Contract Number 12P227

METROPOLITAN COUNCIL CONTRACT FOR ROLLING STOCK PROCUREMENT

THIS CONTRACT is made and entered into by and between the **METROPOLITAN COUNCIL**, a public corporation and political subdivision of the state of Minnesota ("Council"), and **GILLIG LLC**, a corporation with its principal place of business at 25800 Clawiter Road, Hayward, California 94545 ("Contractor").

WHEREAS:

1. The Council requires the manufacture and delivery of 184 forty-foot low-floor transit buses, which are to be a combination of 124 diesel propulsion and 60 hybrid-diesel-electric propulsion buses, for use in its seven-county metropolitan area public transit service programs, and issued a Solicitation, dated 01/14/13, for the purchase and delivery of such vehicles, including an option for up to 221 more of each such type vehicle.

2. The Contractor submitted technical and price proposals, and acknowledged Addenda 1,2,3,4 and 5, dated 3/1/13, and a best and final offer, dated 04/17/13.

3. The Council has reviewed the Contractor's submittals and, in reliance on the representations made by the Contractor in its best and final offer, has awarded the contract for the vehicles to the Contractor, by action of the Council at its meeting of 06/26/13.

NOW, THEREFORE, in consideration of the mutual promises contained in this contract, the parties agree as follows:

I. DEFINITIONS

1.01 C.F.R. "C.F.R." is the acronym referring to the United States Code of Federal Regulations, which contains regulations applicable to FTA grant recipients and their contractors and subcontractors.

1.02 Council. "Council" or "the Council" used without modification throughout this contract means the Metropolitan Council, a grant recipient of the Federal Transit Administration.

1.03 Council's Project Manager. "Council's Project Manager" means the Council employee who is the Council's project manager for purposes of administration of this contract and who is authorized to notify the Contractor of Council decisions regarding questions that arise or clarification needed during the course of this contract. The Project Manager for this contract is Chuck Wurzinger for Metro Transit buses and Paul Colton for Metropolitan Transportation Services (MTS) buses, or such other person as may be designated in writing to the Contractor by the Council.

1.04 DOT. "DOT" or "USDOT" are acronyms referring to the United States Department of Transportation.

1.05 EPA. "EPA" is the acronym referring to the United States Environmental Protection Agency.

1.06 FTA. "FTA" is the acronym referring to the Federal Transit Administration, a public transit regulatory unit of the USDOT, formerly known as the Urban Mass Transit Administration (UMTA).

1.07 Solicitation. "Solicitation" means the Council's solicitation issued on 01/14/13 for the purpose of establishing a contract to supply 184 forty-foot low-floor buses (with an option to purchase up to 221 additional buses).

1.08 Solicitation Package. "Solicitation Package" means the document issued by the Council in connection with the Solicitation, including all addenda, if any, issued by the Council subsequent to the initial document.

1.08 Technical Specifications. "Technical Specifications" means the technical specifications for the Solicitation and included in the Solicitation Package.

1.09 U.S.C. "U.S.C." is the acronym referring to the United States Code.

1.10 Vehicles. "Vehicles" means the buses purchased under this contract for use by the Council to provide public transit service.

II. TERM OF CONTRACT; NOTICE TO PROCEED

2.01 Term. The term of this Contract shall commence on the date that the Contract is executed and shall terminate five years after the date of Contract execution, unless otherwise terminated or amended as provided in this contract.

2.02 Notice to Proceed. The Contractor shall not commence performing work under this contract until it is authorized in writing by the Council to do so by one or more "Notices to Proceed" as described in this contract.

III. CONTRACT DOCUMENTS AND PRECEDENCE

The documents embodying the legally binding obligations between the Council and the Contractor for the work to be performed under this contract consist of the documents listed below ("Contract Documents"). The Contract Documents constituting the contract between the Council and the Contractor are intended to be complementary so that what is required by any one of them shall be as binding as if called for by all of them. In the event of any conflicting provisions or requirements within the several parts of the Contract Documents, they shall take precedence in the following order, the first stated document being of the highest precedence:

1. This Contract, together with any written change orders or amendments executed subsequent to this contract, attached exhibits which are part of this contract, and documents incorporated in this contract by reference.
2. The Council's Technical Specifications, as revised by all addenda issued by the Council in connection with the Solicitation, incorporated in this contract by reference (Final Specifications).
3. The Contractor's Best and Final Offer dated 04/17/13.
4. The Council's Solicitation Package.

In addition, the certifications submitted by the Contractor in its proposal are made a part of the Contract Documents.

IV. CONTRACTOR RESPONSIBILITIES

4.01 Contractor Responsibilities. The Contractor is responsible for performing all work necessary to complete, in a manner satisfactory to the Council, the manufacture and delivery of the Vehicles as described in this contract, and in any properly approved Change Orders or amendments. The Contractor represents that it has or will obtain all personnel and equipment required to perform the work under this contract.

4.02 Technical Specifications. The Contractor shall provide the Vehicles in accordance with the Metropolitan Council's Technical Specifications contained in the Council's Solicitation Package , as revised by all addenda issued by the Council in connection with the Solicitation. The Technical Specifications are intended to provide minimum acceptable standards for the Vehicles. The Vehicles must meet all Federal Motor Vehicle Safety Standards and all Environmental Protection Agency, U.S. Veterans Administration, Minnesota Special Transportation Service, Minnesota Department of Transportation, and Americans with Disabilities Act laws and regulations applicable to the type of Vehicle on the date of manufacture. The Vehicles must also have been fully tested and certified at the Department of Transportation's Penn State Test Facility in Altoona, Pennsylvania, in compliance with 49 U.S.C. section 5323(c) and 49 C.F.R. part 665. Bus testing compliance and documentation are described in Section 12.06 of this contract.

4.03 Title. The Contractor shall provide to the Council adequate documents for securing title to the Vehicles in Saint Paul, Minnesota. The Contractor must provide the documents to the Council at least 30 working days before each Vehicle is released to the common carrier drive away or to the Council, free and clear of all liens, mortgages and encumbrances, financing statements, security agreements, and claims and demands of any character.

V. COMPENSATION; DELIVERY; PAYMENT; LIQUIDATED DAMAGES AND OPTIONS

5.01 Compensation for Vehicles.

a. Base Price, Optional Equipment, BRT Styling Options, Training Modules, Spare Parts, and Specialty Tools.

LIST OF INSERTS
GILLIG LLC - BEST AND FINAL OFFER (BAFO)
PRICE PROPOSAL FORMS

Item	Description	Pages
1.	**Diesel Bus.** The prices for diesel propulsion base buses, optional equipment, BRT styling options, training modules, spare parts, and specialty tools, to be delivered under this Contract, as listed in the Gillig BAFO submittal, to include Tables 1,2,3,4,5 and 6.	4
2.	**Hybrid Diesel-Electric Bus.** The prices for hybrid diesel-electric propulsion base buses, optional equipment, BRT styling options, and spare parts, to be delivered under this Contract, as listed in the Gillig BAFO submittal, to include Tables 1,2,3, and 4.	5

The amount for each Vehicle includes compensation for all manuals, catalogs, training sessions and other items as required in the Technical Specifications. All prices are FOB the point of delivery as specified in Section 5.06 of this contract.

GILLIG LLC
BAFO
APRIL17, 2013

Exhibit B (Rev 4)
Solicitation Package- Part B

BAFO-PRICE PROPOSAL FORM-DIESEL BUS

Table 1 – Base Price – 40' Diesel only Vehicles

Item	Description	Bus Quantity	U/M	Unit Price
1	Price Per Unit (Vehicle)	1	Each	$ 433,672.00
2	Unit Warranty Cost	1	Each	$ 13,063.00
3	Unit Delivery Charge	1	Each	$ 4,461.00
4	**Total Base Price** (Total of Items 1 through 3 extended amounts)	[redacted]		$ 451,196.00

Table 2 – 40' Diesel only Vehicle Optional Equipment

Item	Description	Quantity	U/M	Unit Price
1	Hydraulic cooling fan package (delete EMP electric cooling fans)	1	Each	$ <6,701.00>
2	Modine electric cooling fan package (delete EMP electric cooling fans)	1	Each	$ <3,157.00>
3	Thermo King scroll belt-driven compressor HVAC system (delete electric HVAC system)	1	Each	$ <12,402.00>
4	Trojan group 31AGM batteries (delete Odyssey batteries)	1	Each	$ <280.00>
5	Deka flooded lead acid 8D batteries (delete Odyssey batteries)	1	Each	$ <788.00>
6	Voith 4 speed transmission (delete ZF transmission)	1	Each	$ 0.00
7	Add capacitor starting system	1	Each	$ 3,252.00

GILLIG LLC
BAFO
APRIL18, 2013
REVISION 1
PAGE 2 ONLY

8	Vapor V-Touch bar exit door actuators (delete CLASS exit door system)	1	Each	$ <725.00>
9	Air-operated door motors (delete electric door actuators)	1	Each	$ <6,786.00>
10	RCA flooring (delete Altro flooring)	1	Each	$ <200.00>
11	Halogen headlights (delete LED headlights)	1	Each	$ <400.00>
12	Delete bike rack but install under-bumper mounting bracket for bike rack	1	Each	$ <761.00>
13	Install seamless, fixed (without transom) passenger windows with lightest tint available (delete full-frame transom windows)	1	Each	$ 1,687.00
14	Marine grade plywood or equal sub-floor (delete composite flooring)	1	Each	$ <2,150.00>
15	Ricon wheelchair ramp (delete Lift-U ramp)	1	Each	$ 0.00
16	Solid roof hatches (delete sky lights)	1	Each	$ <75.00>
17	Install rear window	1	Each	$ NOT AVAILABLE
18	Delete Verint surveillance system	1	Each	$ <7,780.00>
19	Delete Trapeze system (communications /APC/ radios/voice annunciation)	1	Each	$ <26,615.00>
20	Install Michelin XDU2 tires (front axle)	1	Each	$ 795.00 PER TIRE
21	Install Michelin XDN2 tires (drive axle)	1	Each	$ 843.00 PER TIRE
22	Allison 6-speed transmission (delete ZF transmission)	1	Each	$ 0.00 ADDITIONALLY, DEDUCT <$2,205.00> FROM WARRANTY
23	Install Amerex fire suppression system	1	Each	$2,534.00
24	Install left turn and right turn lights (headlight module configuration or separate lights on side of bus)	1	Each	$ 294.00
25	Install drum brakes (delete disc brakes)	1	Each	$ <3,774.00>

GILLIG LLC
BAFO
APRIL17, 2013

Table 3 – 40' Diesel only BRT Styling Options

Item	Description	Quantity	U/M	Unit Price
1	Install widest exit door possible	1	Each	$3,720.00
2	Exterior weather-proof exit door activation button	1	Each	$197.00
3	Install wiring for fare card reader at exit door (ground and power wires needed for Council's Go-To card reader)	1	Each	$233.00
4	Aluminum wheels	1	Each	$295.00 PER WHEEL
5	One rear facing wheel chair position and one forward facing position	1	Each	$2,196.00
6	Luggage rack on curbside front wheel housing	1	Each	$603.00
7	One voice annunciation display that is visible from the rear-facing wheelchair position	1	Each	$1,375.00
8	Install Rear window	1	Each	$NOT AVAILABLE
9	Delete exit door and CLASS system	1	Each	$<9,150.00>
10	BRT faring and styling package	1	Each	$ *SEE BELOW FOR OPTIONS
11	Install Luminator Spectrum full-color LED front destination sign (delete standard Luminator front destination sign)	1	Each	$2,375.00
12	Install Luminator INFOtainment on-board communication screens (two per bus) – one front screen and one mid-bus screen	1	Each	$14,994.00
13	Paint BRT bus with four-color paint scheme	1	Each	$1,600.00
14	Install seamless, fixed (without transom) passenger windows with lightest tint available (delete full-frame transom windows)	1	Each	$1,687.00

ITEM	DESCRIPTION	QUANTITY	U/M	UNIT PRICE
* 10	BRT FARING AND STYLING PACKAGE	1	Each	
	ALTERNATIVE 2 - FRONT BRT CAP ONLY			$7,897.00
	ALTERNATIVE 3 - FRONT & REAR BRT CAPS WITH 2 FAIRINGS			$14,570.00
	ALTERNATIVE 4 - BRT PLUS			$18,035.00

BAFO-Price Proposal Form-Diesel Bus
Revisions 4 – Contract 12P227
Page 3 of 4

Table 4 – 40' Diesel only Training Modules

Item	Description	Quantity	U/M	Unit Price
1	Engine training module (fully operational ISL engine, radiator and CAC, DPF and SCR, fuel and DEF tanks, control panel)	1	Each	$ 135,100.00
2	Multiplexing training module (including two remote I/O modules)	1	Each	$ 23,580.00
3	HVAC training module (fully operational system with controls and diagnostic software)	1	Each	$ 40,645.00
4	Air system training module	1	Each	$ 34,643.00
5	Disc brake / drive axle training module	1	Each	$ 29,322.00

Table 5 – 40' Diesel only Spare Parts

Item	Description	Quantity	U/M	Unit Price
1	ISL engine	1	Each	$52,500.00
2	ZF transmission	1	Each	$17,500.00
3	Steel wheel	1	Each	$150.00
4	Trapeze IVLU	1	Each	$15,087.00
5	Allison transmission	1	Each	$18,020.00
6	Voith transmission	1	Each	$17,359.00

Table 6 – 40' Diesel only Specialty Tools

Item	Description	Quantity	U/M	Unit Price
1	Towing bar	1	Each	$9,703.00
2	Disc brake repair tool kit	1	Each	$2,652.00

GILLIG LLC
BAFO
APRIL18, 2013
REVISION 1
PAGE 1 ONLY

Exhibit B (Rev 4)
Solicitation Package- Part B

BAFO PRICE PROPOSAL FORM-HYBRID BUS

Table 1 – Base Price – 40' Hybrid only Vehicles

Item	Description	Bus Quantity	U/M	Unit Price
1	Price Per Unit (Vehicle)	1	Each	$ 631,364.00
2	Unit Warranty Cost	1	Each	$ 23,652.00
3	Unit Delivery Charge	1	Each	$ 4,461.00
4	**Total Base Price** (Total of Items 1 through 3 extended amounts)	[redacted]		$ 659,477.00

Table 2 – 40' Hybrid only Vehicle Optional Equipment

Item	Description	Estimated Quantity	U/M	Unit Price
1	Allison hybrid drive (delete BAE hybrid drive)	1	Each	$ <37,072.00>** SEE BELOW ADDITIONALLY, DEDUCT <$13,717.00> FROM WARRANTY
2	Vanner beltless alternator (delete BAE APS system)	1	Each	$ INCLUDED IN #1
3	Conventional power steering (delete electric power steering and motor)	1	Each	$ <1,534.00>*** SEE BELOW
4	Conventional air compressor (delete electric pneumatic compressor and motor)	1	Each	$ <5,500.00>*** SEE BELOW
5	Hydraulic cooling fan package (delete EMP electric cooling fans)	1	Each	$ <6,701.00>
6	Modine electric cooling fan package (delete EMP electric cooling fans)	1	Each	$ <3,157.00>
7	Thermo King scroll belt-driven compressor HVAC system (delete electric HVAC system)	1	Each	$ <1,010.00> W/BAE APS 2 $ <12,402.00> W/ALLISON

** ITEM 1 - DOES NOT INCLUDE ELECTRIC AIR COMPRESSOR OR ELECTRICAL HYDRAULIC PUMP.

*** ITEMS 3 & 4 - IF BOTH COMPONENTS ARE DELETED PLEASE DEDUCT AN ADDITIONAL $8,083.00 FOR THE DELETION OF THE PDU (POWER DISTRIBUTION UNIT).

8	Trojan group 31AGM batteries (delete Odyssey batteries)	1	Each	$<280.00>
9	Deka flooded lead acid 8D batteries (delete Odyssey batteries)	1	Each	$<788.00>
10	Vapor V-Touch bar exit door actuators (delete CLASS exit door system)	1	Each	$<725.00>
11	Air-operated door motors (delete electric door actuators)	1	Each	$<6,786.00>
12	RCA flooring (delete Altro flooring)	1	Each	$<400.00>
13	Halogen headlights (delete LED headlights)	1	Each	$<400.00>
14	Delete bike rack, but install under-bumper mounting bracket for bike rack	1	Each	$<761.00>
15	Install seamless, fixed (without transom) passenger windows with lightest tint available (delete full-frame transom windows)	1	Each	$1,687.00
16	Marine grade plywood or equal sub-floor (delete composite flooring)	1	Each	$<2,150.00>
17	Ricon wheelchair ramp (delete Lift-U ramp)	1	Each	$0.00
18	Solid roof hatches (delete sky lights)	1	Each	$<75.00>
19	Install rear window	1	Each	$NOT AVAILABLE
20	Delete Verint surveillance system	1	Each	$<7,780.00>
21	Delete Trapeze system (communications /APC/ radios/voice annunciation)	1	Each	$<26,615.00>
22	Install Michelin XDU2 tires (front axle)	1	Each	$795.00 PER TIRE
23	Install Michelin XDN2 tires (drive axle)	1	Each	$843.00 PER TIRE
24	Install left turn and right turn lights (headlight module configuration or separate lights on side of bus)	1	Each	$294.00

25	Install drum brakes (delete disc brakes)	1	Each	$ <3,774.00>

GILLIG LLC
BAFO
APRIL17, 2013

Table 3 – 40' Hybrid only BRT Styling Options

Item	Description	Quantity	U/M	Unit Price
1	Install widest exit door possible,	1	Each	$3,720.00
2	Install exterior weather-proof exit door activation button	1	Each	$197.00
3	Install wiring for fare card reader at exit door (ground and power wires needed for Council's Go-To card reader)	1	Each	$233.00
4	Aluminum wheels	1	Each	$295.00 PER WHEEL
5	One rear facing wheelchair position and one forward facing position	1	Each	$2,196.00
6	Luggage rack on curbside front wheel housing (to ceiling)	1	Each	$603.00
7	One voice annunciation display that is visible from the rear-facing wheelchair position	1	Each	$1,375.00
8	Install Rear window	1	Each	$NOT AVAILABLE
9	Delete exit door and CLASS system	1	Each	$<9,150.00>
10	BRT faring and styling package	1	Each	$* SEE BELOW FOR OPTIONS
11	Install Luminator Spectrum full-color LED front destination sign (delete standard Luminator front destination sign)	1	Each	$2,375.00
12	Install Luminator INFOtainment on-board communication screens (two per bus) – one front screen and one mid-bus screen	1	Each	$14,994.00
13	Paint BRT bus with four-color paint scheme	1	Each	$1,600.00
14	Install seamless, fixed (without transom) passenger windows with lightest tint available (delete full-frame transom windows)	1	Each	$1,687.00

ITEM	DESCRIPTION	QUANTITY	U/M	UNIT PRICE
* 10	BRT FARING AND STYLING PACKAGE	1	Each	
	ALTERNATIVE 2 - FRONT BRT CAP ONLY			$7,897.00
	ALTERNATIVE 3 - FRONT & REAR BRT CAPS WITH FRONT FAIRING			$13,320.00
	ALTERNATIVE 4 - BRT PLUS			$18,035.00

Table 4 – 40' Hybrid only Spare Parts

Item	Description	Quantity	U/M	Unit Price
1	BAE hybrid drive unit	1	Each	$ 51,796.00
2	BAE APS unit (Auxiliary Power Source)	1	Each	$ 24,424.00
3	BAE PCS unit (Propulsion Control System)	1	Each	$ 29,478.00
4	Allison hybrid drive unit	1	Each	$ 123,577.00
5	Allison DPIM	1	Each	$ 42,004.00
6	Vanner Belt-less alternator (converter)	1	Each	$ 4,468.00
7	BAE Energy Storage System (complete battery pack)	1	Each	$ 42,110.00
8	Allison Energy Storage System (complete battery pack)	1	Each	$ 42,004.00

b. Compensation for Vehicles. For each of the Pilot Buses to be configured and ordered under this contract, and for all Vehicles configured and ordered for delivery in calendar year 2014, the Council shall pay the Contractor the prices as set forth in paragraph (a) of this section. For Vehicles configured and ordered by the Council for delivery in calendar years 2015, 2016, 2017 and 2018, the Council shall pay the Contractor the prices as set forth in paragraph (a) of this section, subject to the price adjustment provided for in paragraph (c) below.

c. Price Adjustment. Vehicles ordered by the Council for delivery in calendar year 2015, 2016, 2017 and 2011 shall be provided at the prices specified in Section 5.01(a), subject to a price increase or decrease adjustment as described in this subsection (c). The prices in Section 5.01(a) shall be adjusted based on the percent change (whether up or down) in the *Producer Price Index for Truck and Bus Bodies, Series ID: WPU1413, Not seasonally adjusted* (hereafter the "Index"), as published by the U.S. Department of Labor, Bureau of Labor Statistics." The price adjustment shall be based upon the percent change (whether up or down) in the Index between the Index for the calendar month that was four months prior to the month in which this contract is executed and the Index for the month that is four months prior to the month in which the Notice to Proceed for the Vehicles in question is issued by the Council. If the Index for the month specified is not available, the Index for the next previous calendar month in which the Index is available will be used. If the Bureau of Labor Statistics designates an index with a new title or code number as being continuous with the Index cited in this section, the new index shall be used in lieu of the Index cited in this section. Further, if the Index is discontinued, the index for the next more general product will be used or, by mutual agreement of the parties, a substitute index will be used. If the Council determines that this method of price adjustment has become unsuitable, a new method may be adopted by mutual agreement of the parties.

5.02 Maximum Compensation. The maximum total compensation to be paid to the Contractor by the Council under this contract for all goods and services is $98,499,952.

5.03 Delivery Schedule. The Contractor shall deliver a diesel-propulsion pilot bus to the Council on or before January 6, 2014. The Contractor shall also deliver a hybrid diesel-electric pilot bus to the Council on or before January 6, 2014. The Contractor may deliver the pilot buses simultaneously. The Contractor shall complete delivery of Diesel-Propulsion Buses for Metro Transit as follows: 54 by August 1, 2014, 41 by August 1, 2015 and 18 by August 1, 2016. The Contractor shall complete delivery of Hybrid Diesel-Electric Buses as follows: 19 by August 1, 2014, 20 by August 1, 2015 and 20 by August 1, 2016. The Contractor shall deliver Diesel-Propulsion buses for MTS as follows: 6 by June 1, 2016 and 4 by June 1, 2018. All Vehicles shall be delivered during the period Monday through Friday and delivery shall not exceed 5 Vehicles per week. No Vehicles may be delivered on Saturdays, Sundays, or Council holidays. Hours of delivery shall be 7:00 a.m. through 3:00 p.m. local time only.

Delivery Dates for Pilot Buses:	Diesel Propulsion Pilot Bus and Hybrid Diesel-Electric Propulsion Pilot Bus delivered by January 6, 2014						
Projected Vehicle Delivery Schedule and Quantities for Metro Transit buses (not including option vehicles):	Delivery Year (by August 1 of each year)	2014	2015	2016	2017	2018	Total
	Diesel-Propulsion Bus	54	41	18	0	0	114
	Hybrid Diesel-Electric Bus	19	20	20	0	0	60
	Total Metro Transit buses	75, inc. pilot buses	61	38	0	0	174
Projected Vehicle Delivery Schedule and Quantities for MTS buses (not including option vehicles):	Delivery by June 1 of each year	0	0	6	0	4	10
Procurement totals:		75	61	44	0	4	184

The delivery dates and quantities listed above are projections only. Actual base order quantities to be delivered in each calendar year, any exercised option buses, and their mutually agreed upon delivery dates, shall be based on the Notice(s) to Proceed, sent to the Contractor. The Council may change by Amendment the base order quantities, of both hybrid buses and diesel buses, ordered during the life of this contract to any quantities between zero and 184, without any cost or obligation for the quantities of either type of bus not ordered during the life of the contract

5.04 Delay in Delivery Schedule. The Contractor shall notify the Council's Project Manager as soon as the Contractor has, or should have, knowledge that an event has occurred which will delay complete delivery of all Vehicles to be provided under this contract beyond the final delivery date specified in Section 5.03. Within five (5) calendar days, the Contractor shall confirm such notice in writing, furnishing as much detail as is then available.

The Contractor shall be entitled to a reasonable extension of time for delivery if the delay in delivery is caused by strikes, acts of God, fires, or other conditions beyond the control of the Contractor. If the Contractor believes the delay in delivery is justified for such reasons, it may request the Council for an extension of the final delivery date. The Contractor agrees to supply, as soon as such data is available, any reasonable proof that is required by the Council's Project Manager to make a decision on such a request for extension. The Council's Project Manager shall examine the request and any documents supplied by the Contractor, and shall determine if the Contractor is entitled to an extension and the duration of such extension. The Council's Project Manager shall notify the Contractor of his or her decision in writing. It is expressly

understood and agreed that the Contractor shall not be entitled to damages or additional compensation, and shall not be reimbursed for any losses, due to delays resulting from any cause under this provision.

5.06 Delivery Method. The Contractor shall notify the Council's Project Manager in advance of the anticipated delivery date for each Vehicle. Prior to delivery, the Council's Project Manager shall designate the delivery point for each Vehicle, such delivery point to be located within the Twin Cities metropolitan area. Delivery shall be by common carrier drive away service, if possible. The Contractor shall maintain a standard Department of Transportation log for each delivery and shall provide the log to the Council at the time of delivery. Delivery of each Vehicle shall be considered complete when acknowledged by the signed receipt of the Council's designated delivery agent(s), at the point of delivery.

5.07 Acceptance Testing. The Council will carry out acceptance testing on each Vehicle delivered by the Contractor. The acceptance testing will begin no later than 15 days after the Vehicle is delivered to the Council.

5.08 Invoice and Payment. The Contractor shall invoice the Council as each Vehicle, including the pilot bus, is delivered. In accordance with 26 U.S.C. section 4483, the Contractor shall prepare each invoice exempt from Federal Motor Vehicle Use tax. The Contractor shall invoice in maximum lots of one Vehicle per invoice, and each invoice shall include the following information:

1. Contract number
2. Line item number invoiced
3. Model and serial number of the Vehicle invoiced
4. Unit and total prices by line item number
5. Total invoice amount
6. A signed certification that the Vehicle is delivered free and clear of any liens or other claims of the Contractor's suppliers, subcontractors, or employees

Invoices shall be submitted to the following address:

Metropolitan Council – Metro Transit Division
Accounts Payable
560 Sixth Avenue North
Minneapolis, MN 55411

Subject to the provisions of Section 5.09, the Council shall:

a. "make payment for the pilot bus within 30 days after delivery and initial acceptance testing of the Vehicle, covered by the invoice, is completed; and"

5.09 Deductions from Payment. Should the Council's delivery schedule become delayed or otherwise compromised by the Contractor, the Council reserves the right to deduct 10% of the amount due on each Vehicle invoice as retainage. Such retainage shall be paid upon delivery and acceptance of the last Vehicle in the order. The Council reserves the right

to deduct up to an additional two percent (2%) of the total cost of each delivered and accepted Vehicle to assure correction of fleet defects. The withheld funds shall be paid in full within 75 days of Vehicle acceptance, unless specific defects are found in the Vehicle or it is subject to a fleet defect. The Council's Project Manager shall describe any defect(s) found and submit the description in writing to the Contractor, including the relevant specification requirement, when identified and within the 75-day withholding period. The withheld funds shall be paid in full upon repair of the Vehicle or receipt of a written commitment from the Contractor reflecting a mutual agreement to resolve the identified deficiency.

5.10 Liquidated Damages. In the event of delay in the completion of the delivery of the pilot bus beyond the date specified in Section 5.03, the Council shall assess as liquidated damages the amount of $150 per calendar day of delay. In the event of delay in the completion of the delivery of the balance of the Vehicles beyond the date specified in Section 5.03, the Council shall assess as liquidated damages the amount of $150 per each Vehicle not delivered per calendar day of delay. This amount is assessed as liquidated damages in consequence of the difficulty of ascertaining actual damages to the Council resulting from any such delay by the Contractor, and it generally reflects the average daily additional cost to maintain each bus in the fleet which has achieved or exceeded the FTA's guideline service life. These damages shall be deducted from any moneys due, or which may thereafter become due, to the Contractor under this contract, and shall not be deemed a penalty.

5.11 Option for Additional Vehicles

a. Exercise of Option. At the sole option of the Council, the Contractor shall provide up to 176 diesel-propulsion buses in addition to the initial purchases provided for under this contract and up to 45 hybrid diesel-electric propulsion. The option may be exercised at any time, up to and including five years after the date of contract execution. The Council may exercise the option one or more times during the option period and each exercise of the option may include different quantities of vehicles as designated by the Council, provided that the total number of vehicles acquired through the exercise of the option shall not exceed 176 diesel-propulsion buses and 45 hybrid diesel-electric propulsion buses. All vehicles purchased under the option shall be substantially the same as those purchased under the initial purchase. All conditions, specifications, and requirements set forth in the Contract Documents shall apply to vehicles purchased under the option unless otherwise specified in this section. An option will only be exercised if the Council determines that the option price is better than prices available in the market, or that the option is the more advantageous offer, at the time the option is exercised.

b. Option Pricing. Option Vehicles shall be provided at the unit price specified in Section 5.01 (including Vehicle, warranty and delivery cost), subject to a price increase or decrease adjustment as described in this subsection (b). The unit price in Section 5.01 shall be adjusted based on the percent change (whether up or down) in the *Producer Price Index for Truck and Bus Bodies, Series ID: WPU1413, Not seasonally adjusted* (hereafter the "Index"), as published by the U.S. Department of Labor, Bureau of Labor Statistics." The price adjustment shall be based upon the percent change (whether up or down) in the Index between the Index for the calendar month that was four months prior to the month in which this contract is executed

and the Index for the month that is four months prior to the month in which an option is exercised. If the Index for the month specified is not available, the Index for the next previous calendar month in which the Index is available will be used. If the Bureau of Labor Statistics designates an index with a new title or code number as being continuous with the Index cited in this section, the new index shall be used in lieu of the Index cited in this section. Further, if the Index is discontinued, the index for the next more general product will be used or, by mutual agreement of the parties, a substitute index will be used. If the Council determines that this method of price adjustment has become unsuitable, a new method may be adopted by mutual agreement of the parties.

If the Council exercises an option to purchase additional Vehicles in accordance with this section, the maximum compensation specified in Section 5.02 shall be increased by the amount of compensation for the additional Vehicles ordered by the Council.

c. Delivery Schedule. The delivery schedule for Vehicles ordered by the Council by exercise of the option in this section shall be mutually agreed upon by the parties at the time the Council exercises the option. If the parties are unable to agree upon a delivery schedule, all Vehicles ordered shall be delivered to the Council by the Contractor within 12 months from the date on which the Council exercises the option.

d. Other Option Provisions. Except as specifically modified by this Section 5.11, all the provisions of this section shall apply to the delivery of, and payment for, option Vehicles including, without limitation, the Liquidated Damages provision of Section 5.10.

e. Performance Bond or Letter of Credit for Options. Prior to issuance of a Notice to Proceed on any option purchase, the Contractor must provide to the Council either:

- a performance bond or letter of credit in the amount of ten percent of the total price for all vehicles ordered pursuant to the option; or
- an amendment of the original performance bond or letter of credit for this contract that incorporates such additional amount into the original bond or letter of credit amount.

Except for the amount, any new performance bond or letter of credit must meet all the requirements set forth in section 6.10.

VI. INDEMNIFICATION; INSURANCE; LIABILITY; AND BONDING REQUIREMENTS

6.01 Indemnification. To the fullest extent permitted by law, the Contractor assumes liability for and shall save and protect, hold harmless, indemnify, and defend the Council and its members, officers, agents, employees, and volunteer workers from and against all claims, suits, demands, damages, losses, expenses, and liabilities including, without limitation, attorneys' fees, arising out of, resulting from, or relating to the performance of this contract by the Contractor and provided that any such claim, suit, demand, damage, loss, expense, or liability is caused in whole or in part by any act or omission of the Contractor, or of any subcontractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts or omissions any of them may be liable, except where such claim, suit, demand, damage, loss, expense, or liability is caused by the sole negligence or willful misconduct of the Council.

The Contractor's indemnity obligation under this section includes, without limitation, any claims, suits, demands, damages, losses, expenses, and liabilities arising from allegations of violations of personnel practices or from any allegation of an injury to an employee of the Contractor performing work or labor necessary to carry out the provisions of this contract.

The indemnification obligations in this section shall not be construed to negate, abridge or otherwise reduce any other obligation of indemnity the Contractor may have with respect to the Council which may otherwise exist.

6.02 General Insurance Requirement. The Contractor shall procure, maintain, and keep in force, at Contractor's expense, appropriate insurance against injuries to persons or damage to property which may arise out of, result from, or relate to the performance of the work under this contract by the Contractor or its agents, representatives, employees or subcontractors under this contract.

6.03 Minimum Scope and Limits of Insurance. The Contractor shall maintain NOT LESS THAN the following insurance coverage types and limits:

a. **Commercial General Liability.** Commercial General Liability coverage on an occurrence form with limits of not less than:

   - $5,000,000 each occurrence

   If the Commercial General Liability coverage contains a general aggregate limit, the limit shall be not less than $10,000,000 and the general aggregate limit shall apply separately to this contract.

