17091500000000000174 – November 2017

Major components listed below under "Category 3" are covered by warranties or extended coverages[6], for the miles and/or months indicated, provided by the manufacturer (OEM's) of those components. Purchasers should refer to specific OEM warranty documents for details. Warranty claims are and will be administered by the respective manufacturers (OEM's) and all warranty claims must be made directly to said manufacturers. GILLIG will assist purchasers in dealing with these OEM's and warranty issues that may arise from time to time.

CATEGORY 3

	Coverage Period [1]	
	Months	Miles
ENGINE [7]		
Cummins L9	24	Not applicable
ENGINE ACCESSORIES		
Delco Starter	36	350,000
Delco Alternator	24	Unlimited
Air Compressor	24	Unlimited
TRANSMISSION		
Allison B400R	24	Unlimited
AIR CONDITIONING SYSTEM		
Thermo King	24	Unlimited
WHEELCHAIR RAMP		
Ricon SSR 6:1	24	Unlimited
DOOR SYSTEM		
Vapor	12	Unlimited

Low Floor Transit Coach Emission Warranty

GILLIG warrants to the ultimate purchaser and each subsequent purchaser that the new vehicle is designed, built and equipped so it conforms at the time of sale to the ultimate purchaser with all U.S. federal emissions regulations applicable at the time of manufacture and that it is free from defects in materials or workmanship which would cause the vehicle to fail to not meet these regulations within five years or 100,000 miles of operation, whichever occurs first, as measured from the date the vehicle is placed into service. In no case may this period be less than the Standard Limited Warranty where applicable to emission warrantable parts. If the ultimate purchaser registers the vehicle in the state of California (or any other state following the applicable California Air Resources Board regulations) a separate California Emissions Warranty applies.

LOW FLOOR TRANSIT COACH
STANDARD LIMITED WARRANTY & EXTENDED COVERAGE FOR

State of Maine – Augusta, ME
RFQ # 17A 17091500000000000174 – November 2017

GILLIG warrants to the ultimate purchaser that registers the vehicle in the state of California (or any other state following the applicable California Air Resources Board regulations), and each subsequent purchaser, that the new vehicle is designed, built and equipped so it conforms at the time of sale to the ultimate purchaser with all applicable regulations adopted by the California Air Resources Board at the time of manufacture and that it is free from defects in materials or workmanship which would cause the vehicle to fail to not meet these regulations within five years, 100,000 miles or 3000 hours of operation, whichever occurs first, as measured from the date the vehicle is placed into service. In no case may this period be less than the basic mechanical warranty provided to the purchaser of the engine.

GILLIG warrants to the ultimate purchaser and each subsequent purchaser that the tires on this vehicle conform at the time of sale to the ultimate purchaser with all U.S federal emissions regulations and all applicable regulations adopted by the California Air Resources Board at the time of manufacture and are free from defects in materials or workmanship which would cause the vehicle to fail to not meet these regulations for a period of 2 years or 24,000 miles, whichever occurs first.

This list of emission control parts may be covered by the Emission Warranty under certain failure modes.

- Ambient Air Temperature Sensor
- Charge Air Cooler and associated plumbing
- Wire harness circuits connected at both ends to emissions warrantable components
- Exhaust gas pipes from turbocharger out to the last after treatment device
- Urea quality sensor
- Urea tank, heating element, level sensor, temperature sensor, coolant control valve
- Urea lines and line heater controls
- On-Board Diagnostic (OBD) Malfunction Indicator Lamp (MIL)
- Diesel Exhaust Fluid (DEF) Lamp
- OBD Connector

NOTES

1) Coverage ceases at the first expiration of the time or distance noted.
2) Full coach warranty includes and applies to electrical, doors, seats, flooring, roof hatches, destination signs, wheelchair ramp, handrails, radio, P.A., etc., but not to IVS systems or special options.
3) Fleet defect coverage is for a maximum of 12 months or 50,000 miles and includes all warrantable components and assemblies on the vehicle.
4) Basic body structure warranty includes and applies to structural members in the body and undercarriage including the structural members in the suspensions.
5) The corrosion and structural integrity guarantee covers against a significant loss of structural integrity of the assembly or its functional performance, resulting from a pertinent loss of cross-section due to corrosion caused by normal environmental elements but excludes corrosion caused by aggressive road de-icers such as Magnesium Chloride or equivalents, unless GILLIG approved preventative measures are taken (see Service Manual).
6) Extended coverage may not duplicate Standard Limited warranty coverage. Note: Please refer to OEM warranty documents for details.
7) Use of non-ASTM biodiesel blends from non-BQ9000 suppliers in excess of B20 may void the engine manufacturer's warranty on fuel related components, and also may void warranties of hoses, seals and fittings in contact with the fuel.

Lead time from the day the successful bidder received/receives the order for the vehicles. 65 **weeks**

I certify that all of the information contained in this Technical/Price Proposal to be true and accurate.

Signature: J Policarpio

Printed Name: JOSEPH POLICARPIO

Title: VICE PRESIDENT

Date: NOVEMBER 15, 2017

I certify that the foregoing signature is true and accurate. I further certify that it (a) is intended to have the same force as a manual signature, (b) is unique to myself, (c) is capable of verification, (d) is under the sole control of myself, (e) is linked to data in such a manner that it is invalidated if the data is changed. (10 M.R.S.A. §9501 et seq.)

APPENDIX A

STATE OF MAINE
DEPARTMENT OF ADMINISTRATIVE AND FINANCIAL SERVICES
DIVISION OF PURCHASES

BID COVER PAGE

Bidder's Organization Name: GILLIG LLC		
Chief Executive - Name/Title: JOSEPH POLICARPIO, VICE PRESIDENT		
Tel: 800-735-1500	Fax: 510-789-6819	E-mail: SALES@GILLIG.COM
Headquarters Street Address:		
451 DISCOVERY DRIVE		
Headquarters City/State/Zip:		
LIVERMORE, CA 94551		
(provide information requested below if different from above)		
Lead Point of Contact for Bid - Name/Title: JOSEPH POLICARPIO, VICE PRESIDENT		
Tel: 800-735-1500	Fax: 510-789-6819	E-mail: SALES@GILLIG.COM
Street Address:		
451 DISCOVERY DRIVE		
City/State/Zip:		
LIVERMORE, CA 94551		

By signing below Bidder affirms:

- Their bid complies with all requirements of this RFQ; and
- This bid and the pricing structure contained herein will remain firm for a period of 180 days from the date and time of the bid opening; and
- That no personnel currently employed by the Department or any other State agency participated, either directly or indirectly, in any activities relating to the preparation of the Bidder's proposal; and
- That no attempt has been made or will be made by the Bidder to induce any other person or firm to submit or not to submit a proposal; and
- The undersigned is authorized to enter into contractual obligations on behalf of the above-named organization.

Name: JOSEPH POLICARPIO		Title: VICE PRESIDENT
Authorized Signature: J Policarpio		Date: NOVEMBER 1, 2017

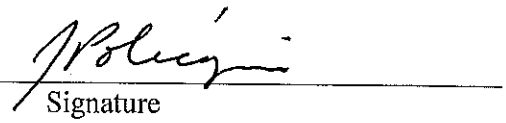
2.8 SPECIFICATION COMPLIANCE

The bidder hereby certifies that the vehicle(s) being bid in response to this invitation meet or exceed these specifications and that where a deviation from the specifications exists, the bidder has obtained written approval of those exceptions, in accordance with paragraph (1.13 (d), prior to submitting this bid.

If a conflict exists between these specifications and Federal and/or State laws, the Federal and/or State laws shall prevail and the bidder must alert the purchaser to any such conflicts.

NOVEMBER 15, 2017
Date

JOSEPH POLICARPIO
Printed Name of Person Bidding


Signature

VICE PRESIDENT
Title

GILLIG LLC HEREBY STATES THAT IT WILL COMPLY WITH THE BID SPECIFICATIONS IN ALL AREAS INCLUDING THE "CLARIFICATIONS, EXCEPTIONS OR APPROVED EQUALS" THAT WERE ACCEPTED AND GRANTED BY THE STATE OF MAINE DURING THE EXCEPTIONS PROCESS.

PLEASE REFERENCE THE ATTACHED CLARIFICATIONS IN RESPONSE TO THE STATE OF MAINE'S INQUIRIES TO GILLIG'S APPROVED EQUALS REQUESTS. PER TERRY DEMERCHANT'S EMAIL DATED 11/3/17 WE SUBMIT SAID CLARIFICATIONS WITH OUR BID SUBMISSION.

FURTHER, THE BUS AND PRICE ARE SUBMITTED WITH THE UNDERSTANDING THAT ALL CLARIFICATIONS, EXCEPTIONS AND APPROVED EQUALS WILL BE CONCURRED WITH BY THE STATE OF MAINE. GILLIG HAS MADE A DILIGENT AND COMPLETE REVIEW OF THE STATE OF MAINE'S REQUEST FOR QUOTATIONS (RFQ), INSOFAR AS IT IS POSSIBLE, ALL ISSUES HAVE BEEN ADDRESSED.

255. Request for Pre-Offer Change or Approved Equal

This form must be used for requested clarifications, changes, substitutes or approval of items equal to items specified with a brand name and must be submitted as far in advance of the Due Date, as specified in "Questions, Clarifications and Omissions."

Request #: 13

Proposer: GILLIG

RFP Section: SECTION 1: SPECIAL PROVISIONS (Table 1)

Page: 16

Questions/clarification or approved equal: 25. **As-built drawings – Due Date – With each delivered bus.**

GILLIG respectfully wishes to clarify the information required to maintain the vehicles is included in the custom, order-specific manuals created by the GILLIG Publications department. Other drawings requested by the Transit Agency will be evaluated on a case-by-case basis.

GILLIG requests concurrence.

Agency action:	oApproved	oDenied
	o See addendum	**X See response below**

Agency response: Un clear of your request, please explain... What drawings are included in the Gillig custom manuals

GILLIG response: GILLIG provides Air system diagrams and Electrical schematics as part of the deliverables for each order of buses. However, any additional requests for drawings and/or schematics will be handled on a case-by-case basis.

255. Request for Pre-Offer Change or Approved Equal

This form must be used for requested clarifications, changes, substitutes or approval of items equal to items specified with a brand name and must be submitted as far in advance of the Due Date, as specified in "Questions, Clarifications and Omissions."

Request #: 27

Proposer: GILLIG

RFP Section: 226. Overhead

Page: 78

Questions/clarification or approved equal: Except forward of the standee line and at the rear door, a continuous, full grip, overhead assist shall be provided.

GILLIG wishes to clarify that our continuous, overhead full-grip assists stops at the Air Tank Closeout. However, we provide adequate vertical and horizontal stanchions throughout the bus to help passengers navigate upon entry to exiting the vehicle.

GILLIG requests approval.

Agency action:	o Approved	o Denied
	o See addendum	**X See response below**

Agency response: Please clarify what is meant by the overhead full-grip assists stops at the Air Tank Closeout

GILLIG response: Our overhead full-grip assists stops just short of our Air Tank Closeout which is a few feet from our standee line location as shown in the attached picture.

APPENDIX B

STATE OF MAINE
DEPARTMENT OF ADMINISTRATIVE AND FINANCIAL SERVICES
DIVISION OF PURCHASES

RFQ # 17A 17091500000000000174

HEAVY DUTY DIESEL POWERED LOW FLOOR TRANSIT BUS

30', 35', 40' FOOT REAR ENGINE BUSES

GENERAL

1.1 Purpose

The following specifications are for a Heavy Duty Diesel Powered Low Floor Transit Bus. Bus must be current model transit style compliant with all ADA regulations. Bus shall be equipped with a front entrance wheelchair ramp. These vehicles are to be used to provide transportation services to low income, elderly and/or disabled passengers, children and general transportation.

1.2 Intent

It is the intent of this specification to describe a vehicle of substantial and durable construction in all respects congruent to practices acceptable to body and chassis manufacturers. Bidder shall submit evidence that the body manufacturer currently holds a "FULLY MEETS" level of compliance with the "Transit Bus Quality Program" of the chassis manufacturer. To ensure the quality of manufacturer and reliability of product support, the bus body manufacturer shall be ISO 9001:2000 certified. The bidder shall submit with bid documentation certifying ISO registration.

1.3 Requirements

The chassis is to be the heaviest duty available with all possible options to make it a heavy-duty vehicle and if applicable shall be Altoona Tested minimum as a 12 Year, 500,000 mile vehicle.

1.4 Completeness

a) Any part or detail which makes the vehicle complete and ready for service shall not be omitted, even though such part or detail is not mentioned in these specifications.

b) The price quoted in any proposal submitted shall include all items of labor, materials, tools, equipment and other costs necessary to fully complete the manufacture and delivery of the vehicle pursuant to these specifications.

Pricing for subsequent model years will be based on current Product Price Index at time of order. Additionally, agency will incur any chassis increases resulting from federally mandated changes.

BASE PRICE CALCULATION
PRODUCER PRICE INDEX ESCALATOR

Buses shall be at the prices quoted. These prices shall remain firm/fixed for any orders issued by the Department within a period of two (2) year of contract award. The price(s) of any buses ordered by the Department after the initial two (2) year firm/fixed price period shall be that quoted (Base Order Prices) plus/minus any change which will be calculated based on the following formula which utilizes the U.S. Department of Labor/Bureau Of Labor Statistics Producer Price Index ("PPI") Category 1413, "Trucks and Bus Bodies". The change in this index will be used to adjust the Base Order Prices. However, in no event will the price(s) for any purchase order release exceed, by more than five percent (5%) increase over the remaining three (3) years of the five (5) year contract.

Simple Percentage Method.

One method of price adjustment is to have the base price changed by the same percentage as the percent change in a selected PPI. To illustrate, suppose that a contract escalation clause called for using the intermediate demand PPI titled Materials and components for manufacturing, not seasonally adjusted. Also suppose that the value of this index was 178.4 for December 2010, the month that corresponds with the base price for escalation, $1,000 per unit. Twelve months later, when December 2011 data were released and the first stipulated price adjustment was to be made, the index value for December 2011, published mid-January 2012, was 187.7. The percent change represents an increase of 5.2 percent in the index for Materials and components for manufacturing and a $52 per unit increase in the price for the escalated product. (See below.)

Index at time of calculation, December 2011: 187.7
Divided by index at time base price was set, December 2010: 178.4
Equals 1.052

Base price $1,000
Multiplied by 1.052
Equals adjusted price $1,052

All future releases, including the equipment modification(s), will be priced based upon the new revised Base Award Price.

Note: This is an example only to indicate how the PPI Calculated Pricing will be determined for Option Year Orders.

1.5 Conformity

All units or parts not specified shall be manufacturer's best quality and shall conform in materials, design, and workmanship to the best practice known in the transit bus industry. All parts shall be new and in no case will used, reconditioned, or obsolete parts be accepted. The parts on all vehicles provided by the same manufacturer shall be interchangeable.

1.6 Materials

All materials used in conversion of the vehicle shall conform in all respects to American Society of Testing Materials, Society of Automotive Engineers, or similar association standards.

1.7 Warranty and Maintenance

The manufacturer's warranty must be provided for the basic vehicle as well as the warranty for any and all modifications. Lift and rust proofing warranties must also be provided. Bidder must be able to provide warranty and maintenance service for the vehicle and the modifications in the areas in which the vehicles are to be used.

Bidders located outside this area must be able to arrange maintenance and warranty service agreement with a certified maintenance facility located within these areas. Bidder must be able to provide or assure access to spare or replacement parts (must specify source). The warranty form that has been included in the bid package MUST be filled out completely and sent with the final bid.

1.8 Pre & Post-Delivery Inspections and Pre-Delivery Inspection:

Pre-Manufacturing Meeting:
A pre-manufacturing meeting will be held in Maine with the successful bidder the purpose of this meeting shall be a review of specifications, approve equals the bid and the bidder's build order. Those in attendance may include, but not limited to, representatives from the Department, Provider, and factory representatives (if bidding vendor so chooses)

Pre-Delivery Inspection:
A factory pre-delivery inspection is required after vehicles are 80% completed and before any unit are delivered. Inspection will be completed by State of Maine Department of Transportation representatives or their designated representatives.

Inspectors shall number up to three (3) representatives from MaineDOT. **The cost of the inspection, including round trip airfare and lodging for a period of up to three (3) days, two (2) nights, depending of number of vehicles to be inspected. All costs shall be separate of the vehicle bid price.** Separate Pricing Per Person.

Maine Department of Transportation also reserves the right, at no cost to the bidder, to send factory inspectors to the factory at any time during the building of these vehicles.

Post-Delivery Inspections:
Upon delivery of each vehicle at the procuring agency desired location (Fleet Services Augusta). State of Maine Department of Transportation representatives and end user agency will perform a post-delivery inspection. State of Maine Department of Transportation representative will create a letter of non-acceptance with furnish details of the deficiencies.

Assignability of Options
If the Department does not exercise the option(s) as listed in "Options and Option Pricing," then the Department reserves the right to assign the option(s) to other grantees of FTA funds in accordance with FTA Circular 4220.1F or its successors.

SECTION 1: SPECIAL PROVISIONS

Contract Deliverables

Contract deliverables associated with this Contract are set forth in the table below, along with other pertinent

information. Contract deliverables shall be submitted in accordance with Technical Specifications. Due dates shown note the last acceptable date for receipt of Contract deliverables. The Agency will consider early receipt of Contract deliverables on a case-by-case basis.

TABLE 1
Contract Deliverables

	Deliverable	Agency Action	Due Date	Format	Quantity Due
1.	Bus Testing — Altoona Test Report	Review	With Proposal	Hardcopy or Electronic Media	1
2.	Copy of Manufacturers formal Quality Assurance Program	Review	With Proposal	Hardcopy or Electronic Media	1
3.	Recommended spare parts list, including bill of materials	Review	With Proposal	Hardcopy or Electronic Media	1
4.	Training options	Review	With Proposal	Hardcopy or Electronic Media	1
5.	Undercoating system program	Approval	With Proposal	Hardcopy or Electronic Media	1
6.	List of OEM component repair manuals	Review	With Proposal	Hardcopy or Electronic Media	1
7.	Motor Vehicle Pollution Requirements Certificate	Review	With Proposal	Hardcopy or Electronic Media	1
8.	Engine Emissions Certificate — NOx levels	Review	With Proposal	Hardcopy or Electronic Media	1
9.	Interior features – fire-resistance certificates	Review	With Proposal	Hardcopy or Electronic Media	1
10.	Crashworthiness	Review	With Proposal	Hardcopy or Electronic Media	1
11.	Power plant certifications	Review	With Proposal	Hardcopy or Electronic Media	1
12.	Pre-production meeting minutes	Approval	30 days after each meeting	Hardcopy or Electronic Media	1
13.	Interior security camera layout	Approval	Prior to production	Layout of interior views	1 per agency
14.	Striping layout	Approval	Prior to production	Hardcopy or Electronic Media	1 per agency
15.	Title documentation	Review	10 days prior to bus delivery	Hardcopy	1 per bus
16.	Parts manuals	Review	With each delivered bus	Hardcopy and Electronic Media	1 per agency
17.	Operators' manuals	Review	With each delivered bus	Hardcopy and Electronic Media	1 per bus
18.	Diagnostic procedures manuals	Review	With each delivered bus	Hardcopy and Electronic Media	1 per agency

TABLE 1
Contract Deliverables

	Deliverable	Agency Action	Due Date	Format	Quantity Due
19.	Final preventative maintenance manuals	Review	With each delivered bus	Hardcopy and Electronic Media	1 per agency
20.	Professionally prepared mechanics' "Bus Orientation" training video	Review	With each delivered bus	Electronic Media	1 per agency
21.	Part number index	Review	With each delivered bus	Hardcopy and Electronic Media	1 per agency
22.	Electrical and air schematics	Review	With each delivered bus	Hardcopy and Electronic Media	1 per agency
23.	List of serialized units installed on each bus	Review	With each delivered bus	Hardcopy and Electronic Media	1 per bus
24.	Driver's log and incident report	Review	With each bus delivery if drive away service is used	Hardcopy	1 per bus
25.	As-built drawings	Review	With each delivered bus	Electronic Media	1 per agency

GENERAL

1. Scope

Technical specifications define requirements for 30 ft., 35ft and 40ft. Heavy-duty transit buses and commuter style buses, which, by the selection of specifically identified alternative configurations, may be used for both suburban express service and general service on urban arterial streets. 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.

2. Legal Requirements

The Contractor shall comply with all applicable federal, state and local regulations. These shall include but not be limited to 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.

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.

3. 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. Components used in the

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

4. 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.

5. Capacity

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

6. 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.

7. Maintenance and Inspection

Scheduled maintenance tasks shall be related and shall be, in accordance with the manufacturer's recommended preventative maintenance schedule.

Test ports, as required, shall be provided for commonly checked functions on the bus, such as air intake, exhaust, hydraulic, pneumatic, charge-air and engine cooling systems.

The manufacturer shall give prime consideration to the routine problems of maintaining the vehicle. All bus 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 bus structure and/or equipment such as seats and flooring under seats in order to gain access to these areas. Each bus 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 bus 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.

Contractor shall provide a list of all special tools and pricing required for maintaining this equipment. Said list shall be submitted as a supplement to the Pricing Schedule.

8. 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.

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.

9. Training

The Contractor shall provide training programs that can be offered to the end user, this shall include but not limited to Preventive Maintenance, Engine, Transmission, Emissions, Electrical/Multiplexing, and HVAC. The training shall be available at the Agency's property. 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 becomes the property of the Agency.

10. Technical/Service Representatives

The Contractor shall, at its own expense, have one or more competent technical service representatives available on request to assist the Agency in the solution of engineering or design problems within the scope of the specifications that may arise during the warranty period. This does not relieve the Contractor of responsibilities under the provisions of "Section 7: Warranty Requirements."

11. Operating Environment

The bus shall achieve normal operation in ambient temperature ranges of 10 °F to 115 °F, at relative humidity between 5 percent and 100 percent, and at altitudes up to 3000 feet above sea level. Degradation of performance due to atmospheric conditions shall be minimized at temperatures below 10 °F, above 115 °F or at altitudes above 3000 feet. Speed, gradability and acceleration performance requirements shall be met at, or corrected to, 77 °F, 29.31 in. Hg, dry air per SAE J1995.

12. 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 83 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 83 dBA. The driver area shall not experience a noise level of more than 75 dBA.

Exterior Noise

Airborne noise generated by the bus and measured from either side shall not exceed 83 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.

13. Fire Safety

The bus shall be designed and manufactured in accordance with all applicable fire safety and smoke emission regulations. These provisions shall include the use of fire-retardant/low-smoke materials, fire detection systems, bulkheads and facilitation of passenger evacuation.

All materials used in the construction of the passenger compartment of the bus shall be in accordance with the Recommended Fire Safety Practices defined in FMVSS 302. Materials entirely enclosed from the passenger compartment, such as insulation within the sidewalls and sub-floor, need not comply. In addition, smaller components and items, such as seat grab rails, switch knobs and small light lenses, and shall be exempt from this requirement.

14. Respect for the Environment

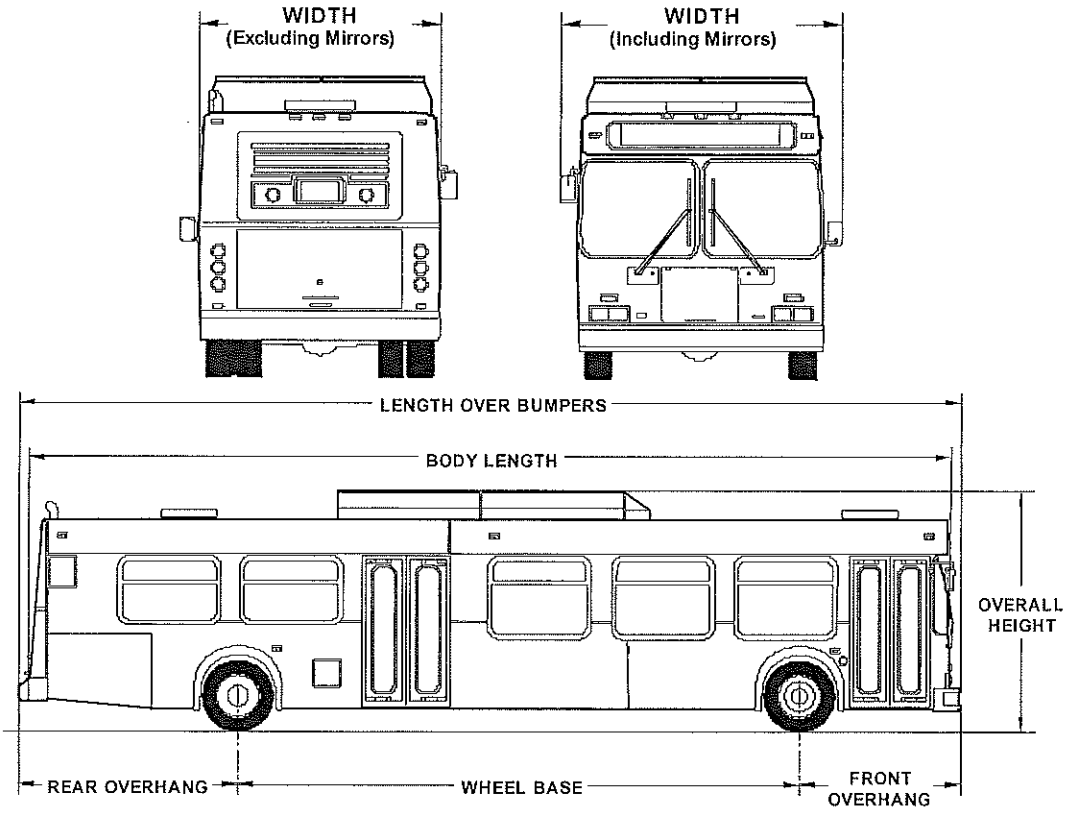
In the design and manufacture of the bus, the Contractor shall make every effort to reduce the amount of potentially hazardous waste. In accordance with Section 6002 of the Resource Conservation and Recovery Act, the Contractor shall use, whenever possible and allowed by the specifications, recycled materials in the manufacture of the bus.

DIMENSIONS

15. Physical Size

With exceptions such as exterior mirrors, marker and signal lights, bumpers, fender skirts, washers, wipers, cameras, object detection systems, and bicycle racks, the bus shall have the following overall dimensions as shown in Figure 1 at static conditions and design height.

FIGURE 1
Transit Bus Exterior Dimensions



16. Bus Length

For ease of use, the following tolerances will be allowable for each given bus length. Bus length is determined as the measurement from bumper to bumper.

- **30-ft bus:** 29 ft, 11 in. to 34 ft, 11 in.
- **35-ft bus:** 35 ft to 39 ft, 11 in.
- **40-ft bus:** 40 ft to 44 ft, 11 in.

17. Bus Width

102-in. Width Bus

Body width shall be 102 in. (+0, -1 in.).

18. Bus Height

Maximum Overall Height

Maximum overall height shall be 140 in., including all rigid, roof-mounted items such as A/C, exhaust, fuel system and cover, etc.

19. Step Height

The step height shall not exceed 16.5 in. at either doorway without kneeling and shall not exceed 15.5 in. at the step. A maximum of two steps is allowed to accommodate a raised aisle floor in the rear of the bus.

20. 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.

21. 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
Breakover Angle

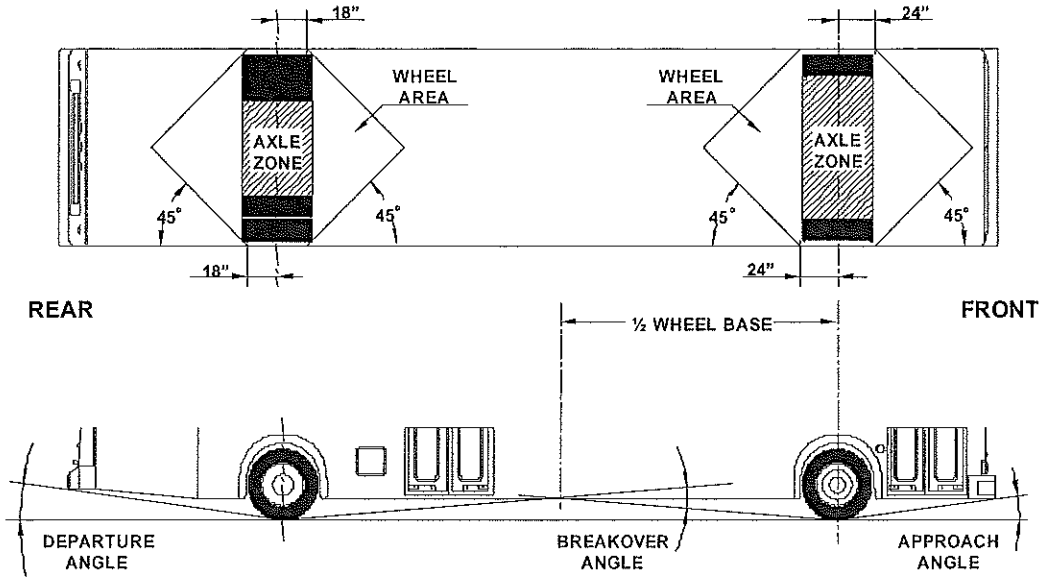
Angle	30-45-ft Bus	
Approach	8.5 degrees (min.)	
Front breakover	7.5 degrees (min.)	
Departure	8. degrees (min.)	

22. 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 5.2 in.

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



23. Floor Height

Height of the step above the street shall be no more than 16 in. measured at the centerline of the front and rear doorway. The floor may be inclined along the longitudinal axis of the bus, and the incline shall not exceed 3.5 degrees off the horizontal except locally at the doors where 2 degree slope toward the door is allowed. All floor measurements shall be with the bus at the design running height and on a level surface and with the standard installed tires. A maximum of two steps is allowed to accommodate a raised aisle floor in the rear of the bus.

24. 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.

25. Aisle Width

The minimum clear aisle width between pairs of transverse seats with all attached hardware shall be at least 23 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

26. 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.

27. Top Speed

The bus shall be capable of achieving a top speed of 70 mph on a straight, level road at GVWR with all accessories operating. The bus shall be capable of safely maintaining the vehicle speed according to the recommendations by the tire manufacturer.

28. 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 drivetrain shall enable the bus to achieve and maintain a speed of 40 mph on a 2½ percent ascending grade and 15 mph on a 10 percent ascending grade continuous.

29. Acceleration

The acceleration shall meet the requirements below and shall be sufficiently gradual and smooth to prevent throwing standing passengers off-balance. Acceleration measurement shall commence when the accelerator is depressed.

TABLE 3
Maximum Start Acceleration Times on a Level Surface[1]

Speed (mph)	Maximum time (seconds)
10	5
20	10.8
30	20.0
40	31.0
50	60
Top speed	70

30. Operating Range

The operating range of the bus shall be designed to meet the operating profile as stated in the "Design Operating Profile" section.

31. Diesel

The operating range of the bus when run on the Altoona Test cycle shall be at least 350 miles with full fuel capacity.

32. Fuel Economy (Design Operating Profile)

Test results from the Altoona fuel economy tests or other applicable test procedures shall be provided to the Agency. Results shall include vehicle configuration and test environment information. Fuel economy data shall be provided for each design operating profile. The design operating profile is assumed to be defined by the Altoona fuel duty cycle.

33. Engine

The Heavy-Duty Diesel engine shall comply with applicable local, state, and/or federal emissions and useful life requirements. Components of the fuel management and/or control system shall have a design life of not less than 150,000 miles without replacement or major service. The lifetime estimate is based on the design operating profile.

The engine shall be equipped with an electronically controlled management system, compatible with either 12- or 24-volt power distribution. The engine control system 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. The engine's electronic management system shall monitor operating conditions and provide instantaneous adjustments to optimize both engine and bus performance. The system shall be programmable to allow optimization of programmable features.

The engine starting system shall be protected by an interlock that prevents its engagement when the engine is running. Special equipment or procedures may be employed to start the bus when exposed to temperatures less than 30 °F for a minimum of four hours without the engine in operation. All cold weather starting aids, engine heating devices and procedures shall be of the type recommended by the engine manufacturer and approved by the Agency. The integration of all systems on the vehicle relative to engine idle speed shall be the responsibility of the vehicle manufacturer to meet the requirements of the transit property.

The engine control system shall protect the engine against progressive damage. The system shall monitor conditions critical for safe operation and automatically derate power and/or speed and initiate engine shutdown as needed.

Automatic Engine Protection/Shutdown Override Feature

A control shall be available to the operator/driver that when constantly depressed and released will delay the engine shutdown or allow the bus to be moved. Override action shall be recorded. This data shall be retrievable by the Agency.

Standard Requirements for a Fast Idle Device

The engine shall be equipped with an operator-controlled fast idle device. The fast idle control shall be a two-way switch mounted on the dash or side console and shall activate only with the transmission in neutral and the parking brake applied.

34. Cooling Systems

The cooling systems shall be of sufficient size to maintain all engine and transmission fluids and engine intake air at safe, continuous operating temperatures during the most severe operations possible and in accordance with engine and transmission manufacturers' cooling system requirements. 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 the operating environment.

35. Engine Cooling

A means of determining satisfactory engine coolant level shall be provided. A spring-loaded, push-button type valve or lever shall be provided to safely release pressure or vacuum in the cooling system with both it and the water filler no more than +/- 60 in. above the ground. Both shall be accessible through the same access door. The radiator and charge air cooler shall be of durable, corrosion-resistant construction with non-removable tanks.

No requirement for coolant filtration

Self-Cleaning
Radiator and charge air cooler fans shall be electrically driven and capable of automated reverse operations for periodic self-cleaning of the radiator and charge air cooler.

Standard Mounting Design
Mounting location of radiator and charge air cooler shall be the Contractor's standard design.

Higher Mounting Design
The lower edge of the radiator and charge air cooler core(s) shall be mounted at a height no less than 3 ft. above street level to minimize core fouling caused by dirt, debris, leaves, etc.

Cooling Fan Controls
The cooling fan shall be temperature controlled, allowing the engine to reach operating temperature quickly.

36. Charge Air Cooling

The charge air cooling system also referred to as after-coolers or inter-coolers shall provide maximum air intake temperature reduction with minimal pressure loss. The charge air radiator shall be sized and positioned to meet engine manufacturer's requirements. The charge air radiator shall not be stacked ahead of or behind the engine radiator and shall be positioned as close to the engine as possible unless integrated with the radiator. Air ducting and fittings shall be protected against heat sources and shall be configured to minimize restrictions and maintain sealing integrity.

37. Transmission Cooling

The transmission shall be cooled by a dedicated heat exchanger sized to maintain operating fluid within the transmission manufacturer's recommended parameters of flow, pressure and temperature. The transmission cooling system shall be matched to retarder and engine cooling systems to ensure that all operating fluids remain within recommended temperature limits established by each component manufacturer. The engine cooling system should provide coolant bypass flow to the transmission cooling system with the engine thermostats closed.

38. Transmission

The transmission shall be multiple speed, automatic shift with torque converter, retarder and electronic controls. Gross input power, gross input torque and rated input speed shall be compatible with the engine. 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 engine 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.

No Automatic Neutral Function

The transmission shall not incorporate an automatic neutral shift function.

39. Retarder

The powertrain shall be equipped with a retarder designed to extend brake lining service life. The application of the retarder shall cause a smooth blending of both retarder and service brake function and shall not activate the brake lights.

Actuation of ABS and/or automatic traction control (ATC) shall override the operation of the brake retarder. Brake lights shall illuminate when the retarder is activated.

Standard Requirement for Retarder Activation

The retarder shall be adjustable within the limits of the powertrain and activated when the brake pedal is depressed. The Agency will work with the OEM/drive system manufacturer to determine retarder performance settings.

Accessible Retarder Disable Switch

The retarder disable switch shall be accessible to the seated driver.

40. Mounting

All power plant 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 power plant so as not to affect performance of belt-driven accessories or cause strain in piping and wiring connections to the power plant.

41. 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. The muffler, exhaust system, air cleaner, air compressor, starter, alternator, radiator, all accessories and any other component requiring service or replacement shall be easily removable and independent of the engine and transmission removal. An engine oil pressure gauge and coolant temperature gauge shall be provided in the engine compartment. These gauges shall be easily read during service and mounted in an area where they shall not be damaged during minor or major repairs.

