

FEDERAL TRANSIT BUS TEST

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

**Manufacturer: High Level Enterprises, Inc.
Model: 16 + 2WC**

**Tested in Service-Life Category
7 Year / 200,000 Miles**

November 2024

Report Number: LTI-BT-R2024-04

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**LTI BUS RESEARCH
AND TESTING CENTER**

FEDERAL TRANSIT BUS TEST

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

In accordance with 49 CFR Part, 665

Manufacturer: High Level Enterprises, Inc.
Manufacturer's address: 1060 E. Waterford St.
Wakarusa, IN 46573

Model: 16 + 2WC

Tested in Service-Life Category
7 Year / 200,000 Miles

Report Number: LTI-BT-R2024-04



David Klinikowski

Quality Authorization

Director, Bus Research
and Testing Center

Title

November 4th, 2024

Date

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EXECUTIVE SUMMARY

TEST HIGHLIGHTS

The information in this report pertains only to this specific bus, as received from the manufacturer for testing.

The Check-In section of the report provides a description of the bus and specifies its major components. The following table gives the salient specifications.

Manufacturer	High Level Enterprises, Inc.
Model	16 + 2WC
Chassis Make/Model	Ford Motor Co. / E-450
Chassis Modified	Yes
Overall Length	26 Feet, 10.2 Inches
Fuel	Gasoline
Service Life	7 Years / 200,000 Miles
Number of Seats (including driver)	Received - 17 and 2 wheelchairs Tested - 15 and 2 wheelchairs
Manufacturer-Designated Standing Passenger Capacity	0
Gross Vehicle Weight used for testing	13,420 lb.
Gross Vehicle Weight Rating	14,500 lb.
Mileage at Delivery	547 miles
Test Start Date	March 26, 2024
Test Completion Date	October 3, 2024
Report Issuance Date	November 4, 2024

The measured curb weight was 3,530 lb. for the front axle and 6,450 lb. for the rear axle. These combined weights provided a total measured curb weight of 9,980 lb. There are 17 seats including the driver, two wheelchair positions and free floor space for 10 standing passengers, bringing the potential total passenger capacity to 29. However, two seats were removed to comply with the rear axle weight rating and there is a placard stating that there are to be no standing passengers. Therefore, the gross load represents seated passengers only, for a total of 17 passengers. Gross load is calculated as $(150 \text{ lb.} \times 15) + (600 \text{ lb.} \times 2) = 3,450 \text{ lb.}$ At full declared capacity, the measured gross vehicle weight was 13,420 lb. There is a potential to overload this bus using the available seating and/or available floor space for standing passengers.

This bus has a modified chassis. The OEM chassis was modified by adding 28.5" to the frame between the axles and an additional 25.9" at the rear for a total of 54.4".

This bus experienced six Class 1 failures during testing. It was determined that two Class 1 failures needed additional miles to ensure that the repairs adequately addressed the issues. The repairs to the two Class 1 failures were made to the crossbeam on May 15, 2024 and the ADA door on July 23, 2024. No additional cracking in the crossbeam was noticed and no further issues with the ADA door falling out were noticed. All of the Class 1 failures are deemed to be corrected.

BUS TESTING BACKGROUND

On August 1, 2016, FTA announced a final rule for bus testing for improving the process of ensuring the safety and reliability of new transit buses. The rule satisfies requirements in MAP-21 to establish minimum performance standards, a standardized scoring system, and a pass-fail threshold based on the score.

FTA's Bus Testing Program (often referred to as "Altoona Testing" due to the location of the main testing center) tests new transit bus models for:

- Maintainability
- Reliability
- Safety
- Performance (including Braking Performance)
- Structural Integrity (including Structural Durability)
- Fuel Economy (Energy Efficiency and Range, for electric buses)
- Noise
- Emissions

Bus models that fail to meet one or more minimum performance standards will "fail" their test and thus be ineligible for purchase with FTA funds until the failures are resolved and validated through further testing. FTA will use this authority to make sure defects are corrected before a bus model can be acquired with FTA funding.

In each application to FTA for the purchase or lease of any new bus model, or any bus model with a major change in configuration or components to be acquired or leased with funds obligated by the FTA, the recipient shall certify that it has received the appropriate full Bus Testing Report and any applicable partial testing report(s) before final acceptance of the first vehicle. In dealing with a bus manufacturer or dealer, the recipient shall be responsible for determining whether a vehicle to be acquired requires full testing or partial testing or has already satisfied the requirements of this part. A bus manufacturer or recipient may request guidance from FTA in making these determinations.

The purpose of the testing is intended set a "Pass/Fail" standard and grade the performance of the buses in order to provide performance information to the transit authorities that can be used in their purchase or lease decisions. The intent of this report is to provide the grantee a relative measure of the performance of a particular model of transit bus against a standard of performance. The passing of this test should ensure a vehicle has a high probability of meeting its service life in the category it was tested.

The data included in this test report and other applicable reports should be reviewed to choose the most suitable bus for a grantee's operation. A higher scoring bus is not necessarily the best bus for a given application. For example, a bus with a powerful engine may score well because of its performance and gradeability, but another bus with a smaller and more fuel-efficient engine could be a better choice for applications in mostly flat areas. It is the responsibility of the grantee to ensure the proper test report or applicable partial report is in their possession and has been thoroughly reviewed.

The score sheet for the subject vehicle of this test report is provided below. **This bus passed the Altoona test, with an aggregate score of 82.6.**

High Level Enterprises, Inc. Bus 2024-04									
Test category	Standard	Base Pts.	Bonus Pts.	Range	Test Data	Score	FAIL		
1. Maintainability	Unscheduled maint.	2	14	0	53.8	9.97			
2. Reliability	# Class 2 failures	2	6	0	0	8.00			
	Hazards	10	0	P	P	10.00			
	Stability	2.5	0	P	P	2.50			
3. Safety	Lane change, 45 mph?	0.5	2	80	97.4	2.05			
	< 158 feet at 45mph	2.5	0	P	P	2.50			
	Holds Lane, Split coefficient	2.5	0	P	P	2.50			
	Parking brake, 20% grade	2.5	0	P	P	2.50			
	less than 30 sec	1.5	0	P	P	1.50			
4. Performance	Acceleration 0-30 mph	1.5	0	P	P	1.50			
	Gradeability 2.5%	2	0	P	P	2.00			
	Gradeability 10%	1	0	P	P	1.00			
	Distortion	1	0	P	P	0.00			
	Static Towing	1	0	P	P	1.00			
	Dynamic Towing	1	0	P	P	1.00			
5. Structural Integrity	Jacking	1	0	P	P	1.00			
	Hoisting	13	0	P	P	13.00			
	Durability-Structural	12	0	P	P	12.00			
	Durability-Powertrain	1	6	10	6.43	3.72			
	Liquid fuels	15-98 cf/mi	15	98	N/A	0.00			
6. Fuel Economy	CNG	1-13 mpg	1	13	N/A	0.00			
	Hydrogen	10-50 scf/mi	3	30	N/A	0.00			
	Electric	1-3 kWh/mi	0.5	0.5	76.3	0.72			
7. Noise	Int. Noise (0-35 mph)	less than 80 db	3	50	78.8	0.88			
	Ext. Noise (0-35 mph)	0-4000 g/mi	4	0	1235	3.77			
	CO ₂	0-20 g/mi	0.4	0	1.3	0.37			
	CO	0-3 g/mi	0.4	0	0.03	0.40			
8. Emissions	Total hydrocarbon	0-3 g/mi	0.4	0	0.03	0.40			
	NMHC	0-3 g/mi	0.4	0	0	0.40			
	Nitrogen oxides	0-0.1 g/m	0.4	0	0	0.40			
	Particulates	60	40	0.1	0	0.40			
Total						82.6			

Note: The use of the scoring system is not mandatory for procurement. It is only necessary that the bus being procured has received a passing score.

ABBREVIATIONS AND ACRONYMS

ABS	- anti-skid braking system
ABTC	- Altoona Bus Test Center
A/C	- air conditioner, or air conditioning
AC	- alternating current
ADA	- American Disability Act
CDCTS	- chassis dynamometer test control system
CVS	- constant volume sampling
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
DC	- direct current
DIR	- test director
DR	- bus driver
EPA	- Environmental Protection Agency
GAWR	- gross axle weight rating
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
HD-UDDS	- Heavy Duty-Urban Dynamometer Driving Schedule
LTI	- Larson Transportation Institute
mpg	- miles per gallon
mph	- miles per hour
PM	- Preventive maintenance
PSTT	- Penn State Test Track
rpm	- revolutions per minute
SAE	- Society of Automotive Engineers
SCF	- Standard cubic foot
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)
TD	- test driver
TECH	- test technician
TM	- track manager
TP	- test personnel
Wh	- Watt hour

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 consisted 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 certified 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 consisted of a High Level Enterprises, Inc., 16 + 2WC model. The bus has a streetside, front driver's door rear of the front axle, and a curbside passenger door rear of the front axle. There is a curbside ADA door equipped with a Braun Corporation NCL919FIB-2 electric fold out lift, behind the rear axle. There is also an emergency exit door at the rear of the bus. Power is provided by a gasoline-fueled, Ford Motor Company 7.3 L engine coupled to a Ford Motor Company Torqshift 6 transmission.

The measured curb weight was 3,530 lb. for the front axle and 6,450 lb. for the rear axle. These combined weights provided a total measured curb weight of 9,980 lb. There are 17 seats including the driver, two wheelchair positions and free floor space for 10 standing passengers, bringing the potential total passenger capacity to 29. However, two seats were removed to comply with the rear axle weight rating and there is a placard stating that there are to be no standing passengers. Therefore, the gross load represents seated passengers only, for a total of 17 passengers. Gross load is calculated as $(150 \text{ lb.} \times 15) + (600 \text{ lb.} \times 2) = 3,450 \text{ lb.}$ At full declared capacity, the measured gross vehicle weight was 13,420 lb. There is a potential to overload this bus using the available seating and/or available floor space for standing passengers.

VEHICLE DATA FORM

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Bus Number: 2024-04	Date of Check-In: 03/26/24
Bus Manufacturer: High Level Enterprises, Inc.	Vehicle Identification Number (VIN): 1FDXE4FN4RDD10986
Model Number: 16 + 2 WC	Chassis Mfr./Mod. #: Ford Motor Co. / E-450
Personnel: S.R., T.G., J.M. & P.D.	Starting Odometer Reading: 546.8

WEIGHT:

Individual Wheel Reactions:

Weights (lb.)	Front Axle		Middle Axle		Rear Axle	
	Curb	Street	Curb	Street	Curb	Street
CW	1,780	1,750	N/A	N/A	3,440	3,010
SLW	1,780	2,060	N/A	N/A	4,820	4,760
GVW	1,780	2,060	N/A	N/A	4,820	4,760

Total Weight Details:

Weight (lb.)	CW	SLW	GVW	GAWR
Front Axle	3,530	3,840	3,840	5,000
Middle Axle	NA	N/A	N/A	N/A
Rear Axle	6,450	9,580	9,580	9,600
Total	9,980	13,420	13,420	GVWR: 14,500 (Declared by Manufacturer)

Dimensions:

Length (ft/in)	26 / 4.6
Length Over Bumpers (ft/in)	26 / 10.2
Overall Length with Add-ons (ft/in)	26 / 10.2
Width (in)	96.0 (excluding mirrors) 114.8 (including mirrors)
Height (in)	116.1
Front Overhang (in)	35.8
Rear Overhang (in)	99.5
Wheelbase (in)	186.9
Wheel Track (in)	Front: 68.0
	Rear: 78.5

VEHICLE DATA FORM

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Bus Number: 2024-04	Date: 03/26/24
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CLEARANCES:

Lowest Point Outside Front Axle	Location: Valance attached to underside of bumper	Clearance(in): 10.1
Lowest Point Outside Rear Axle	Location: Curbside exhaust clamp under springs	Clearance(in): 10.0
Lowest Point between Axles	Location: Underside of passenger entry step	Clearance(in): 8.7
Front Bumper Height (in)	10.1	
Rear Bumper Height (in)	15.0	
Ground Clearance at the Center (in)	9.8	
Front Approach Angle (deg)*	15.8	
Rear Approach Angle (deg)*	7.7	
Ramp Clearance Angle (deg)	6.5	
Aisle Width (in)	17.6	
Inside Standing Height at Center Aisle (in)	80.0	

*measurements used to calculate approach and departure angles are taken from the centerline of the axles.

BODY DETAILS:

Body Structural Type	Integral				
Frame Material	Steel				
Body Material	Fiberglass				
Floor Material	Plywood				
Roof Material	Fiberglass				
Windows Type	☒ Fixed	☐ Movable (emergency exit windows)			
Window Mfg./Model No.	Lippert / DOT620 AS3 / 11223				
Number of Doors	Front: 2 (1 Streetside and 1 Curbside) Rear: 2 (curbside ADA Lift door & rear emergency exit door)				
Mfr. / Model No.	Front: Streetside: A & M Systems / D405719 Curbside: A& M Systems Inc. / D405720 Rear: ADA Lift Door: Lippert Components Inc. / 2023037085 Emergency Door: Lippert Components / 2021120484				
Dimension of Each Door (in)	Front: Streetside: 32.2 x 80.3 Curbside: 32.2 x 80.3 Rear: ADA Door: 46.9 x 71.7 Emergency Door: 37.6 x 58.6				
Passenger Seat Type	☐ Cantilever	☒ Pedestal	☐ Other		
Mfr. / Model No.	Kiel North America / 239156 (streetside) / 239157 (curbside)				
Driver Seat Type	☐ Air	☒ Spring	☐ Other		
Mfr. / Model No.	Ford Motor Company / OEM				
Number of Seats (including Driver)	15 and two wheelchair positions				

VEHICLE DATA FORM

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Bus Number: 2024-04	Date: 03/26/24
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BODY DETAILS (Contd.)