   The Commercial General Liability coverage shall be written on ISO occurrence form CG 00 01, or a substitute form providing equivalent coverage, and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal injury (with employment exclusion deleted), advertising injury, and contractual liability covering liability assumed under an insured contract (including the tort liability of another assumed in a business contract).

b. **Business Automobile Liability.** Business Automobile Liability coverage with limits of not less than:

   - $5,000,000 each accident

   The Business Automobile Liability coverage shall cover, without limitation, physical damage (comprehensive and collision), liability, personal injury protection (PIP), uninsured motorist (UM) and underinsured motorist (UIM). Such insurance shall cover liability that may arise out of the operation or maintenance of any vehicle whether owned, non-owned, or rented.

c. **Employer's Liability.** Employer's Liability coverage with limits of not less than:

- $2,000,000 each accident for bodily injury by accident
- $2,000,000 per employee for bodily injury by disease
- $2,000,000 policy limit for bodily injury by disease

d. **Workers Compensation.** Statutory workers' compensation coverage according to the laws of the state of Minnesota.

e. **Excess and Umbrella Coverage.** Insurance coverage required by this section may be in any combination of primary, excess, and umbrella policies. Any excess or umbrella policy must provide excess coverage over underlying insurance on a following-form basis such that when any loss covered by the primary policy exceeds the limits under the primary policy, the excess or umbrella policy becomes effective to cover such loss.

6.04 Other Insurance Requirements

a. **Insurer Qualifications.** All insurance required to be procured and maintained by the Contractor under this contract must be placed with insurers which:

1. are duly licensed or authorized to issue insurance policies in the State of Minnesota for the limits and coverages required,
2. have a rating of not less than A:X in the most current Best's Insurance Guide, and
3. are otherwise acceptable to the Council.

b. **Duration of Coverage.** All insurance required to procured and maintained by the Contractor under this contract must be maintained for the duration of this contract and for two years after this contract terminates.

c. **Suspension, Voiding, or Cancellation of Policies.** Each insurance policy required to be procured and maintained by the Contractor under this contract shall contain a provision or endorsement that coverage shall not be materially changed, non-renewed, suspended, voided, or cancelled by either party to the insurance policy, or reduced in coverage or in limits, until not less than 60 calendar days prior written notice by certified mail, return receipt requested, has been given to the Council by the insurer.

d. **Deductibles or Self-Insured Retention.** Any deductibles or self-insured retention in any insurance required to be procured and maintained by the Contractor under this contract must be declared to and approved by the Council. If the Council does not approve the declared deductible or self-insured retention, then at the option of the Council, either the insurer shall reduce or eliminate such deductibles or self-insured retention as respects the Council and its members, officers, employees, agents, and

volunteers, or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration, and defense expenses.

e. **Waiver of Subrogation.** All insurance required to be procured and maintained by the Contractor under this contract must contain, or be endorsed to contain, a provision that the insurer agrees to waive all rights of subrogation against the Council and its members, officers, employees, agents, and volunteers for losses arising from performance of this contract.

f. **Commercial General Liability and Business Auto Liability Policies.** The Contractor's Commercial General Liability and Business Automobile Liability coverage policies must contain, or be endorsed to contain, the following provisions and meet the following requirements:

1. The Council and its members, officers, employees, agents, and volunteers shall be included as additional insureds, including completed operations coverage.

2. The Contractor's insurance coverage shall contain no special limitations on the scope of protection afforded to the Council and its members, officers, employees, agents, or volunteers.

3. For any claims related to this contract, the Contractor's insurance coverage shall be primary as respects the Council and its members, officers, employees, agents, and volunteers. Any insurance or self-insurance program maintained by the Council or its members, officers, employees, agents, and volunteers shall be excess of the Contractor's insurance and shall not contribute to it.

4. Any failure to comply with reporting provisions of the policies, including breaches of warranties, shall not affect coverage provided to the Council or its members, officers, employees, agents, or volunteers.

5. The Contractor shall include all subcontractors as insured under its policies or furnish separate certificates and endorsements for each subcontractor. All coverage for subcontractors shall be subject to and consistent with all of the requirements stated in this contract.

6. The Contractor's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability.

6.05 Proof of Insurance. Prior to commencing work under this contract, the Contractor shall provide to the Council certificates and endorsements acceptable to the Council evidencing the Contractor's compliance with the insurance requirements in this contract. The certificates of insurance and endorsements for each insurance policy must be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates and endorsements must be received and approved by the Council before any services are provided under this contract. The Council

reserves the right to require complete, certified copies of all required insurance policies at any time. Upon the Council's request, the Contractor shall promptly deliver to the Council true and correct copies of the Contractor's policy or policies of insurance and all endorsements and riders and receipts for payment of premiums. Upon the Council's request, the Contractor shall furnish evidence of continued insurance coverage as required by this Article VI.

6.06 Failure to Procure or Maintain Insurance. Failure to procure or maintain insurance as required by this contract may result in suspension of payments under this contract to the Contractor by the Council and/or immediate termination of this contract by the Council.

6.07 Contractor's Responsibility for Insurance and Liability. The Council does not represent in any way that the insurance specified in this contract, whether in scope of coverage or limits, is adequate or sufficient to protect the Contractor's business or interests. It is the sole responsibility of the Contractor to determine the need for and to procure additional coverage which may be needed in connection with this contract. In addition, the procuring of such required policy or policies of insurance shall not be construed to limit the Contractor's liability under this contract nor to fulfill the indemnification provisions and requirements of this contract.

6.08 Underlying Insurance. The Contractor shall require indemnification and insurance coverage as it deems appropriate from its subcontractors providing services under this contract.

6.09 Non-Waiver of Municipal Immunity and Limits. Nothing in this contract shall be construed to waive the Council's municipal immunities or liability limits provided in the Minnesota Municipal Tort Claims Act or other applicable state or federal law.

6.10 Bonding Requirements; Letter of Credit in Lieu of Bond.

(a) Performance Bond. The Contractor shall provide and maintain during the term of this contract, at its expense, a performance bond executed by a surety company duly authorized to do business in Minnesota, in a form acceptable to the Council. The performance bond shall be in the amount of 10 percent of the total contract value and shall be provided as security for the faithful completion of all obligations under this contract. The bond shall be executed by a surety named in the current list of "Companies Holding Certificate of Authority as Acceptable Sureties on Federal Bonds and Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operation, U.S. Treasury Department. A bond signed by an agent shall be accompanied by a certified copy of such agent's authority to act.

At the Contractor's option, the performance bond to be provided by the Contractor may include a provision that failure of the Contractor to provide a performance bond for an option order under this contract shall not be considered an event of default solely for the purposes of the surety's obligations under the performance bond. However, the inclusion of such provision in the performance bond shall not be deemed to modify or limit in any manner the Contractor's obligations under this contract including, without limitation, its obligations with respect to providing option vehicles.

The bond must be provided prior to the issuance of a Notice to Proceed under this contract. If the surety of any bond furnished by the successful bidder is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the work is located, the successful offeror shall, within ten calendar days thereafter, substitute another bond and surety, both of which must be acceptable to the Council.

(b) Letter of Credit in Lieu of Performance Bond. In lieu of a performance bond, as required above, the Contractor may provide, at its expense, a letter of credit for the benefit of the Council, irrevocable during the term of this contract, and in a form acceptable to the Council. The letter of credit shall be in the amount of 10 percent of the total contract value and shall be provided as security for the faithful completion of all obligations under this contract. The letter of credit must be issued by a state or national bank (1) acceptable to the Council, (2) authorized to do business in the State of Minnesota, and (3) with an office in the State of Minnesota.

The letter of credit must be provided prior to the issuance of a Notice to Proceed under this contract. If the issuer of any letter of credit furnished by the Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in the State of Minnesota, the Contractor shall, within ten calendar days thereafter, substitute another letter of credit that meets the requirements of this section and is acceptable to the Council.

VII. TERMINATION OF CONTRACT

7.01 Termination for Default. The Council may, by written notice of default to the Contractor, terminate the whole or any part of this contract if the Contractor fails to make delivery of the Vehicles or to perform the work within the time specified in this contract or any extension of this contract, or if the Contractor fails to perform any of the provisions of the contract, or so fails to make progress as to endanger performance of this contract in accordance with its terms, and does not cure such failure within a period of ten calendar days after receipt of notice from the Council's Project Manager specifying such failure.

If the contract is terminated in whole or in part for default, the Council may procure, upon such terms and in such manner as the Council may deem appropriate, Vehicles or services similar to those so terminated. The Contractor shall be liable to the Council for any excess costs for such similar Vehicles or services, and shall continue the performance of this contract to the extent not terminated under the provisions of this section. The rights and remedies of the Council provided in this section shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

If, after notice of termination of this contract under the provisions of this clause, it is determined for any reason that the Contractor was not in default under the provisions of this clause, or that the default was excusable under the provisions of this clause, the rights and obligations of the

parties shall be the same as if the notice of termination had been issued pursuant to termination for convenience of the Council.

7.02 Termination for Convenience. The Council may terminate this contract in whole or in part upon 30 calendar days' notice sent by certified mail, return receipt requested, to the Contractor, if the Council's Regional Administrator determines that termination is in the best interests of the Council. If the Council terminates this contract for convenience, and except as otherwise directed by the Council's Regional Administrator, the Contractor shall:

1. Stop work under the contract on the date and to the extent specified in the notice of termination.

2. Place no further orders or subcontracts for materials, services, or facilities except as may be necessary for completion of such portion of the work under the contract as is not terminated.

3. Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the notice of termination.

4. Settle all outstanding liabilities and all claims arising out of such termination or orders and subcontracts, with the approval or ratification of the Council's Regional Administrator, to the extent that may be required, which approval or ratification shall be final for all the purposes of this section.

5. Transfer title to the Council and deliver in the manner, at the times, and to the extent, if any, directed by the Council's Regional Administrator the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced as a part of, or acquired in connection with the performance of, the work terminated, and the completed or partially completed plans, drawings, information and other property which, if the contract had been completed, would have been furnished to the Council.

6. Use its best efforts to sell, in the manner, at the times, to the extent, and at the price(s) directed or authorized by the Council's Regional Administrator, any property of the types referred to above, provided however, that the Contractor shall not be required to extend credit to any purchaser, and may acquire any such property under the conditions prescribed by and at a price(s) approved by the Council's Regional Administrator. The proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Council to the Contractor under this contract or shall otherwise be credited to the price or cost of the work covered by this contract or paid in such other manner as the Council's Regional Administrator may direct.

7. Complete performance of such part of the work as shall not have been terminated by the notice of termination.

8. Take such action as may be necessary, or as the Council's Regional Administrator may direct, for the protection or preservation of the property related to this contract which is in the possession of the Contractor and in which the Council has or may acquire an interest.

In the event of termination for convenience, the Contractor shall be paid its costs, including contract close-out costs, and profit on work performed up to the time of termination. The Contractor shall promptly submit its termination claim to the Council. Settlement of claims with the Contractor under this termination for convenience clause shall be in accordance with the provisions set forth in Part 49 of the Federal Acquisition Regulations (48 C.F.R. Part 49) except that wherever the word "Government" appears it shall be deleted and the word "Council" shall be substituted in lieu thereof.

7.03 Contractor Responsibility for Subcontracts. If this contract is terminated under this Article VII, the Council shall have no liability or responsibility for leases or contractual agreements entered into by the Contractor for performance of the Contractor's responsibilities under this contract, except as provided in this article.

VIII. AMENDMENTS, ASSIGNMENT AND SUBCONTRACTING

8.01 Amendments; Change Orders. The terms of this contract may be changed by mutual agreement of the parties. Such changes are effective upon the execution of written amendments by the duly authorized representatives of the parties unless a change order is authorized by this section. The Council may, at any time, without notice to the Contractor's sureties, by written order designated or indicated to be a Change Order, make any changes in the work within the scope of the contract, to take effect ten calendar days after the giving of written notice to the Contractor, or such other period of time as the Council and the Contractor may agree. Oral orders will not be binding on the Council or the Contractor unless confirmed in writing by the Council. Except as provided in this section, no order, statement or conduct of the Council will be treated as a change or will entitle the Contractor to an equitable adjustment.

8.02 Change Order Procedure. Within ten calendar days after receipt of the written Change Order to modify the contract, the Contractor shall submit to the Council's Project Manager a detailed price and schedule proposal for the additional work to be performed. This proposal shall be accepted or modified by negotiations between the Contractor and the Council's Project Manager according to the procedure in Section 8.03. If warranted, a detailed amendment based on the Change Order shall be executed in writing by both parties. However, if the modification increases the unit price of any Vehicle or the total maximum compensation to be paid under this contract, the increase must be presented to and approved by the Council's governing body before the modification is executed. Disagreements that cannot be resolved within negotiations shall be resolved in accordance with Article XI (Dispute Resolution). Regardless of any disputes, the Contractor shall proceed with the work ordered.

8.03 Equitable Adjustment Claims. If the Contractor intends to assert a claim for an equitable adjustment due to a written Change Order under this contract, the Contractor shall submit to the Council a written statement setting forth the general nature and monetary extent of

such claim. The Contractor shall supply supporting documents and analysis for the claims as the Council may require to determine if the claims and costs have merit. The Council shall respond in writing within ten working days of receipt of the Contractor's claim. If the parties are unable to agree on the disposition of an equitable adjustment claim, the Contractor may seek resolution pursuant to Article XI (Dispute Resolution). No claim by the Contractor for equitable adjustment under this contract will be allowed if it is asserted after final payment under this contract.

8.04 Assignment; Subcontracting. The Contractor shall not assign or subcontract any interest, obligation, or benefit under or in the contract or transfer any interest in the contract, whether by assignment, subcontract, or novation, without prior written consent of the Council's Project Manager. Such consent shall not be unreasonably withheld. Any attempt by the Contractor to transfer, assign, or subcontract any interest in the contract without the Council's Project Manager's prior written consent will be null, void, and of no effect whatsoever. Consent by the Council's Project Manager to any assignment or subcontracting will not relieve the Contractor of its primary responsibility for performance under this contract. If assignment or subcontracting is approved, the contract shall be binding upon and inure to the benefit of the successors of the parties. If subcontracting is approved, the Contractor agrees that all applicable FTA flow down compliance requirements will be included in such subcontracts and the Contractor will obtain all applicable FTA-required certifications before entering into any subcontract. This contract, including any option, may be assigned, in whole or in part, by the Council without the Contractor's consent.

8.05 Responsibility for Subcontract Work and Supplies. The Contractor shall be responsible for all materials and workmanship in the construction of the Vehicles and all accessories used, whether the same are manufactured by the Contractor, subcontracted, or purchased from a supplier. This provision excludes tires, fare boxes, radios and equipment leased or supplied by the Council, except insofar as such equipment is damaged by the failure of a part or component for which the Contractor is responsible, or except insofar as the damage to such equipment is caused during the manufacture of the Vehicles.

IX. RECORD-KEEPING; AND ACCESS TO RECORDS; AUDIT

9.01 Establishment and Maintenance of Information. The Contractor agrees to establish and maintain accurate, detailed, and complete separate books, accounts, financial records, documentation, and other evidence pertaining to: i) the performance of the work under this contract, and ii) the receipt and expenditure of all funds received under this contract. The Contractor shall also maintain the financial information and data used in preparation or support of the cost submission for any negotiated contract amendment or change order under this contract. The Contractor shall establish and maintain all such information in accordance with generally accepted accounting principles and practices and shall retain intact all such information until the latest of:

a. complete performance of this contract; or
b. six years following the end of the term of this contract; or

c. if any litigation, claim, or audit is commenced during either such period, when all such litigation, claims or audits have been resolved.

If the Contractor engages any subcontractors to perform any of the work under this contract, the Contractor agrees that the contract for such work shall include provisions requiring the subcontractor to establish and maintain information in accordance with the provisions of this section and to allow access to and audit of such information in accordance with Sections 9.02 and 9.03.

9.02 Access to Data and Other Information. The Council shall have access to all Contractor data under this contract and shall cooperate with the Council's reasonable requests for access to the data for the purpose of inspection and copying. The Contractor must maintain the data in convenient formats reasonably requested by the Council. The Contractor will provide appropriate facilities for such access, inspection, audit, and copying and will require that this section be included in any subcontract for the work under the contract. For the Council to determine whether the Contractor has complied with the requirements this contract, the Contractor shall, at any time when requested, submit to the Council properly authenticated documents or other satisfactory proof as to the Contractor's compliance with such requirements. The term "data" for the purposes of this section includes all information and records collected, created, received, maintained, or disseminated by the Contractor in the performance of the work under this contract, regardless of physical form, storage media, or conditions of use.

9.03 Audits. The accounts and records of the Contractor relating to this contract shall be audited in the same manner as all other accounts and records of the Contractor are audited. During the time of maintenance of information under Section 9.01, authorized representatives of the Council, and the Legislative Auditor and/or State Auditor in accordance with Minnesota Statutes, section 16C.05, subdivision 5, will have access to all such books, records, documents, accounting practices and procedures, and other information for the purpose of inspection, audit, and copying during normal business hours. The Contractor will provide proper facilities for such access and inspection. Financial adjustments resulting from any audit by the Council shall be paid in full within 30 calendar days of the Contractor's receipt of audit.

Within 30 calendar days after completion, the Contractor shall deliver to Council a copy of any audit of the Contractor done by the Contractor or at its request or at the direction of any governmental agency or department which relate to the performance of the work under this contract.

X. EQUAL EMPLOYMENT OPPORTUNITY AND AFFIRMATIVE ACTION

10.01 Employment. In performing work under this contract, the Contractor and its subcontractors shall comply with all applicable local, state and federal laws, regulations, and ordinances prohibiting discrimination and requiring equal opportunity in employment including, without limitation, the Minnesota Human Rights Act, Minnesota Statutes, Chapter 363A, Title VII of the Civil Rights Act of 1964, 42 U.S.C. section 2000e et seq., the Age Discrimination in Employment Act of 1967, 29 U.S.C. section 621 et seq., and Title I of the Americans with Disabilities Act of 1990, 42 U.S.C. section 12111 et seq., and as such laws may be amended

from time to time. Specifically, the Contractor agrees to be bound by the provisions of Minnesota Statutes, section 181.59, which prohibits certain discriminatory practices and the terms of said section are incorporated into this contract by reference.

10.02 Affirmative Action.

a. General Requirements. The requirements of Minnesota Statutes, section 473.144, and Minnesota Rules, parts 5000.3400 to 5000.3600, regarding affirmative action plans, are incorporated in this contract by reference.

b. Disabled Individuals Affirmative Action.

1. The Contractor must not discriminate against any employee or applicant for employment because of a physical, sensory, or mental disability in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified disabled persons without discrimination based upon their physical, sensory, or mental disability in all employment practices such as the following: employment, upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.
2. The Contractor agrees to comply with the rules and relevant orders of the Minnesota Department of Human Rights issued pursuant to the Minnesota Human Rights Act.
3. In the event of the Contractor's noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with Minnesota Statutes, section 363.073, and the rules and relevant orders of the Minnesota Department of Human Rights issued pursuant to the Minnesota Human Rights Act.
4. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form prescribed by the Commissioner of the Minnesota Department of Human Rights. Such notices must state the Contractor's obligation under law to take affirmative action to employ and advance in employment qualified disabled employees and applicants for employment, and the rights of applicants and employees.
5. The Contractor must notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Minnesota Statutes, section 363.073 of the Minnesota Human Rights Act and is committed to take affirmative action to employ and advance in employment physically, sensory, and mentally disabled persons.

XI. DISPUTE RESOLUTION

11.01 Contractor Claims; Appeal. Claims by the Contractor disputing the meaning and intent of this contract or arising from performance of this contract shall be referred in writing

to the Council's Project Manager for a written decision. The Council's Project Manager shall respond to the Contractor in writing with a decision within ten calendar days following receipt of the Contractor's claim by the Council's Project Manager. The Council's Project Manager may, at his or her discretion, extend the time period for response to the Contractor specified in this section.

11.02 Appeal of Project Manager Decision. If the Contractor disagrees with any determination or decision of the Council's Project Manager, the Contractor shall, within 15 calendar days of the date of such determination or decision, appeal the determination or decision in writing to the General Manager of Metro Transit. Such written appeal shall include all documents and other information necessary to substantiate the dispute or claim. The General Manager of Metro Transit will review the dispute or claim and transmit a decision in writing to the Contractor within 30 calendar days from the receipt of the dispute or claim. Failure of the Contractor to appeal the decision or determination of the Council's Project Manager within the 15 calendar day period will constitute a waiver of the Contractor's right to assert thereafter any claim resulting from such determination or decision. Submission of a dispute or claim to the General Manager of Metro Transit shall be a condition precedent to any litigation under this contract. The General Manager of Metro Transit may, at his or her discretion, extend the time period for response to the Contractor specified in this section.

11.03 Proceed with Performance; Failure to Comply with Deadlines. Pending final decision of a dispute under this Article XI, the Contractor and the Council shall proceed diligently with the performance of the contract and the question or claim shall be temporarily resolved in accordance with the decision of the General Manager of Metro Transit, until final resolution of the question or claim. Failure by the Contractor to comply precisely with the time deadlines under this section as to any claim shall operate as a release of that claim and a presumption of prejudice to the Council.

XII. QUALITY ASSURANCE

12.01 Contractor's In-Facility Quality Assurance Requirements. The Contractor shall establish and maintain an effective in-facility quality assurance organization. The quality assurance organization shall exercise quality control over all phases of production from initiation of design through manufacture and preparation for delivery and will maintain an ongoing history of customer complaints with corrective action. The organization shall also control the quality of subcomponent articles. The quality assurance organization shall have the authority and responsibility for reliability, quality control, inspection planning, establishment of the quality control system, and acceptance/rejection of materials and manufactured articles in the production of the Vehicles.

12.02 Council Inspectors. The Council shall be periodically represented at the Contractor's facility by representatives of the Council who shall, as inspectors, monitor in the Contractor's facility the manufacture of the Vehicles. The Council inspectors shall be authorized to approve the pre-delivery acceptance tests, and to release the Vehicles for delivery. Upon request to a quality assurance supervisor or similar applicable authority position, the Council inspectors shall have access to the Contractor's quality assurance files related to this contract.

These files shall include drawings, assembly procedures, material standards, parts lists, inspection processing and reports and records of defects.

Not less than 30 calendar days prior to the beginning of Vehicle manufacture, the Council inspectors shall meet with the Contractor's quality assurance manager or similar authority position. They shall review the inspection procedures and check lists. The Council inspectors may begin monitoring coach construction activities two weeks prior to the start of Vehicle fabrication.

Neither the presence of these Council inspectors in the plant nor the testing monitoring and approval conducted by the Council inspectors shall relieve the Contractor of its responsibility to meet all of the requirements of this contract. Meetings between the appropriate Contractor personnel and the Council's inspectors for the review of Quality Assurance provisions are required of the Contractor.

12.03 Control of Purchases. The Contractor shall maintain quality control of purchases. The Contractor shall require that each supplier maintains a quality control program for the services and supplies that it provides. The Contractor's quality assurance organization shall inspect and test materials provided by suppliers for conformance to specification requirements. Materials that have been inspected, tested, and approved shall be identified as acceptable to the point of use in the manufacturing or assembly processes. Controls shall be established to prevent inadvertent or intentional use of nonconforming materials. The Contractor shall verify that all applicable specification requirements are properly included or referenced in purchase orders.

12.04 Manufacturing Control. The Contractor shall ensure that all basic production operations, as well as all other processing and fabricating, are performed under controlled conditions. Establishment of these controlled conditions shall be based on the documented work instructions, adequate production equipment, and special working environments if necessary. The Contractor shall be responsible to maintain uniformity throughout this contract. All changes shall be made in writing to the Council in detail with specific drawings or prints to show the changes.

12.05 Interchangeability. The Contractor shall assure all component and subcomponent articles provided for a particular production run under this contract, whether by suppliers or manufactured by the Contractor, shall be duplicates in design, manufacture, and installation to assure interchangeability among Vehicles within this procurement. This interchangeability shall extend to the individual components as well as to their locations within the Vehicles.

12.06 Bus Tests. Fully-documented tests shall be conducted on each production Vehicle following manufacture to determine its acceptability to the Council. These tests shall include pre-delivery inspections and testing by the Contractor, and may include post-delivery acceptance testing by the Council, in compliance with 49 U.S.C. section 5323 and 49 C.F.R. part 663.

a. Pre-delivery Tests. The Contractor shall conduct acceptance tests at its plant on each Vehicle following completion of manufacture and before delivery to the Council. These pre-delivery tests shall include visual and measured inspections, as well as testing the total Vehicle operation, including safety. The tests shall be conducted and documented in accordance with written test plans. Additional tests may be conducted at the Contractor's discretion to ensure that the completed Vehicles have attained the desired quality and safety standards and have met the requirements of this contract.

The pre-delivery tests shall be scheduled and conducted with sufficient notice so that they may be witnessed by the Council inspectors, who may accept or reject the results of the tests. If the Council inspectors reject the results of any test, the Contractor shall make the adjustments or repairs necessary to correct discovered defects or deficiencies and shall repeat the applicable tests to the satisfaction of the Council inspectors. The results of pre-delivery tests, and any other tests, shall be filed with the assembly inspection records for each Vehicle. The underfloor equipment shall be made available for inspection by the Council inspectors, using a pit or coach hoist provided by the Contractor. A hoist, scaffold, or elevated platform shall be provided by the Contractor to easily and safely inspect Vehicle roofs. Authorization forms for the release of each Vehicle for delivery shall be provided by the Contractor. An executed copy of the authorization shall accompany the delivery of each Vehicle.

b. Inspections. Visual and measured inspections shall be conducted with the Vehicle in a static condition. The purpose of the inspection testing is to verify overall dimensional and weight requirements, to verify that required components are included and are ready for operation, and to verify that components and subsystems that are designed to operate with the Vehicle in a static condition do function as designed.

c. Total Vehicle Operation. The Contractor shall evaluate total Vehicle operation during road tests. The purpose of the road tests is to observe and verify the operation of the Vehicle as a system and to verify the functional operation of the subsystems that can be operated only with the Vehicle in motion. Each Vehicle shall be driven for a minimum of 15 miles during the road tests. Observed defects shall be recorded on the test forms. The Vehicle shall be re-tested when defects are corrected and adjustments are made. This process shall continue until defects or required adjustments are no longer detected. Results shall be pass/fail for these Vehicle operation tests. After the completion of the Contractor's road test and repairs, if required, the Council inspector(s) shall be taken on a five mile (minimum) road test to make all functional checks and to assure that there are no vibrations, unusual noises, or rattles prior to delivery.

d. Post-Delivery Test. The Council may conduct acceptance tests on each delivered Vehicle. These tests shall be completed within 15 working days after Vehicle delivery and shall be conducted in accordance with written test plans. The

purpose of these tests is to identify defects that have become apparent between the time of Vehicle release and delivery to the Council. The post-delivery tests shall include visual inspection of the Vehicle in a static condition and Vehicle operations and safety in road tests. Vehicles that fail to pass the post-delivery tests are subject to rejection. The Council shall record details of all defects on the appropriate tests forms and shall notify the Contractor of rejection of each Vehicle within five calendar days after completion of the tests. The defects detected during these tests shall be repaired according to procedures defined in Article XIII of this contract on Warranty Requirements. Placing a Vehicle in revenue service constitutes acceptance of that Vehicle for purposes of payment.

12.07 Pilot Bus. The Contractor shall build, supply, and transport a diesel-propulsion pilot bus and a hybrid diesel-electric pilot bus to the Council prior to production of the remainder of the Vehicles. The pilot bus shall be subject to a thirty-day test and evaluation period by the Council, during which time it shall be operated in revenue service. Testing shall consist of running the bus in passenger service for the entire thirty-day period as well as a specification audit. The criteria for this test shall be to operate the bus for the entire thirty-day period without defects and free of any failure, regardless of the mileage accumulated.

Except as otherwise provided in this section in the case of failures, within 30 calendar days after the test and evaluation period is completed, the Council will recommend modifications to be made to the pilot bus and the balance of the order. All necessary corrective actions and modifications shall be incorporated into the pilot bus and into the balance of the Vehicle order at no cost to the Council.

In the event that a failure occurs during the test and evaluation period, the Council's Project Manager shall notify the Contractor orally, in writing, or by facsimile transmission. Failure of the bus to operate without failure for the thirty-day period may, at the discretion of the Council, result in the test and evaluation period being continued in thirty-day increments, until the Contractor proves that the bus can attain the required level of performance. The manufacturer shall furnish the Council's Project Manager with a plan which details the nature and cause of the problem, the repair action, and the steps taken to prevent re-occurrence. Approval of the plan by the Council constitutes an approval only of the method taken to resolve the problem and shall not be construed as approval of the repair. The responsibility for performance remains with and is the sole responsibility of the Contractor. The Contractor shall be required to make the necessary repairs to the bus prior to restart of the test and evaluation period. Prior to restart of the test and evaluation period, approval shall be obtained from the Council's Project Manager.

For the purposes of this section, the term "failures" includes, without limitation, the following:

1. mechanical failures including material, process, or design failures of any component of the bus
2. electrical failures including material, process, or design failures of any electrical or electronically operated component of the bus
3. intermittent failures of wiring circuits or errors in software; and
4. any requirement for extraordinary maintenance (i.e., any maintenance beyond the maintenance now performed at the 6,000-mile point by the Council).

Failures noted as a result of maintenance inspections shall be categorized as road failures even though the failure did not cause a service delay. Failures that are beyond the Contractor's ability to control (i.e., flat tires or accidents that are not the result of mechanical failure) will not be used to rate the bus's performance.

12.08 Post-Delivery Technical Support. The Contractor must make available a post-delivery service representative, which may be a local vendor upon approval of the Council, having precise technical knowledge of the technology supplied on the Vehicles, for urgent resolution of technical issues as they may occur in service operations. The technical support may be in the form of a customer service telephone direct-line or hot-line, or on-line computer accessibility. Either method of providing the technical support must include rapid response priority resolution commitment by the Contractor.

XIII. WARRANTY REQUIREMENTS

13.01 Warranty Coverage. Warranties in this contract are in addition to, and not in lieu of any statutory remedies or warranties provided by law, except as provided in this contract. No disclaimer of liability, limitations on scope of warranty, or limitations on damages inconsistent with the warranties contained in this contract or otherwise given shall be construed to limit any remedy available to the Council by law nor to limit the time in which such other remedy may be sought by the Council. The Contractor warrants and guarantees to the Council each complete Vehicle, including specific subsystems and components as provided in this section.
The Contractor shall be the sole provider for all warranties and warranty repairs for the entire bus, including, but not limited to, those that apply to engines, transmissions and other major components. At its sole discretion, the Council reserves the right to utilize a local authorized repair facility to effect warranty repairs on these components but shall be under no obligation to do so.

If an unforeseen event such as a work stoppage or natural disaster occurs, and 25% or more of the Council's fleet is idled for more than five calendar days, the warranty period shall be extended for those Vehicles and warrantable components by the number of days the Vehicles are not used in Council service. During the warranty period, the Vehicle shall maintain its structural and functional integrity. The warranty is based on regular operation of the Vehicle under the operating conditions prevailing in the Council's locale and subjected to the Council's Metro TransitDivision's *Standard Preventive Maintenance Practices.* Each complete Vehicle is warranted and guaranteed to be free from operational and safety defects for two years or 100,000 miles, whichever comes first, beginning on the date of acceptance of each vehicle Specific subsystems and components are warranted and guaranteed to be free from defects and related defects for the minimum times and/or mileages given below, subject to the limitations of extended warranties:

	WHICHEVER OCCURS FIRST:	
ITEM/SUBSYSTEM/COMPONENT	YEARS	MILEAGE
Alternators	2	Unlimited
Engine	5	300,000

Transmission	5	300,000
Brake System (excludes lining & diaphragms)	2	Unlimited
HVAC System	3 Years	Unlimited
Skeletal Structure, including Chassis and load-carrying elements of the body	12	500,000
Ramp	2	Unlimited
Radiator	4	Unlimited
Basic Coach (bumper to bumper Excludes non LED lights and belts)	2	100,000
Suspension	3	150,000

The Council agrees that the warranty shall not apply to any part or component of the Vehicle that has been subject to abuse, negligence, accident or has been repaired or altered in any way so as to affect its performance or reliability, except insofar as such repairs were in accordance with the Council's Metro Transit Maintenance Division's *Standard Preventive Maintenance Practices.* The warranty shall not apply to items furnished by the Council, such as radios, fareboxes, and other auxiliary equipment, except insofar as such equipment may be damaged by the failure of a part or component for which the Contractor is responsible.

The basic structure of the Vehicle, including structural elements of the suspension, and all weldments shall be warranted against failure, corrosion, and cracking sufficient to cause a Class 1 or Class 2 failure for a period of 12 years or 500,000 miles, whichever comes first.

13.02 Detection of Defects. If the Council detects a defect within the warranty periods defined above, it shall promptly, within five working days notify the Contractor's authorized representative. The Contractor's representative shall agree either that the defect is in fact covered by warranty, or reserve judgment for up to ten working days until the subsystem or component is inspected by the Contractor's representative. At that time, the status of warranty coverage on the subsystem or component shall be mutually resolved between the Council and the Contractor. Work necessary to effect warranty repairs shall at the Council's Metro Transit Maintenance Divisions discretion, commence within ten working days after the receipt of notification by the Contractor. If the Contractor has notice of any recall affecting the Vehicles, the Contractor will promptly notify the Council's Metro Transit's Maintenance Division of such recall and of the steps necessary to correct the condition giving rise to the recall.

13.03 Fleet Defects. A fleet defect is defined as a failure of identical items by specific location and function on 15% of vehicles from a particular production run during the warranty period. The Contractor shall correct a fleet defect under the warranty provisions defined in this section and shall promptly expedite and complete a work program designed to prevent the occurrence of the same defect in any other Vehicles still under manufacture under this contract. The work program shall include inspection and/or correction of the potential for defective parts in all of the Vehicles. The warranty period on items determined to be fleet defects shall be suspended until corrected to the Council's satisfaction. The warranty on items determined to be

fleet defects shall be extended for the unexpired time and/or miles of the original warranty. Fleet defect warranty provisions shall not apply to damage that is a result of abuse, negligence, accidents or vandalism to such items as seats, floor coverings, windows, interior trim and paint.

