

## REQUEST FOR TRANSIT VEHICLE PRICE QUOTE (RFQ)

This is (check appropriate):

- Initial Request for Quote (from Requesting Agency to Vendors)  
Due Date: 9/24/2021
  - Response to RFQ (from Responding Vendor back to Requesting Agency)
  - Grant Funded Purchase Grant Agreement Number 34342
- 

VENDOR (Business Name): SCHETKY NW SALES

Vendor Contact Person: MARK ZOLLNER Phone: 503-607-3143  
Email Address: [markz@schetkynw.com](mailto:markz@schetkynw.com) Alt Phone: 971-990-7018

Meets Buy America Standards (49 USC § 5323(j); 49 CFR part 661)

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### REQUESTING AGENCY INFORMATION

Agency: Yamhill County Transit Area Date: 9/2//2021  
Contact Person: Cynthia Thompson Phone: 503-995-7965  
Email Address: [Thompsonc@co.yamhill.or.us](mailto:Thompsonc@co.yamhill.or.us)

Agency Address: 800 NE 2<sup>nd</sup> Street McMinnville, OR 97128

*Kimberly Stanchfield from Knowledge In Mobility will be assisting with this purchase process. Send all questions, correspondence, RFQ submittals to both Kimberly at [Kimberly@KnowledgeInMobility.com](mailto:Kimberly@KnowledgeInMobility.com) and Cynthia Thompson as listed above.*

The above Agency, through its Public Transit program or public transit affiliate, is requesting price quotes from Oregon State Price Agreement Contract Vendors for the purchase of the following vehicle(s):

From (circle): Oregon State Price Agreement / Other No. of Vehicles Required: 4

PTD Vehicle Category (Check): (Please see PTD Vehicle Descriptions and Useful Life Standards)

Cat A  Cat B  Cat C  Cat D  Cat E \_\_\_ (select from 1 to 3)

Length (can be range): 24-28' Regular Seats: 18 ADA Stations/Tiedowns: 3

Fuel Type:  Gasoline  Diesel  Bio-fuel  Hybrid  CNG  Propane

High Floor  Low Floor Other Comment: \_\_\_\_\_

B.O. 21-451

**The general specification for vehicle is as follows:**

Four (4) medium size, medium-duty (24-28'), low-floor buses that use gasoline fuel and seat a minimum of 18 seated passengers and 3 ADA wheelchair stations with tie downs. **The vehicles shall have a minimum expected life of seven (7) years or 200,000 miles**, and must be designed for the widest possible spectrum of passengers, including children, adults, the elderly and people with disabilities.

The Contractor shall comply with all applicable federal and state regulations. These shall include but not be limited to ADA, Buy America, Testing, and safety requirements. In addition, buses must meet all applicable FMVSS regulations in effect at the date of manufacture.

Additional specifications are outlined below – the base price MUST include specifications noted – if there are suggested changes to the specs (and the bid includes those changes) please note this in the vendor response section. The vendor is also asked to provide three references for warranty and service with the bid.

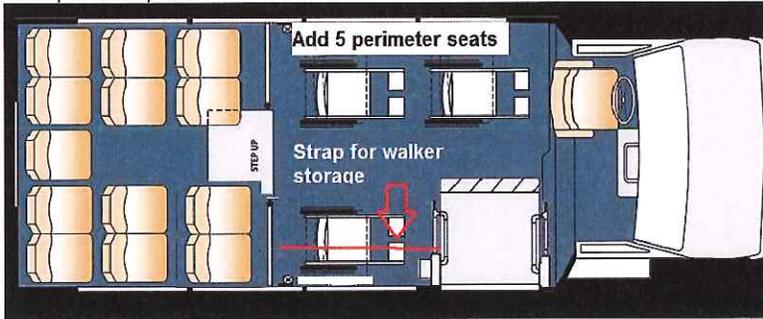
A. VENDOR'S VEHICLE BASE PRICE INFORMATION	VEHICLE BASE PRICE
<b><i>This Section to be completed by Vendor</i></b>	<b><i>Enter base price from State Price Agreement below</i></b>
Vehicle Make/Model: <b>2022 CHAMPION LF TRANSPORT E-450</b>	
Length: <b>APROXIMATELY 27'</b>	<b>\$122,724.00</b>
Fuel Type: <b>GASOLINE</b>	
Floor: <input type="checkbox"/> High Floor <input checked="" type="checkbox"/> Low Floor Other:	
No. of Regular Passenger Seats: <b>3</b>	
No. of ADA Stations w/Tiedowns Desired: <b>17</b>	
Other Special Note: <b>MAX CAPACTY INCLUDES (5) FLIP SEATS</b>	

Please provide 3 previous Oregon Transit customers reference contact numbers, we will inquire:

- How responsive the vendor has been to warranty issues?
- Have you used their maintenance or repair services? If yes, were they able to provide the service in a reasonable amount of time?
- Have you had any major issues with customer service or shop staff?
- Are there any other issues or concerns you've had with the vendor, shop staff, vehicle delivery, etc that you'd like to let me know about?

Negative feedback from previous customers may disqualify your bid.

B. VEHICLE REQUIRED SPECIFICATIONS	
	VENDOR RESPONSE
<b><i>Requesting Agency's Required Specifications Description</i></b>	<b><i>Vendor Suggestions (related to vehicle specs)</i></b>
Altoona Test Executive Summary	PROVIDED
At the end of the RFQ are 3 required certification attachments. Theses must be returned with the RFQ response. Failure to include will render your response non-responsive.	PROVIDED

All standard specs per State Price Agreement. Include a list of vendor provided standard specs with RFQ response including all chassis specs.	PROVIDED-SEE BELOW
Vehicle should be approximately 24-28' long with a heavy duty chassis	PROVIDED- APPROXIMATELY 27' ON FORD E-450 CHASSIS
Gas Engine; emission compliant; minimum 6.0L.	PROVIDED-7.3L PREMIUM GAS ENGINE
Heavy duty automatic transmission	PROVIDED
Heavy duty suspension system; air suspension front and rear with kneeling feature	PROVIDED- BEST IN CLASS AIR SUSPENSION- SEE ATTACHED
Low floor bus with ramp/NO LIFT and kneeling feature. Ramp must have manual bypass easily accessible to driver at entry door.	PROVIDED
Steel cage, low floor "body on chassis" with dual rear wheels	PROVIDED
34" x 62" ADA compliant wheelchair entry Braun ramp or equivalent (minimum 800 lb. capacity)	PROVIDED
Marine Grade Plywood flooring with adequate undercoating to ensure no water intrusion into bus flooring.	PROVIDED
<p>Floor plan with front load wheelchair access and 3 wheelchair stations, seating for 18 using perimeter seats in wc area and ff in rear section of bus, walker / interior bike storage behind ramp. Red line indicates location of single strap to secure bikes/walkers that is easily accessed/hooked by driver. Strap should be approx 6" out from the wall. Check with Agency for correct location before installation.</p> <p>Sample floorplan</p>  <p>The diagram is a top-down view of a bus interior. It shows a driver's seat on the right side. Behind the driver's seat is a wheelchair station with a ramp. A red line indicates a strap for walker storage. There are five perimeter seats along the side walls. A 'STEP UP' label is near the wheelchair station. Text labels include 'Add 5 perimeter seats' and 'Strap for walker storage'.</p>	PROVIDED
Q-Straint (or equivalent) auto-tensioning wheelchair securements with TDSS Storage under folding seats or wall storage as appropriate – NO Bags. (2) wheelchair seat belt extenders.	PROVIDED-Q'STRAIT QRT 360 RETRACTABLE QUOTED WITH TDSS
Full length wheelchair track front to back behind driver with full length wall track for maximum flexibility.	PROVIDED
Fog Lights – OEM or aftermarket acceptable.	PROVIDED
ADA decals, lighting, and park interlock.	PROVIDED
Level floor throughout passenger seating area.	PROVIDED- NO SLOPE IN SEATING AREAS
Treated floor; undercoated and insulated covered with non-skid commercial coloring throughout vehicle. Please state what flooring will be provided and color.	PROVIDED- GERFLOOR SIRIUS ANTHRICITE QUOTED
Large T-Slider windows	PROVIDED
Master Disconnect switch to be mounted in driver's stepwell, near the rear of the driver's seat. Not in battery box	PROVIDED
Comfortable driver compartment that accommodates both large and small operators.	PROVIDED

USSC GE Driver seat or equivalent. Manual base with Level 6 fabric	PROVIDED- USSC G2ELP QUOTED WITH LEVEL 6 COVER
Exhaust routed to exit rear side of bus, drivers side – NOT out the back of the bus	PROVIDED
Automatic transmission with auxiliary transmission cooler	PROVIDED
Intermittent single switch windshield wipers	PROVIDED
LED Back-up lights & back-up alarm	PROVIDED
OEM Dashboard AC, Defroster and Heat for driver Rear passenger AC & Heat – Minimum A/C 70,000 BTU Roof Top Mounted with minimum 65,000 BTU roof top heat included	PROVIDED
All seats to be molded seats with cloth pop out covers, Freedman Citiseat or equivalent. Wheelchair securements to be stored underseat - TDSS. Level 6 fabric. 60" standard belts with (2) 24" extensions per bus	PROVIDED-USR SEATBELTS QUOTED PER EMAIL
2 Heavy Duty 12 V 700 CCA batteries	EXCEEDS- DUAL 800 CCA BATERIES QUOTED
Auxiliary Battery Compartment w/ tray and door	PROVIDED- WITH STAINLESS STEEL TRAY
Rear Tow hooks	PROVIDED
Cup holder in driver doghouse	PROVIDED
Driver's fan (mounted to front dash)	PROVIDED
Daytime running lights (OEM)	PROVIDED
AM/FM/MP3 radio with 4 speakers (REI or equivalent)	PROVIDED
Intercom – PA system with hand held microphone and interior and exterior speakers. Intercom to be integrated with the radio system and override the radio when activated.	PROVIDED
Front locking glove box	PROVIDED
Stop request system – pull cords (yellow) with push buttons at wheelchair stations. Dual chime with lighted sign in driver's line of site.	PROVIDED- BULKHEAD MOUNTED SIGNAGE
Heated / Remote controlled mirrors	PROVIDED
Hanover LED Destination Signs pre-programmed with YCTA destinations. Put destination sign controls within easy reach of driver when driver is seated.	PROVIDED
Merge/Yield Sign (LED) – Triangle (Like TRIMET) wired with momentary switch and auto cancel with left turn signal	PROVIDED
Diamond NV Farebox / 1 vault installed and keyed for YCTA buses. Farebox must be in easy reach of the driver when sitting.	PROVIDED
Kenwood NX-820HGK Two Way Radio (or equivalent) installed by Silke at Vendor location and programmed for YCTA fleet.	PROVIDED-NX-800HK SYSTEM QUOTED PER EMAIL
All Stanchions and Grabrails Powder Coat Yellow with texture at entry doors, parallel to entrance, on ceiling and driver stanchion	PROVIDED
Right side mounted crossover convex mirror – mounted to front fender for bike rack viewing	PROVIDED
YCTA Graphics to be printed and installed by Gillespie Decals at vendor location before delivery.	PROVIDED
Ten (10) brochure racks for tri-fold brochures. YCTA to provide location to the successful vendor	PROVIDED
Yamhill is contracting with <i>Connexionz</i> for Real Time Bus Tracking software. Vendor is required to purchase and install all hardware and software before delivery. All components will be tested by Yamhill before delivery acceptance.	PROVIDED

Please contact Brian Garrett at Connexionz for Yamhill's specific equipment needed.

At a minimum:

Description
Medius G2, MultiMedia, Cellular RC7611 (USA)
8 Inch Rugged MDT Android 9.0 with High Brightness
RAM Mount - Kit
Hanover 120x8 Amber Internal LED sign
REI 20 Inch LCD Slimline Monitor 12/24V
Medius - Media License
Item Freight
Cabling - HDMI, Power, misc
J1708 Hanover Internal Sign Cable, 20ft (Licensed)
Pepwave MAX BR1 Mini with Cat 4 LTE Modem (AT&T/Verizon/T-Mobile)

Brian Garrett | U.S. Sales Director  
 CNX Phone 1 (719)239-3348  
 Direct 1 (213)807-9366  
 Mobile 1 (309)706-0174  
 Email [Brian.Garrett@Connexionz.com](mailto:Brian.Garrett@Connexionz.com)

LED Exterior lights including <b>third back up light.</b>	PROVIDED- REAR CENTER BRAKE LIGHT PER EMAIL
Safety Supplies: 5 lb. Fire Extinguisher, 16 unit first aid kit, triangle kit, Seat belt cutter – mounted before delivery	PROVIDED
Total 5 keys per bus	PROVIDED
Garbage can rack to right of driver – YCTA to approve location	PROVIDED
Colored (Red) lighting inside 1 <sup>st</sup> 2 banks of passenger area with separate switch	PROVIDED
Front mounted Apex 3 or equivalent Bike rack	PROVIDED- STAINLESS STEEL/ANTI GLARE
Additional exterior lighting to enhance illumination around bike rack.	PROVIDED
Digital Clock in driver area	PROVIDED
Curb feeler on Right front corner with steel reinforcements for stability	PROVIDED
Body Fluid Clean-up kit	PROVIDED
Interior Graphics prepared & installed by Gillespie Decals to agency specs.	PROVIDED-ADA/PRIORITY SEATING SIGNAGE FROM CHAMPION INCLUDED
Driver COVID barrier with door	PROVIDED
Estimated delivery date (mm/year)	WITH CURRENT CHASSIS SHORTAGES EXPECTED DELIVERY IS HARD TO ESTIMATE. BEST GUESS IS 12 MONTHS FROM RECIEPT OF P.O.

<b>Subtotal Cost of Required Options:</b>	\$65,259.64
<b>Total Vehicle Cost With All Required Options:</b>	\$187,983.64
<b>Estimated Vehicle Privilege Tax (if billing to agency) – NOTE: ADA Modifications are exempt from tax</b>	\$934.59

<b>Total Vehicle Cost With All Required Options and tax:</b>		\$188,918.23	
<b>C. VEHICLE PREFERRED OPTIONS</b>			
<i>Requesting Agency's Preferred Options Description</i>	<i>Included in Base Price?</i>  YES / NO	<i>\$Additional Cost for Option\$</i>  <i>(or Note Not Available)</i>	<i>Vendor Suggestions</i>  <i>(related to vehicle specs)</i>
Secondary charging system for Connexionz equipment and accessories. Agency wishes to avoid power issues during summer months when AC will be heavily used with ramp and MDT equipment. Include master power switch	NO	N/A FROM CONNEXIONZ PER BRIAN GARRETT	NOT NEEDED WITH NEW SYSTEM PER BRIAN GARRETT
<b>Subtotal Cost of Preferred Options:</b>		\$ N/A	

Vendor's Signature: \_\_\_\_\_ Date Sent: 9/24/2021

**Please don't forget to sign and date your response here.**

Sample Floor plan

\*SEE ATTACHED

**VENDOR INFORMATION**

Vendors are strongly encouraged to submit price quotes using the format provided. Vendors should specifically note if and how they meet the above specifications, and note any differences in what has been called out above, in their price quotes. This may be done on the form, or on an attached sheet. The vehicle(s) will be purchased with funding from the Oregon Department of Transportation, Public Transit Division and the Requesting Agency, and will follow applicable Federal and State procurement guidelines.

Price Quote shall be submitted to the Requesting Agency contact person named on the first page on this form.

Price Quotes may be sent by U.S. Mail, emailed, or faxed to the addresses for Requesting Agency noted on page 1 of this form.

**Vendors are required to submit the following certification attachments with each Quote response:**

**Attachment 1 – Certificate of Compliance with Bus Testing Requirement**

**Attachment 2 – Pre-Award FMVSS and Buy America Certification**

**Attachment 3 – Transit Vehicle Manufacturer (TVM) Certification (DBE)**

## VEHICLE SELECTION INFORMATION

Selection of the vehicle and successful price quote will be based on:

**Lowest Cost With Required Specifications** (*Lifecycle costs may be considered in price determination and may affect lowest bid determination*)

## **ALL STATE STANDARD SPECS INCLUDED UNLESS OTHERWISE REQUESTED:**

### **STANDARD VEHICLE EQUIPMENT**

LOW FLOOR CONVERTED CHASSIS - ELECTRONIC KNEELING SYSTEM  
22821-SUSPENSION HEIGHT INCREASE SWITCH  
TRANSIT SEGMENT  
102" WIDE BODY  
AIRPORTER STYLE BODY W/FIBERGLASS PLUG WINDOW - OPEN CAB DESIGN  
BATTERY BOX IN CURB WING  
STEP FLOOR CONFIGURATION - FIXED STEP  
BLACK POWDERED STEPWELL FOR STEP UP  
RAMP, BRAUN ELECTRIC BI-FOLD 6-1  
INTERLOCK PARKING BRAKE  
PARKING BRAKE APPLIED AND TRANSMISSION IN PARK REQUIRED TO OPERATE ENTRY RAMP  
TRANSMISSION IN PARK REQUIRED TO KNEEL VEHICLE (IF APPLICABLE)  
TRANSMISSION LOCKED IN PARK IF FRONT ENTRY DOOR IS AJAR  
TRANSMISSION LOCKED IN PARK IF VEHICLE IS KNEELED OR LOW ON AIR  
STEELGUARD CAGE CONSTRUCTION  
FULL TUBE STRUCTURE (GATOR SHIELD)  
ANTI CORROSION PROTECTED ENTRY WINGS  
14 GAUGE GALVANIZED WHEELWELLS  
URETHANE FOAM SIDEWALL, CEILING, & UNDER BODY INSULATION  
FOAM INSULATION 1/2" THICK - R VALUE 8  
FUEL ACCESS COVER  
AIRBAG INSPECTION DIAMOND PLATES IN FLOOR REQUIRED  
STREET SIDE EXHAUST  
EXHAUST REQUIRES 2 THERMAL INSULATED EXHAUST SOCKS  
REAR MUD FLAPS  
FULL 4 CORNER ELECTRONIC KNEELING AIR SUSPENSION  
LCD DIAGNOSTIC DISPLAY IN DASH  
12 VOLT ELECTRICAL PANEL (FUSES)  
LED EXTERIOR LIGHTING - INCLUDES ADA  
LED INTERIOR DOME LIGHTS  
DOOR ACTIVATED LIGHTING  
LIGHT,LED STEPWELL 18" STRIP - DOOR HEADER MOUNT  
LIGHT, STEP LED YELLOW ON EACH SIDE OF INTERIOR STEP AREA - TO BE ON AT ALL TIMES  
  
DUAL BATTERIES - OEM OR AFTERMARKET AS LONG AS BOTH BATTERIES ARE THE SAME  
ALL BATTERY CABLE TO BE 2/0 SGX  
EXTERIOR KEY SWITCH - ENTRANCE DOOR  
ROCKER SWITCH IN DASH - RAMP OPERATION  
TOGGLE SWITCH EXTERIOR - RAMP OPERATION  
SEAL EDGES OF PLYWOOD - FLOOR  
YELLOW STEP NOSING FOR STEP UP  
EVAPORATOR CLOSE OUT PANEL IS REQUIRED WITH ANY A/C PACKAGE WITH A REAR A/C EVAPORATOR

FRP INTERIOR  
FRP CEILING  
TOP T-SLIDE WINDOWS  
REAR EGRESS WINDOW  
LARGE DRIP RAIL OVER WINDOWS  
EXTERIOR MATERIAL TO BE NOBLE CHOICE FRP AS FOLLOWS:  
SIDEWALLS - 3.9 THICK  
BACKWALL - 2.54 THICK  
SKIRTS - 3.9 THICK  
ROOF ONE PIECE COMPOSITE PER LF  
RUB RAIL FOR ALL LENGTH UNITS  
DRIVER'S SIDE RUNNING BOARD-FIBERGLASS  
FUEL FILL DOOR S/S- KEYED LOCK  
BLACK STEEL POWDER COATED REAR BUMPER  
ELECTRIC PASSENGER ENTRY DOOR W/AUTO REVERSE  
2" ENTRY DOOR BRUSH  
DOOR CONTROL ACCESS PANEL  
RIGHT AND LEFT HAND GRAB RAIL - STAINLESS STEEL STANCHIONS WITH YELLOW GRAB RAILS  
MODESTY PANEL (LEFT HAND ENTRY STANCHION) - PADDED  
73260-GRAB RAILS MOUNTED ON DOOR YELLOW - REFERENCE ASSEMBLY 0421945  
(2) STANCHION, EXTRA W/PADDED MODESTY PANEL, STEP AREA  
FRONT OBSERVATION WINDOW  
PRIORITY SEATING SIGN  
WHEELCHAIR LOCATION SIGN  
WATCH YOUR STEP SIGN LOCATED ON THE FRONT OF THE INTERIOR FIXED STEP  
TRACK SEATING W/TRACK INSERT IN WALLS AND FLOOR  
OEM DRIVER'S SEAT  
FULL BODY UNDERCOATING  
COAT WELDS ON SKIRTING AND OUTSIDE EDGE OF FLOOR FRAME COATING WITH RUST INHIBITOR  
SUSPENSION, CHASSIS FOUR WHEEL ALIGNMENT

**BASE VEHICLE EQUIPMENT (AS SPECIFIED BY STATE)**

ENGINE COMPARTMENT LIGHT  
EXTENSION, TIRE VALVE STEM  
SPARE TIRE/WHEEL 19.5" SHIP LOOSE  
UNDERCOAT CAB  
AS BUILT WIRING DIAGRAMS  
LEGEND ELECTRICAL BOX  
CIRCUIT BREAKERS IN LIEU OF FUSES  
BATTERIES, DUAL 750CCA  
BATTERY, BOX S/S SLIDE/TRAY (CUTAWAYS)  
AUXILIARY 12v POWER SOURCE w/ COVER  
LIGHTS, DAYTIME RUNNING  
MASTER DISCONNECT SWITCH (BODY ONLY)

RADIO, AM/FM/CD PLAYER W/ 4 SPEAKERS REI  
MIC HANDHELD IN-DASH REI  
PAGE, SPEAKER EXTERIOR (EACH)  
BACK-UP CAMERA SYST 7" MON. & 1 CAM REI  
RADIO, TWO WAY PREP  
PLYWOOD, 3/4" MARINE TECH FLOOR - REAR SECTION ONLY  
PLYWOOD, 5/8" MARINE TECH FLOOR - FRONT SECTION ONLY  
FLOORING - COVERED UP SIDEWALL  
FLOORING, FULL RUBBER GRAY RCA (PER FOOT)  
YELLOW STANDEE LINE  
70,000 BTU MAX A/C (FORD F550 6.8L GAS) ACT  
HEAT CIRCULATION PUMP  
HEATER 65,000 BTU (QTY 2)  
BUMPER, ANTI-RIDE SHIELD  
L-TRACK FRONT TO BACK PER W/C POSITION (QTY 2)  
L-TRACK LENGTH OF W/C SPACE ABOVE WINDOW  
DECAL, PARATRANSIT