Free Floor Space (ft ²)	16.0				
Height of Each Step at Normal Position (in)	Front	1. 10.7	2. 9.2	3. 10.1	4. N/A
	Middle	1. N/A	2. N/A	3. N/A	4. N/A
	Rear	1. N/A	2. N/A	3. N/A	4. N/A
Step Elevation Change - Kneeling (in)	N/A				

ENGINE

Type	☐ C.I.	☐ Alternate Fuel	
	☒ S.I.	☐ Other (explain)	
Mfr. / Model No.	Ford Motor Company / 7.3 L		
Engine Power	Max kW 242 (325 hp) @ 3750 rpm		
Engine Torque	Max torque 450 (lb.ft) @ 3,750 rpm		
Location	☒ Front	☐ Rear	☐ Other
Fuel Type	☒ Gasoline	☐ CNG	☐ Methanol
	☐ Diesel	☐ LNG	☐ Other
Alternator (Generator) Mfr./Model No.	Ford Motor Company / PC3T-100300-DA/N6G8J		
Maximum Rated Output (Volts / Amps)	12 Volts / 240 Amps		
Air Compressor Mfr. / Model No.	N/A		
Maximum Capacity (ft ³ / min)	N/A		
Starter Type	☒ Electrical	☐ Pneumatic	☐ Other
Starter Mfr. / Model No.	Ford Motor Company / NC3T-11000-AA		
Low Voltage Battery	12 Volt (There is also auxiliary battery outside of frame rail on curbside behind passenger entry door – same model)		
Mfr. / Model No.	Ford Motor Company / ML BXT-65-750		

TRANSMISSION

Transmission Type	☐ Manual	☒ Automatic	☐ Load Sensing Adaptive
Mfr. / Model No.	Ford Motor Company / Torqshift 6		
Control Type	☒ Mechanical	☐ Electrical	☐ Other
Integral Retarder Mfr. / Model No.	☐ Yes	☒ No	

VEHICLE DATA FORM

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Bus Number: 2024-04	Date: 03/26/24
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SUSPENSION

Number of Axles	2		
Front Axle Type	☒ Independent	☐ Beam Axle	
Mfr. / Model No.	Ford Motor Company / D567A		
GAWR (lb.)	5,000		
Axle Ratio (if driven)	N/A		
Suspension Type	☐ Air	☒ Spring	☐ Other
Mfr. / Model No.	Ford Motor Company / 9C245310XA*		
No. of Shock Absorbers	2		
Mfr. / Model No.	Ford Motor Company / 8C24 18045 DA		
Middle Axle Type	☐ Independent	☐ Beam Axle	
Mfr. / Model No.	N/A		
Axle Ratio (if driven)	N/A		
Suspension Type	☐ Air	☐ Spring	☐ Other
No. of Shock Absorbers	N/A		
Mfr. / Model No.	N/A		
Rear Axle Type	☐ Independent	☒ Beam Axle	
Mfr. / Model No.	Dana / 47717 032 / D567A		
GAWR (lb.)	9,600		
Axle Ratio (if driven)	4.56		
Suspension Type	☐ Air	☒ Spring	☐ Other
Mfr. / Model No.	Ford Motor Company / 8C245560BG*		
No. of Shock Absorbers	2		
Mfr. / Model No.	Ford Moto Co. / 8C24 18080 DC		

*This vehicle has a Timbren suspension enhancement system.

Front: Timbren / FEF35OUH Rear: Timbren/ FERSDLB

VEHICLE DATA FORM

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WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Fumagalli / 16 x 6
	Wheel Weight Rating (lb.)	2,500
	Tire Mfr./ Model No.	Hankook DynaPro HT / LT 225 75R 16
	Tire Weight Rating (lb.)	2,680 (single)
Rear	Wheel Mfr./ Model No.	Fumagalli / 16 x 6
	Wheel Weight Rating (lb.)	2,500
	Tire Mfr./ Model No.	Hankook DynaPro HT / LT 225 75R 16
	Tire Weight Rating (lb.)	2,470 (dual)

BRAKES

Front Axle Brakes Type	☐ Cam	☒ Disc	☐ Other (explain)
Mfr. / Model No.	Ford Motor Company / BRF 138		
Middle Axle Brakes Type	☐ Cam	☐ Disc	☐ Other
Mfr. / Model No.			
Rear Axle Brakes Type	☐ Cam	☒ Disc	☐ Other (explain)
Mfr. / Model No.	Ford Motor Company / BR5D1330B		
Parking Brake Mfr. / Model No.	Ford Motor Company / LC2Z2780A		

HVAC

Driver Heating System Type	☒ Engine Coolant	☐ Electric
Capacity (Btu/hr)	15,000	
Mfr./Model No.	Ford Motor Company / OEM	
Passenger Heating System Type	☒ Engine Coolant	☐ Electric
Capacity (Btu/hr)	65,000	
Mfr./Model No.	Premier Products / EV5000 / SC1500/ Comp 003	
Auxiliary Heater	☐ Yes	☒ No
Mfr./Model No.	N/A	
Driver Air Conditioner	☒ Yes	☐ No
Location	Engine compartment	
Capacity (Btu/hr)	15,000	
A/C Compressor Mfr./Model Number	Ford Motor Company / RS-20 / SN#1603	
Passenger Air Conditioner	☒ Yes	☐ No

VEHICLE DATA FORM

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Bus Number: 2024-04	Date: 03/26/24
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HVAC (cont.)

Passenger Air Conditioner	☒ Engine Driven ☐ Electric ☐ Other
Location	Back of bus (evaporator), under the floor (condenser)
Capacity (Btu/hr)	65,000
A/C Compressor Mfr./Model No.	Seltec / TM16

-An aftermarket A/C compressor was added by Premier Products to assist with cooling passenger cabin.

STEERING

Steering Gear Box Type	Hydraulic
Mfr. / Model No.	Ford Motor Company / LC243C529AF
Steering Wheel Diameter	15.8"
Number of turns (lock to lock)	4

OTHERS

ADA Ramps	Location: N/A	Type: N/A
ADA Lifts	Location: Rear Curbside	Type: Electric Fold-out
Mfr. / Model No.	Braun Corporation / NCL919FIB-2	
Emergency Exit	Location: Window Door	Number: 2 2
Fire Suppression System Mfr. / Model No.	Buckeye Fire Equipment Co. / 5 HI SA 40 ABC	

CAPACITIES

Fuel Tank Capacity (gallons)	55
Engine Crankcase Capacity (gallons)	2.0
Transmission Capacity (gallons)	4.359
Differential Capacity (gallons)	1.215
Engine Cooling System Capacity (gallons)	6.577
Power Steering Fluid Capacity (quarts)	1.3923

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Bus Number: 2024-04	Date: 03/26/24
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List all spare parts, tools and manuals delivered with the bus.

- ☐ Service manual and operator's manual documentation available
☒ Service manual and operator's manual documentation NOT available

[illegible]

COMPONENT/SUBSYSTEM INSPECTION FORM

Page 1 of 1

Bus Number: 2024-04

Date: 03/26/24

Subsystem	Checked	Initials	Comments
Engine	✓	S.R.	None noted.
Fuel System	✓	S.R.	None noted.
Transmission	✓	S.R.	None noted.
Exhaust	✓	S.R.	None noted.
Engine Cooling System	✓	S.R.	None noted.
Electronics Cooling System	N/A	S.R.	N/A
Drive Motor Cooling System	N/A	S.R.	N/A
Drive Motors/Axle	N/A	S.R.	N/A
High Voltage Batteries	N/A	S.R.	N/A
Body and Sheet Metal	✓	S.R.	None noted.
Frame	✓	S.R.	None noted.
Steering	✓	S.R.	None noted.
Suspension	✓	S.R.	None noted.
Interior/Seating	✓	S.R.	None noted.
Interior Fasteners	✓	S.R.	None noted.
Axles	✓	S.R.	None noted.
Brakes	✓	S.R.	None noted.
Tires/Wheels	✓	S.R.	None noted.
Air Conditioning Heating and Ventilation	✓	S.R.	None noted.
Accessories	✓	S.R.	None noted.
ADA Lift System	✓	S.R.	None noted.
ADA Ramp System	N/A	S.R.	N/A
Low Voltage Batteries	✓	S.R.	None noted.
Emergency Exits	✓	S.R.	None noted.
Fire Suppression System	✓	S.R.	None noted.

CHECK - IN



HIGH LEVEL ENTERPRISES, INC. 16 + 2WC



CHECK - IN CONT.



HIGH LEVEL ENTERPRISES, INC. 16 + 2WC



CHECK - IN CONT.



**BRAUN CORPORATION (NCL919FIB-2)
ELECTRIC FOLD-OUT LIFT**

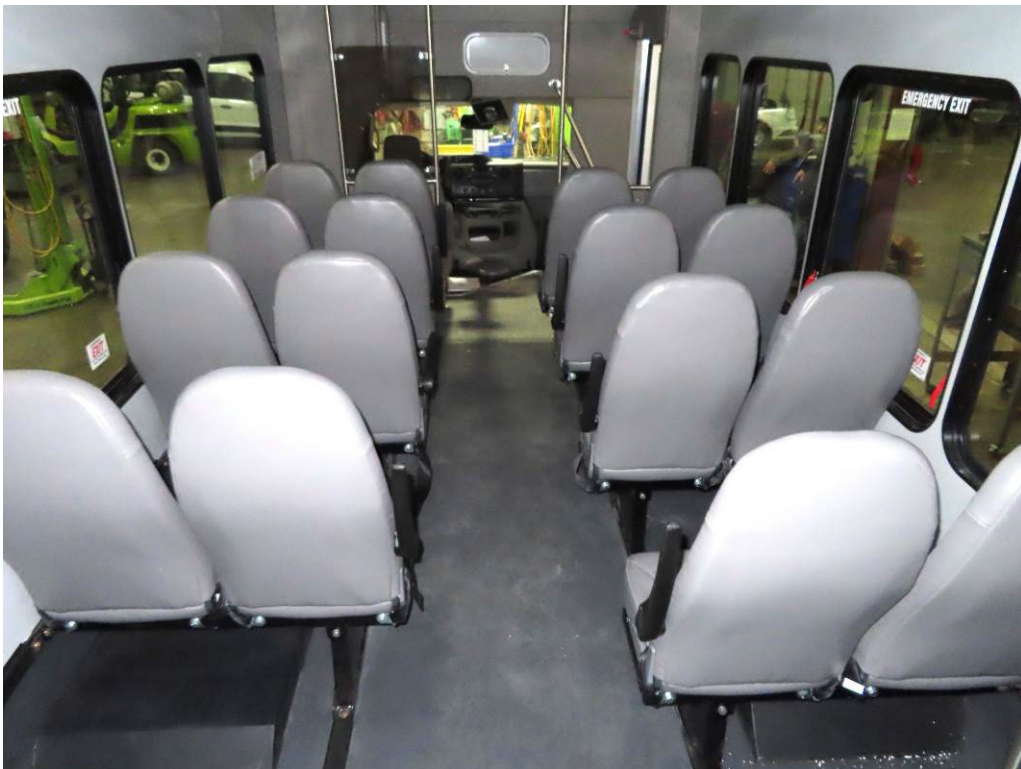


OPERATOR'S AREA

CHECK - IN CONT.



INTERIOR FROM FRONT



INTERIOR FROM REAR

CHECK - IN CONT.

INCOMPLETE VEHICLE MFD. BY FORD MOTOR COMPANY

DATE: 03/23
FRONT GAWR: 2268 KG (5000 LB)
WITH LT225/75R16E 115/112S
16x6.0K
AT 520 kPa/ 75 PSI COLD
VIN: 1FDXE4FN4RDD10986

TIRES
RIMS

GWWR: 6577 KG (14500 LB)
REAR GAWR: 4354 KG (9600 LB)
WITH LT225/75R16E 115/112S
16x6.0K
AT 550 kPa/ 80 PSI COLD

Equipped with the Ford Ambulance Prep Pkg

EXT PNT: YZ RC: 53 DSO:

WB	INT TR	TP/PS	R	AXLE	TR	SPR
158	ME		7	F3	P	XXBB
						ULN

▽ 5U5A-3520472-AA

INCOMPLETE VEHICLE CHASSIS TAG FROM FORD MOTOR COMPANY

MANUFACTURED BY: HIGH LEVEL ENTERPRISES, INC. DATE: 03/2024

GVWR 6583 KG(14500 LB)

GAWR FRONT 2270 KG(5000 LB) TIRES 225/75R16 RIMS 16X6

COLD INFLATION PRESSURE 552 KPA(80 PSI) SINGLE RIMS

GAWR INTERM 4358 KG(9600 LB) TIRES 225/75R16 RIMS 16X6

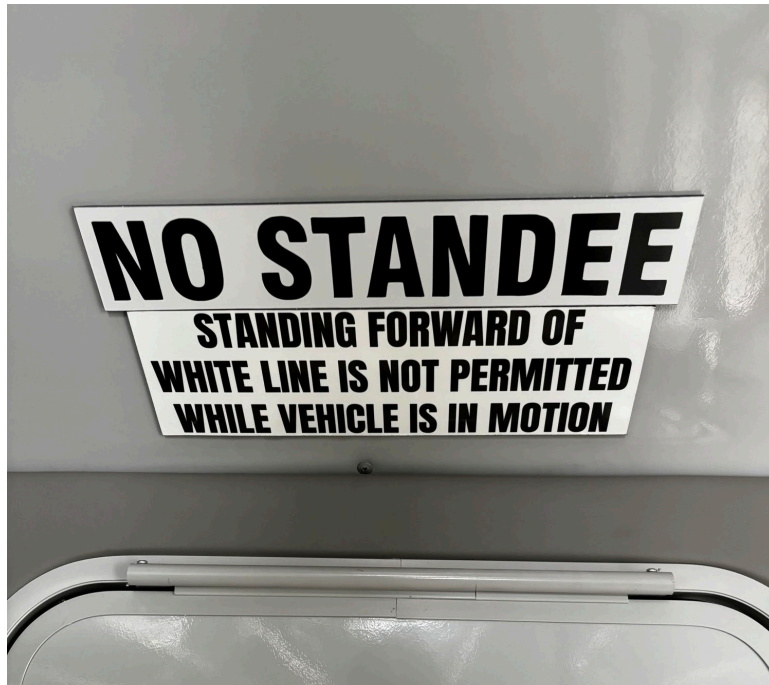
COLD INFLATION PRESSURE 552 KPA(80 PSI) DUAL

THIS VEHICLE HAS BEEN COMPLETED IN ACCORDANCE WITH THE PRIOR MANUFACTURERS' IVD WHERE APPLICABLE.
THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS, IN EFFECT IN 03/2024

V.I.N 1FDXE4FN4RDD10986 TYPE: 16+2WC // 923-20040

HIGH LEVEL ENTERPRISES, INC VIN TAG

CHECK - IN CONT.



PLACARD SHOWING NO STANDING PASSENGERS



ENGINE COMPARTMENT

CHECK - IN CONT.