13.04 Scope of Warranty Repairs. When warranty repairs are required, the Council and the Contractor's representative shall agree within five calendar days after notification on the most appropriate course for the repairs and the exact scope of the repairs to be performed under the warranty. If the Council's Metro Transit Maintenance Division does not perform the corrective work required; the Contractor will begin the work within five calendar days after an agreement has been reached. If no agreement is obtained within the five calendar day period, the Council reserves the right to commence the repairs in accordance with this section. At its discretion, the Council may elect to perform warranty repairs at any time. The Council may require the Contractor or its designated representative to perform warranty repairs. Warrantable work may be done by the Council's personnel with reimbursement by the Contractor.

13.05 Repairs by Contractor. If the Council requires the Contractor to perform repairs after rejection of a Vehicle as described in Section 12.06 or to correct any other defect, including warranty repairs,, the Contractor's representative must begin, within two working days after receiving notification of a defect from the Council, work necessary to effect repairs. The Council shall make the Vehicle available to the Contractor to complete repairs, in accordance with the Contractors repair schedule. The Contractor shall provide at its own expense, all necessary material, parts, tools and labor required to complete repairs.
At the Council's option, the Contractor may be required to remove the Vehicle from the Council's facilities while repairs are being affected. If the Vehicle is removed from Council's property, repair procedures must be diligently pursued by the Contractor or the Contractor's representative. All costs incurred for the transfer of the Council's Vehicles to or from the Vehicles domicile to another repair facility are to be borne by the Contractor. If the Council's personnel are utilized to move the Vehicles, the Contractor will reimburse the Council the applicable rates for the personnel. Disputes arising out of this section will be heard by Metro Transit's Director of Maintenance.
A monthly report listing all Contractor-supplied or Contactor-purchased parts used in warranty or policy repairs will be sent electronically in an Excel format to the warranty manager and warranty supervisor by the 10th day of each month. The Contractor's service representative shall ensure that the report includes all parts installed during the various warranty periods listed in the table in Section 13.01, regardless of whether warranty claims are filed relative to the applicable defect or failure. The report will depict the following items: Bus #, Vehicle Identification Number, contractor part number, item description, the Metro Transit work order number and the cost of the item.
Any materials or parts to be used on Metro Transit buses for warranty repairs will be received and processed through the Metro Transit Material Management Department. A 15% administration fee will be charged to the contactor if parts are installed on Metro Transit buses without being processed through the Materials Management Department.
Contractors and sub-contractors will be provided a vendor ID badge and are required to use the Council timekeeping system when working on any Metro Transit buses. Metro Transit will invoice via a warranty claim any labor the contractor did not record while performing the repair.

13.06 Repairs by Council's Personnel. If the Council's personnel perform the warranty-covered repairs, Contractor specified parts available from Metro Transit parts inventory or those supplied by the Contractor specifically designated for the repair shall be used. The Council shall submit to the Contractor periodic reports of all repairs covered by the warranty for reimbursement or replacement of parts. The Contractor shall provide forms for these reports which are compatible with the Council's warranty administration procedures. The Council's warranty personnel shall submit and the Contractor shall accept warranty claims within 90 days from the date of failure. Efforts shall be made by both the Contractor and the Council to automate warranty claims processing and record-keeping. If the Contractor utilizes an electronic claim filing warranty system, the system shall be capable of interfacing with Metro Transits data management system.

The Council may request that the Contractor supply new parts for the warranty-covered repairs being performed by the Council's personnel. These parts shall be shipped prepaid to the Council's Metro Transit Maintenance Division, from any source selected by the Contractor within five working days of the request for parts.
If parts are not supplied by the Contractor, the Contractor shall reimburse the Council for all parts supplied from the Council's stock that are used to correct the defect. The reimbursement shall be at the actual invoice cost of the part(s) at the time of repair and shall include taxes where applicable, plus 15% handling costs.
The Contactor shall also reimburse the Council for handling expenses if the Council must remove a component from a Council bus for warranty repairs performed off site by a component supplier. This reimbursement shall be15% of the cost of a new identical part.

The Contractor may request that parts covered by the warranty be returned to the Contractor or the manufacturing facility. The total cost for this action, including shipping and 15% handling costs, shall be paid by the Contractor. The Council will return materials in accordance with Contractor's instructions. The Contractor's request for return of parts must be made within 20 calendar days of claim submission.

The Council shall be reimbursed by the Contractor for warranty labor. The amount shall be determined by multiplying the number of person-hours actually required to correct the defect by 163% of the current mechanic-technician rate per hour (this includes wages, fringe benefits, and overhead), plus the cost of towing of the Vehicle if such action was necessary and if the Vehicle was in the normal service area. The labor reimbursement rate shall be adjusted each year on the anniversary of the contract execution date to reflect changes in the mechanic-technician hourly rate.

13.07 Warranty After Replacement or Repairs. If any component, unit, or subsystem is repaired, rebuilt, or replaced by the Contractor, or by the Council's personnel, with the concurrence of the Contractor, the subsystem shall have the unexpired warranty period of the original subsystem. Warranty reimbursement shall be paid by check, payable to the Council, within 90 calendar days from the date the claim was submitted by the Council.

The Contractor shall supply serial numbers for all major components that have had a manufacturer's serial number assigned to the component or subsystem.

XIV. FEDERAL TRANSIT ADMINISTRATION REQUIREMENTS

The provisions of Exhibit A to this contract (Federal Transit Administration Requirements) are attached to and made a part of this contract. The provisions of Exhibit A are required because this contract is funded in whole or in part by the United States Department of Transportation (USDOT), Federal Transit Administration (FTA). The requirements in Exhibit A are in addition to and, unless inconsistent and irreconcilable, do not supplant requirements found elsewhere in this contract. If any requirement of Exhibit A is inconsistent with a provision found elsewhere in this contract and is irreconcilable with such provision, the requirement in Exhibit A shall prevail.

XV. GENERAL PROVISIONS

15.01 Legal Compliance. The Contractor will comply with all of the Council's resolutions and policies applicable to this contract and with all applicable state or federal laws, regulations, and directives. This requirement specifically extends, without limitation, to any motor vehicle safety standards and regulations in effect at the time of manufacture in the state of Minnesota and the local jurisdictions in which the Council will operate the Vehicles. The Contractor agrees that the most recent version of these shall govern at any given time. The Contractor shall exert its best efforts to give all notices required by law and to avoid violations of the law in connection with services provided under this contract. The Contractor shall monitor its agents, subcontractors, and employees for the purposes of ensuring compliance with all applicable laws. If any change in circumstances or law will affect the Contractor's performance under this contract, the Contractor will notify the Council's Project Manager of the change in circumstances or law at the Contractor's earliest opportunity. If a price adjustment is indicated, either upward or downward, it shall be negotiated between the Council and the Contractor for changes that are mandatory as a result of legislation or regulations that are promulgated and become effective between the date on which this contract is entered into and the date of manufacture of the Vehicles that are the subject of this contract.

15.02 Independent Contractor. The Contractor shall be considered an independent contractor and shall have and retain full control over supervision, and shall be responsible for the satisfactory work performance, of all its employees or subcontractors in performing the work described in this contract. Such personnel shall not be considered employees of the Council. The Contractor shall be responsible for payment of all employee wages and benefits and the costs of any subcontractor. The Contractor shall comply with the requirements of employee liability, workers' compensation, unemployment or reemployment insurance, and Social Security, as applicable to its operations. The Contractor shall have in effect personnel policies that conform to all applicable federal, state, and local laws. The Contractor shall maintain at all times a current list of personnel assigned to perform work under the contract with corresponding documentation of any current licenses or certifications each employee must legally have to carry out the employee's assigned duties.

15.03 Conflict of Interest. The Contractor, by entering into this contract with the Council, thereby covenants that it has no direct or indirect pecuniary or proprietary interest, and that it shall not acquire any interest, which conflicts in any manner or degree with the work, services, or materials required to be performed or provided under this contract and that it shall not employ any person or agent having any such interests. In the event that the Contractor or its agents, employees, or representatives hereafter acquires such a conflict of interest, it shall immediately disclose such interest to the Council's Project Manager and take action immediately to eliminate the conflict or to withdraw from this contract, as the Council may require.

The Contractor also certifies that, to the best of its knowledge, no Metropolitan Council member or employee, or employee or officer of any agency interested in the contract has a pecuniary interest in the business of the Contractor or with the contract and that no person associated with the Contractor has any interest that would conflict in any manner or degree with the performance of the contract.

The Contractor, by entering into a contract with the Council further covenants: 1) that no person or selling agency except bona fide employees or designated agents or representatives of the Contractor has been employed or retained to solicit or secure this contract with an agreement or understanding that a commission, percentage, brokerage, or contingent fee would be paid; and 2) that no gratuities were offered or given by the Contractor or any of its agents, employees or representatives, to any official, member, or employee of the Council or other governmental agency with a view toward securing this contract or securing favorable treatment with respect to the awarding or amending, or the making of any determination with respect to the performance of this service.

15.04 Data Practices Act Compliance. In accordance with Minnesota Statutes, section 13.05, subdivision 11, all of the data created, collected, received, stored, used, maintained, or disseminated by the Contractor in the performance of work under this contract is subject to the requirements of the Minnesota Government Data Practices Act. The Contractor must comply with those requirements, and the civil remedies of Minnesota Statutes, section 13.08, apply to the Contractor.

The Contractor shall promptly refer to the Council's Project Manager any third-party requests for release of or access to information, records, or other data collected, created, received, maintained, or disseminated by the Contractor in the performance of work under this contract, regardless of physical form, storage media, or conditions of use.

15.05 Licenses, Permits, or Certificates. The Contractor and its subcontractors shall procure and keep current any and all licenses, permits, or certificates which are or may be required by properly constituted authorities for the performance of work under this contract.

15.06 Complete Contract and Severability. This contract, including exhibits and other documents incorporated in this contract or made applicable by reference, constitutes the complete and exclusive statement of the terms and conditions of the contract between the Contractor and the Council. This contract supersedes all prior representations, understandings, and communications. The validity in whole or in part of any term or condition of the contract

shall not affect the validity of other terms or conditions unless the part or parts which are invalid shall substantially impair the value of the entire contract with respect to the parties.

15.07 Continuing Obligations. The Contractor acknowledges that the provisions of this contract impose continuing obligations on the Contractor which extend and are effective not withstanding termination or the conclusion of the term of this contract.

15.08 Workers Compensation and Tax Withholding Representations. In accordance with Minnesota Statutes, section 176.182, Contractor represents that it is in compliance with the workers' compensation coverage requirements of Minnesota Statutes, section 176.181, subdivision 2.

In accordance with Minnesota Statutes, section 290.97, Contractor represents that it and all its subcontractors under this agreement, if any, are in compliance with the tax withholding on wages requirements of Minnesota Statutes, section 290.92.

15.09 Notice. Notice for purposes of this contract shall be sufficient if personally delivered or sent by certified mail to the other party at the following addresses:

For the Council:	For the Contractor:
Chuck Wurzinger	Joe Policarpio
Metropolitan Council/Metro Transit	Gillig LLC
515 N. Cleveland Avenue	25800 Clawiter Road
St. Paul, MN 55114	Hayward, CA 94545

or such other address as either party may designate for itself in writing to the other party. Notices sent by certified mail shall be deemed to have been given as of the day of mailing.

15.10 Non-Waiver. The Council's failure to insist in any one or more instances upon the Contractor's performance of any term or condition of the contract shall not be construed as a waiver or relinquishment of the Council's right to such performance, or to future performance, of such term or condition by the Contractor, and the Contractor's obligation for performance of that term or condition shall continue in full force and effect.

15.11 Jurisdiction and Venue. All matters relating to the performance of this contract shall be controlled by and determined in accordance with the laws of the State of Minnesota. Venue for all legal proceedings arising out of this contract, or breach of this contract, shall be in the state or federal court with competent jurisdiction in Ramsey County, Minnesota.

15.12 Succession. This contract shall be binding on the parties, their successors, and assigns.

IN WITNESS WHEREOF, the parties have caused this contract to be executed by their duly authorized representatives on the dates indicated below.

GILLIG LLC

By: _____
JOSEPH POLICARPIO
Its: VICE PRESIDENT

Date: JULY 29, 2013

METROPOLITAN COUNCIL

By: _____

Patrick Born, Regional Administrator

Date: 7.30.2013

CONTRACT EXHIBIT A

FEDERAL TRANSIT ADMINISTRATION REQUIREMENTS

FTA-1 Fly America Requirements. The CONTRACTOR 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 subrecipients of Federal funds and their contractors 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 American Act. The CONTRACTOR 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 CONTRACTOR agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

FTA-2 Energy Conservation. The CONTRACTOR 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 federal Energy Policy and Conservation Act.

FTA-3 Access to Records and Reports. The CONTRACTOR agrees to provide the COUNCIL, the FTA Administrator, the Comptroller General of the United States, and any of their authorized representatives access to any books, documents, papers and records of the CONTRACTOR which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions.

CONTRACTOR also agrees, pursuant to 49 C.F.R. 633.17, to provide the FTA Administrator or the Administrator's authorized representatives, including any project management oversight (PMO) contractor, access to CONTRACTOR's records and construction sites pertaining to a major capital project, defined at 49 U.S.C. 5302(a)(1), which is receiving federal financial assistance through the programs described at 49 U.S.C. 5307, 5309, or 5311.

The CONTRACTOR agrees to permit any of the foregoing parties to reproduce such documents by any means whatsoever or to copy excerpts and transcriptions as reasonably needed. In addition to any other requirements for maintenance of project records and documents in this Contract, CONTRACTOR agrees to maintain such records and documents until the COUNCIL, the FTA Administrator, the Comptroller General, or any of their duly authorized representatives have disposed of all litigation, appeals, claims or exceptions arising from the performance of this Contract

FTA-4 Federal Changes. The CONTRACTOR shall at all times comply with the required FTA clauses set forth in this contract and with all applicable FTA regulations, policies, procedures and directives including, without limitation, those listed directly or by reference in the Master Agreement between the COUNCIL and FTA, as they may be amended or promulgated from time to time during the term of this contract. The CONTRACTOR's failure to so comply shall constitute a material breach of this contract.

FTA-5 Recovered Materials. The CONTRACTOR 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 CFR part 247.

FTA-6 No Obligation by the Federal Government. The COUNCIL and CONTRACTOR acknowledge and agree that, notwithstanding any concurrence by the federal government in or approval of the solicitation or award of this 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 COUNCIL, CONTRACTOR, or any other party (whether or not a party to the Contract) pertaining to any matter resulting from this Contract.

The CONTRACTOR agrees to include the preceding clause in each subcontract under this Contract and that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions..

FTA-7 Program Fraud and False or Fraudulent Statements or Related Acts. The CONTRACTOR acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. Section 3801 *et seq.*, and USDOT regulations, "*Program Fraud Civil Remedies*," 49 CFR part 31, apply to its actions pertaining to this contract. Upon execution of this contract, the CONTRACTOR certifies or affirms the truthfulness and accuracy of any statement is has made, it makes, it may make, or causes to be made, pertaining to the contract or the FTA-assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, the CONTRACTOR 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.

The CONTRACTOR 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 U.S.C. Section 5307, the Federal Government reserves the right to impose the penalties of 18 U.S.C. Section 1001 and 49 U.S.C. Section 5307(n)(1) on the CONTRACTOR, to the extent the Federal Government deems appropriate.

The CONTRACTOR agrees to include the above language in each subcontract under this contract and that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

FTA-8 Civil Rights. The following requirements apply to this 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 CONTRACTOR agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, or disability. In addition, the CONTRACTOR 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 this 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 CONTRACTOR 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," 42 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 this Contract. 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, or age. 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 CONTRACTOR 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. § 532, the CONTRACTOR 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 CONTRACTOR 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. **Inclusion in Subcontracts.** The CONTRACTOR agrees to include the requirements of this Section FTA-8 in each subcontract under this contract, modified only to identify the subcontractor that will be subject to the provisions.

FTA-9 Disadvantaged Business Enterprise ("DBE")

1. **Nondiscrimination.** Pursuant to 49 CFR section 26.13, the CONTRACTOR, sub-recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The CONTRACTOR shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts.

Failure by the CONTRACTOR to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the COUNCIL deems appropriate. The CONTRACTOR shall include this requirement in all subcontracts pursuant to this contract.

2. **Prompt Payment.** The CONTRACTOR agrees to pay subcontractors within ten calendar days of the CONTRACTOR's receipt of payment from the COUNCIL for undisputed services provided by the subcontractor. The CONTRACTOR agrees to pay subcontractors all undisputed retainage payments within ten calendar days of the CONTRACTOR's receipt of payment of retainage from the COUNCIL. The CONTRACTOR shall not postpone or delay any undisputed payments owed subcontractors without good cause and without prior written consent of the COUNCIL. The CONTRACTOR agrees to include in all subcontracts a provision requiring the use of appropriate alternative dispute resolution mechanisms to resolve payment disputes. The CONTRACTOR will not be reimbursed for work performed by subcontractors unless and until the CONTRACTOR ensures that subcontractors are promptly paid for work they have performed. Failure to comply with the provisions of this section may result in the COUNCIL finding CONTRACTOR in noncompliance with the DBE provisions of this contract.

FTA-10 Incorporation of FTA Terms. Specific provisions in this contract include, in part, certain standard terms and conditions required by USDOT, whether or not expressly set forth in the contract provisions. All contractual provisions required by USDOT, as set forth in 49 CFR section 18.36 and FTA Circular 4220.1E, are hereby incorporated by reference. Notwithstanding anything to the contrary in this contract, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this contract. The CONTRACTOR shall not perform any act, fail to perform any act, or refuse to comply with any COUNCIL requests which would cause the COUNCIL to be in violation of the FTA terms and conditions.

FTA-10a National Intelligent Transportation Systems Architecture and Standards. To the extent applicable, the CONTRACTOR agrees to conform to the National Intelligent Transportation Systems (ITS) Architecture and Standards as required by section 5206(e) of TEA-21, 23 U.S.C. § 502 note, and to comply with FTA Notice, "FTA National ITS Architecture Policy on Transit Projects" 66 Fed. Reg. 1455 et seq., January 8, 2001, and other Federal requirements that may be issued.

FTA-11 Clean Water. The CONTRACTOR 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. Section 1251 *et seq*. The CONTRACTOR agrees to report each violation to the COUNCIL and understands and agrees that the COUNCIL will, in turn, report each violation as required to assure notification to the FTA and the appropriate Environmental Protection Agency (EPA) Regional Office. The CONTRACTOR also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

FTA-12 Certification of Restrictions on Lobbying; Disclosure. The CONTRACTOR certifies that no federal appropriated funds have been paid or will be paid by or on behalf of the CONTRACTOR for influencing or attempting to influence an officer or employee of any federal 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. The

certification of this compliance ("Lobbying Restriction Certification") submitted by CONTRACTOR in connection with this project is incorporated in, and made a part of, this agreement.

The CONTRACTOR further certifies that, if any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee or any federal agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with the projects funded by the funds allocated to the CONTRACTOR in this agreement, the CONTRACTOR shall complete and submit to the COUNCIL, Standard Form-LLL, "*Disclosure Form to Report Lobbying*," in accordance with its instructions.

The CONTRACTOR certifies that it will require the language of this certification be included in the award documents for any subcontracts equal to or in excess of $100,000.00 under this agreement, and that all subcontractors shall certify and disclose accordingly to the CONTRACTOR.

The certifications referred to in this section (including the "Lobbying Restriction Certification" submitted by CONTRACTOR in connection with this project and incorporated in, and made a part of, this agreement) are material representations of fact upon which the COUNCIL relies when this agreement is made.

FTA-13 Clean Air. The CONTRACTOR agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. section 7401 *et seq*. The CONTRACTOR agrees to report each violation to the COUNCIL and understands and agrees that the COUNCIL will, in turn, report each violation as required to assure notification to the FTA and the appropriate Environmental Protection Agency (EPA) Regional Office. The CONTRACTOR also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

FTA-14 Suspension and Debarment. This contract is a covered transaction for the purposes of 49 CFR Part 29. By executing this contract, the CONTRACTOR certifies that none of the CONTRACTOR, 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 certification in this clause is a material representation of fact relied upon by the COUNCIL. If it is later determined that the CONTRACTOR knowingly rendered an erroneous certification, in addition to remedies available to COUNCIL, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The CONTRACTOR agrees to comply with the requirements of 49 CFR 29, Subpart C throughout the term of this contract. The CONTRACTOR further agrees to include a provision requiring such compliance in its lower tier covered transactions.

FTA-15 [Reserved]

FTA-16 [Reserved]

FTA-17 Buy America. The CONTRACTOR agrees to comply with 49 U.S.C. Section 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. Section 661.7, and include final assembly in the United States for 15 passenger vans and 15 passenger wagons produced by Chrysler Corporation, and microcomputer equipment and software. 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 60 percent domestic content.

FTA-18 Cargo Preference. The CONTRACTOR agrees: (a) to use privately-owned United States-Flag commercial vessels to ship at least 50% 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 loading 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 (a) to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590 and to the COUNCIL (through the CONTRACTOR in the case of a lower-tier participating subcontractors bill of lading); and (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.

FTA-19 [Reserved]

FTA-20 Contract Work Hours and Safety Standards Act.

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

(2) **Violation; Liability for Unpaid Wages; Liquidated Damages.** In the event of any violation of the clause set forth in paragraph (1) of this section, the CONTRACTOR and any subcontractor responsible for a violation shall be liable for the unpaid wages. In addition, the CONTRACTOR 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 COUNCIL shall, upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the CONTRACTOR or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities

of the CONTRACTOR or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.

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

(5) Safety Standards.

(i) General Requirement. The CONTRACTOR agrees to comply with section 107 of the Contract Work Hours and Safety Standards Act, 40 U.S.C., section 333, and applicable Department of Labor regulations, "Safety and Health Regulations for Construction" 29 C.F.R., Part 1926. Among other things, the CONTRACTOR agrees that it will not require any laborer or mechanic to work in unsanitary, hazardous, or dangerous surroundings or working conditions.

(ii) Subcontracts. The CONTRACTOR also agrees to include the requirements of this paragraph (5) in each subcontract. The term "subcontract" under this paragraph (5) is considered to refer to a person who agrees to perform any part of the labor or material requirements of a contract for construction, alteration or repair. A person who undertakes to perform a portion of a contract involving the furnishing of supplies or materials will be considered a "subcontractor" under this paragraph (5) if the work in question involves the performance of construction work and is to be performed: (1) directly on or near the construction site, or (2) by the employer for the specific project on a customized basis. Thus, a supplier of materials which will become an integral part of the construction is a "subcontractor" if the supplier fabricates or assembles the goods or materials in question specifically for the construction project and the work involved may be said to be construction activity. If the goods or materials in question are ordinarily sold to other customers from regular inventory, the supplier is not a "subcontractor." The requirements of this paragraph (5) do not apply to contracts or subcontracts for the purchase of supplies or materials or articles normally available on the open market.

FTA-21 Bus Testing. The CONTRACTOR agrees to comply with 49 U.S.C.A. 5323(c) 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 to the COUNCIL at a point in the procurement process specified by the COUNCIL which will be prior to the COUNCIL'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 COUNCIL prior to COUNCIL'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.

If the CONTRACTOR is not the manufacturer of the vehicles, the CONTRACTOR shall assure that the manufacturer meets the requirements of this section FTA-21.

FTA-22 Pre-Award and Post Delivery Audit Requirements. The CONTRACTOR 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 CONTRACTOR 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 CONTRACTOR shall submit evidence that it will be capable of meeting the bid specifications.

3. **Federal Motor Vehicle Safety Standards (FMVSS).** The CONTRACTOR 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.

TECHNICAL SPECIFICATION

List of Attachments

ITEM	DESCRIPTION	PAGES
1	Table of Contents	5
2	Technical Specifications (Final Specifications)	90
3	Appendix A – Trapeze Communication Systems Information	1
4	Appendix B – Contract Deliverables	3

SECTION 6: TECHNICAL SPECIFICATIONS (FINAL SPECIFICATIONS)

GENERAL

Contents

TS 1. Scope

Technical specifications define requirements for heavy-duty diesel and hybrid drive transit 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.

TS 2. Definitions

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

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

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

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

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

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

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

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

Burst Pressure. The highest pressure reached in a container during a burst test.

Capacity (fuel container). The water volume of a container in gallons (liters).

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

Class of Failures._Classes of failures are described below

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

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

Class 3: Bus Change. A failure that requires removal of the bus from service during its assignments. The bus is operable to a rendezvous point with a replacement bus.

Class 4: Bad Order. A failure that does not require removal of the bus from service during its assignments but does degrade bus operation. The failure shall be reported by operating personnel.

Code. A legal requirement.

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

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

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

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

Defueling. The process of removing fuel from a tank.

Defueling Port. Device which allows for vehicle defueling, or the point at which this occurs.

Destroyed. Physically made permanently unusable.

DEF. The fluid necessary for the proper operation of Selective Catalytic Reduction systems that conforms to ISO standard 22241-1 and is produced in compliance with the API Diesel Exhaust Fluid Certification Program.

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

DPF. Diesel particulate filter.

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

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

Energy Storage System (ESS). A component or system of components that stores energy and for which its supply of energy is rechargeable by a PPU and/or an off-vehicle energy source.

Fuel Line. The pipe, tubing or hose on a vehicle, including all related fittings, through which natural gas passes.

Fusible Material. A metal, alloy or other material capable of being melted by heat.

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

Fireproof. Materials that will not burn or melt at temperatures less than 2000 °F.

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

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

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

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

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

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

Hose: Flexible line.

Hybrid. A vehicle that uses two or more distinct power sources to propel the vehicle.

Hybrid System Controller (HSC). Regulates energy flow throughout hybrid system components in order to provide motive performance and accessory loads, as applicable, while maintaining critical system parameters (voltages, currents, temperatures, etc.) within specified operating ranges.

Hybrid Drive System (HDS). The mechanical and/or electromechanical components, including the PPU and energy storage system, which comprise the traction drive portion of the hybrid propulsion system.

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

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

Leakage. Release of contents through a Defect or crack. See *Rupture.*

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

Local Regulations. Regulations below the state level.

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

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

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

Module. Assembly of individual components

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

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

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

Pipe: Nonflexible line.

Power. Work or energy divided by time

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

Propulsion System. System that provides propulsion for the vehicle proportional to operator commands. Includes, as applicable, the HDS, energy storage system and the hybrid system controller.

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

Regenerative Braking. Deceleration of the bus by switching motors to act as generators, which return vehicle kinetic energy to the energy storage system.

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

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

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

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

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

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

Special Tools. Tools not normally stocked by the Agency.

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

Standard. A firm guideline from a consensus group.

Standards. Standards referenced in "Part 5: Technical Specifications" are the latest revisions unless otherwise stated.

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

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

Stress Loops. The "pig-tails" commonly used to absorb flexing in piping.

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

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

TS 3. Referenced Publications

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

TS 4. Legal Requirements

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

TS 5. Overall Requirements

The Contractor shall ensure that the application and installation of major bus subcomponents and systems are compliant with all such subcomponent vendors' requirements and recommendations. Contractor and the Council shall identify subcomponent vendors that shall submit installation/application approval documents with the completion of a pilot or lead bus. Components used in the vehicle shall be of heavy-duty design and proven in transit service.

All units or parts not specified shall be Contractor's standard units. In all cases, the materials shall be furnished as specified. Components used in the vehicle shall be heavy-duty, state of the art design and proven in transit service. Workmanship shall be of the best grade and shall conform in all respects to the best practice in the industry.

Notwithstanding the provisions of these Technical Specifications or other data provided by the Council, the Contractor shall have the responsibility for supplying all parts and details required to make the vehicles complete and ready for service. No advantage shall be taken by the Contractor in the omission of any part or detail that goes to make the bus complete and ready for service, even though such parts or details are not mentioned in these specifications.

The Contractor shall assume complete and overall responsibility for the design and satisfactory operation of the vehicle and the vehicle's sub-systems or component parts, including those sub-systems and components specified by the Council. The Contractor's responsibility includes, but is not limited to, ensuring that the design and production of the vehicle and the vehicle's component parts are appropriate, coordinated, compatible and perform correctly throughout the life of the vehicle, whether together or individually.

The complete bus and all working and moving parts and operating devices shall be thoroughly adjusted, tested and put in proper operating condition by the Contractor prior to delivery. The Contractor shall water test each vehicle using a series of nozzles which are located around the perimeter of the vehicle so as to spray water over the entire surface of the vehicle for a minimum of five (5) minutes. Buses shall be delivered to Council property with full fuel and DEF tanks.

TS 5.1 Weight

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

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

TS 5.2 Capacity

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

TS 5.3 Service Life

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

TS 5.4 Maintenance and Inspection

Scheduled maintenance tasks shall be related and shall be in accordance with the Contractor's recommended preventative maintenance schedule (along with routine daily service performed during the fueling operations). Routine scheduled maintenance actions, such as filter replacement and adjustments, shall not be required at intervals of less than 6,000 miles.

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. An easily accessible probalizer shall be connected directly to the main engine and transmission reservoirs for oil sampling.

The coach manufacturer shall give prime consideration to the routine problems of maintaining the vehicle. All coach components and systems, both mechanical and electrical, which will require periodic physical Work or inspection processes shall be installed so that a minimum of time is consumed in gaining access to the critical repair areas. It shall not be necessary to disassemble portions of the coach structure and/or equipment such as seats and flooring under seats in order to gain access to these areas. Each coach shall be designed to facilitate the disassembly, reassembly, servicing or maintenance, using tools and equipment that are normally available as standard commercial items. Access doors to the transmission, bulkhead fittings, drive shaft (with planetary axle only) and engine shall be provided. To the extent practicable, removal or physical movement of components unrelated to the specific maintenance and/or repair tasks involved shall be unnecessary.

Requirements for the use of unique specialized tools will be minimized. The body and structure of the coach shall be designed for ease of maintenance and repair. Individual panels or other equipment which may be damaged in normal service shall be repairable or replaceable. Ease of repair shall be related to the vulnerability of the item to damage in service.
The 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. The Contractor shall provide a manual that lists the times required for typical repair and service items on the bus.

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

TS 5.5 Interchangeability

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

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

In the event that the Contractor is unable to comply with the interchangeability requirement, the Contractor must notify the Council and obtain the Council's prior written approval, including any changing in pricing. The Council 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. The Contractor shall ensure that all parts are available for buses purchased under this procurement for a period of 15 years beginning with the date the last bus is delivered under this procurement.

TS 5.6 Training

The Contractor shall provide 1,536 hours of training to Council personnel on bus systems and components chosen by the Council. At the Council's sole discretion, the Contractor shall provide training at any time during the life of the contract. The Council estimates that it will require 1,056 hours of training on the subjects listed below.: The number of hours listed are estimates and the Council may, at its sole discretion, change the number of hours of training required on any subject.

1. Bus operation (24 hours, as outlined below)
2. Steering, alignment and suspension system (48 hours)
3. Diesel engine and electronic engine controls (144 hours)
4. Exhaust after-treatment (96 hours)
5. Transmission and electronic controls (96 hours)
6. Hybrid drive system, ESS and hybrid electronic controls (120 hours)
7. Engine cooling system (electric fans) (48 hours)
8. Heating, ventilating, air conditioning system (96 hours)
9. Wheelchair ramp (24 hours)
10. Electrical system, including the multiplexing system and hardwiring.(192 hours)
11. Brake system, pneumatic system and accessories (96 hours)
12. Passenger entrance and exit door system (48 hours)
13. Body and structure repair (24 hours)

The remaining 480 hours of training shall be provided to the Council on subjects and in amounts to be determined by the Council. The Contractor shall place no time limit upon the Council's use of Contractor-provided training. The training allotment shall be tracked only by hours of training used.

The Contractor shall provide the manuals and other documents listed in Appendix B, "Contract Deliverables", according to the schedules listed in the appendix. The Contractor shall ensure that updates and changes to manuals it supplies are provided to the Council within two weeks of the effective date for those changes. Updates shall be provided for a period of 15 years beginning with the date the last bus is delivered under this procurement.

In addition to providing 1,512 hours of maintenance-related training, the Contractor shall provide 24 hours of training for the Council's Bus Operations Department instructors such that they are able to train any bus operator to properly operate the bus. This training shall take place after delivery of the first bus on a schedule determined by the Council. This training shall be provided in six four-hour classes for a total of 24 hours of instructor training.

The maintenance training hours shall be provided at the sole convenience of the Council at any Council facility and at any time of day or night designated by the Council. Classes shall not be limited in size, except by the Council's needs. Classes shall be provided in eight (8) hour increments, with a maximum of three eight-hour classes (24 hours total) held per week. Classes shall be provided on Tuesdays, Wednesdays and Thursdays only, unless approved in advance in writing by the Council.

The Contractor, at its expense, may contract with their sub-system component manufacturers to provide

training. If a sub-contractor is utilized, the sub-contractor shall adhere to all Council training requirements, including the requirement to provide training on afternoon and night shifts.

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

Technical/Service Representatives

The Contractor shall, at its own expense, have one or more competent technical service representatives available on request to assist the Council 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 the warranty requirements detailed elsewhere in the contract or in these specifications.

TS 5.7 Operating Environment

The bus shall achieve normal operation in ambient temperature ranges of -25 °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 -25 °F, above 115 °F or at altitudes above 3000 feet. Altitude requirements above 3000 feet will need separate discussions with the engine manufacturer to ensure that performance requirements are not compromised. Speed, gradability and acceleration performance requirements shall be met at, or corrected to, 77 °F, 29.31 in. Hg, dry air per SAE J1995.