BACKUP ALARM (SMALL)  
EXTINGUISHER FIRE 5 POUND  
KIT, FIRST AID - 24 UNIT  
GRAB RAILS, CEILING (QTY 2)  
MIRROR, INTERIOR 6.0" x 16.0"  
SEAT BELT WEB CUTTER  
STANCHION, w/MODESTY/DRIVERS BARRIER  
FRONT GLOVE BOX, LOCKING  
PASSENGER, PULL CORD YELLOW  
PASSENGER, TOUCH TAPE  
SIGNAL, CHIME 2-TONE (ADA)  
SIGNAL, PASSENGER STOP REQUEST BULKHEAD MOUNTED  
MID HI FEATHERWEIGHT RIGID W-DBL T-LEG FOR CENTER REAR  
MID HI FEATHERWEIGHT RIGID w/T LEG DOUBLE (QTY 9)  
LEVEL 3 FABRIC UPGRADE (PER PASSENGER) (QTY 19)  
SEAT DRIVERS G2E LP BLK F550  
SEAT BELT - UNDER SEAT RETRACTOR - DOUBLE-FREEDMAN (QTY 7)  
FREEDMAN US ARM (FLIP UP) (QTY 7)  
PADDED AV GRAB HANDLE TOP BLACK (QTY 7)  
2219 INTERLOCK,E-SERIES INTERMOTIVE GTWY 505  
RACK,BIKE APEX 3 S/S ANTI GLARE  
DIAMOND MODEL XV W/ 2 VAULTS  
ADD ADD'L PREWIRE TO TERMINATE IN OVERHEAD COMPARTMENT  
DECALS "VIDEO CAMERA IN USE" - IN ENGLISH & SPANISH  
REDUNDANT GROUND BETWEEN CHASSIS & POWER UNIT @  
12" SEATBELT EXTENSION (QTY 2)  
STANDARD NON-RETRACT. 60" SEATBELTS AT REAR ROW SEATS  
ADD'L PREWIRE TO TERMINATE IN OVERHEAD COMPARTMENT  
QSTRAINT #Q8-6324 LAP BELT EXTENDER  
QRT 360 TIEDOWN L-TRACK WC 18/19 (QTY 2)  
TRIANGLE YIELD SIGN  
HELM SERVICE MANUAL, FORD  
FIVE (5) CAMERA SEON SYSTEM

PROPOSED CHASSIS:

FORD E-450 SUPER DUTY, 158" WB, 14,500 # GVWR, 7.3 L GAS V8 PREMIUM ENGINE, 350 HP @ 3900 RPM- 468 LB/FT @ 3900 RPM, 6-SPEED O/D HD AUTOMATIC TRANS, AUX. TRANSMISSION COOLER, 4.56 REAR AXLE RATIO, 240-AMP ALTERNATOR SINGLE, 750 CCA BATTERY, 55 GALLON FUEL TANK, HD SHOCK ABSORBERS, POWER 4-WHEEL DISC (ABS) W/TRACTION CONTROL, 16 X 6 STEEL WHEELS - PAINTED WHITE, 5000# TWIN I-BEAM FRONT AXLE, 9500# REAR FULL FLOAT, TIRES LT225/75RX16E, BSW ALL SEASON, TILT/CRUISE

## OREGON TRANSIT REFFERENCES:

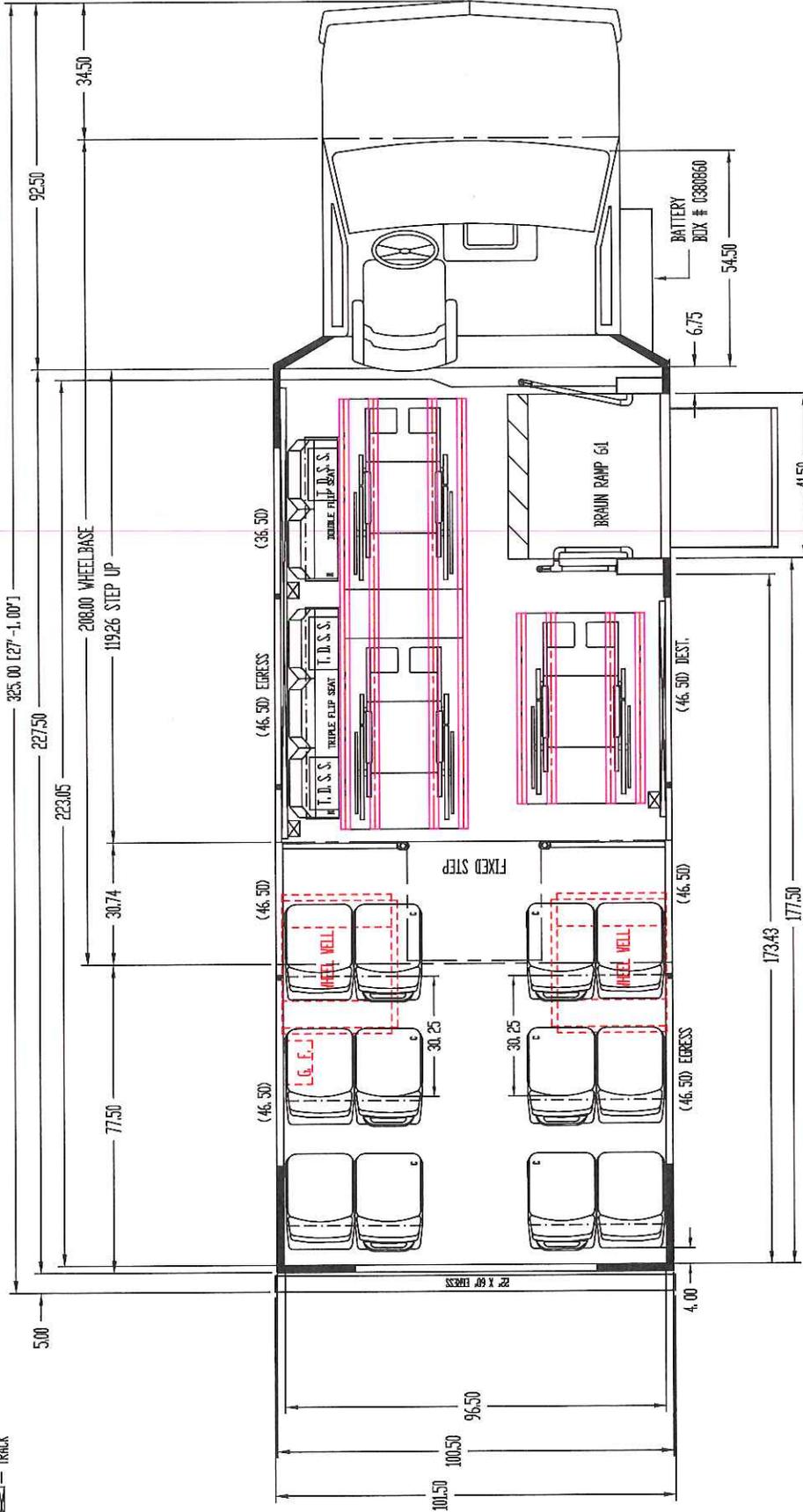
MARGO MOORE  
TRIMET  
971.279.9488  
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SCOTT CHANCEY  
JOSEPHINE COUNTY  
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GREGG THOMPSON  
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NICK BLACK  
RVTD  
541.941.9513  
[nblack@rvtd.org](mailto:nblack@rvtd.org)

☒ -- BELTS  
 ☒ -- TRACK



REV	ECN	DESCRIPTION	DATE	BY
		MODEL V.B		
		270 208		
		LIFT DOOR LUGG. FLOOR		
		ROOF		
		FRONT END C/S WALL		
		R/S WALL		
		BACK WALL		
		MOUNT		
		0419932	0424702	0419886
		REV G	REV A	REV C
		0424699	0424701	0419886
		REV A	REV A	REV C

SEATING: FREEDMAN SEATS - CITI SEATS

PASSENGER COUNT: (18) PASSENGERS & (3) W/C'S

**CHAMPION**  
BUS · INC.

TOLERANCES UNLESS NOTED  
 .XX +/- .06  
 .XXX +/- .005  
 ANG +/- .1°

THIS DRAWING AND ALL INFORMATION THEREON IS THE PROPERTY OF CHAMPION BUS COMPANY. IT IS TO BE KEPT CONFIDENTIAL.

DATE: 9/20/21  
 DRAWN BY: SABRINA R  
 MODEL: FORD LOW FLOOR

SCALE:  
 ALL DIMENSIONS IN INCHES UNLESS NOTED  
 SHEET SIZE: WEIGHT:  
 SHEET NO: DF-12  
 DRAWING NO: CB071272

TITLE: FLOORPLAN LE270 208\*4B

REVISION NO:

# Attachment 1

## BUS TESTING CERTIFICATION

The undersigned bidder [Contractor/Manufacturer] certifies that the vehicle model or vehicle models offered in this bid submission complies with 49 CFR Part 665.

A copy of the test report (for each bid ITEM) prepared by the Federal Transit Administration's (FTA) Altoona, Pennsylvania Bus Testing Center is attached to this certification and is a true and correct copy of the test report as prepared by the facility.

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

Schetky NW Sales

Name of Bidder/Company  
Name

MARK Zollner

Type or print name

Mark Zollner

Signature of authorized representative

Charlene Michelle Gage

Signature of notary and SEAL



Date of Signature 08 27 2021

**Attachment 2**  
**PRE-AWARD CERTIFICATION FOR PROCUREMENT OF ROLLING STOCK (VENDOR)**

**PRE-AWARD AUDIT REQUIREMENTS**

A recipient purchasing revenue service rolling stock with FTA funds must ensure that a pre-award audit under this part is complete before the recipient enters into a formal contract for the purchase of such rolling stock.

**DESCRIPTION OF PRE-AWARD AUDIT**

A pre-award audit under this part includes— (a) A Buy America certification; (b) A purchaser's requirements certification; and (c) Where appropriate, a manufacturer's Federal Motor Vehicle Safety certification information.

**PRE-AWARD BUY AMERICA CERTIFICATION**

For purposes of this part, a pre-award Buy America certification is a certification that the recipient keeps on file that:

- a. There is a letter from FTA which grants a waiver to the rolling stock to be purchased from the Buy America requirements under section 165(b) (1), (b)(2), or (b)(4) of the Surface Transportation Assistance Act of 1982, as amended; or
- b. The recipient is satisfied that the rolling stock to be purchased meets the requirements of section 165(a) or (b)(3) of the Surface Transportation Assistance Act of 1982, as amended, after having reviewed itself or through an audit prepared by someone other than the manufacturer or its agent documentation provided by the manufacturer which lists:
  - 1. The Component and subcomponent parts of the rolling stock that are produced in the United States is more than 60% for FY2016 and 2017, more than 65% for FY2018 and 2019, more than 70% for FY2020 of the cost of all components and subcomponents of the vehicle identified by the manufacturer; and
  - 2. The location of the final assembly must take place in the United States (49 CFR 661.11), including a description of the activities that will take place at the final assembly point and the cost of final assembly.

**PRE-AWARD PURCHASERS REQUIREMENTS CERTIFICATION**

For purposes of this part, a pre-award purchaser's requirements certification is a certification a recipient keeps on file that:

- a. The rolling stock the recipient is contracting for is the same product described in the purchaser's solicitation specification; and
- b. The proposed manufacturer is a responsible manufacturer with the capability to produce a vehicle that meets the recipient's specification set forth in the recipient's solicitation.

If buses or other rolling stock (including train control, communication, and traction power equipment) are being procured, the appropriate certificate as set forth below shall be completed and submitted by each bidder in accordance with the requirements in 49 CFR 661.13(b).

**PRE-AWARD FMVSS COMPLIANCE CERTIFICATION**

As required by Title 49 of the CFR, Part 663 – Subpart D, the recipient certifies that it received, at the pre-award stage, a copy of the manufacturers self-certification information stating that the 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.

Bidder or offeror Certificate of:

**COMPLIANCE with Buy America and FMVSS Rolling Stock Requirements**

As required by 49 CFR Part 663, the bidder or offeror hereby certifies that it will comply with the requirements of 49 U.S.C. 5323(j), and the applicable regulations of 49 CFR 661.11.

Company Schetky NW Sales  
Name MARK ZOLLNER Title Sales Manager  
Signature Mark Zollner Date 08/27/2021

Bidder or offeror Certificate of:

**NON-COMPLIANCE with Buy America and FMVSS Rolling Stock Requirements**

As required by 49 CFR Part 663, the bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323(j), but may qualify for an exception to the requirement consistent with 49 U.S.C. 5323(j)(2), as amended, and the applicable regulations in 49 CFR 661.7.

Company \_\_\_\_\_  
Name \_\_\_\_\_ Title \_\_\_\_\_  
Signature \_\_\_\_\_ Date \_\_\_\_\_

### Attachment 3

#### TRANSIT VEHICLE MANUFACTURER (TVM) CERTIFICATION

Pursuant to the provisions of Section 105(f) of the Surface Transportation Assistance Act of 1982, each bidder for this contract must certify that it has complied with the requirements of 49 CFR Part 26.49, regarding the participation of Disadvantaged Business Enterprises (DBE) in FTA assisted procurements of transit vehicles. Absent this certification, properly completed and signed, a bid shall be deemed non-responsive.

Certification:

I hereby certify, for the bidder named below, that it has complied with the provisions of 49 CFR Part 26.49 and that I am duly authorized by said bidder to make this certification.

Name of Bidder/Company Schetky NW Sales

Name Type or print MARK ZOLLNER

Signature of Authorized Representative *Mark Zollner*

Date 08/27/2021

Signature of notary and SEAL



*Charlene Michelle Gage*

## The LF Transport



### Equal Access and Comfort

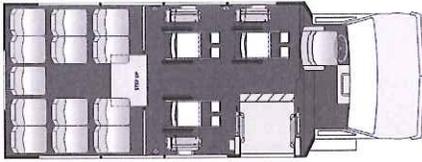
The Champion Low Floor Transport offers equal access, comfort, and dignity for all passengers in a vehicle everyone can appreciate. Passengers and operators alike will be pleased with the spacious interior cabin and smooth vehicle ride. A uniformly-sloped EqualizerRamp and a variety of kneeling options are the essence of accessibility.

Features such as heated remote mirrors, tinted top T-slider windows, track seating, and full underbody undercoating come standard on every vehicle. With a multitude of options and floorplans we can build a bus as resilient as you are.

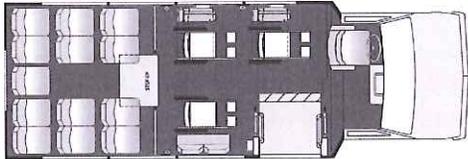


Meeting America's Transportation Needs  
One Customer at a Time

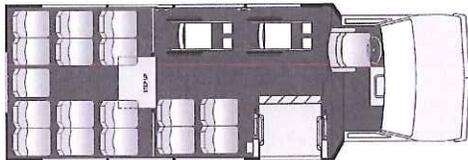
# The LF Transport



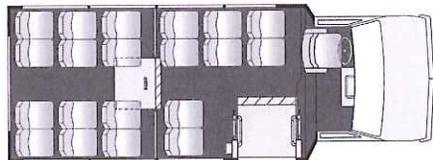
13 Passenger 3 Wheelchair with Foldaway Seats Plus Driver



13 Passenger 3 Wheelchair with Foldaway Seats and Flip Seat Plus Driver



17 Passenger 2 Wheelchair Plus Driver



22 Passenger Plus Driver

## Standard Feature Highlights

- Braun Electric Ramp with Interlock
- Fiberglass Plug Window
- Fuel Access Cover
- Graphite (Black) Gerflor Flooring with White Step Nosing
- 36" x 36" Upper T-Slide Windows Tinted to FMVSS Compliance
- 30" x 48" Nominal Rear Egress Window
- Drip Rail over Windows
- Interior FRP Sidewalls, Rear Wall and Ceiling
- Yellow Stainless Steel Grab Rails
- Stainless Steel Entry Stanchions with Gray Padded Vinyl Modesty Panel
- Priority Seating Decal
- Wheelchair Location Decal
- Watch your Step Sign Signage
- Exterior Entry Key Switch
- LED Stepwell Light 18" Strip Door Header Mount
- Interior Yellow LED Entry Lights
- Backup Camera Display Integrated in Rearview Mirror
- Front and Rear Mud Flaps
- Rosco Manual Exterior Mirrors

## Safety Upgrade Options

- Lock Fuse Panel Door (Key)
- White Standee Line
- Yellow Standee Line
- Fuel Fill Door Locking (ABS) Ford/GM Only
- Decal Paratransit
- Seat Belt Web Cutter
- Fresnal Lens
- Escape Hatch Deluxe Transpec
- Grab Rails Ceiling (Pair)
- Decal Emergency Exit

## Comfort and Convenience Upgrade Options

- Extension, Tire Valve Stem
- Battery Box LF Trans Curbwing with S/S Tray
- Lights, LED All Exterior (Non-ADA) Standard Lights Only - Sound Off, Includes Rear Center and Side Directional/Turn
- Mic Hostess In-Dash with Auxiliary Jack REI
- Flooring, Full Rubber Black RCA (Per Foot)
- Heater 65,000 BTU
- Bumper, Anti-Ride Shield
- Transign LDC Destination Front/Side
- Mirror Interior 6" x 9" Convex Rosco
- Stanchion, Extra with Modesty Panel
- Stanchion Padding Gray (Per Stanchion)
- Mid Body Dynamic Ramp 102" Wide Only
- Luggage, Compartment Rear with Fixed Wall Includes: Fixed Luggage Compartment, Black Rubber Floor, Rear Luggage Door with Lock, Door Actuated Interior Light, Door Ajar Light with Buzzer, Std. Escape Hatch

## Appearance Upgrade Options

- Running Board, Roadside Aluminum
- Wheel Insert 16.0" S/S (Set of 4)
- Windows Blackout Full Sides Only
- Paint Skirt Only



**CHAMPION®**

DALLAS SMITH CORP.®

DALLAS SMITH CORP. **Air-Chassis™**

## Ford E-450 Air-Chassis® with IntelliSYNC®



- ✓ **Intelli SYNC®** Air-Ride Suspension System.
- ✓ Rated for up to 500 full vehicle kneel cycles within a 24-hour period of continuous use, 365 days a year.
- ✓ DSC Intelli SYNC® 210 10CFM High Duty Cycle Compressor (DC or engine driven).
- ✓ No steps, 1:6 purpose-built accessibility.
- ✓ "Buy America" certified.
- ✓ Standard limited 3-year/36,000 mile warranty.
- ✓ Wide-Trac™ Air Ride Suspension System for enhanced vehicle lateral & longitudinal stability.



DSC U-Frame™



Champion Ford E-450 LF Transport



[www.dallasmithcorp.com](http://www.dallasmithcorp.com)

PATENTS  
PENDING

DALLAS SMITH CORP.

## Air-Chassis™ Ford E-450 Air-Chassis® with IntelliSYNC®

<b>Base Vehicle:</b>	FORD E-450 Cutaway Chassis
<b>GVWR:</b>	Max. GVW rating (lbs.) of 14,500 (DRW s/6.8L Gas), with a 5000 (lbs.) maximum front GAWR twin I-beam IFS 9,600 Dana Full Floating Rear Axle
<b>Brake System:</b>	Brake System: Original Equipment Manufacturer (OEM)
<b>Engine/HP/Torque:</b>	6.8L Triton® V10, 305 HP @ 4250 RPM/420lb.-ft. torque @ 3250 RPM
<b>Exhaust:</b>	OEM stainless steel exhaust pipes and muffler properly installed with heat shields and baffles.
<b>Chassis Frame:</b>	Passenger side Equal-Access U-Frame™ frame rail section engineered by Dallas Smith Corp. (patent pending), and installed by a Ford Motor Company QVM Program participant.
<b>Axle &amp; Ratio:</b>	OEM, Twin I-Beam IFS, with a capacity of 5,000 (lbs.) with Dana Full Floating Axle, ratio of 4.56 (std.)
<b>CNG:</b>	CNG (option - contact bus manufacturer)

### IntelliSYNC® Air-Ride Suspension System:

- IntelliSYNC® Air-Ride Suspension System, Ford E-450 model.
- "Buy America" certified.
- Four (4) OEM 1.38" HD gas-type, front and rear shock absorbers.
- DSC IntelliSYNC® 210 10CFM High Duty Cycle Compressor (DC or engine driven).
- DSC in-line air-cooler to reduce operating air system temperature approximately 150 degrees Fahrenheit or less to improve overall air suspension system efficiency and durability.
- Rated to provide and perform up to 500 full vehicle kneel cycles within a 24-hour period of continuous use, for 365 days a year.
- All IntelliSYNC® suspension air system lines, fittings, valves, connectors and tanks are color-coded for plug n' play operation and meet D.O.T. specifications.
- Front vehicle springs - Two (2) 5,000 (lbs.) maximum combined capacity, double convoluted air springs by Firestone® utilizing OEM brackets to mount.
- DSC LoPro™ Heavy Duty Travel Bushings (front and rear).
- IntelliSYNC® Ford E-450 designed LoPro™ air beams by Dallas Smith Corp., and rated specifically to vehicle's GAWR providing enhanced "wide-trac" vehicle lateral and longitudinal stability.
- Full and passenger side vehicle kneel functionality (optional).
- System safety control valves.
- Integrated interlock safety systems.

- User interface dash panel control features with complete air system monitoring.
- Full vehicle flow-controlled kneel within eight (8) seconds.
- Environmental chamber testing (-40 to 180 degree Fahrenheit).
- Easy service and maintainability.
- Standard limited 3-year/36,000 mile warranty.

### Testing and Industry Validation:

- All DSC Air-Chassis™ IntelliSYNC® suspension systems installed by a select, recognized, qualified vehicle modifier or speciality vehicle manufacturer.
- Vehicle accessibility-rail and suspension FEA independently performed by a certified and registered professional engineering service with documentation to establish that the chassis and suspension used produces a ride quality comparable to the best state of the art for low floor vehicles.
- FMEA - Chassis suspension system thoroughly analyzed utilizing rigorous FMEA process.
- ALTOONA (7-Year/200,000 Mile) - Vehicle chassis suspension successfully completed the STURAA test encountering no Class 1 or Class 2 failures.
- FIELD DURABILITY - Vehicle suspension tested and rated to produced up to 500 kneel cycles within a 24-hour period of continuous use, for 365 days a year, in various all-weather climates.

### Manuals:

In addition to the contractor supplied information; vehicle suspension manuals, diagrams, schematics, and part's reference shall be available/accessible online and downloadable/printable.

### About Dallas Smith Corp.:

For over 60 years, Dallas Smith Corp. has been providing the transportation industry with safer, smarter, and easier suspension systems. We are a complete design, engineering, and manufacturing company focusing entirely on low floor chassis and suspension systems for commercial application vehicles. Our patented technology is built, tested, and certified by the industry's very best!

**PRELIMINARY SPECIFICATIONS:** Dallas Smith Corp. (DSC) reserves the right to change, modify, alter any of the specifications listed, without notice, to accommodate any changes in Base Vehicle or Systems used.

**PATENTS PENDING.** Copyright© 2013, Dallas Smith Corp. All Rights Reserved. The Dallas Smith name, logo; IntelliSYNC name, logo; Air-Chassis name, logo; are trademarks owned by Dallas Smith Corp. All other registered trademarks and logos are of the respective company identified.



[www.dallassmithcorp.com](http://www.dallassmithcorp.com)





# Oregon

Kate Brown, Governor

**Department of Administrative Services**  
Enterprise Goods & Services - Procurement Services  
1225 Ferry Street SE  
Salem, Oregon 97301-4285  
PHONE: 503-378-4137  
FAX: 503-373-1626

9/9/2019

Re: Request for Proposals #DASPS-2234-19 – ADA Transit Vehicles

Subject: Notice of Intent to Award

As outlined in RFP Section 5.1.2, Intent to Award, this letter is to notify Proposers that DAS PS intends to award Price Agreements to the following Proposers within each Subcategory defined in the RFP. The scoring is based on the evaluation criteria and scoring methods described in RFP Section 4.10, along with ranking of Proposers as outlined in RFP Section 4.12.