Engine oil and the radiator filler caps shall be hinged to the filler neck and closed with spring pressure or positive locks to prevent leakage. 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.

No engine bypass oil filter.

Engine Oil Pressure and Coolant Temperature Gauges
Engine oil pressure and coolant temperature gauges required in engine compartment.

Engine Air Cleaner
An air cleaner with a dry filter element and a graduated air filter restriction indicator shall be provided. The location of the air intake system shall be designed to minimize the entry of dust and debris and to maximize the life of the air filter. The engine air duct shall be designed to minimize the entry of water into the air intake system. Drainage provisions shall be included to allow any water/moisture to drain prior to entry into air filter.

42. Hydraulic Systems

Hydraulic system service tasks shall be minimized and scheduled no more frequently than those of other major bus 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.

Hydraulic System Sensors
Sensors in the main hydraulic system, excluding those in the power steering system, shall indicate on the driver's on-board diagnostic panel conditions of low hydraulic fluid level.

43. 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.

44. 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.

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.

45. Charge Air Piping

Charge air piping and fittings shall be designed to minimize air restrictions and leaks. Piping shall be as short as possible, and the number of bends shall be minimized. Bend radii shall be maximized to meet the pressure drop and temperature rise requirements of the engine manufacturer. The cross-section of all charge air piping shall not be less than the cross-section of the intake manifold inlet. Any changes in pipe diameter shall be gradual to ensure a smooth passage of air and to minimize restrictions. Piping shall be routed away from heat sources as practicable and shielded as required to meet the temperature rise requirements of the engine manufacturer. Charge air piping shall be constructed of stainless steel, aluminized steel or anodized aluminum, except between the air filter and turbocharger inlet, where piping may be constructed of fiberglass. Connections between all charge air piping sections shall be sealed with a short section of reinforced hose and secured with stainless steel constant tension clamps that provide a complete 360-degree seal.

46. Radiator

Radiator piping shall be stainless steel or brass tubing, and if practicable, hoses shall be eliminated. Necessary hoses shall be impervious to all bus fluids. All hoses shall be secured with stainless steel clamps that provide a complete 360-degree seal. The clamps shall maintain a constant tension at all times, expanding and contracting with the hose in response to temperature changes and aging of the hose material.

47. 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.

48. Fuel

Diesel

49. Fuel Lines

Fuel lines shall be securely mounted, braced and supported as designed by the bus manufacturer to minimize vibration and chafing and shall be protected against damage, corrosion or breakage due to strain or wear. Manifolds connecting fuel containers shall be designed and fabricated to minimize vibration and shall be installed in protected locations to prevent line or manifold damage from unsecured objects or road debris. Fuel hose and hose connections, where permitted, shall be made from materials resistant to corrosion and fuel and protected from fretting and high heat. Fuel hoses shall be accessible for ease of serviceability.

Fuel Lines, Diesel

Fuel lines shall be capable of carrying the type of fuel specified by the Agency (i.e., up to B20 type fuel).

50. Design and Construction,

Fuel Tank(s)

The fuel tank and fuel tank straps shall be made of corrosion resistant stainless steel. The fuel tank shall be made of sufficiently heavy gauge 300 series or ASTM Spec. A240 stainless steel.

Installation

The 120 Gallon fuel tank shall be securely mounted to the bus to prevent movement during bus maneuvers. The fuel tank shall be equipped with an external, hex head, drain plug. It shall be at least a ⅜-inch size and shall be located at the lowest point of the tank. The fuel tank shall have an inspection plate or easily removable filler neck to permit cleaning and inspection of the tank without removal from the bus. The tank shall be baffled internally to prevent fuel-sloshing noise regardless of fill level. The baffles or fuel pickup location shall assure continuous full power operation on a 6 percent upgrade for 15 minutes starting with no more than 25 gallons of fuel over the unusable amount in the tank. The bus shall operate at idle on a 6 percent downgrade for 30 minutes starting with no more than 10 gallons of fuel over the unusable amount in the tank.

The materials used in mounting shall withstand the adverse effects of road salts, fuel oils, and accumulation of ice and snow for the life of the bus.

Labeling

The capacity, date of manufacture, manufacturer name, location of manufacture, and certification of compliance to Federal Motor Carrier Safety Regulation shall be permanently marked on the fuel tank. The markings shall be readily visible and shall not be covered with an undercoating material.

Fuel Filler

The fuel filler shall be located 7 to 32 feet behind the centerline of the front door on the curbside of the bus. The filler cap shall be retained to prevent loss and shall be recessed into the body so that spilled fuel will not run onto the outside surface of the bus.

The fuel lines forward of the engine bulkhead shall be in conformance to SAE Standards.

The fuel filler shall accommodate a standard fuel nozzle. The nozzle shall automatically shut off when the tank is essentially full. An audible signal shall indicate when the tank is essentially full. The fuel filler cap shall be a screw on cap. The fuel filler cap shall be hinged.

EMMISSIONS AND EXHAUST

51. Exhaust Emissions

The engine and related systems shall meet all applicable emission and engine design guidelines and standards.

52. Exhaust System

Exhaust gases and waste heat shall be discharged from the roadside rear corner of the roof. The exhaust pipe shall be of sufficient height to prevent exhaust gases and waste heat from discoloring or causing heat deformation to the bus. The entire exhaust system shall be adequately shielded to prevent heat damage to any bus component, including the exhaust after-treatment compartment area. The exhaust outlet shall be designed to minimize rain, snow or water generated from high-pressure washing systems from entering into the exhaust pipe and causing damage to the after-treatment.

53. Exhaust After treatment

An exhaust after treatment system will be provided to ensure compliance to all applicable EPA regulations in effect.

Diesel Exhaust Fluid Injection

NOx level requirements specified by EPA, a DEF injection system will be provided. The DEF system will minimally include a tank, an injector, a pump, an ECM and a selective catalytic converter. The tanks shall be designed to store DEF in the operating environment described in the "Operating Environment" section. The DEF fluid lines shall be designed to prevent the DEF from freezing. The DEF injection system shall not be damaged from a cold soak at 10 °F.

54. Particulate After treatment

If required by the engine manufacturer to meet particulate level requirements specified by EPA, a particulate trap will be provided. The particulate trap shall regenerate itself automatically if it senses clogging. Regeneration cycles and conditions will be defined by the engine manufacturer.

STRUCTURE

55. 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. The design operating profile specified by the Agency shall be considered for this purpose.

56. Altoona Testing

Prior to the start of any bus manufacturing or assembly processes, the structure of the proposed bus model shall have undergone appropriate structural testing and/or analysis, including the complete regimen of FTA required Altoona tests. Prior to assembly of the first bus, the OEM shall provide the Agency with a completed report of Altoona testing for the proposed bus model along with a plan of corrective action to address deficiencies, breakdowns and other issues identified during Altoona testing. The bus model tested shall match the bus model proposed for procurement, including structure, axles and drive-train. Base model and partial Altoona test reports are acceptable when the combination of these tests adequately represents the proposed bus model.

57. Structural Validation

Baseline Structural Analysis

The structure of the bus shall have undergone appropriate structural testing and/or analysis. At minimum, appropriate structural testing and analysis shall include Altoona testing or Finite Element Analysis (FEA).

58. 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.

59. 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.

60. Engine Compartment Bulkheads

The passenger and engine compartment shall be separated by fire-resistant bulkheads. The engine compartment shall include areas where the engine and exhaust system 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 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.

61. 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.

62. Corrosion

The bus flooring, sides, roof, understructure and axle suspension components shall be designed to resist corrosion or deterioration from atmospheric conditions and de-icing materials for a period of 12 years or 500,000 miles, whichever comes first. It shall maintain structural integrity and nearly maintain original appearance throughout its service life, with the Agency's use of proper cleaning and neutralizing agents. All materials that are not inherently corrosion resistant shall be protected with corrosion-resistant coatings. 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 two-week (336-hour) salt spray test in accordance with ASTM Procedure B-117.

Corrosion Resistance Requirements for Exposed and Interior Surfaces of Tubing throughout Entire Vehicle

All exposed surfaces and the interior surfaces of tubing and other enclosed members shall be corrosion resistant through application of a corrosion protection system.

Additional Corrosion Resistance Requirements

The vehicle shall be constructed using only inherently corrosion-resistant materials and fasteners such as stainless steel or composites 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.

63. Towing

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. Shop air connectors shall be provided at the front and rear of the bus and shall be capable of supplying all pneumatic systems of the bus with externally sourced compressed air. The location of these shop air connectors shall facilitate towing operations.

Two rear recovery devices/tie downs shall permit lifting and towing of the bus for a short distance, such as in cases of an emergency, to allow access to provisions for front towing of bus. The method of attaching the tow bar or adapter shall require the specific approval of the Agency. Any tow bar or adapter exceeding 50 lbs should have means to maneuver or allow for ease of use and application. Each towing device shall accommodate a crane hook with a 1 in. throat.

64. 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.

Yellow Pads

Jacking pads shall be painted safety yellow.

65. 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.

Floor

66. 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.

Bi-level Floor Design

The floor design shall consist of two levels (bi-level construction). Aft of the rear door extending to the rear settee riser, the floor height may be raised to a height no more than 21 in. above the lower level, with equally spaced steps. An increase slope shall be allowed on the upper level, not to exceed 3.5 degrees off the horizontal.

Floor Drain

A floor drain of noncorrosive materials shall be provided on the bus behind the front, curbside wheelhouse near the wall to help drain any water that may accumulate due to ice, snow, rain, etc. The drain pipe shall be approximately 1½ in. in diameter and shall extend no more than 5 in. below the floor. The drain pipe shall be fitted with a rubber drain spout to minimize or prevent air drafts to the interior of the bus. The strainer shall be firmly retained but also removable to allow flushing of any accumulated debris.

67. Strength

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 bus. 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.

68. 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.

Pressure-Preserved Plywood Panel

Plywood 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 of a thickness adequate to support 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 side up. Plywood shall be pressure-treated with a preservative chemical and process such as alkaline copper quaternary (ACQ) that prevents decay and damage by insects. Preservative treatments shall utilize no EPA-listed hazardous chemicals. The concentration of preservative chemicals shall be equal to or greater than required for an above ground level application. Treated plywood will be certified for preservative penetration and retention by a third party inspection agency. Pressure-preservative treated plywood shall have a moisture content at or below 15 percent.

Platforms

69. Driver's Area

The covering of platform surfaces and risers, except where otherwise indicated, shall be the same material as specified for floor covering. Trim shall be provided along top edges of platforms unless integral nosing is provided.

70. 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

71. Farebox

Farebox placement should minimize impact to passenger access and minimize interference with the driver's line of sight.

Driver Interface Required; Platform Needed to Bring Height to Driver Access

If the driver's platform is higher than 12 in., then the farebox is to be mounted on a platform of suitable height to provide accessibility for the driver without compromising passengers' access.

72. 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.

Wheel Housing

73. 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.

CHASSIS

Suspension

74. General Requirements

The front, 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.

75. Alignment

All axles should be properly aligned so the vehicle tracks accurately within the size and geometry of the vehicle.

Springs and Shock Absorbers

76. Suspension Travel

The suspension system shall permit a minimum wheel travel of 3 in. jounce-upward travel of a wheel when the bus hits a bump (higher than street surface), and 3 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.

77. 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 bus 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.

78. Lubrication

Standard Grease Fittings

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 from a pit or with the bus on a hoist. Each element requiring

lubrication shall have its own grease fitting with a relief path. 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.

79. Kneeling

A kneeling system shall lower the entrance(s) of the bus a minimum of 2.5 in. during loading or unloading operations regardless of load up to GVWR, measured at the longitudinal centerline of the entrance door(s) by the driver. The kneeling control shall provide the following functions:

- Downward control must be held to allow downward kneeling movement.
- Release of the control during downward movement must completely stop the lowering motion and hold the height of the bus at that position.
- Upward control actuation must allow the bus to return to normal floor height without the driver having to hold the control.

The brake and throttle interlock shall prevent movement when the bus is kneeled. The kneeling control shall be disabled when the bus is in motion. The bus shall kneel at a maximum rate of 1.25 in. per second at essentially a constant rate. After kneeling, the bus shall rise within 3 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. During the lowering and raising operation, the maximum vertical acceleration shall not exceed 0.2g, and the jerk shall not exceed 0.3g/second.

An indicator visible to the driver shall be 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 kneeler to alert passengers and bystanders. A warning light mounted near the curbside of the front door, a minimum 2.5 in. diameter amber lens, shall be provided that will blink when the kneel feature is activated. Kneeling shall not be operational while the wheelchair ramp is deployed or in operation.

Wheels and Tires

80. Wheels

Alcoa Dura bright aluminum wheels shall be interchangeable and 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.

81. Tires

Firestone 315-80-22.5.tires shall be suitable for the conditions of transit service and sustained operation at the maximum speed capability of the bus. Load on any tire at GVWR shall not exceed the tire Supplier's rating.

82. Steering

Hydraulically assisted steering shall be provided. The steering gear shall be an integral type with the number and length of flexible lines minimized or eliminated. Engine driven hydraulic pump shall be provided for power steering.

83. Steering Axle

Oiled-Type Front Bearings

The front axle shall be non-driving with a load rating sufficient for the bus loaded to GVWR and shall be equipped with sealed, oiled-type front wheel bearings.

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.

The steering geometry of the outside (frontlock) wheel shall be within 2 degrees of true Ackerman up to 50 percent lock measured at the inside (backlock) wheel. The steering geometry shall be within 3 degrees of true Ackerman for the remaining 100 percent lock measured at the inside (backlock) wheel.

Wheel

84. 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.

85. Steering Wheel, General

The steering wheel diameter shall be approximately 18-20 in.; the rim diameter shall be ⅞ in. to 1¼ 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.

86. 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.

87. 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.

Drive Axle

The bus shall be driven by a heavy-duty axle with a load rating sufficient for the bus loaded to GVWR. The

drive axle shall have a design life to operate for not less than 300,000 miles on the design operating profile without replacement or major repairs. The lubricant drain plug shall be magnetic type. If a planetary gear design is employed, the oil level in the planetary gears shall be easily checked through the plug or sight gauge. The axle and driveshaft components shall be rated for both propulsion and retardation modes with respect to duty cycle.

The drive shaft shall be guarded to prevent hitting any critical systems, including brake lines, bus floor or the ground, in the event of a tube or universal joint failure.

Turning Radius

The 30 ft. bus shall have a 31 ft. maximum turning radius overall.

The 35 ft. bus shall have a 39 ft. maximum turning radius overall.

The 40 ft. bus shall have a 44 ft. maximum turning radius overall.

Brakes

88. Service Brake

Air-Actuated Brakes

Service brakes shall be controlled and actuated by a compressed air system. Force to activate the brake pedal control shall be an essentially linear function of the bus deceleration rate and shall not exceed 70 lbs at a point 7 in. above the heel point of the pedal to achieve maximum braking. The heel point is the location of the driver's heel when his or her foot is rested flat on the pedal and the heel is touching the floor or heel pad of the pedal. The ECU for the ABS system shall be protected, yet in an accessible location to allow for ease of service. The total braking effort shall be distributed between all wheels in such a ratio as to ensure equal friction material wear rate at all wheel locations. Manufacturer shall demonstrate compliance by providing a copy of a thermodynamic brake balance test upon request.

Automatic Traction Control

Microprocessor controlled automatic traction control (ATC) shall be provided.

89. Friction Material

The brake linings shall be made of non-asbestos material. In order to aid maintenance personnel in determining extent of wear, a provision such as a scribe line or chamfer indicating the thickness at which replacement becomes necessary shall be provided on each brake lining. The complete brake lining wear indicator shall be clearly visible from the hoist or pit without removing backing plates.

90. Hubs and Drums

Replaceable wheel bearing seals shall run on replaceable wear surfaces or be of an integral wear surface sealed design. Wheel bearing and hub seals and unitized hub assemblies shall not leak or weep lubricant when operating on the design operating profile for the duration of the initial manufacturer's warranty.

Drum Brakes

The bus shall be equipped with brake drums. Brake drums shall allow machining for oversized linings per manufacturers 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.

91. Parking/Emergency Brake

Air Brakes

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.

Interlocks

92. Passenger Door Interlocks

To prevent opening mid and rear passenger doors while the bus is in motion, a speed sensor shall be integrated with the door controls to prevent the mid/rear doors from being enabled or opened unless the bus speed is less than 2 mph.

To preclude movement of the bus, an accelerator interlock shall lock the accelerator in the closed position, and a brake interlock shall engage the service brake system to stop movement of the bus when the driver's door control is moved to a mid/rear door enable or open position, or a mid or rear door panel is opened more than 3 in. from the fully closed position (as measured at the leading edge of the door panel). The interlock engagement shall bring the bus to a smooth stop and shall be capable of holding a fully loaded bus on a 6 percent grade, with the engine at idle and the transmission in gear, until the interlocks are released. These interlock functions shall be active whenever the vehicle Master Run Switch is in any run position.

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 and unsecured condition, unless the door master switch has been actuated to intentionally release the interlocks.

Requiring Accelerator Interlock Whenever Front Doors Are Open

An accelerator interlock shall lock the accelerator in the closed position, and a brake interlock shall engage the service brake system to stop movement of the bus whenever doors are open.

Pneumatic System

93. 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. Provision shall be made to apply shop air to the bus air systems. A quick disconnect fitting shall be easily accessible and located in the engine compartment and near the front bumper area for towing. Retained caps shall be installed to protect fitting against dirt and moisture when not in use. Air for the compressor shall be filtered. The air system shall be protected per FMVSS 121.

94. Air Compressor

The engine-driven air compressor shall be sized to charge the air system from 40 psi to the governor cut-off pressure in less than 4 minutes while not exceeding the fast idle speed setting of the engine.

95. 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 power plant 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. 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.

96. 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.

97. 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.

The air system shall be equipped with a heated air dryer located before the no. 1 air tank and as far from the compressor as possible to allow air to cool prior to entering the air dryer.

ELECTRICAL, ELECTRONIC AND DATA COMMUNICATION SYSTEMS

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:

1. **Drivetrain level:** Components related to the drivetrain including the propulsion system components (engine, transmission and hybrid units), and anti-lock braking system (ABS), which may include traction control.
2. **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.
3. **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.

98. 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.

99. 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.

100. 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.

General Electrical Requirements

Batteries

101. Low-Voltage Batteries (24V)

Two 8D Battery Units

Two 8D battery units conforming to SAE Standard J537 shall be provided. Each battery shall have a minimum of 1150 cold cranking amps. Each battery shall have a purchase date no more than 120 days from the date of release, and shall be fully maintained prior to shipment to the Agency. The battery compartment must be well-ventilated to prevent hydrogen buildup while protecting the compartment from road spray, water intrusion and de-icing chemicals.

Different Size Terminal Ends

Positive and negative terminal ends shall be different sizes.

102. 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.
2100 strand 4/0 cable or greater recommended.

103. Jump Start

Jump-Start Connector

A jump-start connector, red for 24V, shall be provided in the engine compartment, equipped with dust cap and adequately protected from moisture, dirt and debris.

A jump-start connector is located next to the battery disconnect switch.

104. Battery Compartment

The battery compartment shall prevent accumulation of snow, ice and debris on top of the batteries and shall be vented and self-draining. 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 or equivalent 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 and filled. 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.

105. 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.

106. 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 shut off the engine and shall not damage any component of the electrical system. The master switch shall be capable of carrying and interrupting the total circuit load.

Single Switch

The batteries shall be equipped with a single switch for disconnecting both 12V and 24V power.

107. 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.

108. Circuit Protection

All branch circuits, except battery-to-starting motor and battery-to-generator/alternator circuits, shall be protected by current-limiting devices such as circuit breakers, fuses or solid state devices sized to the requirements of the circuit. Electronic circuit protection for the cranking motor shall be provided to prevent engaging of the motor for more than 30 seconds at a time to prevent overheating. 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 Agency shall consider the application of automatic reset circuit breakers on a case-by-case basis. 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.

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.

109. 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.

110. Low Voltage/Low Current Wiring and Terminals

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 grouped, numbered and/or 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.

All wiring harnesses over 5 ft long and containing at least five wires shall include 10 percent (minimum one wire) excess wires for spares. This requirement for spare wires does not apply to data links and communication

cables. Wiring harness length shall allow end terminals to be replaced twice without pulling, stretching or replacing the wire. Terminals shall be crimped to the wiring according to the connector manufacturer's recommendations for techniques and tools. All cable connectors shall be locking type, keyed and sealed, unless enclosed in watertight cabinets or vehicle interior. Pins shall be removable, crimp contact type, of the correct size and rating for the wire being terminated. Unused pin positions shall be sealed with sealing plugs. Adjacent connectors shall either use different inserts or different insert orientations to prevent incorrect connections. Terminals shall be crimped, corrosion-resistant and full ring type or interlocking lugs with insulating ferrules. When using pressure type screw terminal strips, only stranded wire shall be used. Insulation clearance shall ensure that wires have a minimum of "visible clearance" and a maximum of two times the conductor diameter or 1/16 in., whichever is less. When using shielded or coaxial cable, upon stripping of the insulation, the metallic braid shall be free from frayed strands that can penetrate the insulation of the inner wires.

Ultra-sonic and T-splices may be used with 7 AWG or smaller wire. When a T-splice is used, it shall meet these additional requirements:

1. It shall include a mechanical clamp in addition to solder on the splice.
2. The wire shall support no mechanical load in the area of the splice.
3. The wire shall be supported to prevent flexing.

All splicing shall be staggered in the harness so that no two splices are positioned in the same location within the harness.

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.

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.

111. 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.

112. Electrical Compartments

All relays, controllers, flashers, circuit breakers and other electrical components shall be mounted in easily accessible electrical compartments. All compartments exposed to the outside environment shall be corrosion-resistant and sealed. The components and their functions in each electrical compartment 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 driver's seat, vestibule or from the outside.

"Rear start and run" controls shall be mounted in an accessible location in the engine compartment and shall be protected from the environment.

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.

113. Wiring and Terminals

Kinking, grounding at multiple points, stretching and reducing the bend radius below the manufacturer's recommended minimum shall not be permitted.

114. 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.

115. 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.

116. 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.

117. 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.

118. 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.

Multiplexing

119. 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. 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.

120. 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.

121. 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.

Data Communications

122. 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 the Agency with the following minimum information:

1. 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).
2. Data definition requirements that ensure access to diagnostic information and performance characteristics.
3. The capability and procedures for uploading new application or configuration data.
4. Access to revision levels of data, application software and firmware.

5. The capability and procedures for uploading new firmware or application software.
6. 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.

123. 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.

124. 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.

125. Programmability (Software)

The drivetrain level components shall be programmable by the Agency with limitations as specified by the sub-system Supplier.

Multiplex Level

126. 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 the Agency. The communication port(s) shall be located as specified by the Agency.

127. 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.

128. 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:

1. Password protection
2. Limited distribution of the configuration software
3. Limited access to the programming tools required to change the software
4. 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:

1. Hardware component identification where labels are included on all multiplex hardware to identify components
2. Hardware series identification where all multiplex hardware displays the current hardware serial number and firmware revision employed by the module
3. Software revision identification where all copies of the software in service displays the most recent revision number
4. A method of determining which version of the software is currently in use in the multiplex system

129. 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 buses 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

Driver's Area Controls

130. 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."

131. 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.

132. Visors/Sun Shades

Front and Side Sun Shade/Visor

Adjustable sun visor(s) shall be provided for the driver's windshield and the driver's side window. Visors shall be shaped to minimize light leakage between the visor and windshield pillars. Visors shall store out of the way and shall not obstruct airflow from the climate control system or interfere with other equipment, such as the radio handset or the destination control. Deployment of the visors shall not restrict vision of the rearview mirrors. Visor adjustments shall be made easily by hand with positive locking and releasing devices and shall not be subject to damage by over-tightening. Sun visor construction and materials shall be strong enough to resist breakage during adjustments. Visors may be transparent, but shall not allow a visible light transmittance in excess of 10 percent. Visors, when deployed, shall be effective in the driver's field of view at angles more than 5 degrees above the horizontal.

133. 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.

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 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. The intent of the overall physical layout of the indicators shall be in a logical grouping of systems and severity nature of the fault.

TABLE 4
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	
Engine start, front	Approved momentary switch	Side console	Activates engine starter motor	
Engine start, rear	Approved momentary switch	Engine compartment	Activates engine starter motor	
Engine run, rear	Three-position toggle switch	Engine compartment	Permits running engine from rear start, normal front run position and off	Amber light
Drive selector	Touch panel switch	Side console	Provides selection of propulsion: forward, reverse and neutral	Gear selection
Engine Test	Two position toggle switch	Dash right wing	Permits engine diagnostics from the driver's location.	
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	
Fast idle	Two-position switch	Side console	Selects high idle speed of engine	
WC ramp/ kneel enable	Two-position switch	Side console or Dash right wing	Permits operation of ramp and kneel operations	Amber light
Front door ramp	Three-position momentary switch	Right side of steering wheel	Permits deploy and stow of front ramp	Red light
Front kneel	Three-position momentary operation protection switch	Dash right wing	Permits kneeling activation and raise and normal at front door remote location	Amber or red dash indicator. Ext alarm and Amber light
Silent alarm	Recessed push button, NO and NC contacts momentary	Side console	Activates 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

TABLE 4
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
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
Engine shutdown override	Momentary switch with operation protection		Permits driver to override auto engine shutdown	
Hazard flashers	Two-position switch	Side console or Dash right wing	Activates emergency flashers	Two green lights and audible indicator
Destination sign interface	Destination sign interface panel	in approved location	Facilitates driver interaction with destination sign system, manual entry	LCD display
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
High beam	Detented push button	Left foot panel	Permits driver to toggle between low and high beam	Blue light
PA manual	Momentary push button	Left foot panel	Permits driver to manually activate public address microphone	
PA	Three-position switch	Side console	Speaker selection for Interior speakers, exterior speaker, and both	
PA	Variable position	Side console	Volume control	
Parking brake	Pneumatic PPV	Side console or Dash left wing	Permits driver to apply and release parking brake	Red light
Door Air	Two-position switch	Side console	Releases air to the front passengers door	
Exterior Light Test	Two-position switch	Approved location	Permits driver to test all exterior lights	
Remote engine speed	Rotary rheostat	Engine compartment	Permits technician to raise and lower engine RPM from engine compartment	
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

TABLE 4
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Retarder disable	Multi-pole operation protection switch detented	Within reach of Operator or approved location	Permits driver override to disable brake retardation/regeneration	Red light
Alarm acknowledge	Push button momentary	Approved location	Permits driver to acknowledge alarm condition	
Indicator/ alarm test button	Momentary switch or programming[1]	Dash center panel	Permits driver to activate test of sentry, indicators and audible alarms	All visuals and audibles
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	Bus 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
Active regeneration	Detects Status	Dash center	Indication of electric regeneration	Amber or red light
Engine 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
Hot engine indicator	Coolant temperature indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects hot engine condition and initiates time delay shutdown	Red light
Low engine oil pressure indicator	Engine oil pressure indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects low engine oil pressure condition and initiates time-delayed shutdown	Red 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
Fuel tank level	Analog gauge, graduated based on fuel type	Dash center	Indication of fuel tank level/pressure	

TABLE 4
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
DEF gauge	Level Indicator	Center dash	Displays level of DEF tank and indicates with warning light when low	Red light
Pleasure Radio	Variable position	Side console	Remote volume control	
Pleasure Radio	Three-position switch	Side console	Remote speaker selection, Driver's speaker, passenger speakers, or both	
Driver's booster fan	Three-position switch	Dash left wing	Permits booster: fan off, low, or high	
Driver's Auxiliary fan	Three-position switch	Dash right wing	Permits Auxiliary dash: fan off, low, or high	

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.

134. 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.

135. 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.

1 to 2 in. Between Brake and Accelerator Pedals

The accelerator and brake pedals shall be positioned such that the spacing between them, measured at the heel of the pedals, is between 1 and 2 in. Both pedals should be located approximately on the same plane coincident to the surface of the pedals.

Brake and Accelerator Pedals

Brake Pedal

Non-adjustable brake pedal.

136. Driver Foot Switches

Floor-Mounted Foot Control Platform

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.

Turn Signal Controls
Turn signal controls shall be floor-mounted, foot-controlled, water-resistant, heavy-duty, momentary contact switches.

Foot Switch Control
The control switches for the turn signals 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 other signals, including high beam and public address system shall be in approved location.

The foot switches shall be UL-listed, heavy-duty type, of a rugged, corrosion-resistant metal construction. The foot switches for the directionals 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.

Driver's Amenities

137. Coat Hanger

Coat Hook
A hook and loop shall be provided to secure the driver's coat.

138. Drink Holder

Drink Holder
A device shall be provided to securely hold the driver's drink container, which may vary widely in diameter. It must be mounted within easy reach of the driver and must have sufficient vertical clearance for easy removal of the container. When the container is in the device, the driver's view of the road must not be obstructed, and leakage from the container must not fall on any switches, gauges or controls.

139. Storage Box

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.

Windshield Wipers and Washers

140. Windshield Wipers

The bus shall be equipped with a windshield wiper for each half of the windshield. At 70 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. 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.

Single-control, electric two-speed intermittent wiper.

141. Windshield Washers

The 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.

Driver's Seat

Recaro Ergo Metro Air operated driver's seat

142. 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.

143. 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.

144. Seat Pan Cushion Height

Dimensions

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.

145. 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).

146. 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.). On all low-floor buses, the seat-base shall travel horizontally a minimum of 9 in. It shall adjust no closer to the heel point than 6 in. On all high-floor buses, the seat base shall travel a minimum of 9 in. and adjust no closer to the heel-point than 6 in.

147. 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.

148. Seat Suspension

The driver's seat shall be appropriately dampened to support a minimum weight of 380 lbs. The suspension shall be capable of dampening adjustment in both directions.

Rubber snubbers shall be provided to prevent metal-to-metal contact.

149. 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.

150. Headrests

No Adjustable headrest required.

151. 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.

152. 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.

Seat Belt
The lap seat belt webbing shall be black in color. assembly should be an auto-locking retractor (ALR). Seat belt should be stored in automatic retractors. The belt shall be mounted to the seat frame so that the driver may adjust the seat without resetting the seat belt. The seat and seat belt assemblies as installed in the bus shall withstand static horizontal forces as required in FMVSS 207 and 210. All seatbelt assemblies shall come equipped with a warning switch device to remind operators to buckle up.

Lap Belt Length

72 in. with Extension
The lap belt assembly shall be 72 in. in length with an 8-in. extension.

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.

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.

Cushion Materials

Foam and fabric that meets (FMVSS 302).

Pedestal

Powder-coated steel.

Mirrors

153. Exterior Mirrors

The bus shall be equipped with a corrosion-resistant, outside rearview mirrors mounted with stable supports to minimize vibration. Mirrors shall be firmly attached to the bus to minimize vibration and to prevent loss of adjustment with a breakaway mounting system. Mirrors shall permit the driver to view the roadway along the sides of the bus, including the rear wheels. Mirrors should be positioned to prevent blind spots.

Spring loaded mirror heads auto return. Combination of flat and convex mirrors referred to as transit-specific.

Curbside Mirrors

The curbside rearview mirror shall be mounted so that its lower edge is no less than 76 in. above the street surface. A lower mount may be required due to requested mirror configuration requests.

Remote Adjustment of Curbside Mirror

The driver shall be able to adjust the curbside mirror remotely while seated in the driving position. The control for remote positioning of the mirror shall be a single switch or device.

Heated and Remote Mirrors

The heaters shall be energized whenever the driver's heater and/or defroster is activated or activated independently.

Street-Side Mirrors

Remote Adjustment of Curbside Mirror

The driver shall be able to adjust the street-side mirror remotely while seated in the driving position. The control for remote positioning of the mirror shall be a single switch or device.

Heated Street-Side Mirrors

The street-side mirrors shall have heaters that energize whenever the driver's heater and/or defroster is activated, or can be activated independently.

154. Interior Mirrors

Mirrors shall be provided for the driver to observe passengers throughout the bus without leaving the seat and without shoulder movement. The driver shall be able to observe passengers in the front/entrance and rear/exit areas, anywhere in the aisle, and in the rear seats.

General

A minimum of 8000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

155. Windshield

The 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.

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.

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.

Shaded Band

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.

The windshield shall be a two-piece windshield.

156. Driver's Side Window

Standard Driver's Side Window, Traditional Frame, Full slider.

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 glazing material shall have a single-density tint.

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's side window glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming with the requirements of ANSI Z26.1-1996 Test Grouping 2 and the Recommended Practices defined in SAE J673.

The design shall prevent sections from freezing closed in the winter. Light transmittance shall be 75 percent on

the glass area below 53 in. from the operator platform floor. On the top fixed over bottom slider configuration, the top fixed area above 53 in. may have a maximum 5 percent light transmittance.

Side Windows

157. Traditional Frame 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.

158. Emergency Exit (Egress) Configuration

Minimum Egress

All side windows shall be fixed in position, except as necessary to meet the emergency escape requirements. Emergency Exit lighting all Emergency escape locations shall be designated with a small red LED light illuminated when the bus is in the run position.

159. Configuration

Operable Windows with Inward-Opening Transom Panels (Fixed Bottom, Tip-In Top)

Each operable side window shall incorporate an upper transom portion. The transom shall be between 25 and 35 percent of the total window area. The lower portion of the window shall be fixed. The transom portion shall be hinged along the lower edge and open inward.

160. Materials

Safety Glass Glazing Panels

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness laminated safety glass. The material shall conform to the requirements of ANSI Z26.1-1996 Test Grouping 2 and the Recommended Practices defined in SAE J673.

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. Luminous transmittance shall be measured by ASTM D-1003. Windows over the destination signs shall not be tinted.

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.

HEATING, VENTILATING AND AIR CONDITIONING

161. Capacity and Performance

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 shall be rear-mounted. Thermo King Intelligaire III.

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.

Capacity and Performance Requirements

The air-conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 110 to 90 °F in less than 20 minutes after engine start-up. 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, which 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. The appropriate solar load as recommended in the APTA "Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System," representing 4 p.m. on August 21, shall be used. There shall be no passengers on board, and the doors and windows shall be closed.

R134a

The air conditioning system shall meet these performance requirements using R134a

162. 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 engine 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.

Manual Mode Selection of Climate Control System

After manual selection and/or activation of climate control system operation mode, all interior climate control system requirements for the selected mode shall be attained automatically to within ±2 °F of specified temperature control set-point.

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 ± 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 ± 5 °F will be allowed for limited, localized areas provided the majority of the measured temperatures fall within the specified requirement.

Air Flow

163. 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.

164. 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.

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:

1. 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.
2. A manually operated control valve shall control the coolant flow through the heater core.
3. 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.

165. 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:

1. 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.
2. 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.

166. Driver's Cooling

Air from the buses evaporator shall be provided to the driver's area through vents located in the driver's area. With a separate driver's booster blower.

167. 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 arrestance, and a minimum dust holding capacity of 120 g per 1000 cfm cell. Air filters shall be easily removable for service.

Cleanable Filters

Air filters shall be cleanable.

168. Roof Ventilators

Two 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.

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.

169. 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.

170. Entrance/Exit area heating

Entrance/Exit Area Heating

Heat shall be supplied to the entrance and exit areas to maintain a tread surface temperature no less than 35 °F in an ambient of -10 °F to prevent accumulation of snow, ice or slush with the bus operating under design operating profile and corresponding door opening cycle.

171. Floor-Level Heating

Forced-Air Floor-Level Heating

Sufficient floor-level heaters shall be provided to evenly supply heated forced air through floor ducts across the length of bus. Floor ducts may be discontinued at the upper level, but additional provisions to prevent cold floors and ensure temperature uniformity shall be included. Control of the floor-level heating shall be through the main heating system electronic control.

EXTERIOR PANELS, FINISHES AND EXTERIOR LIGHTING

172. 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.

173. 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. Detailing shall be kept simple, and add-on devices and trim shall be minimized and integrated into the basic design.