UNDERSIDE OF BUS – FRONT TO REAR



UNDERSIDE OF BUS – REAR TO FRONT

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 was checked, and where accessibility was restricted the subsystem was 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: 2024-04	Date: 09/16/24
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Component	Checked	Comments
ENGINE:		
Oil Dipstick	✓	None noted.
Oil Filler Hole	✓	None noted.
Oil Drain Plug	✓	None noted.
Oil Filter	✓	None noted.
Fuel Filter	N/A	None noted.
Air Filter	✓	None noted.
Belts	✓	None noted.
Coolant Level	✓	None noted.
Coolant Filler Hole	✓	None noted.
Coolant Drain	✓	None noted.
Spark / Glow Plugs	✓	None noted.
Alternator	✓	None noted.
Diagnostic Interface Connector	✓	None noted.
TRANSMISSION:		
Fluid Dipstick	✓	None noted.
Filler Hole	✓	None noted.
Drain Plug	N/A	None noted.
SUSPENSION:		
Bushings	✓	None noted.
Shock Absorbers	✓	None noted.
Air Springs	N/A	None noted.
Leveling Valves	N/A	None noted.
Grease Fittings	✓	None noted.

ACCESSIBILITY DATA FORM

Page 2 of 2

Bus Number: 2024-04	Date: 09/16/24
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Component	Checked	Comments
HVAC:		
A/C Compressor	✓	None noted.
Filters	✓	None noted.
Fans	✓	None noted.
ELECTRICAL SYSTEM:		
Fuses	✓	None noted.
Batteries	✓	None noted.
Voltage regulator	✓	None noted.
Voltage Converters	✓	None noted.
Lighting	✓	None noted.
MISCELLANEOUS:		
Brakes	✓	None noted.
ADA Accessible Lifts/Ramps	✓	None noted.
Instruments	✓	None noted.
Axles	✓	None noted.
Exhaust	✓	None noted.
Fuel System	✓	None noted.
OTHERS:	N/A	None noted.

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 was conducted by operating the bus and collecting the following data on work order forms and a driver log.

1. Scheduled Maintenance
 - a. Bus number
 - b. Date
 - c. Mileage
 - d. Results of scheduled inspections
 - e. Description of malfunction (if any)
 - f. Repair action and parts used (if any)
 - g. Labor-hours

2. Unscheduled Maintenance
 - a. Bus number
 - b. Date
 - c. Mileage
 - d. Description of malfunction
 - e. Place and time of malfunction (e.g., in service or undergoing inspection)
 - f. Repair action and parts used
 - g. Labor-hours

The bus was operated in accelerated durability service. While typical items are given below, the specific service schedule was 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 manufacturer recommended) 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

*These items are attended to if found necessary, while the others in the list are removed/replaced/tested for all buses undergoing a full test.

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.

The Unscheduled Maintenance List along with 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 was detected, a description of the malfunction and repair, and the time required to perform the repair.

SCHEDULED MAINTENANCE
High Level Enterprises, Inc. Bus# 2024-04
(Page 1 of 7)

DATE	TEST MILES	SERVICE	ACTIVITY/OBSERVATIONS	DOWN TIME	LABOR HOURS
04/05/24	1,123	P.M./Inspection	Steering linkage, tie rods, driveline components all checked; all fluids checked. Inspected frame, body and suspension. Coolant pump outside streetside frame rail in front of fans has a slight leak. Rivet above interior door frame of ADA lift is beginning to pull out. The caulking between the body and the curbside support post next to windshield is cracking and pulling away. Underside of hood is rubbing on mirror support on the curbside. Cracks Observed: Streetside spot welds around core support bolt under power steering reservoir are cracked (Crack #1). Cracks developing in the body above the frame forward of the suspension spring in the front streetside wheel well (Crack #2). Front curbside inner fender is pulling away/cracked on the rear lower side (Crack #3). A crack has developed in the body below the rear, left driver's seat bolt (Crack #4). Spot welds pulled out at backside of driver's entry step on underside of bus above A/C lines (Crack #5). Cracks #6-14 are located directly on top of the curbside frame rail where the heatshield plate is welded. Cracks #15-17 cracks on the heatshield where it is welded at the rear. The curbside crossbeams where the cut-outs were made for the fuel tank have cracked (Cracks #18 & 19). Similarly, the streetside crossbeams where the cut-outs were made for the fuel tank have cracked (Cracks #20 & 21). There is a broken weld on the crossbeam in front of the streetside rear tires where it is attached to supporting framework (Crack #22).	4.00	4.00

SCHEDULED MAINTENANCE
High Level Enterprises, Inc. Bus# 2024-04
(Page 2 of 7)

DATE	TEST MILES	SERVICE	ACTIVITY/OBSERVATIONS	DOWN TIME	LABOR HOURS
04/17/24	2,521	P.M./Inspection	Steering linkage, tie rods, driveline components all checked; all fluids checked. Inspected frame, body and suspension. Washer fluid tank hose is broken and leaking. Bolts from the electrical power box for ADA are pulling out of the lower lift support; power box cover panel is breaking away. All previous cracks were monitored with no change or issues with repairs, with the following exceptions: Crack #18 – Previously repaired with a plate has cracked vertically through the center. This is now Crack #18-2. Crack #20 – There is a crack in the plate at the opposite end of Crack #18-2. This is now Crack #20-2. New cracks were observed: A crack in the weld attaching the heatshield to the body, directly above the second curbside body mount from the front (Crack #23). The crossbeam to which the front carrier bearing is attached has completely cracked on the streetside frame rail where welded (Crack #24). The crossbeam to which the front carrier bearing is attached has cracked on the curbside frame rail where welded (Crack #25). Crack in the weld attaching the heatshield to the crossbeam above body mount between Cracks #9 & 10 (Crack #26). Heatshield is splitting above and between Cracks #12 & 13 (Crack #27). The body at the back of the curbside inner fender above the frame rail has cracked in two separate places (Cracks #28 & 29).	4.00	4.00

SCHEDULED MAINTENANCE
High Level Enterprises, Inc. Bus# 2024-04
(Page 3 of 7)

DATE	TEST MILES	SERVICE	ACTIVITY/OBSERVATIONS	DOWN TIME	LABOR HOURS
05/22/24	3,518	P.M./Inspection	Steering linkage, tie rods, driveline components all checked; all fluids checked. Inspected frame, body and suspension. Streetside rear shackle is worn out. Curbside front mirror missing screw. All previous cracks were monitored with no change or issues with repairs.	4.00	4.00
06/14/24	4,579	P.M./Inspection	Steering linkage, tie rods, driveline components all checked; all fluids checked. Inspected frame, body and suspension. Curbside rear ADA door has broken away from the square tube support attached to the hinge. Caulking is pulling away from the seam at the curbside between support post and windshield. Rear streetside shackle is worn – no change. All previous cracks were monitored with no change or issues with repairs. New Crack observed: A 2 cm crack has developed at the streetside above the frame rail (adjacent to the forwardmost body mount bushing) in the weld surrounding body (Crack # 30).	4.00	4.00
08/12/24	5,533	P.M./Inspection	Steering linkage, tie rods, driveline components all checked; all fluids checked. Inspected frame, body and suspension. On 07/30/24 the local Ford dealership performed a Power Control Module software update due to a recall. (Recall Campaign Number 24B27) Power distribution box for ADA has an electrical issue preventing it from working properly. Last exhaust hanger on the rear streetside is broken. Rear streetside shackle is worn – no change.	4.00	4.00

SCHEDULED MAINTENANCE
High Level Enterprises, Inc. Bus# 2024-04
(Page 4 of 7)

DATE	TEST MILES	SERVICE	ACTIVITY/OBSERVATIONS	DOWN TIME	LABOR HOURS
08/12/24 (Cont.)			All previous cracks were monitored with no change or issues with repairs, with the following exceptions: Crack #4 – the repair weld has cracked through the length of the weld. This will now be Crack #4-2. Crack #23 was previously welded but the welded repair attaching the heatshield to the body has broken away from the body. This will now be Crack #23-2. Cracks #28 & 29 have migrated further. New cracks observed since last PM: A crack developed above the driver's door at support (Crack #31). A crack developed above the driver's door above the visor (Crack #32). A 1 cm crack developed at the top curbside corner of body around the windshield under the gasket to the drip edge (Crack #33). A crack developed in the curbside top of fender under the hood closer to the firewall (Crack #34). New cracks observed in this PM: A 5 cm crack has developed behind the A/C lines on the streetside in the body above the frame rail at the rear of the driver's cabin (Crack #35).		
08/20/24	6,160	P.M./Inspection	Steering linkage, tie rods, driveline components all checked; all fluids checked. Inspected frame, body and suspension. Streetside rear shackle is worn. The rear dual tires were replaced and the best tread depth from the rears were put on the front for proper depths to finish the test. All previous cracks were monitored with no change or issues with repairs, with the following exceptions: Crack #1 is now cracked the whole way across. Crack #2-2 has cracked along the previously welded repair.	4.00	4.00

SCHEDULED MAINTENANCE
High Level Enterprises, Inc. Bus# 2024-04
(Page 5 of 7)

DATE	TEST MILES	SERVICE	ACTIVITY/OBSERVATIONS	DOWN TIME	LABOR HOURS
08/20/24 (Cont.)			Crack #23-2 – the welded repair attaching the heatshield to the body has broken away. Cracks #28 and #29 have further migrated. Crack #35 has grew 1 ½ cm and the spot weld has pulled out. New Cracks observed: The fuse/relay panel above driver and vertical support which frames the fuse panel has cracked at the bottom where welded to the tube below it (Crack #36). The horizontal square tubing to which the vertical support (location of Crack #36) is welded has cracked where it is joined to the adjacent tube (Crack #37). A 2 cm crack has developed on the curbside heatshield behind Crack #23-2, the whole weld is broken (Crack #38).		
09/09/24	7,339	P.M./Inspection Fuel Economy	Steering linkage, tie rods, driveline components all checked; all fluids checked. Inspected frame, body and suspension. Engine oil and filter changed. Air filter changed.	8.00	8.00
09/13/24	7,486	P.M./Inspection	Steering linkage, tie rods, driveline components all checked; all fluids checked. Inspected frame, body and suspension. Screw backed out of transition plate on ADA lift causing it to bind when unfolding. Washer fluid tank is leaking. All previous cracks were monitored with no change or issues with repairs, with the following exceptions: Crack #31 which was previously repaired has cracked again. Will now be Crack #31-2. New cracks observed since last PM: Crack #27 has cracked again, now Crack #27-2. Crack #30 has migrated further to 7.5 cm.	4.00	4.00

SCHEDULED MAINTENANCE
High Level Enterprises, Inc. Bus# 2024-04
(Page 6 of 7)

DATE	TEST MILES	SERVICE	ACTIVITY/OBSERVATIONS	DOWN TIME	LABOR HOURS
09/13/24 (Cont.)			A 2 cm crack has developed on the curbside behind Crack #23-2, the whole weld is broken (Crack #38). The curbside heatshield has cracked (Crack #39). There is a crack and spotweld break in the curbside inner core support inner fender area next to 12-volt battery and curbside mirror mounting bolt area (Crack #40). There is a crack in the curbside inner fender behind A/C line near the A/C filter (Crack #41). A crack developed in the streetside upper corner of the windshield near the drip edge (Crack #42). A 1 cm crack has developed under the curbside front mirror mount (Crack #43). A 3 cm crack has developed at the curbside bottom of the dogbox perimeter (Crack #44). A 5 cm crack has developed at the curbside bottom of the dogbox perimeter (Crack #45). A 3 cm crack developed at the spotweld adjacent to Crack #45 (Crack #46). There is a 2.5 cm crack in the curbside inner fender near the brake booster (Crack #47). There is a crack in the weld on the heatshield above the curbside frame rail inside body mount, just forward of Crack #27-2 (Crack #48). A crack has developed on the heatshield above the curbside body mount behind the battery box mounted on the frame rail (Crack #49). A crack has developed in the body above the frame rail between the body mounts behind the curbside front tire (Crack #50). New Cracks observed this PM: The twice repaired crack in the body below the driver's seat has cracked again (Crack #4-3). A 2cm crack in the curbside inner fender under battery holder (Crack #51).		

SCHEDULED MAINTENANCE
High Level Enterprises, Inc. Bus# 2024-04
(Page 7 of 7)

DATE	TEST MILES	SERVICE	ACTIVITY/OBSERVATIONS	DOWN TIME	LABOR HOURS
09/13/24 (Cont.)			Rear heatshield welds above the horizontal crossmember are cracked (Cracks #52 & 53). A group of 1cm cracks in the body behind the grille in front of the A/C condenser (Cracks #54-57). A crack approximately 1 cm in size has formed above the front curbside coil spring on the inner fender (Crack #58). The steel strap welded to the body behind the driver has cracked (Crack #59). Back topside of inner curbside fender is cracked (Crack #60). A crack has developed on the streetside body next to the exhaust manifold (Crack #61). A group of spot welds cracked/pulled away in driver's door jamb (Cracks #62-66).		

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 involved components that may be expected to fail or require replacement during the service life of the bus. In addition, any component that failed during testing of the bus was 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

At the end of the test, the items on the list were removed and replaced. The transmission assembly took 7.00 labor-hours to remove and replace. The time required for repair/replacement of the other four components is given on the following Repair and/or Replacement Form.

REPLACEMENT AND/OR REPAIR FORM

Subsystem	Replacement Time
Transmission	7.00 labor hours
Wiper Motor	0.17 labor hours
Starter	0.33 labor hours
Alternator	0.50 labor hours
Batteries (Engine bay and curbside frame rail)	0.25 labor hours

During the test, additional components were removed for repair or replacement and the details are available in Section 5.7 in *Unscheduled Maintenance*.

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS



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



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

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS CONT.



**STARTER REMOVAL AND REPLACEMENT
(0.33 LABOR HOURS)**



**ALTERNATOR REMOVAL AND REPLACEMENT
(0.50 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 and labor-hours to repair were recorded on the Reliability Data Form. The dates on the driver's logs reflect operating times. The times when the bus was not operating for a period of time could be due to weather conditions, manufacturer's decision time/non-recurring engineering time, delay for parts delivery, holidays, etc.

CLASS OF FAILURES

Classes of failures are described below:

- (a) Class 1: Physical Safety. A failure that could lead directly to injury, a crash and/or significant physical damage.
- (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 was accumulated during the Structural Durability Test. The following Reliability Data Form lists all unscheduled repairs under classes as defined above.

The classification of repairs according to subsystem is intended to emphasize those systems which had persistent minor or more serious problems. There was a total of 40 reported failures during testing. Of these failures, two were Class 4, 32 were Class 3 and six were Class 1. There were no Class 2 failures. The Class 1 failures have been deemed corrected. Two of the Class 1 failures required additional miles at

the end of testing to prove that the repairs made corrected the issues. These failures are available for review in the Unscheduled Maintenance List, located in Section 5.7 Structural Durability.

This bus passed the Structural and Powertrain Durability sections of the test.

RELIABILITY DATA FORMS

Bus Number: 2024-04	Date: 09/12/24
Personnel: B.L.	