Below is the calculated scores for each subcategory.

**Category E3, Subcategory Side Lift – Minivan (Up to 8,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	331.39
Northwest Bus Sales	298.33
Creative Bus Sales	263.98

**Category E3, Subcategory Rear Lift – Minivan (Up to 8,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	328.95
Northwest Bus Sales	293.54
Creative Bus Sales	265.00

**Category E1, Subcategory Short Body – Small Light Duty (8,001 – 11,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	331.64
Northwest Bus Sales	292.56
Creative Bus Sales	265.00

**Category E1, Subcategory Low Floor – Small Light Duty (8,001 – 11,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Northwest Bus Sales	292.97
Creative Bus Sales	265.00

**Category E1, Subcategory High Floor – Small Light Duty (8,001 – 11,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	319.16
Creative Bus Sales	265.00

**Category D, Subcategory Low Floor – Medium Size Light Duty (11,001 - 16,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	334.45
Creative Bus Sales	265.00

**Category D, Subcategory High Floor – Medium Size Light Duty (11,001- 16,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	324.85
Northwest Bus Sales	294.03
Creative Bus Sales	265.00

**Category C, Subcategory Low Floor – Medium Size, Medium Duty (17,000 - 26,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	338.33
Creative Bus Sales	222.74

**Category C, Subcategory High Floor – Medium Size, Medium Duty (17,000 - 26,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	332.27
Creative Bus Sales	265.00

**Category B, Subcategory Low Floor – Medium Size, Heavy Duty (26,001 - 33,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	338.33
Creative Bus Sales	241.11

**Category B, Subcategory High Floor – Medium Size, Heavy Duty (26,001 - 33,000 GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	321.73
Creative Bus Sales	265.00

**Category A, Subcategory 35ft Heavy Duty, Low Floor (33,001 and up GVWR)**

<u>Proposer</u>	<u>Score</u>
New Flyer of America	334.17

**Category A, Subcategory 40ft Heavy Duty, Low Floor (33,001 and up GVWR)**

<u>Proposer</u>	<u>Score</u>
Schetky NW Sales	335.29
New Flyer of America	334.17

**Category Services, Subcategory Remanufacturing Services**

Complete Coach Works, Inc. only responsive proposer for Subcategory

**Category Services, Subcategory Fuel conversion technology**

Complete Coach Works, Inc. only responsive proposer for Subcategory

RFP Section 5.1.1 allows awarding up to three Price Agreements per Subcategory, each Subcategory will only allow one manufacturing product line to be represented. If the same product line is proposed by two or more Proposers, the highest rank Proposer will be awarded the product line for their Market Basket of vehicles.

Affected Proposers' rights to protest this Intent to Award are located in RFP Section 5.2, Protest Submission.

An Affected Offeror shall have seven (7) calendar days from the date of the intent to award notice to file a Written protest.

A Proposer is an Affected Offeror only if the Proposer would be eligible for Contract award in the event the protest was successful and is protesting for one or more of the following reasons as specified in ORS 279B.410:

- All higher ranked Proposals are non-Responsive.
- DAS PS has failed to conduct an evaluation of Proposals in accordance with the criteria or process described in the RFP.
- DAS PS abused its discretion in rejecting the protestor's Proposal as non-Responsive.
- DAS PS's evaluation of Proposal or determination of award otherwise violates ORS Chapter 279B or ORS Chapter 279A.

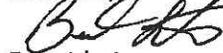
Protest must:

- Be delivered to the SPC via email, facsimile or hard copy
- Reference the RFP number
- Identify prospective Proposer's name and contact information
- Be signed by an authorized representative
- Specify the grounds for the protest
- Be received within seven (7) calendar days of the intent to award notice

The Protest of Intent to Award period expires at 5:00 PM Pacific Time on September 16, 2019.

If you have any questions, please contact me at (503) 378-4137

Sincerely,



Brent Lutz

State Procurement Analyst

# FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration U.S. DOT  
In accordance with CFR 49, Volume 7, Part 665

**Manufacturer: Champion Bus Inc.**  
**Model: LF Transport**

**Submitted for Testing in Service-Life Category**  
**7 Year /200,000 Miles**

**March 2018**

**Report Number: LTI-BT-R1617**

PENNSSTATE



---

The Thomas D. Larson  
Pennsylvania Transportation Institute  
201 Transportation Research Building  
The Pennsylvania State University  
University Park, PA 16802  
(814) 865-1891

Bus Testing and Research Center  
2237 Old Route 220 North  
Duncansville, PA 16635  
(814) 695-3404

# FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration U.S. DOT  
1200 New Jersey Avenue, SE  
Washington, DC 20590

In accordance with CFR 49, Volume 7, Part 665

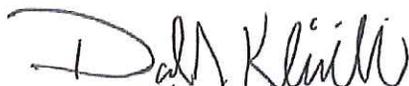
Manufacturer: Champion Bus Inc.  
331 Graham Road  
Imlay City, MI 48444

Model: LF Transport

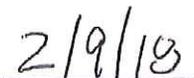
Submitted for Testing in Service-Life Category  
7 Year /200,000 Miles

Report Number: LTI-BT-R1617



  
\_\_\_\_\_  
Quality Authorization

Director, Bus Research  
and Testing Center  
\_\_\_\_\_  
Title

  
\_\_\_\_\_  
Date

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## EXECUTIVE SUMMARY

Champion Bus, Inc. submitted a model LF Transport, gasoline-powered 16 seat (including the driver), two wheelchair position, 27 foot, nine inch bus, for a 7 yr/200,000 mile STURAA test. The odometer reading at the time of delivery was 3,798 miles. Testing started on October 24, 2016 and was completed on November 17, 2017. The Check-In section of the report provides a description of the bus and specifies its major components.

The primary part of the test program is the Structural Durability Test, which also provides the information for the Maintainability and Reliability results. The Structural Durability Test was started on November 7, 2016 and was completed on November 15, 2017.

The measured curb weight is 4,320 lb. for the front axle and 7,890 lb. for the rear axle. These combined weights provide a total measured curb weight of 12,210 lb. There are 16 seats including the driver, 2 ADA accessible positions and room for 17 standing passengers bringing the total passenger capacity to 35. At this full capacity, the gross load is equal to  $(33 \times 150) + (2 \times 600) = 6,150$  lb., and the gross vehicle weight is 18,360 lb. However, the manufacturer recommends that there are no standees. Therefore, the measured gross vehicle weight would be 15,810 lb., for 16 passengers and two wheelchair positions. Even at this configuration, the gross vehicle weight exceeds the manufacturer recommended GVWR of 14,500 lb. In order to stay within the limits of the manufacturer specified GVWR, the equivalent weight of nine seated passengers was removed for testing, bringing the measured gross vehicle weight to 14,460 lb. It is noted that even at full seated capacity as specified by the manufacturer, there is a potential for overloading this bus. The available floor space for standees further exacerbates this problem.

The first segment of the Structural Durability Test was performed with the bus loaded to a GVW of 14,460 lb. The middle segment was performed at a seated load weight of 14,460 lb. and the final segment was performed at a curb weight of 12,210 lb. Durability driving resulted in unscheduled maintenance and failures that involved a variety of subsystems. A description of failures, and a complete and detailed listing of scheduled and unscheduled maintenance is provided in the Maintainability section of this report.

Accessibility, in general, was adequate, components covered in Section 1.3 (Repair and/or Replacement of Selected Subsystems) along with all other components encountered during testing, were found to be readily accessible and no restrictions were noted.

The Reliability section compiles failures that occurred during Structural Durability Testing. Breakdowns are classified according to subsystems. The data in this section are arranged so that those subsystems with more frequent problems are apparent. The problems are also listed by class as defined in Section 2. The test bus encountered no Class 1, but 10 Class 2 failures. Of the 22 reported failures, 11 were Class 3 and one was Class 4. The hydraulic kneeling SQUAT system suffered multiple breakdowns

during the durability tests and was replaced with a Ford OEM suspension at 4,801 test miles at the beginning of the curb weight segment.

The Safety Test, (a double-lane change, obstacle avoidance test) was safely performed in both right-hand and left-hand directions up to a maximum test speed of 45 mph. The performance of the bus is illustrated by a speed vs. time plot. Acceleration and gradeability test data are provided in Section 4, Performance. The average time to obtain 50 mph was 16.18 seconds. The Stopping Distance phase of the Brake Test was completed with the following results; for the Uniform High Friction Test average stopping distances were 24.79' at 20 mph, 50.41' at 30 mph, 83.56' at 40 mph and 102.73' at 45 mph. The average stopping distance for the Uniform Low Friction Test was 31.85'. There was no deviation from the test lane during the performance of the Stopping Distance phase. During the Stability phase of Brake Testing the test bus experienced no deviation from the test lane. The Parking Brake phase was completed with the test bus maintaining the parked position for the full five minute period with no slip or roll observed in both the uphill and downhill positions.

The Shakedown Test produced a maximum final loaded deflection of 0.212 inches with a permanent set ranging between -0.004 to 0.004 inches under a distributed static load of 7,200 lb. The Distortion Test was completed with all subsystems, doors and escape mechanisms operating properly. No water leakage was observed throughout the test. All subsystems operated properly.

The test bus submitted for testing was not equipped with any type of tow eyes or tow hooks. Therefore, the static towing test was not performed. The Dynamic Towing Test was performed by means of a front-lift tow. The towing interface was accomplished using a hydraulic under-lift wrecker. The bus was towed without incident and no damage resulted from the test. The Jacking and Hoisting Tests were also performed without incident. The bus was found to be stable on the jack stands, and the minimum jacking clearance observed with a tire deflated was 7.0 inches.

A Fuel Economy Test was run on simulated central business district, arterial, and commuter courses. The results were 5.85 mpg, 5.92 mpg, and 10.53 mpg respectively; with an overall average of 6.73 mpg.

A series of Interior and Exterior Noise Tests was performed. These data are listed in Section 7.1 and 7.2 respectively.

The Emissions Test was performed. These results are available in Section 8 of this report.

## ABBREVIATIONS

ABTC	- Altoona Bus Test Center
A/C	- air conditioner
ADB	- advance design bus
ATA-MC	- The Maintenance Council of the American Trucking Association
CBD	- central business district
CW	- curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
dB(A)	- decibels with reference to 0.0002 microbar as measured on the "A" scale
DIR	- test director
DR	- bus driver
EPA	- Environmental Protection Agency
FFS	- free floor space (floor area available to standees, excluding ingress/egress areas, area under seats, area occupied by feet of seated passengers, and the vestibule area)
GVL	- gross vehicle load (150 lb. for every designed passenger seating position; for the driver, and for each 1.5 sq ft of free floor space)
GVW	- gross vehicle weight (curb weight plus gross vehicle load)
GVWR	- gross vehicle weight rating
MECH	- bus mechanic
mpg	- miles per gallon
mph	- miles per hour
PM	- Preventive maintenance
PSTT	- Penn State Test Track
PTI	- Pennsylvania Transportation Institute
rpm	- revolutions per minute
SAE	- Society of Automotive Engineers
SCH	- test scheduler
SA	- staff assistant
SLW	- seated load weight (curb weight plus 150 lb. for every designed passenger seating position and for the driver)
STURAA	- Surface Transportation and Uniform Relocation Assistance Act
TD	- test driver
TECH	- test technician
TM	- track manager
TP	- test personnel

## TEST BUS CHECK-IN

### I. OBJECTIVE

The objective of this task is to log in the test bus, assign a bus number, complete the vehicle data form, and perform a safety check.

### II. TEST DESCRIPTION

The test consists of assigning a bus test number to the bus, cleaning the bus, completing the vehicle data form, obtaining any special information and tools from the manufacturer, determining a testing schedule, performing an initial safety check, and performing the manufacturer's recommended preventive maintenance. The bus manufacturer must certify that the bus meets all Federal regulations.

### III. DISCUSSION

The check-in procedure is used to identify in detail the major components and configuration of the bus.

The test bus consists of a Champion Bus, Inc., model LF Transport. The bus has a front driver's door, behind the front axle, and a passenger entry door located midway between the axles, which is equipped with a BraunAbility model BF 3462Y-2 fold out ADA accessible ramp. Power is provided by a gasoline-fueled, Ford Motor Co. model 6.8L engine coupled to a Ford Motor Co. model AC3P-7000-HA transmission.

The measured curb weight is 4,320 lb. for the front axle and 7,890 lb. for the rear axle. These combined weights provide a total measured curb weight of 12,210 lb. There are 16 seats including the driver, 2 ADA accessible positions and room for 17 standing passengers bringing the total passenger capacity to 35. At this full capacity, the gross load is equal to  $(33 \times 150) + (2 \times 600) = 6,150$  lb., and the gross vehicle weight is 18,360 lb. However, the manufacturer recommends that there are no standees. Therefore, the measured gross vehicle weight would be 15,810 lb., for 16 passengers and two wheelchair positions. Even at this configuration, the gross vehicle weight exceeds the manufacturer recommended GVWR of 14,500 lb. In order to stay within the limits of the manufacturer specified GVWR, the equivalent weight of nine seated passengers was removed for testing, bringing the measured gross vehicle weight to 14,460 lb. It is also noted that even at full seated capacity as specified by the manufacturer, there is a potential for overloading this bus. The available floor space for standees further exacerbates this problem.

## VEHICLE DATA FORM

Page 1 of 7

Bus Number: 1617	Date: 10-24-16
Bus Manufacturer: Champion Bus, Inc.	Vehicle Identification Number (VIN): 1FDFE4FS8EDB17252
Model Number: LF Transport	Chassis Mfr./Mod.#: Ford Motor Company/ E-450 Super Duty
Personnel: E.D. & T.S.	Starting Odometer Reading: 3798

WEIGHT:

Individual Wheel Reactions:

Weights (lb.)	Front Axle		Middle Axle		Rear Axle	
	Curb	Street	Curb	Street	Curb	Street
CW	2,230	2,090	N/A	N/A	4,120	3,770
SLW	2,430	2,610	N/A	N/A	4,570	4,850
GVW	2,430	2,610	N/A	N/A	4,570	4,850

Total Weight Details:

Weight (lb.)	CW	SLW	GVW	GAWR
Front Axle	4,320	5,040	5,040	5,000
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	7,890	9,420	9,420	9,600
Total	12,210	14,460	14,460	GVWR: 14,500 Specified by Manufacturer

Dimensions:

Length (ft/in)	27/9
Width (in)	102
Height (in)	128.5
Front Overhang (in)	35.5
Rear Overhang (in)	89.5
Wheel Base (in)	208
Wheel Track (in)	Front: 67.9
	Middle: N/A
	Rear: 77.9

## VEHICLE DATA FORM

Page 2 of 7

Bus Number: 1617	Date: 10-24-16
------------------	----------------

**CLEARANCES:**

Lowest Point Outside Front Axle	Location: Spoiler	Clearance(in): 12.7
Lowest Point Outside Rear Axle	Location: Gas Tank	Clearance(in): 10.8
Lowest Point between Axles	Location: Hose	Clearance(in): 8.6
Ground Clearance at the center (in)	8.6	
Front Approach Angle (deg)	19.6	
Rear Approach Angle (deg)	10.8	
Ramp Clearance Angle (deg)	4.7	
Aisle Width (in)	24.4	
Inside Standing Height at Center Aisle (in)	Front: 84.7 Rear: 77.8	

**BODY DETAILS:**

Body Structural Type	Integral		
Frame Material	Steel		
Body Material	Composite		
Floor Material	Plywood		
Roof Material	Composite		
Windows Type	<input checked="" type="checkbox"/> Fixed - Bottom	<input checked="" type="checkbox"/> Movable – Sliding Top	
Window Mfg./Model No.	Safety / DOT 269 AS3 MI80		
Number of Doors	<u>1</u> Front	<u>1</u> Rear Emergency	<u>1</u> Passenger Entrance
Mfr. / Model No.	OEM Ford	Challenger Door- 500TRN	A&M Systems
Dimension of Each Door (in)	Front: 54.8 x 26.3	Rear: 55.2 x 35.0	Pass.: 75.6 x 33.1
Passenger Seat Type	<input type="checkbox"/> Cantilever	<input checked="" type="checkbox"/> Pedestal	<input type="checkbox"/> Other (explain)
Driver Seat Type	<input type="checkbox"/> Air	<input checked="" type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	OEM Ford Motor Company		
Number of Seats (including Driver)	16 + 2 wheelchair positions		

## VEHICLE DATA FORM

Page 3 of 7

Bus Number: 1617	Date: 10-24-16
------------------	----------------

### BODY DETAILS (Contd..)

Free Floor Space ( ft <sup>2</sup> )	28.6
Height of Each Step at Normal Position (in)	Front 1. <u>14.5</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
	Middle 1. <u>N/A</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
	Rear 1. <u>N/A</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
Step Elevation Change - Kneeling (in)	3.0

### ENGINE

Type	<input type="checkbox"/> C.I.	<input type="checkbox"/> Alternate Fuel	
	<input checked="" type="checkbox"/> S.I.	<input type="checkbox"/> Other (explain)	
Mfr. / Model No.	Ford Motor Co. / 6.8L		
Location	<input checked="" type="checkbox"/> Front	<input type="checkbox"/> Rear	<input type="checkbox"/> Other (explain)
Fuel Type	<input checked="" type="checkbox"/> Gasoline	<input type="checkbox"/> CNG	<input type="checkbox"/> Methanol
	<input type="checkbox"/> Diesel	<input type="checkbox"/> LNG	<input type="checkbox"/> Other (explain)
Alternator (Generator) Mfr. / Model No.	Ford Motor Co. / DC2T-10300-CA		
Maximum Rated Output (Volts / Amps)	12/225		
Air Compressor Mfr. / Model No.	N/A		
Maximum Capacity (ft <sup>3</sup> / min)	N/A		
Starter Type	<input checked="" type="checkbox"/> Electrical	<input type="checkbox"/> Pneumatic	<input type="checkbox"/> Other (explain)
Starter Mfr. / Model No.	Ford Motor Co. / DL3Z11002A		

## VEHICLE DATA FORM

Page 4 of 7

Bus Number: 1617	Date: 10-24-16
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### TRANSMISSION

Transmission Type	<input type="checkbox"/> Manual	<input checked="" type="checkbox"/> Automatic	<input type="checkbox"/> Load Sensing Adaptive
Mfr. / Model No.	Ford Motor Co. / AC3P-7000-HA		
Control Type	<input checked="" type="checkbox"/> Mechanical	<input type="checkbox"/> Electrical	<input type="checkbox"/> Other
Integral Retarder	<input type="checkbox"/> Yes	<input type="checkbox"/> No	

### SUSPENSION

Number of Axles	2		
Front Axle Type	<input checked="" type="checkbox"/> Independent	<input type="checkbox"/> Beam Axle	
Mfr. / Model No.	Ford Motor Co. / OEM		
Axle Ratio (if driven)	N/A		
Suspension Type	<input type="checkbox"/> Air	<input checked="" type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Motorcraft / 8C24-18045DA		
Middle Axle Type	<input type="checkbox"/> Independent	<input type="checkbox"/> Beam Axle	
Mfr. / Model No.	N/A		
Axle Ratio (if driven)	N/A		
Suspension Type	<input type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	N/A		
Mfr. / Model No.	N/A		
Rear Axle Type	<input type="checkbox"/> Independent	<input checked="" type="checkbox"/> Beam Axle	
Mfr. / Model No.	Dana 70		
Axle Ratio (if driven)	4:56		
Suspension Type	<input type="checkbox"/> Air	<input checked="" type="checkbox"/> Spring With hydraulic kneeling system	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Motorcraft / 8C24-1808-DB		

## VEHICLE DATA FORM

Page 5 of 7

Bus Number: 1617	Date: 10-24-16
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### WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Ford Motor Company/ 16x6k
	Tire Mfr./ Model No.	Michelin/LTX M/S <sup>2</sup> LT225/75R16
Rear	Wheel Mfr./ Model No.	Ford Motor Company/ 16x6k
	Tire Mfr./ Model No.	Michelin/LTX M/S <sup>2</sup> LT225/75R16

### BRAKES

Front Axle Brakes Type	<input type="checkbox"/> Cam	<input checked="" type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Ford Motor Co. / OEM		
Middle Axle Brakes Type	<input type="checkbox"/> Cam	<input type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	<input type="checkbox"/> Cam	<input checked="" type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Ford Motor Co. / OEM		

### HVAC

Heating System Type	<input type="checkbox"/> Air	<input checked="" type="checkbox"/> Water	<input type="checkbox"/> Other
Capacity (Btu/hr)	15,000		
Mfr. / Model No.	Ford/ Standard In-Dash		
Air Conditioner	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Location	Rear & Front		
Capacity (Btu/hr)	60,000 max		
A/C Compressor Mfr. / Model No.	Front Unit: Ford/ OEM Rear Unit: American Cooling Technologies / EV-2		

### STEERING

Steering Gear Box Type	Hydraulic Gear		
Mfr. / Model No.	Ford/ OEM		
Steering Wheel Diameter	15.5		
Number of turns (lock to lock)	4		
Control Type	<input type="checkbox"/> Electric	<input checked="" type="checkbox"/> Hydraulic	<input type="checkbox"/> Other (explain)

## VEHICLE DATA FORM

Page 6 of 7

Bus Number: 1617	Date: 10-24-16
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### OTHERS

Wheel Chair Ramps	Location: Front	Type: Fold out ramp
Wheel Chair Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	BraunAbility/ BF 3462Y-2	
Emergency Exit	Location: Doors Windows	Number: 2 1

### CAPACITIES

Fuel Tank Capacity (gallons)	55
Engine Crankcase Capacity (quarts)	6
Transmission Capacity (quarts)	18.8
Differential Capacity (quarts)	4.5
Cooling System Capacity (quarts)	30.4
Power Steering Fluid Capacity (quarts)	Capacity not specified. Instruction says "Fill to line".



## COMPONENT/SUBSYSTEM INSPECTION FORM

Page 1 of 1

Bus Number: 1617	Date: 10-25-16
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Subsystem	Checked	Initials	Comments
Air Conditioning Heating and Ventilation	✓	E.D	None noted.
Body and Sheet Metal	✓	E.D.	None noted.
Frame	✓	E.D.	None noted.
Steering	✓	E.D	None noted.
Suspension	✓	E.D.	Kneeling system leaking at right front
Interior/Seating	✓	E.D.	None noted.
Axles	✓	E.D.	None noted.
Brakes	✓	E.D.	None noted.
Tires/Wheels	✓	E.D.	None noted.
Exhaust	✓	E.D.	None noted.
Fuel System	✓	E.D.	None noted.
Power Plant	✓	E.D.	None noted.
Accessories	✓	E.D.	None noted.
Lift System	✓	E.D.	None noted.
Interior Fasteners	✓	E.D.	None noted.
Batteries	✓	E.D.	None noted.