TS 5.8 Noise

Interior Noise

The combination of inner and outer panels and any material used between them shall provide sufficient sound insulation so that a sound source with a level of 80 dBA measured at the outside skin of the bus shall have a sound level of 65 dBA or less at any point inside the bus. These conditions shall prevail with all openings, including doors and windows, closed and with the engine and accessories switched off.

The bus-generated noise level experienced by a passenger at any seat location in the bus shall not exceed 83 dBA under any conditions. The driver area shall not experience a noise level of more than 77 dBA under any conditions. The test shall be conducted when the bus shall be empty except for test personnel, not to exceed 4 persons, and the test equipment. All openings shall be closed and all accessories shall be operating during the test. The bus shall accelerate at full throttle from a standstill to 35 mph on level commercial asphalt or concrete pavement in an area free of large reflecting surfaces within 50 feet of the bus path. During the test, the ambient noise level in the test area shall be at least 10 dBA lower than the bus under test. Instrumentation and other general requirements shall conform to SAE Standard J366. If the noise contains an audible discrete frequency as defined in Section TS.2 a penalty of 5 dBA shall be added to the sound level measured.

Exterior Noise

Airborne noise generated by the bus and measured from either side shall not exceed 80 dBA under full power acceleration when operated 0 to 35 mph at curb weight. The maximum noise level generated by the bus pulling away from a stop at full power shall not exceed 83 dBA. The bus-generated noise at curb idle shall not exceed 65 dBA. If the noise contains an audible discrete frequency, a penalty of 5 dBA shall be added to the sound level measured. The Contractor shall comply with the exterior noise requirements defined in local laws and ordinances identified by the Council and SAE J366. All noise readings shall be taken 50 feet from and perpendicular to, the centerline of the bus with all accessories operating. Instrumentation, test sites, and other general requirements shall be in accordance with SAE Standard J366. The pull away test shall begin with the front bumper even with the microphone. The curb idle test shall be conducted with the rear bumper even with the microphone.

TS 5.9 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. An Amerex fire suppression system shall be installed on hybrid buses.

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, dated October 20, 1993. 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, shall be exempt from this requirement.

TS 5.10 Respect for the Environment

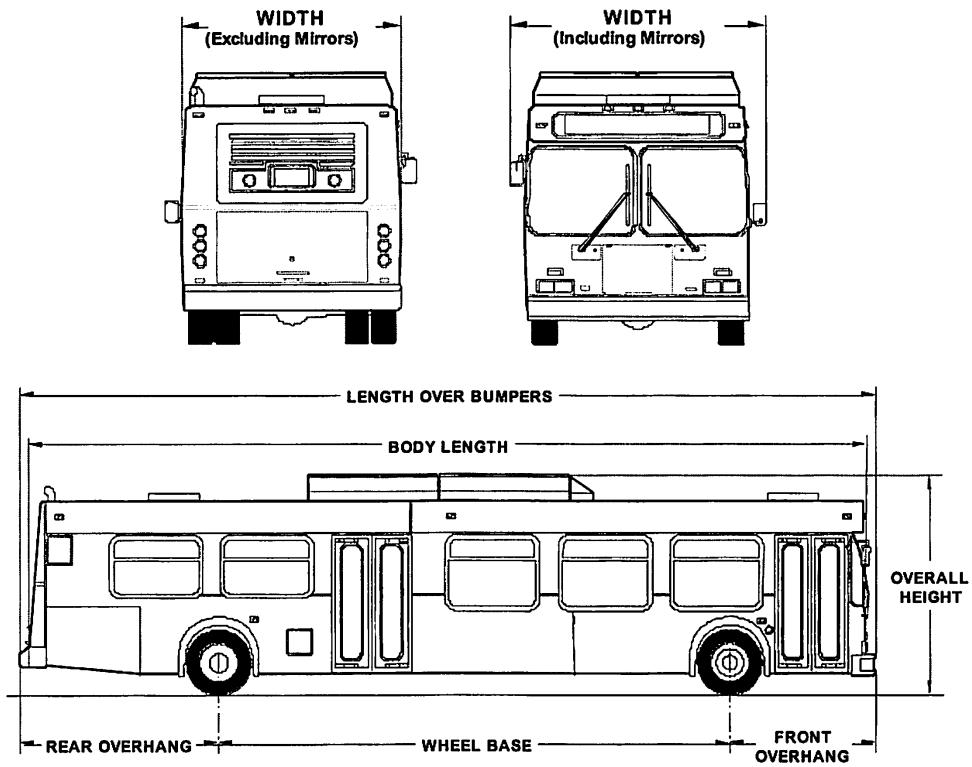
In the design and manufacture of the bus, the Contractor shall make every effort to reduce the amount of potentially hazardous waste. In accordance with Section 6002 of the Resource Conservation and Recovery Act, the Contractor shall use, whenever possible and allowed by the specifications, recycled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

DIMENSIONS

TS 6. Physical Size

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

FIGURE 1
Transit Bus Exterior Dimensions



TS 6.1 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.

- **40-ft bus:** 40 ft to 41 ft 6 in.

TS 6.2 Bus Width

The bus body shall be 102 in. (+0, -1 in.) wide.

TS 6.3 Bus Height

The maximum overall height shall be 134 in., including all rigid, roof-mounted items such as HVAC equipment, exhaust and antennas.

TS 6.4 Step Height

The step height shall not exceed 15 in. at the front door and 16 in at the rear door without kneeling. A maximum of two steps is allowed to accommodate a raised aisle floor in the rear of the bus.

TS 6.5 Underbody Clearance

The bus shall maintain the minimum clearance dimensions as shown in Figure 2 and defined in SAE Standard J689, regardless of load up to the gross vehicle weight rating.

TS 6.6 Ramp Clearances

The approach angle is the angle measured between a line tangent to the front tire static loaded radius arc and the initial point of structural interference forward of the front tire to the ground.

The departure angle is the angle measured between a line tangent to the rear tire static loaded radius arc and the initial point of structural interference rearward of the rear tire to the ground.

The breakover angle is the angle measured between two lines tangent to the front and rear tire static loaded radius and intersecting at a point on the underside of the vehicle that defines the largest ramp over which the vehicle can roll.

TABLE 1

Angle	40-ft Bus
Approach	8.5 degrees (min.)
Front breakover	8 degrees (min.)
Departure	8.7 degrees (min.)

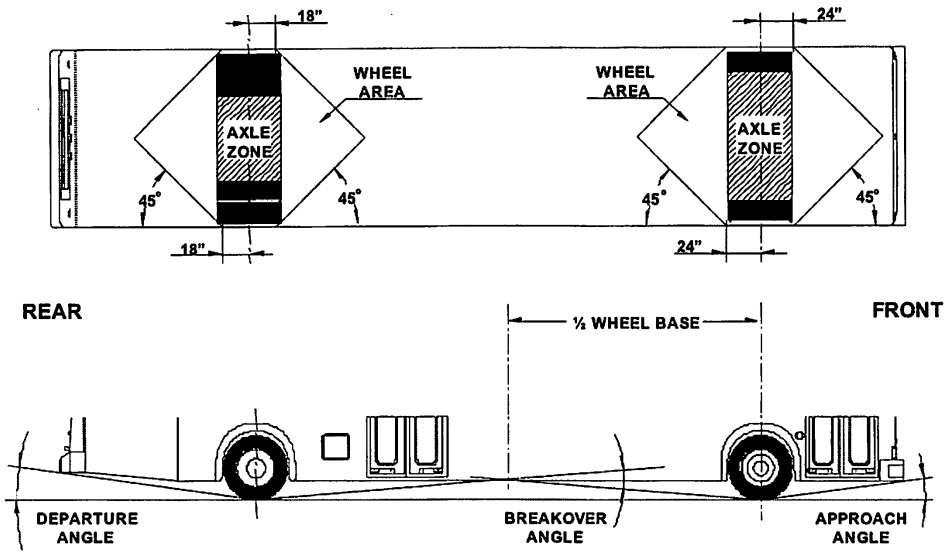
TS 6.7 Ground Clearance

Ground clearance shall be no less than 10 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 5.5 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



TS 6.8 Floor Height

Height of the step above the street shall be no more than 15 in. measured at the centerline of the front door and 16 in measured at the centerline of the rear door. 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.

TS 6.9 Interior Headroom

Headroom above the aisle and at the centerline of the aisle seats shall be no less than 78 in. in the forward half of the bus tapering to no less than 74 in. forward of the rear settee. At the centerline of the window seats, headroom shall be no lower than 65 in., except for parcel racks and reading lights, if specified. Headroom at the back of the rear bench seat may be reduced to a minimum of 50.45 in., but it shall increase to the ceiling height at the front of the seat cushion. In any area of the bus directly over the head of a seated passenger and positioned where a passenger entering or leaving the seat is prone to strike his or her head, padding shall be provided on the overhead paneling.

TS 6.10 Aisle Width

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

TS 7. Power Requirements

The propulsion system shall be sized to provide sufficient power to enable the bus to meet the defined acceleration, top speed, and gradability requirements, and operate all propulsion-driven accessories using actual road test results and computerized vehicle performance data.

TS 7.1 Top Speed

The bus shall be capable of achieving a top speed of 65 mph on a straight, level road at GVWR with all accessories operating. The bus shall be capable of safely maintaining the vehicle speed according to the recommendations by the tire manufacturer.

> **NOTE:** Values are assumed to be sustained. Contractor shall supply the Council with data if there is a variance between peak performance and sustained vehicle performance.

TS 7.2 Gradability

Gradability requirements shall be met on grades with a dry commercial asphalt or concrete pavement at GVWR with all accessories operating. The propulsion system and 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.

> **NOTE:** Values are assumed to be sustained. Contractor shall supply the Council with data if there is a variance between peak performance and sustained vehicle performance.

TS 7.3 Acceleration

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

TABLE 2
Maximum Start Acceleration Times on a Level Surface[1]

Speed (mph)	Maximum time (seconds)
10	5
20	10
30	18
40	30
50	60
Top speed	

1. Vehicle weight = GVWR

Hybrid

The propulsion and braking systems shall meet the performance requirements of the Duty Cycle.

Braking application and performance shall remain consistent regardless of hybrid system State of Charge (SOC) or other variances related to regenerative braking. The hybrid system shall be programmable to

allow optimization of acceleration, deceleration rate and fuel economy. The Contractor shall supply performance data for programming options or available performance selections.

TS 7.4 Operating Range

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

TS 7.4.1 Diesel

The operating range of the coach when run on the Altoona Test cycle shall be at least 400 mi (640 km) or 20 hrs on a full tank of fuel.

TS 7.4.2 CNG

This section not used.

TS 7.4.3 Hybrid

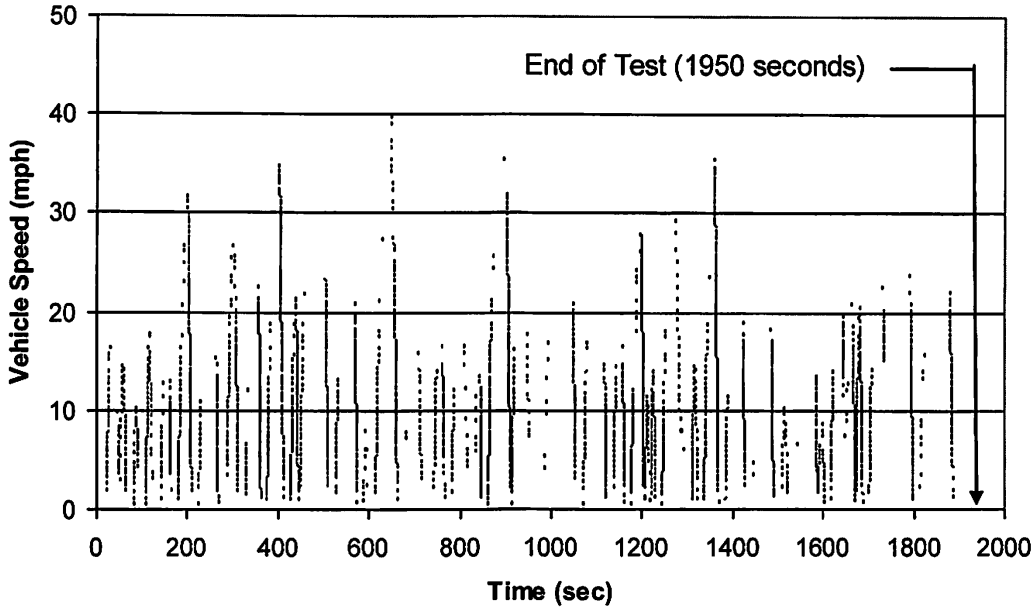
The operating range of the coach when run on the design operating profile shall be at least 400 mi or 20 hrs on a full tank of fuel.

TS 8. Fuel Economy (Design Operating Profile)

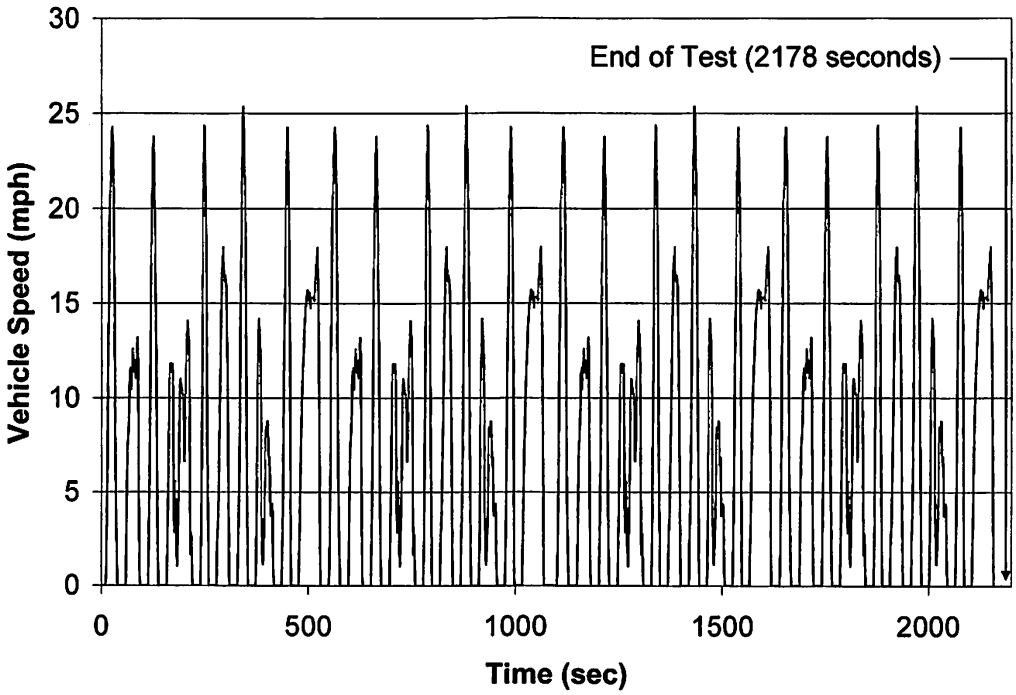
Test results from the Altoona fuel economy tests or other applicable test procedures shall be provided to the Council. Results shall include vehicle configuration and test environment information. Fuel economy data shall be provided for each design operating profile. The design operating profile is assumed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

Fuel economy tests shall be run on these four duty cycles.

Duty Cycles (avg speed)
Manhattan: 6.8 mph
Orange County: 12.7 mph
UDDS: 19 mph
Idle time



Orange County Bus Cycle



Double Manhattan Bus Cycle

TS 8.1 Hybrid

Energy storage system state of charge correction methods stated in SAE J2711 shall be utilized.

POWERPLANT

TS 9. Engine – General Requirements

The 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.

A Cummins ISL engine shall be provided in diesel buses. 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 Council. 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 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. The engine shall be programmed to shut-down after 5 minutes idle time if the fast idle is not enabled.
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. 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.
The engine shall have on-board diagnostic capabilities, able to monitor vital functions, store out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. Diagnostic reader device connector ports, suitably protected against dirt and moisture, shall be provided in operator's area and near or inside engine compartment. The on-board diagnostic system shall inform the operator via visual and/or audible alarms when out-of-parameter conditions exist for vital engine functions.

TS 9.1 Engine (CNG)

This section not used.

TS 9.2 Propulsion System (Hybrid)

Propulsion System Description

Hybrid buses shall be configured with a BAE series hybrid propulsion system coupled with a Cummins ISB engine. Transynd fluid shall be installed in the hybrid drive unit. Function and operation of the hybrid

bus shall be transparent to the Bus Operator and passengers. The OEM shall assure that the bus structure can successfully accept the installation of the propulsion system and be operated on the stated duty-cycle for a period of 12 years without a structural failure. At a minimum, propulsion system shall comply with applicable local, state, and/or federal emissions and useful life requirements. The propulsion system shall comply with local, state, and federal (maintenance) and other applicable sections.

The Hybrid Drive System shall be rated for the GVWR or greater of the bus. An electronic hybrid drive fluid monitoring system shall be provided in addition to a dipstick. The system shall allow accurate determination of the fluid level.

Propulsion System Service
The propulsion system shall be arranged so that accessibility for all routine maintenance is assured. No special tools, other than dollies and hoists, shall be required to remove the propulsion system or any subsystems. However, the Council recognizes that properly rated test equipment and safe electrical work practices are essential when servicing high voltage hybrid components. The exhaust system, air cleaner, air compressor, starter (if used), alternator, radiator, all engine accessories, and any other component requiring service or replacement shall be easily removable.

Energy Storage and Controller
Design and performance shall be provided to the Agency. Energy storage shall be of a commercial design capable of operating in the Council transit environment. The primary charging of the energy storage system shall be accomplished by the on-board hybrid propulsion unit and regenerative braking.

Thermal management will be provided to ensure optimal life and performance of the ESS over the environmental operating range. A BAE auxiliary power source unit (APC) shall be installed to power the electric A/C, electric engine fans, electric power steering and electric pneumatic compressor. All high-voltage cables shall be bright orange or yellow and all high-voltage connectors shall be clearly labeled to indicate the appropriate level of potential danger.

Hybrid System Controller (HSC)
The HSC regulates energy flow throughout hybrid system components in order to provide motive performance and accessory loads, as applicable, while maintaining critical system parameters (e.g., voltages, currents, temperatures, etc.) within specified operating ranges.

The controller shall monitor and process inputs and execute outputs as appropriate to control the operation of all propulsion system components. The hybrid bus engine and related emission systems shall meet all applicable emissions and design/durability guidelines and standards. The hybrid bus engine and drive system shall be equipped with an electronically controlled management system, compatible with multiplex wiring systems and either 12- or 24-volt electrical systems.

The hybrid drive system shall have on-board diagnostic capabilities, able to monitor vital functions, store out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. Diagnostic reader device connector ports, suitably protected against dirt and moisture, shall be provided in operator's area and near or inside engine compartment. The on-board diagnostic system shall inform the operator via visual and/or audible alarms when out-of-parameter conditions exist for vital hybrid drive functions.

TS 10. 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.

TS 10.1 Engine Cooling

A vial-type sight glass shall be provided on the surge tank, if applicable, for determining the engine coolant level. 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 removable tanks, if available. The radiator shall be e-coated for corrosion prevention, if available. Radiators with a fin density greater than 10 fins per in. or a louvered slit design shall not be used.

No heat-producing components or climate control system components shall be mounted between the engine cooling air intake aperture and the radiator. The radiator and charge air cooler shall be designed to withstand thermal fatigue and vibration associated with the installed configuration. The radiator and charge air cooler cores shall be easily cleaned (to include engine side core surface) with standard pressure-washing equipment.

The engine cooling system shall be equipped with a properly sized, engine manufacturer-approved water filter with a spin-on element and an automatic system for releasing supplemental coolant additives as needed to replenish and maintain protection properties. Quarter-turn shut-off valves shall be installed to prevent coolant loss when replacing the water filter. .

The radiator and charge air cooler fan(s) shall be electrically driven and capable of automated reverse operations for periodic self-cleaning of the radiator and charge air cooler. The electrically driven fan system shall be manufactured by EMP. The cooling fan shall be temperature controlled, allowing the engine to reach operating temperature quickly

The mounting location of radiator and charge air cooler shall be the Contractor's standard design. Other radiator mounting locations must be approved by the Council. The cooling system shall be filled with Old World brand fleet charge antifreeze in a 50-50 mixture with water.

A semi-transparent coolant overflow tank shall be provided. An access door shall be provided that allows the coolant level to be readily determined without opening the engine compartment door. The configuration of the access door must be approved by the Council.

TS 10.2 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.

TS 10.3 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.

TS 10.4 Hybrid Drive System Cooling

Thermal management system shall maintain hybrid system components within design operating temperature limits.

TS 11. Transmission (Conventional Powertrain)

A ZF Ecolife transmission shall be provided. ZF Ecolife Plus fluid shall be installed. 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 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. The transmission, when in forward gear, shall automatically shift the transmission to neutral when the vehicle registers zero road speed, engine is idle and service brakes or brake interlocks are applied. If the status of any one or more of the three signals changes, the transmission immediately and automatically resumes forward mode operation.

TS 12. 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. The retarder shall reactivate automatically after the ABS or ATC event ends.

The retarder shall become partially engaged (approximately one-third of its total application, with a resulting deceleration of no greater than 0.077g) when the throttle pedal is completely released. Maximum retarder shall be achieved when brake pedal is depressed prior to engagement of service brakes, with a maximum resulting deceleration of approximately 0.20g in an empty bus. The resulting decelerations specified include the effects of engine braking, wind resistance and rolling resistance. Retarder performance settings must be approved by the Council.

The thermostatically controlled cooling fan shall be activated when the retarder is engaged and the coolant temperature reaches the maximum operating temperature established by the engine and transmission manufacturers. The retarder disable switch shall not be accessible to the seated driver. The location of the retarder disable switch must be approved by the Council. Disabling the retarder shall

activate a signal which shall be sent in real time to the Council's Transit Control Center via the Trapeze data radio.

TS 13. Mounting

All powerplant mounting shall be mechanically isolated to minimize transfer of vibration to the body structure and provide a minimum clearance of 0.75 in. Mounts shall control the movement of the powerplant so as not to affect performance of belt-driven accessories or cause strain in piping and wiring connections to the powerplant.

TS 13.1 Service and Engine Air Cleaner

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. Gauges may be electronic."

The engine 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 with permanent, metal tags 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, except the engine. The engine shall be fitted with two ESOC fittings, one on the oil pan and one at the oil filter, to connect to an ESOC automated engine oil drain and refill machine.
The engine and transmission shall be equipped with sufficient heavy-duty fuel and oil filters for efficient operation and to protect the engine and transmission between scheduled filter changes. All filters shall be easily accessible and the filter bases shall be plumbed to ensure correct reinstallation. No engine bypass filter shall be installed.

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. The engine air intake shall be covered with a removable screen or grill. Drainage provisions shall be included to prevent any water/moisture from entering the air filter.
The air cleaner housing shall be constructed of corrosion-free materials, such as stainless steel or composite material. Aluminum or mild steel will not be acceptable regardless of the paint or finish used. To ensure proper installation, the filter element shall be self-aligning and self-sealing. The airflow through the filter shall be from the outside to the inside (the housing shall be on the unfiltered side of the system). The air filter element shall be self-aligning and self-sealing.

TS 14. 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. 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. The hydraulic system shall operate on 15-40 oil without compromising the longevity of any hydraulic components.

TS 14.1 Fluid Lines

All lines shall be rigidly supported to prevent chafing damage, fatigue failures, degradation and tension strain. Lines should be sufficiently flexible to minimize mechanical loads on the components. Lines passing through a panel, frame or bulkhead shall be protected by grommets (or similar devices) that fit snugly to both the line and the perimeter of the hole that the line passes through to prevent chafing and wear. Pipes and fluid hoses shall not be bundled with or used to support electrical wire harnesses.

Lines shall be as short as practicable and shall be routed 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. Lines in the engine compartment shall be mounted away from the engine to facilitate easy replacement of engine-mounted components. All hoses, pipes, lines and fittings shall be specified and installed per manufacturer's recommendations, including bend radius specifications.

TS 14.2 Fittings and Clamps

All clamps shall maintain a constant tension at all times, expanding and contracting with the line in response to temperature changes and aging of the line material. Coolant hose clamps shall be manufactured by Oetiker, Breeze or equivalent.
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. Hydraulic fittings exposed to road splash shall be corrosion proof.

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. All hose, harness and line support clamps and clamp attachment hardware that are exposed to weather shall be stainless steel.

TS 14.3 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.
The engine manufacturer shall approve the engine air intake system, including clamps, and written verification of such approval shall be provided to the Council. All charge air piping shall be seamless. No part of the engine air piping shall be capable of introducing insulation or other foreign material into the engine air system.
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.

TS 15. 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.

TS 16. Oil and Hydraulic Lines

Oil and hydraulic lines shall be compatible with the substances they carry. Oil and hydraulic lines shall be manufactured by Manuli, Aeroquip or Gates. 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. All lines shall be supported by the properly sized clamps so they will not make contact with any other object. Stainless steel lines shall be provided from the engine bulkhead forward to the steering gear, with flexible lines allowed near the gear.

Oil and Hydraulic lines in the engine compartment shall be encased in a material designed to withstand high-pressure liquid leaks. The covering material shall have a relief opening that will direct leaking hydraulic fluid away from components that operate above the auto-ignition temperature of the fluid.

TS 17. Fuel

TS 17.1 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. All fuel system components shall be compatible with #1 diesel, #2 diesel and any combination of those fuels with a bio-diesel component up to 20%.

Fuel Lines, Diesel

Fuel lines shall be capable of carrying the type of fuel specified by the Council (i.e., up to B20 type fuel). The engine shall be equipped with a fuel-priming pump and check valve fitted in the fuel suction line to aid restarting after fuel filter changes. Return fuel lines shall be heated. A heated fuel filter shall be provided. Fuel lines shall be shielded as necessary to prevent leaking fuel from contacting any components that operate above the auto-ignition temperature of the fuel. The fuel lines forward of the engine bulkhead shall be in conformance to SAE Standards.

Fuel Lines, CNG

This section is not used.

TS 17.2 Design and Construction

TS 17.2.1 Design and Construction, Diesel Fuel Tank(s)

The fuel tank(s) shall be made of sufficiently heavy gauge 300 series or ASTM Spec. A240 stainless

steel. A fuel tank made from synthetic material or 3CR12 stainless steel may be proposed but must be approved by the Council.

Installation
The fuel tank(s) shall be securely mounted to the bus to prevent movement during bus maneuvers. Fuel tank capacity shall be a minimum of 100 gallons of useable fuel.
The fuel tank(s) 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(s). The fuel tank(s) shall have an inspection plate or easily removable filler neck to permit cleaning and inspection of the tank(s) without removal from the bus.
The tank(s) 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(s). 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(s).
The materials and hardware used in mounting shall be stainless steel in order to withstand the adverse effects of road salts, fuel oils, and accumulation of ice and snow for the life of the bus. Removing the fuel tank(s) shall possible from under the bus and shall not require disassembly of any structural components or major body components such as floor or wall panels.

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(s). 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 filler shall be an Emco-Wheaton Posi-Lock-105, compatible with the Emco-Wheaton G2266-106 fuel filler.
A provision mounted on the fuel tank shall provide an audible signal indicating when the tank is essentially full. The fuel inlet tube entry at the fuel tank shall not in any way reduce the usable capacity of the fuel tank. The tank filler pipe shall be so designed as to permit a minimum filling rate of forty (40) gallons per minute filling to the "full" point with no back splash when fuel fill nozzle shuts off.

TS 17.2.2 Design and Construction, CNG
This section is not used.

TS 18. . Emissions and Exhaust

TS 18.1 Exhaust Emissions
The engine and related systems shall meet all applicable emission and engine design guidelines and standards.

TS 18.2 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. Under no circumstances shall exhaust gases be capable of entering the passenger compartment.

The entire exhaust system shall be adequately shielded to prevent heat damage to any bus component, including the exhaust after-treatment compartment area. All sections of exhaust piping, including double-walled flexible sections, shall be constructed without internal insulation material. External insulation material shall not be capable of entering the exhaust stream.
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. All exhaust system piping shall be stainless steel.

TS 18.3 Exhaust Aftertreatment

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

Diesel Exhaust Fluid Injection

If required by the engine manufacturer to meet 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 reduction unit. The tanks shall be designed to store DEF in the operating environment described in the "Operating Environment" section.
The DEF fluid lines shall be heated in order to prevent the DEF from freezing. The DEF injection system shall not be damaged from a cold soak at -25°F. The DEF tank filler shall be located no more than 48 inches above ground level. All DEF tank and injection system components shall comply with applicable ISO standards.

TS 18.4 Particulate Aftertreatment

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

TS 19. General

TS 19.1 Design

The structure of the bus shall be designed to withstand the transit service conditions typical of an urban duty cycle throughout its service life. The vehicle structural frame shall be designed to operate with minimal maintenance throughout the 12-year design operating profile. The design operating profile specified by the Council shall be considered for this purpose. Welding procedures, welding materials and qualifications of welders shall be in accordance with the standards of the A.S.T.M. and the American Welding Society.

TS 20. Altoona Testing

Prior to acceptance of the first bus, the vehicle must have completed any FTA-required Altoona testing. Any items that required repeated repairs or replacement must undergo the corrective action with supporting test and analysis. A report clearly describing and explaining the failures and corrective actions taken to ensure any and all such failures will not occur shall be submitted to the Agency.
Prior to proposing the vehicle for procurement by the Council,, 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 .The bus model tested shall match the bus model proposed for procurement, including structure, axles and drive-train. The Altoona test report shall be included with the RFP response to the Council. Base model and partial Altoona test reports are acceptable when the combination of these tests adequately represents the proposed bus model.

TS 20.1 Structural Validation

Prior to proposing the vehicle for purchase by the Council, the structure of the bus shall have undergone appropriate structural testing. At minimum, appropriate structural testing and analysis shall include Altoona testing or Finite Element Analysis (FEA).
An OEM whose bus has experienced a structural-related fleet failure in any transit property in the U.S. or Canada in the last ten years must complete a detailed investigation of the failure and a detailed post-failure structural analysis of the complete bus structure. The investigation of the failure and the structural analysis shall be conducted by a reputable, independent transit industry engineering consultant and shall include finite elemental analysis and track testing over an adequate period of time that proves the ability of the modified structure to perform without failure for 500,000 miles in transit service. Any such reports shall be included with the RFP response to the Council.

TS 21. 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.

TS 22. Resonance and Vibration

All structure, body and panel-bending mode frequencies, including vertical, lateral and torsional modes, shall be sufficiently removed from all primary excitation frequencies to minimize audible, visible or sensible resonant vibrations during normal service.

TS 22.1 Engine Compartment Bulkheads

The passenger and engine compartment shall be separated by a fire-resistant bulkhead that shall serve as a fire wall. 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 or a fire in the exhaust and emission control components compartment into the passenger compartment and shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90A, dated October 20, 1993 or FMVSS 302. Only necessary openings shall be allowed in the bulkhead, and these shall be sealed appropriately to 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.

TS 22.2 Crashworthiness

The bus body and roof structure shall withstand a static load equal to 150 percent of the curb weight evenly distributed on the roof with no more than a 6 in. reduction in any interior dimension. Windows shall remain in place and shall not open under such a load. These requirements must be met without the roof-mounted equipment installed.

The bus shall withstand a 25 mph impact by a 4000-pound automobile at any side, excluding doorways, along either side of the bus with no more than 3 in. of permanent structural deformation at seated passenger hip height. This impact shall not result in sharp edges or protrusions in the bus interior.

Exterior panels below 35 in. from ground level shall withstand a static load of 2000 lbs applied perpendicular to the bus by a pad no larger than 5 sq in. This load shall not result in deformation that prevents installation of new exterior panels to restore the original appearance of the bus.

TS 23. 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 12-year service life. Corrosion protection materials such as undercoating shall not require inspection or repair more often than bi-annually in order to protect the bus structure against corrosion-related failures of any kind during the 12-year life of the bus. Corrosion protection materials shall not require any cleaning procedure other than what a standard automated bus wash rack provides, and they shall not require treatment or cleaning with compounds or chemicals other than standard bus wash soap and water.

All materials that are not inherently corrosion resistant shall be protected with corrosion-resistant coatings. All joints and connections of dissimilar metals, whether exposed or not, shall be corrosion proof 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 with no structural detrimental effects to normally visible surfaces and no weight loss of over 1 percent. All exposed surfaces and the interior surfaces of tubing and other enclosed members below lower window line shall be corrosion resistant through application of a corrosion protection system.

TS 24. Towing

Two towing attachment points or loops shall be incorporated into the bus frame or attached at a suitable location at the front of the bus. These shall permit flat towing with an OEM-designed towing bar or adaptor. The attachment points / loops shall permit winching of the buses stuck in snow. Each attachment point or loop 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. The method of attaching the OEM-designed towing bar or adaptor shall not require the removal, or disconnection, of front suspension or steering components.

Removal of the bike rack is permitted for attachment of towing bar or adaptor. Towing and compressed air connectors shall be installed as follows: A Milton 727 male airline connector shall be installed on the front end and rear end of the bus to charge the entire bus pneumatic system from either connector. A check valve shall be provided for each connector to prevent air loss from the bus when they are not in use. A Parker Hannifin (CPI) male airline quick-change coupler shall be provided for service brake application from a towing vehicle. The coupler shall be mounted on the front of the bus, pointed forward or downward. A Cole Hersee l2063 7-way electrical socket connector shall be installed on the front of the bus to meet the standard SAE J560. These air and electrical connectors shall be mounted in an enclosure with a weather proofed removable panel to prevent exposure to road splash. The Council must approve the design and location.