Subsystems	Failure Type				Labor Hours	Down Time
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Body/Mirrors		300			0.25	0.25
		3,551			0.25	0.25
		3,878			0.25	0.25
		4,183			0.50	0.50
		4,924			0.25	0.25
		7,034			0.50	0.50
Body	1,123				0.05	0.05
		1,123			0.50	0.50
		1,123			6.00	6.00
		2,521			5.00	5.00
		4,975			0.10	0.10
		4,975			2.92	2.92
		4,975			2.00	2.00
		4,975			0.08	0.08
		6,207			5.00	5.00
		7,486			12.92	12.92
HVAC		1,123			0.25	0.25
		3,218			0.25	0.25
		4,781			5.40	5.40
Wiper/Washer		2,521			0.50	0.50
		3,551			0.50	0.50
		7,486			0.50	0.50

RELIABILITY DATA FORMS

Bus Number: 2024-04	Date: 09/12/24
Personnel: B.L.	

Subsystems	Failure Type				Labor Hours	Down Time
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
ADA Lift		2,521			0.17	0.17
		3,705			0.25	0.25
		4,346			0.50	0.50
				6,160	1.50	1.50
		7,486			0.17	0.17
Chassis				2,521	1.83	1.83
Electrical		2,766			0.25	0.25
Suspension		3,551			0.25	0.25
				4,781	0.50	0.50
		6,160			0.25	0.25
Interior				3,786	0.50	0.50
		6,477			0.25	0.25
		7,034			0.25	0.25
Wiring	4,579				0.17	0.17
Doors				4,579	1.50	1.50
Exhaust		5,533			0.25	0.25
		7,324			1.00	1.00
Steering				6,118	0.25	0.25

3.1 SAFETY - A DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE)

3.1-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.

3.1-II. TEST DESCRIPTION

The Safety Test consisted of an obstacle avoidance maneuver to evaluate the handling and stability of the bus. The test was conducted at the LTI test track on the vehicle dynamics pad. The bus was driven through a double-lane change course at increasing speeds until the test was determined to be unsafe or a speed of 45 mph is reached. The test is determined unsafe if vehicle handling becomes unstable or if any of the tires lose contact with the pavement.

The layout of the test course was defined by placing pylons along painted guidelines that delineated the course. The guidelines marked off two 12-foot center-to-center lanes. Each lane had two 100-foot-long gates with a spacing distance of 100 feet between them. The bus entered the test course in one lane, crossed over to the other lane within the 100-foot gate, traveled for 100 feet, and then returned back into the original lane within the next 100-foot gate. This maneuver was repeated from 20 mph with speed increasing in increments of 5 mph. The test was performed starting from both the right and left lanes.

A test run is considered valid if the bus is able to perform the maneuver at a constant speed without deviating from the test course or striking pylons. If the bus is not able to successfully complete the maneuver due to vehicle instability, the test will be terminated. The highest speed at which the maneuver can be successfully performed up to a maximum speed of 45 mph is recorded on the Safety Data Form.

3.1-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, and therefore, passed this portion of the test.

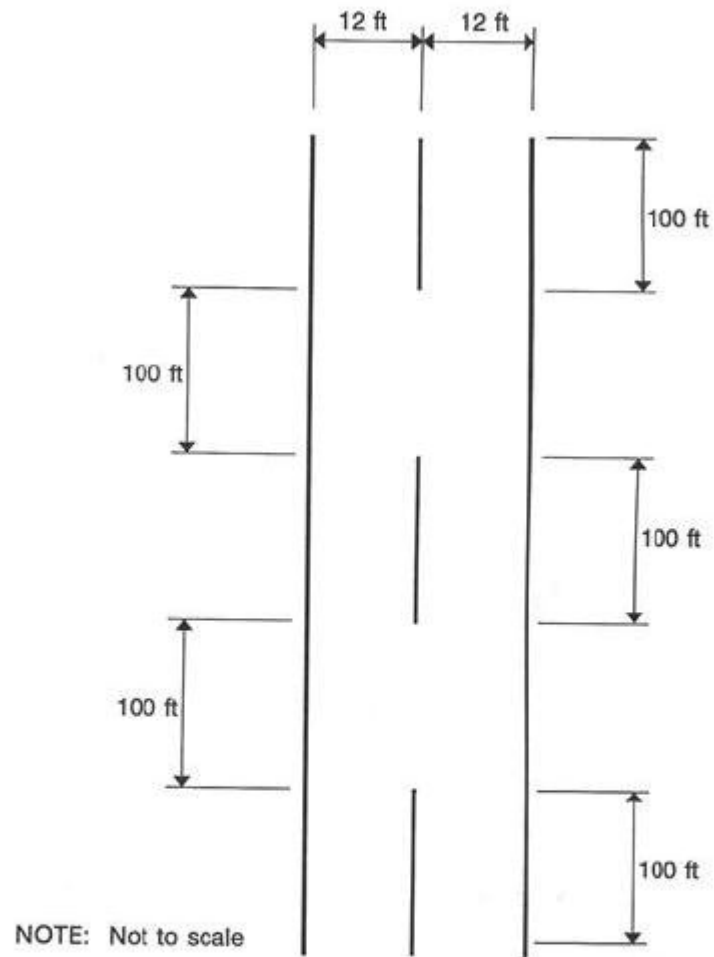


Figure 3.1. Double lane change test course

SAFETY DATA FORM

Page 1 of 1

Bus Number: 2024-04	Date: 06/12/24
Personnel: S.R., F.T., J.M., & T.G.	

Temperature (°F): 64	Humidity (%): 63
Wind Direction: SW	Wind Speed (mph): 3
Barometric Pressure (mbar): 1017	

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

3.1 SAFETY



RIGHT - HAND APPROACH



LEFT - HAND APPROACH

3.2 Safety - Braking

3.2 I. TEST OBJECTIVE

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

3.2 II. TEST DESCRIPTION

The testing was conducted at the LTI Test Track skid pad area. Brake tests were 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. For buses that have not completed Durability Testing, the brakes will be burnished according to the test procedure. Testing was performed when the bus was fully loaded at its GVW. All tires on each bus were representative of the tires on the production model vehicle and inflated to the bus manufacturer's specified pressures.

The brake testing procedure is comprised of 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

3.2-III. DISCUSSION

The results of the Stopping Distance phase of the Brake Test are available in table 3.2-2. There was no deviation from the test lane during the performance of the Stopping Distance phase. The bus passed this portion of the test.

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.

This bus passed all three phases of the Safety –Braking Test.

Table 3.2-1. Braking Test Data Forms

Page 1 of 3

Bus Number: 2024-04	Date: 05/21/24
Personnel: S.R., T.G., P.D. & D.B.	
Amb. Temperature (°F): 76	Barometric Pressure (mbar): 1014
Wind Speed (mph): 7	Wind Direction: S
Pavement Temp (°F) Start: 98	Pavement Temp (°F) End: 127

TIRE INFLATION PRESSURE (psi):				
Tire Type: Front and Rear: Hankook DynaPro HT 225 75R 16				
	Left Tire(s)		Right Tire(s)	
Front	80		80	
	Inner	Outer	Inner	Outer
Middle	N/A	N/A	N/A	N/A
Rear	80	80	80	80

AXLE LOADS (lb.)		
	Left	Right
Front	2,060	1,780
Middle	N/A	N/A
Rear	4,760	4,820

Table 3.2-2. Stopping Distance Test Results Form
(longest stopping distance in each test condition in bold)

Stopping Distance (ft)					
Vehicle Direction	CW	CW	CCW	CCW	
Speed (mph)	Stop 1	Stop 2	Stop 3	Stop 4	Average
20 (dry)	23.10	23.13	22.22	24.20	23.16
30 (dry)	47.61	46.19	44.31	48.14	46.56
40 (dry)	78.81	76.90	78.00	82.13	78.96
45 (dry)	97.24	94.51	100.13	97.52	97.35
20 (wet)	28.20	27.13	27.19	25.31	26.96

Table 3.2-3. Stability Test Results Form

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

Table 3.2-4. Parking Brake Test Form

PARKING BRAKE (GVW) – 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

Table 3.2-5. Record of All Braking System Faults/Repairs.

Date	Fault/Repair	Description
05/21/24	None note.	None noted.

3.2 Safety - Bus Braking



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



4. PERFORMANCE - AN ACCELERATION, GRADEABILITY, AND TOP SPEED TEST

4-I. TEST OBJECTIVE

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

4-II. TEST DESCRIPTION

In this test, the bus was operated at SLW on a chassis dynamometer. The procedure dictates that the test bus be accelerated to a maximum “power-limited”/”governed” or maximum “safe” speed not exceeding 80 mph. The maximum power-limited/governed speed, if applicable, is the top speed as limited by the engine control system. The maximum safe speed is defined as the maximum speed that the dynamometer, the tires or other bus components are limited to. The test vehicle speed was measured using a speed encoder built in the chassis dynamometer. The time intervals between 10 mph increments were recorded using a Data Acquisitions System. Time-speed data and the top speed attained were recorded on the Performance Data Form. The recorded data was used to generate a percent grade versus speed table and a speed versus time curve. All the above are available in the following pages.

4-III. DISCUSSION

This test consisted of three runs from standstill to full throttle on the chassis dynamometer. Speed versus time data was obtained for each run and results are averaged to minimize test variability. The test was performed up to a maximum safe speed of 79.8 mph. The calculated gradeability results are attached. The average time to reach 30 mph was 7.0 seconds. The maximum gradeability at 10 mph was 37.1% and at 40 mph was 12.0%. This bus passed this section of the test.

PERFORMANCE DATA FORM

Page 1 of 1

Bus Number: 2024-04		Date: 09/11/24	
Personnel: S.B. & S.I.			
Temperature (°F): 78.4		Humidity (%): 58	
Barometric Pressure (inHg): 28.9			
			INITIALS:
Air Conditioning - OFF	✓Checked	S.B.	
Defroster - OFF	✓ Checked	S.B.	
Exterior and interior lights - ON	✓ Checked	S.B.	
Windows and doors - CLOSED	✓ Checked	S.B.	
ACCELERATION, GRADEABILITY, TOP SPEED			
Recorded Interval Times			
Speed	Run 1	Run 2	Run 3
10 mph	2.2	2.1	2.3
20 mph	4.3	4.1	4.2
30 mph	7.1	6.9	6.9
40 mph	10.9	10.6	10.7
50 mph	15.7	15.3	15.3
60 mph	22.7	22.0	22.0
70 mph	35.5	34.5	34.3

Maximum Speed (mph): 79.8 (maximum safe dynamometer speed reached)

PERFORMANCE SUMMARY SHEET

Bus Number: 2024-04	Date: 09/11/24
Personnel: S.B. & S.I.	

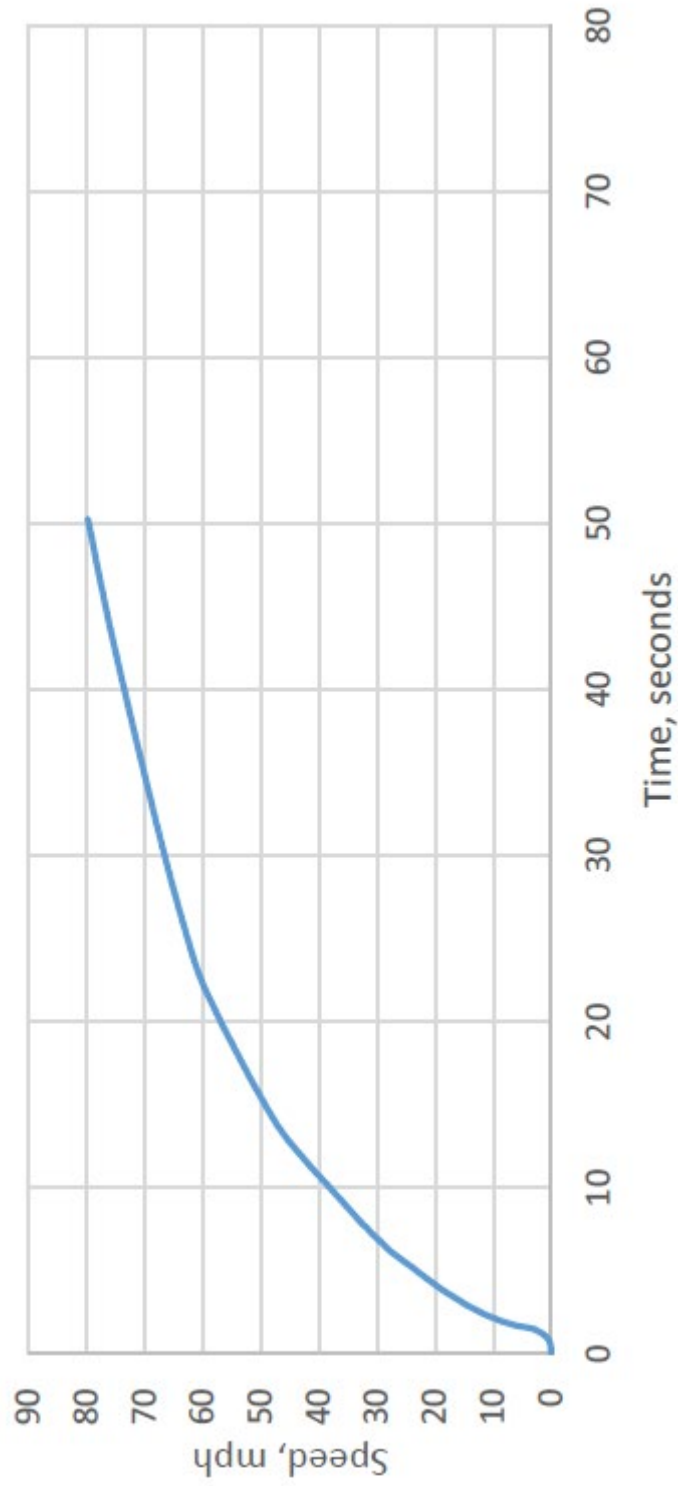
Test Conditions:

Temperature (°F): 78.4	Humidity (%): 58
Barometric Pressure (inHg): 28.9	

Test Results:

Vehicle Speed (MPH)	Time (SEC)	Acceleration (FT/SEC^2)	Max. Grade (%)
1.0	1.1	6.57	20.8
5.0	1.6	11.87	39.7
10.0	2.2	11.21	37.1
15.0	3.0	7.40	23.6
20.0	4.2	5.83	18.4
25.0	5.5	5.58	17.6
30.0	7.0	4.25	13.3
35.0	8.8	3.75	11.7
40.0	10.7	3.83	12.0
45.0	12.7	3.34	10.4
50.0	15.4	2.39	7.4
55.0	19.4	2.13	6.6
60.0	22.3	1.80	5.6
65.0	27.9	1.15	3.6
70.0	34.8	1.04	3.2
75.0	42.2	0.97	3.0
79.8	50.3	Maximum Speed	