## CHECK - IN



**CHAMPION BUS, INC.  
MODEL LF TRANSPORT**



**EQUIPPED WITH A BRAUNABILITY  
MODEL BF 3462Y-2 ADA ACCESSIBLE RAMP**

**CHECK - IN CONT.**



**INTERIOR FROM FRONT**



**INTERIOR FROM REAR**

**CHECK - IN CONT.**

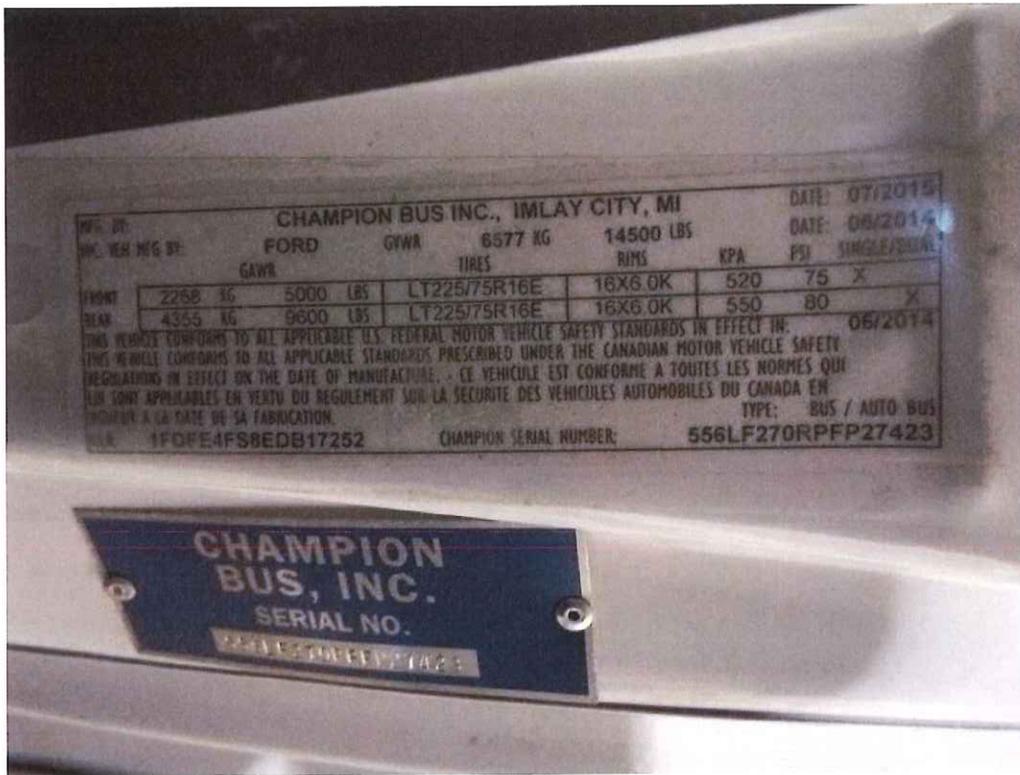


**OPERATOR'S AREA**



**ENGINE COMPARTMENT**

# CHECK - IN CONT.



VIN TAG

# 1. MAINTAINABILITY

## 1.1 ACCESSIBILITY OF COMPONENTS AND SUBSYSTEMS

### 1.1-I. TEST OBJECTIVE

The objective of this test is to check the accessibility of components and subsystems.

### 1.1-II. TEST DESCRIPTION

Accessibility of components and subsystems is checked, and where accessibility is restricted the subsystem is noted along with the reason for the restriction.

### 1.1-III. DISCUSSION

Accessibility, in general, was adequate. Components covered in Section 1.3 (repair and/or replacement of selected subsystems), along with all other components encountered during testing, were found to be readily accessible and no restrictions were noted.

## ACCESSIBILITY DATA FORM

Page 1 of 2

Bus Number: 1617	Date: 11-17-17
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Component	Checked	Comments
<b>ENGINE :</b>		
Oil Dipstick	✓	None Noted
Oil Filler Hole	✓	None Noted
Oil Drain Plug	✓	None Noted
Oil Filter	✓	None Noted
Fuel Filter	✓	Filter is inside fuel tank
Air Filter	✓	None Noted
Belts	✓	None Noted
Coolant Level	✓	None Noted
Coolant Filler Hole	✓	None Noted
Coolant Drain	✓	None Noted
Spark / Glow Plugs	✓	Spark Plugs
Alternator	✓	None Noted
Diagnostic Interface Connector	✓	None Noted
<b>TRANSMISSION :</b>		
Fluid Dip-Stick	✓	None Noted
Filler Hole	✓	None Noted
Drain Plug	✓	None Noted
<b>SUSPENSION :</b>		
Bushings	✓	None Noted
Shock Absorbers	✓	None Noted
Air Springs	N/A	N/A
Leveling Valves	N/A	None
Grease Fittings	✓	None Noted

## ACCESSIBILITY DATA FORM

Page 2 of 2

Bus Number: 1617	Date: 11-17-17
------------------	----------------

Component	Checked	Comments
<b>HVAC :</b>		
A/C Compressor	✓	None Noted
Filters	✓	None Noted
Fans	✓	None Noted
<b>ELECTRICAL SYSTEM :</b>		
Fuses	✓	None Noted
Batteries	✓	None Noted
Voltage regulator	N/A	In the alternator
Voltage Converters	N/A	In the alternator
Lighting	✓	None Noted
<b>MISCELLANEOUS :</b>		
Brakes	✓	None Noted
ADA accessible Lifts/Ramps	✓	ADA accessible Ramp
Instruments	✓	None Noted
Axles	✓	None Noted
Exhaust	✓	None Noted
Fuel System	✓	None Noted
<b>OTHERS :</b>		

## 1.2 SERVICING, PREVENTIVE MAINTENANCE, AND REPAIR AND MAINTENANCE DURING TESTING

### 1.2-I. TEST OBJECTIVE

The objective of this test is to collect maintenance data about the servicing, preventive maintenance, and repair.

### 1.2-II. TEST DESCRIPTION

The test will be conducted by operating the NBM and collecting the following data on work order forms and a driver log.

1. Unscheduled Maintenance
  - a. Bus number
  - b. Date
  - c. Mileage
  - d. Description of malfunction
  - e. Location of malfunction (e.g., in service or undergoing inspection)
  - f. Repair action and parts used
  - g. Man-hours required
2. Scheduled Maintenance
  - a. Bus number
  - b. Date
  - c. Mileage
  - d. Engine running time (if available)
  - e. Results of scheduled inspections
  - f. Description of malfunction (if any)
  - g. Repair action and parts used (if any)
  - h. Man-hours required

The buses will be operated in accelerated durability service. While typical items are given below, the specific service schedule will be that specified by the manufacturer.

- A. Service
  1. Fueling
  2. Consumable checks
  3. Interior cleaning
- B. Preventive Maintenance
  1. Brake adjustments
  2. Lubrication
  3. 3,000 mi (or equivalent) inspection

4. Oil and filter change inspection
5. Major inspection
6. Tune-up

C. Periodic Repairs

1. Brake reline
2. Transmission change
3. Engine change
4. Windshield wiper motor change
5. Stoplight bulb change
6. Towing operations
7. Hoisting operations

1.2-III. DISCUSSION

Servicing and preventive maintenance were performed at manufacturer-specified intervals. The following Scheduled Maintenance Form lists the mileage, items serviced, the service interval, and amount of time required to perform the maintenance. Finally, the Unscheduled Maintenance List along with Unscheduled Maintenance-related photographs is included in Section 5.7, Structural Durability. This list supplies information related to failures that occurred during the durability portion of testing. The Unscheduled Maintenance List includes the date and mileage at which the malfunction occurred, a description of the malfunction and repair, and the time required to perform the repair.

(Page 1 of 1)  
**SCHEDULED MAINTENANCE**  
 Champion Bus, Inc. Bus #1617

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
11-17-16	378	P.M. / Inspection	Linkage and tie rods lubed; all fluids checked.	4.00	4.00
06-01-17	1,620	P.M. / Inspection	Linkage and tie rods lubed; all fluids checked.	4.00	4.00
07-12-17	3,066	P.M. / Inspection	Linkage and tie rods lubed; all fluids checked.	4.00	4.00
08-11-17	4,038	P.M. / Inspection Fuel Economy Prep	Linkage and tie rods lubed. Oil changed. Oil, fuel, and air filters changed. Transmission oil and filter changed.	8.00	8.00
10-30-17	5,349	P.M. / Inspection	Linkage and tie rods lubed; all fluids checked.	4.00	4.00
11-03-17	6,289	P.M. / Inspection	Linkage and tie rods lubed; all fluids checked.	4.00	4.00
11-09-17	7,245	P.M. / Inspection	Linkage and tie rods lubed; all fluids checked.	4.00	4.00

## 1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS

### 1.3-I. TEST OBJECTIVE

The objective of this test is to establish the time required to replace and/or repair selected subsystems.

### 1.3-II. TEST DESCRIPTION

The test will involve components that may be expected to fail or require replacement during the service life of the bus. In addition, any component that fails during the NBM testing is added to this list. Components to be included are:

1. Transmission
2. Alternator
3. Starter
4. Batteries
5. Windshield wiper motor

### 1.3-III. DISCUSSION

During the test, several additional components were removed for repair or replacement. Following is a partial list of components and total repair/replacement time.

	<u>LABOR HOURS</u>
Hydraulic pump	4.00
Left, front hydraulic kneeling cylinder	8.00
Catalytic converter	10.00
Left, front coil spring	1.00

At the end of the test, the remaining items on the list were removed and replaced. The transmission assembly took 5.50 labor-hours (two persons 2.75 hrs) to remove and replace. The time required for repair/replacement of the four remaining components is given on the following Repair and/or Replacement Form.

**REPLACEMENT AND/OR REPAIR FORM**

Page 1 of 1

<b>Subsystem</b>	<b>Replacement Time</b>
Transmission	5.50 labor hours
Wiper Motor	1.00 labor hours
Starter	0.50 labor hour
Alternator	1.50 labor hours
Batteries	0.50 labor hours

### 1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS



**TRANSMISSION REMOVAL AND REPLACEMENT  
(5.5 LABOR HOURS)**



**WIPER MOTOR REMOVAL AND REPLACEMENT  
(1.0 LABOR HOURS)**

**1.3 REPLACEMENT AND/OR REPAIR OF  
SELECTED SUBSYSTEMS CONT.**



**STARTER REMOVAL AND REPLACEMENT  
(0.5 LABOR HOUR)**



**ALTERNATOR REMOVAL AND REPLACEMENT  
(1.5 LABOR HOURS)**

## 2. RELIABILITY - DOCUMENTATION OF BREAKDOWN AND REPAIR TIMES DURING TESTING

### 2-I. TEST OBJECTIVE

The objective of this test is to document unscheduled breakdowns, repairs, down time, and repair time that occur during testing.

### 2-II. TEST DESCRIPTION

Using the driver log and unscheduled work order forms, all significant breakdowns, repairs, labor-hours to repair, and hours out of service are recorded on the Reliability Data Form.

### CLASS OF FAILURES

Classes of failures are described below:

- (a) Class 1: Physical Safety. A failure that could lead directly to passenger or driver injury and represents a severe crash situation.
- (b) Class 2: Road Call. A failure resulting in an en route interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.
- (c) 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.
- (d) Class 4: Bad Order. A failure that does not require removal of the bus from service during its assignments but does degrade coach operation. The failure shall be reported by driver, inspector, or hostler.

### 2-III. DISCUSSION

A listing of breakdowns and unscheduled repairs is accumulated during the Structural Durability Test. The following Reliability Data Form lists all unscheduled repairs under classes as defined above. These classifications are somewhat subjective as the test is performed on a test track with careful inspections every two hours. However, even on the road, there is considerable latitude on deciding how to handle many failures.

The Unscheduled Repair List is also attached to provide a reference for the repairs that are included in the Reliability Data Forms.

The classification of repairs according to subsystem is intended to emphasize those systems which had persistent minor or more serious problems. There were no Class 1 failures. Of the 22 failures, 10 were Class 2, 11 were Class 3 and one was a Class 4 failure. Of the Class 2 failures, nine involved the suspension system and one involved the engine. Six of the Class 3 failures involved the suspension system, while three affected the exhaust and one each related to the body/electrical and emissions control systems. The single Class 4 failure involved the exhaust. These failures are available for review in the Unscheduled Maintenance List, located in Section 5.7 Structural Durability.

**RELIABILITY DATA FORMS**

Bus Number : 1617	Date: 11-17-17
Personnel: B.L.	

Failure Type			
Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety

Subsystem	Mileage	Mileage	Mileage	Mileage	Man Hours	Down Time
Suspension			378		4.00	4.00
		957			8.00	8.00
		1,271			4.00	4.00
		1,271			9.00	3.00
			1,620		3.00	1.00
		1,747			1.00	1.00
			2,571		1.00	1.00
			3,066		3.00	3.00
			3,066		2.00	2.00
		3,066			2.00	2.00
		3,066			2.00	2.00
			4,572		2.00	2.00
			4,801		6.00	3.00
			4,801		3.00	1.00
		7,245		4.00	2.00	
Exhaust		1,271			3.00	1.00
		1,414			10.00	8.00
		5,349			1.00	1.00
		7,060			1.00	1.00
Body/Electrical		2,102			2.00	4.00
Emissions Control		4,800			1.00	1.00
Engine			4,111		1.00	1.00

### **3. SAFETY - A DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE)**

#### **3-I. TEST OBJECTIVE**

The objective of this test is to determine handling and stability of the bus by measuring speed through a double lane change test.

#### **3-II. TEST DESCRIPTION**

The Safety Test is a vehicle handling and stability test. The bus will be operated at SLW on a smooth and level test track. The bus will be driven through a double lane change course at increasing speed until the test is considered unsafe or a speed of 45 mph is reached. The lane change course will be set up using pylons to mark off two 12 foot center to center lanes with two 100 foot lane change areas 100 feet apart. The bus will begin in one lane, change to the other lane in a 100 foot span, travel 100 feet, and return to the original lane in another 100 foot span. This procedure will be repeated, starting first in the right-hand and then in the left-hand lane.

#### **3-III. DISCUSSION**

The double-lane change was performed in both right-hand and left-hand directions. The bus was able to safely negotiate the test course in both the right-hand and left-hand directions up to the maximum test speed of 45 mph.

## SAFETY DATA FORM

Page 1 of 1

Bus Number: 1617	Date: 08-02-17
Personnel: T.S., T.G. & S.B.	

Temperature (°F): 83	Humidity (%): 60
Wind Direction: Calm	Wind Speed (mph): 0
Barometric Pressure (in.Hg): 30.12	

<b>SAFETY TEST: DOUBLE LANE CHANGE</b>	
Maximum safe speed tested for double-lane change to left	45 mph
Maximum safe speed tested for double-lane change to right	45 mph
<b>Comments of the position of the bus during the lane change:</b> The bus maintained a safe profile throughout the test.	
<b>Comments of the tire/ground contact patch:</b> The bus maintained tire/ground contact throughout the test.	

### 3. SAFETY



**RIGHT - HAND APPROACH**



**LEFT - HAND APPROACH**

## 4.0 PERFORMANCE

### 4.1 PERFORMANCE - AN ACCELERATION, GRADEABILITY, AND TOP SPEED TEST

#### 4.1-I. TEST OBJECTIVE

The objective of this test is to determine the acceleration, gradeability, and top speed capabilities of the bus.

#### 4.1-II. TEST DESCRIPTION

In this test, the bus will be operated at SLW on the skid pad at the PSBRTF. The bus will be accelerated at full throttle from a standstill to a maximum "geared" or "safe" speed as determined by the test driver. The vehicle speed is measured using a Correvit non-contacting speed sensor. The times to reach speed between ten mile per hour increments are measured and recorded using a stopwatch with a lap timer. The time to speed data will be recorded on the Performance Data Form and later used to generate a speed vs. time plot and gradeability calculations.

#### 4.1-III. DISCUSSION

This test consists of three runs in both the clockwise and counterclockwise directions on the Test Track. Velocity versus time data is obtained for each run and results are averaged together to minimize any test variability which might be introduced by wind or other external factors. The test was performed up to a maximum speed of 50 mph. The fitted curve of velocity vs. time is attached, followed by the calculated gradeability results. The average time to obtain 50 mph was 16.18 seconds.

# PERFORMANCE DATA FORM

Page 1 of 1

Bus Number: 1617		Date: 08-08-17	
Personnel: T.S., S.R. & M.R.			
Temperature (°F): 75		Humidity (%): 52	
Wind Direction: NW		Wind Speed (mph): 8	
Barometric Pressure (in.Hg): 30.08			
		<b>INITIALS:</b>	
Air Conditioning - OFF	✓Checked	T.S.	
Ventilation fans - ON HIGH	✓Checked	T.S.	
Heater pump motor - OFF	✓Checked	T.S.	
Defroster - OFF	✓ Checked	T.S.	
Exterior and interior lights - ON	✓ Checked	T.S.	
Windows and doors - CLOSED	✓ Checked	T.S.	
<b>ACCELERATION, GRADEABILITY, TOP SPEED</b>			
Counter Clockwise Recorded Interval Times			
Speed	Run 1	Run 2	Run 3
10 mph	1.97	1.85	1.88
20 mph	4.57	3.82	3.94
30 mph	7.26	6.91	7.02
40 mph	11.22	11.15	11.25
Top Test Speed(mph) 50	16.59	16.44	16.57
Clockwise Recorded Interval Times			
Speed	Run 1	Run 2	Run 3
10 mph	1.78	1.75	1.76
20 mph	4.06	3.97	3.88
30 mph	6.70	6.76	6.53
40 mph	11.02	10.66	10.62
Top Test Speed(mph) 50	15.70	15.64	15.53

PERFORMANCE SUMMARY SHEET

BUS MANUFACTURER :Champion Bus, Inc.                   BUS NUMBER :1617  
 BUS MODEL               :LF Transport                    TEST DATE :08/08/17

TEST CONDITIONS :

-----  
 TEMPERATURE (DEG F )               : 75.0  
 WIND DIRECTION                       : NW  
 WIND SPEED (MPH)                    : 8.0  
 HUMIDITY (%)                         : 52  
 BAROMETRIC PRESSURE (IN. HG) : 30.1

-----

VEHICLE SPEED (MPH)	AVERAGE TIME (SEC)		
	CCW DIRECTION	CW DIRECTION	TOTAL
10.0	1.90	1.76	1.83
20.0	4.11	3.97	4.04
30.0	7.06	6.66	6.86
40.0	11.21	10.77	10.99
50.0	16.53	15.62	16.08

-----

TEST SUMMARY :

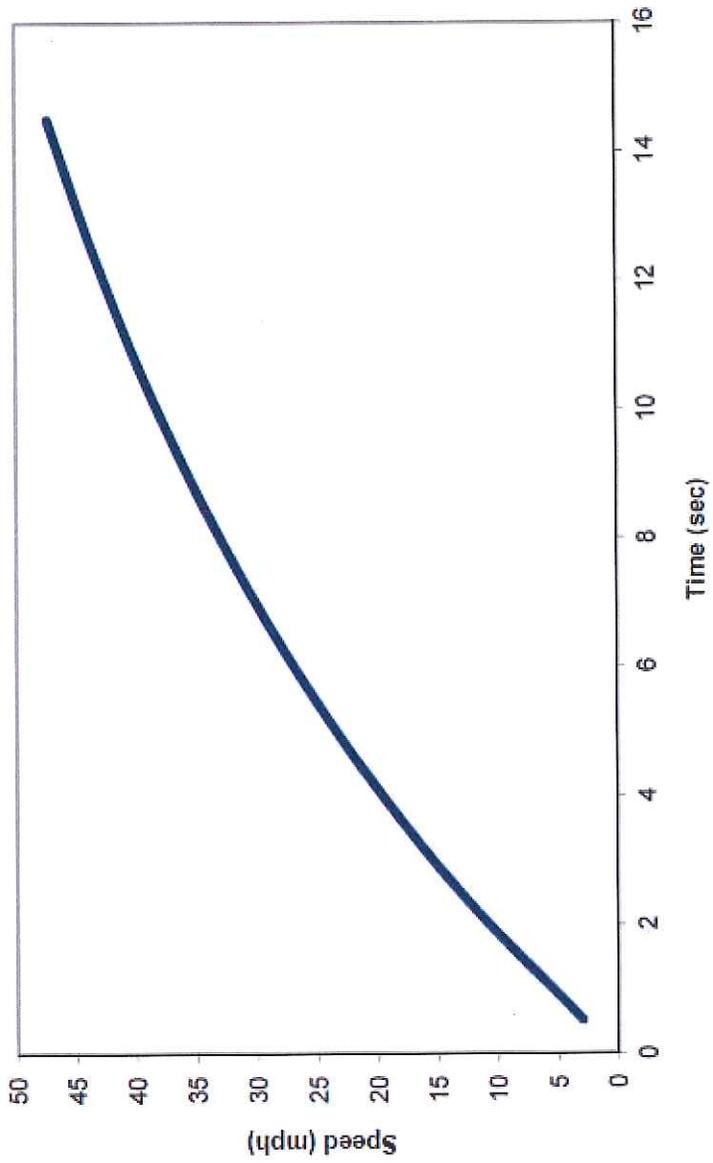
-----

VEHICLE SPEED (MPH)	TIME (SEC)	ACCELERATION (FT/SEC^2)	MAX. GRADE (%)
1.0	.17	8.6	27.8
5.0	.87	8.0	25.7
10.0	1.83	7.3	23.2
15.0	2.90	6.5	20.7
20.0	4.09	5.8	18.4
25.0	5.43	5.1	16.2
30.0	6.96	4.5	14.1
35.0	8.72	3.9	12.1
40.0	10.77	3.3	10.3
45.0	13.22	2.7	8.5
50.0	16.18	2.2	7.0

-----

NOTE : Gradeability results were calculated from performance  
 ----- test data. Actual sustained gradeability performance  
 for vehicles equipped with auto transmission may be  
 lower than the values indicated here.

Velocity vs. Time  
Champion Bus, Inc. Bus #1617



## 4.0 PERFORMANCE

### 4.2 Performance - Bus Braking

#### 4.2 I. TEST OBJECTIVE

The objective of this test is to provide, for comparison purposes, braking performance data on transit buses produced by different manufacturers.

#### 4.2 II. TEST DESCRIPTION

The testing will be conducted at the PTI Test Track skid pad area. Brake tests will be conducted after completion of the GVW portion of the vehicle durability test. At this point in testing the brakes have been subjected to a large number of braking snubs and will be considered well burnished. Testing will be performed when the bus is fully loaded at its GVW. All tires on each bus must be representative of the tires on the production model vehicle

The brake testing procedure comprises three phases:

1. Stopping distance tests
  - i. Dry surface (high-friction, Skid Number within the range of 70-76)
  - ii. Wet surface (low-friction, Skid Number within the range of 30-36)
2. Stability tests
3. Parking brake test

#### **Stopping Distance Tests**

The stopping distance phase will evaluate service brake stops. All stopping distance tests on dry surface will be performed in a straight line and at the speeds of 20, 30, 40 and 45 mph. All stopping distance tests on wet surface will be performed in straight line at speed of 20 mph.

The tests will be conducted as follows:

1. **Uniform High Friction Tests:** Four maximum deceleration straight-line brake applications each at 20, 30, 40 and 45 mph, to a full stop on a uniform high-friction surface in a 3.66-m (12-ft) wide lane.
2. **Uniform Low Friction Tests:** Four maximum deceleration straight-line brake applications from 20 mph on a uniform low friction surface in a 3.66-m (12-ft) wide lane.

When performing service brake stops for both cases, the test vehicle is accelerated on the bus test lane to the speed specified in the test procedure and this speed is maintained into the skid pad area. Upon entry of the appropriate lane of the skid pad area, the vehicle's service brake is applied to stop the vehicle as quickly as possible. The stopping distance is measured and recorded for both cases on the test

data form. Stopping distance results on dry and wet surfaces will be recorded and the average of the four measured stopping distances will be considered as the measured stopping distance. Any deviation from the test lane will be recorded.