Two rear recovery loops or tie downs shall permit lifting, winching or towing of the bus for a short distance, such as in cases of an emergency or if a bus is stuck in snow. If applicable, the rear towing attachment points shall not provide a toehold for unauthorized riders. The method of attaching the OEM-designed 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. or a 1.25 in. throat.

TS 25. Jacking

It shall be possible to safely jack up the bus, at curb weight, with a common 10-ton floor jack with or without special adapter, when a tire or dual set is completely flat and the bus is on a level, hard surface, without crawling under any portion of the bus. Jacking from a single point shall permit raising the bus sufficiently high to remove and reinstall a wheel and tire assembly.
Jacking pads located on the axle or suspension near the wheels shall permit easy and safe jacking with the flat tire or dual set on a 6 in. high run-up block not wider than a single tire. The bus shall withstand such jacking at any one or any combination of wheel locations without permanent deformation or damage. Jacking pads shall be painted safety yellow.

TS 26. 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.

TS 27. Floor

TS 27.1 Design

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers and wheel housings, 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.. A molding, cover or other method of preventing debris accumulation between the floor and wheel housings shall be provided. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 2 degrees to allow for drainage.

The floor 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.

A floor drain of noncorrosive materials shall be provided on the bus behind both the front and rear curbside wheelhouses 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 and a strainer. The strainer shall be firmly retained but also removable to allow flushing of any accumulated debris. The floor drain rim shall be completely and permanently sealed such that water will pass through without damaging the sub-floor, the floor covering or floor adhesive.

TS 27.2 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 coach.
All fasteners that pass through the floor shall be stainless steel. 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 without noticeable deflection. 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 2 in. diameter rod, with 1/32-inch radius, without permanent visible deformation.

TS 27.3 Construction

The floor shall consist of the subfloor and the floor covering that will last the life of the bus. The floor as assembled, including the sealer, attachments and covering, shall be waterproof, non-hygroscopic and resistant to mold growth. A composite sub-floor shall be provided. 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.

TS 28. Platforms

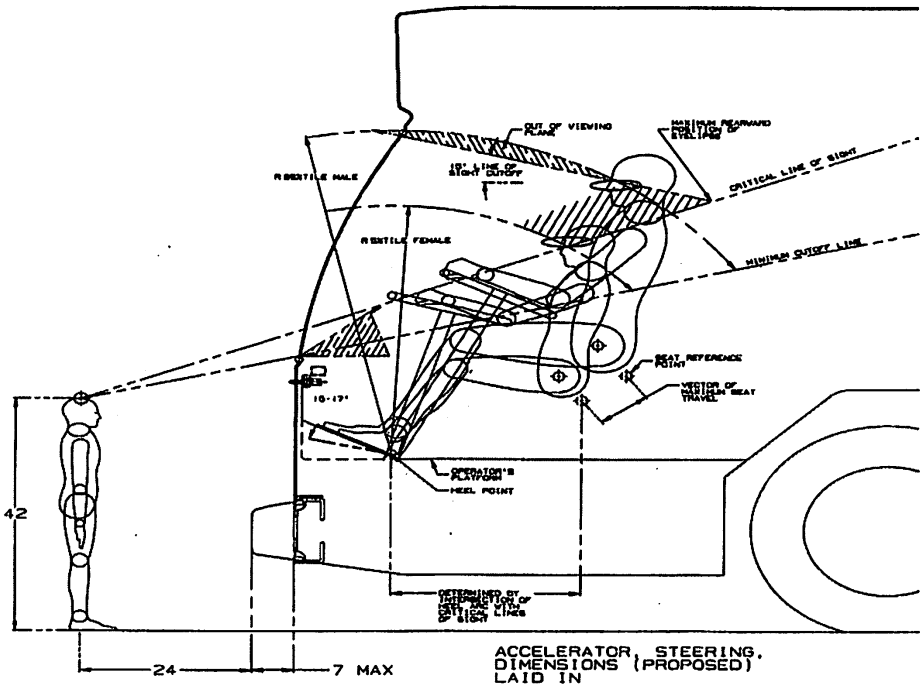
TS 28.1 Driver's Area

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.
Stainless steel trim shall be installed along the horizontal and vertical edges of all platforms and steps. Other material such as anodized aluminum may be installed along the curved edges of wheel housings, subject to approval by the Council. All trim shall be attached with stainless steel fasteners. Stainless steel kick panels shall be installed on the entire aisle side of the street side wheel housing and along the driver's platform and farebox platform as far forward as possible

TS 28.2 Driver's Platform

The driver's platform shall be of a height such that, in a seated position, the driver can see an object located at an elevation of 42 in. above the road surface, 24 in. from the leading edge of the bumper. Notwithstanding this requirement, the platform height shall not position the driver such that the driver's vertical upward view is less than 15 degrees. A warning decal or sign shall be provided to alert the driver to the change in floor level. Figure 3 illustrates a means by which the platform height can be determined, using the critical line of sight.

FIGURE 3
Determining Platform Height



TS 28.3 Farebox

Farebox placement should minimize impact to passenger access and minimize interference with the driver's line of sight. The floor area at the farebox shall be of adequate strength to keep farebox from weaving when bus is in service. A stainless steel plate shall be installed under the floor for this purpose. The farebox platform shall be beveled or rounded to allow maximum room for passage of wheelchairs through this area. The dimensions of the farebox area shall be approved by the Council.
A farebox riser, painted black shall be provided and installed on each bus. The riser shall be a steel box, approximately 8in. wide x 8in. long x 6in. high that shall include a bolted access panel to allow installation and removal of the farebox from the riser. The combination of the farebox platform and farebox riser shall provide operator access to the Council's Cents-a-Bill farebox keypad without compromising the operator's line of sight, passenger access to the farebox or access to the farebox for maintenance purposes. The proposed location of the farebox must be approved by the Council.

TS 28.4 Rear Step Area to Rear Area

If the vehicle is of a bi-level floor design, a rear step area shall be provided along the center aisle of the bus to facilitate passenger traffic between the upper and lower floor levels. This step area shall be cut into the rear platform and shall be approximately the aisle width (21in. – 23in.), a minimum 12 in. deep and approximately half the height of the upper level relative to the lower level. The horizontal surface of the steps shall be covered with Altro floor covering 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.

TS 29. Wheel Housing

TS 29.1 Design and Construction

Sufficient clearance and air circulation shall be provided around the tires, wheels and brakes to preclude overheating when the bus is operating on the design operating profile. Wheel housings shall be constructed of corrosion-resistant and fire-resistant material. All fasteners passing through the wheel housings shall be stainless steel.

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.

TS 29.2 Articulated Joint

This section not used

TS 29.3 Raceway

This section not used

TS 29.4 Bellows

This section not used.

CHASSIS

TS 30. Suspension

TS 30.1 General Requirements

The front and rear suspensions shall be pneumatic type and shall be controlled by Barksdale leveling valves 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. Suspension fasteners shall not require service more often than at 50,000 mile intervals. The failure of suspension components shall not cause the bus to become unstable. Adjustable suspension rods shall be completely sealed around the adjustment threads and along all other openings to prevent internal corrosion.

TS 30.2 Alignment

TS 30.3 All axles shall be properly aligned so the vehicle tracks accurately and within specifications at the time of delivery.Springs and Shock Absorbers

TS 30.3.1 Suspension Travel

The suspension system shall permit a minimum wheel travel of 2.75 in. jounce-upward travel of a wheel when the bus hits a bump (higher than street surface), and 2.75 in. rebound-downward travel when the bus comes off a bump and the wheels fall relative to the body. Elastomeric or urethane bumpers shall be provided at the limit of jounce travel. Elastomeric bumpers shall be secured by bolts passing through the bumper. Rebound travel may be limited by elastomeric bumpers or hydraulically within the shock absorbers. Suspensions shall incorporate appropriate devices for automatic height control so that regardless of load the bus height relative to the centerline of the wheels does not change more than ½ in. at any point from the height required. The safe operation of a bus cannot be impacted by ride height up to 1 in. from design normal ride height.

TS 30.3.2 Damping

Vertical damping of the suspension system shall be accomplished by hydraulic shock absorbers mounted to the suspension arms or axles and attached to an appropriate location on the chassis. Koni shocks shall be provided. Damping shall be sufficient to control coach motion to three cycles or less after hitting road perturbations. The shock absorber bushing shall be made of elastomeric material or rubber that will last the life of the shock absorber. The damper shall incorporate a secondary hydraulic rebound stop.

TS 30.3.3 Lubrication

All elements of steering, suspension and drive systems requiring scheduled lubrication shall be provided with grease fittings conforming to SAE Standard J534. These fittings shall be located for ease of inspection and shall be accessible with a standard grease gun from a pit or with the bus on a hoist without removing splash panels or other components. All grease fittings not meeting these requirements shall be fitted with a remote means of installing grease. 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.

TS 30.3.4 Kneeling

A kneeling system shall lower the entrance(s) of the bus a minimum of 2 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.

TS 31. Wheels and Tires

TS 31.1 Wheels

All 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. Wheels and rims shall be hub-piloted, powder coated steel (maximum 3.5 mil thickness) and shall resist rim flange wear. Hub pilots shall be lubricated with Frey Lube prior to installation. Steel wheels shall be manufactured by Accuride."

TS 31.2 Tires

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. Tires shall be provided under the Council's lease agreement with the tire supplier.

TS 32. 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. An engine driven hydraulic pump shall be provided for power steering
The power steering pump on hybrid buses shall be driven by an electric motor that drives only the steering pump.

TS 32.1 Steering Axle

TS 32.2 The front axle axle shall be solid beam, non-driving with a load rating sufficient for the bus loaded to GVWR and shall be equipped with grease type front wheel bearings and seals. All friction points on the front axle shall be equipped with replaceable bushings or inserts and, if needed, lubrication fittings easily accessible from a pit or hoist.

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.

TS 32.3 Wheel

TS 32.3.1 Turning Effort

Steering effort shall be measured with the bus at GVWR, stopped with the brakes released and the engine at normal idling speed on clean, dry, level, commercial asphalt pavement and the tires inflated to recommended pressure.
Under these conditions, the torque required to turn the steering wheel 10 degrees shall be no less than 5 ft-lbs and no more than 10 ft-lbs. Steering torque may increase to 70 ft-lbs when the wheels are approaching the steering stops, as the relief valve activates.
Power steering failure shall not result in loss of steering control. With the bus in operation, the steering effort shall not exceed 55 lbs at the steering wheel rim, and perceived free play in the steering system shall not materially increase as a result of power assist failure. Gearing shall require no more than seven turns of the steering wheel lock-to-lock.

Caster angle shall be selected to provide a tendency for the return of the front wheels to the straight position with minimal assistance from the driver.

TS 32.3.2 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. The steering wheel shall be hard, black plastic with a metal core.
Steering wheel spokes and wheel thickness shall ensure visibility of the dashboard so that vital instrumentation is clearly visible at center neutral position (within the range of a 95th-percentile male, as described in SAE 1050a, Sections 4.2.2 and 4.2.3). Placement of steering column must be as far forward as possible, but either in line with or behind the instrument cluster.

TS 32.3.3 Steering Column Tilt

The steering column shall have full tilt capability with an adjustment range of no less than 40 degrees from the vertical and easily adjustable by the driver.

TS 32.3.4 Steering Wheel Telescopic Adjustment

The steering wheel shall have full telescoping capability and have a minimum telescopic range of 1.875in. 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. The steering column shall be manufactured by Douglas or TRW.

TABLE 3
Steering Wheel Height[1] Relative to Angle of Slope

At Minimum Telescopic Height Adjustment (29 in.)		At Maximum Telescopic Height Adjustment (5 in.)	
Angle of Slope	**Height**	**Angle of Slope**	**Height**
0 degrees	29 in.	0 degrees	34 in.
15 degrees	26.2 in.	15 degrees	31.2 in.
25 degrees	24.6 in.	25 degrees	29.6 in.
35 degrees	22.5 in.	35 degrees	27.5 in.

1. Measured from bottom portion closest to driver.

TS 33. 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 axle shall be filled with synthetic gear oil prior to delivery. The drive axle shall be manufactured by Meritor or MAN. The same manufacturer shall provide the steer and drive axles.

NOTE: The retardation duty cycle can be more aggressive than propulsion.

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

with stainless steel fasteners, shall be provided that allows easy removal of the drive shaft from inside the bus without rotating the shaft if a planetary gear drive axle is installed. The panel shall be of sufficient strength to prevent parts of the drive shaft from entering the passenger compartment in the event of a failure.

TS 33.1 Non-Drive Axle

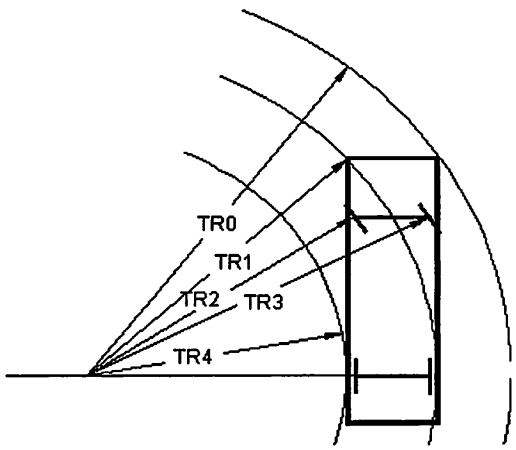
This section not used

TS 34. Turning Radius

TABLE 4
Maximum Turning Radius

Bus Length (approximate)	Maximum Turning Radius (see Figure 4)	Council Requirement
40 ft	44 ft (TR0)	45 ft 1 in w/ BRT front cap

FIGURE 4
Turning Radius



TS 35. Brakes

TS 35.1 Service Brake

Brakes shall be self-adjusting. Brake wear indicators (visible brake sensors) shall be provided on disc brake calipers. Brake wear indicators shall be visible at all wheels without removing components or pad thickness shall be monitored electronically. The brake system shall be manufactured by Knorr or Meritor.

TS 35.2 Actuation

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 mounted inside the bus or mounted in a weather-tight, compartment that provides access to the ECU without removing other components. An

ABS diagnostic code switch shall be provided in the front sign compartment or adjacent to the ECU. 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 as much as possible. Contractor shall demonstrate compliance by providing a copy of a thermo dynamic brake balance test upon request. A microprocessor-controlled automatic traction control (ATC) system shall be provided. The ABS / ATC system shall be manufactured by Wabco.

TS 35.3 Friction Material

The brake pads 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 pad. The caliper brake pad wear indicators shall be clearly visible from the hoist or pit without removing backing plates.

TS 35.4 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. The bus shall be equipped with disc brakes on all axles, and the brake discs shall allow machining of each side of the disc to obtain smooth surfaces per manufacturer's specifications. The rake 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.

Drum brakes, if available, shall be listed as an option on the Price Proposal Sheet. Drum brakes may be proposed. Drum brakes shall incorporate all the general requirements as applied to disc brakes. Slack adjusters shall be manufactured by Haldex.

TS 35.5 Parking/Emergency Brake

The parking brake shall be a spring-operated system, actuated by a valve that exhausts compressed air to apply the brakes. The parking brake may be manually enabled when the air pressure is at the correct operating level. An emergency brake release shall be provided to release the brakes in the event of automatic emergency brake application. The driver shall be able to manually depress and hold down the emergency brake release valve to release the brakes and maneuver the bus to safety. Once the driver releases the emergency brake release valve, the brakes shall engage to hold the bus in place. Parking and emergency release valves shall be easily accessible to a seated bus operator.

TS 36. Interlocks

TS 36.1 Passenger Door Interlocks

To prevent opening rear passenger doors while the bus is in motion, a speed sensor shall be integrated with the door controls to prevent the/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 rear door enable or open position, or a 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. The brake interlock air pressure regulator shall be adjustable and equipped with a port or schrader valve for checking interlock pressure.

TS 37. Pneumatic System

TS 37.1 General

The bus air system shall operate the air-powered accessories and the braking system with reserve capacity. New buses shall not leak down more than 5 psi over a 60-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 through the engine air filter. Air for the air compressor shall be taken from a location on the engine air system that ensures that EGR gasses will not be ingested by the air compressor. T he air system shall be protected per FMVSS 121.
All air valves and air valve fasteners, except the brake application valve and any valve housed in a sealed compartment, shall be electrically isolated from the bus structure to eliminate electrolysis. The air valve isolation system shall be approved by the Council. All exposed air system valves shall be coated or sealed with a corrosion protection compound designed specifically for this application.

TS 37.2 Air Compressor

The diesel bus air compressor shall be engine-driven and 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. The coolant flow through the air compressor shall be approved in writing by the air compressor manufacturer.
The hybrid bus air compressor shall be a scroll-type compressor and shall be driven by an electric motor that drives only the compressor._ The motor shall operate only if the air system reaches the compressor cut-in point and it shall shut off when the air system reaches the compressor cut-out point.

TS 37.3 Air Lines and Fittings

Air lines, except necessary flexible lines, shall conform to the installation and material requirements of SAE Standard J1149 for copper tubing with standard, brass, flared or ball sleeve fittings, or SAE Standard J844 for nylon tubing if not subject to temperatures over 200 °F. The air on the delivery side of the compressor where it enters nylon housing shall not be above the maximum limits as stated in SAE J844. Nylon tubing shall be installed in accordance with the following color-coding standards:

- **Green:** Indicates primary brakes and supply.
- **Red:** Indicates secondary brakes.
- **Brown:** Indicates parking brake
- **Yellow or other color:** Indicates compressor governor signal.
- **Black or other color:** Indicates accessories.

Line supports shall prevent movement, flexing, tension, strain and vibration. Copper lines shall be supported to prevent the lines from touching one another or any component of the bus. To the extent practicable and before installation, the lines shall be pre-bent on a fixture that prevents tube flattening or excessive local strain. Copper lines shall be bent only once at any point, including pre-bending and installation. Rigid lines shall be supported at no more than 5-ft intervals. Nylon lines may be grouped and shall be supported at 30 in. intervals or less.

The compressor discharge line between powerplant and body-mounted equipment or engine bulkhead 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. Air lines and fittings may be manufactured by Manuli. 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. Hoses routed through entrance and exit door areas may be supported at longer intervals provided they do not fail as a result of rubbing or sagging.

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.

TS 37.4 Air Reservoirs

All air reservoirs shall meet the requirements of FMVSS Standard 121 and SAE Standard J10 and shall be equipped with drain plugs and guarded or flush type drain valves. Major structural members shall protect these valves and any automatic moisture ejector valves from road hazards. Reservoirs shall be sloped toward the drain valve. All air reservoirs shall have drain valves that discharge below floor level with lines routed to eliminate the possibility of water traps and/or freezing in the drain line. All air reservoir drain valves shall be remotely operable, with an individual cable for each reservoir or a quarter-turn valve that is accessible from the side of the bus. If preventative maintenance requirements include draining the air tanks more often than once a month, then all cable pulls and drain valves shall be located in one Council-approved location.

TS 37.5 Air System Dryer

An air dryer shall prevent accumulation of moisture and oil in the air system. The air dryer shall be a SKS Dual Turbo 2000 or a Graham-White dual-stage dryer. The dryer shall be enclosed or surrounded by shields that protect it from road splash. ..

.ELECTRICAL, ELECTRONIC AND DATA COMMUNICATION SYSTEMS

TS 38. Overview

The electrical system will consist of vehicle battery systems and components that generate, distribute and store power throughout the vehicle. (e.g.,generator, voltage regulator, wiring, relays, and connectors).

Electronic devices are individual systems and components that process and store data, integrate electronic information or perform other specific functions.

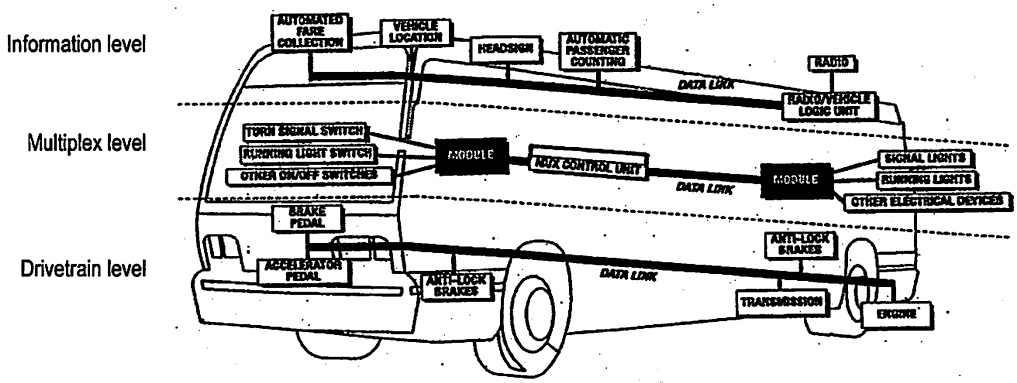
The data communication system consists of the bi-directional communications networks that electronic devices use to share data with other electronic devices and systems. Communication networks are essential to integrating electronic functions, both onboard the vehicle and off.

Information level systems that require vehicle information for their operations or provide information shall adhere to J1939 data standard.

Data communications systems are divided into three levels to reflect the use of multiple data networks:

- **Drivetrain level:** Components related to the drivetrain including the propulsion system components (engine, transmission and hybrid units), and anti-lock braking system (ABS), including traction control.
- **Information level:** Components whose primary function is the collection, control or display of data that is not necessary to the safe drivability of the vehicle (i.e., the vehicle will continue to operate when those functions are inoperable). These components typically consist of those required for automatic vehicle location (AVL) systems, destination signs, fare boxes, passenger counters, radio systems, automated voice and signage systems, video surveillance and similar components.
- **Multiplex level:** Electrical or electronic devices controlled through input/output signals such as discrete, analog and serial data information (i.e., on/off switch inputs, relay or relay control outputs). Multiplexing is used to control components not typically found on the drivetrain or information levels, such as lights; wheelchair lifts; doors; heating, ventilation and air conditioning (HVAC) systems; and gateway devices.

FIGURE 5
Data Communications Systems Levels



TS 38.1 Modular Design

Design of the electrical, electronic and data communication systems shall be modular so that each electronic device, apparatus panel, or wiring bundle is easily separable from its interconnect by means of connectors.

Powerplant wiring shall be an independent wiring harness. Replacement of the engine compartment wiring harness(es) shall not require pulling wires through any bulkhead or removing any terminals from the wires.

TS 39. 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 Contractor shall provide the Council with the appropriate procedures regarding methods to prevent damage from voltage spikes generated from welding, jump starts, shorts, etc.

TS 39.1 Hardware Mounting

The mounting of the hardware shall not be used to provide the sole source ground, and all hardware shall be isolated from potential EMI/RFI, as referenced in SAE J1113.

All electrical/electronic hardware mounted in the interior of the vehicle shall be inaccessible to passengers and hidden from view unless intended to be viewed. The hardware shall be mounted in such a manner as to protect it from splash or spray.

All electrical/electronic hardware mounted on the exterior of the vehicle that is not designed to be installed in an exposed environment shall be mounted in a sealed, waterproof enclosure.

All electrical/electronic hardware and its mounting shall comply with the shock and vibration requirements of SAE J1455.

TS 40. General Electrical Requirements

TS 40.1 Batteries

TS 40.1.1 Low-Voltage Batteries (24V)

Four Odyssey Group 31 Series deep cycling maintenance-free battery units shall be provided. Each battery shall have a minimum of 700 cold cranking amps. Each battery shall have a purchase date no more than 60 days from the date of delivery to the Council. Positive and negative terminal ends shall be different sizes.

TS 40.1.2 Battery Cables

The battery terminal ends and cables shall be color-coded with red for the primary positive, black for negative and another color for any intermediate voltage cables. Positive and negative battery cables shall not cross each other if at all possible, be flexible and sufficiently long to reach the batteries with the tray in the extended position without stretching or pulling on any connection and shall not lie directly on top of the batteries. Except as interrupted by the master battery switch, battery and starter wiring shall be continuous cables with connections secured by bolted terminals and shall conform to specification requirements of SAE Standard J1127 – Type SGT, SGX or GXL and SAE Recommended Practice J541.

TS 40.1.3 Jump Start

An Anderson Power Products SB350 jump-start connector shall be provided in the engine compartment. The location must be approved by the Council. A second Anderson Power Products SB 350 jump-start connector may be provided next to the battery disconnect switch. Jump start connector(s) shall be equipped with a dust cap and completely sealed from moisture, dirt and debris.

TS 40.1.4 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(es). The battery compartment door shall conveniently accommodate operation of the 12VDC and 24VDC quick disconnect switch(es).

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, polyethylene 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.

TS 40.1.5 Auxiliary Electronic Power Supply

If required, gel-pack, or any form of sealed (non-venting) batteries used for auxiliary power are allowed to be mounted on the interior of the vehicle if they are contained in an enclosed, non-airtight compartment and accessible only to maintenance personnel. This compartment shall contain a warning label prohibiting the use of lead-acid batteries.

TS 40.1.6 Master Battery Switch

A single master switch shall be provided near the battery compartment for the disconnecting of all battery positives (12V and 24V), except for safety devices such as the fire suppression system and other systems as specified. The location of the master battery switch shall be clearly identified on the exterior access panel, be accessible in less than 10 seconds for deactivation and prevent corrosion from fumes and battery acid when the batteries are washed off or are in normal service.

Turning the master switch off with the powerplant 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. The batteries shall be equipped with a single switch for disconnecting both 12V and 24V power.

TS 40.1.7 Low-Voltage Generation and Distribution

The low-voltage generating system shall maintain the charge on fully charged batteries, except when the vehicle is at standard idle with a total low voltage generator load exceeding 70 percent of the low voltage generator nameplate rating. A Niehoff alternator shall be provided on diesel buses

Voltage monitoring and over-voltage output protection (recommended at 32V) shall be provided. Voltage regulator shall be mounted away from the alternator.

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 12 volt cables and 1 volt on 24 volt cables.

TS 40.1.8 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. In-line fuses shall not be allowed.
Fuse holders shall be adequately supported to prevent damage from vibration, rugged and waterproof. All manual reset circuit breakers critical to the operation of the bus shall be mounted in a location convenient to the Council mechanic with visible indication of open circuits. The Council 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.

TS 40.2 Grounds

The battery shall be grounded to the vehicle chassis/frame at one location only, as close to the batteries as possible. When using a chassis ground system, the chassis shall be grounded to the frame in multiple locations, evenly distributed throughout the vehicle to eliminate ground loops. No more than four ground ring/spade terminal connections shall be made per ground stud. Electronic equipment requiring an isolated ground to the battery (i.e., electronic ground) shall not be grounded through the chassis. All ground connections shall be protected against corrosion.

TS 40.3 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 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, vibration 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. Electrical harnesses not mounted in interior of the bus shall be enclosed in conduit for as much of their length as practicable. Conduit shall be sealed with caulking or similar material that prevents moisture from contacting harnesses for the life of the bus. All electrical connectors shall be Weather Pack or similar and special care shall be applied to sealing all connectors located under the bus.

All wiring harnesses over 5 ft long and containing at least five wires shall include 10 percent (minimum two wires) excess wires for spares with terminals and identifiable as 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 machine 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:

- It shall include a mechanical clamp in addition to solder on the splice.
- The wire shall support no mechanical load in the area of the splice.
- The wire shall be supported to prevent flexing.
- The Council may require the Contractor to provide an engineering report for its T-splices that establishes the reliability of these connections

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.

TS 40.4 Electrical Components

All electrical components, including switches, relays, flashers and circuit breakers, shall be heavy-duty designs with either a successful history of application in heavy-duty vehicles or design specifications for an equivalent environment.

All electric motors shall be heavy-duty brushless type where practical, and have a continuous duty rating of no less than 40,000 hours (except cranking motors, washer pumps and wiper motors). All electric motors shall be easily accessible for servicing.

TS 40.5 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 completely 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.

TS 41. 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.

TS 41.1 Wiring and Terminals

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

TS 41.1.1 Discrete I/O (Inputs/Outputs)

All wiring to I/O devices, either at the harness level or individual wires, shall be labeled, stamped or color-coded in a fashion that allows unique identification at a spacing not exceeding 4 in. Wiring for each I/O device shall be bundled together. If the I/O terminals are the same voltages, then jumpers may be used to connect the common nodes of each I/O terminal.

TS 41.1.2 Shielding

All wiring that requires shielding shall meet the following minimum requirements. A shield shall be generated by connecting to a ground, which is sourced from a power distribution bus bar or chassis. A shield shall be connected at one location only, typically at one end of the cable. However certain standards or special requirements, such as SAE J1939 or RF applications, have separate shielding techniques that also shall be used as applicable.

> **NOTE:** A shield grounded at both end forms a ground loop, which can cause intermittent control or faults.

When using shielded or coaxial cable, upon stripping of the insulation, the metallic braid shall be free from frayed strands, which can penetrate the insulation of the inner wires. To prevent the introduction of noise, the shield shall not be connected to the common side of a logic circuit.

TS 41.1.3 Communications

The data network cabling shall be selected and installed according to the selected protocol requirements. The physical layer of all network communication systems shall not be used for any purpose other than communication between the system components, unless provided for in the network specifications.

Communications networks that use power line carriers (e.g., data modulated on a 24V-power line) shall meet the most stringent applicable wiring and terminal specifications.

TS 41.1.4 Radio Frequency (RF)

RF components, such as radios, video devices, cameras, global positioning systems (GPS), etc., shall use coaxial cable to carry the signal. All RF systems require special design consideration for losses along the cable. Connectors shall be minimized, since each connector and crimp has a loss that will attribute to attenuation of the signal. Cabling should allow for the removal of antennas or attached electronics without removing the installed cable between them. If this cannot be done, then a conduit of sufficient size shall be provided for ease of attachment of antenna and cable assembly. The corresponding component vendors shall be consulted for proper application of equipment, including installation of cables.

TS 41.1.5 Audio

Cabling used for microphone level and line level signals shall be 22 AWG minimum with shielded twisted pair. Cabling used for amplifier level signals shall be 18 AWG minimum.

TS 42. Multiplexing

TS 42.1 General

The primary purpose of the multiplexing system is control of components necessary to operate the vehicle. This is accomplished by processing information from input devices and controlling output devices through the use of an internal logic program.

Versatility and future expansion shall be provided for by expandable system architecture. The multiplex system shall be capable of accepting new inputs and outputs through the addition of new modules and/or the utilization of existing spare inputs and outputs. 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. Ten percent of the total number of inputs and outputs, or at least one each for each voltage type utilized (0V, 12V, 24V), at each module location shall be designated as spares

TS 42.2 System Configuration

Multiplexing may either be distributed or centralized. A distributed system shall process information on multiple control modules within the network. A centralized system shall process the information on a single control module. Either system shall consist of several modules connected to form a control network.

TS 42.2.1 I/O Signals

The input/output for the multiplex system may contain three types of electrical signals: discrete, analog or serial data.

Discrete signals shall reflect the on/off status of switches, levers, limit switches, lights, etc. Analog signals shall reflect numerical data as represented by a voltage signal (0-12V, 10-24V, etc.) or current signal (4-20 mA). Both types of analog signals shall represent the status of variable devices such as rheostats, potentiometers, temperature probes, etc. Serial data signals shall reflect ASCII or alphanumeric data used in the communication between other on-board components.

TS 43. Data Communications

TS 43.1 General

All data communication networks shall be either in accordance with a nationally recognized interface standard, such as those published by SAE, IEEE or ISO, or shall be published to the Council with the following minimum information:

- Protocol requirements for all timing issues (bit, byte, packet, inter-packet timing, idle line timing, etc.) packet sizes, error checking and transport (bulk transfer of data to/from the device).
- Data definition requirements that ensure access to diagnostic information and performance characteristics.
- The capability and procedures for uploading new application or configuration data.
- Access to revision levels of data, application software and firmware.
- The capability and procedures for uploading new firmware or application software.
- Evidence that applicable data shall be broadcast to the network in an efficient manner such that the overall network integrity is not compromised.

Any electronic vehicle components used on a network shall be conformance tested to the corresponding network standard.

TS 43.2 Drivetrain Level

Drivetrain components, consisting of the engine, transmission, retarder, anti-lock braking system and all other related components, shall be integrated and communicate fully with respect to vehicle operation with data using SAE Recommended Communications Protocols such as J1939 and/or J1708/J1587 with forward and backward compatibilities or other open protocols.

TS 43.2.1 Diagnostics, Fault Detection and Data Access

Drivetrain performance, maintenance and diagnostic data, and other electronic messages shall be formatted and transmitted on the communications networks.

The drivetrain level shall have the ability to record abnormal events in memory and provide diagnostic codes and other information to service personnel. At a minimum, this network level shall provide live/fail status, current hardware serial number, software/data revisions and uninterrupted timing functions.

TS 43.2.2 Programmability (Software)

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

TS 43.3 Multiplex Level

TS 43.3.1 Data Access

At a minimum, information shall be made available via a communication port on the multiplex system. The location of the communication port shall be easily accessible. A hardware gateway and/or wireless communications system are options if requested by the Agency. The communication port(s) shall be located as specified by the Agency.

TS 43.3.2 Diagnostics and Fault Detection

The multiplex system shall have a proven method of determining its status (system health and input/output status) and detecting either active (online) or inactive (offline) faults through the use of on-board visual/audible indicators.

In addition to the indicators, the system shall employ an advanced diagnostic and fault detection system, which shall be accessible via either a personal computer or a handheld unit. Either unit shall have the ability to check logic function. The diagnostic data can be incorporated into the information level network or the central data access system.