High Level Enterprises, Inc. Bus #2024-04



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 GVW, each wheel of the bus was raised (one at a time) to simulate operation over a curb and the following were 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 was then 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. This bus passed this section of the test.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 1 of 10

Bus Number: 2024-04	Date: 03/29/24
Personnel: S.R., P.D. & M.R.	Temperature(°F): 40

Wheel Position: (check one)		
All wheels level	☒ before	☐ after
Left front	☐ 6 in higher	☐ 6 in lower
Right front	☐ 6 in higher	☐ 6 in lower
Right rear	☐ 6 in higher	☐ 6 in lower
Left rear	☐ 6 in higher	☐ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 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/ 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: 2024-04	Date: 03/29/24
Personnel: S.R., P.D. & M.R.	Temperature(°F): 40

Wheel Position: (check one)		
All wheels level	☐ before	☐ after
Left front	☒ 6 in higher	☐ 6 in lower
Right front	☐ 6 in higher	☐ 6 in lower
Right rear	☐ 6 in higher	☐ 6 in lower
Left rear	☐ 6 in higher	☐ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 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/ 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: 2024-04	Date: 03/29/24
Personnel: S.R., P.D. & M.R.	Temperature(°F): 40

Wheel Position: (check one)		
All wheels level	☐ before	☐ after
Left front	☐ 6 in higher	☐ 6 in lower
Right front	☒ 6 in higher	☐ 6 in lower
Right rear	☐ 6 in higher	☐ 6 in lower
Left rear	☐ 6 in higher	☐ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 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/ 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: 2024-04	Date: 03/29/24
Personnel: S.R., P.D. & M.R.	Temperature(°F): 40

Wheel Position: (check one)		
All wheels level	☐ before	☐ after
Left front	☐ 6 in higher	☐ 6 in lower
Right front	☐ 6 in higher	☐ 6 in lower
Right rear	☒ 6 in higher	☐ 6 in lower
Left rear	☐ 6 in higher	☐ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 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/ 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: 2024-04	Date: 03/29/24
Personnel: S.R., P.D. & M.R.	Temperature(°F): 40

Wheel Position: (check one)		
All wheels level	☐ before	☐ after
Left front	☐ 6 in higher	☐ 6 in lower
Right front	☐ 6 in higher	☐ 6 in lower
Right rear	☐ 6 in higher	☐ 6 in lower
Left rear	☒ 6 in higher	☐ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 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/ 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: 2024-04	Date: 03/29/24
Personnel: S.R., P.D. & M.R.	Temperature(°F): 40

Wheel Position: (check one)		
All wheels level	☐ before	☐ after
Left front	☐ 6 in higher	☒ 6 in lower
Right front	☐ 6 in higher	☐ 6 in lower
Right rear	☐ 6 in higher	☐ 6 in lower
Left rear	☐ 6 in higher	☐ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 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/ 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: 2024-04	Date: 03/29/24
Personnel: S.R., P.D. & M.R.	Temperature(°F): 40

Wheel Position: (check one)		
All wheels level	☐ before	☐ after
Left front	☐ 6 in higher	☐ 6 in lower
Right front	☐ 6 in higher	☒ 6 in lower
Right rear	☐ 6 in higher	☐ 6 in lower
Left rear	☐ 6 in higher	☐ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 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/ 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: 2024-04	Date: 03/29/24
Personnel: S.R., P.D. & M.R.	Temperature(°F): 40

Wheel Position: (check one)		
All wheels level	☐ before	☐ after
Left front	☐ 6 in higher	☐ 6 in lower
Right front	☐ 6 in higher	☐ 6 in lower
Right rear	☐ 6 in higher	☒ 6 in lower
Left rear	☐ 6 in higher	☐ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 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/ 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: 2024-04	Date: 03/29/24
Personnel: S.R., P.D. & M.R.	Temperature(°F): 40

Wheel Position: (check one)		
All wheels level	☐ before	☐ after
Left front	☐ 6 in higher	☐ 6 in lower
Right front	☐ 6 in higher	☐ 6 in lower
Right rear	☐ 6 in higher	☐ 6 in lower
Left rear	☐ 6 in higher	☒ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 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/ 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: 2024-04	Date: 03/29/24
Personnel: S.R., P.D. & M.R.	Temperature(°F): 40

Wheel Position: (check one)		
All wheels level	☐ before	☒ after
Left front	☐ 6 in higher	☐ 6 in lower
Right front	☐ 6 in higher	☐ 6 in lower
Right rear	☐ 6 in higher	☐ 6 in lower
Left rear	☐ 6 in higher	☐ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 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/ 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



LEFT FRONT 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 was used to apply a static tension load equal to 1.2 times the bus curb weight. The load was 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 was 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. This bus is deemed to pass this section of the test, but no points were allotted for this section.

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

DYNAMIC TOWING TEST DATA FORM

Page 1 of 1

Bus Number: 2024-04	Date: 08/13/24
Personnel: S.R., F.T., R.M. & T.G.	

Temperature (°F): 76	
Wind Direction: NNW	Wind Speed (mph): 3

Inspect tow equipment-bus interface.
Comments: A safe and adequate connection was made between the tow equipment and the bus.
Inspect tow equipment-wrecker interface.
Comments: A safe and adequate connection was made between the tow equipment and the wrecker.
Towing Comments: A complete tow was accomplished using a hydraulic under-wheel lift system.
Description and location of any structural damage: None noted.
General Comments: 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 were replaced with deflated tire(s) of the appropriate type. A portable hydraulic floor jack was 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) were replaced with the original tire(s) and the jack was lowered. Any structural damage or permanent deformation was recorded on the test data sheet. This procedure was repeated for each corner of the bus.

5.5-III. DISCUSSION

During the deflated portion of the test, the jacking point clearances ranged from 7.4 inches to 15.4 inches. No deformation or damage was observed during testing. A complete listing of jacking point clearances is provided in the Jacking Test Data Form. This bus passed this section of the test.

JACKING CLEARANCE SUMMARY

Condition	Frame Point Clearance
Front axle – one tire flat	7.4
Rear axle – one tire flat	14.4
Rear axle – two tires flat	12.1

JACKING TEST DATA FORM

Page 1 of 1

Bus Number: 2024-04	Date: 03/28/24
Personnel: S.R.	Temperature (°F): 68

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

I= Inflated D= Deflated

Deflated Tire	Jacking Pad Clearance Body/Frame (in)	Jacking Pad Clearance Axle/Suspension (in)	Comments
Right front	9.5"I 7.4"D	12.9"I 11.2" D	Body/Suspension
Left front	14.3"I 12.4"D	13.1"I 11.3"D	Body/Suspension
Right rear—outside	14.8"I 14.4"D	15.4"I 15.1"D	Body/Suspension
Right rear—both	14.8"I 12.1"D	15.4"I 13.4"D	Body/Suspension
Left rear—outside	15.6"I 15.2"D	15.6"I 15.4"D	Body/Suspension
Left rear—both	15.6"I 12.8"D	15.6"I 13.4"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
Additional comments of any deformation or difficulty during jacking:			
None noted.			

5.5 JACKING TEST



JACK IN PLACE – FRONT



JACK IN PLACE – REAR

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 was 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 was checked for stability on the jack stands and for any damage to the jacking pads or bulkheads. The procedure was repeated for the tag/middle axles (if equipped), and rear end of the bus. The procedure was then repeated for the front, tag/middle (if equipped) axles, and rear simultaneously.

5.6-III. DISCUSSION

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

The bus accommodated the placement of the vehicle lifts and jack stands and the procedure was performed without any instability noted. This bus passed this section of the test.

HOISTING TEST DATA FORM

Page 1 of 1

Bus Number: 2024-04	Date: 03/28/24
Personnel: S.R. & T.G.	Temperature (°F): 68

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

5.6 HOISTING TEST



JACK STANDS IN PLACE - FRONT



JACK STANDS IN PLACE – FRONT AND REAR

5.7 STRUCTURAL DURABILITY TEST

5.7-I. TEST OBJECTIVE

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

5.7-II. TEST DESCRIPTION

The test vehicle was driven a total of 9,170 miles; approximately 6,500 miles on the LTI Durability Test Track and approximately 2,670 miscellaneous other miles. The test was conducted with the bus operated under three different loading conditions. The first segment consisted of approximately 3,000 miles with the bus operated at GVW. The second segment consisted of approximately 1,500 miles with the bus operated at SLW. The remainder of the test, approximately 3,000 miles, was conducted with the bus loaded to CW. Once these miles were completed, the bus ran an additional 1,000 miles at GVW and 500 miles at SLW to demonstrate that the repairs/modifications to the cracks in the crossbeam to which the front carrier bearing is attached and repairs/modifications to the ADA door were adequate. The loads on both axles and GVW were within their ratings with the bus loaded as specified by the manufacturer. All subsystems were running during these tests in their normal operating modes. All manufacturer-recommended servicing was followed and noted on the vehicle maintainability log. Servicing items accelerated by the durability tests were compressed by 10:1; all others were done on a 1:1 mi/mi basis. Unscheduled breakdowns and repairs were recorded on the same log as are any unusual occurrences as noted by the driver. Once a week the test vehicle was washed down and inspected for any signs of failure. The dates on the driver's logs reflect operating times. The times when the bus was not operating for a period of time could be due to weather conditions, manufacturer's decision time/non-recurring engineering time, delay for parts delivery, holidays, etc.

5.7-III. DISCUSSION

The Structural Durability Test was started on April 1, 2024 and was conducted until October 7, 2024. The first 3,000 miles were performed at a GVW of 13,420 lb. and completed on May 20, 2024. The next 1,500-mile SLW segment was performed at 13,420 lb. and completed on June 13, 2024 and the final 3,000-mile segment was performed at a CW of 9,980 lb. and completed on September 12, 2024.

The FTA determined that this bus was to run an additional 1,000 miles at GVW, which started on September 23, 2024 and completed on October 1, 2024, and 500 miles at SLW which started on October 1, 2024 and completed on October 7, 2024. These additional miles were required to demonstrate that the repair/modifications made to the crossbeam on May 15, 2024 and the repair/modification made to the ADA door on July 23, 2024 adequately corrected the issues. No additional cracking in the crossbeam was noticed and no further issues with the ADA door falling out were noticed. These failures are deemed to be corrected.

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 LTI 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. This bus passed this section of the test, as there were no uncorrected Class 1 or Class 2 failures and the unscheduled maintenance of 53.81 hours was less than 125 hours.

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
04/01/24 To 04/07/24	978.00	146.00	1124.00
04/08/24 To 04/14/24	210.00	55.00	265.00
04/15/24 To 04/21/24	288.00	845.00	1133.00
04/22/24 To 04/28/24	0.00	0.00	0.00
04/29/24 To 05/05/24	0.00	0.00	0.00
05/06/24 To 05/12/24	0.00	0.00	0.00
05/13/24 To 05/19/24	354.00	65.00	419.00
05/20/24 To 05/26/24	790.00	64.00	854.00
05/27/24 To 06/02/24	380.00	17.00	397.00
06/03/24 To 06/09/24	0.00	0.00	0.00
06/10/24 To 06/16/24	197.00	153.00	350.00
06/17/24 To 06/23/24	0.00	0.00	0.00
06/24/24 To 06/30/24	0.00	0.00	0.00
07/01/24 To 07/07/24	0.00	0.00	0.00
07/08/24 To 07/14/24	0.00	0.00	0.00

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
07/15/24 To 07/21/24	0.00	0.00	0.00
07/22/24 To 07/28/24	285.00	160.00	445.00
07/29/24 To 08/04/24	0.00	0.00	0.00
08/05/24 To 08/11/24	63.00	351.00	414.00
08/12/24 To 08/18/24	565.00	206.00	771.00
08/19/24 To 08/25/24	0.00	0.00	0.00
08/26/24 To 09/01/24	125.00	106.00	231.00
09/02/24 To 09/08/24	732.00	33.00	765.00
09/09/24 To 09/15/24	33.00	303.00	336.00
09/16/24 To 09/22/24	0.00	0.00	0.00
09/23/24 To 09/29/24	936.00	91.00	1027.00
09/30/24 To 10/06/24	564.00	25.00	589.00
10/07/24 To 10/13/24	0.00	50.00	50.00
Total	6500.00	2670.00	9170.00

Driving Schedule for Bus Operation on the Durability Test Track.