### **Stability Tests**

This test will be conducted in both directions on the test track. The test consists of four maximum deceleration, straight-line brake applications on a surface with split coefficients of friction (i.e., the wheels on one side run on high-friction SN 70-76 or more and the other side on low-friction [where the lower coefficient of friction should be less than half of the high one] at initial speed of 30 mph).

(I) The performance of the vehicle will be evaluated to determine if it is possible to keep the vehicle within a 3.66m (12 ft) wide lane, with the dividing line between the two surfaces in the lane's center. The steering wheel input angle required to keep the vehicle in the lane during the maneuver will be reported.

### **Parking Brake Test**

The parking brake phase utilizes the brake slope, which has a 20% grade. The test vehicle, at its GVW, is driven onto the brake slope and stopped. With the transmission in neutral, the parking brake is applied and the service brake is released. The test vehicle is required to remain stationary for five minutes. The parking brake test is performed with the vehicle facing uphill and downhill.

## **4.2-III. DISCUSSION**

The Stopping Distance phase of the Brake Test was completed with the following results; for the Uniform High Friction Test average stopping distances were 24.79' at 20 mph, 50.41' at 30 mph, 83.56' at 40 mph and 102.73' at 45 mph. The average stopping distance for the Uniform Low Friction Test was 31.85'. There was no deviation from the test lane during the performance of the Stopping Distance phase.

During the Stability phase of Brake Testing the test bus experienced no deviation from the test lane during both approaches to the Split Friction Road surface.

The Parking Brake phase was completed with the test bus maintaining the parked position for the full five minute period with no slip or roll observed in both the uphill and downhill positions.

## Table 4.2-6. Braking Test Data Forms

Page 1 of 3

Bus Number: 1617	Date: 08-08-17
Personnel: T.S., S.R. & M.R.	
Amb. Temperature (°F): 75	Wind Speed (mph): 8
Wind Direction: NW	Pavement Temp (°F) Start: 111 End: 120

TIRE INFLATION PRESSURE (psi):				
Tire Type: Front: Michelin LT 225/75/16      Rear: Michelin LTX LT 225/75/16				
	Left Tire(s)		Right Tire(s)	
Front	75		75	
	Inner	Outer	Inner	Outer
Middle	N/A	N/A	N/A	N/A
Rear	80	80	80	80

AXLE LOADS (lb.)		
	Left	Right
Front	2,610	2,430
Middle	N/A	N/A
Rear	4,850	4,570

**Table 4.2-7. Record of All Braking System Faults/Repairs.**

Page 2 of 3

<b>Date</b>	<b>Fault/Repair</b>	<b>Description</b>
	None Noted	

**Table 4.2-8.1. Stopping Distance Test Results Form**

Page 3 of 3

Stopping Distance (ft)					
Vehicle Direction	CW	CW	CCW	CCW	
Speed (mph)	Stop 1	Stop 2	Stop 3	Stop 4	Average
20 (dry)	24.92	24.07	27.22	22.96	24.79
30 (dry)	48.74	47.92	55.33	49.65	50.41
40 (dry)	84.32	79.63	83.44	86.85	83.56
45 (dry)	99.58	101.03	105.12	105.22	102.73
20 (wet)	31.38	33.06	33.02	29.94	31.85

**Table 4.2-8.2. Stability Test Results Form**

Stability Test Results (Split Friction Road surface)			
Vehicle Direction	Attempt	Did test bus stay in 12' lane? (yes/no)	Comments
Drivers side on high friction	1	Yes	None noted
	2	Yes	None noted
Drivers side on low friction	1	Yes	None noted
	2	Yes	None noted

**Table 4.2-8.3. Parking Brake Test Form**

PARKING BRAKE (Fully Loaded) – GRADE HOLDING						
Vehicle Direction	Attempt	Hold Time (min)	Slide (in)	Roll (in)	Did Hold	No Hold
Front up	1	5:00	0	0	✓	
	2	N/A	N/A	N/A	N/A	N/A
	3	N/A	N/A	N/A	N/A	N/A
Front down	1	5:00	0	0	✓	
	2	N/A	N/A	N/A	N/A	N/A
	3	N/A	N/A	N/A	N/A	N/A

## 4.2 Performance - Bus Braking



**PARKING BRAKE TEST  
PARKING BRAKE HELD FOR 5 MINUTES IN  
BOTH 20% UP AND 20% DOWN POSITIONS**



## 5.1 STRUCTURAL INTEGRITY

### 5.1 STRUCTURAL STRENGTH AND DISTORTION TESTS – STRUCTURAL SHAKEDOWN TEST

#### 5.1-I. DISCUSSION

The objective of this test is to determine certain static characteristics (e.g., bus floor deflection, permanent structural deformation, etc.) under static loading conditions.

#### 5.1-II. TEST DESCRIPTION

In this test, the bus will be isolated from the suspension by blocking the vehicle under the suspension points. The bus will then be loaded and unloaded up to a maximum of three times with a distributed load equal to 2.5 times gross load. Gross load is 150 lb. for every designed passenger seating position, for the driver, and for each 1.5 sq ft of free floor space. For a distributed load equal to 2.5 times gross load, place a 375-lb. load on each seat and on every 1.5 sq ft of free floor space. The first loading and unloading sequence will “settle” the structure. Bus deflection will be measured at several locations during the loading sequences.

#### 5.1-III. DISCUSSION

This test was performed based on a maximum passenger capacity of 16 passengers including the driver and two wheelchair positions. The resulting test load is  $(16 \times 375 \text{ lb.}) + (2 \times 600) = 7,200 \text{ lb.}$  The load is distributed evenly over the passenger space. Deflection data before and after each loading and unloading sequence is provided on the Structural Shakedown Data Form.

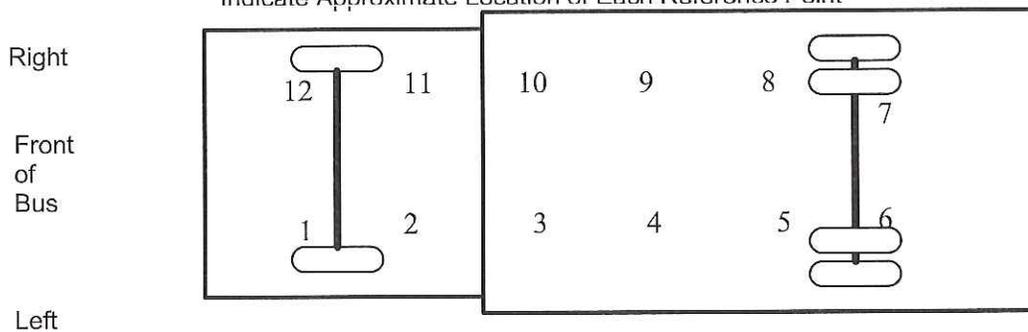
The unloaded height after each test becomes the original height for the next test. Some initial settling is expected due to undercoat compression, etc. After each loading cycle, the deflection of each reference point is determined. The bus is then unloaded and the residual (permanent) deflection is recorded. On the final test, the maximum loaded deflection was 0.212 Inches at reference point 6. The maximum permanent deflection after the final loading sequence ranged from -0.004 Inches at reference point 1 to 0.004 inches at reference points 4, 5 and 8.

### STRUCTURAL SHAKEDOWN DATA FORM

Page 1 of 2

Bus Number: 1617	Date: 11-09-16
Personnel: E.D, E.L. & P.D.	Temperature (°F): 63
Loading Sequence: <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3   (check one)	
Test Load (lb.): 7,200 (16 seats + 2 wheelchairs)	

Indicate Approximate Location of Each Reference Point

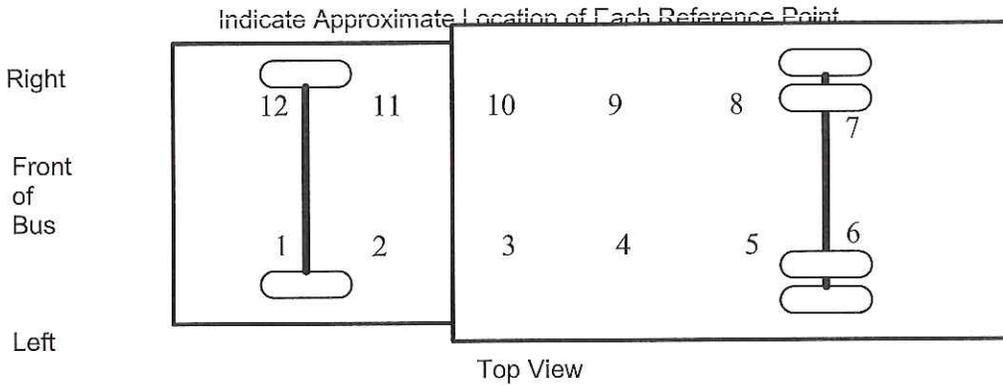


Reference Point No.	A (in) Original Height	B (in) Loaded Height	B-A (in) Loaded Deflection	C (in) Unloaded Height	C-A (in) Permanent Deflection
1	0	-.074	-.074	-.005	-.005
2	0	.078	.078	.002	.002
3	0	.148	.148	.007	.007
4	0	.141	.141	.007	.007
5	0	.137	.137	.046	.046
6	0	.238	.238	.026	.026
7	0	.215	.215	.007	.007
8	0	.095	.095	.015	.015
9	0	.139	.139	.015	.015
10	0	.113	.113	.011	.011
11	0	.053	.053	.006	.006
12	0	-.078	-.078	-.003	-.003

### STRUCTURAL SHAKEDOWN DATA FORM

Page 2 of 2

Bus Number: 1617	Date: 11-10-16
Personnel: E.D., E.L. & P.D.	Temperature (°F): 63
Loading Sequence: <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 (check one)	
Test Load (lb.): 7,200 (16 seats + 2 wheelchairs)	



Reference Point No.	A (in) Original Height	B (in) Loaded Height	B-A (in) Loaded Deflection	C (in) Unloaded Height	C-A (in) Permanent Deflection
1	-.005	-.079	-.074	-.009	-.004
2	.002	.081	.079	.004	.002
3	.007	.153	.146	.010	.003
4	.007	.146	.139	.011	.004
5	.046	.171	.125	.050	.004
6	.026	.238	.212	.029	.003
7	.007	.211	.204	.009	.002
8	.015	.104	.089	.019	.004
9	.015	.149	.134	.018	.003
10	.011	.120	.109	.014	.003
11	.006	.056	.050	.008	.002
12	-.003	-.083	.080	-.006	-.003

## 5.1 STRUCTURAL SHAKEDOWN TEST



**BUS LOADED TO 2.5 TIMES GVL  
(7,200 lb.)**

## 5.2 STRUCTURAL STRENGTH AND DISTORTION TESTS - STRUCTURAL DISTORTION

### 5.2-I. TEST OBJECTIVE

The objective of this test is to observe the operation of the bus subsystems when the bus is placed in a longitudinal twist simulating operation over a curb or through a pothole.

### 5.2-II. TEST DESCRIPTION

With the bus loaded to GVWR, each wheel of the bus will be raised (one at a time) to simulate operation over a curb and the following will be inspected:

1. Body
2. Windows
3. Doors
4. Roof vents
5. Special seating
6. Undercarriage
7. Engine
8. Service doors
9. Escape hatches
10. Steering mechanism

Each wheel will then be lowered (one at a time) to simulate operation through a pothole and the same items inspected.

### 5.2-III. DISCUSSION

The test sequence was repeated ten times. The first and last test is with all wheels level. The other eight tests are with each wheel 6 inches higher and 6 inches lower than the other three wheels.

All doors, windows, escape mechanisms, engine, steering and ADA Accessible devices operated normally throughout the test. The undercarriage and body indicated no deficiencies. No water leakage was observed during the test. The results of this test are indicated on the following data forms.

**DISTORTION TEST INSPECTION FORM**  
 (Note: Ten copies of this data sheet are required)

Page 1 of 10

Bus Number: 1617	Date: 11-11-16
Personnel: T.S., J.P., E.L., T.G. & P.D.	Temperature(°F): 53

Wheel Position : (check one)		
All wheels level	<input checked="" type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies
Front Doors	No Deficiencies
Rear Doors	No Deficiencies
Escape Mechanisms/ Roof Vents	No Deficiencies
Engine	No Deficiencies
ADA Accessible Device/ Special Seating	No Deficiencies
Undercarriage	No Deficiencies
Service Doors	No Deficiencies
Body	No Deficiencies
Windows/ Body Leakage	No Deficiencies
Steering Mechanism	No Deficiencies

**DISTORTION TEST INSPECTION FORM**  
 (Note: Ten copies of this data sheet are required)

Page 2 of 10

Bus Number: 1617	Date: 11-11-16
Personnel: T.S., J.P., E.L., T.G. & P.D.	Temperature(°F): 53

Wheel Position : (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies
Front Doors	No Deficiencies
Rear Doors	No Deficiencies
Escape Mechanisms/ Roof Vents	No Deficiencies
Engine	No Deficiencies
ADA Accessible Device/ Special Seating	No Deficiencies
Undercarriage	No Deficiencies
Service Doors	No Deficiencies
Body	No Deficiencies
Windows/ Body Leakage	No Deficiencies
Steering Mechanism	No Deficiencies

**DISTORTION TEST INSPECTION FORM**  
 (Note: Ten copies of this data sheet are required)  
 Page 3 of 10

Bus Number: 1617	Date: 11-11-16
Personnel: T.S., J.P., E.L., T.G. & P.D.	Temperature(°F): 53

Wheel Position : (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies
Front Doors	No Deficiencies
Rear Doors	No Deficiencies
Escape Mechanisms/ Roof Vents	No Deficiencies
Engine	No Deficiencies
ADA Accessible Device/ Special Seating	No Deficiencies
Undercarriage	No Deficiencies
Service Doors	No Deficiencies
Body	No Deficiencies
Windows/ Body Leakage	No Deficiencies
Steering Mechanism	No Deficiencies

**DISTORTION TEST INSPECTION FORM**  
 (Note: Ten copies of this data sheet are required)  
 Page 4 of 10

Bus Number: 1617	Date: 11-11-16
Personnel: T.S., J.P., E.L., T.G. & P.D.	Temperature(°F): 53

Wheel Position : (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies
Front Doors	No Deficiencies
Rear Doors	No Deficiencies
Escape Mechanisms/ Roof Vents	No Deficiencies
Engine	No Deficiencies
ADA Accessible Device/ Special Seating	No Deficiencies
Undercarriage	No Deficiencies
Service Doors	No Deficiencies
Body	No Deficiencies
Windows/ Body Leakage	No Deficiencies
Steering Mechanism	No Deficiencies

**DISTORTION TEST INSPECTION FORM**  
 (Note: Ten copies of this data sheet are required)  
 Page 5 of 10

Bus Number: 1617	Date: 11-11-16
Personnel: T.S., J.P., E.L., T.G. & P.D.	Temperature(°F): 53

Wheel Position : (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies
Front Doors	No Deficiencies
Rear Doors	No Deficiencies
Escape Mechanisms/ Roof Vents	No Deficiencies
Engine	No Deficiencies
ADA Accessible Device/ Special Seating	No Deficiencies
Undercarriage	No Deficiencies
Service Doors	No Deficiencies
Body	No Deficiencies
Windows/ Body Leakage	No Deficiencies
Steering Mechanism	No Deficiencies

**DISTORTION TEST INSPECTION FORM**  
 (Note: Ten copies of this data sheet are required)  
 Page 6 of 10

Bus Number: 1617	Date: 11-11-16
Personnel: T.S., J.P., E.L., T.G. & P.D.	Temperature(°F): 53

Wheel Position : (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies
Front Doors	No Deficiencies
Rear Doors	No Deficiencies
Escape Mechanisms/ Roof Vents	No Deficiencies
Engine	No Deficiencies
ADA Accessible Device/ Special Seating	No Deficiencies
Undercarriage	No Deficiencies
Service Doors	No Deficiencies
Body	No Deficiencies
Windows/ Body Leakage	No Deficiencies
Steering Mechanism	No Deficiencies

**DISTORTION TEST INSPECTION FORM**  
 (Note: Ten copies of this data sheet are required)  
 Page 7 of 10

Bus Number: 1617	Date: 11-11-16
Personnel: T.S., J.P., E.L., T.G. & P.D.	Temperature(°F): 53

Wheel Position : (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies
Front Doors	No Deficiencies
Rear Doors	No Deficiencies
Escape Mechanisms/ Roof Vents	No Deficiencies
Engine	No Deficiencies
ADA Accessible Device/ Special Seating	No Deficiencies
Undercarriage	No Deficiencies
Service Doors	No Deficiencies
Body	No Deficiencies
Windows/ Body Leakage	No Deficiencies
Steering Mechanism	No Deficiencies

**DISTORTION TEST INSPECTION FORM**  
 (Note: Ten copies of this data sheet are required)  
 Page 8 of 10

Bus Number: 1617	Date: 11-11-16
Personnel: T.S., J.P., E.L., T.G. & P.D.	Temperature(°F): 53

Wheel Position : (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies
Front Doors	No Deficiencies
Rear Doors	No Deficiencies
Escape Mechanisms/ Roof Vents	No Deficiencies
Engine	No Deficiencies
ADA Accessible Device/ Special Seating	No Deficiencies
Undercarriage	No Deficiencies
Service Doors	No Deficiencies
Body	No Deficiencies
Windows/ Body Leakage	No Deficiencies
Steering Mechanism	No Deficiencies

**DISTORTION TEST INSPECTION FORM**  
 (Note: Ten copies of this data sheet are required)  
 Page 9 of 10

Bus Number: 1617	Date: 11-11-16
Personnel: T.S., J.P., E.L., T.G. & P.D.	Temperature(°F): 53

Wheel Position : (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies
Front Doors	No Deficiencies
Rear Doors	No Deficiencies
Escape Mechanisms/ Roof Vents	No Deficiencies
Engine	No Deficiencies
ADA Accessible Device/ Special Seating	No Deficiencies
Undercarriage	No Deficiencies
Service Doors	No Deficiencies
Body	No Deficiencies
Windows/ Body Leakage	No Deficiencies
Steering Mechanism	No Deficiencies

**DISTORTION TEST INSPECTION FORM**  
 (Note: Ten copies of this data sheet are required)  
 Page 10 of 10

Bus Number: 1617	Date: 11-11-16
Personnel: T.S., J.P., E.L., T.G. & P.D.	Temperature(°F): 53

Wheel Position : (check one)		
All wheels level	<input type="checkbox"/> before	<input checked="" type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies
Front Doors	No Deficiencies
Rear Doors	No Deficiencies
Escape Mechanisms/ Roof Vents	No Deficiencies
Engine	No Deficiencies
ADA Accessible Device/ Special Seating	No Deficiencies
Undercarriage	No Deficiencies
Service Doors	No Deficiencies
Body	No Deficiencies
Windows/ Body Leakage	No Deficiencies
Steering Mechanism	No Deficiencies

## 5.2 STRUCTURAL DISTORTION TEST



**RIGHT FRONT WHEEL SIX INCHES HIGHER**



**RIGHT REAR WHEEL SIX INCHES LOWER**

## **5.3 STRUCTURAL STRENGTH AND DISTORTION TESTS - STATIC TOWING TEST**

### **5.3-I. TEST OBJECTIVE**

The objective of this test is to determine the characteristics of the bus towing mechanisms under static loading conditions.

### **5.3-II. TEST DESCRIPTION**

Utilizing a load-distributing yoke, a hydraulic cylinder is used to apply a static tension load equal to 1.2 times the bus curb weight. The load will be applied to both the front and rear, if applicable, towing fixtures at an angle of 20 degrees with the longitudinal axis of the bus, first to one side then the other in the horizontal plane, and then upward and downward in the vertical plane. Any permanent deformation or damage to the tow eyes or adjoining structure will be recorded.

### **5.3-III. DISCUSSION**

The test bus submitted for testing was not equipped with any type of tow eyes or tow hooks. Therefore, the static towing test was not performed.

## **5.4 STRUCTURAL STRENGTH AND DISTORTION TESTS - DYNAMIC TOWING TEST**

### **5.4-I. TEST OBJECTIVE**

The objective of this test is to verify the integrity of the towing fixtures and determine the feasibility of towing the bus under manufacturer specified procedures.

### **5.4-II. TEST DESCRIPTION**

This test requires the bus be towed at curb weight using the specified equipment and instructions provided by the manufacturer and a heavy-duty wrecker. The bus will be towed for 5 miles at a speed of 20 mph for each recommended towing configuration. After releasing the bus from the wrecker, the bus will be visually inspected for any structural damage or permanent deformation. All doors, windows and passenger escape mechanisms will be inspected for proper operation.

### **5.4-III. DISCUSSION**

The bus was towed using a heavy-duty wrecker. The towing interface was accomplished by incorporating a hydraulic under lift. A front lift tow was performed. No problems, deformation, or damage was noted during testing.

# DYNAMIC TOWING TEST DATA FORM

Page 1 of 1

Bus Number: 1617	Date: 08-30-17
Personnel: S.R. & P.D.	

Temperature (°F): 62	
Wind Direction: N	Wind Speed (mph): 2

<b>Inspect tow equipment-bus interface.</b>
<b>Comments:</b> A safe and adequate connection was made between the tow equipment and bus.
<b>Inspect tow equipment-wrecker interface.</b>
<b>Comments:</b> A safe and adequate connection was made between the tow equipment and the wrecker.
<b>Towing Comments:</b> A front-lift tow was performed incorporating a hydraulic under lift wrecker.
<b>Description and location of any structural damage:</b> None Noted
<b>General Comments:</b> None Noted

## 5.4 DYNAMIC TOWING TEST



**TOWING INTERFACE**



**TEST BUS IN TOW**

## 5.5 STRUCTURAL STRENGTH AND DISTORTION TESTS – JACKING TEST

### 5.5-I. TEST OBJECTIVE

The objective of this test is to inspect for damage due to the deflated tire, and determine the feasibility of jacking the bus with a portable hydraulic jack to a height sufficient to replace a deflated tire.

### 5.5-II. TEST DESCRIPTION

With the bus at curb weight, the tire(s) at one corner of the bus are replaced with deflated tire(s) of the appropriate type. A portable hydraulic floor jack is then positioned in a manner and location specified by the manufacturer and used to raise the bus to a height sufficient to provide 3-in clearance between the floor and an inflated tire. The deflated tire(s) are replaced with the original tire(s) and the jack is lowered. Any structural damage or permanent deformation is recorded on the test data sheet. This procedure is repeated for each corner of the bus.

### 5.5-III. DISCUSSION

The jack used for this test has a minimum height of 8.75 inches. During the deflated portion of the test, the jacking point clearances ranged from 12.4 inches to 7.0 inches. No deformation or damage was observed during testing. A complete listing of jacking point clearances is provided in the Jacking Test Data Form.

### JACKING CLEARANCE SUMMARY

Condition	Frame Point Clearance
Front axle – one tire flat	7.0"
Rear axle – one tire flat	11.1"
Rear axle – two tires flat	8.5"

## JACKING TEST DATA FORM

Page 1 of 1

Bus Number: 1617	Date: 11-01-16
Personnel: E.D. & E.L.	Temperature (°F): 64

Record any permanent deformation or damage to bus as well as any difficulty encountered during jacking procedure.