TS 43.3.3 Programmability (Software)

The multiplex system shall have security provisions to protect its software from unwanted changes. This shall be achieved through any or all of the following procedures:

- password protection
- limited distribution of the configuration software
- limited access to the programming tools required to change the software
- hardware protection that prevents undesired changes to the software

Provisions for programming the multiplex system shall be possible through a PC or laptop. The Contractor shall provide a minimum of four Council-requested multiplexing upgrades or revisions, if needed, to all buses within the warranty period without additional cost to the Council. 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 labels shall be electronic. Revision control shall be provided by all of the following:

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

TS 43.4 Electronic Noise Control

Electrical and electronic sub-systems and components on all buses shall not emit electromagnetic radiation that will interfere with on-board systems, components or equipment, telephone service, radio or TV reception or violate regulations of the Federal Communications Commission.

Electrical and electronic sub-systems on the coaches shall not be affected by external sources of RFI/EMI. This includes, but is not limited to, radio and TV transmission, portable electronic devices including

computers in the vicinity of or onboard the buses, ac or dc power lines and RFI/EMI emissions from other vehicles.

DRIVER PROVISIONS, CONTROLS AND INSTRUMENTATION

TS 44. Driver's Area Controls

TS 44.1 General

In general when designing the driver's area, it is recommended that SAE J833, "Human Physical Dimensions," be used.

Switches and controls shall be divided into basic groups and assigned to specific areas, in conformance with SAE Recommended Practice J680, Revised 1988, "Location and Operation of Instruments and Controls in Motor Truck Cabs," and be essentially within the hand reach envelope described in SAE Recommended Practice J287, "Driver Hand Control Reach."

TS 44.2 Glare

The driver's work area shall be designed to minimize glare to the extent possible. Objects within and adjacent to this area shall be matte black or dark gray in color wherever possible to reduce the reflection of light onto the windshield. The use of polished metal and light-colored surfaces within and adjacent to the driver's area shall be avoided.

TS 44.3 Visors/Sun Shades

An opaque, adjustable roller type sunscreen shall be provided over the driver's windshield and the driver's side window. The sunscreen shall be capable of being lowered to the midpoint of the driver's window. When deployed, the screen shall be secure, stable and shall not rattle, sway or intrude into the driver's field of view due to the motion of the coach or as a result of air movement. Once lowered, the screen shall remain in the lowered position until returned to the stowed position by the driver. Sunscreen shall be shaped to minimize light leakage between the visor and windshield pillars to the extent possible. Sunscreen brackets shall not intrude into the area over the fare collection equipment or interfere with visibility out the windshield or driver's side window. .

TS 44.4 Driver's Controls

Frequently used controls must be in easily accessible locations. These include the door control, kneeling 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. The relative frequency of use shall guide the placement of driver's controls. Controls also shall be located so that passengers may not easily tamper with control settings. The location of all driver controls and indicator lights is subject to Council approval.

All panel-mounted switches and controls shall be marked with easily read identifiers. Identifiers shall be back-lit by LEDs. 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.
Two horns shall be provided. The horn button shall be sealed to prevent liquids, dirt and dust from affecting operation. The horns shall be protected by shields to prevent road splash from affecting their operation.

TS 44.5 Normal Bus Operation Instrumentation and Controls

The following list identifies bus controls used to operate the bus. These controls are either frequently used or critical to the operation of the bus. They shall be located within easy reach of the operator. The operator shall not be required to stand or turn to view or actuate these controls unless specified otherwise.

Systems or components monitored by onboard diagnostics system shall be displayed in clear view of the operator and provide visual and/or audible indicators. The intensity of indicators shall permit easy determination of on/off status in bright sunlight but shall not cause a distraction or visibility problem at night. All indicators shall be illuminated using backlighting or other methods subject to Council approval.
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The indicator light panel shall be located on the dashboard or other location subject to Council approval. All indicators shall have a method of momentarily testing their operation. The audible alarm shall be tamper-resistant and shall have an outlet level between 80 and 83 dBA when measured at the location of the operator's ear.

On-board displays visible to the operator shall be limited to indicating the status of those functions described herein that are necessary for the operation of the bus. All other indicators needed for diagnostics and their related interface hardware shall be concealed and protected from unauthorized access. Table 3 represents instruments and alarms. The intent of the overall physical layout of the indicators shall be in a logical grouping of systems and severity nature of the fault.

Consideration shall be provided for future additions of spare indicators as the capability of onboard diagnostic systems improves. Blank spaces shall contain LEDs.

TABLE 5
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 or other configuration, subject to approval by the Council	
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 or Dash or on the instrument panel	Provides selection of propulsion: forward, reverse and neutral	Gear selection

TABLE 5
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
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	
Auxiliary defroster fans	Three-position toggle switch	Side console or Dash left wing	Controls two-speed auxiliary dashboard-mounted fans	
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	
Auxiliary Windshield wiper (if required)	One-variable rotary position operating both wipers	Near Windshield wiper switch	Variable speed control of left and right auxiliary windshield wipers	
Dash panel lights	Rotary rheostat or stepping switch	Side Console or Dash left wing	Provides adjustment for light intensity in night run position	
Stop Requested light	Rotary rheostat	Side Console or Dash left wing	Provides adjustment of light intensity for 2 in. "stop requested" indicator in night run position	
Interior lights	Three-position switch	Side console	Selects mode of passenger compartment lighting: off, on, normal or road side	
Fast idle	Two-position switch	Side console	Selects high idle speed of engine	
WC ramp/ kneel enable	Two-position switch[1]	Side console or Dash right wing	Permits operation of ramp and kneel operations at each door remote panel	Amber light
Front door ramp	Three-position momentary switch	Dash right wing	Permits deploy and stow of front ramp	Red light

TABLE 5
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Front kneel	Three-position momentary switch	Side console near door actuator	Permits kneeling activation and raise and normal at front door remote location	Amber or red dash indicator. Ext alarm and Amber light
Auxiliary heater	Two-position switch	Side console or Dash	Enables auxiliary heater	Amber or red dash indicator
Silent alarm	Recessed push button, NO and NC contacts momentary	Side console – Location must be approved by the Council	Activates emergency radio alarm at dispatch and permits covert microphone and/or enables destination sign emergency message	
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	Side console, forward	Permits open/close control of front and rear passenger doors	Red light
Rear door override	Two-position switch in approved location	Side console, forward	Allows driver to override activation of rear door passenger switches	
Engine shutdown override	Momentary switch with operation protection	Side console	Permits driver to override auto engine shutdown	
Hazard flashers	Two-position switch	Side console or Dash right wing	Activates emergency flashers	Two green lights
Fire suppression (hybrids only)	Red push button with protective cover or other method to protect against accidental activation	Dash left wing or dash center	Permits driver to override and manually discharge fire suppression system	Red light
Mobile data terminal	Mobile data terminal coach operator interface panel	Above right dash wing Location and mounting bracket must be approved by the Council	Facilitates driver interaction with communication system and master log-on	LCD display with visual status and text messages

TABLE 5
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Destination sign interface light switch	Two-position toggle switch	Vicinity of destination sign interface panel	Illuminates destination sign interface panel	
Destination sign interface	Destination sign interface panel– illuminated by LEDs	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
PA manual	Momentary push button	Floor switch- Location must be approved by the Council	Permits driver to manually activate public address microphone	
High beam	Detented push button	Floor switch	Permits driver to toggle between low and high beam	Blue light
Parking brake	Pneumatic PPV	Side console or Dash left wing	Permits driver to apply and release parking brake	Red light
Park brake release	Pneumatic PPV	Vertical side of the side console or dash center	Permits driver to push and hold to release brakes	
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, protected switch	Out of operator's reach Location must be approved by the Council	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
Service brake on	Red indicator light	Dash panel indicator light bar	Alerts driver that service brakes are applied	Red light
Parking brake on	Red indicator light	Dash panel indicator light bar	Alerts driver that parking brake is on	Red light
Rear door open	Red indicator light	Dash panel indicator light bar	Alerts driver that rear door is open	Red light

TABLE 5
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
High beam	Amber or blue indicator light	Dash panel indicator light bar	Alerts driver that high beams are on	Amber or blue light
Retarder or auxiliary brake disable	Multi-pole switch detented	Engine compartment rear run panel Location must be approved by the Council	Permits driver override to disable brake retardation/regeneration	Red light
Retarder off	Red indicator light	Dash panel indicator light bar	Alerts driver that retarder is disabled	Red light
Indicator/ alarm test button	Momentary switch or programming[1] (upon start-up of the bus)	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	Coach operator display	Property specific or dash center	Indication of fire detection activation by zone/location	Buzzer 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
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

TABLE 5
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
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
Seat belt	Indicates seat belt status	Dash center	Detects seat belt not buckled under Council-defined conditions	Amber or red light and audible alarm
DEF gauge	Level Indicator	Dash center	Displays level of DEF tank and indicates with warning light when low	Red light
Active regeneration or Auxiliary brake	Detects Status	Dash center	Indication of electric (hybrid) regeneration	Amber or red light
Regeneration or Auxiliary brake off	Red indicator light	Dash panel indicator light bar	Alerts driver that auxiliary brake is disabled	Red light
Hot Exhaust	Detects Status	Dash center	Indication of DPF regeneration	Amber or red light

1. Indicate area by drawing. Break up switches control from indicator lights.

TS 44.6 Driver Foot Controls

Accelerator and brake pedals shall be designed for ankle motion. Foot surfaces of the pedals shall be faced with wear-resistant, nonskid, replaceable material. The area immediately behind the brake and throttle pedals shall be protected by a stainless steel plate at least 6 inches by 12 inches in size that is attached to the floor with counter-sunk stainless steel fasteners.

TS 44.6.1 Pedal Angle

The vertical angle of the accelerator and brake pedals shall be determined from a horizontal plane regardless of the slope of the cab floor. The accelerator and brake pedals shall be positioned at an angle of 37 to 50 degrees at the point of initiation of contact and extend downward to an angle of 10 to 20 degrees at full throttle.

The location of the brake and accelerator pedals shall be determined by the Contractor, based on space needs, visibility, lower edge of windshield, and vertical H-point.

TS 44.6.2 Pedal Dimensions and Position

The floor-mounted accelerator pedal shall be 9 to 12 in. long and 3 to 4 in. wide. Clearance around the pedal must allow for no interference precluding operation. 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

TS 44.7 Brake and Accelerator Pedals

Both pedals shall be adjustable forward and rearward a minimum of 3 in. The adjustment shall be made by use of a dash-mounted toggle or rocker switch. The switch shall be clearly labeled to identify it as pedal adjustment and shall be within easy reach of the driver. Pedal adjustment shall be enabled only when the bus is stationary and the parking brake engaged. Adjustable pedals shall be manufactured by Teleflex Morse.

TS 44.8 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. 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 turn signal switches shall be inclined approximately 30 degrees. 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 directional signals shall be momentary type, while those for the high beam shall be latching type. The spacing of the switches shall be such that inadvertent simultaneous deflection of switches is prevented.

The PA system switch shall be a floor mounted, momentary switch. The location must be approved by the Council.

TS 45. Driver's Amenities

TS 45.1 Coat Hanger

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

TS 45.2 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.

TS 45.3 Storage Box

An enclosed driver storage area shall be provided on the street side wheel housing, under the electronic equipment cabinet. The storage box shall be fitted with a key lock that accepts the Metro Transit bus operator universal bathroom key. This lock shall accept a Yale #8 key. The minimum size shall be 14in. W x 12in. H x 20in. L.

TS 46. Windshield Wipers and Washers

TS 46.1 Windshield Wipers

The bus shall be equipped with a windshield wiper for each half of the windshield. At 60 mph, no more than 10 percent of the wiped area shall be lost due to windshield wiper lift. For two- piece windshields,

both wipers shall park along the center edges of the windshield glass. For single-piece windshields, wipers shall park along the bottom edge of the windshield. Windshield wiper motors and mechanisms shall be easily accessible for repairs or service. The fastener that secures the wiper arm to the drive mechanism shall be corrosion-resistant. Windshield wipers shall be controlled by a single switch and shall have a minimum of two speeds.

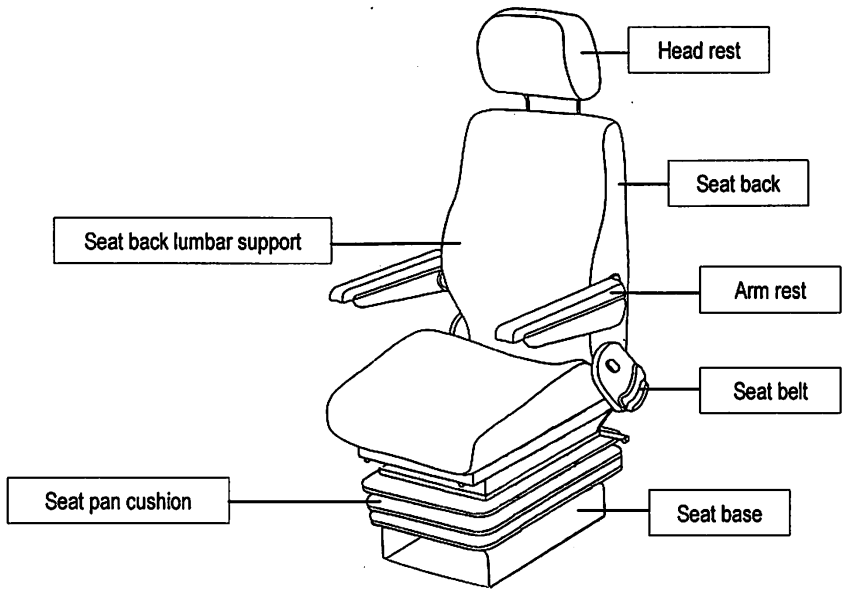
TS 46.2 Windshield Washers

The windshield washer system, when used with the wipers, shall deposit washing fluid evenly and completely wet the entire wiped area. Washer fluid shall be delivered from the top of the wiper arms.

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. The washer bottle vent shall be higher than the cap and fill port to prevent overflow.

TS 47. Driver's Seat

FIGURE 6
Driver's Seat



TS 47.1 Dimensions

The driver's seat shall be comfortable and adjustable so that people ranging in size from a 95th-percentile male to a 5th-percentile female may operate the bus. A Recaro Metro Ergo Metro driver's seat shall be provided.

TS 47.1.1 Seat Pan Cushion Length

Measurement shall be from the front edge of the seat pan to the rear at its intersection with the seat back. The adjustment of the seat pan length shall be no less than 16.5 in. at its minimum length and no more than 20.5 in. at its maximum length.

SP 1.1.1 Seat Pan Cushion Height

This section not used.

TS 47.1.2 Seat Pan Cushion Slope

Measurement is the slope of the plane created by connecting the two high points of the seat, one at the rear of the seat at its intersection with the seat back and the other at the front of the seat just before it waterfalls downward at the edge. The slope can be measured using an inclinometer and shall be stated in degrees of incline relative to the horizontal plane (0 degrees). The seat pan shall adjust in its slope from no less than plus 12 degrees (rearward "bucket seat" incline), to no less than minus 5 degrees (forward slope).

TS 47.1.3 Seat Base Fore/Aft Adjustment

Measurement is the horizontal distance from the heel point to the front edge of the seat. The minimum and maximum distances shall be measured from the front edge of the seat when it is adjusted to its minimum seat pan depth (approximately 15 in.). 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.

TS 47.1.4 Seat Pan Cushion Width

Measurement is the horizontal distance across the seat cushion. The seat pan cushion shall be 17 to 21 in. across at the front edge of the seat cushion and 20 to 23 in. across at the side bolsters.

TS 47.1.5 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 bumpers shall be provided to prevent metal-to-metal contact.

TS 47.1.6 Seat Back

Width

Measurement is the distance between the outermost points of the front of the seat back, at or near its midpoint in height. The seat back width shall be no less than 19 in. Seat back will include dual recliner gears on both sides of the seat.

Height

A standard height seat back shall be provided.

TS 47.1.7 Headrests

An adjustable headrest shall be provided.

TS 47.1.8 Seat Back Lumbar Support

Measurement is from the bottom of the seat back at its intersection with the seat pan to the top of the lumbar cushioning. The seat back shall provide adjustable depth lumbar back support with three individual operating lumbar cells within a minimum range of 7 to 11 in.

TS 47.1.9 Seat Back Angle Adjustment

The seat back angle shall be measured relative to a level seat pan, where 90 degrees is the upright position and 90 degrees-plus represents the amount of recline.

The seat back shall adjust in angle from a minimum of no more than 90 degrees (upright) to at least 105 degrees (reclined), with infinite adjustment in between.

TS 47.2 Seat Belt

The belt assembly should be an auto-locking retractor (ALR). All seat belts should be stored in automatic retractors. The belts 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. A lap seat belt with black webbing shall be provided. The driver's seat shall be equipped with a warning switch device to remind operators to buckle the seat belt.

Lap Belt Length

Lap belt assembly shall be a minimum of 72 in. in length.

TS 47.3 Adjustable Armrest

This section not used.

TS 47.4 Seat Control Locations

While seated, the driver shall be able to make seat adjustments by hand without complexity, excessive effort or being pinched. Adjustment mechanisms shall hold the adjustments and shall not be subject to inadvertent changes.

TS 47.5 Seat Structure and Materials

Cushions

Cushions shall be fully padded with at least 3 in. of materials in the seating areas at the bottom and back. The driver's seat bottom and back cushions shall be covered in black cloth and all other surfaces shall be covered in black vinyl.

Cushion Materials

Bottom cushions shall be Closed-cell polyurethane (FMVSS 302). Bottom cushions and seat back cushions shall be "FR" coated foam.

TS 47.6 Pedestal

Pedestal shall be powder-coated steel.

TS 47.7 Seat Options

This section not used.

TS 47.8 Mirrors

TS 47.8.1 Exterior Mirrors

The bus shall be equipped with corrosion-resistant, outside rearview mirrors mounted with stable supports to minimize vibration. The entire mirror mounting system, including the mirror arms and mirror housing, shall be constructed to prevent mirror glass vibration. Mirrors shall be mounted to the bus structure with a minimum of three (3) bolts, 3/8in. or greater in diameter. The mirror arms and associated hardware shall be made of stainless steel. Both mirrors shall be 10in. x 11in., manufactured by Hadley and both shall incorporate a replaceable LED turn signal assembly on the outside of the mirror housing.

Mirrors arms shall retract or fold sufficiently to allow bus washing operations but avoid contact with windshield. Electrical connections to the mirrors shall be completely sealed to prevent water intrusion and electrical harnesses shall be impervious to water and road chemicals. Electrical harnesses shall be attached to the mirror arm or routed through the mirror arm. Mirror glass shall be replaceable without removing the mirror assembly from the bus. The Council must approve the exterior mirror configuration and mounting.

Curbside Mirrors

Curbside mirror glass shall be convex, shipped to the Council as part of the bus delivery. The curbside mirror shall incorporate a return-to-position feature that will ensure that the mirror head returns to its pre-set position relative to the mirror arm should it come in contact with another object. The mirror arm shall also incorporate a return-to-position feature to ensure that it can be returned to the pre-set position relative to the bus. The curbside mirror arm assembly shall have internal position stops.

The bottom of the curbside mirror housing shall be mounted so it is at least 80.75 in. above pavement. With the driver's seat adjusted to accommodate bus operators between the 5 – 95 percentile range, the curbside mirror shall provide a clear field of view of a triangular-shaped area on the ground, including the side of the bus, that begins 11' rearward from a point directly under the mirror housing, extending along the length of the bus to the rear wheels and out from the rear wheels 18'. The outer edge of the curbside mirror housing shall extend no more than 13in. from the curbside of the bus when adjusted to meet the field-of-view requirements. The curbside mirror shall be heated and remotely adjustable.

Street-Side Mirrors

The bottom of the street side mirror shall be mounted so it is at least 55in. above the pavement. With the driver's seat adjusted to accommodate bus operators between the 5 – 95 percentile range, the street side mirror shall provide a clear field of view of a triangular-shaped area on the ground, including the side of the bus, that begins 15' rearward, measured from a point directly under the mirror housing, extending along the length of the bus to the rear wheels and out from the rear wheels 10'. The outer edge of the street side mirror housing shall extend no more than 12in. from the side of the bus when adjusted to meet the field-of-view requirements. The street side mirror shall be heated, but shall not include a remote adjustment feature.

TS 47.8.2 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. Five interior mirrors shall be installed: 1)A center rear view mirror above windshield that shall be at least seven inches (7in.) by at least fifteen inches (15in.). This mirror shall be located such that it will not interfere with passengers. 2) A right windshield header mirror that shall be a seven inches (7in.) by six inches (6in.) or six inch (6in.) round mirror. This mirror shall be positioned such that the operator will have a clear view of the exit door mirror, with no interference from stanchions or other equipment. 3) A seven-inch (7in.) by ten inch

(10in.) convex mirror with adjustable brackets shall be installed in the front vestibule over the front door area.. 4) A three (3) inch convex mirror shall be mounted on the case of the right side destination sign such that a seated operator can see the passenger seats directly behind the operator's area. 5) A twelve inch (12in.) diminishing mirror to be mounted at the exit door such that it will not interfere with passengers. This mirror shall be completely visible via the right windshield header mirror

WINDOWS

TS 48. General

A minimum of 10,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus. A two-piece windshield shall be provided.

TS 49. 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.

TS 49.1 Glazing

The windshield glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1 Test Grouping 1A and the Recommended Practices defined in SAE J673. The upper portion of the windshield above the driver's field of view shall have a dark, shaded, six-inch band with a minimum luminous transmittance of 5 percent when tested in accordance to ASTM D-1003. A two-piece windshield shall be provided.

TS 50. Driver's Side Window

The driver's side window shall be the sliding type, requiring only the rear half of sash to latch upon closing, and shall open sufficiently to permit the seated operator to easily adjust the street-side outside rearview mirror. When in an open position, the window shall not rattle or close during braking. When in closed position, the window shall not rattle or open during accelerating. 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. Glazing in the window assembly shall be replaced without removing the window from its installed position on the bus or manipulation of the rubber molding surrounding the glazing. The glazing shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the the vehicle

TS 51. Side Windows

TS 51.1 Configuration

Side windows shall not be bonded in place, but shall be easily replaceable without disturbing adjacent windows and shall be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent. All aluminum and steel material will be treated to prevent corrosion. Side windows shall be full-frame, transom style with clear anodized aluminum frames. .

TS 51.2 Emergency Exit (Egress) Configuration

All passenger windows shall be egress windows expect selected windows in the back of the bus or others as approved by the Council" Each window shall have a permanent metal decal attached on or below the window frame that describes the emergency window operation procedure. Egress window latches and springs shall be made from corrosion-resistant materials.

TS 51.3 Configuration

This section not used.

TS 51.4 Materials

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness tempered 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.

All glazing material aft of the exit door shall be equipped with a graffiti guard film. The film shall be removable without tools and shall not leave a residue on the window after removal.
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. Side windows shall be tinted to allow 44 percent luminous transmittance or the lightest tint available. .

TS 51.5 Rear Window

A rear window shall priced as an option.

HEATING, VENTILATING AND AIR CONDITIONING

TS 52. 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. A fully AC high-voltage electric-driven A/C system with full hermetic AC compressor, condenser fan, evaporator blower motors and brushless AC generators shall be provided. Refrigerant pressures shall be readable by means of an

electronic display. The condenser shall be coated by a material approved by the manufacturer to prevent corrosion. The HVAC system shall be manufactured by Thermo King.

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 -25 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. A Spheros model 350 auxiliary heater shall be provided. The auxiliary heater shall be isolated from road splash. Auxiliary heater fuel pumps and lines and coolant pumps and lines shall be easily accessible for maintenance. The power portion of the auxiliary heater shall be removable without removing other components. Quarter-turn shut-off valves shall be provided in the coolant lines to and from the auxiliary heater and on each side of all auxiliary coolant circulating pumps.

System capacity testing, including pull-down/warm-up, stabilization and profile, shall be conducted in accordance to the APTA's "Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System."

The recommended locations of temperature probes are only guidelines and may require slight modifications to address actual bus design. Care must be taken to avoid placement of sensing devices in the immediate path of an air duct outlet. In general, the locations are intended to accurately represent the interior passenger area.

Additional testing shall be performed as necessary to ensure compliance to performance requirements stated herein. The air conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 110 to 90 °F in in a time period acceptable to the Council 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. The pull-up requirements for the heating system shall be in accordance with Section 9 of APTA's "Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning." With ambient temperature at -20 °F, and vehicle cold soaked at that temperature, the bus heating system shall warm the interior passenger compartment to an average temperature of 70 °F ±2 °F within 70 minutes. The air conditioning system shall meet these performance requirements using R134a or 407c

TS 53. 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 has a minimum maintenance free service life for both the brushless motor and the pump of at least 40,000 hours at full power 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. The temperature control set-point shall be 70 °F.

The driver shall have full control over the defroster and driver's heater. The driver shall be able to adjust the temperature in the driver's area through air distribution and fans. The interior climate control system shall switch automatically to the ventilating mode if the refrigerant compressor or condenser fan fails. Interior temperature distribution shall be uniform to the extent practicable to prevent hot and/or cold spots.

After stabilization with doors closed, the temperatures between any two points in the passenger compartment in the same vertical plane, and 6 to 72 in. above the floor, shall not vary by more than 5 °F with doors closed. The interior temperatures, measured at the same height above the floor, shall not vary more than ± 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.

TS 54. Air Flow

TS 54.1 Passenger Area

The cooling mode of the interior climate control system shall introduce air into the bus at or near the ceiling height at a minimum rate of 25 cubic ft per minute (cfm) per passenger based on the standard configuration bus carrying a number of passengers equal to 150 percent of the seated load. Airflow shall be evenly distributed throughout the bus, with air velocity not exceeding 100 ft per minute on any passenger. The ventilating mode shall provide air at a minimum flow rate of 20 cfm per passenger.

Airflow may be reduced to 15 cfm per passenger (150 percent of seated load) when operating in the heating mode. The fans shall not activate until the heating element has warmed sufficiently to ensure at least 70 °F air outlet temperature. The heating air outlet temperature shall not exceed 120 °F under any normal operating conditions.

The climate control blower motors, ductwork and fans shall be designed such that their operation complies with the interior noise level requirements. The passenger compartment air shall be composed of no less than 10 percent fresh (outside) air. Fresh air intake openings shall be designed and located to ensure that exhaust gasses and DPF regeneration gasses cannot enter the passenger compartment.

TS 54.2 Driver's Area

The bus interior climate control system shall deliver at least 100 cfm of air to the driver's area when operating in the ventilating and cooling modes. Adjustable nozzles shall permit variable distribution or shutdown of the airflow. Airflow in the heating mode shall be reduced proportionally to the reduction of airflow into the passenger area. The windshield defroster unit shall meet the requirements of SAE Recommended Practice J382, "Windshield Defrosting Systems Performance Requirements," and shall have the capability of diverting heated air to the driver's feet and legs. The defroster or interior climate control system shall maintain visibility through the driver's side window, the windshield and all other windows forward of the passenger compartment, excepting destination sign glass in all weather conditions.

TS 54.3 Controls for the Climate Control System (CCS)

The controls for the driver's compartment for heating, ventilation and cooling systems shall be integrated and shall meet the following requirements:

- The heat/defrost system fan shall be controlled by a separate switch that has an "off" position and at least two positions for speed control. All switches and controls shall preclude the possibility of clothing becoming entangled, and shields shall be provided, if required. If the fans are approved by the Agency, an "on-off" switch shall be located to the right of or near the main defroster switch.
- A manually operated control valve shall control the coolant flow through the front heater/defroster core.
- If a cable-operated manual control valve is used, the cable length shall be kept to a minimum to reduce cable seizing. Heater water control valves shall be "positive" type, closed or open. The method of operating remote valves shall require the concurrence of the Council project manager.

TS 54.4 Driver's Compartment Requirements

A separate heating, ventilation and defroster system for the driver's area, or Council-approved alternative, shall be provided and shall be controlled by the driver. The system shall meet the following requirements:

The heater and defroster system shall provide heating for the driver and heated air to completely defrost and defog the windshield, driver's side window, the front door glasses and all other windows forward of the passenger compartment, excepting destination sign glass 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. The ductwork and associated controls shall allow the driver to direct heated air through the defroster outlets, toward the driver's feet or in both locations simultaneously. A minimum capacity of 100 cfm shall be provided. The defroster air shall include a minimum of 10% fresh air. The driver shall have complete control of the heat and fresh airflow for the driver's area. The system shall maintain 70 °F in the driver's area at outside temperatures of -20 °F.

- The defroster supply outlets shall be located at the lower edge of the windshield. These outlets shall be durable and shall be free of sharp edges that can catch clothes during normal daily cleaning. The system shall be such that foreign objects such as coins or tickets cannot fall into the defroster air outlets. Adjustable ball vents or louvers shall be provided at the left of the driver's position to allow direction of air onto the side windows.

A ventilation system shall be provided to ensure driver comfort and shall be capable of providing fresh air in both the foot and head areas. Vents shall be controllable by the driver from the normal driving position. Decals shall be provided, indicating "operating instructions" and "open" and "closed" positions. When closed, vents shall be sealed to prevent the migration of water or air into the bus.

TS 54.5 Driver's Cooling

A booster blower, or Council-approved alternative, shall be provided to increase air flow to the driver's area. The booster shall be operated by a separate switch located on the dash. There shall be two fans mounted on the dashboard to augment air flow in the driver's area The fans shall be mounted such that they can be rotated in any direction without interference from the dash board, windshield or any other part of the bus, and they shall controlled independently by a dedicated switch mounted on the dash or side console. The Council shall approve the location. The dash fans shall be Bergstrom Model PBG 2-28 or 9B025 or Mobile Climate Control 24 volt.

TS 55. Air Filtration

All circulated air shall be filtered before discharge into the passenger compartment or the driver's area. 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. Air filters shall be disposable. Grills that support or retain HVAC filters shall be designed to allow dust to accumulate on the filter media without building up on the on the grid material.

TS 56. 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. Roof ventilators shall incorporate skylights that shall not leak for the life of the bus.

Each ventilator shall be easily opened and closed manually. When open with the bus in motion, this ventilator shall provide fresh air inside the bus. The ventilator shall cover an opening area no less than 425 sq in. and shall be capable of being positioned as a scoop with either the leading or trailing edge open no less than 4 in., or with all four edges raised simultaneously to a height of no less than 3½ in. An escape hatch shall be incorporated into the roof ventilator. Roof ventilator(s) shall be sealed to prevent entry of water when closed. A tool shall be provided with each bus to manually open and close the roof hatch.

TS 57. 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 pressures shall be readable through the HVAC electronic control system.

TS 58. Entrance/exit area heating

A heating unit shall be provided at the entrance door area 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. The entrance door heater shall be controlled by the driver by means of a dash-mounted switch.

TS 59. Floor-Level Heating

A forced-air floor heater shall be installed under a passenger seat module in the vicinity of the rear door. Control of the floor-level heating shall be through the main heating system electronic control.

EXTERIOR PANELS, FINISHES AND EXTERIOR LIGHTING

TS 60. Design

The bus shall have a clean, smooth, simple design, primarily derived from bus performance requirements and passenger service criteria. The exterior and body features, including grilles and louvers, shall be shaped to facilitate cleaning by automatic bus washers without snagging washer brushes. Water and dirt shall not be retained in or on any body feature to freeze or bleed out onto the bus after leaving the washer. The body and windows shall be sealed to prevent leaking of air, dust or water under normal operating conditions and during cleaning in automatic bus washers for the service life of the bus.

Exterior panels shall be sufficiently stiff to minimize vibration, drumming or flexing while the bus is in service. When panels are lapped, the upper and forward panels shall act as a watershed. However, if entry of moisture into the interior of the vehicle is prevented by other means, then rear cap panels may be lapped otherwise. The windows, hatches and doors shall be able to be sealed. Accumulation of spray and splash generated by the bus's wheels shall be minimized on windows and mirrors.

TS 60.1 Materials

Body materials shall be selected and the body fabricated to reduce maintenance, extend durability and provide consistency of appearance throughout the service life of the bus. Detailing shall be kept simple, and add-on devices and trim shall be minimized and integrated into the basic design.

TS 60.2 Roof-Mounted Equipment

The roof shall generally be capable of supporting a 315- lb technician. Small areas of the roof that will not provide support for a 315-lb technician shall be clearly marked on the roof.

TS 61. 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. 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.

TS 62. Repair and Replacement

TS 62.1 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 6 ft. The lower section (approximately 17.5 in.) of the side body panels shall be made of impact-resistant material or aluminum and shall be easily and quickly replaceable.

TS 63. 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.

TS 64. License Plate Provisions

The engine door and the front cap shall not include provisions for a license plate.

TS 64.1 Rub rails
Rub rails shall not be used.

TS 65. 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.

TS 66. Wheel covers
Wheel covers are not required.

TS 66.1 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.

TS 67. Service Compartments and Access Doors
TS 67.1 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 for checking engine oil and transmission oil may be through the engine compartment door. 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 shall be corrosion resistant. Hinges shall be stainless steel and shall be isolated from access doors and the bus structure as necessary to prevent galavanic corrosion. 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. All exterior access doors shall be permanently sealed to prevent water, road splash and liquids applied by automatic bus washers and automatic wheel washers from entering service components.

If precluded by design, the Contractor shall provide door design information specifying how the requirements are met.

TS 67.2 Access Door Latch/Locks
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. Fuel, coolant, DEF and battery disconnect access doors shall incorporate latches that do not require a tool to open.

TS 68. Bumpers

TS 68.1 Location

Bumpers shall provide impact protection for the front and rear of the bus with the top of the bumper being 27 in., ± 2 in., above the ground. The center of the bumper may slope to 24" 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.. Aluminum bumper components shall be isolated from all steel components to prevent electrolytic corrosion.

TS 68.2 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, including all parts of the front cap, 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. A two-place stainless steel bike rack, Sports Works model DL2, shall be installed.

TS 68.3 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.

TS 68.4 Bumper Material

Bumper material shall be corrosion-resistant and withstand repeated impacts of the specified loads without sustaining damage. Visible surfaces shall be black. These bumper qualities shall be sustained throughout the service life of the bus.