STANDARD OPERATING SCHEDULE

Monday through Friday

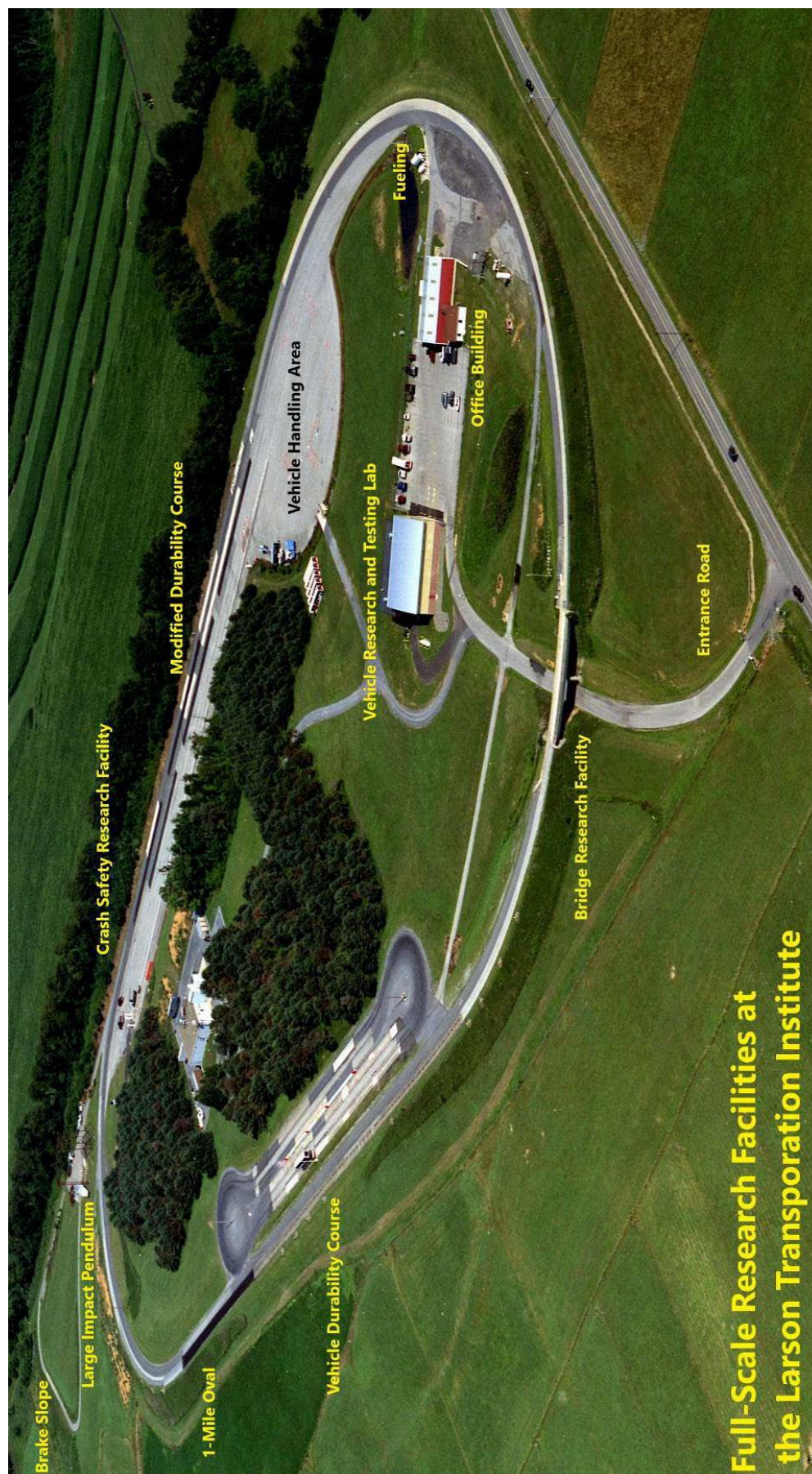
	HOUR	ACTION
Shift 1	midnight	D
	1:40 am	C
	1:50 am	B
	2:00 am	D
	3:35 am	C
	3:45 am	B
	4:05 am	D
	5:40 am	C
	5:50 am	B
	6:00 am	D
	7:40 am	C
	7:50 am	F
Shift 2	8:00 am	D
	9:40 am	C
	9:50 am	B
	10:00 am	D
	11:35 am	C
	11:45 am	B
	12:05 pm	D
	1:40 pm	C
	1:50 pm	B
	2:00 pm	D
	3:40 pm	C
	3:50 pm	F
Shift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

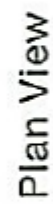
C—Cycle all systems five times, visual inspection, driver's log entries

D—Drive bus as specified by procedure

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



**Full-Scale Research Facilities at
the Larson Transportation Institute**

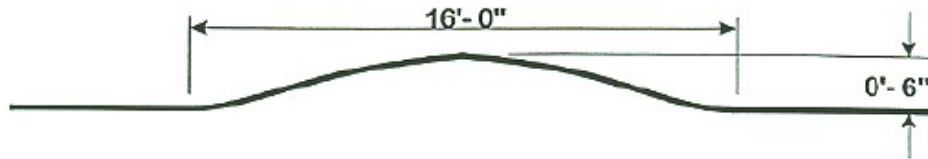


Track 1 (Track 2 has similar layout)

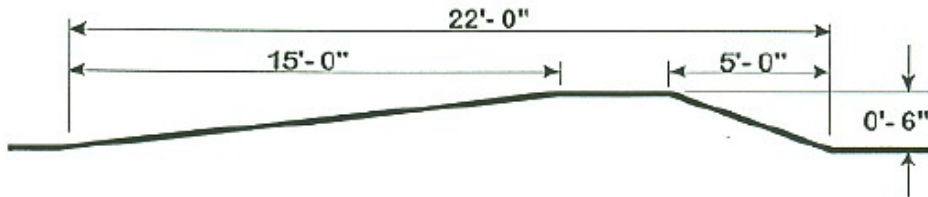
The Larson Transportation Institute

Penn State

Staggered
Bumps
(10 mph)



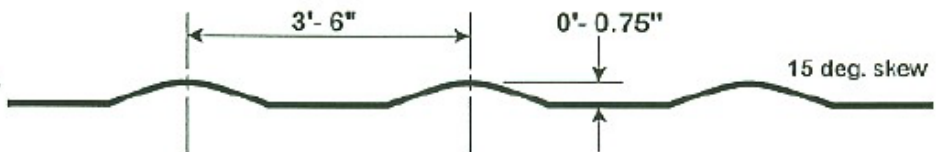
Railroad
Crossing
(8 mph)



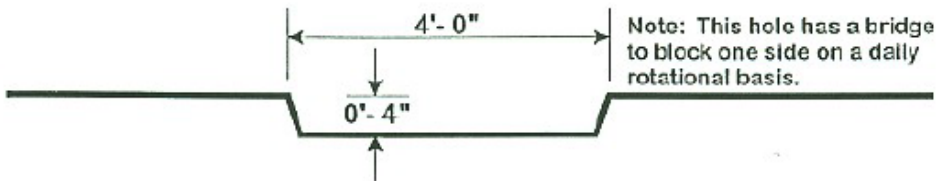
1" Random
Chuck Holes
(20 mph)



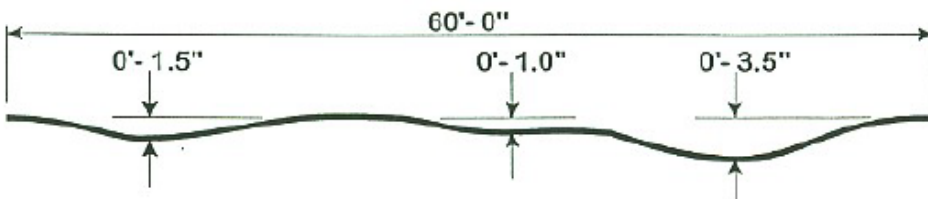
Chatter Bumps
(20 mph)



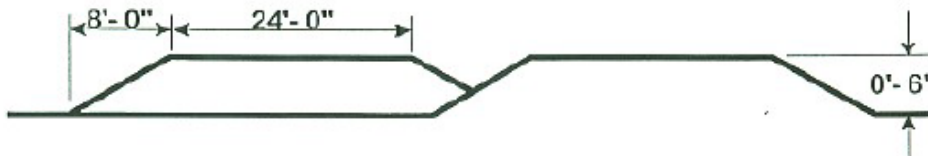
4" Chuck Hole
(5 mph)



High Crown
Intersection
(20 mph)



Frame Twist
(10 mph)



Durability Element Profiles

The Larson Transportation Institute
Penn State

Unscheduled Maintenance
High Level Enterprises, Inc. Bus #2024-04
(Page 1 of 8)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
04/02/24	300	A screw fell out of the curbside front mirror.	The screw was replaced with a bolt and nut to secure the mirror.	0.25	Body/ Mirrors	3
04/11/24	1,123	Rivet above ADA door is loose.	Removed and replaced the rivet.	0.05	Body	4
04/11/24	1,123	Coolant pump located outside the frame rail on streetside, in front of the fans is leaking.	Removed and replaced the coolant pump assembly.	0.25	HVAC	3
04/11/24	1,123	The outer panel support post adjacent to the windshield on the curbside is loose.	Removed inner trim panels for access and found screws were broken. Removed and replaced broken screws that hold the outer panel on vehicle.	0.50	Body	3
04/11/24	1,123	Multiple cracks on bus body. Streetside spot welds around core support bolt under power steering reservoir are cracked (Crack #1). Cracks developing in the body above the frame forward of the suspension spring in the front streetside wheel well (Crack #2). Front curbside inner fender is pulling away/cracked on the rear lower side (Crack #3). A crack has developed in the body below the rear, left driver's seat bolt (Crack #4). Spot welds pulled out at backside of driver's entry step on underside of bus above A/C lines (Crack #5). Cracks #6-14 are located directly on top of the curbside frame rail where the heatshield plate is welded. Cracks #15-17 are cracks on the heatshield where it is welded at the rear. The curbside crossbeams where the cut-outs were made for the fuel tank have cracked (Cracks #18 & 19). Similarly, the streetside crossbeams where the cut-outs were made for the fuel tank have cracked (Cracks #20 & 21). There is a broken weld on the crossbeam in front of the streetside rear tires where it is attached to supporting framework (Crack #22). Curbside underside of hood rubbing on mirror support.	Cracks #1, 3 and 5 will continue to be monitored. Cracks #2, 4, 15, 16, 17, and 22 were prepped and welded. For cracks #6-13, the heatshield was modified and welded to the body. Angle plate was added and welded to repair Crack #14. Cracks #18-21 were welded with plates. The end of the mirror bracket was ground down to prevent it from hitting the hood.	6.00	Body	3

Unscheduled Maintenance
High Level Enterprises, Inc. Bus #2024-04
(Page 2 of 8)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
04/18/24	2,521	Windshield washer tank is leaking.	Found that the hose attached to the washer pump was broken and disconnected. Cut the end of the hose off that was broken and reattached it to the tank.	0.50	Wiper/Washer	3
05/15/24	2,521	Bolts for the electrical power box for the ADA lift are pulling out of the lower lift support. The power box cover panel is breaking away.	Replaced the ADA lift power box cover panel and installed fender washers to reinforce the area.	0.17	ADA Lift	3
05/15/24	2,521	Crack #18 (previously repaired with a plate) has cracked vertically through the center from top to bottom (Crack #18-2). The repair to Crack #20 has cracked in the plate (Crack #20-2). Several cracks in the heatshield – Crack in the weld directly above the 2 nd curbside body mount from the front where the heatshield attaches to the body (Crack #23), a crack in the weld attaching the heatshield to the crossbeam above body mount between Cracks #9 and #10 (Crack #26), and the heatshield is splitting above Cracks #12 & #13 (Crack #27).	Cracks #18-2, 20-2, 19 & 21 repaired with two fabricated brackets using steel plates were installed (one on the curbside and one on the streetside). Cracks #23, 26 & 27 were prepped and welded.	5.00	Body	3
05/15/24	2,521	The crossbeam to which the front carrier bearing is attached to completely cracked on the streetside frame rail where it is welded (Crack #24) and partially cracked on the curbside frame rail (Crack #25).	Crack #24 was welded and small plates were added to the ends to fill in the gap. Crack #25 was welded.	1.83	Chassis	1
05/17/24	2,766	The 12-volt power supply wire broke off at the ADA lift.	Crimped a new terminal end and shrink tube on the wire and reinstalled.	0.25	Electrical	3
05/20/24 To 05/29/24	3,218 To 4,183	Rear A/C is not working.	The control board for the rear A/C is defective. Replaced the control board.	0.25	HVAC	3
05/23/24	3,551	Streetside rear spring shackle is worn out.	Replaced shackle.	0.25	Suspension	3

Unscheduled Maintenance
High Level Enterprises, Inc. Bus #2024-04
(Page 3 of 8)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
05/23/24	3,551	Bolt missing from curbside front mirror.	Replaced bolt and lock nut.	0.25	Body/ Mirrors	3
05/23/24	3,551	Windshield washer tank is leaking.	Found the tube on the bottom of the tank had a rubber tube that had a hole in it. Cut off the portion of the tube that had the hole in it and reattached it.	0.50	Wiper/ Washer	3
05/24/24	3,705	Bolts fell out of the inner barrier on ADA lift.	Reinstalled bolts. The bolt that fell out and the matching bolt on the other side of the ramp were reinstalled with blue thread lock.	0.25	ADA Lift	3
05/24/24 To 06/04/24	3,786 To 4,183	The 12-volt electrical system cover panel above the driver came loose and fell on the driver's head.	Reinstalled the 12-volt electrical system cover panel. Updated with 3M double sided tape and through bolts with nylon lock nuts. Original design was self-tapping screws.	0.50	Interior	1
05/28/24	3,878	Curbside front mirror is loose.	Tightened bolts.	0.25	Body/ Mirrors	3
06/07/24	4,183	Curbside front mirror bracket is cracked.	Mirror bracket was replaced with new bracket and hardware. The new mirror mount was mounted utilizing two extra mounting holes with 1/4" self-tapping screws.	0.50	Body/ Mirrors	3
06/13/24 To 08/12/24	4,346 To 5,533	On 06/13/24, the ADA lift will not fold up to stow. Manual assistance was required for lift to stow. On 08/08/24, the ADA lift would not function.	It was found that two wires (green and blue) that were connected to the solenoid in the power box had separated from their terminals. New terminals were installed and reattached. A loose wire was found on the relay and secured. The pressure switch on the box was adjusted to help the ramp fold into place without helping it.	0.50	ADA Lift	3
07/23/24	4,579	High idle not working.	Vehicle was missing jumper harness to allow for high idle. Manufacturer's representative added the missing jumper harness.	0.17	Wiring	4

Unscheduled Maintenance
High Level Enterprises, Inc. Bus #2024-04
(Page 4 of 8)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
07/23/24	4,579	Streetside ADA entrance door fell off when opened.	A modified door provided by the door manufacturer was installed. The door was modified by adding an additional structure to the hinge side of the door frame.	1.50	Doors	1
07/24/24	4,781	Front curbside bump stop broke and fell off.	Removed the broken bolt from the frame, replaced the 8 mm bolt and reattached the bump stop to the bus.	0.50	Suspension	1
07/24/24 To 07/30/24	4,781 To 4,973	A/C is not cold.	Took bus to the local Ford dealership for repair. Two broken wires were found in the wiring harness below the 12-volt battery. Wiring harness was repaired.	5.40	HVAC	3
07/25/24 To 08/08/24	4,924 To 4,975	Curbside front mirror is loose. Curbside mirror is missing a mounting bolt on the mirror mounting bracket under the hood.	Holes were drilled in body core support area and nuts were used for mirror mounting.	0.25	Body/ Mirrors	3
08/08/24	4,975	Curbside outer fender has a crack located under the hood near the top rear most bolt by the firewall area.	Removed and reinstalled the bolt with a washer.	0.10	Body	3
08/08/24	4,975	Curbside panel behind front fender in front of passenger door came loose. Caulking is pulling away from the seam at the curbside between support post and windshield.	Inner bus panels near entrance door were removed. Screws that were holding the outer body panel on bus were found broken. Installed new screws, bolts, nuts and washers. Installed epoxy between panel and body to help hold outer panel on vehicle. Silicone was placed over panel epoxy and inner panels were reinstalled.	2.92	Body	3
08/08/24	4,975	Found cracks in the body above the driver area, in structure where the roof is welded to the body (Crack #31) and a crack in the body metal that was cut for modification (Crack #32).	Crack # 31 was welded with a plate and Crack #32 was repaired with epoxy. A support strap was added between the bus body and cab area for extra support.	2.00	Body	3
08/08/24	4,975	Crack at curbside top of windshield near drip edge (Crack #33).	Repaired the crack with epoxy and silicone.	0.08	Body	3