174. Pedestrian Safety

Exterior protrusions along the side and front of the bus greater than ½ in. and within 80 in. of the ground shall

have a radius no less than the amount of the protrusion. The exterior rearview mirrors, cameras and required lights and reflectors are exempt from the protrusion requirement. Advertising frames shall protrude no more than ⅞ in. from the body surface. Grilles, doors, bumpers and other features on the sides and rear of the bus shall be designed to minimize toeholds or handholds.

Exterior protrusions shall not cause a line-of-sight blockage for the driver.

Repair and Replacement

175. Side Body Panels

Structural elements supporting exterior body panels shall allow side body panels below the windows to be repaired in lengths not greater than 12.5 ft.

Easily Replaceable Lower Side Body Panels

The lower section of the side body panels or skirt panels shall be easily and quickly replaceable.

176. Rain Gutters

Rain gutters shall be provided to prevent water flowing from the roof onto the passenger doors and driver's side window. When the bus is decelerated, the gutters shall not drain onto the windshield, driver's side window or door boarding area. Cross-sections of the gutters shall be adequate for proper operation.

177. License Plate Provisions

Provisions shall be made to mount standard-size U.S./Canada license plates per SAE J686 on the front and rear of the bus. These provisions shall direct-mount or recess the license plates so that they can be cleaned by automatic bus-washing equipment without being caught by the brushes. The rear license plate provision shall be illuminated per SAE J587.

178. Fender Skirts

Features to minimize water spray from the bus in wet conditions shall be included in wheel housing design. Any fender skirts shall be easily replaceable. They shall be flexible if they extend beyond the allowable body width. Wheels and tires shall be removable with the fender skirts in place.

179. Splash Aprons

Standard Splash Aprons

Splash aprons, composed of ¼ in. minimum composition or rubberized fabric, shall be installed behind and/or in front of wheels as needed to reduce road splash and protect underfloor components. The splash aprons shall extend downward to within 6 in. off the road surface at static conditions. Apron widths shall be no less than tire widths. Splash aprons shall be bolted to the bus understructure. Splash aprons and their attachments shall be inherently weaker than the structure to which they are attached. The flexible portions of the splash aprons shall not be included in the road clearance measurements. Splash apron shall be installed as necessary to protect the wheelchair loading device from road splash. Other splash aprons shall be installed where necessary to protect bus equipment.

Service Compartments and Access Doors

180. Access Doors

Conventional or pantograph 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 lubricant 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 maintain mechanical integrity and function under normal operations throughout the service 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 prevented from coming loose or opening during transit service or in bus washing operations. All access doors shall be retained in the open position by props or counterbalancing with over-center or gas-filled springs with safety props and shall be easily operable by one person. Springs and hinges shall be corrosion resistant. 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.

181. Access Door Latch/Locks

Requirement for Latches on Access Doors

Access doors larger than 100 sq in. in area shall be equipped with corrosion-resistant flush-mounted latches or locks except for coolant and fuel fill access doors. All such access doors that require a tool to open shall be standardized throughout the vehicle and will require a nominal 5/16 in. square male tool to open or lock.

Bumpers

182. Location

Bumpers shall provide impact protection for the front and rear of the bus with the top of the bumper being 28in., ± 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.

183. Front Bumper

No part of the bus, including the bumper, shall be damaged as a result of a 5 mph impact of the bus at curb weight with a fixed, flat barrier perpendicular to the bus's longitudinal centerline. The bumper shall return to its pre-impact shape within 10 minutes of the impact. The bumper shall protect the bus from damage as a result of 6.5 mph impacts at any point by the common carriage with contoured impact surface defined in Figure 2 of FMVSS 301 loaded to 4000 lbs parallel to the longitudinal centerline of the bus. It shall protect the bus from damage as a result of 5.5 mph impacts into the corners at a 30-degree angle to the longitudinal centerline of the bus. The energy absorption system of the bumper shall be independent of every power system of the bus and shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

The front bumper shall have mounting provisions for integrated bike rack.

184. Rear Bumper

No part of the bus, including the bumper, shall be damaged as a result of a 2 mph impact with a fixed, flat barrier perpendicular to the longitudinal centerline of the bus. The bumper shall return to its pre-impact shape within 10 minutes of the impact. When using a yard tug with a smooth, flat plate bumper 2 ft wide contacting the horizontal centerline of the rear bumper, the bumper shall provide protection at speeds up to 5 mph, over pavement discontinuities up to 1 in. high, and at accelerations up to 2 mph/sec. The rear bumper shall protect

the bus, when impacted anywhere along its width by the common carriage with contoured impact surface defined in Figure 2 of FMVSS 301 loaded to 4000 lbs, at 4 mph parallel to or up to a 30-degree angle to, the longitudinal centerline of the bus. The rear bumper shall be shaped to preclude unauthorized riders standing on the bumper. The bumper shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

185. 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.

Finish and Color

186. 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:

1. Blisters or bubbles appearing in the topcoat film
2. Chips, scratches, or gouges of the surface finish
3. Cracks in the paint film
4. Craters where paint failed to cover due to surface contamination
5. Overspray
6. Peeling
7. Runs or sags from excessive flow and failure to adhere uniformly to the surface
8. Chemical stains and water spots
9. Dry patch due to incorrect mixing of paint activators
10. 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. Standard Contractor exterior paint finish quality.

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 appliqués. 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.

187. 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.

188. Exterior Lighting

Exterior lighting and reflectors shall comply, as applicable, with Part 393, Subpart B of the FMCSA and FMVSS 108.

All exterior lights shall be designed to prevent entry and accumulation of moisture or dust. Commercially available LED-type lamps shall be utilized at all exterior lamp locations except headlights. 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.

Standard Lamps

All LED lamps shall be standard installation of the OEM. The entire assembly shall be specifically coated to protect the light from chemical and abrasion degradation.

Standard Size

Size of LED lamps used for tail, brake and turn signal lamps shall be standard installation of OEM.

189. Backup Light/Alarm

Visible and audible warnings 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.

190. Doorway Lighting

Lamps at the front and rear passenger doorways shall comply with ADA requirements and shall activate only when the doors open. These lamps shall illuminate the street surface to a level of no less than 1 foot-candle for a distance of 3 ft outward from the outboard edge of the door threshold. The lights may be positioned above or below the lower daylight opening of the windows and shall be shielded to protect passengers' eyes from glare.

191. 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.

Wraparound Front Turn Signals

Front turn signals shall be of wrap-around design or shall be designed to be visible from the front and the near side of the bus.

192. Headlights

Roved headlamps shall be designed for replacement without removing the headlamp bezel.

Daytime Running Lights
Headlamps shall incorporate a daytime running light feature.

LED/Halogen
Headlamps shall be LED/halogen, sealed beam.

193. Brake Lights

Brake lights shall be provided in accordance with FMVSS 108 and Part 393, Subpart B of the FMCSA as applicable.

High and Center Mount Red Brake Lamp
Bus shall include standard size 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.

194. Service Area Lighting

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

195. 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. Trim and attachment details shall be kept simple and unobtrusive. Interior trim shall be secured to avoid resonant vibrations under normal operational conditions.
Interior surfaces more than 10 in. 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. Any components and other electrical components within close proximity to these surfaces shall also be resistant to this cleaning method.

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. Interior panel required to meet FMVSS 302.

196. Driver Area Barrier

A barrier or bulkhead between the driver and the street-side front passenger seat shall be provided. The barrier shall minimize glare and reflections in the windshield directly in front of the barrier from interior lighting during night operation. Location and shape must permit full seat travel and reclining possibilities that can accommodate the shoulders of a 95th-percentile male. The partition shall have a side return and stanchion to prevent passenger from reaching the driver by standing behind the driver's seat. The lower area between the seat and panel must be accessible to the driver. The partition must be strong enough in conjunction with entire partition assembly for mounting of such equipment as flare kits, fire extinguishers (1.2 kg), microcomputer, public address amplifier, etc. Dark or black panels are preferred behind the driver's head. The panel should be isolated for noise control and attached with rubber grommets.

Wheel-Well-to-Ceiling Configuration of Driver's Barrier

The driver's barrier shall extend from the top of the wheel well to the ceiling the level of the seated driver and shall fit close to the bus side windows and wall to prevent passengers from reaching the driver or the driver's personal effects.

197. Modesty Panels

Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior shall be provided to act as both a physical and visual barrier for seated passengers.

Design and installation of modesty panels located in front of forward-facing seats shall include a handhold or grab handle 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 from at least the window opening of the side windows, and those forward of transverse seats shall extend downward to 1 and 1½ in. 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 2½ in. clearance between the modesty panel and a fully open, inward opening door, or the path of a deploying flip-out ramp to protect passengers from being pinched. Modesty panels installed at doorways shall be equipped with grab rails if passengers assist are not provided by other means.

The modesty panel and its mounting shall withstand a static force of 250 lbs applied to a 4 × 4 in. area in the center of the panel without permanent visible deformation.

198. Front End

The entire front end of the bus shall be sealed to prevent debris accumulation behind the dash and to prevent the driver's feet from kicking or fouling wiring and other equipment. The front end shall be free of protrusions that are hazardous to passengers standing at the front of the standee line area of the bus during rapid decelerations. Paneling across the front of the bus and any trim around the driver's compartment shall be formed metal or composite material. Composite dash panels shall be reinforced as necessary, vandal-resistant and replaceable. All colored, painted and plated parts forward of the driver's barrier shall be finished with a surface that reduces glare. Any mounted equipment must have provision to support the weight of equipment.

199. Rear Bulkhead

The rear bulkhead and rear interior surfaces shall be material suitable for exterior skin; painted and finished to exterior quality; or paneled with melamine-type material, composite, scratch-resistant plastic or carpeting and trimmed with stainless steel, aluminum or composite.

The rear bulkhead paneling shall be contoured to fit the ceiling, side walls and seat backs so that any litter or

trash will tend to fall to the floor or seating surface when the bus is on a level surface. Any air vents in this area shall be louvered to reduce airflow noise and to reduce the probability of trash or liter being thrown or drawn through the grille. If it is necessary to remove the panel to service components located on the rear bulkhead, the panel shall be hinged or shall be able to be easily removed and replaced. Grilles where access to or adjustment of equipment is required shall be heavy-duty and designed to minimize damage and limit unauthorized access.

200. Headlining

Ceiling panels shall be made of durable, corrosion resistant, easily cleanable material. 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.

201. 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.

202. 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.

All insulation materials shall comply with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated October 20, 1993.

203. Floor Covering

The floor covering shall have a non-skid walking surface that remains effective in all weather conditions. 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 standee line shall be approximately 2 in. wide and shall extend across the bus aisle. The color and pattern shall be consistent throughout the floor covering.

The floor shall be easily cleaned and shall be arranged to minimize debris accumulation.

A one-piece center strip shall extend from the vertical wall of the rear settee between the aisle sides of transverse seats to the standee line. If the floor is of a bi-level construction, then the center strip shall be one piece at each level. The covering between the center strip and the wheel housings may be separate pieces. At the

rear door, however, a separate strip as wide as the door shall extend from the center strip to the outboard edge of the rear/exit area.

The floor under the seats shall be covered with smooth surface flooring material. The floor covering shall closely fit the sidewall in a fully sealed butt joint or extend to the top of the cove.

204. 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 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.

205. Passenger

Automatically Dimming First Row Lights

The first light on each side (behind the driver and the front door) is normally turned on only when the front door is opened, in "night run" and "night park." As soon as the door closes, these lights shall go out. These lights shall be turned on at any time if the toggle switch is in the "on" position.

All interior lighting shall be turned off whenever the transmission selector is in reverse and the engine run switch is in the "on" position.

The interior lighting design shall require the approval of the Agency.

All lights shall be LED lights.

206. 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 5 to 10 foot-candles.

207. 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.

208. 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.

209. Step Lighting

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 low-profile to minimize tripping and snagging hazards for passengers and shall be shielded as necessary to protect passengers' eyes from glare.

210. Ramp Lighting

Exterior and interior ramp lighting shall comply with CFR Part 49, Sections 19.29 and 19.31.

211. Farebox Lighting

Farebox Light

A 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.

Fare Collection

Space and structural provisions shall be made for installation of currently available fare collection devices and shall be as far forward as practicable. Location of the fare collection device shall not restrict traffic in the vestibule, including wheelchairs if a front door loading device is used, and shall allow the driver to easily reach the farebox controls and to view the fare register. The fare box shall not restrict access to the driver area, shall not restrict operation of driver controls and shall not — either by itself or in combination with stanchions, transfer mounting, cutting and punching equipment, or route destination signs — restrict the driver's field of view per SAE Recommended Practice J1050. The location and mounting of the fare collection device shall allow use, without restriction, by passengers. The fare box location shall permit accessibility to the vault for easy manual removal or attachment of suction devices. Meters and counters on the fare box shall be readable on a daily basis. The floor under the fare box shall be reinforced as necessary to provide a sturdy mounting platform and to prevent shaking of the fare box.

Transfer mounting, cutting and punching equipment shall be located in a position convenient to the driver.

Agency will specify a fare box for Contractor to install.

Interior Access Panels and Doors

Access for maintenance and replacement of equipment shall be provided by panels and doors that appear to be an integral part of the interior. 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 with Locks

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.

212. 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. The number of special fastener tools required for panel and access door fasteners shall be minimized.

PASSENGER ACCOMMODATIONS

Passenger Seating

213. Arrangements and Seat Style

The passenger seating arrangement in the bus shall be such that seating capacity is maximized and in compliance to the following requirements.

Note: The Agency recognizes that ramp location, foot room, hip-to-knee room, doorway type, width, seat construction, floor level type, seat spacing requirements, ramp or lift, number of wheelchair positions, etc. ultimately affect seating capacity and layout.

Forward-Facing Seat Configuration

Passenger seats shall be arranged in a forward-facing configuration, except at the wheel housings, if applicable, where aisle-facing seats may be arranged as appropriate with due regard for passenger access and comfort. Other areas where aisle-facing seats may be provided are at wheelchair securement areas.

214. Padded Inserts

Padded Inserts

The passenger seats shall be equipped with vandal-resistant padded inserts throughout the bus (measure to uncompressed surface).

215. 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 a minimum of 26 in. At all seating positions in paired transverse seats immediately behind other seating positions, hip-to-knee room shall be no less than 27 in.

216. Foot Room

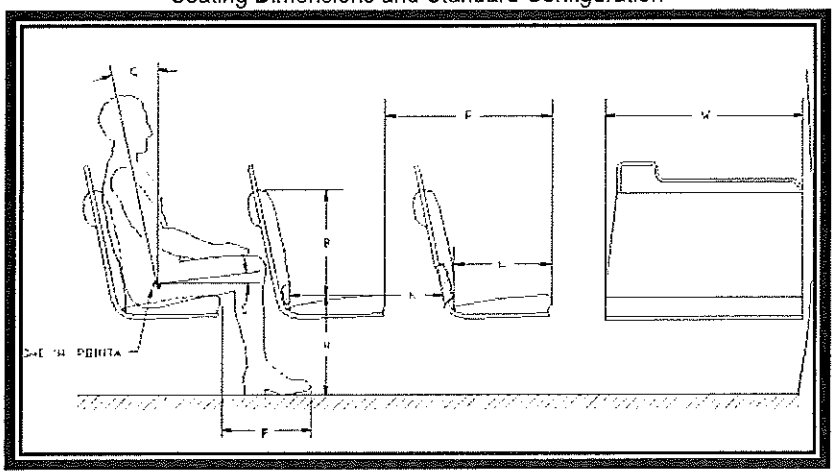
Foot room, measured at the floor forward from a point vertically below the front of the seat cushion, shall be no less than 14 in. Seats immediately behind the wheel housings and modesty panels may have foot room reduced.

217. 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).

218. Dimensions

FIGURE 3
Seating Dimensions and Standard Configuration



Seat dimensions for the various seating arrangements shall have the dimensions as follows (refer to Figure 3):

- The width, W, of the two-passenger transverse seat shall be a minimum 35 in.
- The length, L, shall be 17 in., ±1 in.
- The seat back height, B, shall be a minimum of 15 in.
- The seat height, H, shall be 17 in ± 1 in. For the seat 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. ± 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.

219. 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.

Seats, structures and restraints around the securement area should not infringe into the mobility device envelope or maneuverability.

The transverse seat structure shall be fully cantilevered from the sidewall with sufficient strength for the intended service. The lowest part of the seat assembly that is within 12 in. of the aisle shall be at least 10 in. above the floor.

In locations at which cantilevered installation is precluded by design and/or structure, other seat mounting may be allowed.

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 1000 lbs onto the femur of passengers ranging in

size from a 5th-percentile female to a 95th-percentile male during a 10g deceleration of the bus. This deceleration shall peak at 0.05 to 0.015 seconds from initiation. Permanent deformation of the seat resulting from two 95th-percentile males striking the seat back during this 10g deceleration shall not exceed 2 in., measured at the aisle side of the seat frame at height H. The seat back should not deflect more than 14 in., 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.

The seat assembly shall withstand static vertical forces of 500 lbs applied to the top of the seat cushion in each seating position with less than ¼-in. permanent deformation in the seat or its mountings. The seat assembly shall withstand static horizontal forces of 500 lbs evenly distributed along the top of the seat back with less than ¼-in. permanent deformation in the seat or its mountings. The seat backs at the aisle position and at the window position shall withstand repeated impacts of two 40-lb 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-in. pendulum and shall strike the seat back 10,000 times each from distances of 6, 8, 10 and 12 in. Seats at both seating positions shall withstand 4000 vertical drops of a 40-lb sandbag without visible deterioration. The sandbag shall be dropped 1000 times each from heights of 6, 8, 10 and 12 in. Seat cushions shall withstand 100,000 randomly positioned 3½-in. drops of a squirming, 150-lb, smooth-surfaced, buttocks-shaped striker with only minimal wear on the seat covering and no failures to seat structure or cushion suspension components.

The back of each transverse seat shall incorporate a handhold no less than ⅞ in. in diameter for standees and seat access/egress. The handhold shall not be a safety hazard during severe decelerations. The handhold shall extend above the seat back near the aisle so that standees shall have a convenient vertical assist, no less than 4 in. 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 upper rear portion of the seat back and the seat back handhold immediately forward of transverse seats shall be padded and/or 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 5th percentile female through a 95th percentile male.

The seat back handhold may be deleted from seats that do not have another transverse seat directly behind and where a vertical assist is provided.

Longitudinal seats shall be the same general design as transverse seats but without seat back handholds. Longitudinal seats may be mounted on the wheelhouses. Armrests shall be included on the ends of each set of longitudinal seats except on the forward end of a seat set that is immediately to the rear of a transverse seat, the driver's barrier, or a modesty panel, 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 3½ in. of the end of the seat cushion. Armrests shall be located from 7 to 9 in. above the seat cushion surface. The area between the armrest and the seat cushion shall be closed by a barrier or panel. The top and sides of the armrests shall have a minimum width of 1 in. and shall be free from sharp protrusions that form a safety hazard.

Seat back handhold and armrests shall withstand static horizontal and vertical forces of 250 lbs applied anywhere along their length with less than ¼-in. permanent deformation. Seat back handhold and armrests shall withstand 25,000 impacts in each direction of a horizontal force of 125 lbs with less than ¼-in. permanent deformation and without visible deterioration.

220. 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, pads and cushions 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 be constructed of energy-absorbing materials to 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. Agency shall select seat fabric.

221. Passenger Assists

Passenger assists in the form of full grip, vertical stanchions or handholds shall be provided for the safety of standees and for ingress/egress. 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 and out the exit door, 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 and the other without losing support. All handholds and stanchions at front doorway, around farebox, and at interior steps for bi-level designs shall be powder-coated in a high-contrast yellow color. The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area shall be: Stainless steel finish.

222. 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.

223. 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.

224. Vestibule

The aisle side of the driver's barrier, the wheel housings, and when applicable the modesty panels shall be fitted with vertical passenger assists that are functionally continuous with the overhead assist and that extend to within 36 in. 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 shall be located across the front of the bus and shall prevent passengers from sustaining injuries on the fare collection device 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. The assist shall be no less than 36 in. above the floor. The assists 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, wheel housings or front modesty panel.

225. 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.

226. Overhead

Except forward of the standee line and at the rear door, a continuous, full grip, overhead assist shall be provided. This assist shall be located over the center of the aisle seating position of the transverse seats. The assist shall be no less than 70 in. above the floor. Grab straps or other extensions as necessary shall be provided for sections where vertical assists are not available and for the use by passengers that cannot reach to 70 in. Grab straps shall be: Fabric. 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.

227. 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.

228. 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, 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.

229. Passenger Doors

Doorways will be provided in the locations and styles as follows. Passenger doors and doorways shall comply with ADA requirements. The front door shall be 40 inch two piece slide and glide design and positioned forward of the front wheels and under direct observation of the driver. The rear curbside doorway centerline located rearward of the point midway between the front door centerline and the rearmost seat back. The rear door shall be a 34 inch two piece swing out design. The air-powered, the door system shall operate per specification at air pressures between 90 and 130 psi.

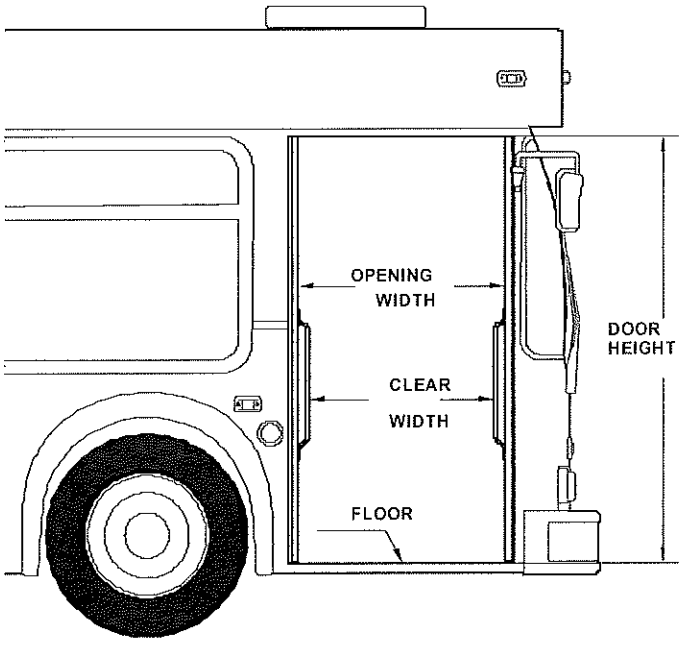
Materials and Construction

Structure of the doors, their attachments, inside and outside trim panels and any mechanism exposed to the elements shall be corrosion-resistant. Door panel construction shall be of corrosion-resistant metal or reinforced non-metallic composite materials. When fully opened, the doors shall provide a firm support and shall not be damaged if used as an assist by passengers during ingress or egress. 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.

230. Dimensions

FIGURE 4
Transit Bus Minimum Door Opening



When open, the doors shall leave an opening no less than 75.3 in. in height.

32-in. Minimum Doorway Clear Width

Front door clear width shall be a minimum of 32 in. with the doors fully opened. Rear door opening clear width shall be a minimum of 24 in. with the doors fully opened.

If the Agency requires a minimum rear door clear width of 31¾ in. or greater and an outward opening (swing) door is specified, then the maximum outboard excursion of 13 in. may be exceeded.

231. Door Glazing

The upper section of both front and rear doors shall be glazed for no less than 45 percent of the respective door opening area of each section. The lower section of the front door shall be glazed for no less than 25 percent of the door opening area of the section.

The front door panel glazing material shall have a nominal ¼ in. thick laminated safety glass conforming with the requirements of ANSI Z26.1 Test Grouping 2 and the Recommended Practices defined in SAE J673. Door glazing shall be easily replaceable

232. 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 of the rear exit door via the curb side mirror when the doors are fully open. The exterior projection of both doors shall be minimized during the opening or closing cycles or when doors are fully opened.

Interior

Projection inside the bus shall not cause an obstruction of the rear door mirror or cause a hazard for standees.

233. 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.

234. Closing Force

Closing door edge speed shall not exceed 12 in. per second, and opening door speed shall not exceed 19 in. per second. Power doors shall not slam closed under any circumstance, even if the door is obstructed during the closing cycle. If a door is obstructed during the closing cycle, the pressure exerted on the obstruction shall not increase once initial contact has been made.

Power-close rear doors shall be equipped with an obstruction sensing system such that if an obstruction is within the path of the closing doors, the doors will stop and/or reverse direction prior to imparting a 10-lb force on 1 sq in. of that obstruction. If a contactless obstruction sensing system is employed, it shall be capable of discriminating between the normal doorway environment and passengers or other obstructions within the doorway, and of altering the zones of detection based upon the operating state of the door system.

Doors closed by a return spring shall be equipped with an obstruction-sensing device that, at a minimum, alerts the driver if an obstruction is detected between the closing doors. Doors closed by a return spring shall be capable of being pushed to the point where the door starts to open with a force not to exceed 25 lbs applied to the center edge of the forward door panel. Whether or not the obstruction sensing system is present or

functional, it shall be possible to withdraw a 1½ in. diameter cylinder from between the center edges of a closed and locked door with an outward force not greater than 35 lbs.

235. Actuators

Doors shall open or close completely in not more than 3.5 seconds from the time of control actuation and shall be subject to the closing force requirements.

Door actuators shall be adjustable so that the door opening and closing speeds can be independently adjustable to satisfy the above requirements. Actuators and the complex door mechanism shall be concealed from passengers but shall be easily accessible for servicing. The door actuators shall be rebuildable. If powered by compressed air, exhaust from the door system shall be routed below the floor of the bus to prevent accumulation of any oil that may be present in the air system and to muffle sound.

Door actuators and associated linkages shall maximize door holding forces in the fully open and fully closed positions to provide firm, non-rattling, non-fluttering door panels while minimizing the force exerted by the doors on an obstruction midway between the fully open and closed positions.

The rear door actuator(s) shall be under the complete control of the vehicle operator and shall open and close in response to the position of the driver's door control.

Doors that employ "swing" geometry and/or are closed by a return spring.

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.

236. Emergency Operation

In the event of an emergency, it shall be possible to manually open doors designated as emergency exits from inside the bus using a force of no more than 25 lbs after actuating an unlocking device. The unlocking device shall be clearly marked as an emergency-only device and shall require two distinct actions to actuate. The respective door emergency unlocking device shall be accessible from the doorway area. The unlocking device shall be easily reset by the operator without special tools or opening the door mechanism enclosure. Doors that are required to be classified as "Emergency Exits" shall meet the requirements of FMVSS 217.

237. Door Control

The door control shall be located in the operator's area within the hand reach envelope described in SAE Recommended Practice J287, "Driver Hand Control Reach." The driver's door control shall provide tactile feedback to indicate commanded door position and resist inadvertent door actuation.
Exterior front door override switch located at the front cap on street side in an access panel.

238. 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.

239. Door Open/Close

Operator-Controlled Front and Rear Doors

Operation of, and power to, the passenger doors shall be completely controlled by the operator.

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.

Accessibility Provisions

Space and body structural provisions shall be provided at the front door of the bus to accommodate a wheelchair loading system. Low-floor ramp minimum of 1000 lbs. capacity.

240. Ramp

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.
Deployment or storage of the ramp shall require no more than 15 seconds. The device shall function without failure or adjustment for 500 cycles or 5000 miles in all-weather conditions on the design operating profile when activated once during the idle phase. A manual override system shall permit unloading a wheelchair and storing the device in the event of a primary power failure. The manual operation of the ramp shall not require more than 35 lbs of force.

241. Loading System for 30- 35-40-ft Low-Floor Bus

An automatically-controlled, power-operated ramp system compliant to requirements defined in 49 CFR Part 38, Subpart B, §38.23c shall provide ingress and egress quickly, safely and comfortably, both in forward and rearward directions, for a passenger in a wheelchair from a level street or curb.

Front Door Location of Loading System, Flip-Out Design Ramp with 6:1 Slope

The wheelchair loading system shall be located at the front door, with the ramp being a flip-out type design being capable of deploying to the ground at a maximum 6:1 slope.

242. Wheelchair Accommodations

Agency will approve acceptable securement system.

Two Forward-Facing Wheelchair Securement Locations

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.

243. 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

244. Destination Signs

A destination sign system shall be furnished on the front, on the right side near the front door.

Route sign on the rear of the vehicle.

Street and Curb Side Route Sign

The sign located near the front door shall not block the driver's critical horizontal line of sight. Display areas of destination signs shall be clearly visible in direct sunlight and/or at night. Parts shall be commercially available. All signs shall be controlled via a single human-machine interface (HMI). In the absence of a single mobile data terminal (MDT), the HMI shall be conveniently located for the bus driver within reach of the seated driver. The destination sign compartments shall meet the following minimum requirements:

1. Compartments shall be designed to prevent condensation and entry of moisture and dirt.
2. Compartments shall be designed to prevent fogging of both compartment window and glazing on unit itself.
3. Access shall be provided to allow cleaning of inside compartment window and unit glazing.
4. Front window shall have an exterior display area of no less than 8.5 in. high by 56 in. wide.

Passenger Information and Advertising

245. Interior Displays

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.

246. 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.

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 touch tape, chime and interior sign message. The touch tape shall be accessible to all seated passengers, with provisions for standees. It shall be easily accessible to all passengers, seated or standing. Vertical touch tape shall be provided at each window mullion and adjacent to each wheelchair parking position and priority seating positions.

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.

Communications

247. Camera Surveillance System

As an Option Provide all wiring and mounting for a 5 camera high definition 1080p resolution with audio capabilities surveillance system. The digital video recorder shall be SD card type system with a minimum of 128GB of storage. An event marker button shall also be provided. (Provision cameras or an approved equal). The Camera surveillance system and layout shall require the approval of the Agency.

248. Public Address System

A public address system shall be provided on each bus for facilitating radio system and driver-originated announcements to passengers.

249. Speakers

A minimum of 6 interior loudspeakers shall be provided, semi-flush mounted, on alternate sides of the bus passenger compartment and driver's area, installed with proper phasing. Total impedance seen at the input connecting end shall be 8 Ohms. Mounting shall be accomplished with rivet or machine screws.

250. Pleasure radio

AM / FM radio located overhead of the drivers compartment, audible on the drivers and passengers speakers with automatic PA override. The speaker and remote volume control shall be located at the side console.

251. Driver Display Unit (DDU)

SECTION 2: WARRANTY

Warranty Requirements

252. Contractor Warranty

Contractor shall list all standard warranties for the bus and specific subsystems and components but not limited to as follows:

- Brake system: Foundation brake components, including advancing mechanisms, as supplied with the axles, excluding friction surfaces.
- Destination signs: All destination sign equipment for the front, side and rear signs, power modules and operator control.
- Heating, ventilating: Roof and/or rear main unit only, excluding floor heaters and front defroster.
- AC unit and compressor: Roof and/or rear main unit only, excluding floor heaters and front defroster.
- Door systems: Door operating actuators and linkages.
- Air compressor
- Air dryer
- Wheelchair lift and ramp system: Lift and/or ramp parts and mechanical only
- Starter
- Alternator: Alternator only. Does not include the drive system.
- Charge air cooler: Charge air cooler including core, tanks and including related surrounding framework and fittings.
- Hydraulic systems: Power steering as applicable.
- Engine cooling systems: Radiator including core, tanks and related framework, including surge tank.
- Transmission cooler
- Passenger seating excluding upholstery
- Fuel storage and delivery system
- Surveillance system including cameras and video recorders

253. Extended Warranty

The Agency requires the following items listed priced separately as an option for an extended warranty: **Engine, Transmission, HVAC**

254. 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:

- Engine
- Transmission
- Alternator
- Starter
- A/C compressor and condenser/evaporator unit
- Drive axle
- Power steering unit
- Fuel cylinders (if applicable)
- Air compressor
- Wheelchair ramp (if applicable)

The Contractor shall provide updated serial numbers resulting from warranty campaigns.

SECTION 3: FORMS AND CERTIFICATIONS

258. Vehicle Questionnaire

NOTE: This is a sample form. The Agency should customize to comply with its proposed requirements.

This form must be completed and included in the Technical Proposal.