Deflated Tire	Jacking Pad Clearance Body/Frame (in)	Jacking Pad Clearance Axle/Suspension (in)	Comments
Right front	9.4 " I 7.0 " D	11.8 " I 8.9 " D	Body & Axle
Left front	14.8 " I 12.1 " D	7.7 " I 8.9 " D	Body & Axle
Right rear—outside	11.7 " I 11.1 " D	9.3 " I 8.9 " D	Body & Suspension
Right rear—both	11.7 " I 8.5 " D	9.3 " I 6.8 " D	Body & Suspension
Left rear—outside	12.9 " I 12.4 " D	9.8 " I 9.4 " D	Body & Suspension
Left rear—both	12.9 " I 10.4 " D	9.8 " I 7.8 " D	Body & Suspension
Right middle or tag—outside	N/A	N/A	N/A
Right middle or tag—both	N/A	N/A	N/A
Left middle or tag—outside	N/A	N/A	N/A
Left middle or tag—both	N/A	N/A	N/A
<b>Additional comments of any deformation or difficulty during jacking:</b>			
None noted.			

## 5.5 JACKING TEST



**JACK UNDER THE FRONT AXLE**



**BUS LIFTED – REAR AXLE**

## **5.6 STRUCTURAL STRENGTH AND DISTORTION TESTS - HOISTING TEST**

### **5.6-I. TEST OBJECTIVE**

The objective of this test is to determine possible damage or deformation caused by the jack/stands.

### **5.6-II. TEST DESCRIPTION**

With the bus at curb weight, the front end of the bus is raised to a height sufficient to allow manufacturer-specified placement of jack stands under the axles or jacking pads independent of the hoist system. The bus will be checked for stability on the jack stands and for any damage to the jacking pads or bulkheads. The procedure is repeated for the tag axle and rear end of the bus. The procedure is then repeated for the front, tag axle and rear simultaneously.

### **5.6-III. DISCUSSION**

The test was conducted using four posts of a six-post electric lift and standard 19 inch jack stands. The bus was hoisted from the front wheel, rear wheel, and then the front and rear wheels simultaneously and placed on jack stands.

The bus easily accommodated the placement of the vehicle lifts and jack stands and the procedure was performed without any instability noted.

# HOISTING TEST DATA FORM

Page 1 of 1

Bus Number: 1617	Date: 11-01-16
Personnel: E.D. & E.L.	Temperature (°F): 64

<b>Comments of any structural damage to the jacking pads or axles while both the front wheels are supported by the jack stands:</b>
None noted.
<b>Comments of any structural damage to the jacking pads or axles while both the rear wheels are supported by the jack stands:</b>
None noted.
<b>Comments of any structural damage to the jacking pads or axles while both the tag axle wheels are supported by the jack stands:</b>
N/A
<b>Comments of any structural damage to the jacking pads or axles while both the front and rear wheels are supported by the jack stands:</b>
None noted.
<b>Comments of any problems or interference placing wheel hoists under wheels:</b>
None noted.

## 5.6 HOISTING TEST



**TEST BUS ON LIFTS**



**TEST BUS ON JACK STANDS**

## 5.7 STRUCTURAL DURABILITY TEST

### 5.7-I. TEST OBJECTIVE

The objective of this test is to perform an accelerated durability test that approximates up to 25 percent of the service life of the vehicle.

### 5.7-II. TEST DESCRIPTION

The test vehicle is driven a total of 7,500 miles; approximately 5,000 miles on the PSBRTF Durability Test Track and approximately 2,500 miscellaneous other miles. The test will be conducted with the bus operated under three different loading conditions. The first segment will consist of approximately 2,000 miles with the bus operated at GVW. The second segment will consist of approximately 1,000 miles with the bus operated at SLW. The remainder of the test, approximately 2,000 miles, will be conducted with the bus loaded to CW. If GVW exceeds the axle design weights, then the load will be adjusted to the axle design weights and the change will be recorded. All subsystems are run during these tests in their normal operating modes. All recommended manufacturers servicing is to be followed and noted on the vehicle maintainability log. Servicing items accelerated by the durability tests will be compressed by 10:1; all others will be done on a 1:1 mi/mi basis. Unscheduled breakdowns and repairs are recorded on the same log as are any unusual occurrences as noted by the driver. Once a week the test vehicle shall be washed down and thoroughly inspected for any signs of failure.

### 5.7-III. DISCUSSION

The Structural Durability Test was started on November 7, 2016 and was conducted until November 15, 2017. The first 2,000 miles were performed at a GVW of 14,460 lb. and completed on June 08, 2017. The next 1,000 mile SLW segment was performed at 14,460 lb. and completed on October 25, 2017, and the final 2,000 mile segment was performed at a CW of 12,210 lb. and completed on November 15, 2017.

The following mileage summary presents the accumulation of miles during the Structural Durability Test. The driving schedule is included, showing the operating duty cycle. A detailed plan view of the Test Track Facility and Durability Test Track are attached for reference. Also, a durability element profile detail shows all the measurements of the different conditions. Finally, photographs illustrating some of the failures that were encountered during the Structural Durability Test are included.

Champion Bus, Inc. Bus #1617  
MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
11/07/16 TO 11/13/16	23.00	48.00	71.00
11/14/16 TO 11/20/16	240.00	59.00	299.00
11/21/16 TO 11/27/16	0.00	0.00	0.00
11/28/16 TO 12/04/16	0.00	0.00	0.00
12/05/16 TO 12/11/16	0.00	0.00	0.00
12/12/16 TO 12/18/16	0.00	0.00	0.00
12/19/16 TO 12/25/16	0.00	0.00	0.00
12/26/16 TO 01/01/17	0.00	0.00	0.00
01/02/17 TO 01/08/17	0.00	0.00	0.00
01/09/17 TO 01/15/17	0.00	0.00	0.00
01/16/17 TO 01/22/17	0.00	0.00	0.00
01/23/17 TO 01/29/17	509.00	70.00	579.00
01/30/17 TO 02/05/17	0.00	0.00	0.00
02/06/17 TO 02/12/17	256.00	58.00	314.00

Champion Bus, Inc. Bus #1617

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
02/13/17 TO 02/19/17	0.00	0.00	0.00
02/20/17 TO 02/26/17	0.00	0.00	0.00
02/27/17 TO 03/05/17	0.00	0.00	0.00
03/06/17 TO 03/12/17	0.00	0.00	0.00
03/13/17 TO 03/19/17	0.00	0.00	0.00
03/20/17 TO 03/26/17	0.00	0.00	0.00
03/27/17 TO 04/02/17	41.00	102.00	143.00
04/03/17 TO 04/09/17	0.00	0.00	0.00
04/10/17 TO 04/16/17	0.00	0.00	0.00
04/17/17 TO 04/23/17	0.00	0.00	0.00
04/24/17 TO 04/30/17	0.00	0.00	0.00
05/01/17 TO 05/07/17	139.00	55.00	194.00
05/08/17 TO 05/14/17	11.00	1.00	12.00
05/15/17 TO 05/21/17	0.00	0.00	0.00

Champion Bus, Inc. Bus #1617  
MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
05/22/17 TO 05/28/17	0.00	0.00	0.00
05/29/17 TO 06/04/17	143.00	54.00	197.00
06/05/17 TO 06/11/17	738.00	33.00	771.00
06/12/17 TO 06/18/17	473.00	22.00	495.00
06/19/17 TO 06/25/17	0.00	0.00	0.00
06/26/17 TO 07/02/17	0.00	0.00	0.00
07/03/17 TO 07/09/17	0.00	0.00	0.00
07/10/17 TO 07/16/17	0.00	0.00	0.00
07/17/17 TO 07/23/17	0.00	0.00	0.00
07/24/17 TO 07/30/17	0.00	0.00	0.00
07/31/17 TO 08/06/17	0.00	357.00	357.00
08/07/17 TO 08/13/17	0.00	615.00	615.00
08/14/17 TO 08/20/17	0.00	48.00	48.00
08/21/17 TO 08/27/17	0.00	0.00	0.00

Champion Bus, Inc. Bus #1617

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
08/28/17 TO 09/03/17	0.00	37.00	37.00
09/04/17 TO 09/10/17	0.00	105.00	105.00
09/11/17 TO 09/17/17	100.00	48.00	148.00
09/18/17 TO 09/24/17	304.00	14.00	318.00
09/25/17 TO 10/01/17	0.00	0.00	0.00
10/02/17 TO 10/08/17	0.00	0.00	0.00
10/09/17 TO 10/15/17	0.00	0.00	0.00
10/16/17 TO 10/22/17	0.00	0.00	0.00
10/23/17 TO 10/29/17	427.00	18.00	445.00
10/30/17 TO 11/05/17	984.00	235.00	1219.00
11/06/17 TO 11/12/17	612.00	421.00	1033.00
11/13/17 TO 11/19/17	0.00	111.00	111.00
TOTAL	5000.00	2511.00	7511.00

Table 4. Driving Schedule for Bus Operation on the Durability Test Track.

STANDARD OPERATING SCHEDULE

Monday through Friday

	HOUR	ACTION
Shift 1	midnight	D
	1:40 am	C
	1:50 am	B
	2:00 am	D
	3:35 am	C
	3:45 am	B
	4:05 am	D
	5:40 am	C
	5:50 am	B
	6:00 am	D
	7:40 am	C
	7:50 am	F
	Shift 2	8:00 am
9:40 am		C
9:50 am		B
10:00 am		D
11:35 am		C
11:45 am		B
12:05 pm		D
1:40 pm		C
1:50 pm		B
2:00 pm		D
3:40 pm		C
3:50 pm		F
Shift 3		4:00 pm
	5:40 pm	C
	5:50 pm	B
	6:00 pm	D
	7:40 pm	C
	7:50 pm	B
	8:05 pm	D
	9:40 pm	C
	9:50 pm	B
	10:00 pm	D
	11:40 pm	C
	11:50 pm	F

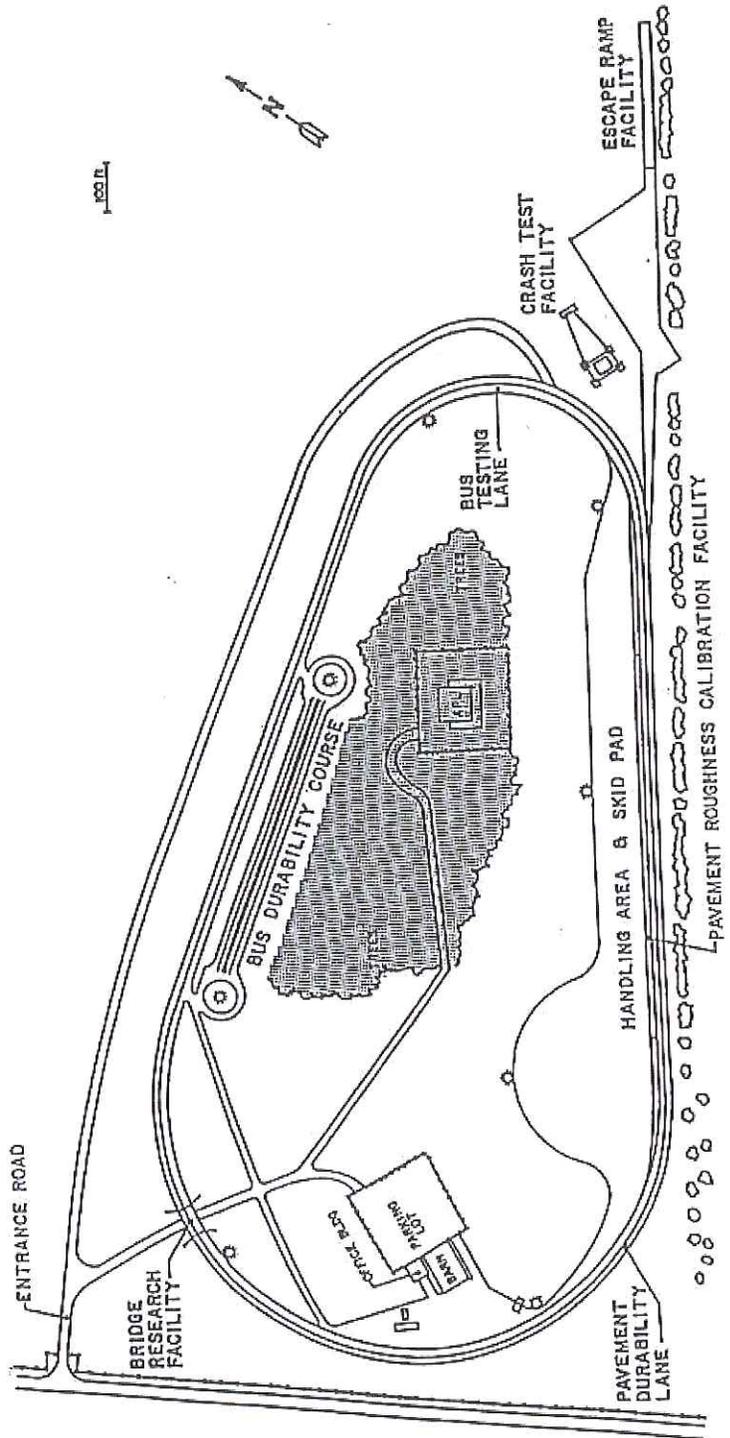
B—Break

C—Cycle all systems five times, visual inspection, driver's log entries

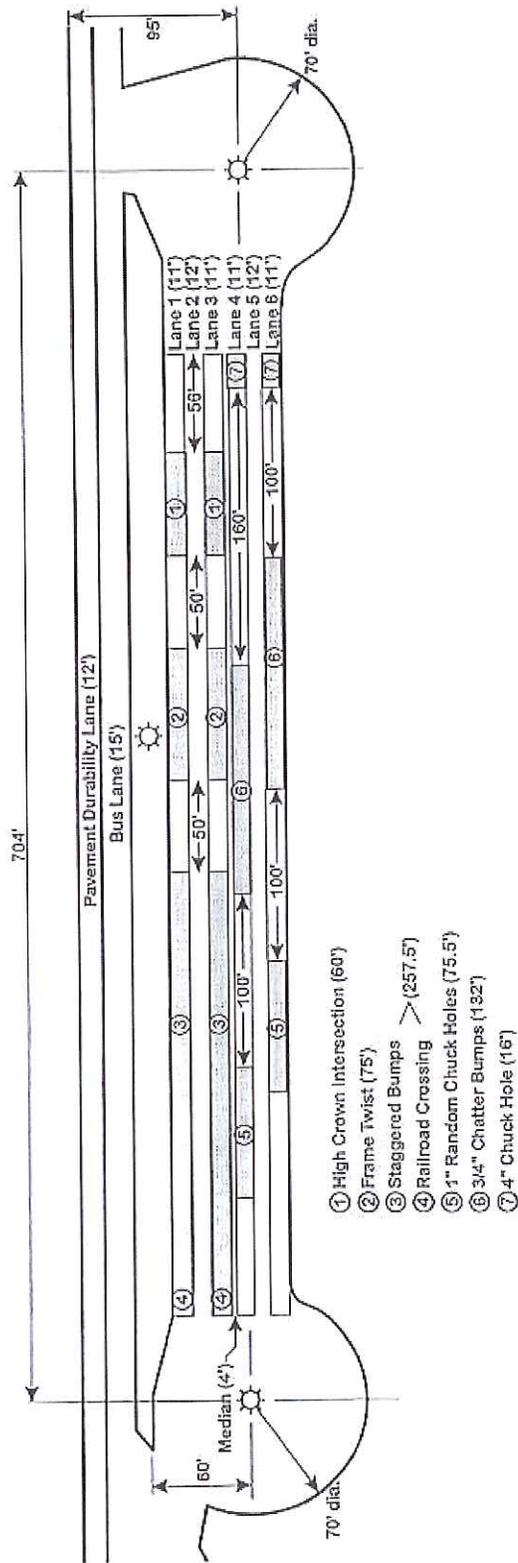
D—Drive bus as specified by procedure

F—Fuel bus, complete driver's log shift entries

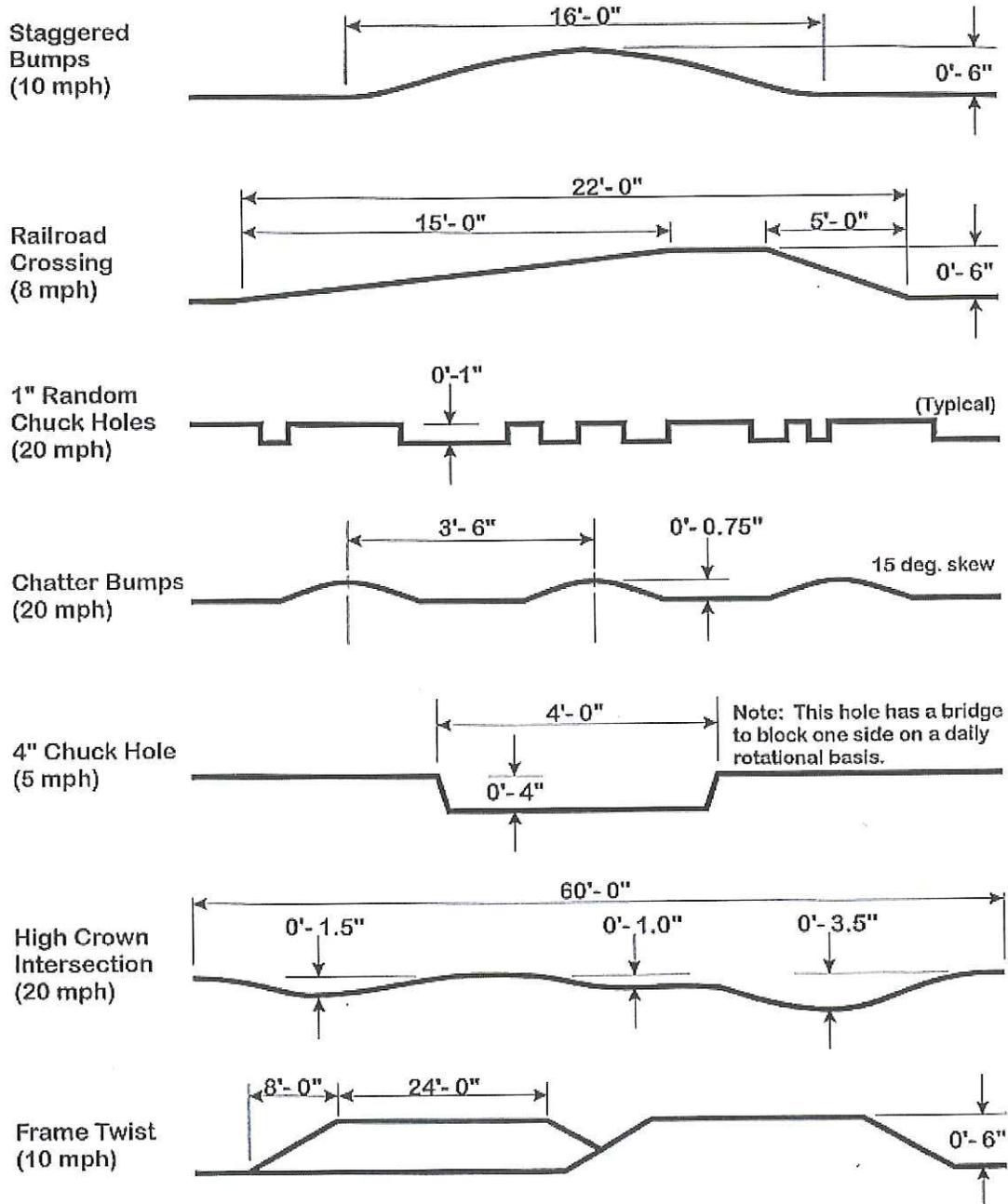
# “PLAN VIEW OF PENN STATE BUS TESTING AND RESEARCH FACILITY”



BUS TESTING AND RESEARCH TEST TRACK  
UNIVERSITY PARK, PA



Plan View  
**Vehicle Durability Test Track**  
 The Pennsylvania Transportation Institute  
 Penn State



## Durability Element Profiles

The Pennsylvania Transportation Institute  
 Penn State

(Page 1 of 3)  
**UNSCHEDULED MAINTENANCE**  
**Champion Bus, Inc. Bus # 1617**

DATE	TEST MILES	ISSUE	ACTION	LABOR HOURS	DOWN TIME
01-03-17	378	The bus will not return to ride height after kneeling.	Troubleshooting found hydraulic pump failed. Hydraulic pump replaced.	4.00	4.00
02-03-17	957	Hydraulic fluid is leaking at the left front wheel. Hydraulic kneel cylinder in the left front coil spring is leaking hydraulic fluid.	Left, front hydraulic kneeling cylinder replaced.	8.00	4.00
02-28-17	1,271	The left, front hydraulic kneel cylinder is leaking oil.	Left, front hydraulic kneeling cylinder replaced.	4.00	4.00
03-29-17	1,271	The hydraulic line from the hydraulic pump to the right, front suspension cylinder is leaking.	Hydraulic line replaced.	9.00	3.00
03-29-17	1,271	The tailpipe has separated from the muffler.	Installed a connector pipe at the muffler and reconnected to the tailpipe.	3.00	1.00
05-03-17	1,414	The inlet pipe to catalytic convertor is cracked.	Replaced catalytic convertor.	10.00	8.00
06-01-17	1,620	Left, front hydraulic suspension cylinder is leaking and left, front spring is broken.	Replaced left, front hydraulic cylinder and coil spring.	3.00	3.00
06-02-17	1,747	Left, front hydraulic hose is leaking at the cylinder.	Replaced fitting to the cylinder.	1.00	1.00
06-08-17	2,102	Battery tray track glides are broken, collapsed in battery compartment.	Replaced tray track glides.	2.00	4.00
06-14-17	2,571	Left, front coil spring is broken.	Replaced left, front coil spring.	1.00	1.00

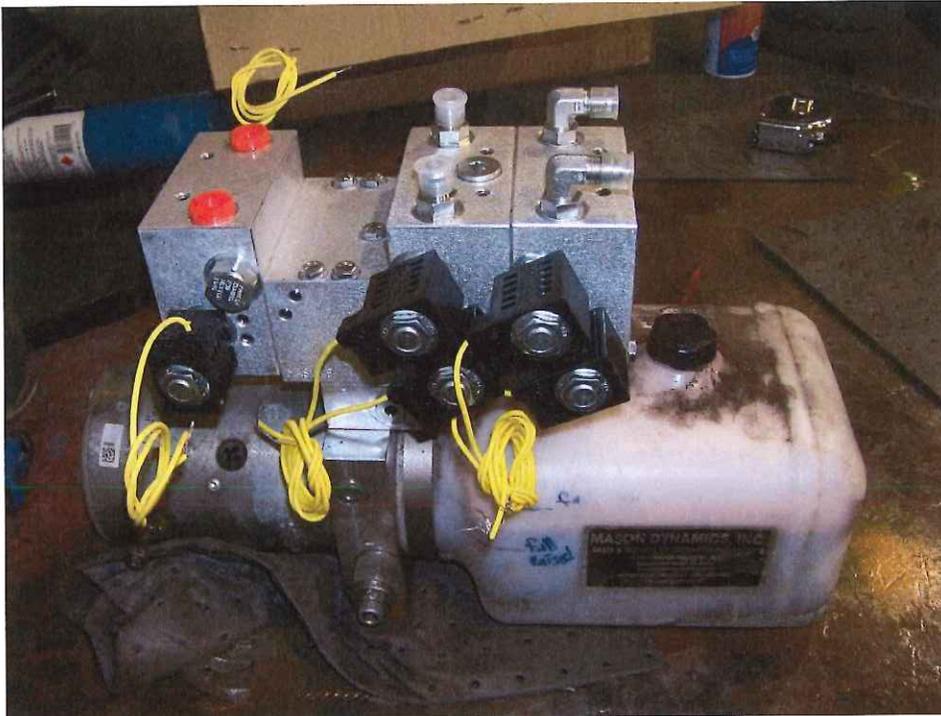
(Page 2 of 3)  
**UNSCHEDULED MAINTENANCE**  
 Champion Bus, Inc. Bus # 1617