TS 69. Finish and Color

TS 69.1 Appearance

All exterior surfaces shall be smooth and free of wrinkles and dents. Exterior surfaces to be painted shall be properly prepared as required by the paint system supplier prior to application of paint to assure a proper bond between the basic surface and successive coats of original paint for the service life of the bus.

Drilled holes and cutouts in exterior surfaces shall be made prior to cleaning, priming and painting, where possible, to prevent corrosion. The bus shall be completely painted prior to installation of exterior lights, windows, mirrors and other items that are applied to the exterior of the bus. Body filler materials may be used for surface dressing, but not for repair of damaged or improperly fitted panels. The Contractor's paint quality standards are subject to Council approval.

Paint shall be applied smoothly and evenly with the finished surface free of visible dirt and the following other imperfections:

- blisters or bubbles appearing in the topcoat film
- chips, scratches, or gouges of the surface finish
- cracks in the paint film
- craters where paint failed to cover due to surface contamination
- overspray
- peeling
- runs or sags from excessive flow and failure to adhere uniformly to the surface
- chemical stains and water spots
- dry patch due to incorrect mixing of paint activators
- buffing swirls

All exterior finished surfaces shall be impervious to diesel fuel, gasoline and commercial cleaning agents. Finished surfaces shall resist damage by controlled applications of commonly used graffiti-removing chemicals.

Proper adhesion between the basic surface and successive coats of the original paint shall be measured using an Elcometer adhesion tester as outlined in ASTM D4541-85. Adhesion shall be a minimum 300 in.lbs. The bus manufacturer shall supply test samples of the exterior surface for each step of the painting process that may be subject to adhesion testing per ASTM G4541-87 and ASTM D4145-85. ASTM D4541-93 may be used for inspection testing during assembly of the vehicle.

The exterior of the coach shall be white with yellow accents on the top of the front cap and around the headlight area. The yellow accent at the top shall wrap around to the upper sides of the bus such that it mates with the yellow portion of the stripe. The yellow accent around the headlight area shall wrap around the lower sides of the bus to the vertical edges of the front cap. DuPont Imron Elite SS. N0006EA paint shall be used for white. DuPont Imron Elite SS. N0006EA paint shall be used for white. DuPont Imron Elite Express SS. 802381EF shall be used for yellow.

A reflective stripe 11.375in. to 11.5in. in width shall be applied horizontally on the sides of the bus above the window line. The stripe shall be blue for approximately the forward 25% of the distance from the rear edge of the front cap to the forward edge of the rear cap and shall be yellow for approximately 75% of that distance. The Council will provide sample drawings for reference. The Council must approve the exterior stripe and decal configuration.

TS 70. 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. Decals shall be provided by Seifert Graphics or approved equal. Decal material, color and configuration must be approved by the Council.

Table 6

Decals Required

QTY	DESCRIPTION	TYPE	LOCATION
4	Bus ID Number 4 in.	Decal	Front (right front corner) Rear (center on rear panel) Both sides near front of bus
1	No Smoking	Decal	Rear (center on rear panel)
2	Watch Your Step	Decal	Front, step riser Rear, top of exit door
1	Passenger Exit Signal ("Touch Here to Open Door"	Decal	Rear exit door
2	Emergency Exit Instructions (Break glass, turn handle)	Decal	Top of rear exit Top of front exit (if applicable)
Each Window	Emergency Exit Instructions – Window Release	Decal or Plate	On Mullions
2	Emergency Exit Instructions	Decal	Roof Hatches
1	Please Use Hand Holds When walking or standing	Decal	I Back of radio equipment box
1	Parking and Emergency Brake Control Instructions (Push to Apply)	Decal	Park Brake
	Any other instructional decals	Decal	As necessary
	Passenger Exit Signal	Decal	At intervals along exit strip as necessary
1	Diesel Fuel Only	Decal	Inside fuel filler door
1	DEF only	Decal	Inside DEF filler door
1	Hydraulic Fluid Only	Metal Tag	Hydraulic fluid fill area
1	Coolant Only	Decal	Coolant fill area
1	Transmission Fluid Only	Metal Tag	Transmission fill area
1	Engine Oil Only	Metal Tag	Engine oil fill area
4	Hybrid Bus (approx. 8 in. wide by 12 in. high)	Green Decal	To be determined
1	Battery Disconnect	Decal	Battery disconnect switch access door
1	6.65 in. by 3.5 in. American flag	Decal	Lower left corner or forward curbside window

1	11. 875 in. by 6.2.5 in. American flag	Decal	Below drivers' side window
1	Blue, universal handicapped logo	Decal	Near front door
1	Yield to Buses 10 in. by 10 in.	Decal	Above engine door
1	Red, circle, white T transit logo, 13 in. diameter	Decal	Curb side, rear
1	Red circle, white T transit logo, 10 in. diameter	Decal	Above engine door
1	A Service of the Metropolitan Council approx. 33 in. by 2.25 in.	Decal	Curb side, rear
2	Circle T and MetroTransit.Org. Approx 8 in. by 71 in.	Decal	Both sides, near top of bus
1	Metro Transit A Service of the Metropolitan Council approx. 25 in. by 5.5 in.	Decal	Front of bus
2	2 in. wide reflective stripe	Decal	Both sides of bus below windows
1	Bus I.D. number 22 in. in diameter	Decal	Roof of bus
2	Hybrid Electric Bus approx. 71 in. by 11 in.	Decal	Both sides of hybrid ESS compartment
1	For Passenger Safety – Federal Law prohibits operation of this bus while anyone is standing forward of the standee line	Decal	Front Destination Sign
2	Please give up these seats if needed by the elderly or disabled	Decal	To be determined
2	Attention: Your image and voice are being recorded on this vehicle to enhance safety and security	Decal	To be determined

TS 70.1 Passenger Information

ADA priority seating signs as required and defined by 49 CFR, Part 38.27 shall be provided to identify the seats designated for passengers with disabilities.

TS 71. 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, including 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. The Council must approve the turn signal, doorway lighting and tail / brake light configuration.

TS 71.1 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.

TS 71.2 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. Rear door lights shall be programmed to remain lit for ten (10) seconds after the rear door is closed and the interlocks are released. .

TS 71.3 Turn Signals

Turn signal lights shall be provided on the front, rear, curb and street sides of the bus in accordance with FMVSS 108 and Part 393, Subpart B of the FMCSA as applicable. Turn signals shall be provided behind the front wheel fenders and also at the rear wheel. Rear turn signal lights shall be approximately 7 in. in diameter and front turn signal lights shall be a minimum of 4 in. in diameter. Front turn signals may be integrated into the headlight cluster.

TS 71.4 Headlights

Headlamps shall be designed for replacement without removing the headlamp bezel. Headlight installation shall be provided in accordance with FMVSS 108 and Part 393, Subpart B of the FMCSA as applicable. Headlamps shall incorporate a low voltage daytime running light feature. Low beam headlamps shall be LED sealed beam and high beam headlights shall be halogen, sealed beam.

TS 71.5 Brake Lights

Brake lights shall be provided in accordance with FMVSS 108 and Part 393, Subpart B of the FMCSA as applicable. Brake lights shall be approximately 7 in. in diameter. Red, high and center mount brake lamp(s) approximately 4 in. in diameter shall be provided along the backside of the bus in addition to the lower brake lamps required under FMVSS 108. Alternative center mount brake lights may be proposed, subject to Council approval. The high and center mount brake lamp(s) shall illuminate steadily with brake application.

TS 71.6 Service Area Lighting (Interior and Exterior)

LED lamps shall be provided in the engine and all other compartments where service may be required to generally illuminate the area for night emergency repairs or adjustments. A minimum of three LED light strips shall be provided in the engine compartment, with the switch mounted on the rear run box. 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 15 minutes to prevent damage caused by inadvertently leaving the service area lighting switch in the on position after repairs are made.

INTERIOR PANELS AND FINISHES

TS 72. 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 coach is parked on a level surface.

TS 73. 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 panels shall meet FMVSS 302 and shall be constructed from a Melamine-type material. Interior panels may be retained by adhesives.

TS 73.1 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 barrier 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 barrier 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 required behind the driver's head. The barrier panels shall be isolated for noise control and attached with rubber grommets.
The manufacturer shall furnish and install a reflector kit and five-pound fire extinguisher – properly tagged with expiration date. The fire extinguisher and reflector kit shall be mounted behind the operator's seat such that the operator's seat will not contact either when placed in the lowest position, tilted backward to its farthest point and moved as far rearward as possible. This clearance shall be tested with the horizontal travel "stop bolts" temporarily removed from the seat track. The location for the fire extinguisher and the reflector kit shall be approved by the Council. The fire extinguisher shall be mounted using a Kidde brand mount, part number 368064.
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. The configuration of the drivers' barrier must be approved by the Council.

TS 73.2 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 2 and 2½ 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.

TS 73.3 Front End

The entire front end of the bus shall be sealed to prevent debris accumulation behind the dash and to prevent the driver'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.

TS 73.4 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 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.

TS 73.5 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. Double-sided tape shall be installed between all headlining materials metal roof members. Moldings and trim strips, as required to make the edges tamperproof, shall be stainless steel, aluminum or plastic, colored to complement the ceiling material. Headlining panels covering operational equipment that is mounted above the ceiling shall be on hinges for ease of service but retained to prevent inadvertent opening.

TS 73.6 Fastening

Interior panels shall be attached so that there are no exposed unfinished or rough edges or rough surfaces. Fasteners should be corrosion resistant. Panels and fasteners shall not be easily removable by passengers. Exposed interior fasteners should be minimized, and where required shall be tamper-resistant.

TS 73.7 Insulation

Any insulation material used between the inner and outer panels shall minimize the entry and/or retention of moisture. All body and ceiling insulation shall be interference fit between bus frame members with no visible gaps. Caulking may be used to fill small gaps. 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, including pressure washing. Engine compartment insulation shall perform its intended functions for the life of the bus.

The combination of inner and outer panels on the sides, roof, engine compartment, 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 and sound requirements. The bus body shall be thoroughly sealed so that the driver or passengers cannot feel drafts during normal operations with the passenger doors closed. Insulation shall meet the requirements of FMVSS 302.

TS 73.8 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. 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 covering shall be Altro Chroma black, 2.7mm thick, with a coefficient of friction that is at least .8 and that complies with all ADA requirements both wet and dry. Color/pattern shall be consistent throughout the vehicle. The flooring material shall be a minimum of 79in. wide to minimize the requirement of heat welded seams. Floor covering shall be installed over the entire surface of all four wheel housings. The floor covering at the exit door shall be welded to a reversed Altro yellow nosing that shall provide a continuous surface under the door panels and extending down over the entire vertical face of the frame under the door.

The floor covering material and lowest 3 inches of wall covering shall be completely sealed such that water cannot contact the subfloor material if the floor is rinsed with water. All seams between adjacent sections of floor material shall be permanently welded per manufacturer's specifications, regardless of orientation.

All floor covering edges and seams that do not adjoin other floor covering material shall be caulked with Altro caulking or equivalent. All caulking applied at floor level and above up to a minimum of 3 in. above the floor level shall not deteriorate due exposure to any type of road chemical, soap or water and shall not require any maintenance for a minimum of six years. Floor adhesive shall not deteriorate for the life of the bus.

In places where the floor material is installed over soft material such as an insulating blanket, spacers shall be installed under the floor material to prevent "cupping" of floor material under seat-mounting brackets and other installation hardware.

TS 73.9 Interior Lighting

The light source shall be located to minimize windshield glare, with distribution of the light focused primarily on the passengers' reading plane while casting sufficient light onto the advertising display. The lighting system may be designed to form part of or the entire air distribution duct.

The lens material shall be translucent polycarbonate. Lenses shall be designed to effectively "mask" the light source. Lenses shall be sealed to inhibit incursion of dust and insects yet be easily removable for

service. Access panels shall be provided to allow servicing of components located behind light panels. If necessary, the entire light fixture shall be hinged.

TS 73.10 Passenger Lighting

LED lighting shall be provided. All LED light banks or segments forward of the exit door on both sides of the bus shall be individually dimmable and programmable from lighting levels of 5% to 100%, in increments of 5%. Programming of individual interior light banks or segments shall not require changes in the multiplexing system program. The Council will provide initial programming instructions to the Contractor during the pre-production meeting. During production the first light on each side (behind the driver and the front door) shall be programmed to turn on only when the front door is opened, in "night run" and "night park." These lights shall go out when the front door is closed.

All interior lighting shall be turned off whenever the transmission selector is in reverse and the engine run switch is in the "on" position. All interior lighting shall be programmed through the multiplexing system to go out after 10 minutes if the engine is not running.

The interior lighting design and programming shall require the approval of the Council.

TS 73.11 Driver Area Lighting

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.

TS 73.12 Seating Areas

The interior lighting system shall provide a minimum 15 foot-candle illumination on a 1 sq ft plane at an angle of 45 degrees from horizontal, centered 33 in. above the floor and 24 in. in front of the seat back at each seat position. Allowable average light level for the rear bench seats shall be 7 foot-candles.

TS 73.13 Vestibules/Doors

Floor surface in the aisles shall be a minimum of 10 foot-candles, and the vestibule area a minimum of 4 foot-candles with the front doors open and a minimum of 2 foot-candles with the front doors closed. The front entrance area and curb lights shall illuminate when the front door is open and master run switch is in the "lights" positions. Rear exit area and curb lights shall illuminate when the rear door is unlocked.

TS 73.14 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. Step lights shall be mounted on step risers or vertical side panels.

TS 73.15 Ramp Lighting

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

TS 73.16 Turntable Lighting

This section not used

TS 73.17 Farebox Lighting

No farebox light shall be provided.

TS 74. Fare Collection

Space, electrical harness (power and ground) and structural provisions shall be made for the Council to install a GFI "Cents-a-Bill" fare box. Location of the fare collection device shall not restrict traffic in the vestibule, including wheelchairs 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.

The Contractor shall install a U-shaped support bracket, wiring and connections for use with the Council's Go To Card reader. The support bracket shall be a powder-coated, U-shaped stanchion, approximately 12in. high and 20in. long, mounted on the dash to the curbside of the fare box location. Wiring for the card reader shall be routed inside the support bracket and shall exit at approximately the middle of the bracket through a hole and grommet on the underside of the bracket tube.

The GO TO card reader control shall be powered by a multiplexing system output that is timer controlled to remain on for 20 min after the ignition is off. The Council must approve the configuration of the farebox mounting area and the card reader support bracket installation.

TS 75. 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, or a prop rod to hold the doors out of the mechanic's way. Panel doors that swing downward when open shall be supported by a chain that can be detached as needed. Panels shall prevent entry of mechanism lubricant into the bus interior. All fasteners that retain access panels shall be captive in the cover. Access doors shall be secured with hand screws or latches.

TS 75.1 Floor Panels

Access openings in the floor shall be sealed to prevent entry of fumes and water into the bus interior. Flooring material at or around access openings shall be flush with the floor and shall be edge-bound with stainless steel or another material such as heavy-duty plastic that is acceptable to the Council 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

TS 76. Passenger Seating

TS 76.1 Arrangements and Seat Style

The American Seating InSight seat shall be provided with all bottom cushions 18in. wide.

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

Note: The Council 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.
Passenger seats shall be arranged in a transverse, forward-facing configuration, except at the wheel housings, 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 and platforms (such as for fuel tank storage space). The areas between longitudinal (wheel housing) seat backs and the side walls and between the settee seats and the rear wall shall be covered to prevent debris accumulation.

TS 76.2 Rearward Facing Seats

Rearward facing seats are not allowed.

TS 76.3 Turntable Seating

This section not used.

TS 76.4 Padded Inserts/Cushioned Seats

The passenger seats be equipped with vandal-resistant padded inserts throughout the bus (measure to uncompressed surface). Bottom cushion insert foam shall be a minimum of 1.25in. thick throughout the bus. Back cushion foam shall be a minimum of 5/8in. thick. All seat bottom cushions shall be 18in. wide.

TS 76.5 Drain Hole in Seats

This section not used.

TS 76.6 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 28 in. At all seating positions in paired transverse seats immediately behind other seating positions, hip-to-knee room shall be no less than 28 in.

TS 76.7 Foot Room

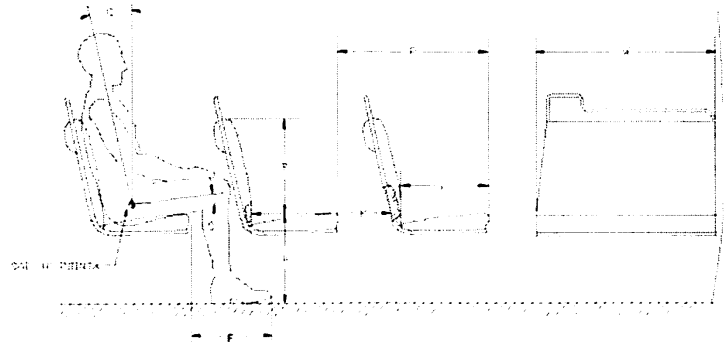
Foot room, measured at the floor forward from a point vertically below the front of the seat cushion, shall be no less than 14 in. Seats immediately behind the wheel housings and modesty panels may have foot room reduced.

TS 76.8 Aisles

The aisle between the seats shall be no less than 23 in. wide at seated passenger hip height. Seat backs shall be shaped to increase this dimension to no less than 26 in. at 32 in. above the floor (standing passenger hip height).

TS 76.9 Dimensions

FIGURE 7
Seating Dimensions and Standard Configuration



Seat dimensions for the various seating arrangements shall have the dimensions as follows (refer to Figure 7):

- 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 rear lounge (or settee) and longitudinal seats, and seats located above raised areas for storage of under-floor components, a cushion height of up to 18 in., ±2 in., will be allowed. This shall also be allowed for limited transverse seats, but only with the expressed approval of the Agency.
- Foot room = F.
- The seat cushion slope, S, shall be between 5 and 11 degrees.
- The seat back slope, C, shall be between 8 and 17 degrees.
- Hip to knee room = K.
- The pitch, P, is shown as reference only.

TS 76.10 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. The area between the longitudinal seat backs and the attachment to the bus sidewalls shall be covered to prevent debris accumulation.

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.

TS 76.11 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.
Raised platforms for passenger seats shall not be allowed without Council's approval. Seat attachment rails and channels shall be huck-riveted to bus frame members, both at floor level and through wall panels, no less than every 4in. to ensure that these components remain permanently attached. All seat attachments, including brackets and fasteners shall be adequate for all operating and loading conditions for the life of the bus.

The seat rail that supports the cantilever mounting hardware at the floor / wall interface shall be stainless steel or anodized aluminum to prevent corrosion. Fasteners used in this area shall be stainless steel. Seat fabric shall be Holdsworth YV/P 2648 with American Seating "Defender" fabric protection or equivalent applied to prevent spilled liquids from reaching the cushion material..

TS 77. 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, rear doorway and at interior steps for bi-level designs shall be stainless steel or anodized aluminum. All passenger assist mounting points shall be secured to the bus structure under ceiling and side panels.

TS 77.1 Assists

Excluding those mounted on the seats and doors, the assists shall have a cross-sectional diameter between 1¼ and 1½ in. or shall provide an equivalent gripping surface with no corner radii less than ¼ in. All passenger assists shall permit a full hand grip with no less than 1½ in. of knuckle clearance around the assist. Passenger assists shall be designed to minimize catching or snagging of clothes or personal items and shall be capable of passing the NHTSA Drawstring Test.

Any joints in the assist structure shall be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assists. Seat handholds may be of the same construction and finish as the seat frame. Door mounted passenger assists shall be of anodized aluminum, stainless steel or powder-coated metal. Passenger assists mounted on or near the dash, including the mount for the Council's Go-To Card reader, shall be powder coated black. All other passenger assists, connecting tees, angles and fasteners shall be brushed stainless steel, except those integral to the passenger seats.

Passenger assists shall be designed to minimize glare in the Operator's area to the extent possible. Assists shall withstand a force of 300 lbs applied over a 12-in. lineal dimension in any direction normal to the assist without permanent visible deformation. All passenger assist components, including brackets, clamps, screw heads and other fasteners used on the passenger assists shall be designed to eliminate pinching, snagging and cutting hazards and shall be free from burrs or rough edges.

TS 77.2 Front Doorway

Front doors, or the entry area, shall be fitted with ADA-compliant assists. Assists shall be as far outward as practicable, but shall be located no farther inboard than 6 in. from the outside edge of the entrance step and shall be easily grasped by a 5th-percentile female boarding from street level. Door assists shall be functionally continuous with the horizontal front passenger assist and the vertical assist and the assists on the wheel housing or on the front modesty panel.

TS 77.3 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.

TS 77.4 Rear Doorway(s)

Vertical assists that are functionally continuous with the overhead assist shall be provided at the aisle side of the transverse seat immediately forward of the rear door and on the aisle side of the rear door modesty panel(s). Passenger assists shall be provided on modesty panels that are functionally continuous with the rear door assists. Rear doors, or the exit area, shall be fitted with assists having a cross-sectional diameter between 1¼ and 1½ in. or providing an equivalent gripping surface with no corner radii less than ¼ in., and shall provide at least 1½ in. of knuckle clearance between the assists and their mounting. The assists shall be designed to permit a 5th-percentile female to easily move from one assist to another during the entire exiting process. The assists shall be located no farther inboard than 6 in. from the outside edge of the rear doorway step.

TS 77.5 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. A minimum of of sixteen (16) grab straps shall be provided for sections where vertical assists are not available and for the use by passengers that cannot reach to 70 in. The grab straps shall be distributed throughout the bus. The grab strap configuration must be approved by the Council.

TS 77.6 Longitudinal Seat Assists

Longitudinal seats shall have vertical assists located between every other designated seating position, except for seats that fold/flip up to accommodate wheelchair securement. Assists shall extend from near

the leading edge of the seat and shall be functionally continuous with the overhead assist. Assists shall be staggered across the aisle from each other where practicable and shall be no more than 52 in. apart or functionally continuous for a 5th percentile female passenger.

TS 77.7 Wheel Housing Barriers/Assists

Unless passenger seating is provided on top of wheel housing, passenger assists shall be mounted around the exposed sides of the wheel housings (and propulsion compartments if applicable), which shall also be designed to prevent passengers from sitting on wheel housings. Such passenger assists shall also effectively retain items, such as bags and luggage, placed on top of wheel housing.

TS 78. Passenger Doors

Doorways will be provided in the locations and styles as follows. Passenger doors and doorways shall comply with ADA requirements.

The entrance door shall be located on the right-hand side just ahead of the front axle. The double entrance consists of a two-section outward opening "slide glide" type door manufactured by Vapor Corporation that incorporates proximity control switches, an electric door engine and Ameriview door panels. Door panels shall be equipped with Vapor quick-change glass. The frames shall be constructed of heavy-duty aluminum extrusions welded or bolted and braced to form a secure framework. An aluminum skin panel shall be bonded or riveted into place. The door pivots shall be made of stainless steel with bushings made of Nylatron or another corrosion-proof material. All door mounting fasteners at floor level or through the floor shall be stainless steel.

The rear door shall be located on the right side just ahead of the rear wheels and shall be a swing-out type. The rear door assembly shall be manufactured by Vapor Corporation and shall incorporate proximity control switches, an electric door engine and Ameriview door panels. The door panels shall be equipped with the Vapor quick-change glass. The door shaft shall be splined to the operating levers in the mechanism and are guided by self-aligning lower bearings.

The door system shall operate per specification at air pressures between 90 and 130 psi.

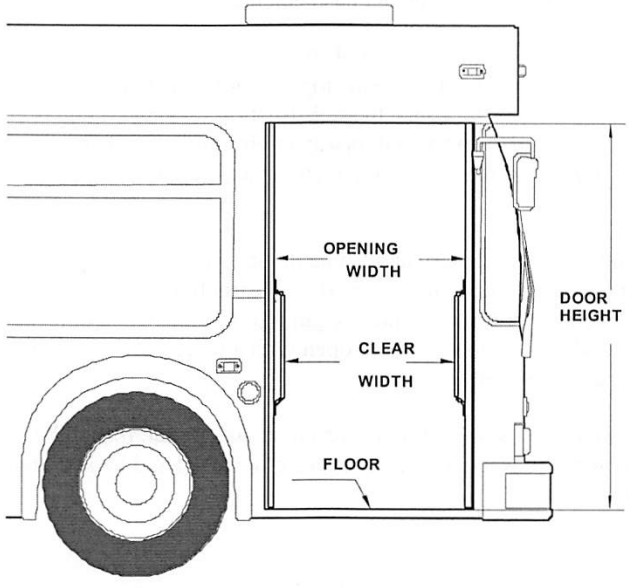
Materials and Construction

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 form a weather-tight seal when closed to prevent any infiltration of exterior moisture, noise, dirt and air elements from entering the passenger compartment at any speed.

The closing edge of each door panel shall have no less than 2 in. of soft weather stripping. The hard surfaces of the doors shall be at least 4 in. apart when closed. The combined weather seal and window glazing elements of the front door shall not exceed 10 degrees of binocular obstruction of the driver's view through the closed door.

TS 78.1 Dimensions

FIGURE 8
Transit Bus Minimum Door Opening



When open, the doors shall leave an opening no less than 75.3 in. in height. The front door clear width shall be a minimum of 31 ¾ in. with the doors fully open. The rear door clear width shall be a minimum of 24 in. with the doors fully opened.

TS 78.2 Door Glazing

Vapor Ameriview door panels shall be provided for front and rear doors.

TS 78.3 Door Projection

Exterior

The exterior projection of the front doors beyond the side of the bus shall be minimized and shall not block the line of sight 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 and shall not exceed 14 in. to the hard point 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.

TS 78.4 Door Height Above Pavement

It shall be possible to open and close either passenger door when the bus loaded to gross vehicle weight rating is not knelt and parked with the tires touching an 8-in.-high curb on a street sloping toward the curb so that the street side wheels are 5 in. higher than the right side wheels.

TS 78.5 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 or counterweight-type device 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 or counterweight type device, when unlocked, 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.

TS 78.6 Actuators

Doors shall open or close completely in not more than 2.5 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. Exhaust air 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. Access doors shall be provided for the front and rear door actuator compartments. These access doors shall not require disassembly of the heating plenums or interior lighting fixtures to open.

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 doors shall be passenger-controlled. The vehicle operator shall unlock and enable the opening mechanism, which shall be indicated by illumination of a green light near the door. After enabling and unlocking, the doors shall be opened by passenger activation of a Vapor CLASS system.

Doors that employ a "swing" or pantograph geometry and/or are closed by a return spring or counterweight-type device shall be equipped with a positive mechanical holding device that automatically engages and prevents the actuation mechanism from being back-driven from the fully closed position. The holding device shall be overcome only when the driver's door control is moved to an "Exit Door Enable" position and the vehicle is moving at a speed of less than 2 mph, or in the event of actuation of the emergency door release.

Locked doors shall require a force of more than 300 lbs to open manually. When the locked doors are manually forced to open, damage shall be limited to the bending of minor door linkage with no resulting damage to the doors, actuators or complex mechanism.

TS 78.7 Rear Door Interlocks

See "Interlocks" for door system interlock requirements.

TS 78.8 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.

TS 78.9 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. The door control shall be mounted on the side console. The front door shall remain in its commanded state position even if power is removed or lost.

TS 78.10 Door Controller

The control device shall be protected from moisture. The door control shall be mounted on the side console within comfortable, easy 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. The position of the door control handle result in the following operation of the front and rear doors:
Center position: Front door closed, rear door(s) closed or set to lock.
First position forward: Front door open, rear door(s) closed or set to lock.
Second position forward: Front door open, rear door(s) open or set to open.
First position back: Front door closed, rear door(s) open or set to open.
Second position back: Front door open, rear door(s) open or set to open.

TS 78.11 Door Open/Close

Operation of, and power to, the front passenger doors shall be completely controlled by the operator. Power to rear doors shall be controlled by operator. After enabling, the rear doors shall be opened by the passenger. A switch shall be provided to enable the driver to obtain full control of the rear doors.

A control or valve in the operator's compartment shall shut off the power to, and/or dump the power from, the front door mechanism to permit manual operation of the front door with the bus shut down. The location of the air shut-off valve shall be approved by the Council. A master door switch, which is not within reach of the seated operator, when set in the "off" position shall close the rear/center doors, deactivate the door control system, release the interlocks, and permit only manual operation of the rear/center doors.

TS 79. Accessibility Provisions

Space and body structural provisions shall be provided at the front of the bus to accommodate a wheelchair loading system.

TS 79.1 Loading Systems

A Lift-U 6:1 ramp shall be provided. A Lift-U model LU-18 may be proposed.

TS 79.2 Lift

This section not used.

TS 79.3 Loading System

This section not used .

TS 79.4 Loading System for Level Boarding on a 45- to 60-ft Low-Floor BRT

This section not used

TS 79.5 Wheelchair Accommodations

Two forward-facing wheelchair tie-down location(s), as close to the wheelchair loading system as practical, shall be provided. The parking space and securement system shall be compliant with ADA requirements for a passenger in a wheelchair and with State of Minnesota regulations. A four-point tie-down system shall be provided. The Council must approve the wheelchair tie-down system.

TS 79.6 Interior Circulation

Maneuvering room inside the bus shall accommodate easy travel for a passenger in a wheelchair from the loading device and from the designated securement area. It shall be designed so that no portion of the wheelchair protrudes into the aisle of the bus when parked in the designated parking space(s). When the positions are fully utilized, an aisle space of no less than 20 in. shall be maintained. As a guide, no width dimension should be less than 34 in. Areas requiring 90-degree turns of wheelchairs should have a clearance arc dimension no less than 45 in., and in the parking area where 180-degree turns are expected, space should be clear in a full 60-in.-diameter circle. A vertical clearance of 12 in. above the floor surface should be provided on the outside of turning areas for wheelchair footrest.

SIGNAGE AND COMMUNICATION

TS 80. Destination Signs

A destination sign system shall be furnished on the front, on the right side near the front door and on the back of the vehicle. The system shall be a Luminator Horizon SMT with ODK4 LED sign System or approved equal. The destination sign system shall consist of:

- 16 rows X 160 columns full matrix format front destination sign
- 8 rows X 96 columns full matrix format side destination sign
- 16 rows X 48 columns full matrix format rear destination sign
- ODK4 system control console
- Cables and mounting provisions shall be provided.

All signs shall be controlled via a single keypad. The keypad shall be conveniently located within reach of the seated driver. The destination sign keypad shall be illuminated by two posts lights controlled by a single switch located in the vicinity of the keypad.

The destination sign compartments shall meet the following minimum requirements:

- Compartments shall be designed to prevent condensation and entry of moisture and dirt.
- The front destination sign glass shall be heated.
- Compartments shall be designed to prevent fogging of both compartment window and glazing on unit itself.
- Access shall be provided to allow cleaning of inside compartment window and unit glazing.
- Front window shall have an exterior display area of no less than 8.5 in. high by 56 in. wide.

TS 81. Passenger Information and Advertising

TS 81.1 Interior Displays

A customer information center shall be installed on the rear panel of the communications compartment on the street side front wheel housing in accordance with 49 CFR, Part 38.35. The customer information center shall be model number OBIC 6P 1L-Minneapolis manufactured by Transit Information Products. The mounting location must be approved by the Council.

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. The retaining strips shall be compatible with those currently used on Council buses.

TS 81.2 Exterior Displays

Provisions shall be made to integrate advertising into the exterior design of the bus. Advertising media, frames or supporting structures shall not detract from the readability of destination signs and signal lights, and shall not compromise passenger visibility. Advertising provisions shall not cause pedestrian hazards or foul automatic bus washing equipment, and shall not cover or interfere with doors, air passages, vehicle fittings, or in any other manner restrict the operation or serviceability of the bus. Side body panels shall provide a flat space a minimum of 32 in. high by 146 in. long to accommodate advertising. The engine compartment door shall provide a flat space a minimum of 23 in. high by 75 in. long to accommodate advertising, centered left-to-right. An advertizing panel shall be installed on the bike rack of each bus or shipped to the Council separately if bike racks are not required. This panel shall measure 15 inches by 47.5 inches and shall be constructed from aluminum sheet stock, folded on all four sides, welded at the corners for strength and configured to accept U-bolts for mounting on the bike rack.

TS 82. Passenger Stop Request / Exit 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 heavy-duty "stop request" signal button shall be installed on modesty panel stanchion immediately forward of the rear door and clearly identified as "STOP REQUESTED."

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. The volume of the chime shall be controllable by the bus driver. A red "Stop Requested" indicator lamp shall be provided on the dash in the

vicinity of the speedometer. The indicator lamp shall be a minimum of 2 in. in diameter and shall be labeled "Stop Requested".

Exit signals located in the wheelchair passenger area shall be no higher than 4 feet above the floor. Instructions shall be provided to clearly indicate function and operation of these signals.

TS 83. Communications

TS 83.1 Camera Surveillance System

A Verint five (5)camera surveillance system shall be provided, including the installation of day-night color cameras, recorder, a terabyte hard drive, two (2) microphones, status light module and all associated cabling.

The camera system shall be pre-programmed and adjusted to parameters supplied by the Council at the pre-production meeting. The system shall incorporate the latest technology available at the time of installation

One camera shall be mounted to face out the windshield in a location that does not compromise the bus operator's view. One camera shall be aimed at the entrance door and one shall be aimed at the exit door and seat immediately behind the exit door. The entrance door camera shall be a wide dynamic range camera. The remaining two cameras shall be mounted in locations that provide video coverage of the entire bus interior. The Council must approve camera wiring installations and all camera locations.