GENERAL BUS DATA SHEET:

[40FT Diesel]

Bus Manufacturer: GILLIG LLC

Bus Model Number: G27D102N4

Basic Body Construction Type: Extruded Aluminum

General Dimensions

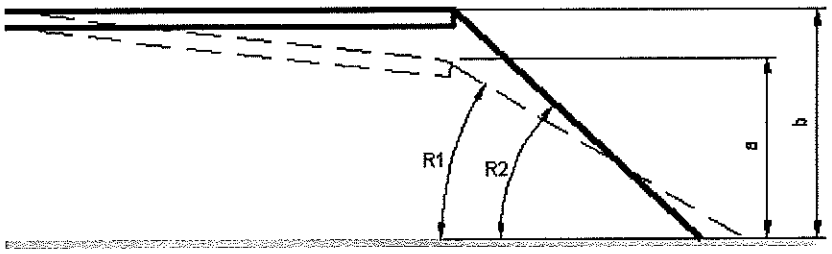
Overall length	Over bumpers		feet	491.5	inches
	Over body		feet	480.5	inches
Overall width	Over body excluding mirrors and lights		feet	102	inches
	Over body including mirrors		feet	123	inches
	Over tires		feet	100	inches
Overall height (maximum)			feet	122.8	inches

Angle of approach	8.6	degrees
Angle of departure	8.8	degrees
Breakover angle 1	10.7	degrees
Breakover angle 2	N/A	degrees

Doorway clear opening (at widest point) 34.50 inches

	Width with grab handles		**Width** without grab handles		**Height**	
Front door	36.38	inches	34.50	inches	75	inches
Center door (1)	N/A	inches	N/A	inches	N/A	inches
Center door (2)	N/A	inches	N/A	inches	N/A	inches
Rear door	26	inches	30.35	inches	77.62	inches

Front axle floor height above ground (centerline of bus)	16	inches
Center axle floor height above ground (centerline of bus)	N/A	inches
Rear axle floor height above ground (centerline of bus)	35.74	inches
Step height from ground (measured at center of doorway)	15.3	inches



	Front doorway		Center doorway		Ramp angle		Rear doorway	
Kneeled	11.9	inches (a)	N/A	inches (a)	9.3	degrees (R1)	14.4	inches (a)
Unkneeled	15.3	inches (b)	N/A	inches (b)	13.6	degrees (R2)	15.3	inches (b)

Interior head room (floor to ceiling at center of aisle)

First axle location	95	inches
Center of articulation	N/A	inches
Rear axle location	76.5	inches
Rear settee (in front of seat)	76.5	inches

Aisle width

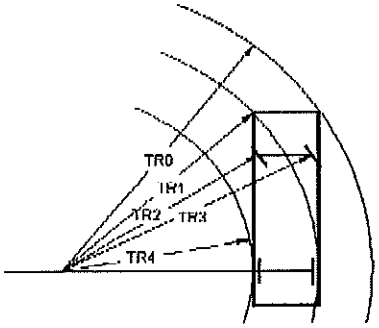
Minimum width on floor between first axle wheel housings	36	inches
Minimum width on floor between center axle (1) wheel housings	N/A	inches
Minimum width on floor between center axle (2) wheel housings	N/A	inches
Minimum width on floor between rear axle wheel housings	24.3	inches

Minimum ground clearance

Outside axles zones	8.80	inches
Inside axles zones	8.04	inches

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)	44	feet	7	inches
Inside Body Turning Radius innermost point, TR4 (including bumper)	23	feet	8	inches



Wheel base

First axle to center/rear axle	279	inches
Center axle to rear axle	N/A	inches

Overhang, centerline of axle over bumper

Front	84.5	inches
Rear	117	inches

Floor

Maximum interior floor slope (from horizontal)	.27	degrees

Capacity

Total number of passenger sittings	38	
Passenger seating manufacturer/model number	6468	
Total number of standing passengers (1 per 1.5 sq. ft.)	41	
Minimum hip to knee space	27.5	inches
Maximum hip to knee space	29.2	inches
Restraint system type and model number	ARM	

Bus weight

	Curb weight		Curb weight plus seated load*		GVWR	
First axle	8470	lbs	10690	lbs	14600	lbs
Center axle	N/A	lbs	N/A	lbs	N/A	lbs
Rear axle	18840	lbs	22740	lbs	25000	lbs
Total	27580	lbs	34536	lbs	39600	lbs

* Including operator and passengers at 150 lbs per person

Steering Axles

Manufacturer	MERITOR (ROCKWELL)
Type and weight rating	DEEP DROP 14600
Model number	FH946

Drive axle (☐ Center ☒ Rear)

Manufacturer	MERITOR (ROCKWELL)
Type and weight rating	SINGLE REDUCTION (25000)
Model number	71163

Drive axle ratio

Differential ratio	5.38
Hub reduction ratio (if used)	N/A
Final axle ratio (if hub reduction is used)	N/A

Brake system

Make/type of fundamental system	MERITOR/MGM
First axle brake chamber model	24"/1627002

Center axle brake chamber model	N/A
Rear axle brake chamber model	36"/3436051
First axle slack adjuster	
Manufacturer	HALDEX
Model number	419-10776/419-10777
Center axle slack adjuster	
Manufacturer	N/A
Model number	
Rear axle slack adjuster	
Manufacturer	HALDEX
Model number	419-10972/419-10973
First axle brake drum/rotor	
Manufacturer	MERITOR 3219Y5797
Center axle brake drum/rotor	
Manufacturer	N/A
Rear axle brake drum/rotor	
Manufacturer	MERITOR 3219M4615

Air compressor

Manufacturer	CUMMINS (WABCO)	
Type	RECIPROCATING PISTON-TWIN CYLINDER	
Model number	N/A	
Rated capacity	30.4	cfm
Capacity at idle	6.5	cfm
Maximum warranted speed	3000	rpm
Idle speed	700	rmp
Drive type	GEAR DRIVEN	
Governor cut-in pressure	110	psi
Governor cut-out pressure	130	psi

Air Reservoir Capacity

Manufacturer				
Supply reservoir number and size	1	/	1000	cubic inches total
Primary reservoir number and size	1	/	1516	cubic inches total
Secondary reservoir number and size	1	/	2095	cubic inches total
Parking reservoir number and size	N/A	/	N/A	cubic inches total
Accessory reservoir number and size	1	/	1090	cubic inches total
Other reservoir number and size	N/A	/	N/A	cubic inches total

Cooling System

	Radiator	Charge air cooler
Manufacturer	MODINE	MODINE

Type	ELECTRIC	SIDE BY SIDE
Model number	EPR023969002	EPR239700002
Number of tubes	276	22
Fins per inch	10	.313 X 3.0
Fin thickness (inches)	.003	.006
Fin construction	ALUMINUM/ALLOY	ALUMINUM/ALLOY

Total cooling system capacity (gallons)	23	gallons
Radiator fan manufacturer	MODINE	
Fan speed/control type (mech/elect/hyb)	ELECTRIC	
Surge tank capacity	2.7	~~gallons~~ QUARTS
Surge tank material		
Overheat alarm temperature	215	degrees F
Shutdown temperature settings	225	degrees F

Electrical

Primary interior lighting system

Manufacturer	DINEX I/O CONTROLS
Type	LED
Model number	N/A

Alternator

Manufacturer	NIEHOFF
Type	AIR COOLED
Model number	803
Output at idle	325 amps

Voltage regulator

Manufacturer	DELCO REMY
Model number	50VR

Voltage equalizer

Manufacturer	VANNER
Model number	100 SERIES

Auxiliary inverter (120/240)

Manufacturer	N/A
Model number	
Inverter technology	
Output voltage(s)	

Starter motor

Manufacturer	DELCO REMY

Voltage	HD ELECTRIC 24v
Model number	42MT TYPE 400

Energy storage

Batteries – low voltage

Manufacturer	DEKA
Type	8D
Model number	908DFT716
Cold cranking amps	1425

Batteries/energy storage – high voltage

Manufacturer	N/A
Type	N/A
Model number	N/A
Energy density	N/A
Specific power	N/A
Operating temperature range	N/A
Cooling/heating system	N/A

Ultra-capacitor

Manufacturer	N/A
Model number	N/A

Ultra-capacitor ratings: Provide data sheet for energy efficiency, estimated calendar life, cycle life, voltage (each capacitor and each module), working and peak power, and weight

Engine

Manufacturer	CUMMINS
Model number/version	L9
Horsepower/torque rating	280 /1900FT LBS

Fire Suppression/Methane Detection System

Manufacturer	N/A
Model number	
Number of detectors	[ ] fire [ ] methane
Type of detector	☐ Thermal ☐ Optical
Battery backup	☐ Yes ☐ No

Bumpers

Manufacturer	RO-LAB AMERICAN BUMPER CO.
Type	ENERGY ABSORBING

Fuel and Exhaust System

Fuel type	ULS DIESEL FUEL
Operating range and route profile	450 MILES (CBD PROFILE)

Fuel tanks (liquid fuels)

Manufacturer	IMPERIAL FABRICATION			
Capacity (total and usable)	125	Gallons /	120	Gallons
Construction material	STAINLESS STEEL			
Quantity and location of tanks	(1) TRANSVERSE MOUNTD AFT OF REAR DOOR			

Fuel tanks (gaseous fuels)

Manufacturer	N/A			
Capacity (total and usable)		SCF /		SCF
Construction material				
Quantity and location of tanks				

Exhaust system

Diesel particulate filter manufacturer	CUMMINS
Describe DPF electronic interface	PRESSURE AND TEMPERATURE SENSORS
Muffler manufacturer (if applicable)	N/A

Air Suspension

	Front	Middle	Rear
Air spring manufacturer	NEWAY	N/A	NEWAY
Air spring quantity per axle	4	N/A	4
Shock absorber manufacturer	KONI	N/A	
Shock absorber quantity per axle	2	N/A	

Steering

Pump manufacturer	PARKER	
Pump model number	PGP300	
Steering gear manufacturer	TRW (ROSS)	
Steering gear model number	TA565	
Steering gear type	POWER INTEGRAL	
Steering wheel diameter	20	inches
Maximum effort at steering wheel*	10 LBS	

* Unloaded stationary bus on dry asphalt pavement

☒ **Transmission** / ☐ **Hybrid drive system** (check one)

Manufacturer	ALLISON
Type	AUTOMATIC ELECTRIC
Model number	B400R
Number of forward speeds	5
Traction motor horsepower rating	N/A
Type ventilation/cooling	OIL/COOLANT

Propshaft

Manufacturer	SPICER

Wheels

Manufacturer	ALCOA
Type	ALUMINUM
Size	22.5"
Mounting type	HUB
Bolt circle diameter	11.25
Protective coating	DURA-BRITE

Tires

Manufacturer	FIRESTONE
Type	TRANSIT
Size	315/80R22.5
Load range/air pressure	(J)

Door System

Door panels	Manufacturer	Type
Front door	VAPOR	SLIDE GLIDE
Center door (1)	N/A	N/A
Center door (2)	N/A	N/A
Rear door	VAPOR	SWING OUT

Actuating mechanism (air, electric, spring, other)

Manufacturer	VAPOR
Front door	AIR OPEN/CLOSED
Center door (1)	N/A
Center door (2)	N/A
Rear door	AIR OPEN/SPRING CLOSED

Heating and Ventilating Equipment

Heating system capacity	98000	Btu
Air conditioning system capacity	94000	Btu
Ventilating capacity	N/A	CFM per passenger
Manufacturer and model	THERMO KING T-14 SERIES	
Refrigerant type	R134A	

Driving heater

Manufacturer	MOBILE CLIMATE CONTROL (MCC)
Type	ELECTRONIC CONTROL WITH BRUSHLESS MOTORS
Model number	21-65539-000

Capacity	62000 BTU

Auxiliary heater

Manufacturer	N/A
Type	
Model number	
Capacity	

Floor heaters

Manufacturer	MOBILE CLIMATE CONTROL (MCC)
Type/number	ELECTRONIC CONTROL WITH BRUSHLESS MOTORS
Model number	21-61304-000
Capacity	34000 BTU

Passenger Loading System

Manufacturer	RICON
Type (hydraulic, electric or both)	ELECTRIC
Model number	SSR
Capacity (lbs.)	1000

Dimensions

Width of ramp	30	inches
Length of ramp	68	inches

Cycle times	**Normal idle**		**Fast idle**	
Stowed to ground	N/A	seconds	N/A	seconds
Ground to stow	N/A	seconds	N/A	seconds

Electronics

Video system manufacturer	N/A
Video system model number	N/A
Number of cameras	N/A
Multiplex system manufacturer	I/O CONTROLS
Multiplex system model number	G4
Automatic passenger counter system manufacturer	N/A
Automatic passenger counter system model number	N/A
Destination sign manufacturer	HANOVER
Destination sign model number	PUNFOLD
AVL/AVM system manufacturer	N/A
AVL/AVM system model number	N/A
Passenger information system manufacturer	KD SPECIALTIES
Passenger information system model number	N/A
Signal prioritization system manufacturer	N/A

Signal prioritization system model number	N/A

Bus Body Fittings

Passenger windows manufacturer	DURA

Exterior/interior mirrors

Size	10" X 11"
Manufacturer	SAFE FLEET
Model number	N/A
Manufacturer part numbers	N/A

Bicycle racks

Manufacturer	N/A
Model number	

Paint system

Manufacturer	XALTA (DUPONT)
Type	IMRON ELITE

Operator control layout diagram:

SEE ATTACHED SAMPLE LAYOUT.

258. Vehicle Questionnaire

NOTE: This is a sample form. The Agency should customize to comply with its proposed requirements.

This form must be completed and included in the Technical Proposal.

GENERAL BUS DATA SHEET:

[35FT Diesel]

Bus Manufacturer: GILLIG LLC

Bus Model Number: G27B102N4

Basic Body Construction Type: Extruded Aluminum

General Dimensions

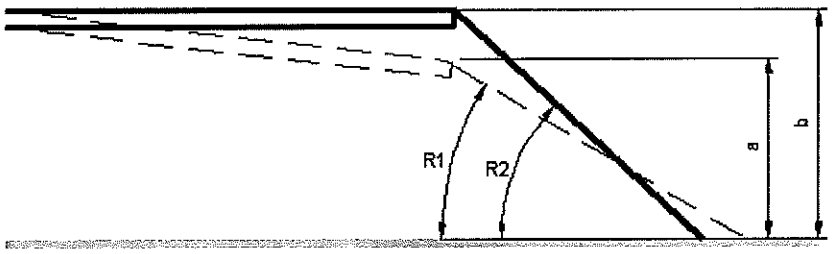
Overall length	Over bumpers		feet	442	inches
	Over body		feet	432.1	inches
Overall width	Over body excluding mirrors and lights		feet	102	inches
	Over body including mirrors		feet	123	inches
	Over tires		feet	100	inches
Overall height (maximum)			feet	122.9	inches

Angle of approach	8.5	degrees
Angle of departure	8.9	degrees
Breakover angle 1	12.8	degrees
Breakover angle 2	N/A	degrees

Doorway clear opening (at widest point) 34.50 inches

	Width with grab handles		**Width** without grab handles		**Height**	
Front door	36.38	inches	34.50	inches	75	inches
Center door (1)	N/A	inches	N/A	inches	N/A	inches
Center door (2)	N/A	inches	N/A	inches	N/A	inches
Rear door	26	inches	30.35	inches	77.62	inches

Front axle floor height above ground (centerline of bus)	16	inches
Center axle floor height above ground (centerline of bus)	N/A	inches
Rear axle floor height above ground (centerline of bus)	35.74	inches
Step height from ground (measured at center of doorway)	15.3	inches



	Front doorway		Center doorway		Ramp angle		Rear doorway	
Kneeled	11.9	inches (a)	N/A	inches (a)	9.3	degrees (R1)	14.4	inches (a)
Unkneeled	15.3	inches (b)	N/A	inches (b)	13.6	degrees (R2)	15.3	inches (b)

Interior head room (floor to ceiling at center of aisle)

First axle location	95	inches
Center of articulation	N/A	inches
Rear axle location	76.5	inches
Rear settee (in front of seat)	76.5	inches

Aisle width

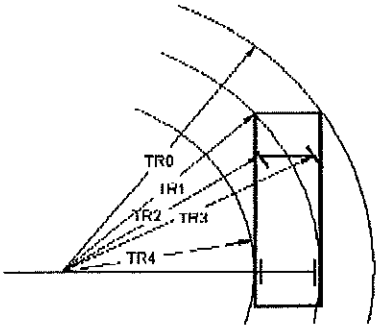
Minimum width on floor between first axle wheel housings	36	inches
Minimum width on floor between center axle (1) wheel housings	N/A	inches
Minimum width on floor between center axle (2) wheel housings	N/A	inches
Minimum width on floor between rear axle wheel housings	24.3	inches

Minimum ground clearance

Outside axles zones	8.80	inches
Inside axles zones	8.04	inches

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)	37	feet	4	inches
Inside Body Turning Radius innermost point, TR4 (including bumper)	26	feet	10	inches



Wheel base

First axle to center/rear axle	230	inches
Center axle to rear axle	N/A	inches

Overhang, centerline of axle over bumper

Front	84.5	inches
Rear	117	inches

Floor

Maximum interior floor slope (from horizontal)	.27	degrees

Capacity

Total number of passenger sittings	31	
Passenger seating manufacturer/model number	6468	
Total number of standing passengers (1 per 1.5 sq. ft.)	54	
Minimum hip to knee space	27.5	inches
Maximum hip to knee space	31	inches
Restraint system type and model number	ARM	

Bus weight

	Curb weight		Curb weight plus seated load*		GVWR	
First axle	7940	lbs	9540	lbs	14600	lbs
Center axle	N/A	lbs	N/A	lbs	N/A	lbs
Rear axle	18640	lbs	21840	lbs	25000	lbs
Total	26580	lbs	31380	lbs	39600	lbs

* Including operator and passengers at 150 lbs per person

Steering Axles

Manufacturer	MERITOR (ROCKWELL)
Type and weight rating	DEEP DROP 14600
Model number	FH946

Drive axle (☐ Center ☒ Rear)

Manufacturer	MERITOR (ROCKWELL)
Type and weight rating	SINGLE REDUCTION (25000)
Model number	71163

Drive axle ratio

Differential ratio	5.38
Hub reduction ratio (if used)	N/A
Final axle ratio (if hub reduction is used)	N/A

Brake system

Make/type of fundamental system	MERITOR/MGM
First axle brake chamber model	24"/1627002

Center axle brake chamber model	N/A
Rear axle brake chamber model	36"/3436051
First axle slack adjuster	
Manufacturer	HALDEX
Model number	419-10776/419-10777
Center axle slack adjuster	
Manufacturer	N/A
Model number	
Rear axle slack adjuster	
Manufacturer	HALDEX
Model number	419-10972/419-10973
First axle brake drum/rotor	
Manufacturer	MERITOR 3219Y5797
Center axle brake drum/rotor	
Manufacturer	N/A
Rear axle brake drum/rotor	
Manufacturer	MERITOR 3219M4615

Air compressor

Manufacturer	CUMMINS (WABCO)	
Type	RECIPROCATING PISTON-TWIN CYLINDER	
Model number	N/A	
Rated capacity	30.4	cfm
Capacity at idle	6.5	cfm
Maximum warranted speed	3000	rpm
Idle speed	700	rmp
Drive type	GEAR DRIVEN	
Governor cut-in pressure	110	psi
Governor cut-out pressure	130	psi

Air Reservoir Capacity

Manufacturer				
Supply reservoir number and size	1	/	1000	cubic inches total
Primary reservoir number and size	1	/	1516	cubic inches total
Secondary reservoir number and size	1	/	2095	cubic inches total
Parking reservoir number and size	N/A	/	N/A	cubic inches total
Accessory reservoir number and size	1	/	1090	cubic inches total
Other reservoir number and size	N/A	/	N/A	cubic inches total

Cooling System

	Radiator	Charge air cooler
Manufacturer	MODINE	MODINE

Type	ELECTRIC	SIDE BY SIDE
Model number	EPR023969002	EPR239700002
Number of tubes	276	22
Fins per inch	10	.313 X 3.0
Fin thickness (inches)	.003	.006
Fin construction	ALUMINUM/ALLOY	ALUMINUM/ALLOY

Total cooling system capacity (gallons)	23 gallons
Radiator fan manufacturer	MODINE
Fan speed/control type (mech/elect/hyb)	ELECTRIC
Surge tank capacity	2.7 ~~gallons~~ QUARTS
Surge tank material	
Overheat alarm temperature	215 degrees F
Shutdown temperature settings	225 degrees F

Electrical

Primary interior lighting system

Manufacturer	DINEX I/O CONTROLS
Type	LED
Model number	N/A

Alternator

Manufacturer	NIEHOFF
Type	AIR COOLED
Model number	803
Output at idle	325 amps

Voltage regulator

Manufacturer	DELCO REMY
Model number	50VR

Voltage equalizer

Manufacturer	VANNER
Model number	100 SERIES

Auxiliary inverter (120/240)

Manufacturer	N/A
Model number	
Inverter technology	
Output voltage(s)	

Starter motor

Manufacturer	DELCO REMY

Voltage	HD ELECTRIC 24v
Model number	42MT TYPE 400

Energy storage

Batteries – low voltage

Manufacturer	DEKA
Type	8D
Model number	908DFT716
Cold cranking amps	1425

Batteries/energy storage – high voltage

Manufacturer	N/A
Type	N/A
Model number	N/A
Energy density	N/A
Specific power	N/A
Operating temperature range	N/A
Cooling/heating system	N/A

Ultra-capacitor

Manufacturer	N/A
Model number	N/A

Ultra-capacitor ratings: Provide data sheet for energy efficiency, estimated calendar life, cycle life, voltage (each capacitor and each module), working and peak power, and weight

Engine

Manufacturer	CUMMINS
Model number/version	L9
Horsepower/torque rating	280 /1900FT LBS

Fire Suppression/Methane Detection System

Manufacturer	N/A
Model number	
Number of detectors	____ fire ____ methane
Type of detector	☐ Thermal ☐ Optical
Battery backup	☐ Yes ☐ No

Bumpers

Manufacturer	RO-LAB AMERICAN BUMPER CO.
Type	ENERGY ABSORBING

Fuel and Exhaust System

Fuel type	ULS DIESEL FUEL
Operating range and route profile	450 MILES (CBD PROFILE)

Fuel tanks (liquid fuels)

Manufacturer	IMPERIAL FABRICATION			
Capacity (total and usable)	125	Gallons /	120	Gallons
Construction material	STAINLESS STEEL			
Quantity and location of tanks	(1) TRANSVERSE MOUNTD AFT OF REAR DOOR			

Fuel tanks (gaseous fuels)

Manufacturer	N/A			
Capacity (total and usable)		SCF /		SCF
Construction material				
Quantity and location of tanks				

Exhaust system

Diesel particulate filter manufacturer	CUMMINS
Describe DPF electronic interface	PRESSURE AND TEMPERATURE SENSORS
Muffler manufacturer (if applicable)	N/A

Air Suspension

	Front	Middle	Rear
Air spring manufacturer	NEWAY	N/A	NEWAY
Air spring quantity per axle	4	N/A	4
Shock absorber manufacturer	KONI	N/A	
Shock absorber quantity per axle	2	N/A	

Steering

Pump manufacturer	PARKER	
Pump model number	PGP300	
Steering gear manufacturer	TRW (ROSS)	
Steering gear model number	TA565	
Steering gear type	POWER INTEGRAL	
Steering wheel diameter	20	inches
Maximum effort at steering wheel*	10 LBS	

* Unloaded stationary bus on dry asphalt pavement

☒ Transmission / ☐ Hybrid drive system (check one)

Manufacturer	ALLISON
Type	AUTOMATIC ELECTRIC
Model number	B400R
Number of forward speeds	5
Traction motor horsepower rating	N/A
Type ventilation/cooling	OIL/COOLANT

Propshaft

Manufacturer	SPICER

Wheels

Manufacturer	ALCOA
Type	ALUMINUM
Size	22.5"
Mounting type	HUB
Bolt circle diameter	11.25
Protective coating	DURA-BRITE

Tires

Manufacturer	FIRESTONE
Type	TRANSIT
Size	315/80R22.5
Load range/air pressure	(J)

Door System

Door panels	Manufacturer	Type
Front door	VAPOR	SLIDE GLIDE
Center door (1)	N/A	N/A
Center door (2)	N/A	N/A
Rear door	VAPOR	SWING OUT

Actuating mechanism (air, electric, spring, other)

Manufacturer	VAPOR
Front door	AIR OPEN/CLOSED
Center door (1)	N/A
Center door (2)	N/A
Rear door	AIR OPEN/SPRING CLOSED

Heating and Ventilating Equipment

Heating system capacity	98000	Btu
Air conditioning system capacity	94000	Btu
Ventilating capacity	N/A	CFM per passenger
Manufacturer and model	THERMO KING T-14 SERIES	
Refrigerant type	R134A	

Driving heater

Manufacturer	MOBILE CLIMATE CONTROL (MCC)
Type	ELECTRONIC CONTROL WITH BRUSHLESS MOTORS
Model number	21-65539-000

Capacity	62000 BTU

Auxiliary heater

Manufacturer	N/A
Type	
Model number	
Capacity	

Floor heaters

Manufacturer	MOBILE CLIMATE CONTROL (MCC)
Type/number	ELECTRONIC CONTROL WITH BRUSHLESS MOTORS
Model number	21-61304-000
Capacity	34000 BTU

Passenger Loading System

Manufacturer	RICON
Type (hydraulic, electric or both)	ELECTRIC
Model number	SSR
Capacity (lbs.)	1000

Dimensions

Width of ramp	30	inches
Length of ramp	68	inches

Cycle times	Normal idle		Fast idle	
Stowed to ground	N/A	seconds	N/A	seconds
Ground to stow	N/A	seconds	N/A	seconds

Electronics

Video system manufacturer	N/A
Video system model number	N/A
Number of cameras	N/A
Multiplex system manufacturer	I/O CONTROLS
Multiplex system model number	G4
Automatic passenger counter system manufacturer	N/A
Automatic passenger counter system model number	N/A
Destination sign manufacturer	HANOVER
Destination sign model number	PUNFOLD
AVL/AVM system manufacturer	N/A
AVL/AVM system model number	N/A
Passenger information system manufacturer	KD SPECIALTIES
Passenger information system model number	N/A
Signal prioritization system manufacturer	N/A

Signal prioritization system model number	N/A

Bus Body Fittings

Passenger windows manufacturer	DURA

Exterior/interior mirrors

Size	10" X 11"
Manufacturer	SAFE FLEET
Model number	N/A
Manufacturer part numbers	N/A

Bicycle racks

Manufacturer	N/A
Model number	

Paint system

Manufacturer	XALTA (DUPONT)
Type	IMRON ELITE

Operator control layout diagram:

SEE ATTACHED SAMPLE LAYOUT.)

258. Vehicle Questionnaire

NOTE: This is a sample form. The Agency should customize to comply with its proposed requirements.

This form must be completed and included in the Technical Proposal.

GENERAL BUS DATA SHEET:

[30FT Diesel]

Bus Manufacturer: GILLIG LLC

Bus Model Number: G27E102N2

Basic Body Construction Type: Extruded Aluminum

General Dimensions

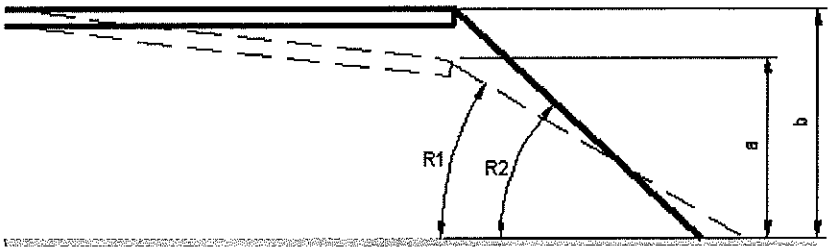
Overall length	Over bumpers		feet	370	inches
	Over body		feet	359	inches
Overall width	Over body excluding mirrors and lights		feet	101.9	inches
	Over body including mirrors		feet	123	inches
	Over tires		feet	100	inches
Overall height (maximum)			feet	122.9	inches

Angle of approach	8.7	degrees
Angle of departure	8.1	degrees
Breakover angle 1	14.6	degrees
Breakover angle 2	N/A	degrees

Doorway clear opening (at widest point) 34.50 inches

	Width with grab handles		**Width** without grab handles		**Height**	
Front door	36.38	inches	34.50	inches	75	inches
Center door (1)	N/A	inches	N/A	inches	N/A	inches
Center door (2)	N/A	inches	N/A	inches	N/A	inches
Rear door	26	inches	30.35	inches	77.62	inches

Front axle floor height above ground (centerline of bus)	16	inches
Center axle floor height above ground (centerline of bus)	N/A	inches
Rear axle floor height above ground (centerline of bus)	33.25	inches
Step height from ground (measured at center of doorway)	15.3	inches



	Front doorway		Center doorway		Ramp angle		Rear doorway	
Kneeled	10.66	inches (a)	N/A	inches (a)	8.8	degrees (R1)	14.0	inches (a)
Unkneeled	15.3	inches (b)	N/A	inches (b)	13.9	degrees (R2)	14.8	inches (b)

Interior head room (floor to ceiling at center of aisle)

First axle location	95	inches
Center of articulation	N/A	inches
Rear axle location	76.5	inches
Rear settee (in front of seat)	76.5	inches

Aisle width

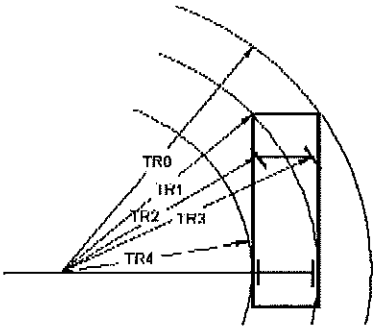
Minimum width on floor between first axle wheel housings	36	inches
Minimum width on floor between center axle (1) wheel housings	N/A	inches
Minimum width on floor between center axle (2) wheel housings	N/A	inches
Minimum width on floor between rear axle wheel housings	24.3	inches

Minimum ground clearance

Outside axles zones	7.74	inches
Inside axles zones	7.89	inches

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)	29	feet	10	inches
Inside Body Turning Radius innermost point, TR4 (including bumper)	12	feet	5	inches



Wheel base

First axle to center/rear axle	162.5	inches
Center axle to rear axle	N/A	inches

Overhang, centerline of axle over bumper

Front	84.5	inches
Rear	112	inches

Floor

Maximum interior floor slope (from horizontal)	.34	degrees

Capacity

Total number of passenger sittings	23	
Passenger seating manufacturer/model number	6468	
Total number of standing passengers (1 per 1.5 sq. ft.)	12	
Minimum hip to knee space	28	inches
Maximum hip to knee space	28	inches
Restraint system type and model number	OPT A2	

Bus weight

	Curb weight		Curb weight plus seated load*		GVWR	
First axle	6320	lbs	7520	lbs	11000	lbs
Center axle	N/A	lbs	N/A	lbs	N/A	lbs
Rear axle	17620	lbs	21020	lbs	23000	lbs
Total	23940	lbs	28540	lbs	34000	lbs

* Including operator and passengers at 150 lbs per person

Steering Axles

Manufacturer	MERITOR (ROCKWELL)
Type and weight rating	DEEP DROP 11000
Model number	FH946

Drive axle (☐ Center ☒ Rear)

Manufacturer	MERITOR (ROCKWELL)
Type and weight rating	SINGLE REDUCTION 23000
Model number	RS23160

Drive axle ratio

Differential ratio	5.38
Hub reduction ratio (if used)	N/A
Final axle ratio (if hub reduction is used)	N/A

Brake system

Make/type of fundamental system	MERITOR/MGM
First axle brake chamber model	24"/W863276T20

Center axle brake chamber model	N/A
Rear axle brake chamber model	30"/LTR3030HD
First axle slack adjuster	
Manufacturer	HALDEX
Model number	300-10042/300-10041
Center axle slack adjuster	
Manufacturer	N/A
Model number	
Rear axle slack adjuster	
Manufacturer	HALDEX
Model number	419-10636/419-10636
First axle brake drum/rotor	
Manufacturer	MERITOR 85-123861-002
Center axle brake drum/rotor	
Manufacturer	N/A
Rear axle brake drum/rotor	
Manufacturer	WEBB 66864B

Air compressor

Manufacturer	CUMMINS (WABCO)	
Type	RECIPROCATING PISTON-TWIN CYLINDER	
Model number	N/A	
Rated capacity	30.4	cfm
Capacity at idle	6.5	cfm
Maximum warranted speed	3000	rpm
Idle speed	700	rmp
Drive type	GEAR DRIVEN	
Governor cut-in pressure	110	psi
Governor cut-out pressure	130	psi

Air Reservoir Capacity

Manufacturer				
Supply reservoir number and size	1	/	1000	cubic inches total
Primary reservoir number and size	1	/	1516	cubic inches total
Secondary reservoir number and size	1	/	2095	cubic inches total
Parking reservoir number and size	N/A	/	N/A	cubic inches total
Accessory reservoir number and size	1	/	1090	cubic inches total
Other reservoir number and size	N/A	/	N/A	cubic inches total

Cooling System

	Radiator	Charge air cooler
Manufacturer	MODINE	MODINE

Type	ELECTRIC	SIDE BY SIDE
Model number	EPR023969002	EPR239700002
Number of tubes	276	22
Fins per inch	10	.313 X 3.0
Fin thickness (inches)	.003	.006
Fin construction	ALUMINUM/ALLOY	ALUMINUM/ALLOY

Total cooling system capacity (gallons)	23	gallons
Radiator fan manufacturer	MODINE	
Fan speed/control type (mech/elect/hyb)	ELECTRIC	
Surge tank capacity	2.7	~~gallons~~ QUARTS
Surge tank material		
Overheat alarm temperature	215	degrees F
Shutdown temperature settings	225	degrees F

Electrical

Primary interior lighting system

Manufacturer	DINEX I/O CONTROLS
Type	LED
Model number	N/A

Alternator

Manufacturer	NIEHOFF
Type	AIR COOLED
Model number	803
Output at idle	325 amps

Voltage regulator

Manufacturer	DELCO REMY
Model number	50VR

Voltage equalizer

Manufacturer	VANNER
Model number	100 SERIES

Auxiliary inverter (120/240)

Manufacturer	N/A
Model number	
Inverter technology	
Output voltage(s)	

Starter motor

Manufacturer	DELCO REMY

Voltage	HD ELECTRIC 24v
Model number	42MT TYPE 400

Energy storage

Batteries – low voltage

Manufacturer	DEKA
Type	8D
Model number	908DFT716
Cold cranking amps	1425

Batteries/energy storage – high voltage

Manufacturer	N/A
Type	N/A
Model number	N/A
Energy density	N/A
Specific power	N/A
Operating temperature range	N/A
Cooling/heating system	N/A

Ultra-capacitor

Manufacturer	N/A
Model number	N/A

Ultra-capacitor ratings: Provide data sheet for energy efficiency, estimated calendar life, cycle life, voltage (each capacitor and each module), working and peak power, and weight

Engine

Manufacturer	CUMMINS
Model number/version	L9
Horsepower/torque rating	280 /1900FT LBS

Fire Suppression/Methane Detection System

Manufacturer	N/A
Model number	
Number of detectors	[ ] fire [ ] methane
Type of detector	☐ Thermal ☐ Optical
Battery backup	☐ Yes ☐ No

Bumpers

Manufacturer	RO-LAB AMERICAN BUMPER CO.
Type	ENERGY ABSORBING

Fuel and Exhaust System

Fuel type	ULS DIESEL FUEL
Operating range and route profile	238 MILES (CBD PROFILE)

Fuel tanks (liquid fuels)

Manufacturer	IMPERIAL FABRICATION			
Capacity (total and usable)	80	Gallons /	75	Gallons
Construction material	STAINLESS STEEL			
Quantity and location of tanks	(1) TRANSVERSE MOUNTED CURBSIDE, FORWARD OF REAR DOOR			

Fuel tanks (gaseous fuels)

Manufacturer	N/A			
Capacity (total and usable)		SCF /		SCF
Construction material				
Quantity and location of tanks				

Exhaust system

Diesel particulate filter manufacturer	CUMMINS
Describe DPF electronic interface	PRESSURE AND TEMPERATURE SENSORS
Muffler manufacturer (if applicable)	N/A

Air Suspension

	Front	Middle	Rear
Air spring manufacturer	NEWAY	N/A	NEWAY
Air spring quantity per axle	4	N/A	2
Shock absorber manufacturer	KONI	N/A	
Shock absorber quantity per axle	2	N/A	

Steering

Pump manufacturer	PARKER	
Pump model number	PGP300	
Steering gear manufacturer	TRW (ROSS)	
Steering gear model number	TA565	
Steering gear type	POWER INTEGRAL	
Steering wheel diameter	20	inches
Maximum effort at steering wheel*	10 LBS	

* Unloaded stationary bus on dry asphalt pavement

☒ Transmission / ☐ Hybrid drive system (check one)

Manufacturer	ALLISON
Type	AUTOMATIC ELECTRIC
Model number	B400R
Number of forward speeds	5
Traction motor horsepower rating	N/A
Type ventilation/cooling	OIL/COOLANT

Propshaft

Manufacturer	SPICER

Wheels

Manufacturer	ALCOA
Type	ALUMINUM
Size	22.5"
Mounting type	HUB
Bolt circle diameter	285.75mm
Protective coating	DURA-BRITE

Tires

Manufacturer	FIRESTONE
Type	TRANSIT
Size	275/70R22.5
Load range/air pressure	(J)

Door System

Door panels	**Manufacturer**	**Type**
Front door	VAPOR	SLIDE GLIDE
Center door (1)	N/A	N/A
Center door (2)	N/A	N/A
Rear door	VAPOR	SWING OUT

Actuating mechanism (air, electric, spring, other)

Manufacturer	VAPOR
Front door	AIR OPEN/CLOSED
Center door (1)	N/A
Center door (2)	N/A
Rear door	AIR OPEN/SPRING CLOSED

Heating and Ventilating Equipment

Heating system capacity	98000	Btu
Air conditioning system capacity	94000	Btu
Ventilating capacity	N/A	CFM per passenger
Manufacturer and model	THERMO KING T-14 SERIES	
Refrigerant type	R134A	

Driving heater

Manufacturer	MOBILE CLIMATE CONTROL (MCC)
Type	ELECTRONIC CONTROL WITH BRUSHLESS MOTORS
Model number	21-65539-000

Capacity	62000 BTU

Auxiliary heater

Manufacturer	N/A
Type	
Model number	
Capacity	

Floor heaters

Manufacturer	N/A
Type/number	
Model number	
Capacity	

Passenger Loading System

Manufacturer	RICON
Type (hydraulic, electric or both)	ELECTRIC
Model number	SSR
Capacity (lbs.)	1000

Dimensions

Width of ramp	30	inches
Length of ramp	68	inches

Cycle times	Normal idle		Fast idle	
Stowed to ground	N/A	seconds	N/A	seconds
Ground to stow	N/A	seconds	N/A	seconds

Electronics

Video system manufacturer	N/A
Video system model number	N/A
Number of cameras	N/A
Multiplex system manufacturer	I/O CONTROLS
Multiplex system model number	G4
Automatic passenger counter system manufacturer	N/A
Automatic passenger counter system model number	N/A
Destination sign manufacturer	HANOVER
Destination sign model number	PUNFOLD
AVL/AVM system manufacturer	N/A
AVL/AVM system model number	N/A
Passenger information system manufacturer	KD SPECIALTIES
Passenger information system model number	N/A
Signal prioritization system manufacturer	N/A

Signal prioritization system model number	N/A

Bus Body Fittings

Passenger windows manufacturer	DURA

Exterior/interior mirrors

Size	10" X11"
Manufacturer	SAFE FLEET
Model number	N/A
Manufacturer part numbers	N/A

Bicycle racks

Manufacturer	N/A
Model number	

Paint system

Manufacturer	XALTA (DUPONT)
Type	IMRON ELITE

Operator control layout diagram:

SEE ATTACHED SAMPLE LAYOUT.