Unscheduled Maintenance
High Level Enterprises, Inc. Bus #2024-04
(Page 5 of 8)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
08/12/24	5,533	Exhaust hanger on the streetside (last one on the rear) has cracked and separated.	Removed and replaced the exhaust hanger.	0.25	Exhaust	3
08/16/24 To 08/29/24	6,160 To 6,207	The inboard barrier bracket on the ADA lift is broken.	Removed and replaced the inboard barrier brackets on both sides.	1.50	ADA Lift	1
08/16/24	6,118	Loss of power steering.	A hole was found on the intake hose of the power steering pump. The hose was bouncing against the compressor head unit causing a hole and loss of power steering fluid. The power steering hose was replaced.	0.25	Steering	1
08/22/24	6,160	Streetside rear shackle worn out.	Removed and replaced streetside rear shackle.	0.25	Suspension	3
08/29/24	6,207	Multiple cracks: Welding repair made to cracks in the body above the frame forward of the suspension spring in the front streetside wheel well has cracked (Crack #2-2). The crack in the body below the rear left driver's seat bolt that was previously welded has cracked through the length of the weld (Crack #4-2). The welding repair to the weld attaching the shield to the body directly above the second curbside body mount from the front has broken away (Crack #23-2). A 5 cm crack has developed behind the A/C lines on the streetside in the body above the frame rail at the rear of the driver's cabin (Crack #35). The fuse/relay panel above the driver and the vertical support which frames the fuse panel has cracked at the bottom where welded to the tube below it (Crack #36). The horizontal square tubing to which the vertical support (location of Crack #36) is	Cracks #1, 2-2, 4-2, 23-2, 35, 36, 37, 38, 39 and 40 were prepped and welded. Crack #42 was repaired with epoxy and caulking sealer. Crack #41 is being monitored.	5.00	Body	3

Unscheduled Maintenance
High Level Enterprises, Inc. Bus #2024-04
(Page 6 of 8)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
08/29/24 (Cont.)		welded has cracked where it is joined to the adjacent tube (Crack # 37). A 2cm crack developed on the curbside heatshield behind Crack #23-2 and the whole weld is broken (Crack # 38). A crack has developed on the heatshield (Crack #39). A crack and spot weld break was found on the curbside inner core support inner fender area next to the 12-volt battery and curbside mirror mounting bolt area (Crack #40). A crack in the curbside inner fender behind A/C line near the A/C filter (Crack #41). A crack developed in the streetside upper corner of the windshield near the drip edge (Crack #42).				
09/03/24 To 09/06/24	6,477 To 7,034	Curbside standee handrail has broken weld and has broken off.	Replaced ends and middle supports for the handrail.	0.25	Interior	3
09/05/24 To 09/23/24	7,034 To 7,486	Interior light over passenger door fell down. The screws pulled out of the panel and the light was hanging by the wires.	Reinstalled the light using slightly bigger mounting screws.	0.25	Interior	3
09/06/24	7,034	Curbside front mirror is loose. Mounting screws are loose and bracket is cracked.	A new modified mounting bracket was provided. The cut outs for the mounting locations are different. One hole was wider, so a washer was added for the bolt to grab the bracket.	0.50	Body/ Mirrors	3
09/09/24	7,324	Broken exhaust hanger near fuel tank.	Removed and replaced hanger. Hanger had to be modified to fit mounting holes.	1.00	Exhaust	3
09/13/24	7,486	ADA lift is binding when lowering and transition plate is catching the lift mechanism.	Found the transition stop plate between the lift and bus floor to be loose. A screw had fallen out. Reinstalled screw.	0.17	ADA System	3

Unscheduled Maintenance
High Level Enterprises, Inc. Bus #2024-04
(Page 7 of 8)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
09/16/24	7,486	Washer tank is empty and fluid is leaking.	Found the washer hose was damaged at the washer pump connection due to tank bolts coming loose. Repaired hose by trimming the hose end. Tightened the tank bolts, reassembled and filled tank.	0.50	Wiper/Washer	3
09/19/24	7,486	Multiple cracks: A previously welded crack in the body below the rear left driver's bolt has cracked again (Crack #4-3). Crossbeam in front of streetside rear tires has a broken weld (previously repaired) where it attaches to supporting framework (Crack #22-2). Previously repaired split in the heatshield between cracks #12 & #13 has cracked again (Crack #27-2). The body at the back of the curbside front inner fender above the frame rail has cracked in two separate places very close to one another. (Cracks #28 & 29). A 2 cm crack has developed at the streetside above the frame rail (adjacent to the forwardmost body mount bushing) in weld (Crack #30). Previously repaired support gusset above the driver's door has cracked again (Crack #31-2). Curbside top of fender under hood closer to firewall has a crack that was previously repaired with a washer (Crack# 34). Previously welded crack and spotweld break on curbside inner fender area next to the 12-volt battery and curbside mirror mounting bolt area has cracked again (Crack#40-2). A 1 cm crack has developed under the curbside front mirror mount (Crack #43). A 3 cm crack at the curbside bottom of dogbox perimeter (Crack# 44).	Crack # 3 was repaired with a plate. All remaining cracks identified throughout testing were prepped and welded. Upon further inspection, Crack #60 was not a crack and did not require repair.	12.92	Body	3

Unscheduled Maintenance
High Level Enterprises, Inc. Bus #2024-04
(Page 8 of 8)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
09/19/24 (Cont.)		A 5 cm crack at the curbside bottom of dogbox perimeter (Crack# 45). A 3 cm crack at the spotweld adjacent to Crack #45 (Crack #46). Approximately 2.5 cm crack at the curbside inner fender near the brake booster (Crack #47). The weld on the heatshield above the curbside frame rail inside the body mount just forward of Crack #27-2 has cracked (Crack #48). The heatshield above curbside body mount behind battery box mounted on frame rail has cracked (Crack #49). Crack in the body above frame rail between body mounts behind curbside front tire (Crack #50). A 2 cm crack in curbside inner fender under battery holder (Crack #51). Cracks in rear heatshield welds above horizontal crossmember (Cracks #52 & #53). A group of 1 cm cracks in the body behind grille in front of the A/C condenser (Cracks #54-57). Approximately 1 cm crack above front curbside coil spring on inner fender (Crack #58). Steel strap welded to body behind driver has cracked (Crack #59). Top inner fender at seam under curbside windshield post is cracked (Crack #60). Streetside underside of dogbox next to exhaust manifold is cracked (Crack #61). A group of spot welds cracked/pulled away in driver's door jamb (Cracks #62-66). Curbside backside of inner fender under corner of windshield has a 2cm crack (Crack #67).				

UNSCHEDULED MAINTENANCE



**SCREW FELL OUT OF CURBSIDE MIRROR
(300 TEST MILES)**



**COOLANT PUMP ASSEMBLY REPLACED
(1,123 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**SCREWS THAT HOLD THE OUTER PANEL ON THE SUPPORT POST
ADJACENT TO THE WINDSHIELD ON THE CURBSIDE ARE BROKEN
(1,123 TEST MILES)**



**CRACK #1 – SPOT WELDS AROUND CORE SUPPORT, STREETSIDE
(1,123 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #2 – CRACKS IN BODY ABOVE THE FRAME FORWARD OF THE
SUSPENSION SPRING IN THE FRONT STREETSIDE WHEEL WELL
(1,123 TEST MILES)**



**CRACK #3 – FRONT CURBSIDE INNER FENDER IS PULLING
AWAY/CRACKED ON THE REAR LOWER SIDE
(1,123 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #6 – TOP OF THE CURBSIDE FRAME
WHERE THE HEATSHIELD IS WELDED
(1,123 TEST MILES)**



**CRACKS #7, 8 & 9 – TOP OF THE CURBSIDE FRAME
WHERE THE HEATSHIELD IS WELDED
(1,123 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #9 – TOP OF THE CURBSIDE FRAME
WHERE THE HEATSHIELD IS WELDED
(1,123 TEST MILES)**



**CRACKS #10, 11 & 12 – TOP OF THE CURBSIDE FRAME
WHERE THE HEATSHIELD IS WELDED
(1,123 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #13 – TOP OF THE CURBSIDE FRAME
WHERE THE HEATSHIELD IS WELDED
(1,123 TEST MILES)**

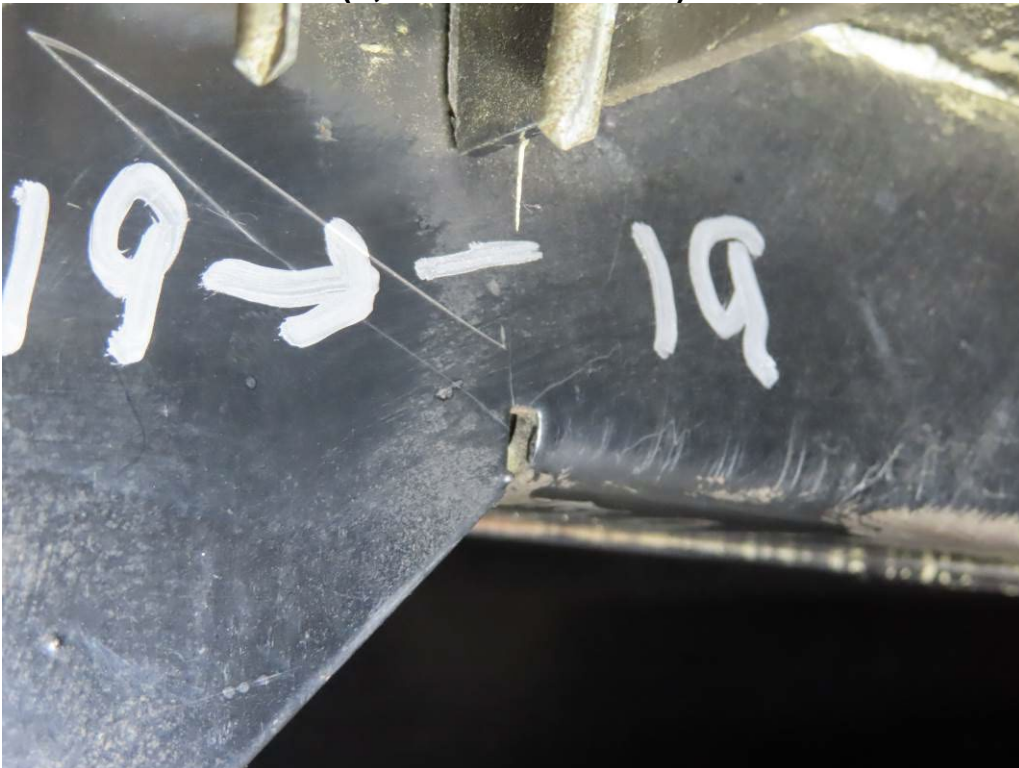


**CRACKS #15, 16 & 17 – ADDITIONAL CRACKS
WHERE HEATSHIELD WELDED AT THE REAR
(1,123 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #18 – CURBSIDE CROSSBEAM WHERE CUT OUTS
WERE MADE FOR FUEL TANK
(1,123 TEST MILES)**



**CRACK #19 – CURBSIDE CROSSBEAM WHERE CUT OUTS
WERE MADE FOR FUEL TANK
(1,123 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #22 –BROKEN WELD ON CROSSBEAM IN FRONT OF STREET-SIDE REAR TIRES WHERE IT ATTACHES TO SUPPORTING FRAMEWORK
(1,123 TEST MILES)**



**REPAIRED BROKEN HOSE ON WASHER PUMP
(2,521 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.

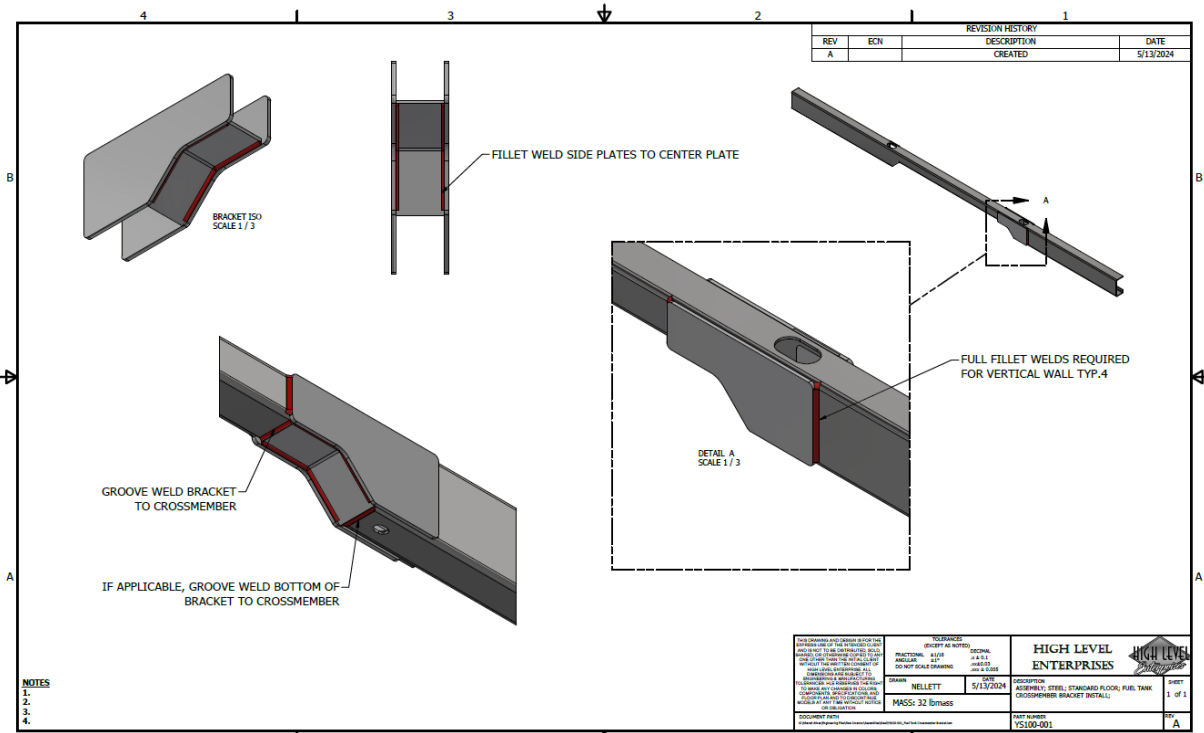


**BROKEN COVER PANEL OF POWER BOX FOR ADA LIFT
(2,521 TEST MILES)**



**REPAIR OF CRACKS #18-2 & 19 WITH FABRICATED BRACKETS
USING STEEL PLATES
(2,521 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



REPAIR OF CRACKS #18-2, 20-2, 19 & 21-2 WITH FABRICATED BRACKETS USING STEEL PLATES (2,521 TEST MILES)



CRACK #24 – CROSSBEAM TO WHICH FRONT CARRIER BEARING IS ATTACHED CRACKED ON STREETSIDE FRAME RAIL WHERE IT IS WELDED – PREPPED FOR WELDING (2,521 TEST MILES)

UNSCHEDULED MAINTENANCE CONT.