DATE	TEST MILES	ISSUE	ACTION	LABOR HOURS	DOWN TIME
07-12-17	3,066	Left, rear spring hanger is broken and front eye bolt on left, rear spring is broken.	Replaced rear spring hanger and eye bolt.	3.00	3.00
07-13-17	3,066	Bus will not raise from the kneel position.	Troubleshooting the power supply and input circuits to the Ecomat mobile controller.	2.00	2.00
07-26-17	3,066	Clean, inspect and tighten all chassis ground points and chassis to frame ground points.	Troubleshooting the kneeling/ride height system.	2.00	2.00
07-31-17	3,066	Assist bus rep with troubleshooting the squat ride system.	Bleed the hydraulic system and adjust hydraulic pump pressure.	2.00	2.00
08-30-17	4,111	Engine light on and vehicle surging with no power.	Dealer ECM reflash. Under warranty.	1.00	1.00
09-18-17	4,572	Right, front coil spring is broken.	Replaced right, front coil spring.	2.00	2.00
10-24-17	4,800	Broken bracket on charcoal canister on left side.	Welded bracket.	1.00	1.00
10-25-17	4,801	Left, front coil spring is broken.	Removed both front kneeling springs and replaced with OEM springs, per Bus rep.	6.00	3.00
10-25-17	4,801	Right, rear spring shackle is broken.	Replaced broken shackle.	3.00	1.00
10-30-17	5,349	Exhaust system is loose.	Replaced broken tailpipe hanger.	1.00	1.00

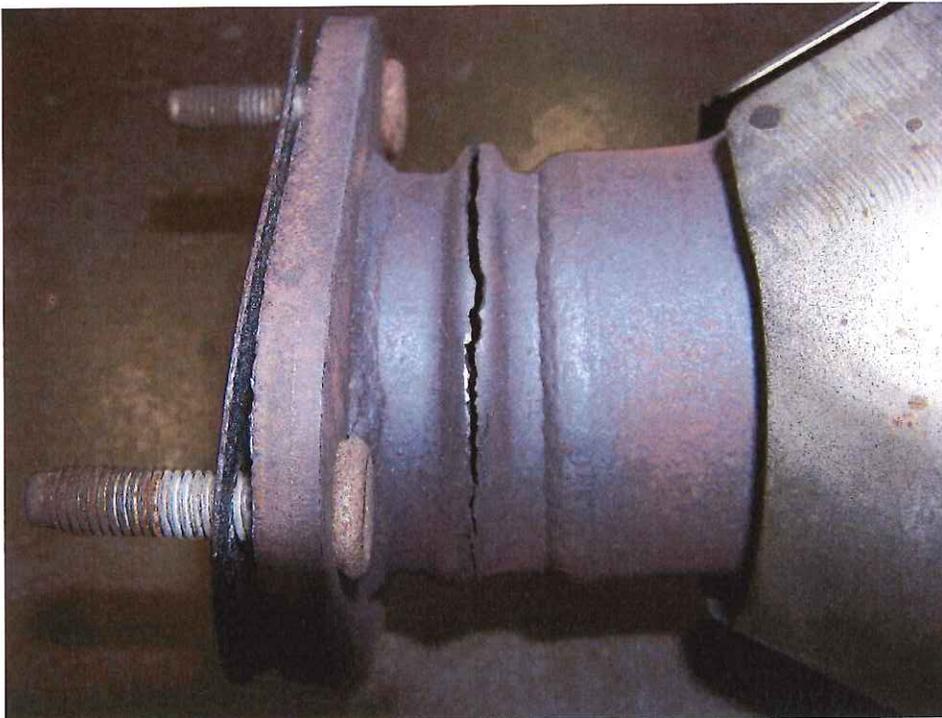
(Page 3 of 3)  
**UNSCHEDULED MAINTENANCE**  
 Champion Bus, Inc. Bus # 1617

DATE	TEST MILES	ISSUE	ACTION	LABOR HOURS	DOWN TIME
10-30-17	5,349	Left, front tire has bolt in tread.	Removed bolt installed tire plug. Rotated tire to left, rear.	1.00	1.00
11-08-17	7,060	Exhaust pipe behind catalytic converter has two grooves worn from rubbing on cross beam.	Exhaust pipe was welded to fill grooves and a plate was added to the top of the cross beam to prevent additional wear.	1.00	1.00
11-09-17	7,245	Bolts are broken on front hanger of both rear springs.	Replaced bolts.	4.00	2.00

## UNSCHEDULED MAINTENANCE



**HYDRAULIC PUMP REPLACED  
378 TEST MILES**



**CATALYTIC CONVERTER CRACKED  
1,414 TEST MILES**

**UNSCHEDULED MAINTENANCE CONT.**



**LEFT, FRONT COIL SPRING IS BROKEN  
1,620 TEST MILES**



**LEFT, FRONT HYDRAULIC KNEELING CYLINDER  
1,620 TEST MILES**

**UNSCHEDULED MAINTENANCE CONT.**



**LEFT, REAR SPRING HANGER FAILURE  
3,066 TEST MILES**



**RIGHT, REAR SPRING SHACKLE  
4,801 TEST MILES**

**UNSCHEDULED MAINTENANCE CONT.**



**FRONT LEAF SPRING BOLTS ON REAR AXLE REPLACED X 2  
7,245 TEST MILES**

## **6. FUEL ECONOMY TEST - A FUEL CONSUMPTION TEST USING AN APPROPRIATE OPERATING CYCLE**

### **6-I. TEST OBJECTIVE**

The objective of this test is to provide accurate comparable fuel consumption data on transit buses produced by different manufacturers. This fuel economy test bears no relation to the calculations done by the Environmental Protection Agency (EPA) to determine levels for the Corporate Average Fuel Economy Program. EPA's calculations are based on tests conducted under laboratory conditions intended to simulate city and highway driving. This fuel economy test, as designated here, is a measurement of the fuel expended by a vehicle traveling a specified test loop under specified operating conditions. The results of this test will not represent actual mileage but will provide data that can be used by recipients to compare buses tested by this procedure.

### **6-II. TEST DESCRIPTION**

This test requires operation of the bus over a course based on the Transit Coach Operating Duty Cycle (ADB Cycle) at seated load weight using a procedure based on the Fuel Economy Measurement Test (Engineering Type) For Trucks and Buses: SAE 1376 July 82. The procedure has been modified by elimination of the control vehicle and by modifications as described below. The inherent uncertainty and expense of utilizing a control vehicle over the operating life of the facility is impractical.

The fuel economy test will be performed as soon as possible (weather permitting) after the completion of the GVW portion of the structural durability test. It will be conducted on the bus test lane at the Penn State Test Facility. Signs are erected at carefully measured points which delineate the test course. A test run will comprise 3 CBD phases, 2 Arterial phases, and 1 Commuter phase. An electronic fuel measuring system will indicate the amount of fuel consumed during each phase of the test. The test runs will be repeated until there are at least two runs in both the clockwise and counterclockwise directions in which the fuel consumed for each run is within  $\pm 4$  percent of the average total fuel used over the 4 runs. A 20-minute idle consumption test is performed just prior to and immediately after the driven portion of the fuel economy test. The amount of fuel consumed while operating at normal/low idle is recorded on the Fuel Economy Data Form. This set of four valid runs along with idle consumption data comprise a valid test.

The test procedure is the ADB cycle with the following four modifications:

1. The ADB cycle is structured as a set number of miles in a fixed time in the following order: CBD, Arterial, CBD, Arterial, CBD, and Commuter. A separate idle fuel consumption measurement is performed at the beginning and end of the fuel economy test. This phase sequence permits the reporting of fuel consumption for each of these phases separately, making the data more useful to bus manufacturers and transit properties.
2. The operating profile for testing purposes shall consist of simulated transit type service at seated load weight. The three test phases (figure 6-1) are: a central business district (CBD) phase of 2 miles with 7 stops per mile and a top speed of 20 mph; an arterial phase of 2 miles with 2 stops per mile and a top speed of 40 mph; and a commuter phase of 4 miles with 1 stop and a maximum speed of 40 mph. At each designated stop the bus will remain stationary for seven seconds. During this time, the passenger doors shall be opened and closed.
3. The individual ADB phases remain unaltered with the exception that 1 mile has been changed to 1 lap on the Penn State Test Track. One lap is equal to 5,042 feet. This change is accommodated by adjusting the cruise distance and time.
4. The acceleration profile, for practical purposes and to achieve better repeatability, has been changed to "full throttle acceleration to cruise speed".

## FUEL ECONOMY CALCULATION PROCEDURE

### **For diesel, gasoline, methanol and fuels in the liquid state.**

The reported fuel economy is based on the following: measured test quantities-- distance traveled (miles) and fuel consumed (pounds); standard reference values-- density of water at 60EF (8.3373 lb./gal) and volumetric heating value of standard fuel; and test fuel specific gravity (unitless) and volumetric heating value (BTU/gal). These combine to give a fuel economy in miles per gallon (mpg) which is corrected to a standard gallon of fuel referenced to water at 60EF. This eliminates fluctuations in fuel economy due to fluctuations in fuel quality. This calculation has been programmed into a computer and the data processing is performed automatically.

The fuel economy correction consists of three steps:

- 1.) Divide the number of miles of the phase by the number of pounds of fuel consumed

phase	miles per phase	total miles per run
CBD	1.9097	5.7291
ART	1.9097	3.8193
COM	3.8193	3.8193

$$FEO_{mi/lb.} = \text{Observed fuel economy} = \frac{\text{miles}}{\text{lb. of fuel}}$$

- 2.) Convert the observed fuel economy to miles per gallon [mpg] by multiplying by the specific gravity of the test fuel  $G_s$  (referred to water) at 60°F and multiply by the density of water at 60°F

$$FEO_{mpg} = FEC_{mi/lb.} \times G_s \times G_w$$

where  $G_s$  = Specific gravity of test fuel at 60°F (referred to water)  
 $G_w$  = 8.3373 lb./gal

- 3.) Correct to a standard gallon of fuel by dividing by the volumetric heating value of the test fuel ( $H$ ) and multiplying by the volumetric heating value of standard reference fuel ( $Q$ ). Both heating values must have the same units.

$$FEC = FEO_{mpg} \times \frac{Q}{H}$$

where

$H$  = Volumetric heating value of test fuel [BTU/gal]

$Q$  = Volumetric heating value of standard reference fuel

Combining steps 1-3 yields

$$\Rightarrow FEC = \frac{\text{miles}}{\text{lb.}} \times (G_s \times G_w) \times \frac{Q}{H}$$

- 4.) Covert the fuel economy from mpg to an energy equivalent of miles per BTU. Since the number would be extremely small in magnitude, the energy equivalent will be represented as miles/BTUx10<sup>6</sup>.

Eq = Energy equivalent of converting mpg to mile/BTUx10<sup>6</sup>.

$$Eq = ((\text{mpg})/(\text{H})) \times 10^6$$

### 6-III. DISCUSSION

This is a comparative test of fuel economy using gasoline fuel with a heating value of 19,303 btu/lb. The driving cycle consists of Central Business District (CBD), Arterial (ART), and Commuter (COM) phases as described in 6-II. The fuel consumption for each driving cycle and for idle is measured separately. The results are corrected to a reference fuel with a volumetric heating value of 126,700.0 btu/gal.

An extensive pretest maintenance check is made including the replacement of all lubrication fluids. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection. The next four Fuel Economy Forms provide the data from the four test runs. Finally, the summary sheet provides the average fuel consumption. The overall average is based on total fuel and total mileage for each phase. The overall average fuel consumption values were; CBD – 5.85 mpg, ART – 5.92 mpg, and COM – 10.53 mpg. Average fuel consumption at idle was 0.59 G/hr.

## FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Page 1 of 3

Bus Number: 1617	Date: 08-11-17	SLW (lb.): 15,810
Personnel: S.R.,E.L.,P.D. & T.S.		

FUEL SYSTEM	OK
Install fuel measurement system	✓
Replace fuel filter	N/A
Check for fuel leaks	✓
Specify fuel type (refer to fuel analysis)	Gasoline
Remarks:None noted	
BRAKES/TIRES	OK
Inspect hoses	✓
Inspect brakes	✓
Relube wheel bearings	N/A
Check tire inflation pressures (mfg. specs.)	✓
Check tire wear (less than 50%)	✓
Remarks:None noted	
COOLING SYSTEM	OK
Check hoses and connections	✓
Check system for coolant leaks	✓
Remarks:None noted	

## FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Page 2 of 3

Bus Number: 1617	Date: 08-11-17
Personnel: S.R., E.L. & P.D.	
ELECTRICAL SYSTEMS	OK
Check battery	✓
Inspect wiring	✓
Inspect terminals	✓
Check lighting	✓
Remarks: None noted	
DRIVE SYSTEM	OK
Drain transmission fluid	N/A
Replace filter/gasket	N/A
Check hoses and connections	✓
Replace transmission fluid	N/A
Check for fluid leaks	✓
Remarks: Manufacturer recommends changing transmission fluid at 60,000 miles.	
LUBRICATION	OK
Drain crankcase oil	✓
Replace filters	✓
Replace crankcase oil	✓
Check for oil leaks	✓
Check oil level	✓
Lube all chassis grease fittings	✓
Lube universal joints	✓
Replace differential lube including axles	N/A
Remarks: Manufacturer recommends changing differential lube at 105,000 miles.	

## FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Page 3 of 3

Bus Number: 1617	Date: 08-11-17
Personnel: S.R., E.L. & P.D.	
EXHAUST/EMISSION SYSTEM	OK
Check for exhaust leaks	✓
Remarks: None noted	
ENGINE	OK
Replace air filter	✓
Inspect air compressor and air system	✓
Inspect vacuum system, if applicable	✓
Check and adjust all drive belts	✓
Check cold start assist, if applicable	✓
Remarks: None noted	
STEERING SYSTEM	OK
Check power steering hoses and connectors	✓
Service fluid level	✓
Check power steering operation	✓
Remarks: None noted	
	OK
Ballast bus to seated load weight	✓
TEST DRIVE	OK
Check brake operation	✓
Check transmission operation	✓
Remarks: None noted	

## FUEL ECONOMY PRE-TEST INSPECTION FORM

Page 1 of 1

Bus Number: 1617	Date: 09-01-17
Personnel: T.S., E.D. & C.S.	
<b>PRE WARM-UP</b>	If OK, Initial
Fuel Economy Pre-Test Maintenance Form is complete	T.S.
Cold tire pressure (psi): Front <u>75</u> Middle <u>N/A</u> Rear <u>80</u>	C.S.
Engine oil level	C.S.
Engine coolant level	C.S.
Interior and exterior lights on, evaporator fan on	C.S.
Fuel economy instrumentation installed and working properly.	T.S.
Fuel line -- no leaks or kinks	T.S.
Speed measuring system installed on bus. Speed indicator installed in front of bus and accessible to TECH and Driver.	E.D.
Bus is loaded to SLW	T.S.
<b>WARM-UP</b>	If OK, Initial
Bus driven for at least one hour warm-up	C.S.
No extensive or black smoke from exhaust	C.S.
<b>POST WARM-UP</b>	If OK, Initial
Warm tire pressure (psi): Front <u>80</u> Middle <u>N/A</u> Rear <u>83</u>	T.S.
Environmental conditions Average wind speed <12 mph and maximum gusts <15 mph Ambient temperature between 30°F(-1C°) and 90°F(32°C) Track surface is dry Track is free of extraneous material and clear of interfering traffic	T.S.

### FUEL ECONOMY DATA FORM (Liquid Fuels)

Page 1 of 4

Bus Number: 1617		Manufacturer: Champion		Date: 09-01-17			
Run Number: 1		Personnel: T.S.E.D. & C.S.					
Test Direction: <input type="checkbox"/> CW or <input checked="" type="checkbox"/> CCW		Temperature (°F): 58		Humidity (%): 51			
SLW (lbs): 15,810		Wind Speed (mph) & Direction: 11 ENE		Barometric Pressure (in.Hg): 30.20			
Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Flow Meter Reading (gals)		Fuel Used (gals)
	Start	Finish			Start	Finish	
CBD #1	0	8:37	8:37	19.9	0	.357	.357
ART #1	0	3:55	3:55	18.6	0	.353	.353
CBD #2	0	8:16	8:16	19.2	0	.345	.345
ART #2	0	3:56	3:56	18.5	0	.344	.344
CBD #3	0	8:14	8:14	19.1	0	.347	.347
COMMUTER	0	6:07	6:04	20.0	0	.395	.395
Total Fuel = 2.141 gals							
20 minute idle : Total Fuel Used = .209 gals							
Heating Value = 19,303.00 BTU/LB							
Comments: Passenger entry door does not open while in drive.							

**FUEL ECONOMY DATA FORM (Liquid Fuels)**

Page 2 of 4

Bus Number: 1617		Manufacturer: Champion		Date: 09-01-17			
Run Number: 2		Personnel: T.S.E.D. & C.S.					
Test Direction: <input checked="" type="checkbox"/> CW or <input type="checkbox"/> CCW		Temperature (°F): 62		Humidity (%): 44			
SLW (lbs): 15,810		Wind Speed (mph) & Direction: 5 N		Barometric Pressure (in.Hg): 30.19			
Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Flow Meter Reading (gals)		Fuel Used (gals)
	Start	Finish			Start	Finish	
CBD #1	0	8:19	8:19	21.2	0	.343	.343
ART #1	0	4:02	4:02	20.9	0	.323	.323
CBD #2	0	8:07	8:07	20.1	0	.358	.358
ART #2	0	4:02	4:02	21.3	0	.323	.323
CBD #3	0	8:12	8:12	21.4	0	.345	.345
COMMUTER	0	6:17	6:17	22.3	0	.378	.378
Total Fuel = 2.070 gals							
20 minute idle : Total Fuel Used = N/A gals							
Heating Value = 19,303.00 BTU/LB							
Comments: Passenger entry door does not open while in drive.							

### FUEL ECONOMY DATA FORM (Liquid Fuels)

Page 3 of 4

Bus Number: 1617		Manufacturer: Champion		Date: 09-06-17			
Run Number: 3		Personnel: T.G. & E.L.					
Test Direction: <input type="checkbox"/> CW or <input checked="" type="checkbox"/> CCW		Temperature (°F): 60		Humidity (%): 90			
SLW (lbs): 15,810		Wind Speed (mph) & Direction: 0		Barometric Pressure (in.Hg): 29.88			
Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Flow Meter Reading (gals)		Fuel Used (gals)
	Start	Finish			Start	Finish	
CBD #1	0	8:16	8:16	19.6	0	.349	.349
ART #1	0	3:56	3:56	19.8	0	.360	.360
CBD #2	0	8:16	8:16	19.8	0	.349	.349
ART #2	0	3:55	3:55	20.0	0	.356	.356
CBD #3	0	8:14	8:14	19.6	0	.349	.349
COMMUTER	0	5:58	5:58	19.9	0	.393	.393
Total Fuel = 2.156 gals							
20 minute idle : Total Fuel Used = N/A gals							
Heating Value = 19,303.00 BTU/LB							
Comments: None noted							

### FUEL ECONOMY DATA FORM (Liquid Fuels)

Page 4 of 4

Bus Number: 1617		Manufacturer: Champion		Date: 09-06-17			
Run Number: 4		Personnel: T.G. & E.D.					
Test Direction: <input checked="" type="checkbox"/> CW or <input type="checkbox"/> CCW		Temperature (°F): 62		Humidity (%): 88			
SLW (lbs): 15,810		Wind Speed (mph) & Direction: 0		Barometric Pressure (in.Hg):			
Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Flow Meter Reading (gals)		Fuel Used (gals)
	Start	Finish			Start	Finish	
CBD #1	0	8:15	8:15	20.4	0	.338	.338
ART #1	0	3:56	3:56	20.8	0	.342	.342
CBD #2	0	8:16	8:16	20.4	0	.340	.340
ART #2	0	3:56	3:56	21.9	0	.342	.342
CBD #3	0	8:14	8:14	21.4	0	.343	.343
COMMUTER	0	6:00	6:00	21.7	0	.376	.376
Total Fuel = 2.081 gals							
20 minute idle : Total Fuel Used = .208 gals							
Heating Value = 19,303.00 BTU/LB							
Comments: None noted							

FUEL ECONOMY SUMMARY SHEET

BUS MANUFACTURER :Champion Bus, Inc.      BUS NUMBER :1617  
 BUS MODEL :LF Transport                      TEST DATE :09-01-17

FUEL TYPE : GASOLINE  
 SP. GRAVITY : .7375  
 HEATING VALUE : 19303.00 BTU/Lb  
 FUEL TEMPERATURE : 68.50 deg F  
 Standard Conditions : 60 deg F and 14.7 psi  
 Density of Water : 8.3373 lb/gallon at 60 deg F

CYCLE	TOTAL FUEL USED (GAL)	TOTAL MILES	FUEL ECONOMY MPG (Measured)	FUEL ECONOMY MPG (Corrected)
Run # :1, CCW				
CBD	1.049	5.73	5.462	5.80
ART	.697	3.82	5.481	5.82
COM	.395	3.82	9.671	10.27
TOTAL	2.141	13.37	6.245	6.63
Run # :2, CW				
CBD	1.046	5.73	5.478	5.82
ART	.646	3.82	5.913	6.28
COM	.378	3.82	10.106	10.73
TOTAL	2.070	13.37	6.459	6.86
Run # :3, CCW				
CBD	1.047	5.73	5.473	5.81
ART	.716	3.82	5.335	5.67
COM	.393	3.82	9.720	10.32
TOTAL	2.156	13.37	6.201	6.59
Run # :4, CW				
CBD	1.021	5.73	5.612	5.96
ART	.684	3.82	5.585	5.93
COM	.376	3.82	10.160	10.79
TOTAL	2.081	13.37	6.425	6.82

-----  
 IDLE CONSUMPTION (MEASURED)  
 -----

First 20 Minutes Data : 0.21GAL      Last 20 Minutes Data : 0.21GAL  
 Average Idle Consumption : 0.63GAL/Hr

RUN CONSISTENCY: % Difference from overall average of total fuel used

-----  
 Run 1 : -1.4      Run 2 : 2.0      Run 3 : -2.1      Run 4 : 1.5

SUMMARY (CORRECTED VALUES)  
 -----

Average Idle Consumption : .59 G/Hr  
 Average CBD Phase Consumption : 5.85 MPG  
 Average Arterial Phase Consumption : 5.92 MPG  
 Average Commuter Phase Consumption : 10.53 MPG  
 Overall Average Fuel Consumption : 6.73 MPG  
 Overall Average Fuel Consumption : 56.66 Miles/ Million BTU

## 7. NOISE

### 7.1 INTERIOR NOISE AND VIBRATION TESTS

#### 7.1-I. TEST OBJECTIVE

The objective of these tests is to measure and record interior noise levels and check for audible vibration under various operating conditions.

#### 7.1-II. TEST DESCRIPTION

During this series of tests, the interior noise level will be measured at several locations with the bus operating under the following three conditions:

1. With the bus stationary, a white noise generating system shall provide a uniform sound pressure level equal to 80 dB(A) on the left, exterior side of the bus. The engine and all accessories will be switched off and all openings including doors and windows will be closed. This test will be performed at the Test Track Facility.
2. The bus accelerating at full throttle from a standing start to 35 mph on a level pavement. All openings will be closed and all accessories will be operating during the test. This test will be performed on the track at the Test Track Facility.
3. The bus will be operated at various speeds from 0 to 55 mph with and without the air conditioning and accessories on. Any audible vibration or rattles will be noted. This test will be performed on the test segment between the Test Track and the Bus Testing Center.