CUMMINS L9 ENGINE

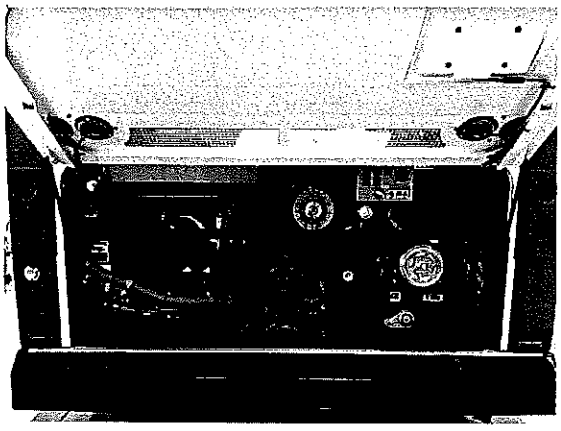
GILLIG utilizes the Cummins L9 diesel engine in the 29', 35' and 40' Low Floor buses. The engine utilizes a single, high-capacity Electronic Control Module (ECM) which provides fully integrated control over the engine and aftertreatment system, for optimized performance and improved engine lamp strategy.

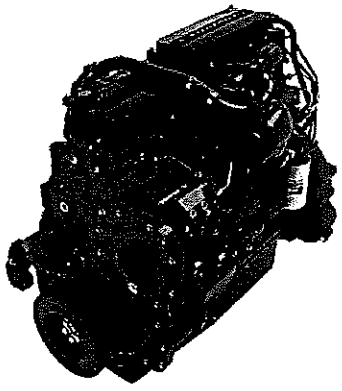
The proposed engine meets all applicable Federal EPA requirements currently in effect and Cummins has committed to meeting future requirements during the contract period.

The U.S. Environmental Protection Agency (EPA) regulations call for the addition of On-Board Diagnostics (OBD) for on-highway diesel engines. The OBD system continuously monitors the engine and aftertreatment system, recognizing the potential for an out-of-range event and thus providing a real-time alert of the entire emissions control system.

GILLIG works extensively with the engine manufacturers and vibration control system suppliers to develop "best practices" for engine isolation and mounting. Every engineering design is specifically tailored to address each individual engine installation. GILLIG engineers, using testing data collected by our engine suppliers, evaluate isolation mounts based on both velocity and accelerations of the drive train on a frequency analysis. We carefully look at both transmissibility and resultant vibration in the coach at the driver's floor, middle floor and rear floor. Based on the analysis, GILLIG has selected to use Metalastic mountings at the flywheel housing and at the pad mount under the accessory drive.

The straightforward design of the Low Floor bus allows for easy removal of the engine and transmission by 1 or 2 maintenance people. The removal of either the engine and/or transmission should only be required for major overhaul. Due to the accessibility provided in the Low Floor, all other repair work can be accomplished with the components in the bus.





GILLIG

CUMMINS L9 ENGINE

L9™

The Cummins L9 diesel for 2017 delivers outstanding productivity and the best power-to-weight ratio in its class. Its proven reliability keeps buses in service longer. Transit fleet managers can expect up to 15 percent better fuel economy versus buses purchased 10 years ago. Heavy-duty features such as a replaceable wet liner, roller followers, bypass oil filtration and targeted-piston cooling add years of engine life. But the most important component we put in every L9 engine is the trust that comes from a legacy of over 27 years and 5 million engines. Cummins L9 comes from a family of proven performers with a heritage that gets stronger every year.

The transit duty cycle provides a unique challenge in creating consistent exhaust temperatures required for passive Diesel Particulate Filter (DPF) regeneration. In 2017, Cummins is continuing to leverage the product experience and Particulate Matter (PM) storage capacity of the modular aftertreatment system to provide the best solution for reliability and uptime for larger buses while meeting emissions regulations.

Another SmartEfficiency™-driven improvement is the isolated coolant loop for transit buses (using either the L9 or ISL G powertrain), which improves reliability and reduces downtime. A water-to-water heat exchanger will be mounted on the engine to provide heat to the passenger compartments as needed, while providing a self-contained coolant flow to the engine compartment area. This new approach reduces potential coolant leakage and air infiltration for better Exhaust Gas Recirculation (EGR) cooler reliability and durability.

L9 Specifications

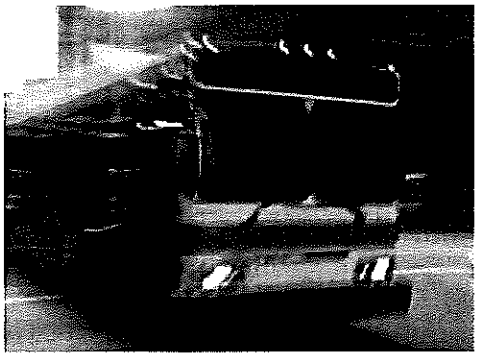
Advertised HP	260-380 HP	194-283 KW
Peak Torque	900-1100 LB-FT	1221-1493 N•M
Governed Speed	2200 RPM	
Clutch Engagement Torque	550 LB-FT	746 N•M
Number of Cylinders	6	
Engine Weight (Dry)	1,697 LB	770 KG

*Increase over standard muffler; does not include chassis OEM-supplied components.

Source: Cummins

Smart Support™

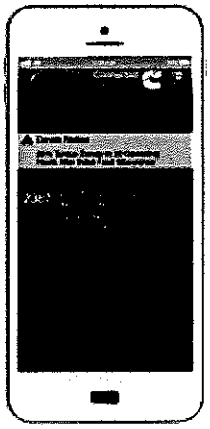
To provide unparalleled service and support for transit authorities, Cummins now offers the SmartSupport™ program, by which Cummins will proactively replace critical engine components to reduce unscheduled downtime for end customers. The proactive replacement will utilize Cummins Connected Diagnostics™ to keep transit fleets operating with maximum reliability and minimum downtime. SmartSupport is currently available on L9-powered transit applications, but will be cascaded through the lineup in the near future. Contact your local Cummins representative for updates.



Connected Diagnostics™

The Lifeline For Your Engine.

Cummins Connected Diagnostics wirelessly connects your Cummins-powered transit and shuttle buses to product experts at Cummins. Available on 2007 and newer diesel and natural gas engines, Connected Diagnostics instantly transmits key data surrounding the event through your vehicle's existing telematics system to Cummins for immediate analysis.



A notification based on the most probable cause is sent instantly to you via email or the free Connected Diagnostics mobile app, so you know exactly what action to take. That reduces guesswork and allows operators to safely proceed on their trip with the knowledge of the probable cause and information on when service can wait or if it needs to be performed immediately.

Key service event information that can be accessed using the Connected Diagnostics app includes the following:

- Derate notice banner
- Active and inactive faults
- Suggested root cause
- Derate notice details
- Possible performance impact
- Equipment information
- Cummins Service Locator
- Cummins contact information
- Current status of service events

Connected Diagnostics is designed to maintain complete service histories attached to each engine. Information about your transit or shuttle bus fleet is available on the Connected Diagnostics web portal anywhere you have Internet access. Learn more at cumminsengines.com/connected-diagnostics.

Source: Cummins

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2017 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: Cummins Inc. (U.S. Manufacturer or Importer) **Certificate Number: HCEXH0540LAT-018**	**Effective Date:** 12/27/2016 **Expiration Date:** 12/31/2017	Byron J. Bunker, Division Director Compliance Division	**Issue Date:** 12/27/2016 **Revision Date:** N/A

Model Year: 2017 **Manufacturer Type:** Original Engine Manufacturer **Engine Family:** HCEXH0540LAT **Intended Service Class:** Heavy Heavy-Duty Diesel **Fuel Type:** Diesel **FELs (g/hp-hr):** NOx: 0.2	**Intended Engine Application:** Vocational **Primary Test Configuration Transient Duty Cycle:** CO2 FCL value (g/hp-hr): 555 CO2 FEL value (g/hp-hr): 572 N2O FEL value (g/hp-hr): 0.12 CH4 FEL value (g/hp-hr): 0.1 **Primary Test Configuration Steady-State Duty Cycle:** CO2 FEL value (g/hp-hr): null

Pursuant to Section 206 of the Clean Air Act (42 U.S.C. section 7525), 40 CFR Parts 86 and 1036, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which represent the engine family, and is subject to the terms and conditions prescribed in those provisions.

This certificate of conformity covers only those new motor vehicle engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Parts 86 and 1036 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Parts 86 and 1036.

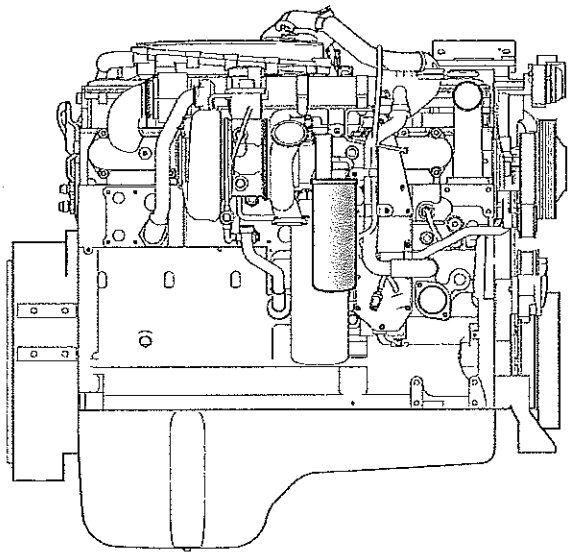
This certificate of conformity is conditional upon compliance of said manufacturer with the averaging, banking and trading provisions of 40 CFR Parts 86 and 1036. Failure to comply with these provisions may render this certificate void *ab initio*.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR Parts 86 and 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Parts 86 and 1036. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Parts 86 and 1036.

This certificate does not cover engines sold, offered for sale, or introduced, or delivered for introduction into commerce in the U.S. prior to the effective date of the certificate.

Oil Filter

All L9 engines are furnished by Cummins with a full flow engine oil filter mounted under the filter head, just below the oil cooler on the street side of the bus. These full flow filters include a higher filtration bypass section. This spin on filter is made by Fleetguard, a division of Cummins and contains an internal venture that provides filter bypass oil flow through a stacked disc section of the filter. The oil, supplied to the engine by the oil pump, passes through the full flow filter before reaching the various moving parts of the engine.



Oil Sampling

The optional Probalyzer™ brass mini-gauge sampling valve allows for easy engine oil sampling without shutting down the unit. Sampling with the Probalyzer plug requires the compatible Probalyzer I cap, which screws onto standard 4-ounce sample bottles, or the Probalyzer II Bottle, which is a self-contained sampling bottle.

GILLIG

SPINNER II OIL FILTER

The Spinner II model 576HE is a centrifugal type oil filter. It works by receiving oil from the engine oil gallery and sends the oil down through a cylinder or bowl that spins, driven by an air turbine, at a high rate of speed. This pushes the particles in the oil to the sides of the bowl where they stick, and allows the clean oil to drain out the bottom and back to the engine. GILLIG utilizes FC300 single wire braid, blue braid cover oil lines when utilizing the Spinner II.

SPINNER II PRODUCTS

New Spinner II® 576HE Centrifuges!

The Oil-cleaning Power of Spinner II Centrifuges – Now with Higher Efficiency

Introducing the Spinner II 576HE centrifuge: the compact, high-efficiency unit with a maintenance-free, replaceable rotor. The new 576HE brings the benefits of effective bypass oil cleaning to today's transit engines.

High Efficiency

As with all Spinner II centrifuges, the 576HE is powered by normal engine oil pressure. However, the 576HE centrifuge features a lightweight thermoplastic rotor and innovative high-speed bearing system. This allows it to generate centrifugal force 2,000 times greater than gravity.

The efficiency of the 576HE makes it highly effective at removing not only large particles, but also soot and other fine contaminants as small as one-tenth of a micron. By maintaining ultra-clean oil, the 576HE protects against premature wear and maximizes the service life of critical engine components - even in demanding transit service.

Convenient Disposable Rotors

Manufactured from engineered thermoplastic, the 576HE rotor is designed for ease of service. The single-use, disposable rotor is simply removed and replaced at each service interval. There are no special requirements for disposal. A used 576HE rotor may be disposed of as you would ordinary full-flow oil filters, or it may be drained and thrown away as regular trash.

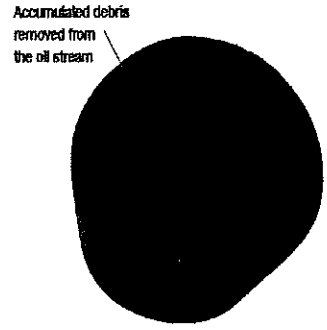
Advantages of the Spinner II 576HE

- Efficient removal of soot and fine particulate
- Reduces long-term engine wear
- Disposable rotor
- Reduces maintenance time
- No special requirements for used rotor disposal

Proven Technology

New Spinner II 576HE centrifuges incorporate the proven centrifugal filtration technology used on more than a million engines and trusted by transit fleets worldwide.

Spinner II centrifuges – oil-cleaning power and advanced protection for virtually any transit service engine.



Cross-section of a 576HE rotor after a routine service interval

T.F. HUDGINS INCORPORATED
SINCE 1947

www.spinnerii.com
Toll-free: 800-231-SPIN (7746)
Tel: 713-682-3651

ELECTRIC STARTER

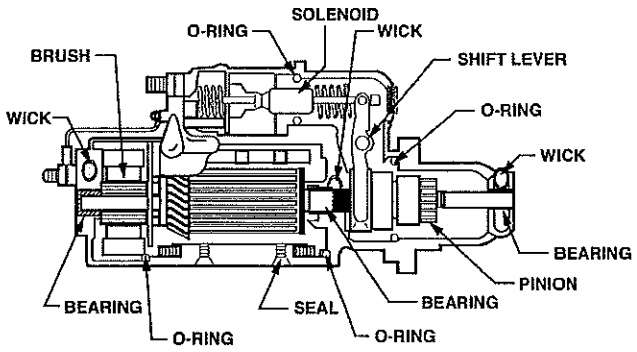
The starting system includes the batteries, starter motor, starter solenoid, starter control relay, rotary ignition switch and other circuit breakers, switches and wiring.

When the starter circuit is energized, the solenoid operates the shift lever to move the pinion into mesh with the flywheel ring gear. At the end of the solenoid travel, the solenoid makes electrical contact to complete the circuit for the starter motor. The motor then cranks the engine. The pinion remains engaged until the starter solenoid circuit is interrupted. If the pinion fails to engage the ring gear, the motor will not be energized, thus preventing damage to the pinion and gear teeth.

When the engine starts, the pinion overrunning clutch protects the armature from excessive speed until the switch is opened, at which time the return spring cause the pinion to disengage.

After the engine has started, the engine ECM will disable the starter circuit to prevent the starter from being engaged again, which precludes damage to the starter from engagement with the rotating flywheel ring gear.

The electrical starter motor is a heavy duty, solenoid operated unit. The armature shaft is supported in sintered bronze bushings in three places: the commutator end frame, the shift lever housing and the nose housing. O-ring seals are used between the commutator end frame and the field frame and between the shift lever housing and the field frame. A spring-loaded lip-type oil seal, together with an O-ring seal in the shift lever housing and a boot over the solenoid plunger prevent entry of oil into the armature, field coils and the solenoid case.



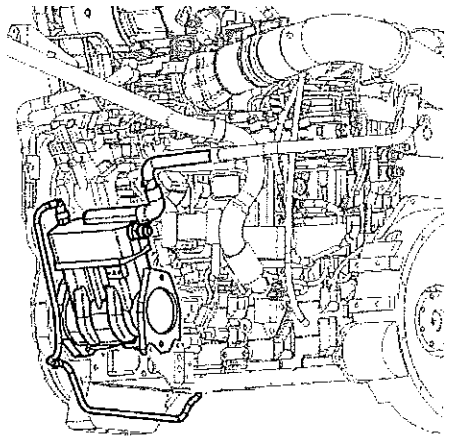
To prevent overheating and possible damage, the starter motor is equipped with an overcrank protection system. A thermostatically controlled mechanical circuit breaker is installed adjacent to the starter brush ground lead. The breaker connects to the starter magnetic switch. When the starter reaches the danger point, the circuit breaker opens, interrupting the ground circuit to the starter magnetic switch and de-energizing the solenoid. When the motor cools to a safe operating temperature, the circuit breaker automatically resets, allowing the starter to operate again.

AIR SYSTEM

The compressed air system operates the service brakes, emergency/parking brakes, suspension system, passenger door and the driver's seat. The basic air system is composed of an air compressor, air governor, air dryer, air reservoir tanks, overpressure (relief) and check valves, and the tubing, hoses and fittings necessary to connect all the components.

The air compressor is flange mounted to the curbside of the engine and is coupling driven. The air compressor is accessible through the rear engine door. Inlet air, oil lubrication, and coolant are supplied from the engine. The flow of air is controlled by an air governor mounted to the curbside A/C compressor outrigger.

The Cummins 30.4 air compressor provides and maintains air under pressure to operate devices in the air brake and auxiliary air systems of the bus. It consists of two major subassemblies: the cylinder head and the crankcase/cylinder block. The cylinder head contains the inlet, discharge, and unloader valving, as well as an integral relief valve. The cylinder head is mounted on the crankcase/ cylinder block. The crankcase/ cylinder block contains the cylinder bores, pistons, bearings, crankshaft, governor port, and connecting rods.

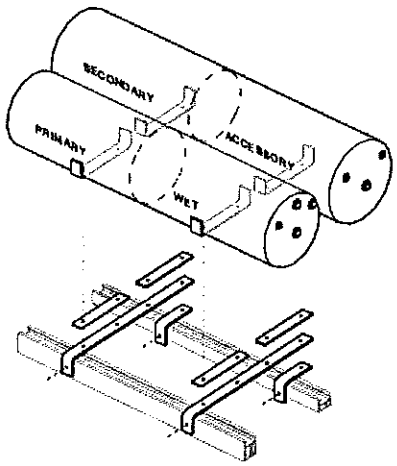


The air compressor provides compressed air through a braided stainless steel hoses, in order to dissipate heat, to the ping tank where the pulses form the air compressor are absorbed, providing smoother and quieter operation. The air dryer removes moisture from the compressed air. Accumulated moisture is regularly expelled from the air dryer onto the ground beneath the bus and will account for the occasional air discharge heard. The compressed air fills the air tanks.

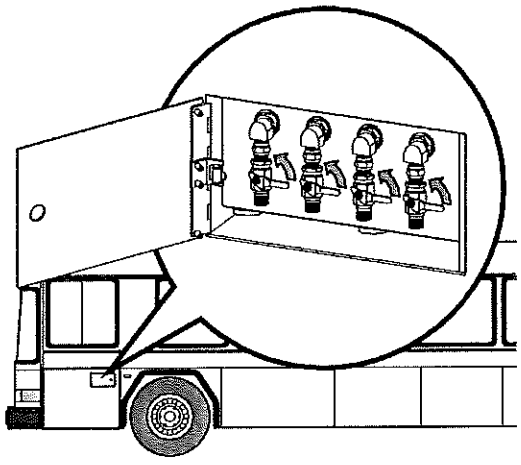
The SKF-2000 air governor, operating in conjunction with the air compressor unloading mechanism, automatically controls air pressure in the air brake or air supply system between the predetermined maximum and minimum pressures. The air compressor runs continuously while the engine runs, but actual compression of air into the vehicle air system is controlled by the governor which stops or starts compression when the maximum or minimum reservoir pressures are reached.

The air dryer and the wet tank also have a relief valve to prevent overpressure should the air governor fail. Dry air is delivered to the wet tank reservoir and from there, compressed air is supplied to the other three air reservoir tank. The four air reservoirs are located in a ceiling compartment in the front section of the bus.

There are two tanks, each partitioned into two separate reservoirs, providing four separate reservoirs. These tanks are, in order of priority, the wet tank, primary tank, secondary tank and accessory tank. The primary and secondary tanks supply the rear and front brakes, respectively. Air from the accessory supply tank operates the suspension system, the passenger doors and the driver's seat. The air reservoirs also serve to cool the air and condense water and oil vapors out of the compressed air. Most of this condensation takes place in the air dryer and the wet supply reservoir. The GILLIG air system is FMVSS 121 compliant.



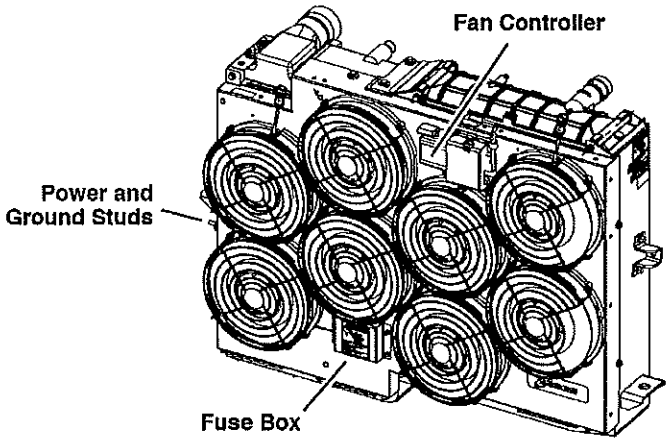
Each reservoir has a check valve at the supply port to maintain pressure in that tank if other reservoirs or air lines were to leak. Each tank is fitted with a standard manual drain valve. GILLIG Low Floors incorporate these drain valves inside the battery compartment door at the front, driver's side of the bus. The drain lines discharge at street level below the floor of the bus.



The heat generated by the engine is dissipated by a coolant solution that is circulated under pressure within the cooling system. The cooling system includes the pump, radiator, surge tank, engine thermostat and the piping to connect the components.

The recovery tank allows routine maintenance of coolant levels. The thermostat is located in the thermostat housing on the engine. When a cold engine is started or when the coolant temperature is below operating temperature, the coolant flow to the radiator is blocked or restricted by the thermostat. A bypass provides coolant circulation within the engine during the warm-up period. Coolant from the engine pump is circulated through the transmission fluid cooler to absorb heat from the transmission fluid.

The cooling module assembly consists of the engine coolant radiator and the charge air cooler, which receives hot air from the engine turbocharger and cools it before it returns to the engine. The cooling module assembly is mounted on chassis outriggers at the left rear corner of the bus in the engine compartment. Rubber vibration mounts isolate the cooling module assembly from chassis vibrations. Hot coolant enters the radiator through the upper piping, circulates through the core, and returns to the engine through the lower piping. The Modine E-Fan cooling system uses eight small electric fans to push air through the cooling module and over the engine for cooling.



There are two banks of fans. One bank contains two fans for the charge air cooler. The other bank contains six fans for the radiator. Each bank of fans is controlled independently. The speed of each bank varies depending on a J1939 signal from the engine ECM. The motor and electronics of each fan are fully sealed in order to be completely waterproof.

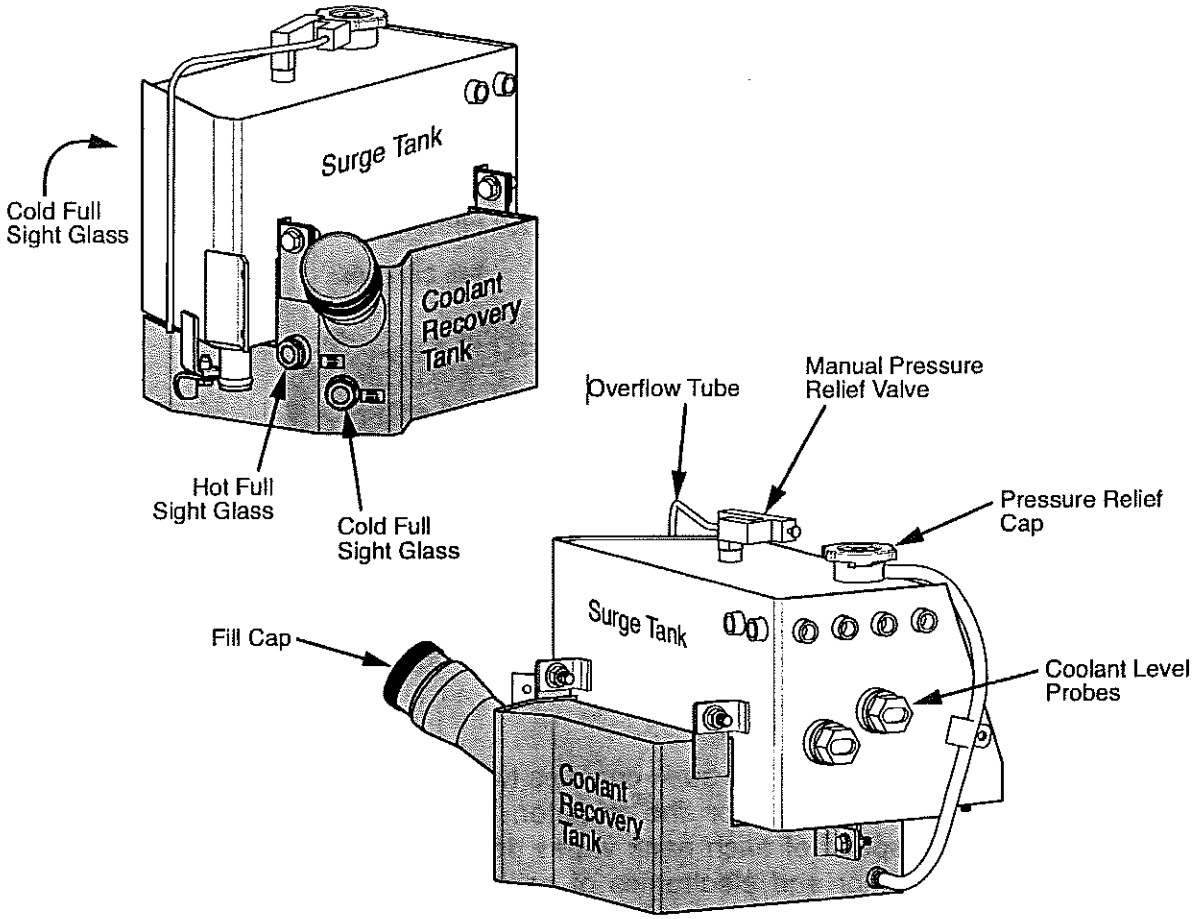
The charge air cooler fans star about 5 seconds after the engine has started and run at low speed most of the time. They can reach maximum speed quickly as needed due to charge air cooling needs. The radiator fans stay on for a minimum of 30 seconds at a time to prevent excessive thermal cycling. An engine fan reverse switch in the rear run box can be used to blow out any trapped debris.

Surge Tank and Recovery Tank

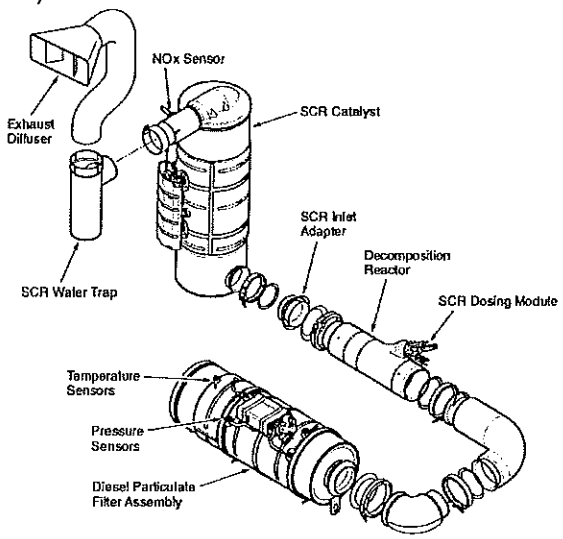
The cooling system is filled through the surge tank. A pressure cap at the surge tank maintains pressure within the cooling system.

The surge tank is attached to the coolant recovery tank and mounted in the left rear corner of the engine compartment separately from the cooling module assembly. The surge tank has one sight glass and the recovery tank has two sight glasses.

The automatic pressure relief cap releases excess pressure when the system heats up and allows coolant back into the surge tank without air when the system cools down. The manual pressure relief valve allows for safe relief of system pressure to perform maintenance or system inspections.



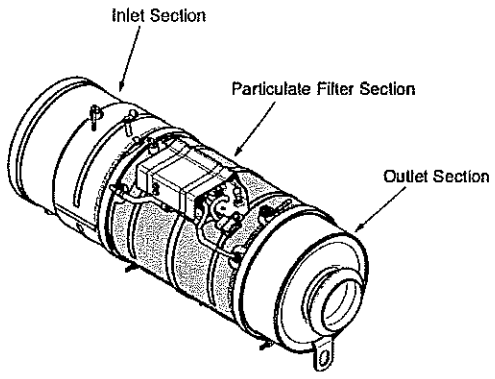
The exhaust system is made up of the engine exhaust manifold, a turbocharger, a particulate filter, a Diesel Exhaust Fluid (DEF) supply, a decomposition tube, a Selective Catalytic Reduction (SCR) and an exhaust diffuser.



Hot exhaust gases from the exhaust manifold are directed to the turbocharger. The pressurized exhaust gasses rotate a turbine wheel at one end of the turbine shaft, which compresses intake air going to the cylinders for more efficient combustion.

Diesel Particulate Filter (DPF)

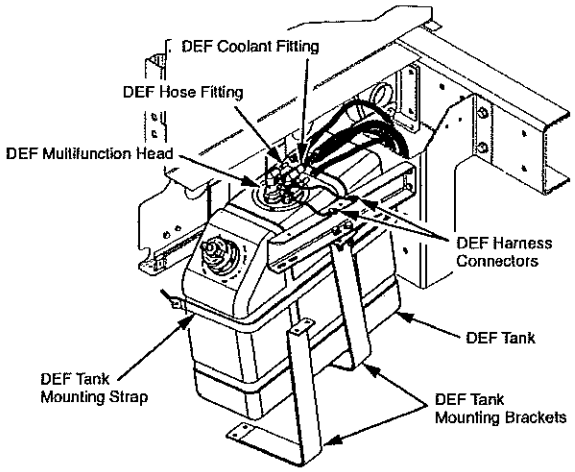
The particulate filter helps the bus meet the current air-quality requirements by removing particulate matter (soot) from diesel engine exhaust. The DPF is an active particulate filter, which monitors exhaust system backpressure which automatically "regenerates" by burning off the collected particulate matter. When backpressure reaches a certain pre-programmed level, the engine computer will increase the exhaust temperature and the particulate filter will go into an active regeneration mode.



Diesel Exhaust Fluid (DEF)

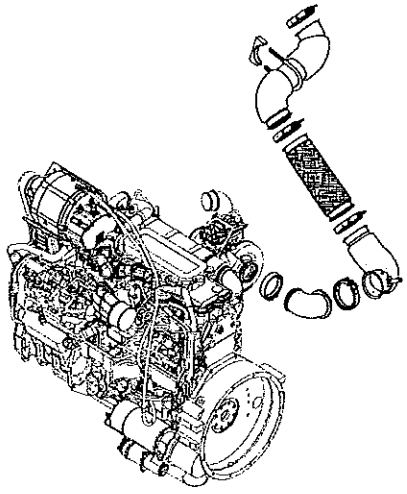
The bus carries a tank of diesel exhaust fluid (DEF) which is mounted on a chassis outrigger on the rear curbside of the bus and can be filled through a filter door behind the

rear wheel. The tank and associated pipping are accessible through the rear curbside access panel. DEF consumption will vary depending on the engine load.



Selective Catalytic Reduction (SCR)
Selective Catalytic Reduction (SCR) is an exhaust aftertreratement system that significantly reduces the amount of oxides of nitrogen (NOx) emitted from the exhaust. The DEF is injected into the decomposition chamber by the dosing moduel. When the DEF mixes with the hot exhaust, ammonia is released. The exhaust/ammonia mixture passes through the SCR catalyst, where the oxides of nitrogen are turned into nitrogen and water.

Flexible Exhaust Bellows
A flexible exhaust bellows absorbs vibration and thermal expansion that would otherwise cause exhaust system components to shake off or break.

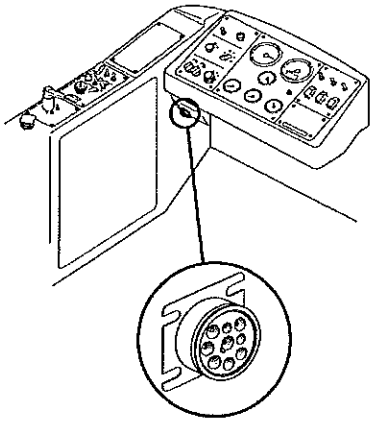


Exhaust Diffuser
To redirect and diffuse the heat generated through the emissions system, all GILLIG buses are equipped with an exhaust diffuser.

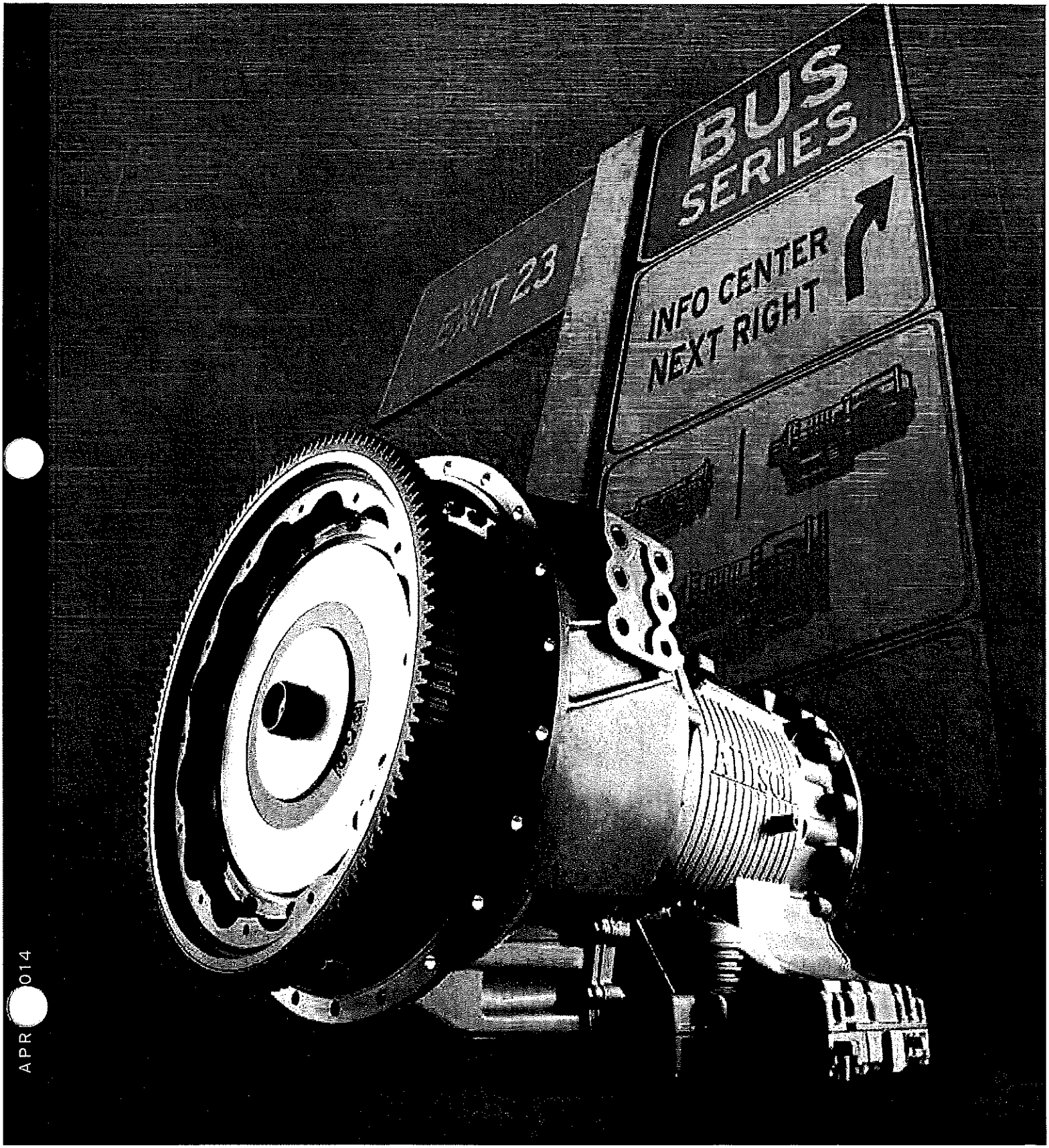
On-board Diagnostics

EXHAUST SYSTEM

The Cummins engine features On-Board Diagnostics (OBD). On-Board Diagnostics are designed to monitor the performance of the vehicle's emission system to help detect issues, recognize faults and ensure optimal performance. The OBD system continuously monitors the engine and after-treatment system, recognizing the potential for an out-of-range event, thus providing a real-time alert of the entire emission control system. The OBD test port is located under the left dash panel, left of the steering wheel.