TS 83.2 Public Address System / Voice and Data Radios

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

The public address system shall be part of a complete communications system that shall include front and rear door automatic passenger counters, voice annunciation system, stop request system, data and voice radios and GPS functions. See Appendix A for details.

This system shall be supplied by Trapeze and shall be housed in a compartment secured to the street side front wheel housing. This compartment shall include four slide-out shelves for the Trapeze system and the Verint camera system and it shall be equipped with two cooling fans. The configuration of the compartment must be approved by the Council.

TS 83.2.1 Speakers

Six (6) interior loudspeakers shall be provided in the passenger area, semi-flush mounted, on alternate sides of the bus passenger compartment, installed with proper phasing. Total impedance seen at the input connecting end shall be 8 Ohms. Mounting shall be accomplished with riv-nuts and machine screws. One weather-proof exterior speaker shall be provided in the vicinity of the front door. The speaker shall be completely shielded from road splash and debris if it is mounted below the level of the passenger window line.

TS 83.3 Automatic Passenger Counter (APC)

An infrared APC system shall be installed at the front door and at the rear door. See Appendix A for details.

TS 83.4 Radio Handset and Control System

TS 83.4.1 Drivers Speaker

Each bus shall have a recessed speaker in the ceiling panel above the driver. This speaker shall be the same component used for the speakers in the passenger compartment. It shall have 8 Ohms of impedance.

TS 83.4.2 Handset

Contractor will install a handset for driver use.

TS 83.4.3 Driver Display Unit (DDU) or Mobile Data Terminal (MDT)

Contractor shall install a driver display unit or mobile data terminal as close to the driver's instrument panel as possible. The location of the MDT and mounting bracket design must be approved by the Council

TS 83.4.4 Emergency Alarm

Contractor shall install an emergency alarm that is accessible to the driver but hidden from view. The location of the alarm must be approved by the Council.

Appendix A

Trapeze Communications System Information

Quantity	Description	Manufacturer	Part number
1	Data radio	Tait	TM8150
1	Voice radio	Motorola	XTL2500 / 5000

1	APC	Transitmaster (Horizontal)	
1	Trapeze	Voice Annunciation System	
1	Trapeze	AVL system w/ IVLU, MDT, and associated cabling	
Antenna Quantity	**Description**	**Manufacturer**	**Part number**
2	800 MHz antennas 806-894 MHz Unity gain, N female bulkhead connector	Antenna Specialists	ASP931
1	GPS antenna	AeroAntenna	AT575-97W-SMAF-000-05-26-NM
1	WLAN antenna	Antenex	DISC2400PNSM
1	GPS cable	Trapeze	75T0005-025
1	WLAN cable	Trapeze	75T0028-020

Appendix B –Contract Deliverables

Deliverable		Council Action	Due Date	Format	Quantity Due
1	Crashworthiness information	Review	Pre-award audit	Certificate	2
2	Description of electronic functionality and installation (equipment listed in Appendix A)	Approval	First pre-production meeting	Hardcopy	2
3	Interior security camera layout	Approval	First pre-production meeting	Copies of interior views	2
4	Technical review of powerplant	Review and retention	First pre-production meeting		2
5	Powerplant certifications	Review and retention	First pre-production meeting	Hardcopy	2
6	Exterior decal, paint and lighting layout	Approval	First pre-production meeting	Hardcopy	2
7	Material samples (floor material, seat fabric, exterior paint, decals, etc.)	Review and retention	First pre-production meeting		1 each for each separate order
8	Interior features – fire-resistance certificates	Review and retention	First pre-production meeting	Certificates	2
9	Pre-production meeting minutes	Approval	10 days after each pre-production meeting	Hardcopy or electronic media	2 copies of OEM notes for each meeting
10	Resolution of issues "subject to Council approval"	Approval	10 days after each pre-production meeting	Hardcopy or electronic media	2
11	Draft component repair / service manuals	Approval	10 days before delivery of pilot bus(s)	Hardcopy Electronic Media	1 2
12	List of OEM component repair manuals	Approval	10 days before delivery of pilot bus(s)	Hardcopy	2
13	Draft parts manuals.	Approval	10 days before delivery of pilot bus(s)	Hardcopy Electronic Media	1 2
14	Draft operators' manuals	Approval	10 days before delivery of pilot bus(s)	Hardcopy	10
15	Recommended spare parts list, including bill of materials	Review	10 days before delivery of pilot bus(s)	Hardcopy or electronic media	2
16	Mechanics' "Bus Orientation" training video	Retain for maintenance purposes	10 days before delivery of pilot bus(s)	Electronic Media	6
17	Draft Electrical, hydraulic and air schematics	Review	10 days before delivery of pilot bus(s)	Hardcopy Electronic media	2 2
18	Final operators' manuals	Review	10 days prior to delivery of first bus of each order.	Hardcopy Electronic media	1 for each bus in each order 2

Deliverable		Council Action	Due Date	Format	Quantity Due
19	Part number index	Approval	30 days prior to production of each order	Hardcopy (spreadsheet)	2
20	Current parts price list	Review	30 days prior to production of each order	Hardcopy Electronic media	2 2
21	In-process drawings	Review	30 days prior to production of each order	Scale drawings	2
22	List of serialized units installed on each bus	Review and retention	With each delivered bus	Electronic Media	1 per bus
23	QA manufacturing certificate	Review and retention	With each delivered bus	Hardcopy	1 per bus
24	Delivery driver's log and incident report, including fuel used during delivery	Review	With each delivered bus	Hardcopy	1 per bus
25	Final component repair / service manuals	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
26	Final parts manuals	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
27	Fire suppression system repair and diagnostics manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
28	Transmission parts manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
29	Transmission repair and diagnostics manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
30	Engine parts manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
31	Engine repair and diagnostics manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
32	Hybrid drive system parts manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
33	Hybrid drive system repair and diagnostics manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
34	HVAC system parts manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
35	HVAC system repair and diagnostics manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2

Deliverable		Council Action	Due Date	Format	Quantity Due
36	Auxiliary heater parts manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
37	Auxiliary heater repair and diagnostic manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
38	Wheelchair ramp parts manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
39	Wheelchair ramp repair and diagnostic manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
40	Brake system parts manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
41	Brake system repair and diagnostic manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
42	Electric engine cooling fan diagnostic and repair manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
43	Multiplexing system diagnostic manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
44	Drive axle repair manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
45	Steer axle repair manual	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
46	Electrical, hydraulic and air schematics	Retain for maintenance purposes	30 days after delivery of first production bus of each separate order	Hardcopy Electronic Media	9 2
47	Teaching materials	Retain for maintenance purposes	For each class, during classroom instruction	Hardcopy Electronic Media	1 for each student and 2 for Council Training Dept. 2
48	As-built drawings	Review and retain	60 days after delivery of final bus in each order	Electronic Media	2

METROPOLITAN COUNCIL, METRO TRANSIT
ST PAUL, MN
PRE-AWARD BUY AMERICA CERTIFICATE
FORTY FOOT LOW FLOOR TRANSIT BUSES (QTY: 75, S/N: TBD, BID/CONTRACT: MN RFP#12P227)
27-Feb-13

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.	0.09%
AIR CONDITIONING SYSTEM	THERMO KING	U.S.A.	8.33%
AIR DRYER ASSEMBLY	SKF USA, INC	U.S.A.	0.12%
ALTERNATOR	C E NIEHOFF	U.S.A.	0.64%
BIKE RACK	SPORTWORKS	U.S.A.	0.20%
BOOSTER PUMP	AMETEK TECHNICAL	U.S.A.	0.16%
BULKHEAD ASSEMBLY	ALVA GWYN	U.S.A.	0.12%
COMPOSITE FLOORING	MILWAUKEE COMPOSITES	U.S.A.	0.40%
DESTINATION SIGNS	LUMINATOR	U.S.A.	1.34%
DOOR CONTROLS & PANELS - FRONT	VAPOR BUS INTERNATIONAL	U.S.A.	0.71%
DOOR CONTROLS & PANELS - REAR	VAPOR BUS INTERNATIONAL	U.S.A.	0.66%
DRIVER'S BARRIER - WRAP AROUND	AMTECH LLC	U.S.A.	0.09%
DRIVER'S CONSOLE	PERFORMANCE COMPOSITES, INC	U.S.A.	0.07%
DRIVER'S SEAT	RECARO NORTH AMERICA	U.S.A.	0.52%
ELECTRICAL HARNESSES & CABLES	LACO INCORPORATED	U.S.A.	1.10%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS	U.S.A.	4.13%
ENGINE	CUMMINS ENGINE	U.S.A.	8.41%
EXTERIOR MIRRORS	HADLEY PRODUCTS, INC - B&R DIVISION	U.S.A.	0.28%
FABRICATIONS	AMTECH LLC	U.S.A.	0.32%
FABRICATIONS	COMMERCIAL PATTERN	U.S.A.	0.27%
FABRICATIONS	DETENTION DEVICE SYSTEMS	U.S.A.	0.33%
FABRICATIONS	DIAMOND MANUFACTURING	U.S.A.	0.56%
FABRICATIONS	DIE & TOOL PRODUCTS	U.S.A.	1.20%
FABRICATIONS	EAST BAY MACHINE	U.S.A.	0.14%
FABRICATIONS	GCM	U.S.A.	0.80%
FABRICATIONS	GOLDEN PLASTICS	U.S.A.	0.16%
FABRICATIONS	HOGAN MANUFACTURING	U.S.A.	3.90%
FABRICATIONS	IMPERIAL FABRICATING	U.S.A.	0.87%
FRONT AND REAR AXLE ASSEMBLIES	RON NUNES ENTERPRISES	U.S.A.	0.32%
FRONT AND REAR BUMPER ASSEMBLIES	MERITOR AUTOMOTIVE	U.S.A.	3.58%
FRONT CAP	RO-LAB AMERICAN RUBBER CO.	U.S.A.	0.48%
INTERIOR LIGHTING KIT	AMTECH LLC	U.S.A.	0.47%
MUFFLER ASSEMBLIES	I/O CONTROLS CORPORATION	U.S.A.	1.05%
PAINT	CUMMINS EMISSION SOLUTIONS	U.S.A.	2.08%
PASSENGER SEAT ASSEMBLIES	DUPONT	U.S.A.	0.32%
RADIATOR AND CHARGE AIR COOLER	AMERICAN SEATING	U.S.A.	4.74%
REAR CAP ASSEMBLY	ENGINEERED MACHINED PRODUCTS, INC	U.S.A.	2.48%
REAR SUSPENSION	COMMERCIAL PATTERN	U.S.A.	0.17%
ROOF HATCH	SAF HOLLAND USA	U.S.A.	1.01%
ROOF SKIN	SPECIALTY MANUFACTURING INC	U.S.A.	0.11%
STEERING GEAR ASSEMBLY	CRANE COMPOSITES, INC.	U.S.A.	0.17%
VIDEO SURVEILLANCE SYSTEM	TRW	U.S.A.	0.33%
VOLTAGE CONVERTER	DIGITAL RECORDERS	U.S.A.	2.19%
WHEELCHAIR RAMP	VANNER, INC.	U.S.A.	0.11%
WHEELWELL COVERS	LIFT-U	U.S.A.	1.66%
WINDOW ASSEMBLIES	AMTECH LLC	U.S.A.	0.30%
	RICON CORPORATION	U.S.A.	3.12%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			60.61% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN HAYWARD, CA	GILLIG	U.S.A.	100.00%

GILLIG

GILLIG LLC
HAYWARD, CALIFORNIA

DESCRIPTION AND COST OF FINAL ASSEMBLY

Gillig LLC certifies that final assembly of its buses occurs at its manufacturing plant in Hayward, 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 $14,210.08 per bus.

METROPOLITAN COUNCIL, METRO TRANSIT
ST PAUL, MN
PRE-AWARD BUY AMERICA CERTIFICATE
FORTY FOOT HYBRID LOW FLOOR TRANSIT BUSES (QTY: 75, S/N: TBD, BID/CONTRACT#: MN RFP#12P227)
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AIR CONDITIONING SYSTEM	THERMO KING	U.S.A.	5.53%
AIR DRYER ASSEMBLY	SKF USA, INC	U.S.A.	0.08%
ALTERNATOR	C E NIEHOFF	U.S.A.	0.42%
BIKE RACK	SPORTWORKS	U.S.A.	0.13%
BOOSTER PUMP	AMETEK TECHNICAL	U.S.A.	0.11%
BULKHEAD ASSEMBLY	ALVA GWYN	U.S.A.	0.08%
DESTINATION SIGNS	LUMINATOR	U.S.A.	0.89%
DOOR CONTROLS & PANELS - FRONT	VAPOR BUS INTERNATIONAL	U.S.A.	0.47%
DOOR CONTROLS & PANELS - REAR	VAPOR BUS INTERNATIONAL	U.S.A.	0.44%
DRIVER'S BARRIER - WRAP AROUND	AMTECH LLC	U.S.A.	0.06%
DRIVER'S CONSOLE	PERFORMANCE COMPOSITES, INC	U.S.A.	0.05%
DRIVER'S SEAT	RECARO NORTH AMERICA	U.S.A.	0.34%
ELECTRIC DRIVE HYBIRD PROPULSION SYSTEM	BAE SYSTEM CONTROLS, INC	U.S.A.	30.06%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS	U.S.A.	2.79%
ENGINE	CUMMINS ENGINE	U.S.A.	2.94%
EXTERIOR MIRRORS	HADLEY PRODUCTS, INC - B&R DIVISION	U.S.A.	0.19%
FABRICATIONS	HOGAN MANUFACTURING	U.S.A.	2.55%
FIRE SUPPRESSION SYSTEM	AMEREX CORPORATION	U.S.A.	0.39%
FRONT AND REAR AXLE ASSEMBLIES	MERITOR AUTOMOTIVE	U.S.A.	2.37%
FRONT AND REAR BUMPER ASSEMBLIES	RO-LAB AMERICAN RUBBER CO.	U.S.A.	0.32%
FRONT CAP	AMTECH LLC	U.S.A.	0.31%
INTERIOR LIGHTING KIT	I/O CONTROLS CORPORATION	U.S.A.	0.70%
MUFFLER ASSEMBLIES	CUMMINS EMISSION SOLUTIONS	U.S.A.	1.13%
PAINT	DUPONT	U.S.A.	0.19%
PASSENGER SEAT ASSEMBLIES	AMERICAN SEATING	U.S.A.	3.15%
RADIATOR AND CHARGE AIR COOLER	ENGINEERED MACHINED PRODUCTS, INC	U.S.A.	1.65%
REAR CAP ASSEMBLY	COMMERCIAL PATTERN	U.S.A.	0.11%
REAR SUSPENSION	SAF HOLLAND USA	U.S.A.	0.67%
ROOF HATCH	SPECIALTY MANUFACTURING INC	U.S.A.	0.07%
ROOF SKIN	CRANE COMPOSITES, INC.	U.S.A.	0.11%
VIDEO SURVEILLANCE SYSTEM	DIGITAL RECORDERS	U.S.A.	1.45%
VOLTAGE CONVERTER	VANNER, INC.	U.S.A.	0.08%
WHEELCHAIR RAMP	LIFT-U	U.S.A.	1.10%
WHEELWELL COVERS	AMTECH LLC	U.S.A.	0.19%
WINDOW ASSEMBLIES	RICON CORPORATION	U.S.A.	2.07%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			63.25% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN HAYWARD, CA	GILLIG	U.S.A.	100.00%

GILLIG

GILLIG LLC
HAYWARD, CALIFORNIA

DESCRIPTION AND COST OF FINAL ASSEMBLY

Gillig LLC certifies that final assembly of its buses occurs at its manufacturing plant in Hayward, 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 $15,049.19 per bus.

ENGINEERING REFERENCE:
SUBJECT: DATA
PART #: 59-35132-003
STATUS: TB
COLORS: BLACK ON WHITE
DESCRIPTION: DATA PLATE
REMARKS: METRIC AND INCH-POUND UNITS (49 CFR PART 567)
LANQUAGE: ENGLISH
CUSTOMER: ALL
SERIAL NUMBER: N/A

REVISIONS					
SYM	OWN	ZONE	DESCRIPTION	REL	DATE
A			RELEASED FOR PRODUCTION	REI 72353	03/17/09

MANUFACTURED BY GILLIG LLC

HAYWARD, CA 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.

59-35132-003

VEHICLE I.D. NO.: _____ MODEL: _____

TYPE OF VEHICLE: BUS

ENGINE NUMBER: _____

CAPACITY: _____ PASSENGERS

UNLADEN WEIGHT: _____ lb.

59-35132-003_1.DWG:Library

SPECIFICATIONS:
1. MATERIAL IS 59-52697-000
2. SURFACE PRINTING. BLACK ARTWORK.
3. DIMENSIONS ARE 6.125" WIDE BY 4.56" HIGH. (0.1"LETTERING MINIMUM)

ITEM NO	DESCRIPTION	QTY
2	GILLIG CORP. HAYWARD, CA	UNLESS SHOWN, RH OPPOSITE HDE

PROPRIETARY
THIS DRAWING AND THE INFORMATION CONTAINED THEREON SUBMITTED CONFIDENTIALLY AND IS THE PROPERTY OF THE GILLIG CORPORATION. USE, REPRODUCTION OR DISCLOSURE OF THE CONTENT OF THIS DRAWING OR ANY PORTION THEREOF FOR ANY PURPOSE MUST BE APPROVED IN WRITING BY THE GILLIG CORPORATION.

REMOVE ALL BURRS, BREAK SHARP EDGES

DIMENSIONING AND TOLERANCING ARE PER ANSI Y14.5M-1982 UNLESS OTHERWISE SPECIFIED TOLERANCES ARE IN INCHES:

DECIMALS .X ± .06 .XX ± .03 .XXX ± .010 ANGULAR ± .5° THIRD ANGLE

MATL & G. DESIGN

TITLE: DECAL-DATA PLATE GILLIG LLC

OWN	JJC	DATE	03/17/09
CHK'R'S INIT:		DATE:	
APPR'S INIT:		DATE:	
ORIG REL'D.	REI 72353	SIZE	A
CAD SCALE:	FULL	DOCUMENT NO.	59-35132-003

MATER'L SPEC:
MFG STD
FMVSS COMPL: STD NO 302

GILLIG LOW FLOOR

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 Standards as required by the F.T.A. and the D.O.T., and described with Title 49 CFR Chapter V, Part 571 FMVSS, last revised on October 1, 1998.

GILLIG LLC

BY: _____
JOSEPH POLICARPIO

TITLE: VICE PRESIDENT

DATE: FEBRUARY 27, 2013

(2/01)

METROPOLITAN COUNCIL/METRO TRANSIT

PRE-AWARD BUY AMERICA COMPLIANCE CERTIFICATION

As required by Title 49 of the CFR, Part 663 – Subpart B, the Metropolitan Council (the recipient) is satisfied that the buses to be purchased, 75 40' diesel buses (number and description of buses) from Gillig Corp. (the manufacturer), meet the requirements of Section 165(b)(3) of the Surface Transportation Assistance Act of 1982, as amended. The recipient , or its appointed analyst (the analyst – not the manufacturer or its agent), has reviewed documentation provided by the manufacturer, which lists (1) the proposed component and subcomponent parts of the buses identified by manufacturer, country of origin, and cost; and (2) the proposed location of the final assembly point for the buses, including a description of the activities that will take place at the final assembly point and the cost of final assembly.

Date: 8-8-13

Signature: Chuck Wunderlich Title: Assistant Director

Department: Bus Maintenance

Gillig Contract 12P227
Bus production release 12P227A For 45 buses
+ release 12P227B For 30 buses
75 buses total

METROPOLITAN COUNCIL/METRO TRANSIT

PRE-AWARD FMVSS COMPLIANCE CERTIFICATION

As required by Title 49 of the CFR, Part 663 – Subpart D, the Metropolitan Council (the recipient) certifies that it received, at the pre-award stage, a copy of Gillig Corporation's(the manufacturer) self-certification information stating that the buses, 75 40' diesel buses (number and description of buses), will comply with the relevant Federal Motor Vehicle Safety Standards issued by the National Highway Traffic Safety Administration in Title 49 of the Code of Federal Regulations, Part 571.

Date: 8-8-13

Signature: Chuck Wunsch Title: Assistant Director

Department: Bus Maintenance

METROPOLITAN COUNCIL/METRO TRANSIT

PRE-AWARD PURCHASER'S REQUIREMENTS CERTIFICATION

As required by Title 49 of the CFR, Part 663 – Subpart B, the Metropolitan Council (the recipient) certifies that the buses to be purchased, 75 40' diesel buses (number and description of buses) from Gillig Corp. (the manufacturer), are the same product described in the recipient's solicitation specification and that the proposed manufacturer is a responsible manufacturer with the capability to produce a bus that meets the specifications.

Date: 8-8-13

Signature: Chuck Wunsch Title: Assistant Director

Department: Bus Maintenance

METROPOLITAN COUNCIL, METRO TRANSIT
ST PAUL, MN
PRE-AWARD BUY AMERICA CERTIFICATE
FORTY FOOT LOW FLOOR TRANSIT BUSES (QTY: 75, S/N: TBD, BID/CONTRACT: MN RFP#12P227)
27-Feb-13

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.	0.09%
AIR CONDITIONING SYSTEM	THERMO KING	U.S.A.	8.33%
AIR DRYER ASSEMBLY	SKF USA, INC	U.S.A.	0.12%
ALTERNATOR	C E NIEHOFF	U.S.A.	0.64%
BIKE RACK	SPORTWORKS	U.S.A.	0.20%
BOOSTER PUMP	AMETEK TECHNICAL	U.S.A.	0.16%
BULKHEAD ASSEMBLY	ALVA GWYN	U.S.A.	0.12%
COMPOSITE FLOORING	MILWAUKEE COMPOSITES	U.S.A.	0.40%
DESTINATION SIGNS	LUMINATOR	U.S.A.	1.34%
DOOR CONTROLS & PANELS - FRONT	VAPOR BUS INTERNATIONAL	U.S.A.	0.71%
DOOR CONTROLS & PANELS - REAR	VAPOR BUS INTERNATIONAL	U.S.A.	0.66%
DRIVER'S BARRIER - WRAP AROUND	AMTECH LLC	U.S.A.	0.09%
DRIVER'S CONSOLE	PERFORMANCE COMPOSITES, INC	U.S.A.	0.07%
DRIVER'S SEAT	RECARO NORTH AMERICA	U.S.A.	0.52%
ELECTRICAL HARNESSES & CABLES	LACO INCORPORATED	U.S.A.	1.10%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS	U.S.A.	4.13%
ENGINE	CUMMINS ENGINE	U.S.A.	8.41%
EXTERIOR MIRRORS	HADLEY PRODUCTS, INC - B&R DIVISION	U.S.A.	0.28%
FABRICATIONS	AMTECH LLC	U.S.A.	0.32%
FABRICATIONS	COMMERCIAL PATTERN	U.S.A.	0.27%
FABRICATIONS	DETENTION DEVICE SYSTEMS	U.S.A.	0.33%
FABRICATIONS	DIAMOND MANUFACTURING	U.S.A.	0.56%
FABRICATIONS	DIE & TOOL PRODUCTS	U.S.A.	1.20%
FABRICATIONS	EAST BAY MACHINE	U.S.A.	0.14%
FABRICATIONS	GCM	U.S.A.	0.80%
FABRICATIONS	GOLDEN PLASTICS	U.S.A.	0.16%
FABRICATIONS	HOGAN MANUFACTURING	U.S.A.	3.90%
FABRICATIONS	IMPERIAL FABRICATING	U.S.A.	0.87%
FRONT AND REAR AXLE ASSEMBLIES	RON NUNES ENTERPRISES	U.S.A.	0.32%
FRONT AND REAR BUMPER ASSEMBLIES	MERITOR AUTOMOTIVE	U.S.A.	3.58%
FRONT CAP	RO-LAB AMERICAN RUBBER CO.	U.S.A.	0.48%
INTERIOR LIGHTING KIT	AMTECH LLC	U.S.A.	0.47%
MUFFLER ASSEMBLIES	I/O CONTROLS CORPORATION	U.S.A.	1.05%
PAINT	CUMMINS EMISSION SOLUTIONS	U.S.A.	2.08%
PASSENGER SEAT ASSEMBLIES	DUPONT	U.S.A.	0.32%
RADIATOR AND CHARGE AIR COOLER	AMERICAN SEATING	U.S.A.	4.74%
REAR CAP ASSEMBLY	ENGINEERED MACHINED PRODUCTS, INC	U.S.A.	2.48%
REAR SUSPENSION	COMMERCIAL PATTERN	U.S.A.	0.17%
ROOF HATCH	SAF HOLLAND USA	U.S.A.	1.01%
ROOF SKIN	SPECIALTY MANUFACTURING INC	U.S.A.	0.11%
STEERING GEAR ASSEMBLY	CRANE COMPOSITES, INC.	U.S.A.	0.17%
VIDEO SURVEILLANCE SYSTEM	TRW	U.S.A.	0.33%
VOLTAGE CONVERTER	DIGITAL RECORDERS	U.S.A.	2.19%
WHEELCHAIR RAMP	VANNER, INC.	U.S.A.	0.11%
WHEELWELL COVERS	LIFT-U	U.S.A.	1.66%
WINDOW ASSEMBLIES	AMTECH LLC	U.S.A.	0.30%
	RICON CORPORATION	U.S.A.	3.12%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			60.61% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN HAYWARD, CA	GILLIG	U.S.A.	100.00%

GILLIG

GILLIG LLC
HAYWARD, CALIFORNIA

DESCRIPTION AND COST OF FINAL ASSEMBLY

Gillig LLC certifies that final assembly of its buses occurs at its manufacturing plant in Hayward, 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 $14,210.08 per bus.

METROPOLITAN COUNCIL, METRO TRANSIT
ST PAUL, MN
PRE-AWARD BUY AMERICA CERTIFICATE
FORTY FOOT HYBRID LOW FLOOR TRANSIT BUSES (QTY: 75, S/N: TBD, BID/CONTRACT#: MN RFP#12P227)
27-Feb-13

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.	0.06%
AIR CONDITIONING SYSTEM	THERMO KING	U.S.A.	5.53%
AIR DRYER ASSEMBLY	SKF USA, INC	U.S.A.	0.08%
ALTERNATOR	C E NIEHOFF	U.S.A.	0.42%
BIKE RACK	SPORTWORKS	U.S.A.	0.13%
BOOSTER PUMP	AMETEK TECHNICAL	U.S.A.	0.11%
BULKHEAD ASSEMBLY	ALVA GWYN	U.S.A.	0.08%
DESTINATION SIGNS	LUMINATOR	U.S.A.	0.89%
DOOR CONTROLS & PANELS - FRONT	VAPOR BUS INTERNATIONAL	U.S.A.	0.47%
DOOR CONTROLS & PANELS - REAR	VAPOR BUS INTERNATIONAL	U.S.A.	0.44%
DRIVER'S BARRIER - WRAP AROUND	AMTECH LLC	U.S.A.	0.06%
DRIVER'S CONSOLE	PERFORMANCE COMPOSITES, INC	U.S.A.	0.05%
DRIVER'S SEAT	RECARO NORTH AMERICA	U.S.A.	0.34%
ELECTRIC DRIVE HYBIRD PROPULSION SYSTEM	BAE SYSTEM CONTROLS, INC	U.S.A.	30.05%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS	U.S.A.	2.79%
ENGINE	CUMMINS ENGINE	U.S.A.	2.94%
EXTERIOR MIRRORS	HADLEY PRODUCTS, INC - B&R DIVISION	U.S.A.	0.19%
FABRICATIONS	HOGAN MANUFACTURING	U.S.A.	2.55%
FIRE SUPPRESSION SYSTEM	AMEREX CORPORATION	U.S.A.	0.39%
FRONT AND REAR AXLE ASSEMBLIES	MERITOR AUTOMOTIVE	U.S.A.	2.37%
FRONT AND REAR BUMPER ASSEMBLIES	RO-LAB AMERICAN RUBBER CO.	U.S.A.	0.32%
FRONT CAP	AMTECH LLC	U.S.A.	0.31%
INTERIOR LIGHTING KIT	I/O CONTROLS CORPORATION	U.S.A.	0.70%
MUFFLER ASSEMBLIES	CUMMINS EMISSION SOLUTIONS	U.S.A.	1.13%
PAINT	DUPONT	U.S.A.	0.19%
PASSENGER SEAT ASSEMBLIES	AMERICAN SEATING	U.S.A.	3.15%
RADIATOR AND CHARGE AIR COOLER	ENGINBERED MACHINED PRODUCTS, INC	U.S.A.	1.65%
REAR CAP ASSEMBLY	COMMERCIAL PATTERN	U.S.A.	0.11%
REAR SUSPENSION	SAF HOLLAND USA	U.S.A.	0.87%
ROOF HATCH	SPECIALTY MANUFACTURING INC	U.S.A.	0.07%
ROOF SKIN	CRANE COMPOSITES, INC.	U.S.A.	0.11%
VIDEO SURVEILLANCE SYSTEM	DIGITAL RECORDERS	U.S.A.	1.45%
VOLTAGE CONVERTER	VANNER, INC.	U.S.A.	0.08%
WHEELCHAIR RAMP	LIFT-U	U.S.A.	1.10%
WHEELWELL COVERS	AMTECH LLC	U.S.A.	0.19%
WINDOW ASSEMBLIES	RICON CORPORATION	U.S.A.	2.07%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			63.25% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN HAYWARD, CA	GILLIG	U.S.A.	100.00%

GILLIG

GILLIG LLC
HAYWARD, CALIFORNIA

DESCRIPTION AND COST OF FINAL ASSEMBLY

Gillig LLC certifies that final assembly of its buses occurs at its manufacturing plant in Hayward, 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 $15,049.19 per bus.

REVISIONS					
SYM	CHK	ZONE	DESCRIPTION	REL	DATE
A			RELEASED FOR PRODUCTION	REI72353	03/17/09

ENGINEERING REFERENCE:
SUBJECT: DATA
PART #: 59-35132-003
STATUS: TB
COLORS: BLACK ON WHITE
DESCRIPTION: DATA PLATE
REMARKS: METRIC AND INCH-POUND UNITS (49 CFR PART 567)
LANOUAGE: ENGLISH
CUSTOMER: ALL
SERIAL NUMBER: N/A

MANUFACTURED BY GILLIG LLC

HAYWARD, CA 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.

59-35132-003

VEHICLE I.D. NO.: ____________ MODEL: ____________

TYPE OF VEHICLE: BUS

ENGINE NUMBER: ____________

CAPACITY: ____________ PASSENGERS

UNLADEN WEIGHT: ____________ lb.

SPECIFICATIONS:
1. MATERIAL IS 59-52697-000
2. SURFACE PRINTING. BLACK ARTWORK.
3. DIMENSIONS ARE 6.125" WIDE BY 4.56" HIGH. (0.1" LETTERING MINIMUM)

ITEM NO	DESCRIPTION		QTY
2	GILLIG CORP. HAYWARD, CA		
		TITLE: DECAL-DATA PLATE GILLIG LLC	
		DWN: JJC	DATE: 03/17/09
		ORIG REL #: REI 72353	PAINT/COMPL: STD NO 302
	DESIGN	CAD SCALE: FULL	SIZE: A DOCUMENT NO.: 59-35132-003

GILLIG LOW FLOOR

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 Standards as required by the F.T.A. and the D.O.T., and described with Title 49 CFR Chapter V, Part 571 FMVSS, last revised on October 1, 1998.

GILLIG LLC

BY: _____
JOSEPH POLICARPIO

TITLE: VICE PRESIDENT

DATE: FEBRUARY 27, 2013

(2/01)

First Transit

Exhibit III-1 – Post-Delivery Purchaser's Requirements Certification

As required by Title 49 of the CFR, Part 663 - Subpart C, the Metropolitan Council – Metro Transit (the recipient) certifies that a resident inspector, First Transit Inc., who is not an agent or employee of Gillig, LLC, was at the Gillig LLC manufacturing site during the period of manufacture of seventy-five (75) 40' diesel buses. The inspector monitored manufacturing and completed a report on the manufacture of the vehicles providing accurate records of all vehicle construction activities. The report addressed how the construction and operation of the vehicles fulfills the contract specifications, details visual and measured inspections, and contains road test records. After reviewing this report, the recipient certifies that the vehicles meet the contract vehicle specific technical specifications.

Date: 8-19-14

Signature: Chuck Wiegand Title: Asst. Director, Bus Maint

First Transit

Exhibit II-2 – Post-Delivery Buy America Compliance Certification

As required by Title 49 of the CFR, Part 663 - Subpart C, the Metropolitan Council – Metro Transit (the recipient) certifies that it is satisfied that the vehicles received, seventy-five (75) 40' diesel buses from Gillig LLC, meet the requirements of Section 165(b)(3) of the Surface Transportation Assistance Act of 1982, as amended. The recipient, or its appointed analyst, First Transit Inc., has reviewed documentation provided by the manufacturer, which lists (1) the actual component and subcomponent parts of the vehicles identified by the manufacturer, country of origin, and cost; and (2) the actual location of the final assembly point for the vehicles, including a description of the activities that took place at the final assembly point and the cost of final assembly.

Date: 8-19-14

Signature: Chuck Wunnicke Title: Asst. Director, Bus Maint.

Exhibit I-2 – Post-Delivery FMVSS Compliance Certification

As required by Title 49 of the CFR, Part 663 - Subpart D, I: the Metropolitan Council – Metro Transit (the recipient) certifies that it received, at the post-delivery stage, a copy of Gillig LLC's self-certification information stating that the seventy-five (75) diesel buses comply with the relevant Federal Motor Vehicle Safety Standards issued by the National Highway Traffic Safety Administration in Title 49 Code of Federal Regulations, Part 571.

Date: 8-19-14

Signature: Chuck Wunjon Title: Asst. Director, Bus Maint.