All tests will be performed in an area free from extraneous sound-making sources or reflecting surfaces. The ambient sound level as well as the surrounding weather conditions will be recorded in the test data.

#### 7.1-III. DISCUSSION

This test is performed in three parts. The first part exposes the exterior of the vehicle to 80.0 dB(A) on the left side of the bus and the noise transmitted to the interior is measured. The overall average of the six measurements was 48.2 dB(A); ranging from 46.9 dB(A) at the rear passenger seats to 48.8 dB(A) in line with the middle speaker. The interior ambient noise level for this test was less than 30.0 dB(A).

The second test measures interior noise during acceleration from 0 to 35 mph. This noise level ranged from 75.1 dB(A) at the rear passenger seats 78.3 dB(A) at the driver's seat. The overall average was 76.5 dB(A). The interior ambient noise level for this test was less than 30.0 dB(A).

The third part of the test is to listen for resonant vibrations, rattles, and other noise sources while operating over the road. No vibrations or rattles were noted.

**INTERIOR NOISE TEST DATA FORM**  
**Test Condition 1: 80 dB(A) Stationary White Noise**

Page 1 of 3

Bus Number: 1617	Date: 10-27-17
Personnel: S.R., E.L. & P.D.	
Temperature (°F): 57	Humidity (%): 48
Wind Speed (mph): 6	Wind Direction: SE
Barometric Pressure (in.Hg): 30.00	
Initial Sound Level Meter Calibration: 93.9 dB(A)	
Interior Ambient Noise Level dB(A): < 30.0	Exterior Ambient Noise Level dB(A): 40.4
Microphone Height During Testing (in): 47.2	
Initial Reading at Bus: 80.2 dB(A)	Final Reading at Bus: 80.0 dB(A)

Reading Location	Measured Sound Level dB(A)
Driver's Seat	48.7
Front Passenger Seats	48.6
In Line with Front Speaker	48.7
In Line with Middle Speaker	48.8
In Line with Rear Speaker	47.6
Rear Passenger Seats	46.9

Final Sound Level Meter Calibration: 93.9 dB(A)
---

<b>Comments:</b> None noted

**INTERIOR NOISE TEST DATA FORM**  
**Test Condition 2: 0 to 35 mph Acceleration Test**

Page 2 of 3

Bus Number: 1617	Date: 08-02-17
Personnel: T.G. & T.S.	
Temperature (°F): 85	Humidity (%): 50
Wind Speed (mph): 5	Wind Direction: W
Barometric Pressure (in.Hg): 30.05	
Initial Sound Level Meter Calibration: 93.9 dB(A)	
Interior Ambient Noise Level dB(A): < 30.0	Exterior Ambient Noise Level dB(A): 43.2
Microphone Height During Testing (in): 45.5	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	78.3
Front Passenger Seats	76.9
Middle Passenger Seats	75.7
Rear Passenger Seats	75.1

Final Sound Level Meter Calibration: 93.9 dB(A)
---

<b>Comments:</b> None noted

**INTERIOR NOISE TEST DATA FORM**  
**Test Condition 3: Audible Vibration Test**

Page 3 of 3

Bus Number: 1617	Date: 08-02-17
Personnel: T.S., T.G. & S.B.	
Temperature (°F): 87	

Describe the following possible sources of noise and give the relative location on the bus.

Source of Noise	Location	Description of Noise
Engine and Accessories	N/A	None noted
Windows and Doors	N/A	None noted
Seats and Wheel Chair lifts	N/A	None noted
Other	N/A	None noted

<b>Comment on any other vibration or noise source which may have occurred that is not described above:</b> None noted
<b>Comments:</b> None noted

## 7.1 INTERIOR NOISE TEST



**TEST BUS SET-UP FOR 80 dB(A)  
INTERIOR NOISE TEST**

## 7.2 EXTERIOR NOISE TESTS

### 7.2-I. TEST OBJECTIVE

The objective of this test is to record exterior noise levels when a bus is operated under various conditions.

### 7.2-II. TEST DESCRIPTION

In the exterior noise tests, the bus will be operated at a SLW in three different conditions using a smooth, straight and level roadway:

1. Accelerating at full throttle from a constant speed at or below 35 mph and just prior to transmission up shift.
2. Accelerating at full throttle from standstill.
3. Stationary, with the engine at low idle, high idle, and wide open throttle.

In addition, the buses will be tested with and without the air conditioning and all accessories operating. The exterior noise levels will be recorded.

The test site is at the PSBRTF and the test procedures will be in accordance with SAE Standards SAE J366b, Exterior Sound Level for Heavy Trucks and Buses. The test site is an open space free of large reflecting surfaces. A noise meter placed at a specified location outside the bus will measure the noise level.

During the test, special attention should be paid to:

1. The test site characteristics regarding parked vehicles, signboards, buildings, or other sound-reflecting surfaces
2. Proper usage of all test equipment including set-up and calibration
3. The ambient sound level

### 7.2-III. DISCUSSION

The Exterior Noise Test determines the noise level generated by the vehicle under different driving conditions and at stationary low and high idle, with and without air conditioning and accessories operating. The test site is a large, level, bituminous paved area with no reflecting surfaces nearby.

With an outside ambient noise level of 40.7 dB(A), the average test result obtained while accelerating from a constant speed was 69.12 dB(A) on the right side and 70.86 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 41.5 dB(A), the average of the results obtained were 70.28 dB(A) on the right side and 73.88 dB(A) on the left side.

With the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 47.8 dB(A) at low idle, 59.2 dB(A) at high idle, and 68.6 dB(A) at wide open throttle. With the accessories and air conditioning off, the readings averaged 0.3 dB(A) higher at low idle, 1.3 dB(A) higher at high idle, and 0.4 dB(A) lower at wide open throttle. The exterior ambient noise level measured during this test was 44.4 dB(A).

## EXTERIOR NOISE TEST DATA FORM

### Accelerating from Constant Speed

Page 1 of 3

Bus Number: 1617		Date: 08-08-17	
Personnel: T.S. & S.R.			
Temperature (°F): 72		Humidity (%): 52	
Wind Speed (mph): 5		Wind Direction: NW	
Barometric Pressure (in.Hg): 30.00			
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■			
Initial Sound Level Meter Calibration: 93.9 dB(A)			
Exterior Ambient Noise Level: 40.7 dB(A)			
Accelerating from Constant Speed Curb (Right) Side		Accelerating from Constant Speed Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	68.5	1	70.5
2	70.0	2	70.5
3	68.6	3	70.8
4	69.4	4	71.4
5	69.1	5	71.1
6	N/A	6	N/A
7	N/A	7	N/A
8	N/A	8	N/A
9	N/A	9	N/A
10	N/A	10	N/A
Average of two highest actual noise levels = 69.7 dB(A)		Average of two highest actual noise levels = 71.25 dB(A)	
Final Sound Level Meter Calibration Check: 93.9 dB(A)			
<b>Comments:</b> None noted			

## EXTERIOR NOISE TEST DATA FORM

### Accelerating from Standstill

Page 2 of 3

Bus Number: 1617		Date: 08-08-17	
Personnel: T.S. & S.R.			
Temperature (°F): 73		Humidity (%): 51	
Wind Speed (mph): 6		Wind Direction: NW	
Barometric Pressure (in.Hg): 30.00			
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■			
Initial Sound Level Meter Calibration: 93.9 dB(A)			
Exterior Ambient Noise Level: 41.5 dB(A)			
Accelerating from Standstill Curb (Right) Side		Accelerating from Standstill Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	68.9	1	72.8
2	70.2	2	74.1
3	70.0	3	74.1
4	71.3	4	74.3
5	71.0	5	74.1
6	N/A	6	N/A
7	N/A	7	N/A
8	N/A	8	N/A
9	N/A	9	N/A
10	N/A	10	N/A
Average of two highest actual noise levels = 71.15 dB(A)		Average of two highest actual noise levels = 74.2 dB(A)	
Final Sound Level Meter Calibration Check: 93.9 dB(A)			
<b>Comments:</b> None noted			

## EXTERIOR NOISE TEST DATA FORM

### Stationary

Page 3 of 3

Bus Number: 1617		Date: 08-08-17	
Personnel: T.S. & S.R.			
Temperature (°F): 74		Humidity (%): 50	
Wind Speed (mph): 6		Wind Direction: NW	
Barometric Pressure (in.Hg): 30.00			
Initial Sound Level Meter Calibration: 93.9 dB(A)			
Exterior Ambient Noise Level: 44.4 dB(A)			
Accessories and Air Conditioning ON			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side dB(A)
		Measured	Measured
Low Idle	620	47.6	47.9
High Idle	1500	60.7	57.7
Wide Open Throttle	3459	69.0	68.2
Accessories and Air Conditioning OFF			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side dB(A)
		Measured	Measured
Low Idle	625	46.9	49.2
High Idle	1500	59.0	61.9
Wide Open Throttle	3460	68.3	68.0
Final Sound Level Meter Calibration Check: 93.9 dB(A)			
<b>Comments:</b> None noted			

## 7.2 EXTERIOR NOISE TESTS



**TEST BUS SET-UP FOR EXTERIOR NOISE TEST**

## **8. EMISSIONS TEST – DYNAMOMETER-BASED EMISSIONS TEST USING TRANSIT DRIVING CYCLES**

### **8-I. TEST OBJECTIVE**

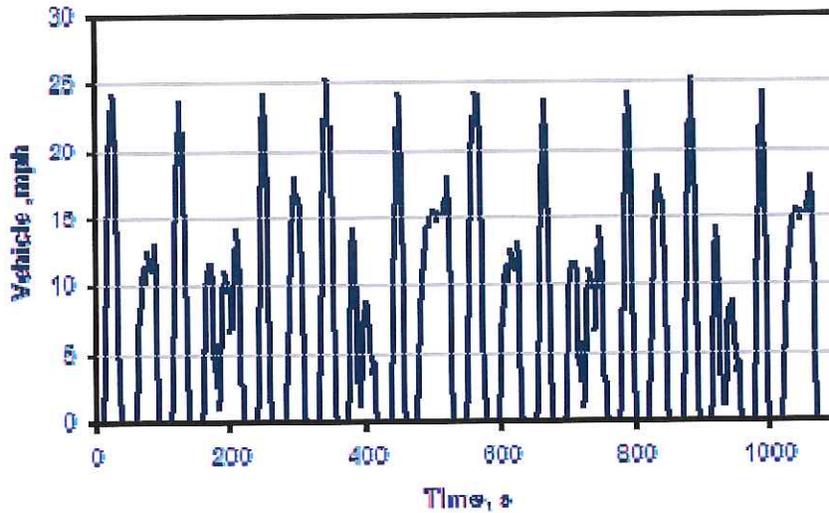
The objective of this test is to provide comparable emissions data on transit buses produced by different manufacturers. This chassis-based emissions test bears no relation to engine certification testing performed for compliance with the Environmental Protection Agency (EPA) regulation. EPA's certification tests are performed using an engine dynamometer operating under the Federal Test Protocol. This emissions test is a measurement of the gaseous engine emissions CO, CO<sub>2</sub>, NO<sub>x</sub>, HC and particulates (diesel vehicles) produced by a vehicle operating on a large-roll chassis dynamometer. The test is performed for three differed driving cycles intended to simulate a range of transit operating environments. The cycles consist of Manhattan Cycle, the Orange County Bus driving cycle, and the Urban Dynamometer Driving Cycle (UDDS). The test is performed under laboratory conditions in compliance with EPA 1065 and SAE J2711. The results of this test may not represent actual in-service vehicle emissions but will provide data that can be used by recipients to compare buses tested under different operating conditions.

### **8-II. TEST DESCRIPTION**

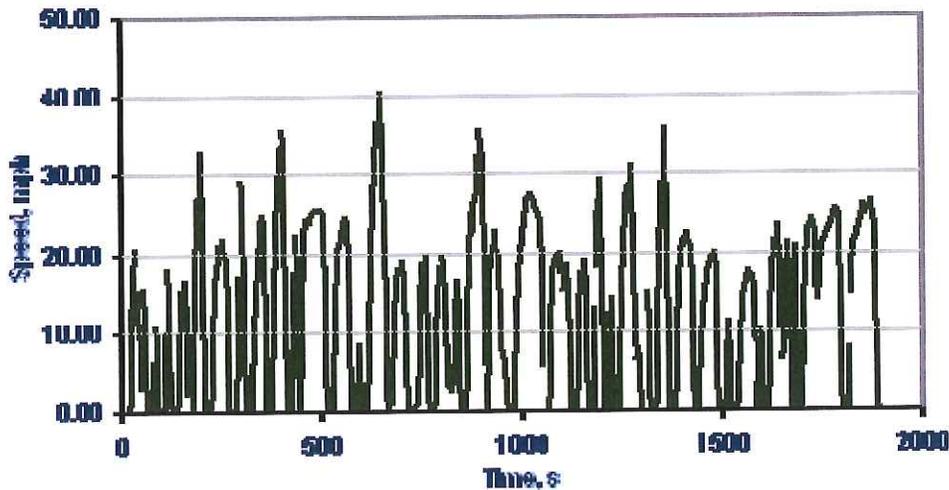
This test is performed in the emissions bay of the LTI Vehicle Testing Laboratory. The Laboratory is equipped with a Schenk Pegasus 300 HP, large-roll (72 inch diameter) chassis dynamometer suitable for heavy-vehicle emissions testing. The emissions laboratory provides capability for testing heavy-duty diesel and alternative-fueled buses for a variety of tailpipe emissions including particulate matter, oxides of nitrogen, carbon monoxide, carbon dioxide, and hydrocarbons. It is equipped with a Horiba full-scale CVS dilution tunnel and emissions sampling system. The system includes Horiba Mexa 7400 Series gas analyzers and a Horiba HF47 Particulate Sampling System. Test operation is automated using Horiba CDTCS software. The computer controlled dynamometer is capable of simulating over-the-road operation for a variety of vehicles and driving cycles.

The emissions test will be performed as soon as permissible after the completion of the GVW portion of the structural durability test. The driving cycles are the Manhattan cycle, a low average speed, highly transient urban cycle (Figure 1), the Orange County Bus Cycle which consists of urban and highway

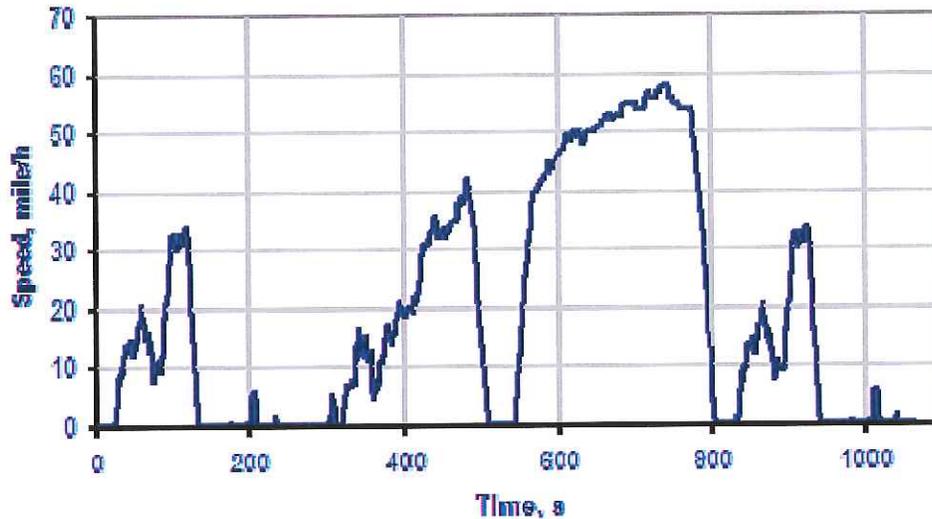
driving segments (Figure 2), and the EPA UDDS Cycle (Figure 3). An emissions test will comprise of two runs for the three different driving cycles, and the average value will be reported. Test results reported will include the average grams per mile value for each of the gaseous emissions for gasoline buses, for all the three driving cycles. In addition, the particulate matter emissions are included for diesel buses, and non-methane hydrocarbon emissions (NMHC) are included for CNG buses. Testing is performed in accordance with EPA CFR49, Part 1065 and SAE J2711 as practically determined by the FTA Emissions Testing Protocol developed by West Virginia University and Penn State University.



**Figure 1.** Manhattan Driving Cycle (duration 1089 sec, Maximum speed 25.4mph, average speed 6.8mph)



**Figure 2.** Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41mph, Average Speed 12mph)



**Figure 3.** HD-UDDS Cycle (duration 1060seconds, Maximum Speed 58mph, Average Speed 18.86mph)

### 8-III. TEST ARTICLE

The test article is a Champion Bus, Inc. model LF Transport bus equipped with gasoline fueled Ford Motor Co. 6.8L engine. The bus was tested on September 14, 2017 with the odometer reading 8,176 miles.

### 8-IV. TEST EQUIPMENT

Testing is performed in the LTI Vehicle Testing Laboratory emissions testing bay. The test bay is equipped with a Schenk Pegasus 72-inch, large-roll chassis dynamometer. The dynamometer is electronically controlled to account for vehicle road-load characteristics and for simulating the inertia characteristics of the vehicle. Power to the roller is supplied and absorbed through an electronically controlled 3-phase ac motor. Absorbed power is dumped back onto the electrical grid.

Vehicle exhaust is collected by a Horiba CVS, full-flow dilution tunnel. The system has separate tunnels for diesel and gasoline/natural gas fueled vehicles.

In the case of diesel vehicles, particulate emissions are measured gravimetrically using 47mm Teflon filters. These filters are housed in a Horiba HF47 particulate sampler, per EPA 1065 test procedures.. Heated gaseous emissions of hydrocarbons and NOx are sampled by Horiba heated oven analyzers. Gaseous emissions for CO, CO2 and cold NOx are measured using a Horiba Mexa 7400 series gas analyzer. System operation, including the operation of the chassis dynamometer, and all calculations are controlled by a Dell workstation running Horiba CDCTS test control software. Particulate Filters are weighed in a glove box using a Sartorius microbalance accurate to 1 microgram.

#### 8-V. TEST PREPARATION AND PROCEDURES

All vehicles are prepared for emissions testing in accordance with the Fuel Economy Pre-Test Maintenance Form. (In the event that fuel economy test was performed immediately prior to emissions testing this step does not have to be repeated) This is done to ensure that the bus is tested in optimum operating condition. The manufacturer-specified preventive maintenance shall be performed before this test. The ABS system and when applicable, the regenerative braking system are disabled for operation on the chassis dynamometer. Any manufacturer-recommended changes to the pre-test maintenance procedure must be noted on the revision sheet. The Fuel Economy Pre-Test Inspection Form will also be completed before performing. Both the Fuel Economy Pre-Test Maintenance Form and the Fuel Economy Pre-Test Inspection Form are found in Section 6.0.

Prior to performing the emissions test, each bus is evaluated to determine its road-load characteristics using coast-down techniques in accordance with SAE J1263. This data is used to program the chassis dynamometer to accurately simulate over-the-road operation of the bus.

Warm-up consists of driving the bus for 20 minutes at approximately 40 mph on the chassis dynamometer. The test driver follows the prescribed driving cycle watching the speed trace and instructions on the Horiba Drivers-Aid monitor which is placed in front of the windshield. The CDCTS computer monitors driver performance and reports any errors that could potentially invalidate the test.

All buses are tested at half seated load weight. The base line emissions data are obtained at the following conditions:

1. Air conditioning off
2. Evaporator fan or ventilation fan on
3. One Half Seated load weight
4. Appropriate test fuel with energy content (BTU/LB.) noted in CDTCS software

5. Exterior and interior lights on
6. Heater Pump Motor off
7. Defroster off
8. Windows and Doors closed

The test tanks or the bus fuel tank(s) will be filled prior to the fuel economy test with the appropriate grade of test fuel.

#### 8-VI DISCUSSION

The following Table 1 provides the emissions testing results on a grams per mile basis for each of the exhaust constituents measured and for each driving cycle performed.

TABLE 1 Emissions Test Results

<b>Test Completed at Half SLW: 14,160 LB.</b>			
<b>Driving Cycle</b>	<b>Manhattan</b>	<b>Orange County Bus</b>	<b>UDDS</b>
<b>CO<sub>2</sub>, gm/mi</b>	1575	1320	1119
<b>CO, gm/mi</b>	0.10	0.11	0.32
<b>THC, gm/mi</b>	0.08	0.04	0.07
<b>CH<sub>4</sub>, gm/mi</b>	0.07	0.02	0.05
<b>NO<sub>x</sub>, gm/mi</b>	0.07	0.04	0.09
<b>Particulates, gm/mi</b>	N/A	N/A	N/A
<b>Fuel consumption mpg</b>	5.34	6.26	7.66

Accepted by Yamhill County  
 Board of Commissioners on  
 11/4/21 by Board Order  
 # 21-451

**ODOT PUBLIC TRANSIT VEHICLE PURCHASE**

Agency Name: Yamhill County Transit Area

Contact Person: Cynthia Thompson

35090

9/27/2021

Phone No. 503-995-7965

**STATE PRICE AGREEMENT RFQ COMPARISON FORM - LOWEST COST SELECTION**

Vehicle Useful Life Category: C

No. of Vehicles To Be Purchased: 2

No. of Regular Seats: 18

No. of ADA Stations: 3

Required Specifications:

From RFQ (attach all RFQs behind this form)

Other (Attach list or document)

Additional Preferred Options:

From RFQ (attach all RFQs behind this form)

Other (Attach list or document)

**Requested Quotes**

**PRICES QUOTED FROM VENDORS (Insert Vendor Names in Columns Below):**

Vendor: Schelky NW Sales

Vendor: Creative Bus Sales

Vendor:

Vendor:

Vehicle Make/Model Proposed:

2022 Champion LF Transport E-450

Arhoc Spirit of Mobility /Chevrolet Express 4500

Vehicle Base Price:

\$ 122,724.00

\$ 121,100.00

Cost of Required Specifications:

\$ 66,194.23

\$ 76,313.00

Total Vehicle Cost With All Required Specifications:

\$ 188,918.23

\$ 197,413.00

Cost of Additional Preferred Options (if any - enter zero if none):

\$ -

\$ 1,410.00

Total Vehicle Cost With Required Specifications and Preferred Options:

\$ 188,918.23

\$ 198,823.00

Lowest Cost Vehicle Selected:

Selected  
 Not Selected

Selected  
 Not Selected

Selected  
 Not Selected

Selected  
 Not Selected

Comments:

Very comparable vehicles. Reference checks came back with negative feedback from all agencies for Creative Bus Sales. Based on service/warranty references and confirming missing parts for the last 4 buses ordered from Creative, the Board chose Schelky NW.

**AGENCY SIGNATURE (Required):**

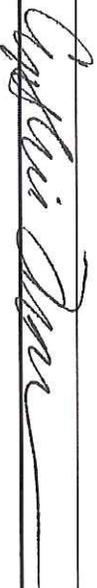
Agency Representative (enter printed name and title below)

Phone No. / E-mail address (enter below)

Cynthia Thompson

[thompsonc@co.yamhill.or.us](mailto:thompsonc@co.yamhill.or.us)

Signature of Agency Representative:



Date of Signature:

10-28-21