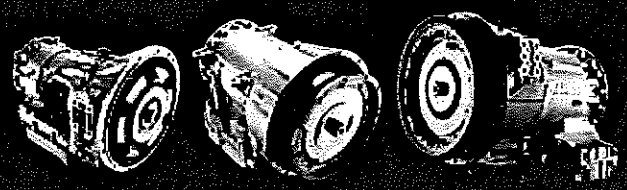


Allison Transmission®



APR 014

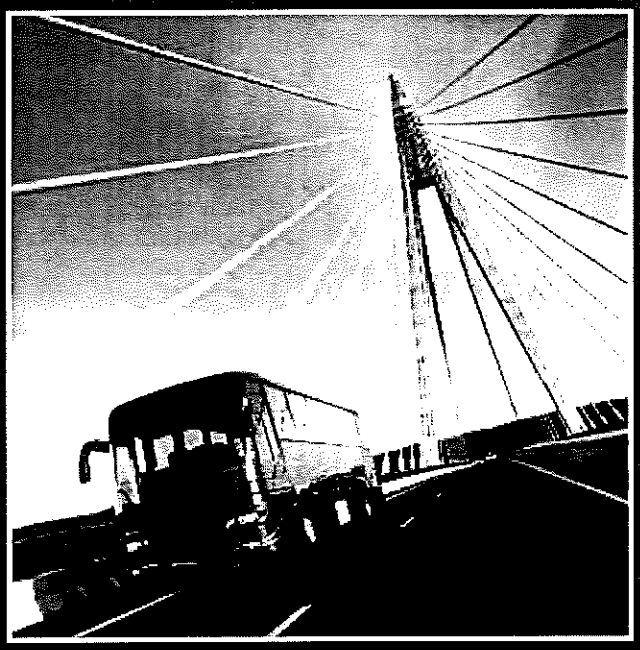
Allison Transmission is Optimized. Our commitment to understand and satisfy your needs drives us to constantly analyze, refine and improve our products and their features. Nothing else delivers the durability, productivity and fuel efficiency like an Allison. When it comes to transit and charter bus applications, Allison Bus Series fully automatic transmissions help keep your vehicles and your business on schedule with maximum operating economies, improved vehicle performance and better passenger comfort. If it's not Allison, it's not Optimized.



B 210, B 220 B 300, B 400 B 500

Life cycle value. When you factor in all life cycle costs — vehicle purchase price, insurance, fuel, tires, preventive maintenance, component repair, driver wages, taxes, license, permits and retail resale value — along with the increased productivity, an Allison Automatic-equipped vehicle costs less per mile* to operate than a comparable competitively-equipped vehicle.

*Results may vary depending on your operating conditions. See your local authorized Allison Dealer to find the potential productivity gains for your particular business.



Proven reliability and durability. Allison Transmission has built a reputation on our ability to build transmissions that last just about forever. That is why Allison Automatics are the preferred choice for many large, well-known transit and charter bus fleets.

No power interrupts.

On a vehicle with an automated manual transmission, the power interrupts that occur during shift changes result in lower average wheel horsepower. With an Allison Automatic, there is no power interrupt during shift changes so Allison Automatic's can make full use of the engine's horsepower. No power interrupts also contribute to a smoother ride.

Torque converter.

Increased shifting performance, faster acceleration, greater operating flexibility and minimal rollback are all advantages attributed to the patented heavy-duty Allison torque converter. The torque converter's cushion effect reduces shock and strain on all driveline components.

FUELSENSE®

Allison Bus Series models are now available with FuelSense.®

DYNAMIC SHIFT SENSING	Feature that automatically selects between lower and higher speed shift schedules based on the vehicle's weight and the grade on which it's operating.
ECOCAL	A defined set of low and "super" low speed shift schedules designed to keep the engine speed at its optimum point, maintaining necessary performance without shift cycling.
NEUTRAL AT STOP	BUS STOP — Feature that reduces or eliminates the load on the engine while the vehicle is stopped, reducing fuel usage and emissions.
ACCELERATION RATE MANAGEMENT	Feature that mitigates aggressive driving practices by automatically controlling engine torque. The intensity of control is determined by the vehicle's weight and grade on which it's operating.
5TH GENERATION ELECTRONIC CONTROLS	To get the most out of every drop of fuel, Allison 5th Generation Electronic Controls offer an enhanced array of smart controls designed to increase fuel economy and fuel efficiency for the specific needs of buses.

Keeping it safe. The driver in an Allison-equipped bus has more time to check the mirrors and to look forward and behind. There simply aren't as many distractions.

Comprehensive coverage.
All Allison Bus Series models offer comprehensive coverage with 100% parts and labor. Coverage may vary by model and application. Contact your Allison representative for details

Maintenance made easy.
Routine oil and filter changes are the only regular preventive maintenance required with an Allison Automatic. An Allison Approved TES 295 transmission fluid greatly extends oil change intervals for most applications.

PROGNOSTICS	Calibrated to the vehicle's particular operating requirements, Allison prognostics monitor various operating parameters to determine and alert when service is due. This eliminates unnecessary oil and filter changes and provides maximum transmission protection.
INCREASED LOCKUP AVAILABILITY	B 300 and B 400 models equipped with this feature are able to shift into lockup in 1st range, and lockup stays on through 1st to 2nd shift. The transmission's electronic controls monitor acceleration to determine when to activate lockup. APPLICATION ENGINEERING REVIEW IS REQUIRED FOR THIS FEATURE.
RETARDER ENABLE	Allison's electronic controls precisely blend the transmission with the ABS-compatible, integral retarder and the vehicle's service brakes to provide peak braking efficiency.
SECONDARY SHIFT SCHEDULE	Allows driver to select between two pre-programmed shift patterns, quickly and easily, to match driving conditions.
DIRECTION CHANGE ENABLE	Prohibits shifts from Neutral to Drive or Reverse without first pressing a dash switch or applying the service brakes.
AUXILIARY FUNCTION RANGE INHIBIT	Will not allow transmission to shift into forward or reverse unless the service brakes are applied.

Ratings and Specifications

RATINGS

MODEL	RATIO	PARK PAWL	MAX INPUT POWER[1] w/o SEM	MAX INPUT TORQUE[1] w/o SEM	MAX INPUT POWER w/SEM or TORQUE LIMITING[1,2]	MAX INPUT TORQUE w/SEM or TORQUE LIMITING[1,2]	MAX TURBINE TORQUE[3]	MAX GVW	MAX GCW
			hp (kW)	lb-ft (N • m)	hp (kW)	lb-ft (N • m)	lb-ft (N • m)	lbs (kg)	lbs (kg)
B 210									
– Transit	Close Ratio	No	230 (172)	520 (705)	270[4] (201)[4]	575[4] (780)[4]	850 (1152)	29,000 (13,150)	29,000 (13,150)
B 220									
– Transit	Close Ratio	Yes	230 (172)	520 (705)	270[4] (201)[4]	575[4] (780)[4]	850 (1152)	29,000 (13,150)	29,000 (13,150)
B 300									
– Transit	Close Ratio	n/a	280 (209)	735 (997)	n/a	n/a	1370 (1857)	38,000 (17,236)	38,000 (17,236)
B 400									
– Transit	Close Ratio	n/a	300 (224)	925 (1254)	n/a	n/a	1370 (1857)	45,000 (20,412)	45,000 (20,412)
– Tour Coach	Close Ratio	n/a	330 (246)	1000 (1356)	n/a	n/a	1600 (2170)	45,000 (20,412)	45,000 (20,412)
B 500									
– Transit	Close Ratio	n/a	420 (313)	1300 (1763)	n/a	n/a	2450 (3322)	–	–
– Intercity Coach	Close Ratio	n/a	550 (410)	1700 (2305)	n/a	n/a	2450 (3322)	–	–

1 Gross ratings as defined by ISO 1585 or SAE J1995. 2 SEM = engine controls with Shift Energy Management. 3 Turbine torque limit based on ISCAAN standard deductions. 4 With SEM available 2010.

GEAR RATIOS – TORQUE CONVERTER MULTIPLICATION NOT INCLUDED

MODEL	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH	REVERSE
B 210	3.10:1	1.81:1	1.41:1	1.00:1	0.71:1	0.61:1	–	-4.49:1
B 220	3.10:1	1.81:1	1.41:1	1.00:1	0.71:1	0.61:1	–	-4.49:1
B 300	3.49:1	1.86:1	1.41:1	1.00:1	0.75:1	0.65:1	–	-5.03:1
B 400	3.49:1	1.86:1	1.41:1	1.00:1	0.75:1	0.65:1	–	-5.03:1
B 500	3.51:1	1.91:1	1.43:1	1.00:1	0.74:1	0.64:1	–	-4.80:1

ENGINE SPEEDS

MODEL	FULL LOAD GOVERNED SPEED	IDLE SPEED IN DRIVE	OUTPUT SHAFT SPEED
	Min-Max (rpm)	Min-Max (rpm)	rpm
B 210/220	2200-3200	500-820	4500
B 300/400	1950-2800	500-800	3600[1]
B 500	1700-2300	500-800	–

1 Retarder-equipped models only.

OPTIONAL RETARDER PROVISION – INTEGRAL, HYDRAULIC TYPE

MODEL	TORQUE CAPACITY lb-ft (N • m)	POWER CAPACITY hp (kW)
B 300/400		
– High	1600 (2170)	600 (447)
– Medium	1300 (1760)	500 (373)
– Low	1100 (1490)	400 (298)
B 500		
– High	2000 (2710)	600 (447)
– Medium	1600 (2170)	600 (447)
– Low	1300 (1760)	500 (373)

TORQUE CONVERTER SPECIFICATIONS

MODEL	TORQUE CONVERTER	NOMINAL STALL TORQUE
B 210/220	TC-210	2.05
	TC-211	1.91
	TC-221	1.73
	TC-222	1.58
B 300/400	TC-411	2.71
	TC-413	2.44
	TC-415	2.35
	TC-417	2.20
	TC-418	1.98
	TC-419	2.02
	TC-421	1.77
B 500	TC-521	2.42
	TC-531	2.34
	TC-541	1.90
	TC-551	1.79
	TC-561	1.58

STANDARD POWER TAKEOFF PROVISION – CONTINUOUS OPERATION

MODEL	MOUNTING PAD POSITIONS VIEWED FROM REAR	DRIVE GEAR RATING WITH ONE PTO lb-ft (N • m)	DRIVE GEAR RATING WITH TWO PTOS lb-ft (N • m)	DRIVE
B 210[1]	3 and 9 o'clock	250 (339)	200[2] (271)[2]	Turbine
B 220[1]	3 and 9 o'clock	250 (339)	200[2] (271)[2]	Turbine
B 300[1]	4 and 8 o'clock	485 (660)	685[3] (930)[3]	Engine
B 400[1]	4 and 8 o'clock	485 (660)	685[3] (930)[3]	Engine
B 500[1]	1 and 8 o'clock	685 (930)	1175 (1595)	Engine

1 PTO-delete option available. 2 Rating per PTO. 3 Total on the drive gear.

PHYSICAL DESCRIPTION

MODEL	LENGTH[1] in (mm)	DEPTH[2] W/DEEP OIL PAN/SUMP in (mm)	DEPTH[2] W/SHALLOW OIL PAN/SUMP in (mm)	DRY WEIGHT lbs (kg)
B 210/220				
– SAE No. 3 mounting	28.01 (711.4)	11.22 (284.9)	–	330 (150)
– SAE No. 2 mounting	28.39 (721.1)	11.22 (284.9)	–	330 (150)
B 300/400				
– Basic model	28.29 (718.6)	12.90 (327.8)	11.14 (283.1)	535 (243)
– With PTO only	32.49 (825.4)	12.90 (327.8)	11.14 (283.1)	575 (261)
– With retarder only	28.29 (718.6)	12.90 (327.8)	11.14 (283.1)	615 (279)
– With PTO & retarder	32.49 (825.4)	12.90 (327.8)	11.14 (283.1)	655 (297)
B 500				
– Basic model	30.54 (775.8)	14.75 (374.7)	13.17 (334.6)	831 (377)
– With PTO only	33.42 (848.8)	14.75 (374.7)	13.17 (334.6)	893 (405)
– With retarder only	30.54 (775.8)	14.75 (374.7)	13.17 (334.6)	906 (411)
– With PTO & retarder	33.42 (848.8)	14.75 (374.7)	13.17 (334.6)	968 (439)

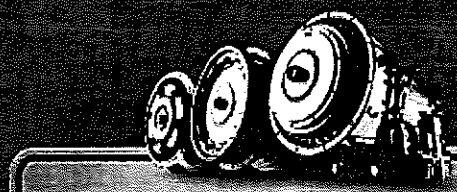
1 Length measured from flywheel housing to end of output shaft. 2 Depth measured below transmission centerline.

OIL SYSTEM

MODEL	CAPACITY[1] quarts (liters)	MAIN CIRCUIT FILTER	LUBE CIRCUIT FILTER	ELECTRONIC OIL LEVEL SENSOR (OLS)
B 210/220		Spin-On Canister	–	–
– Standard Oil Sump	14.8[2] (14)[2]			
B 300/400		Integral	Integral	Standard
– Deep Oil Sump w/o PTO	29[2] (27.4)[2]			
– Shallow Oil Sump w/o PTO	26[2] (24.6)[2]			
B 500		Integral	Integral	Standard
– Deep Oil Sump and PTO	51[2] (48)[2]			
– Deep Oil Sump	48[2] (45)[2]			
– Shallow Oil Sump and PTO	43[2] (41)[2]			
– Shallow Oil Sump	40[2] (38)[2]			

Recommended oil types for all models are Allison Approved TES 295 transmission fluid.

1 Transmission only. Does not include cooler, hoses or fittings. 2 Amount of oil necessary to fill a dry transmission.



ALLISON BRAND PROMISE

The Allison Brand Promise is the automatic experience with an unrivaled combination of Quality, Reliability, Durability, Vocational Value, and Customer Service.

P.O. Box 894, Speed Code PF3
Indianapolis, Indiana 46206-0894

SA3740EN (2014/04)
ISO/QS 9000 and ISO 14001 Certified

Allison Transmission.

2.7 BUS TESTING PROVISION

The Bidder and Manufacturer agree to comply with 49 U.S.C. 5318(e) and FTA's implementing regulation at 49 CFR Part 665 and shall perform the following:

1) A manufacturer of a new bus model or a bus produced with a major change in components or configuration, shall provide a copy of the final test report and that the bus model achieved a passing score to the recipient at a point in the procurement process specified by the recipient which will be prior to the recipient's final acceptance of the first vehicle.

2) A manufacturer who releases a report under paragraph 1 above shall provide notice to the operator of the testing facility that the report is available to the public.

3) If the manufacturer represents that the vehicle was previously tested, the vehicle being sold should have the identical configuration and major components as the vehicle in the test report, which must be provided to the recipient prior to recipient's final acceptance of the first vehicle. If the configuration or components are not identical, the manufacturer shall provide a description of the change and the manufacturer's basis for concluding that it is not a major change requiring additional testing.

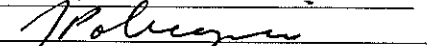
4) If the manufacturer represents that the vehicle is "grandfathered" (has been used in mass transit service in the United States before October 1, 1988, and is currently being produced without a major change in configuration or components), the manufacturer shall provide the name and address of the recipient of such a vehicle and the details of that vehicle's configuration and major components.

CERTIFICATION OF COMPLIANCE WITH FTA'S BUS TESTING REQUIREMENTS

The undersigned [Bidder/Manufacturer] certifies that the vehicle offered in this procurement complies with 49 U.S.C. 5318(e) and FTA's implementing regulation at 49 CFR Part 665.

The undersigned understands that misrepresenting the testing status of a vehicle acquired with Federal financial assistance may subject the undersigned to civil penalties as outlined in the Department of Transportation's regulation on Program Fraud Civil Remedies, 49 CFR Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 CFR Part 29.

Date: NOVEMBER 15, 2017

Signature: 

Company Name: GILLIG LLC

Title: JOSEPH POLICARPIO, VICE PRESIDENT

BIDDERS MUST INCLUDE THE ALTOONA TEST REPORT WITH THEIR BID FOR VEHICLE BEING PROPOSED.

NOTE: REFERENCE OUR ATTACHED ALTOONA BUS TEST CERTIFICATION.

GILLIG

ALTOONA BUS TEST CERTIFICATION

This is to certify that the bus model proposed for your procurement complies with the bus testing regulations required by the Surface Transportation and Uniform Relocation Assistance Act of 1987 as defined in the Interim Final Rulemaking (IFR) by the FTA in the Federal Register 49 CFR Part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated August 1, 2016.

This statement means that the proposed vehicle complies with one or more of the clauses below, as required by the above IFR:

- was in mass transportation service prior to September 30, 1988, or
- is the same vehicle model that has been previously tested in PTI (Altoona), and that
- any new component(s) has (have) been tested at PTI (Altoona), or
- the installation of any new component(s) did not result in significant structural modification to the vehicle; or
- the installation of the component(s) did not result in a significant change in the data obtained from previous testing of the vehicle model.

GILLIG LLC

By: _____

JOSEPH POLICARPIO

Title: VICE PRESIDENT

Date: NOVEMBER 15, 2017

TESTING

Altoona Testing

Attached are copies of the complete test report for each of following GILLIG Altoona Tests:

1. PTI-BT-R0410 – 35'/40' Low Floor Diesel (Dec'04)
2. PTI-BT-R9922-06-00 – 29' Low Floor Diesel (June'00)

Side Impact Testing

The attached Crash Test report, including pre- and post-crash pictures, shows the results of the testing conducted at a private test facility in Ohio. The test was conducted on a specially built "worst-case" forty foot (40') Low Floor built in late 1997. The bus was first subjected to the full Altoona Bus Test prior to the crash test in 1998.

The test requires a 4,000lb car to be crashed into the side of the bus at 25mph. The impact is to cause no more than 3" of permanent structural deformation at the seated passengers hip height and should not produce any sharp edges protruding into the interior of the bus.

The test results found that the impact caused no more than ½" deformation at the H-point and there were no sharp edges or protrusions.

Conclusion

- Actual deformation was less than 17% of that allowed
- Damage was so insignificant that structural repair was not required
- Damage was essentially confined to two quick-change skirt panels and their lower anchor plates
- Total repair time was estimated at less than 1 hour for a 3M mechanic. No welding was required; skirt panels were unbolted from their anchor plates and were pulled from the mid-rail channel. The anchor plates were replaced and new, pre-painted skirt panels were installed
- Total repair cost was estimated at less than $750, parts and labor

These results are unmatched by any competing vehicle and are a testimony to GILLIG's superior design knowledge and technology as well as an acknowledgment of the vehicle's structural strength and build integrity. These results are proof of the value and durability built into each GILLIG bus.

GILLIG

TESTING AND DESIGN OPERATING PROFILE VALIDATION

Structural Analysis Validation - Completed

- Design Load Calculations
- Design Codes (interior lighting, driver's visibility, etc.)
- Design FMVSS Requirements
- Stress Calculations
- Finite Element Analysis
- Computer Simulations

Component Application Analysis - Completed

- Component Selections
- Component Application Approvals
- Computer Simulations

Physical Validation Testing – Most Current Completion Date

- Optimization of Ride and Handling – 2011
- Vibration Tests – 2010
- Turning Radius Tests – 2011
- Engine Manufacturer Approvals
    - Cummins IQA Approvals 2007
    - Cummins IQA Approvals 2010
    - Cummins IQA Approvals 2013
    - Cummins IQA Approvals 2015 EMP Radiator only
    - Cummins IQA Approvals 2017 ISB BAE Hybrid
    - Cummins IQA includes engine/emission system installation approval, cooling system validation and compliance with electrical, AEB's.
- Strain Gauge Validation – 2005
- Loaded Road Dynamic Stress Test – 2006
- TRW Steering Geometry Test – 1998
- Crashworthiness Test – 1998
- Thermo King Performance Test – 2010
- Altoona Test 40' Diesel Bus Complete (ISM/Voith) – December 2004
- Altoona Test 40' Hybrid Bus Complete (ISB/EV40) – October 2004
- Altoona Test 29' Diesel Bus Complete (S40/B300) – June 2000
- Altoona Test 40' Hybrid Bus Complete (ISL/Voith Hybrid) – 2010
- Altoona Test 40' CNG Bus Complete (ISLG/B400R) – May 2011
- Altoona Test 29' CNG Bus Complete (ISLG/B400R) – January 2012
- Altoona Test 40' BAE Hybrid – July 2012
- Altoona Test 29' ISL – June 2010
- Altoona Test 40' CNG/Disc Brake – June 2013

TESTING AND DESIGN OPERATING PROFILE VALIDATION

- FMVSS 121 Testing – Brakes
  - 2002 29 Ft. Low Floor Drum Brakes
  - 1999 29 Ft. Low Floor Drum Brake
  - 1998 40 Ft. Low Floor Drum Brake
  - 1997 40 Ft. Low Floor Drum Brake
  - 2011 40 Ft. Low floor Drum Brake 27,000 Rear GAWR
  - 2013 40 Ft. Low floor Meritor Disc Brakes
  - 2015 29' Low floor Meritor Disc Brakes
- Transmission Installation Approval & Cooling Tests
  - Allison 2007, 2010, 2013
  - Voith 2007, 2010, 2013
  - ZF 2007, 2010, 2013
- Amerex Fire Suppression Installation Approval 2013
- Kidde Fire Suppression Installation Approval 2013
- Fogmaker Fire Suppression Installation Approval 2013
- Fire Trace Fire Suppression Installation Approval 2013
- Fire suppression installation approvals ongoing with new configurations

APPENDIX C

FEDERAL REQUIREMENTS AND CERTIFICATIONS

1.0 FEDERAL REQUIREMENTS

1.1 INSPECTION-FEDERAL

The U.S. Department of Transportation, Federal Transit Administration and/or representatives ofthe MaineDOT shall have the right and be at liberty to inspect, with the cooperation of the successful bidder, materials and workmanship of proposed vehicles and shall have the right to reject materials and workmanship which do not conform to the specifications. Inspections, if any, shall take place during normal business hours. Whether or not inspection is made, the successful bidder shall not be relieved of any obligation to furnish material and workmanship strictly in accordance with specifications.

1.2 CIVIL RIGHTS

The following requirements apply to the underlying contract:

(1) Nondiscrimination - In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. § 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6102, section 202 of the Americans with Disabilities Act of 1990, 42 U.S.C. § 12132, and Federal transit law at 49 U.S.C. § 5332, the successful bidder agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, disability, or sexual preference. In addition, the successful bidder agrees to comply with applicable Federal implementing regulations and other implementing requirements FTA may issue.

(2) Equal Employment Opportunity - The following equal employment opportunity requirements apply to the underlying contract:

(a) Race, Color, Creed, National Origin, Sex - In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. § 2000e, and Federal transit laws at 49 U.S.C. § 5332, the successful bidder agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 C.F.R. Parts 60 et seq ., (which implement Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," 42 U.S.C. § 2000e note), and with any applicable Federal statutes, executive orders, regulations, and Federal policies that may in the future affect construction activities undertaken in the course of the Project. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, creed, national origin, sex, age, or sexual preference. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, the successful bidder agrees to comply with any implementing requirements FTA may issue.

(b) Age - In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. § § 623 and Federal transit law at 49 U.S.C. § 5332, the successful bidder agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

(c) Disabilities - In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. § 12112, the successful bidder agrees that it will comply with the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630, pertaining to employment of persons with disabilities. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

(3) The successful bidder also agrees to include these requirements in each subcontract financed in whole or in part with Federal assistance provided by FTA, modified only if necessary to identify the affected parties.

Contract Work Hours and Safety Standards (If Applicable)

All subcontracts of the successful bidder, and all lower tiers subcontracts, shall contain or reference all applicable provisions of this Invitation to Bid.
To the extent applicable any procurement may be covered by The Contract Work Hours and Safety Standards Act as codified at 40 USC 3701, 40 USC
3701(b)(1)(B)(iii) and (b)(2), 40 USC 3701(b)(3) (A)(iii),29 CFR 5.5(b), 29 CFR 5.5(c), 29 CFR 5.2(h), and 49 CFR 18.36(i)(6), Maine DOT will include this clause in said procurements with the following language.

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

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

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

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

1.3 FLY AMERICA REQUIREMENTS:
The successful bidder agrees to comply with 49 U.S.C. 40118 (the "Fly America" Act) in accordance with the General Services Administration's regulations at 41 CFR Part 301-10, which provide that recipients and sub-recipients of Federal funds and their successful bidders are required to use U.S. Flag air carriers for U.S Government-financed international air travel and transportation of their personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The successful bidder shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S. flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly

America requirements. The successful bidder agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

1.4 CARGO PREFERENCE - USE OF UNITED STATES-FLAG VESSELS:

The successful bidder agrees: a. to use privately owned United States-Flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to the underlying contract to the extent such vessels are available at fair and reasonable rates for United States-Flag commercial vessels; b. to furnish within 20 working days following the date of loading for shipments originating within the United States or within 30 working days following the date of leading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of -lading in English for each shipment of cargo described in the preceding paragraph to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590 and to the FTA recipient (through the successful bidder in the case of a subcontractor's bill-of-lading.) c. to include these requirements in all subcontracts issued pursuant to this contract when the subcontract may involve the transport of equipment, material, or commodities by ocean vessel.

1.5 PRE-AWARD AND POST-DELIVERY AUDIT REQUIREMENTS:

The successful bidder agrees to comply with 49 U.S.C. § 5323(l) and FTA's implementing regulation at 49 C.F.R. Part 663 and to submit the following certifications:

(1) Buy America Requirements: The successful bidder shall complete and submit a declaration certifying either compliance or noncompliance with Buy America. If the Bidder/Offeror certifies compliance with Buy America, it shall submit documentation which lists 1) component and subcomponent parts of the rolling stock to be purchased identified by manufacturer of the parts, their country of origin and costs; and 2) the location of the final assembly point for the rolling stock, including a description of the activities that will take place at the final assembly point and the cost of final assembly.

(2) Solicitation Specification Requirements: The successful bidder shall submit evidence that it will be capable of meeting the bid specifications.

(3) Federal Motor Vehicle Safety Standards (FMVSS): The successful bidder shall submit 1) manufacturer's FMVSS self-certification sticker information that the vehicle complies with relevant FMVSS or 2) manufacturer's certified statement that the contracted buses will not be subject to FMVSS regulations.

1.6 CLEAN AIR:

(1) The successful bidder agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§ 7401 et seq . The successful bidder agrees to report each violation to the Purchaser and understands and agrees that the Purchaser will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.

(2) The successful bidder also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

1.7 CLEAN WATER:

(1) The successful bidder agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq . The successful bidder agrees to report each violation to the Purchaser and understands and agrees that the Purchaser will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.

(2) The successful bidder also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

1.8 ENERGY CONSERVATION:

The successful bidder agrees to comply with mandatory standards and policies relating to energy efficiency

which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

1.9 FEDERAL CHANGES:

Successful bidder shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between Purchaser and FTA, as they may be amended or promulgated from time to time during the term of this contract. Successful bidder's failure to so comply shall constitute a material breach of this contract.

1.10 NO OBLIGATION BY THE FEDERAL GOVERNMENT.:

(1) The Purchaser and successful bidder acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of the underlying contract, absent the express written consent by the Federal Government, the Federal Government is not a party to this contract and shall not be subject to any obligations or liabilities to the Purchaser, successful bidder, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract.
(2) The successful bidder agrees to include the above clause in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

1.11 PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS:

(1) The successful bidder acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § § 3801 et seq . and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying contract, the successful bidder certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract or the FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, the successful bidder further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the Federal Government deems appropriate.
(2) The successful bidder also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 U.S.C. § 5307, the Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1) on the successful bidder, to the extent the Federal Government deems appropriate.
(3) The successful bidder agrees to include the above two clauses in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

1.12 INCORPORATION OF FEDERAL TRANSIT ADMINISTRATION (FTA) TERMS:

The preceding provisions include, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the preceding contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1E are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. The successful bidder shall not perform any act, fail to perform any act, or refuse to comply with any (name of grantee) requests which would cause (name of grantee) to be in violation of the FTA terms and conditions

1.13 SUSPENSION AND DEBARMENT

This contract is a covered transaction for purposes of 49 CFR Part 29, Executive orders 12549 & 12689, and 31 U.S.C 6101.. As such, the successful bidder is required to verify that none of the successful bidder, its

principals, as defined at 49 CFR 29.995, or affiliates, as defined at 49 CFR 29.905, are excluded or disqualified as defined at 49 CFR 29.940 and 29.945.

The successful bidder is required to comply with 49 CFR 29, Subpart C and must include the requirement to comply with 49 CFR 29, Subpart C in any lower tier covered transaction it enters into.

By signing and submitting its bid or proposal and the certificate of eligibility, the bidder or proposer certifies as follows:

The certification in this clause is a material representation of fact relied upon by the bidder. If it is later determined that the bidder or proposer knowingly rendered an erroneous certification, in addition to remedies available to the bidder, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The bidder or proposer agrees to comply with the requirements of 49 CFR 29, Subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

2.1 CERTIFICATE OF ELIGIBILITY

The GILLIG LLC (Company name) hereby certifies that it:

(1) Is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal Department or Agency;

(2) Have not, within a three year period preceding this proposal, been convicted of, nor had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction; violation of Federal or State anti-trust statutes; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for, or otherwise criminally or civilly charged by a governmental entity (Federal, State, or Local) with commission of any of the offenses listed in paragraph (2) of this certification; and

(4) Have not, within a three year period preceding this application, had one or more public transactions (Federal, State, or Local) terminated by default.

The Bidder certifies that if it becomes aware of any later information that contradicts the statements of paragraphs (1) through (4) above, it will promptly inform the State of Maine. Should the Bidder be unable to certify to the statements of paragraphs (1) through (4) above, it shall so acknowledge on its Signature Page and provide a written explanation to the State of Maine.

NOVEMBER 15, 2017
Dated

JOSEPH POLICARPIO
Printed Name of Person Bidding


Authorized Signature

VICE PRESIDENT
Title

2.2 NONCOLLUSION BIDDING CERTIFICATION

By submission of this Bid, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint bid, each party certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief:

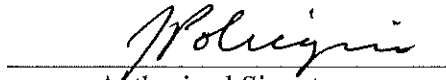
1. The prices in this Bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition as to any other matter relating to such prices with any other Bidder or with any other competitor;

2. Unless otherwise required by law, the prices which have been quoted in this Bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to opening, directly or indirectly, to any other Bidder or to any competitor; and,

3. No attempt has been made or will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a Bid for the purpose of restricting competition.

NOVEMBER 15, 2017
Dated

JOSEPH POLICARPIO
Printed name of Person Bidding


Authorized Signature

VICE PRESIDENT
Title

2.4 APPLICABLE REGULATIONS: SAFETY, EXHAUST & NOISE STANDARDS

Vehicles must meet all appropriate State and Federal Motor Vehicle Safety Standards, including standards for impact, rollover, brakes, windshield, windows and lights. FMVSS

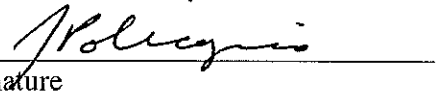
Vehicles must meet Federal noise and exhaust emission standards.

Vehicle must meet Federal accessibility specifications as published in the Americans with Disabilities Act (ADA) and 49 CFR Parts 27.37 and 38 as they apply to this purchase.

Please certify that vehicle being bid meets all Federal and State Safety Standards, Federal Noise & Exhaust/Emissions Standards, ADA regulations, ALL according to regulations cited above.

NOVEMBER 15, 2017
Date

JOSEPH POLICARPIO
Printed Name of Person Bidding


Signature

VICE PRESIDENT
Title

GILLIG

AIR POLLUTION CERTIFICATION

GILLIG LLC certifies that the buses delivered under this contract will conform to the applicable EPA emission regulations currently in effect. Certification documentation can be supplied on request.

Any request to comply with other regulations, including those subsequently enacted, shall be subject to separate negotiations and may include component, design, price, and delivery time adjustments.

GILLIG LLC

By: _____

JOSEPH POLICARPIO

Title: VICE PRESIDENT

Date: NOVEMBER 15, 2017

2.5 DISADVANTAGED BUSINESS/WOMEN OWNED BUSINESS ENTERPRISE GOALS

The undersigned hereby certifies that its Disadvantaged Business Enterprise/Women Owned Business Enterprise Goals have not been disapproved by the U.S. Department of Transportation Federal Transit Administration pursuant to 49 CFR, Part 26.49.

NOVEMBER 15, 2017
Date

JOSEPH POLICARPIO
Printed Name of Person Bidding

J Policarpio
Authorized Signature

VICE PRESIDENT
Title

NOTE: REFERENCE OUR ATTACHED DBE CERTIFICATION.

TRANSIT VEHICLE MANUFACTURERS (TVM)

Certification of Compliance with Disadvantaged Business Regulations

This procurement is subject to the provisions of 49 CFR Section 26.49. Accordingly, the following certification must be completed and submitted with the bid, as a condition of bidding. A bid which does not include the certification will not be considered.

TVM Certification

The bidder if a transit vehicle manufacturer, hereby certifies that it has complied with the requirements of 49 CFR Section 26.49 by submitting an annual DBE/WBE goal to the Federal Transit Administration (FTA). The goal has either been approved or not disapproved by FTA.

The bidder, if a non-manufacturer supplier, hereby certifies that the manufacturer of the transit vehicle to be supplied has complied with the above referenced requirement of 49 CFR Section 26.49.

JOSEPH POLICARPIO
Printed Name of Person Bidding

NOVEMBER 15, 2017
Date

J Policarpio
Signature

VICE PRESIDENT
Title

NOTE: REFERENCE OUR TVM CERTIFICATION

DISADVANTAGED/MINORITY BUSINESS ENTERPRISE (DBE/MBE) CERTIFICATION

GILLIG LLC, 451 Discovery Drive, Livermore California 94551, hereby certifies that GILLIG LLC has complied with the requirements of 49 CFR Part 26 of the Transportation Assistance Act of 1982, and submitted the required documents to the Federal Transit Administration (FTA).

The FTA advised that GILLIG has obtained 49 C.F.R. Part 26.49 certification and we are eligible to bid on federally funded contracts in FY2018. Transit customers may call the FTA for verification.

BRITNEY BERRY
FEDERAL TRANSIT ADMINISTRATION
Office of Civil Rights
1200 New Jersey Avenue SE
Washington, DC 20590
Phone: 202-366-1065
E-mail: britney.berry@dot.gov

GILLIG LLC

By: _____

JOSEPH POLICARPIO

Title: VICE PRESIDENT

Date: NOVEMBER 15, 2017

GILLIG

TRANSIT VEHICLE MANUFACTURER (TVM) CERTIFICATION

GILLIG LLC, a Transit Vehicle Manufacturer, hereby certifies that it has complied with the requirements of 49 CFR Part 26 by submitting an annual combined Disadvantaged Business Enterprise (DBE) goal to the Federal Transit Administration (FTA). The goals apply to Federal Fiscal Year 2018 and have not been approved or disapproved by the FTA.

GILLIG LLC

By: _____

JOSEPH POLICARPIO

Title: VICE PRESIDENT

Date: NOVEMBER 15, 2017

2.6 BUY AMERICA:

The successful bidder agrees to comply with 49 U.S.C. 5323(j) and 49 C.F.R. Part 661, which provide that Federal funds may not be obligated unless steel, iron, and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 C.F.R. 661.7. Separate requirements for rolling stock are set out at 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. 661.11. :

Rolling stock must be assembled in the United States and have a 70 percent domestic content.

Certification requirement for procurement of buses, other rolling stock and associated equipment:

Certificate of Compliance with 49 U.S.C. 5323(j)(2)(C).

The bidder or offeror hereby certifies that it will comply with the requirements of 49 U.S.C. 5323(j)(2)(C) and the regulations at 49 C.F.R. Part 661.11.

Date NOVEMBER 15, 2017

Signature _____

Company Name GILLIG LLC

Title JOSEPH POLICARPIO, VICE PRESIDENT

Certificate of Non-Compliance with 49 U.S.C. 5323(j)(2)(C)

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. 661.11, but may qualify for an exception pursuant to 49 U.S.C. 5323(j)(2)(A), 5323(j)(2)(B), or 5323(j)(2)(D), and 49 C.F.R. 661.7.

Date ------

Signature _____

Company Name _____

Title _____

STATE OF MAINE
AUGUSTA, ME
PRE-AWARD BUY AMERICA CERTIFICATE
FORTY FOOT LOW FLOOR TRANSIT BUSES (QTY: 2, OPTION: 13, BID/CONTRACT# RFQ17A091500000000000174)
15-Nov-17

GILLIG IS ONE OF THE MOST "AMERICAN" BUS MANUFACTURERS IN THE WORLD. Gillig is 100% U.S. owned and operated. ALL OF OUR FACILITIES are located in the U.S.A. ALL OF OUR MANUFACTURING is done in the U.S.A. and we have a policy that stresses the use of products produced in the U.S.A.

We certify full compliance with the FTA's "Buy America" regulations (Section 49 CFR Part 663) and submit the following abbreviated listing as evidence of this compliance.

COMPONENT	MANUFACTURER	COUNTRY OF ORIGIN	PERCENT OF TOTAL COST
AIR CONDITIONING SYSTEM	THERMO KING CORPORATION	U.S.A.	6.88%
AIR DRYER ASSEMBLY	SKF	U.S.A.	0.16%
BULKHEAD ASSEMBLY	ALVA GWYN, INC	U.S.A.	0.18%
CEILING PANELS	WILSONART LLC	U.S.A.	0.41%
COMPOSITE FLOORING	MILWAUKEE COMPOSITES, INC	U.S.A.	0.45%
DESTINATION SIGNS	HANOVER DISPLAYS INC	U.S.A.	1.29%
DRIVER'S BARRIER	McCLARIN PLASTICS (DBA AMTECH)	U.S.A.	0.11%
DRIVER'S SEAT	RECARO NORTH AMERICA, INC	U.S.A.	0.59%
ELECTRICAL HARNESSES & CABLES	LACO INC	U.S.A.	1.46%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS	U.S.A.	4.97%
ENGINE & AFTERTREATMENT SYSTEM	CUMMINS, INC	U.S.A.	14.46%
EXTERIOR MIRRORS	SAFE FLEET BUS & RAIL	U.S.A.	0.30%
EXTRUSIONS	SAPA EXTRUDER, INC	U.S.A.	1.07%
FABRICATIONS	DIE & TOOL PRODUCTS, INC	U.S.A.	1.29%
FABRICATIONS	GLOBAL CONTRACT MANUFACTURING (GCM)	U.S.A.	1.32%
FABRICATIONS	HOGAN MFG. INC	U.S.A.	0.37%
FABRICATIONS	IMPERIAL GROUP MANUFACTURING INC	U.S.A.	5.54%
FABRICATIONS	SAN FRANCISCO PIPE & TUBE BENDING, INC (SF TUBE)	U.S.A.	0.74%
FLOORING	RCA RUBBER COMPANY	U.S.A.	0.38%
FRONT AND REAR AXLE ASSEMBLIES	MERITOR HEAVY VEHICLE SYSTEMS	U.S.A.	4.71%
FRONT AND REAR BUMPER ASSEMBLIES	DYNATECH RO-LAB	U.S.A.	0.73%
FRONT CAP	McCLARIN PLASTICS (DBA AMTECH)	U.S.A.	0.57%
INTERIOR LIGHTING KIT	I/O CONTROLS CORPORATION	U.S.A.	1.35%
PASSENGER SEAT ASSEMBLIES	4ONE LLC	U.S.A.	5.01%
RADIATOR AND CHARGE AIR COOLER	MODINE	U.S.A.	1.88%
REAR CAP ASSEMBLY	COMMERCIAL PATTERN, INC	U.S.A.	0.23%
REAR SUSPENSION	SAF HOLLAND, INC	U.S.A.	1.08%
ROOF HATCH	SPECIALTY MANUFACTURING/SAFE FLEET AND RAIL	U.S.A.	0.14%
ROOF SKIN	CRANE COMPOSITES, INC.	U.S.A.	0.21%
TRANSMISSION	ALLISON TRANSMISSION	U.S.A.	5.35%
VOLTAGE REGULATOR	VANNER, INC.	U.S.A.	0.15%
WHEELWELL COVERS	McCLARIN PLASTICS (DBA AMTECH)	U.S.A.	0.40%
WINDOW ASSEMBLIES	DURA AUTOMOTIVE (EXCEL)	U.S.A.	2.82%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			66.60% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN LIVERMORE, CA.	GILLIG	U.S.A.	100.00%

GILLIG LLC
LIVERMORE, CALIFORNIA

DESCRIPTION AND COST OF FINAL ASSEMBLY FOR 35' & 40' LOW FLOOR BUSES

Gillig LLC certifies that final assembly of its buses occurs at its manufacturing plant in Livermore, California. The final assembly process consists of the assembly of the chassis; the installation and interconnection of the engine, transmission, axles, including the cooling and braking systems; the installation and interconnection of the heating and air conditioning equipment; the installation of pneumatic and electrical systems; mounting of the body structure to the chassis; installation of door systems; painting of the vehicle; installation of destination signs, windows, passenger seats, passenger grab rails, and wheelchair lifts; wheel alignment, dynamometer and road testing; final inspection, repairs and preparation of the vehicles for delivery.

The cost of the above mentioned activities for this order has been estimated to be $17,507.71 per bus.

STATE OF MAINE
AUGUSTA, ME
PRE-AWARD BUY AMERICA CERTIFICATE
THIRTY-FIVE FOOT LOW FLOOR TRANSIT BUSES (QTY: 2, OPTION: 13, BID/CONTRACT# RFQ17A091500000000000174)
15-Nov-17

GILLIG IS ONE OF THE MOST "AMERICAN" BUS MANUFACTURERS IN THE WORLD. Gillig is 100% U.S. owned and operated. ALL OF OUR FACILITIES are located in the U.S.A. ALL OF OUR MANUFACTURING is done in the U.S.A. and we have a policy that stresses the use of products produced in the U.S.A.

We certify full compliance with the FTA's "Buy America" regulations (Section 49 CFR Part 663) and submit the following abbreviated listing as evidence of this compliance.

COMPONENT	MANUFACTURER	COUNTRY OF ORIGIN	PERCENT OF TOTAL COST
A/C TRANSITION DUCTS	THERMAL STRUCTURES, INC	U.S.A.	0.11%
AIR CONDITIONING SYSTEM	THERMO KING CORPORATION	U.S.A.	7.02%
AIR DRYER ASSEMBLY	SKF	U.S.A.	0.16%
BULKHEAD ASSEMBLY	ALVA GWYN, INC	U.S.A.	0.18%
CEILING PANELS	WILSONART LLC	U.S.A.	0.40%
COMPOSITE FLOORING	MILWAUKEE COMPOSITES, INC	U.S.A.	0.46%
DESTINATION SIGNS	HANOVER DISPLAYS INC	U.S.A.	1.31%
DRIVER'S SEAT	RECARO NORTH AMERICA, INC	U.S.A.	0.61%
ELECTRICAL HARNESSES & CABLES	LACO INC	U.S.A.	1.33%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS	U.S.A.	5.16%
ENGINE & AFTERTREATMENT SYSTEM	CUMMINS, INC	U.S.A.	14.74%
EXTERIOR MIRRORS	SAFE FLEET BUS & RAIL	U.S.A.	0.30%
EXTRUSIONS	SAPA EXTRUDER, INC	U.S.A.	0.99%
FABRICATIONS	DIE & TOOL PRODUCTS, INC	U.S.A.	1.48%
FABRICATIONS	GLOBAL CONTRACT MANUFACTURING (GCM)	U.S.A.	1.25%
FABRICATIONS	HOGAN MFG. INC	U.S.A.	5.34%
FABRICATIONS	IMPERIAL GROUP MANUFACTURING INC	U.S.A.	0.94%
FABRICATIONS	SAN FRANCISCO PIPE & TUBE BENDING, INC (SF TUBE)	U.S.A.	0.79%
FLOORING	RCA RUBBER COMPANY	U.S.A.	0.38%
FRONT AND REAR AXLE ASSEMBLIES	MERITOR HEAVY VEHICLE SYSTEMS	U.S.A.	4.80%
FRONT AND REAR BUMPER ASSEMBLIES	DYNATECH RO-LAB	U.S.A.	0.74%
FRONT CAP	McCLARIN PLASTICS (DBA AMTECH)	U.S.A.	0.58%
INTERIOR LIGHTING KIT	I/O CONTROLS CORPORATION	U.S.A.	1.19%
PASSENGER SEAT ASSEMBLIES	4ONE LLC	U.S.A.	4.45%
RADIATOR AND CHARGE AIR COOLER	MODINE	U.S.A.	1.91%
REAR CAP ASSEMBLY	COMMERCIAL PATTERN, INC	U.S.A.	0.23%
REAR SUSPENSION	SAF HOLLAND, INC	U.S.A.	1.10%
ROOF HATCH	SPECIALTY MANUFACTURING/SAFE FLEET AND RAIL	U.S.A.	0.14%
ROOF SKIN	CRANE COMPOSITES, INC.	U.S.A.	0.19%
TRANSMISSION	ALLISON TRANSMISSION	U.S.A.	5.45%
VOLTAGE REGULATOR	VANNER, INC.	U.S.A.	0.15%
WHEELWELL COVERS	McCLARIN PLASTICS (DBA AMTECH)	U.S.A.	0.41%
WINDOW ASSEMBLIES	DURA AUTOMOTIVE (EXCEL)	U.S.A.	2.43%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			66.75% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN LIVERMORE, CA.	GILLIG	U.S.A.	100.00%

GILLIG LLC
LIVERMORE, CALIFORNIA

DESCRIPTION AND COST OF FINAL ASSEMBLY FOR 35' & 40' LOW FLOOR BUSES

Gillig LLC certifies that final assembly of its buses occurs at its manufacturing plant in Livermore, California. The final assembly process consists of the assembly of the chassis; the installation and interconnection of the engine, transmission, axles, including the cooling and braking systems; the installation and interconnection of the heating and air conditioning equipment; the installation of pneumatic and electrical systems; mounting of the body structure to the chassis; installation of door systems; painting of the vehicle; installation of destination signs, windows, passenger seats, passenger grab rails, and wheelchair lifts; wheel alignment, dynamometer and road testing; final inspection, repairs and preparation of the vehicles for delivery.

The cost of the above mentioned activities for this order has been estimated to be $17,507.71 per bus.

STATE OF MAINE
AUGUSTA, ME
PRE-AWARD BUY AMERICA CERTIFICATE
TWENTY-NINE FOOT LOW FLOOR TRANSIT BUSES (QTY: 2, OPTION: 13, BID/CONTRACT# RFQ17A091500000000000174)
15-Nov-17

GILLIG IS ONE OF THE MOST "AMERICAN" BUS MANUFACTURERS IN THE WORLD. Gillig is 100% U.S. owned and operated. ALL OF OUR FACILITIES are located in the U.S.A. ALL OF OUR MANUFACTURING is done in the U.S.A. and we have a policy that stresses the use of products produced in the U.S.A.

We certify full compliance with the FTA's "Buy America" regulations (Section 49 CFR Part 663) and submit the following abbreviated listing as evidence of this compliance.

COMPONENT	MANUFACTURER	COUNTRY OF ORIGIN	PERCENT OF TOTAL COST
A/C TRANSITION DUCTS	THERMAL STRUCTURES, INC	U.S.A.	0.12%
AIR CONDITIONING SYSTEM	THERMO KING CORPORATION	U.S.A.	6.51%
AIR DRYER ASSEMBLY	SKF	U.S.A.	0.17%
BULKHEAD ASSEMBLY	ALVA GWYN, INC	U.S.A.	0.18%
CEILING PANELS	WILSONART LLC	U.S.A.	0.32%
COMPOSITE FLOORING	MILWAUKEE COMPOSITES, INC	U.S.A.	0.37%
DESTINATION SIGNS	HANOVER DISPLAYS INC	U.S.A.	1.34%
DOOR CONTROLS & PANELS - FRONT	VAPOR BUS INTERNATIONAL	U.S.A.	0.78%
DOOR CONTROLS & PANELS - REAR	VAPOR BUS INTERNATIONAL	U.S.A.	0.82%
DRIVER'S BARRIER	McCLARIN PLASTICS (DBA AMTECH)	U.S.A.	0.12%
DRIVER'S SEAT	RECARO NORTH AMERICA, INC	U.S.A.	0.62%
ELECTRICAL HARNESSES & CABLES	LACO INC	U.S.A.	1.24%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS	U.S.A.	5.18%
ENGINE & AFTERTREATMENT SYSTEM	CUMMINS, INC	U.S.A.	15.03%
EXTERIOR MIRRORS	SAFE FLEET BUS & RAIL	U.S.A.	0.31%
EXTRUSIONS	SAPA EXTRUDER, INC	U.S.A.	0.87%
FABRICATIONS	DETENTION DEVICE SYSTEMS	U.S.A.	0.40%
FABRICATIONS	DIAMOND MANUFACTURING	U.S.A.	0.58%
FABRICATIONS	DIE & TOOL PRODUCTS, INC	U.S.A.	1.61%
FABRICATIONS	GLOBAL CONTRACT MANUFACTURING (GCM)	U.S.A.	1.24%
FABRICATIONS	HOGAN MFG. INC	U.S.A.	0.28%
FABRICATIONS	IMPERIAL GROUP MANUFACTURING INC	U.S.A.	5.44%
FABRICATIONS	RON NUNES ENTERPRISES	U.S.A.	0.44%
FABRICATIONS	SAN FRANCISCO PIPE & TUBE BENDING, INC (SF TUBE)	U.S.A.	0.19%
FLOORING	RCA RUBBER COMPANY	U.S.A.	0.39%
FRONT AND REAR AXLE ASSEMBLIES	MERITOR HEAVY VEHICLE SYSTEMS	U.S.A.	4.17%
FRONT AND REAR BUMPER ASSEMBLIES	DYNATECH RO-LAB	U.S.A.	0.76%
FRONT CAP	McCLARIN PLASTICS (DBA AMTECH)	U.S.A.	0.59%
INTERIOR LIGHTING KIT	I/O CONTROLS CORPORATION	U.S.A.	1.06%
MISCELLANEOUS	KD SPECIALTIES, INC	U.S.A.	0.75%
PASSENGER SEAT ASSEMBLIES	4ONE LLC	U.S.A.	3.70%
RADIATOR AND CHARGE AIR COOLER	MODINE	U.S.A.	1.95%
REAR CAP ASSEMBLY	COMMERCIAL PATTERN, INC	U.S.A.	0.24%
REAR SUSPENSION	SAF HOLLAND, INC	U.S.A.	0.98%
ROOF HATCH	SPECIALTY MANUFACTURING/SAFE FLEET AND RAIL	U.S.A.	0.15%
TRANSMISSION	ALLISON TRANSMISSION	U.S.A.	5.56%
VOLTAGE REGULATOR	VANNER, INC.	U.S.A.	0.15%
WINDOW ASSEMBLIES	DURA AUTOMOTIVE (EXCEL)	U.S.A.	1.93%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			66.53% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN LIVERMORE, CA.	GILLIG	U.S.A.	100.00%

GILLIG LLC
LIVERMORE, CALIFORNIA

DESCRIPTION AND COST OF FINAL ASSEMBLY FOR 29' LOW FLOOR BUSES

Gillig LLC certifies that final assembly of its buses occurs at its manufacturing plant in Livermore, California. The final assembly process consists of the assembly of the chassis; the installation and interconnection of the engine, transmission, axles, including the cooling and braking systems; the installation and interconnection of the heating and air conditioning equipment; the installation of pneumatic and electrical systems; mounting of the body structure to the chassis; installation of door systems; painting of the vehicle; installation of destination signs, windows, passenger seats, passenger grab rails, and wheelchair lifts; wheel alignment, dynamometer and road testing; final inspection, repairs and preparation of the vehicles for delivery.

The cost of the above mentioned activities for this order has been estimated to be $16,143.12 per bus.

GILLIG

FMVSS CERTIFICATION

FEDERAL MOTOR VEHICLE SAFETY STANDARDS CERTIFICATION

This is to certify that the GILLIG transit bus model(s) proposed, complies (comply) with all applicable Federal Motor Vehicle Safety Standard as required by the F.T.A. and the D.O.T., and described in Title 49 CFR Chapter V, part 571-FMVSS, last revised on October 1, 1998.

GILLIG LLC

By: _____

JOSEPH POLICARPIO

Title: VICE PRESIDENT

Date: NOVEMBER 15, 2017

REVISIONS					
SYM	BY	ZONE	DESCRIPTION	REL.	DATE
A	RAV		RELEASED FOR PRODUCTION	115460	10/04/16

MANUFACTURED BY GILLIG LLC

LIVERMORE, CALIFORNIA DATE: ___________

GVWR: ______ kg ______ lb

GAWR: FRONT ______ kg ______ lb

WITH ____ TIRES,

__________ RIMS AT ____ kPa ____ psi COLD SINGLE

GAWR: REAR ______ kg ______ lb

WITH ____ TIRES,

__________ RIMS AT ____ kPa ____ psi COLD DUAL

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S.
FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT
ON THE DATE OF MANUFACTURE SHOWN ABOVE.

VEHICLE I.D. NO.: __________________ MODEL: ___________

TYPE OF VEHICLE: BUS

ENGINE NUMBER: __________

UNLADEN WEIGHT: ______ lb

59-35132-007

NOTES:

1. ALL TEXT HEIGHT MUST BE GREATER THAN 3/32" TALL.
2. PRINT USING ZEBRA ZT410 LABEL PRINTER.
3. MINIMUM QUALITY SETTING OF 600DPI.
4. MEDIA TYPE IS THERMAL TRANSFER.
5. DARKNESS SETTING IS 28.
6. SPEED IS 2 INCHES PER SECOND.
7. DITHERING IS SMOOTH.

ITEM NO	DESCRIPTION	QTY
	MAKE FROM: 59-52697-001	1

GILLIG LLC
HAYWARD, CA

MARK PART W/PN PER GIL DB #370.002

LH AS SHOWN, RH OPPOSITE NONE

TITLE: DECAL-DATA PLATE
GILLIG LLC, LIVERMORE LOCATION

DWN: RAW DATE: 10/04/16

STD NO 302

ORIG ECO #: 115460

A 59-35132-007

SHEET 1 OF 3

255. Request for Pre-Offer Change or Approved Equal

This form must be used for requested clarifications, changes, substitutes or approval of items equal to items specified with a brand name and must be submitted as far in advance of the Due Date, as specified in "Questions, Clarifications and Omissions."

Request #: 48 **Proposer: GILLIG** **RFP Section: 2.6 BUY AMERICA CERTIFICATION** **Page: 116**		
Questions/clarification or approved equal: Rolling stock must be assembled in the United States and have a 70 percent domestic content. GILLIG respectfully advises that the current Buy America requirement for rolling stock is 65 percent for FY2018 and FY2019. This information can be found on the FTA's website at www.transit.dot.gov/buyamerica		
Agency action:	**X Approved** o See addendum	o Denied o See response below
Agency response:		

2.7 BUS TESTING PROVISION

The Bidder and Manufacturer agree to comply with 49 U.S.C. 5318(e) and FTA's implementing regulation at 49 CFR Part 665 and shall perform the following:

1) A manufacturer of a new bus model or a bus produced with a major change in components or configuration, shall provide a copy of the final test report and that the bus model achieved a passing score to the recipient at a point in the procurement process specified by the recipient which will be prior to the recipient's final acceptance of the first vehicle.

2) A manufacturer who releases a report under paragraph 1 above shall provide notice to the operator of the testing facility that the report is available to the public.

3) If the manufacturer represents that the vehicle was previously tested, the vehicle being sold should have the identical configuration and major components as the vehicle in the test report, which must be provided to the recipient prior to recipient's final acceptance of the first vehicle. If the configuration or components are not identical, the manufacturer shall provide a description of the change and the manufacturer's basis for concluding that it is not a major change requiring additional testing.

4) If the manufacturer represents that the vehicle is "grandfathered" (has been used in mass transit service in the United States before October 1, 1988, and is currently being produced without a major change in configuration or components), the manufacturer shall provide the name and address of the recipient of such a vehicle and the details of that vehicle's configuration and major components.

CERTIFICATION OF COMPLIANCE WITH FTA'S BUS TESTING REQUIREMENTS

The undersigned [Bidder/Manufacturer] certifies that the vehicle offered in this procurement complies with 49 U.S.C. 5318(e) and FTA's implementing regulation at 49 CFR Part 665.

The undersigned understands that misrepresenting the testing status of a vehicle acquired with Federal financial assistance may subject the undersigned to civil penalties as outlined in the Department of Transportation's regulation on Program Fraud Civil Remedies, 49 CFR Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 CFR Part 29.

Date: NOVEMBER 15, 2017

Signature: 

Company Name: GILLIG LLC

Title: JOSEPH POLICARPIO, VICE PRESIDENT

BIDDERS MUST INCLUDE THE ALTOONA TEST REPORT WITH THEIR BID FOR VEHICLE BEING PROPOSED.

NOTE: REFERENCE OUR ATTACHED ALTOONA BUS TEST CERTIFICATION.

GILLIG

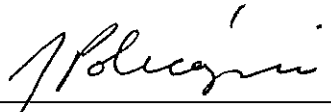
ALTOONA BUS TEST CERTIFICATION

This is to certify that the bus model proposed for your procurement complies with the bus testing regulations required by the Surface Transportation and Uniform Relocation Assistance Act of 1987 as defined in the Interim Final Rulemaking (IFR) by the FTA in the Federal Register 49 CFR Part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated August 1, 2016.

This statement means that the proposed vehicle complies with one or more of the clauses below, as required by the above IFR:

- was in mass transportation service prior to September 30, 1988, or
- is the same vehicle model that has been previously tested in PTI (Altoona), and that
- any new component(s) has (have) been tested at PTI (Altoona), or
- the installation of any new component(s) did not result in significant structural modification to the vehicle; or
- the installation of the component(s) did not result in a significant change in the data obtained from previous testing of the vehicle model.

GILLIG LLC

By: 

JOSEPH POLICARPIO

Title: VICE PRESIDENT

Date: NOVEMBER 15, 2017

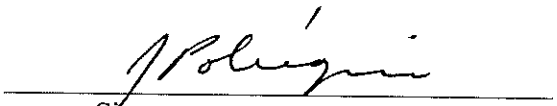
2.8 SPECIFICATION COMPLIANCE

The bidder hereby certifies that the vehicle(s) being bid in response to this invitation meet or exceed these specifications and that where a deviation from the specifications exists, the bidder has obtained written approval of those exceptions, in accordance with paragraph (1.13 (d), prior to submitting this bid.

If a conflict exists between these specifications and Federal and/or State laws, the Federal and/or State laws shall prevail and the bidder must alert the purchaser to any such conflicts.

NOVEMBER 15, 2017
Date

JOSEPH POLICARPIO
Printed Name of Person Bidding


Signature

VICE PRESIDENT
Title

GILLIG LLC HEREBY STATES THAT IT WILL COMPLY WITH THE BID SPECIFICATIONS IN ALL AREAS INCLUDING THE "CLARIFICATIONS, EXCEPTIONS OR APPROVED EQUALS" THAT WERE ACCEPTED AND GRANTED BY THE STATE OF MAINE DURING THE EXCEPTIONS PROCESS.

PLEASE REFERENCE THE ATTACHED CLARIFICATIONS IN RESPONSE TO THE STATE OF MAINE'S INQUIRIES TO GILLIG'S APPROVED EQUALS REQUESTS. PER TERRY DEMERCHANT'S EMAIL DATED 11/3/17 WE SUBMIT SAID CLARIFICATIONS WITH OUR BID SUBMISSION.

FURTHER, THE BUS AND PRICE ARE SUBMITTED WITH THE UNDERSTANDING THAT ALL CLARIFICATIONS, EXCEPTIONS AND APPROVED EQUALS WILL BE CONCURRED WITH BY THE STATE OF MAINE. GILLIG HAS MADE A DILIGENT AND COMPLETE REVIEW OF THE STATE OF MAINE'S REQUEST FOR QUOTATIONS (RFQ), INSOFAR AS IT IS POSSIBLE, ALL ISSUES HAVE BEEN ADDRESSED.

2.9 LOBBYING:

Byrd Anti-Lobbying Amendment, 31 U.S.C. 1352, as amended by the Lobbying Disclosure Act of 1995, P.L. 104-65 [to be codified at 2 U.S.C. § 1601, et seq.] - Bidders who apply or bid for an award of $100,000 or more shall file the certification required by 49 CFR part 20, "New Restrictions on Lobbying." Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose the name of any registrant under the Lobbying Disclosure Act of 1995 who has made lobbying contacts on its behalf with non-Federal funds with respect to that Federal contract, grant or award covered by 31 U.S.C. 1352. Such disclosures are forwarded from tier to tier up to the recipient.

APPENDIX A, 49 CFR PART 20--CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

(To be submitted with each bid or offer exceeding $100,000)

The undersigned [Bidder] certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form--LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions [as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96). Note: Language in paragraph (2) herein has been modified in accordance with Section 10 of the Lobbying Disclosure Act of 1995 (P.L. 104-65, to be codified at 2 U.S.C. 1601, et seq .)]

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

[Note: Pursuant to 31 U.S.C. § 1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure or failure.]

The Bidder, GILLIG LLC, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Bidder understands and agrees that the provisions of 31 U.S.C. A 3801, et seq., apply to this certification and disclosure, if any.

JPolicarpio Signature of Bidder's Authorized Official

JOSEPH POLICARPIO, VICE PRESIDENT Name and Title of Bidder's Authorized Official

NOVEMBER 1, 2017 Date

2.10 RECYCLED PRODUCTS:

(42 U.S.C. 6962; 40 CFR Pzrt247; Executive Order 12873)
The successful bidder agrees to comply with all the requirements of Section 6002 of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6962), including but not limited to the regulatory provisions of 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in Subpart B of 40 CFP.Part247. .

Signature _____

Title JOSEPH POLICARPIO, VICE PRESIDENT

Company Name GILLIG LLC

Date NOVEMBER 15, 2017

GILLIG

January 16, 2018

Terry DeMerchant
Procurement Manager
Division of Procurement Services
State of Maine
4th Floor Burton M. Cross Building
#9 State House Station
111 Sewall Street
Augusta, ME 04333-0009

Re: Request for Proposal RFQ 17A17091500000000000174 Bid Response to Questions for Gillig on 12 Year bus.

Dear Mr. DeMerchant,

In response to your Additional Questions for Clarification Purposes, received via email on January 9, 2018, GILLIG would like to respond as follows. For convenience sake, we have listed your question first followed by GILLIG'S response.

1. Could you provide information on the Hanover Destination Sign?

   GILLIG Response: GILLIG's proposal includes Hanover Amber LED destination signs in the front, curb side and rear locations. Please find attached additional information regarding these destination signs.

2. Section 158. Will the Red LED Light be installed on the Roof Escape Hatch as requested?

   GILLIG Response: As mentioned in our approved equal, GILLIG does not have a design for this feature. Our proposal includes the same emergency exit identification as previously delivered to the agencies in Maine by GILLIG. This identification has proven to be sufficient for transit agencies across the nation in every operation in which GILLIG buses are utilized.

3. Section 253. Requesting pricing and information on extended warranties

   GILLIG Response: GILLIG provided the following pricing for the extended coverages on the pricing schedules included with our proposal:

	Price per Unit	Coverage Period
Engine (Cummins)	$5,500	Total of 5 Years / 300,000 Miles (Whichever Occurs First)
Transmission (Allison)	$2,899	Total of 5 Years / 300,000 Miles (Whichever Occurs First)
Air Conditioning (Thermo King)	$1,851	3 Years
Electric Engine Fan (Modine)	$1,250	5 Years

4. Requesting Information on Under Coating Material used on the bus

   GILLIG Response: GILLIG utilizes HydroArmor, a latex based anti-corrosion undercoating which is highly sag resistant and intended for direct to metal underbody adhesion. It has passed over 1,000 hrs of salt spray resistance per ASTM B-117 as well as 100% relative humidity testing per ASTM D-1748. The film is not affected when immersed in aggressive, caustic solutions. This undercoating is environmentally safe and meets the strictest of air quality regulations.

5. Repair Manuals: What GILLIG and Vendor Manuals will be provided with the bid?

   GILLIG Response: Each GILLIG order includes the following manuals:

Manual	Quantity
GILLIG Drivers Manual	5
GILLIG Service Manual	5
GILLIG Electrical Schematics Manual	5
GILLIG Parts Manual	5
GILLIG Manuals	5
Cummins Engine Manual	2
Allison Transmission Manual	2
Axle Manual	2
Brake System Manual	2
Wheel Manual	2
Destination Sign Manual	2
Wheelchair Ramp Manual	2
HVAC Manual	2
Drivers Heater Manual	2
Driver Seat Manual	2

6. GILLIG Approved Equal Request #35 states the Drivers Fan & Fuel Tank Gauge is not required per technical specification. The request the Fuel Gauge is on Page 53. Table # 4 but is also shown in the dash layout. The request for drivers Dash Fan is on Page 54. Table # 4, but is not shown on the Console layout provide by GILLIG.

   GILLIG Response: Table #4 is taken from the APTA Standard Bus Procurement Guidelines. In GILLIG's experience, this table is often not updated to reflect the options selected throughout the rest of the specification. As a result, GILLIG clarified in our approved equal that the table was not representative of the items included in the rest of the technical specification and in our 10/31/17 answer to the question posed in response to our original approved equal, we clarified that the following was listed in the table but not otherwise required to be included in the base bus price:
   - Video System Event Switch (Video systems were listed as optional items in technical specifications and price pages)
   - Red light for Master Door/interlock
   - Retarder disable (will be amber in place of red)
   - Fuel Tank Gauge
   - DEF Gauge (amber lamp in place of red)
   - Drivers Auxiliary fan (not required in technical specifications)

Additionally, our proposal noted that the dash layout included in our proposal was intended to show basic layout configuration and not specific details. GILLIG will provide a custom layout for the Agency's review during the preproduction meeting.

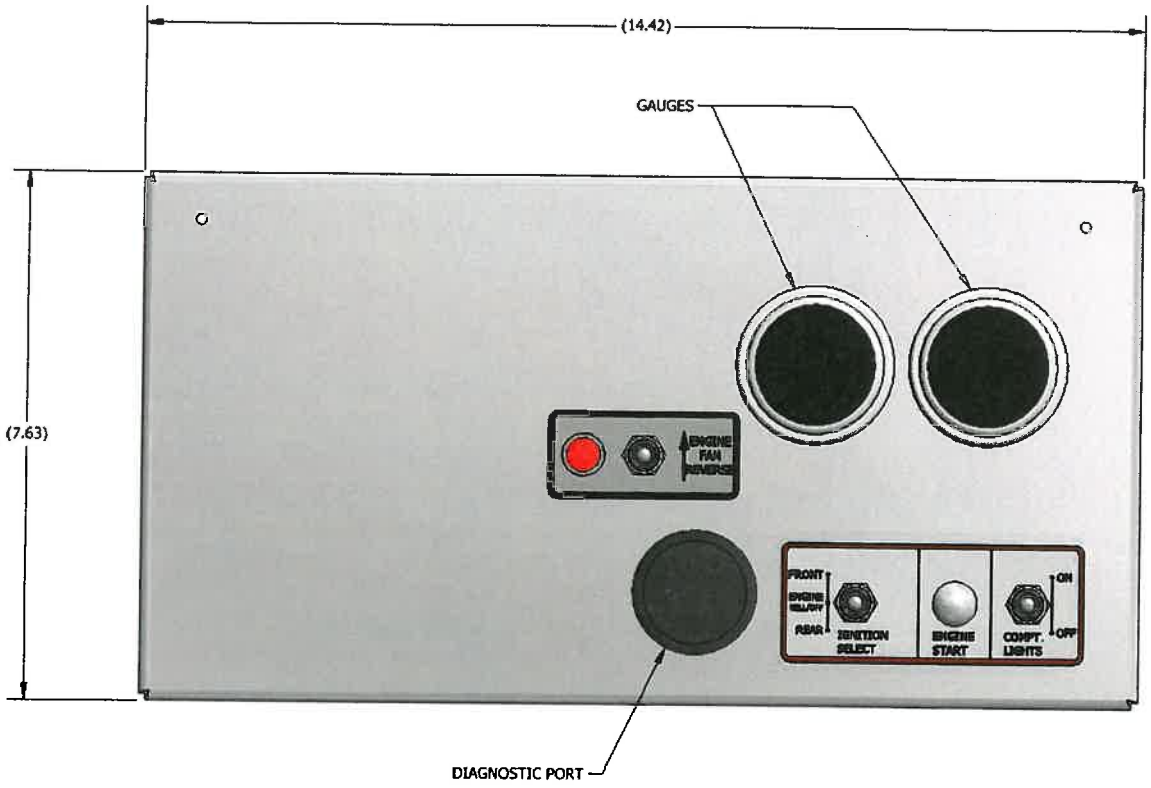
While our proposal did not include pricing for the fuel tank gauge or the auxiliary driver's dash fan, these options are available for the agencies at an additional price of $50 and $96, respectively.

7. In the console layout that was provided by GILLIG the following items that was not located on the layout. Will the following items be supplied with the bus as request in Table 4: Engine Test Switch, Silent Alarm Switch, Remote Mirrors Control Switch, Heater Mirrors Switch, Retarder Disable Switch, Engine Test switch, Pleasure Radio Controls & Switches?

   GILLIG Response: As our proposal noted. the dash layout included in our proposal was intended to show basic layout configuration and not specific details. GILLIG will provide a custom layout with the requested items for the Agency's review during the preproduction meeting.

8. Could GILLIG provide a layout of the Rear Run Box?

   GILLIG Response: Please refer to the following:



9. Is there an option for a wider Ricon ramp?

   GILLIG Response: The width of the wheelchair ramp is driven by the width of the front door which is maximized based on the design of our chassis. As such, there are no additional widths available for this ramp.

10. Request information on the Webb rear axle in the 30' bus

    GILLIG Response: GILLIG utilizes a Meritor RS-23160 single drive axle. Refer to the attached brochure for additional information.

We welcome the opportunity to discuss any of these items in further detail and will provide any additional information which will assist in your positive consideration of the above items. GILLIG believes we are able to provide the State of Maine with the best value proposal to meet your needs and look forward to our presentation and interview next week.

Sincerely,

Benjamin M. Gruat
Director of Project Sales Management
Phone: (510) 2564-5093

cc: Joseph Policarpio, Vice President
William F. Fay Jr., Director National Sales
Norm Reynolds, Regional Sales Manager

LED DISPLAY DATA SHEET
MATRIX: 160x17
Product code: DD028

MECHANICAL DATA	
Case dimensions (excluding brackets):	66 x 10 1/2 x 2" / 1675 x 269 x 50mm (l x h x d)
Viewing area:	64 3/4 x 8 3/4" / 1646 x 222mm (l x h)
Sign construction:	Punched and folded aluminum case (no welds), for increased strength, no louvers required. Matte black, powder coat finish.
Weight:	20.1lbs / 9.5kg
Cable exit points:	Rear panel top left, top right, bottom left, bottom right (to be specified at time of order)

DISPLAY DATA	
Maximum character height:	8 3/4" / 222mm
Text format:	Static, paging or scrolling, 1 or 2 lines
Font options:	Hanover fonts as supplied with Helen programming software plus Windows™ fonts
Display technology:	High visibility LEDs (with integrated ambient light sensor control (full linear range from 10-100% range))
Communication interfaces:	RS485 (standard). J1708, RS232, IBIS, Ethernet (via display controller)

LED SPECIFICATION	
Lifetime (to ½ brightness):	Approx. 100,000 hours dependent on temperature and current
Size and type:	1/8 x 5/32" / 3.2 x 4.0mm (w x h) oval through-hole
Dominant color wavelength:	Amber 588 - 594nm (typically 591nm)
Pitch:	Horizontal: 13/32" / 10.2mm - vertical: 17/32" / 13.3mm
Viewing angle (horizontal):	120°

ELECTRICAL DATA	
Operating voltage:	24Vdc nominal (18-32V)
Typical power consumption (33% on at 100% brightness):	27 watts (1.11A measured at 24V)
Maximum power consumption (all on at 100% brightness):	48 watts (2.00A measured at 24V)
Electrical protection:	Anti-surge, reverse polarity
Display processor fuse rating:	5A quick blow

OPERATIONAL DATA	
Temperature range (storage):	0 - 140°F (0 - 180°F) / -20° to +60°C (-20° to +80°C)
Humidity:	95% max

Product guaranteed for 12 years against faulty materials and/or workmanship.
Buy America compliant – Signs (including casework and PCB's) are all manufactured in the USA.
Hanover Displays LED signs meet Automotive EMC Directive ECE R10 as amended. Certificate N°E11 10R-046100.
Hanover Displays LED signs meet United Nations Automotive Burning Behaviour Directive ECE R118.
Certificate N°E11 118RII-021140.
ADA, Equality Act 2010, PSV Accessibility Regulations & Annexe 11 compliant.

Hanover Displays Inc.
1601 Tonne Road
Elk Grove Village, IL 60007
T +1 (773) 334 9934
www.hanoverdisplays.com

LED DISPLAY DATA SHEET
MATRIX: 96x8
Product code: DD044

MECHANICAL DATA	
Case dimensions (excluding brackets):	38 1/2 x 6 x 2" / 980 x 152 x 50mm (l x h x d)
Viewing area:	37 1/4 x 3 1/2" / 946 x 87mm (l x h)
Sign construction:	Punched and folded aluminum case (no welds), for increased strength, no louvers required. Matte black, powder coat finish.
Weight:	8lbs / 3.6kg
Cable exit points	Top left, top right, bottom left, bottom right (to be specified at time of order)

DISPLAY DATA	
Maximum character height:	3 1/2" / 87mm
Text format:	Static, paging or scrolling, 1 line
Font options:	Hanover fonts as supplied with Helen programming software plus Windows™ fonts
Display technology:	High visibility LEDs (with integrated ambient light sensor control (full linear range from 10-100% range))
Communication interfaces:	RS485 (standard). J1708, RS232, IBIS, Ethernet (via display controller)

LED SPECIFICATION	
Lifetime (to ½ brightness):	Approx. 100,000 hours dependent on temperature and current
Size and type:	1/8 x 5/32" / 3.2 x 4.0mm (w x h) oval through-hole
Dominant color wavelength:	Amber 588 - 594nm (typically 591nm)
Pitch:	Horizontal: 3/8" / 9.7mm - vertical: 13/32" / 10.2mm
Viewing angle (horizontal):	120°

ELECTRICAL DATA	
Operating voltage (24Vdc & 12Vdc models):	24Vdc nominal (18-32V) / 12Vdc nominal (10-32V)
Typical power consumption (33% on at 100% brightness):	8 watts (0.34A measured at 24V – 0.68A measured at 12V)
Maximum power consumption (all on at 100% brightness):	14 watts (0.59A measured at 24V – 1.2A measured at 12V)
Electrical protection:	Anti-surge reverse polarity
Display processor fuse rating:	5A quick blow

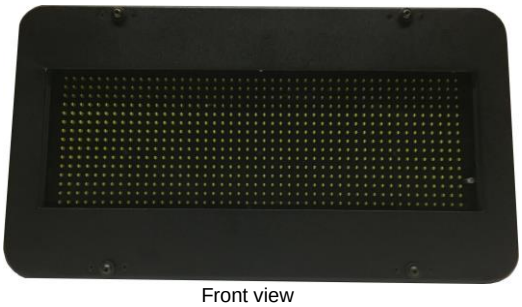
OPERATIONAL DATA	
Temperature range (storage):	0 - 140°F (0 - 180°F) / -20° to +60°C (-20° to +80°C)
Humidity:	95% max

Product guaranteed for 12 years against faulty materials and/or workmanship.
Buy America compliant – Signs (including casework and PCB's) are all manufactured in the USA.
Hanover Displays LED signs meet Automotive EMC Directive ECE R10 as amended. Certificate N°E11 10R-046100.
Hanover Displays LED signs meet United Nations Automotive Burning Behaviour Directive ECE R118.
Certificate N°E11 118RII-021140.
ADA, Equality Act 2010, PSV Accessibility Regulations & Annexe 11 compliant.

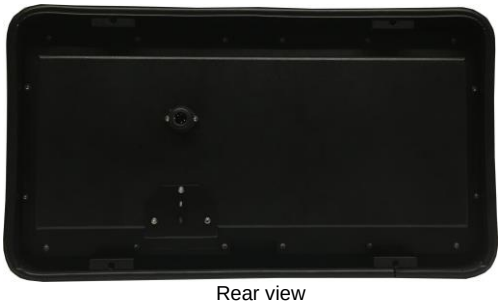
Hanover Displays Inc.
1601 Tonne Road
Elk Grove Village, IL 60007
T +1 (773) 334 9934
www.hanoverdisplays.com

LED DISPLAY DATA SHEET
MATRIX: 48x15

Product code: DD142



Front view



Rear view

MECHANICAL DATA	
Case dimensions (excluding brackets):	$22^{1}/_{8}$ x $12^{1}/_{4}$ x 2" / 562 x 311 x 51mm (l x h x d)
Viewing area:	$18^{1}/_{8}$ x $6^{1}/_{4}$" / 460 x 158mm (l x h)
Sign construction:	NEMA 4 / IP65 enclosure. Matte black, powder coat finish.
Weight:	14lbs / 6.4kg
Cable exit points:	Rear panel

DISPLAY DATA	
Maximum character height:	6" /152mm
Text format:	Static, paging or scrolling, 1 or 2 lines
Font options:	Hanover fonts as supplied with Helen programming software plus Windows™ fonts
Display technology:	High visibility LEDs (with integrated ambient light sensor control (full linear range from 10-100% range))
Communication interfaces:	RS485 (standard). J1708, RS232, IBIS, Ethernet (via display controller)

LED SPECIFICATION	
Lifespan (to ½ brightness):	100,000 hours MTBF (LED manufacturer's data)
Size and type:	$^{1}/_{8}$ x $^{5}/_{32}$" / 3.2 x 4.0mm (w x h) oval through-hole
Dominant color wavelength:	Amber 588 - 594nm (typically 591nm)
Pitch:	Horizontal: $^{3}/_{8}$" / 9.7mm - vertical: $^{13}/_{32}$" / 10.2mm
Viewing angle (horizontal):	120°

ELECTRICAL DATA	
Operating voltage (24Vdc & 12Vdc models):	24Vdc nominal (18-32V) / 12Vdc nominal (10-32V)
Typical power consumption (33% on at 100% brightness):	6 watts (0.25A measured at 24V - 0.50A measured at 12V)
Max. power consumption (all on at 100% brightness):	10 watts (0.43A measured at 24V - 0.86A measured at 12V)
Electrical protection:	Anti-surge, reverse polarity
Display processor fuse rating:	5A quick blow

OPERATIONAL DATA	
Temperature range (storage):	0 - 140°F (0 - 180°F) / -20° to +60°C (-20° to +80°C)
Humidity:	95% max

Product guaranteed for 12 years against faulty materials and/or workmanship.
Buy America compliant – Signs (including casework and PCB's) are all manufactured in the USA.
Hanover Displays LED signs meet Automotive EMC Directive ECE R10 as amended. Certificate N°E11 10R-059689.
ADA, Equality Act 2010, PSV Accessibility Regulations & Annexe 11 compliant.

Hanover Displays Inc.
1601 Tonne Road
Elk Grove Village, IL 60007
T +1 (773) 334 9934
www.hanoverdisplays.com

DRIVER CONSOLE DATA SHEET
ERIC ++

Product code: E420F

MECHANICAL	
Case dimensions (w x h x d):	$5^{2}/_{3}$ x $3^{3}/_{4}$ x $4^{3}/_{4}$" / 144 x 95 x 121mm
Mounting cut-out dimensions (w x h):	$5^{1}/_{2}$ x $3^{5}/_{8}$" / 138 x 92mm
Mounting type:	Dashboard/panel using DIN clamps
Approximate weight:	1.2lbs / 0.5kg
Driver interface :	20 button tactile membrane function/navigation keypad

DISPLAY	
Display size (w x h):	$2^{1}/_{4}$ x $^{3}/_{4}$" / 59.5 x 17.5mm
Display format:	128 x 32 pixels, multi-line or graphics including sign mimic
Display technology:	High resolution LCD

DATA STORAGE	
Memory capacity:	2MB (4 & 8MB optional)
Dual database capacity (optional):	Timed update triggered by programmable real-time clock
Data loading:	Keyfob storage device via front panel socket

COMMUNICATIONS, INPUT/OUTPUT	
Sign communications:	RS485 (standard communications with Hanover signs)
Secondary communications (optional):	J1708, RS232, RS485, isolated RS485, IBIS Slave.
Digital input/output:	4x digital output 3x digital inputs

ELECTRICAL	
Operating voltage:	24Vdc nominal
Typical power consumption:	12 watts (0.5A measured at 24V in testing signs mode)
Electrical protection:	Reverse polarity and transient

OPERATIONAL	
Temperature range:	-20° to +60°C / 0 – 140°F
Humidity:	95% max

Product guaranteed for 12 years against faulty materials and/or workmanship.
Buy America compliant – Driver Consoles are all manufactured in the USA.
Hanover Displays ERIC++ meet Automotive EMC Directive ECE R10 as amended. Certificate N°E11 10R-044552.
ADA, Equality Act 2010, PSV Accessibility Regulations & Annexe 11 compliant.

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Benefits of Hanover Displays Inc.

- Zero cost ownership.
- **12 year warranty on Amber signs parts**.
- 5 year warranty on White and Color signs parts.
- **Free** consignment spare parts placed on site.
- Warranty process: When a unit fails, the defective unit or modular part is removed by Transit Authority. A spare sign or modular part is taken off the shelf and put in the bus. After receiving an RMA, a new unit or part is sent to replace Transit Authority stock and Transit Authority ships the bad unit or part to Hanover Elk Grove Village, IL.
- Modular parts between all signs which are interchangeable.
- Extremely low failure rate, less than .05% Global.
- **Free** programming and destination list updates, (2 week notice).
- **Free** programming software and all software updates.
- **Free** programming devices - KeyLo and base station programmers - as required.
- Programming for any configuration and quantity of bus types go on one programming device, (separate devices are not required for each bus type or sign configuration).
- All necessary training for software and hardware as well as operator training, (if necessary).
- Integration for single point login, (if already activated by integrator).
- Post-Delivery Installation inspection on all new vehicles onsite. PDI includes maintenance training and software program training for Transit Authority personnel
- Stand alone wireless destination list update capable, (does not include install or setup of hotspots).
- 10% to 100% linear dimming in 1% increments.
- Tightest pitch possible for Higher Definition.
- Power consumption of system significantly lower than competition.
- Higher Buy American content percentage, Hanover system greater than 80%.
- All display boards are manufactured and signs are assembled in our Illinois factory.
- Signs weigh significantly less than competitors.
- Global financial stability. Privately Owned, Family Owned.
- Upload of routes via USB into controller

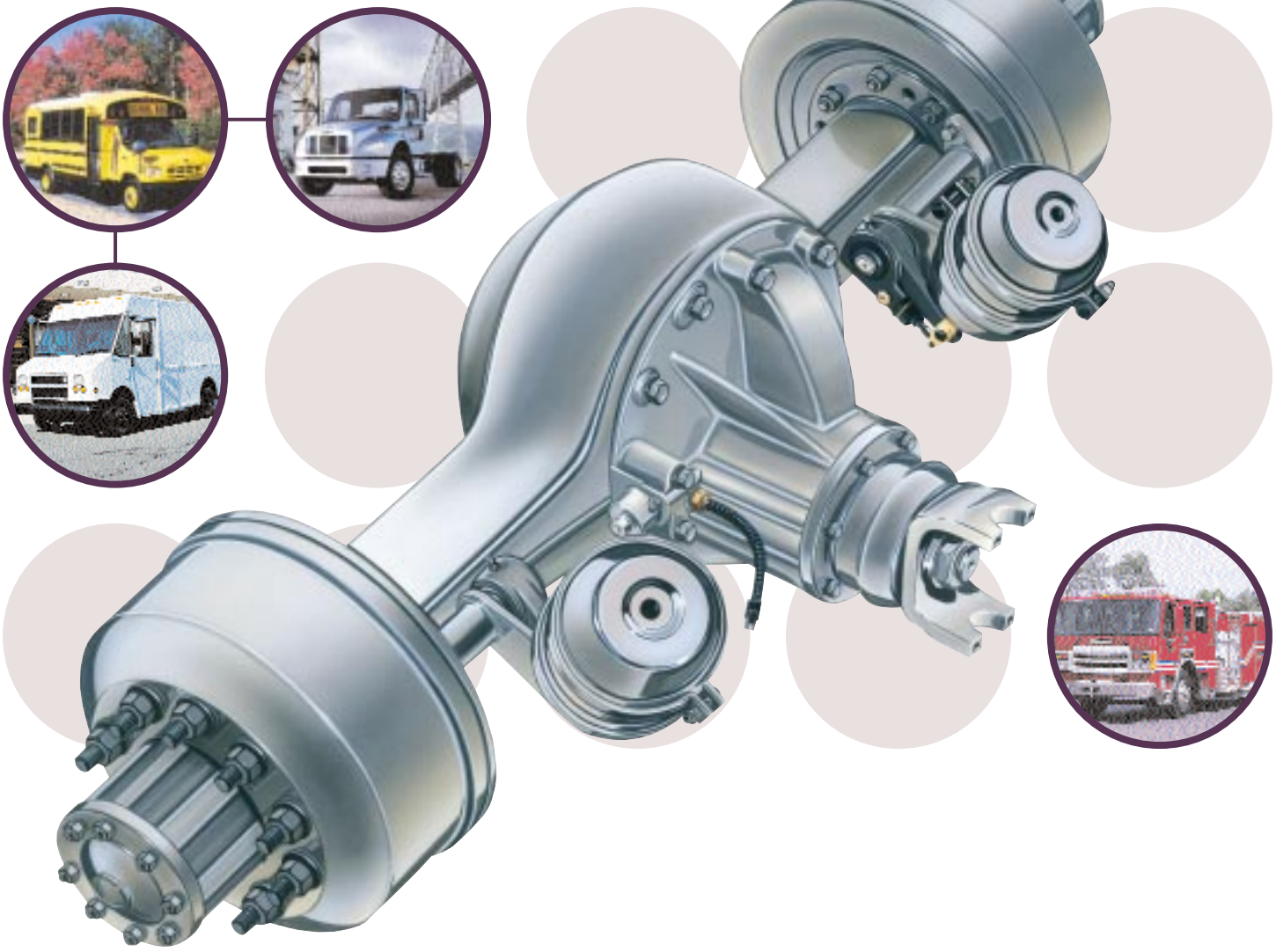
If you have any further questions please do not hesitate to contact me.

Rian Phillips - Regional Sales Manager @ rphillips@hanoverdisplays.com M +1 (916) 240-0601

MERITOR®

Single Drive Axles

23,000 lb. GAWR



DRIVETRAIN PLUS™
THE COMPLETE SYSTEM
ArvinMeritor™

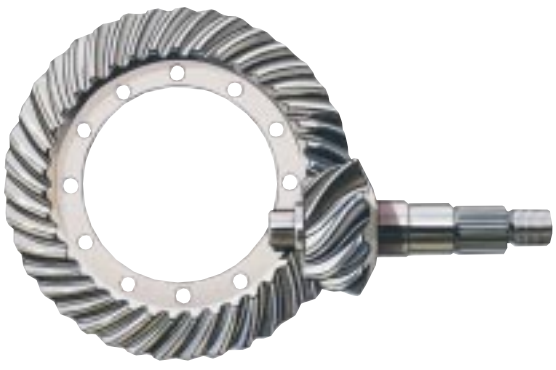
RS-23-160/161 series single drive axles

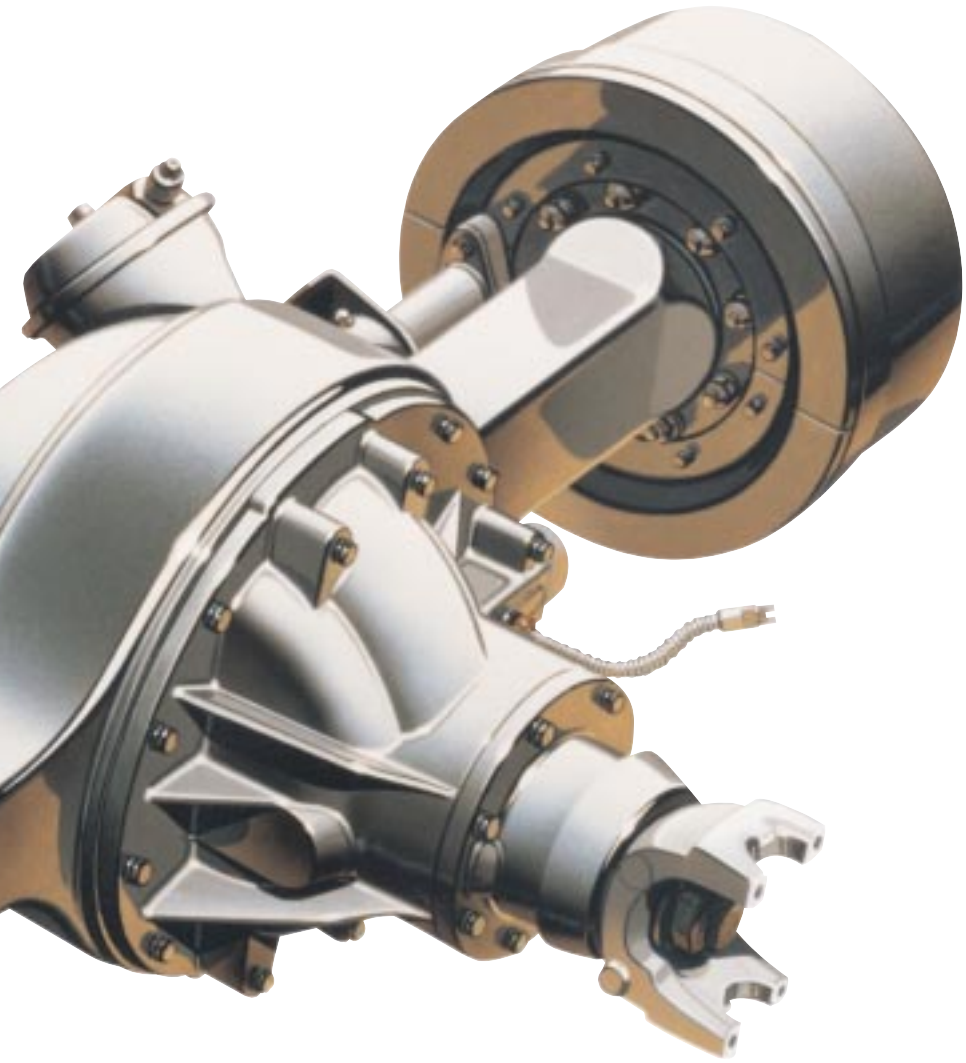
The Meritor® 23,000 lb. single drive axle family offers the strength and durability that truck operators have come to depend on. A full line of axle models is designed to meet the various requirements of a range of vocations. The line includes axles for applications in construction, refuse and city delivery to fire and rescue, LTL, and double- and triple-trailer linehaul.

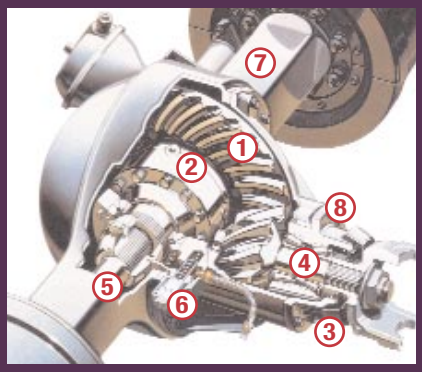
In the 23,000 lb. gross axle weight rating (GAWR) class, the Meritor® RS-23-160/161 axles are capable of meeting the needs of 6 x 2 linehaul tractors as well as vocational usage such as construction and refuse. With a GCW rating of up to 127,000 lbs., these axles can perform the heavy work, day in and day out. The RS-23-160/161 axles feature the widest range of gear ratios in their class, with the fast 2.80 for today's gear fast/run slow engines through the slow 7.17 for special vocational requirements. Heavy-duty features such as 18" hypoid-Generoid gearing, torsion-flow axle shafts and a rectangular axle housing ensure the load-carrying capacity needed for severe service. The primary difference between these two axles is the housing wall thickness, with the RS-23-160 having a 0.43" wall and the RS-23-161 having a 0.50" wall, each designed to handle heavy payloads.

18" Ring Gear — High-Torque Gear Design for Longer Life

Advanced hypoid-Generoid gearing delivers smoother and more continuous tooth contact between the 18" ring gear and pinion. This means better torque capacity, quieter operation and longer component life. Precision forging of the differential side gears and pinions increases reliability even more and adds shock resistance.







Economical Performance in Most Vocational Applications

1 18" hypoid-Generoid gearing provides high strength, longer life and a wide range of gear ratios.

2 Precision-forged differential side gears make for maximum strength and greater resistance to shock impact.

3 Unitized pinion seals keep lubricant in and prevent installation and contamination damage.

4 High-capacity tapered roller bearings provide for heavier load capacity and longer life.

5 Torsion-flow axle shafts feature a surface hardness which resists fatigue and a resilient core which absorbs shock.

6 Optional driver-controlled differential lock (DCDL) provides maximum traction and increased driver control.

7 Rectangular axle housing with several wide-track options allows maximum strength and rigidity for a variety of applications.

8 Optional aluminum-carrier casting reduces axle weight by 43 lbs., which allows for increased payload (available only with ratios 3.07 through 5.63).

RS-21, 24/25 and 26/30 series single drive axles

Designed for dependability in the most demanding environments, these axles feature sturdy construction and traction-enhancing options.

RS-21-160 Series Single Drive Axles

This axle was designed and engineered for use primarily with refuse and recycle vehicles where the demanding requirements of door-to-door pickups, frequent stopping and quick runs to landfill sites, transfer stations and recycling plants are the norm. ArvinMeritor engineers have combined robust features like the 18" ring gear and 2.25" axle shaft diameter to provide a cost-effective and dependable axle for the refuse and recycling industry.

RS-24/25-160 Series Single Drive Axles

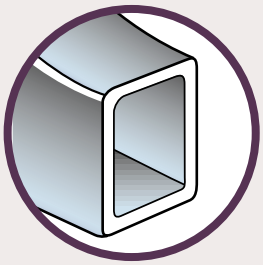
The RS-24/25-160 models combine excellent construction and quality components to provide the rugged dependability needed to stand up to the industry's toughest demands. The construction, refuse, fire and rescue vocations can all make use of these axles. Extra strength and rigidity are built into the hot-formed, rectangular-shaped housings. Unitized pinion seals virtually eliminate leakage and help prevent harmful road contaminants from entering the axle components. Coupled with a rigid differential case, these features add up to high axle strength and reduced maintenance.

For maximum traction on slippery surfaces, an optional driver-controlled differential lock (DCDL) is also available. DCDL can be locked and unlocked when the vehicle is stationary or during low-speed operation. A sturdy, robust clutch collar mechanically locks both axle shafts together to produce superior traction at both wheels.

RS-26/30-185 Series Single Drive Axles

The excellence and dependability of the RS-26/30-185 models have made them the premium single axle, high GAWR models in the market. One-piece forward-mounted carriers and durable housings ensure long and dependable service. For maximum traction on slippery surfaces, the optional driver-controlled differential lock (DCDL) is also available. The brute strength built into the RS-26/30-185 axles create a design especially suitable for heavy-duty truck and tractor applications. The performance of fire and rescue vehicles, pumper and ladder trucks and waste-hauling vehicles benefit greatly from these single-reduction axles. High axle ratings and high-input torque capability provide the strength and durability required by transfer trailers and front loaders, as well as recycle and residential refuse pickup vehicles.

Driver-Controlled
Differential Lock (DCDL)



Rectangular
Axle Housing

Precision-forged
Differential Gearing

Aluminum
Carrier Casting

Unitized
Pinion Seals

18" and 19.6"
Hypoid-Generoid Gearing

18" and 19.6" Hypoid-Generoid Gearing

ArvinMeritor's advanced hypoid-Generoid gearing delivers smoother and more continuous tooth contact between the ring gear and pinion than conventional systems. This means better torque capacity, quieter operation and longer component life.

Precision-forged Differential Gearing

Differential side gears and pinions are precision forged for maximum strength and greater resistance to shock impact.

Aluminum Carrier Casting

When payload weight is critical, significant weight savings can be achieved with aluminum carriers in the RS-160 single axle families.

Rectangular Axle Housing

Rugged, hot-formed, rectangular-shaped housings are designed with full corner sections for strength and excellent rigidity. The deep vertical dimensions provide greater stiffness to the entire axle assembly.

Unitized Pinion Seals

ArvinMeritor's state-of-the-art drive axle carrier seals are fully unitized to help reduce drive axle maintenance. Located in the single axle pinion position, the unique design is a vast improvement over current seal technology. The sealing lips no longer run on the exposed yoke surface and do not contact the yoke journal, eliminating the need for yoke replacement due to worn journal area. The lips are entirely encased to keep lubricant in and eliminate the potential for handling, installation and contamination damage.

Driver-Controlled Differential Lock (DCDL)

For maximum traction, even in icy conditions, slippery mud or off-road terrain, ArvinMeritor developed the driver-controlled differential lock (DCDL). This feature lets drivers select engagement to generate equal power at each wheel, as needed. Available as an optional feature on both the -160 and -180 Series single axles, the DCDL can be locked and unlocked when the vehicle is stationary or during low-speed operation. A clutch collar mechanically locks both axle shafts together to provide maximum traction at both wheels. This reduces the need for chains or towing, allows precise driver control and provides for less maintenance and lower cost.

Description / Axle Model		RS-23-160	RS-23-161	RS-23-186
Rating - lb (kg)		23,000 (10433)	23,000 (10433)	23,000 (10433)
Typical Applications		Construction, Refuse and City Delivery	Construction, Refuse, Fire & Rescue	Double- & Triple-Trailer Linehaul, LTL and Construction
GCW Highway lbs. (kg)[1]	**Turnpike**	127,000 (57607)	127,000 (57607)	140,000 (63504)
	Paved	100,000 (45360)	100,000 (45360)	125,000 (56700)
Standard Ratios		2.80, 2.93, 3.07, 3.21, 3.42, 3.58, 3.73, 3.91, 4.10, 4.30, 4.56, 4.89, 5.38, 5.63, 6.14, 6.43, 6.83, 7.17		2.93, 3.08, 3.21, 3.42, 3.58, 3.73, 3.91, 4.10, 4.30, 4.56, 4.89, 5.13, 5.38, 5.63, 5.86, 6.14, 6.83, 7.17, 7.40
Ring Gear Size (Pitch Diameter) Inches (mm)		18.00 (457.2)	18.00 (457.2)	19.62 (498.3)
Housing Size Wall Thickness at Spring Seat Inches (mm)		5.28 x 4.61/0.43 or /0.63 Wide Track (134 x 117/11 or /16)	5.28 x 4.61/0.50 (134 x 117/12.7)	5.25 x 4.61/0.50 (133 x 117/12.7)
Brake Types and Sizes Inches (mm)		Cam-Master Q Plus 15 x 8.62 (381 x 219) 16.5 x 7 (419 x 178) 16.5 x 8 (419 X 203) Stopmaster 15 x 7 (381 x 178) Dura-Master Air Disc ADB-1560	Cam-Master Q Plus 16.5 x 7 (419 x 178) 16.5 x 8 (419 X 203) Stopmaster 15 x 7 (381 x 178) Dura-Master Air Disc ADB-1560	Cam-Master Q Plus 16.5 x 7 (419 x 178) 16.5 x 8 (419 X 203) Stopmaster 15 x 7 (381 x 178) Dura-Master Air Disc ADB-1560
Hub and Drum or Rotor, Bolt Circle Dia./Inches (mm)		10 Stud, 11.25 (285.75)/10 Stud, 13.19 (335)/Cast Spoke Wheels		
OPTIONS:				
Driver-Controlled Main Differential Lock		X	X	X
Aluminum Carrier Casting		X	X	
Anti-Lock Braking System (ABS)		X	X	X
Track Inches (mm)[2]	**Standard**	72.24 (1834)	72.24 (1834)	72.24 (1834)
	Optional	77.87 (1977) 84.00 (2133) 90.24 (2292)	Not Available	Not Available

1 All applications must comply with the ArvinMeritor Application Guidelines, TP-9441, or must be approved by the ArvinMeritor Engineering Department.
2 Other tracks and wall thicknesses available.

For axle specifications on RS-21-160, RS-24/25-160 and RS-26/30-185, contact ArvinMeritor.

The permitted use of axles and components, including the capacity ratings that are shown, vary with application and service. Meritor® axles are covered by an industry-competitive warranty. For complete details, refer to publication SP-95155 or contact your ArvinMeritor representative.

Meritor Heavy Vehicle Systems, LLC
2135 West Maple Road
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800-535-5560
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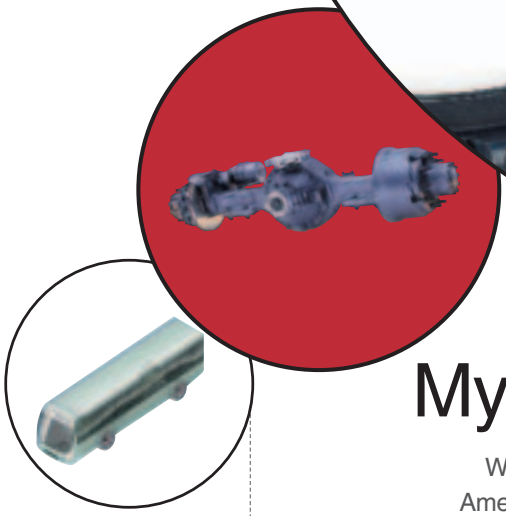
Litho in USA
SP-97122 r 0903 (465089/11900)

ArvinMeritor™



My, what big teeth you have.

Wider teeth are just one feature of the QuietRide gearing designed for North American's Bus, Coach and Motor home market.

The enhanced concentration on gear design, inspection and manufacturing has led to a decrease in sound and a smoother rolling gear set. Leading edge tooth design examines the unique situation of the Coach and Motor home duty cycle to improve tooth contact pattern in both driving and coasting. The latest CNC equipment creates precise and repeatable tooth forms for improved rolling action. QuietRide gears are screened with specialized NVH test equipment to insure a low noise signature.

The results? Improved performance, durability and rider comfort. Not to mention, reduced noise levels and maintenance costs. All of this makes it the ideal choice for heavy start-and-stop duty cycles and demanding retarder loads.

For more information, call us at 800-535-5560. You'll think, "My, what a great axle." We'll respond, "The better to drive you with."

New
QuietRide Gearing

- **Commercial Vehicle Systems**
- Commercial Vehicle Aftermarket
- Light Vehicle Systems
- Air and Emissions Technologies

ArvinMeritor™

www.arvinmeritor.com

1733

Quiet Ride™ Gearing

R-120, R-145, R-160, 71000 Series Axles

MERITOR®

an ArvinMeritor brand

Product Summary

The new Quiet Ride™ gearing is effective and economical in making gear sets superlative for low noise demanded in the Transit Bus, Coach and Motor Home market. It brings together the gear set design, and manufacturing process, and inspection to optimize the gear tooth design for low noise while still retaining high strength and durability.

Using state of the art design, manufacturing and inspection equipment the Quiet Ride provides a durable product and still offers, a low noise ride that is 7 to 9 dBA quieter at the gear set level. It is also enhanced with gear cutting and inspection equipment and a special gear tooth design for low noise.

The Quiet Ride gearing takes design and processing to a new level to make smooth running and quiet gear sets. A truck gear operates in an open environment in which noise is secondary concern. For the Transit Bus, Coach and Motor home market, noise is a primary concern. Quiet Ride ensures that both the drive and coast side of the tooth are quiet.

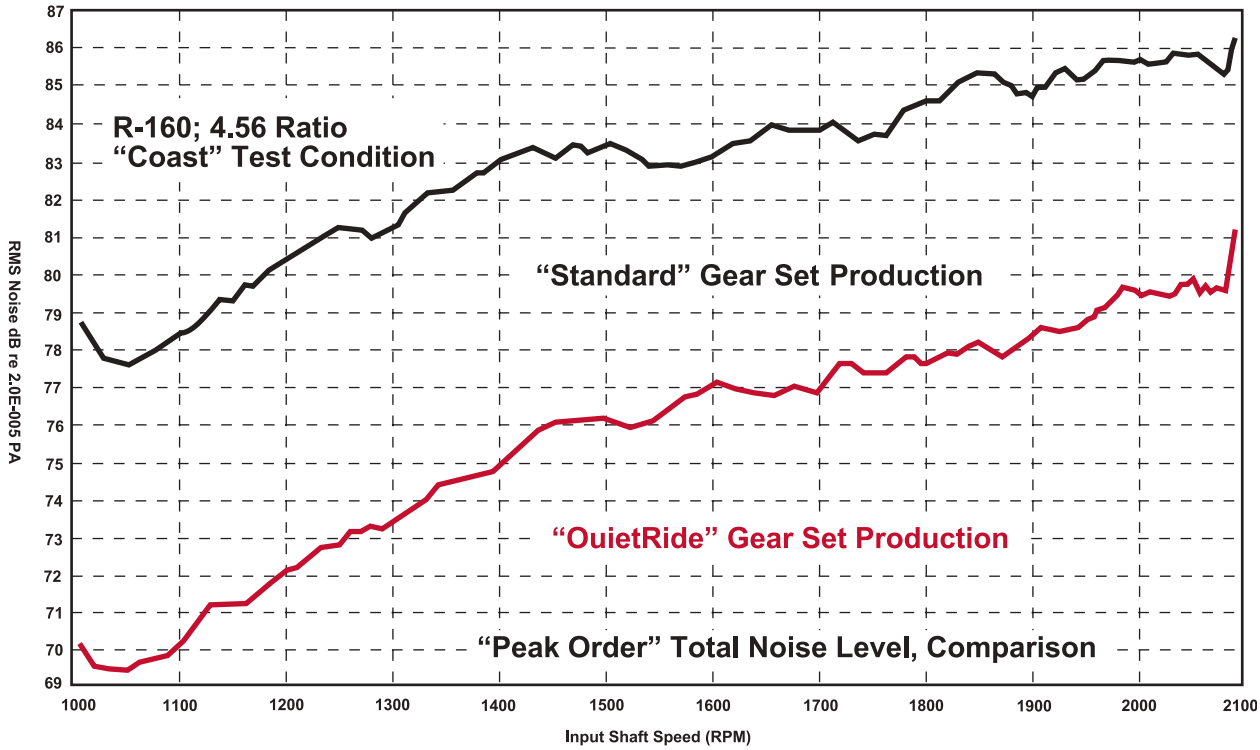
Application Summary

Ideal for the Coach and Motor home market, noise is a primary design criteria. This generally requires finer pitch designs (more teeth for given gear diameter) with longer contact patterns at light gear loads.

Use of specialized noise, vibration and harshness test equipment can check for a low noise signature. Through years of experience with 'Noise Sensitive' and 'Coach Quality', ArvinMeritor has developed an electronic profile on this equipment with pass/ fail criteria for both drive and coast side of the gear.

The Quiet Ride™ Gearing is available on all Meritor axles designed for full-size coaches and buses in North America, including the R-120, R-145, R-160 and 71000 Series.

Features	Benefits
Innovative gear tooth design	Low noise while retaining high strength and durability
Gearing produced with noise signature	Superior performance in the Customer's Coach
CNC gear cutting equipment	Cutting process very precise, with excellent repeatability
Noise, Vibration and Harshness test equipment	Checks for low noise signature
Electronic equipment profile	Receives quality noise inspection
State-of-the-art design, manufacturing, and inspection equipment	Durable product with low noise ride that is 7 to 9 dBA quieter at the gear set level
New revolutionary design	Ensures both drive and coast side of the tooth is quiet



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ArvinMeritor™