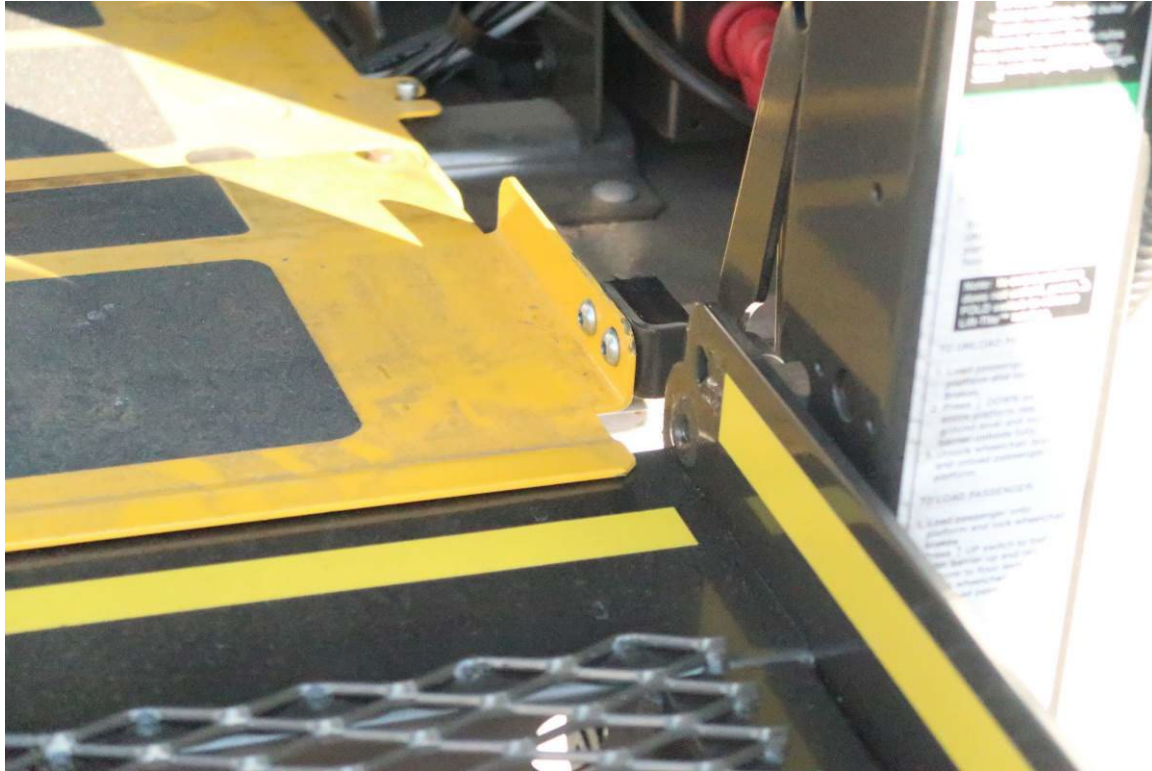


**12-VOLT POWER SUPPLY CABLE BROKE AT THE ADA LIFT
(2,766 TEST MILES)**



**REPLACEMENT SPRING SHACKLE (LEFT) / WORN STREETSIDE
REAR SPRING SHACKLE (RIGHT)
(3,551 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**BOLTS FELL OUT OF INNER BARRIER ON ADA LIFT
(3,705 TEST MILES)**



**CURBSIDE FRONT MIRROR BRACKET IS CRACKED
(4,183 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**DEFECTIVE CONTROL BOARD FOR REAR A/C REPLACED
(4,183 TEST MILES)**



**ELECTRICAL SYSTEM COVER PANEL ABOVE DRIVER FELL DOWN
(4,183 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**JUMPER HARNESS FOR HIGH IDLE INSTALLED
(4,579 TEST MILES)**



**ADA DOOR FELL OFF
(4,579 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.

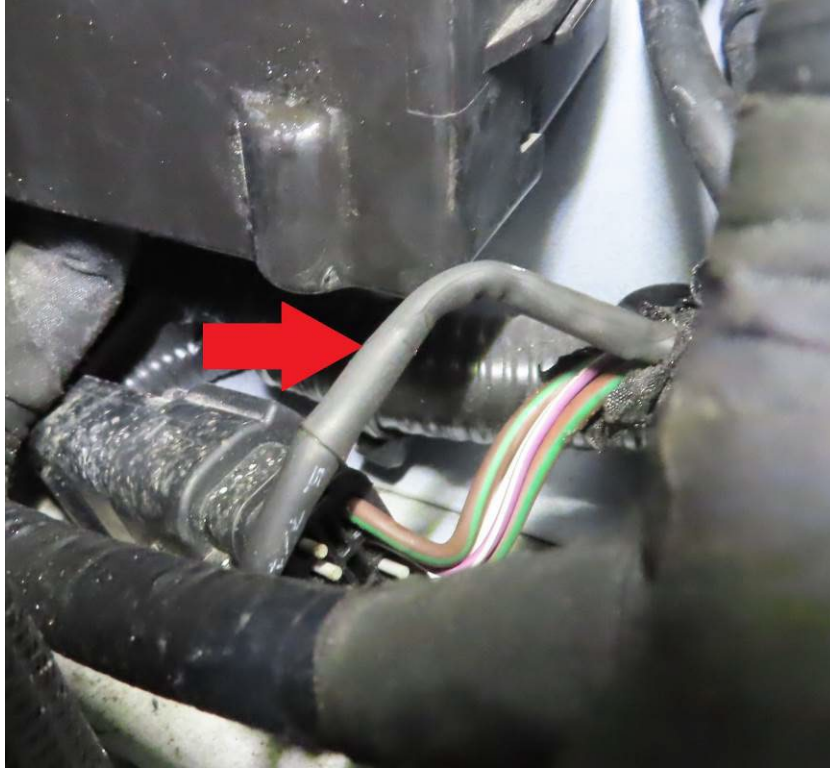


**BROKEN PART OF ADA DOOR THAT FELL OFF
(4,579 TEST MILES)**



**FRONT CURBSIDE BUMP STOP BROKE AND FELL OFF
(4,781 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**WIRING HARNESS REPAIRED TO FIX A/C
(4,973 TEST MILES)**



**WASHER INSTALLED UNDER BOLT WHERE CRACKING
ON CURBSIDE OUTER FENDER UNDER THE HOOD
(4,973 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**HOLES DRILLED IN CORE SUPPORT AREA AND
NUTSERTS ADDED FOR MIRROR MOUNTING
(4,975 TEST MILES)**



**CAULKING IS SEPARATING BETWEEN SUPPORT
POST AND WINDSHIELD
(4,975 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**LOCATION OF CRACK #31 AND NEW SUPPORT STRAP
(4,975 TEST MILES)**

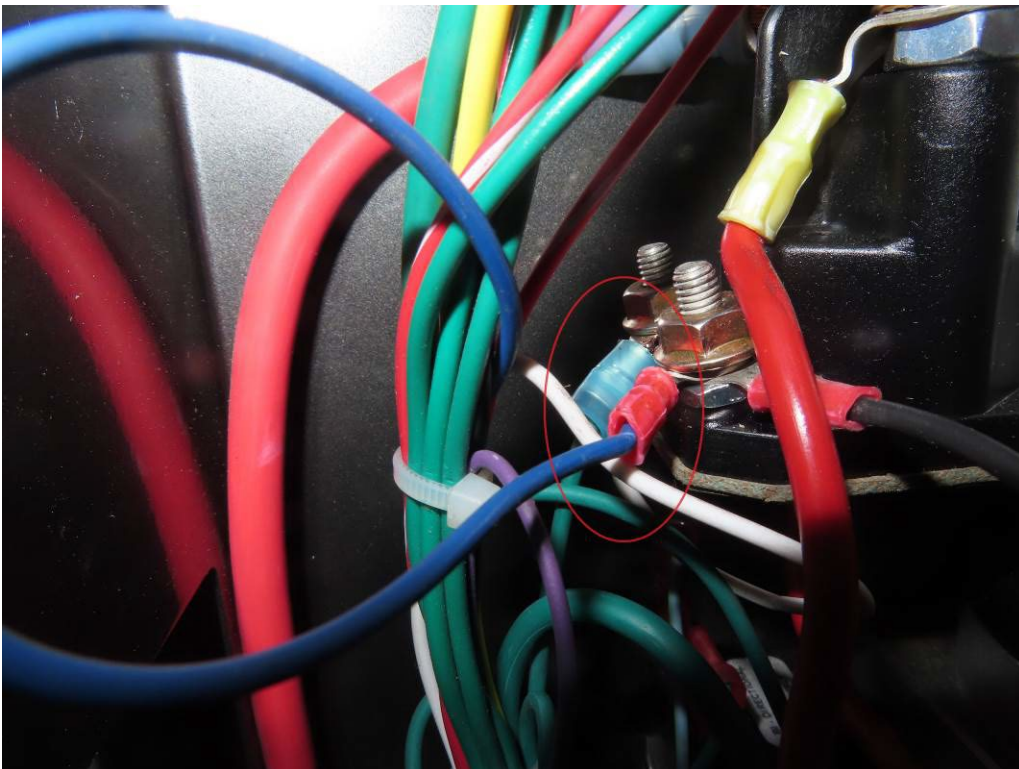


**CRACK #33 AT CURBSIDE TOP OF WINDSHIELD
REPAIRED WITH EPOXY AND SILICONE
(4,975 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**EXHAUST HANGER ON STREETSIDE HAS CRACKED AND SEPARATED
(5,533 TEST MILES)**



**NEW TERMINALS INSTALLED AND REATTACHED IN ADA POWER BOX
(5,533 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**HOLE ON INTAKE HOSE OF POWER STEERING PUMP
(6,118 TEST MILES)**



**CRACK #36 & 37– VERTICAL SUPPORT AND HORIZONTAL
TUBING THAT FRAMES THE FUSE PANEL
(6,207 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #38 –CURBSIDE HEATSHIELD, WELD IS BROKEN
(6,207 TEST MILES)**



**CRACK #39 – CRACK ON THE HEATSHIELD
(6,207 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #42 – A CRACK IN THE STREETSIDE UPPER CORNER OF THE WINDSHIELD NEAR THE DRIP EDGE
(6,207 TEST MILES)**



**BROKEN WELD ON CURBSIDE GRAB HANDRAIL
(7,034 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.

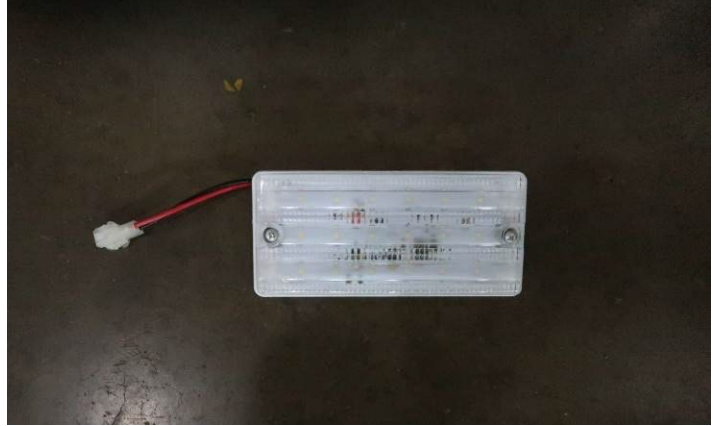


**MODIFIED BRACKET FOR CURBSIDE FRONT MIRROR (LEFT)
ORIGINAL BRACKET (RIGHT)
(7,034 TEST MILES)**

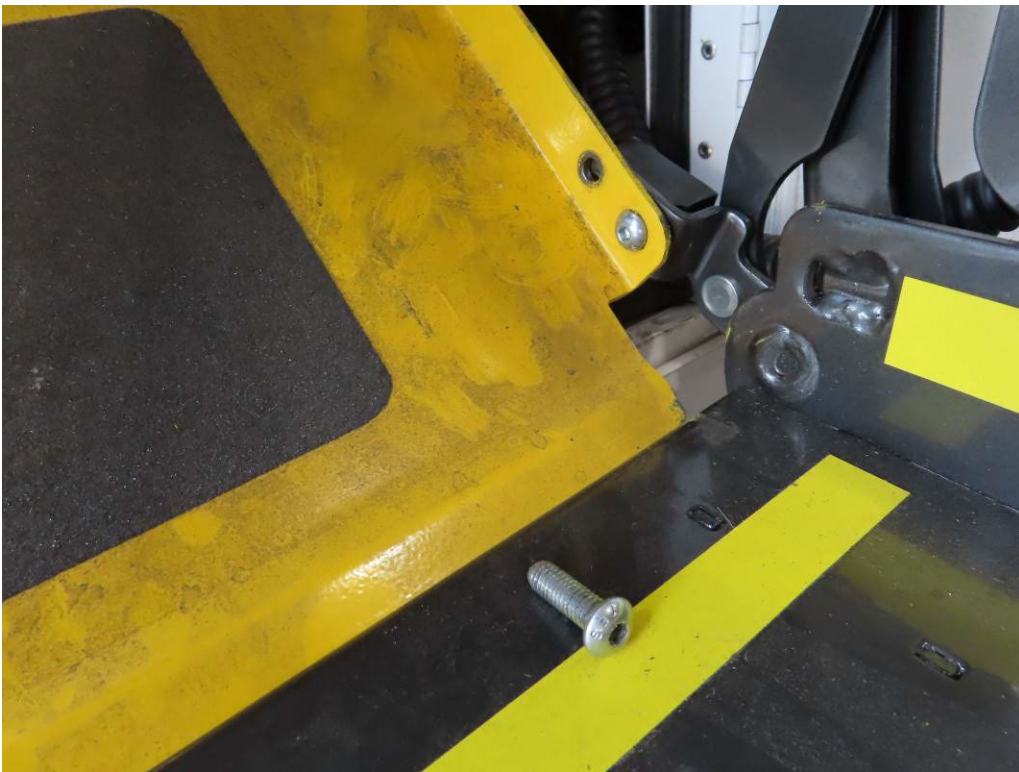


**EXHAUST HANGER REPLACED
(7,324 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**INTERIOR LIGHT OVER PASSENGER DOOR FELL DOWN
(7,486 TEST MILES)**

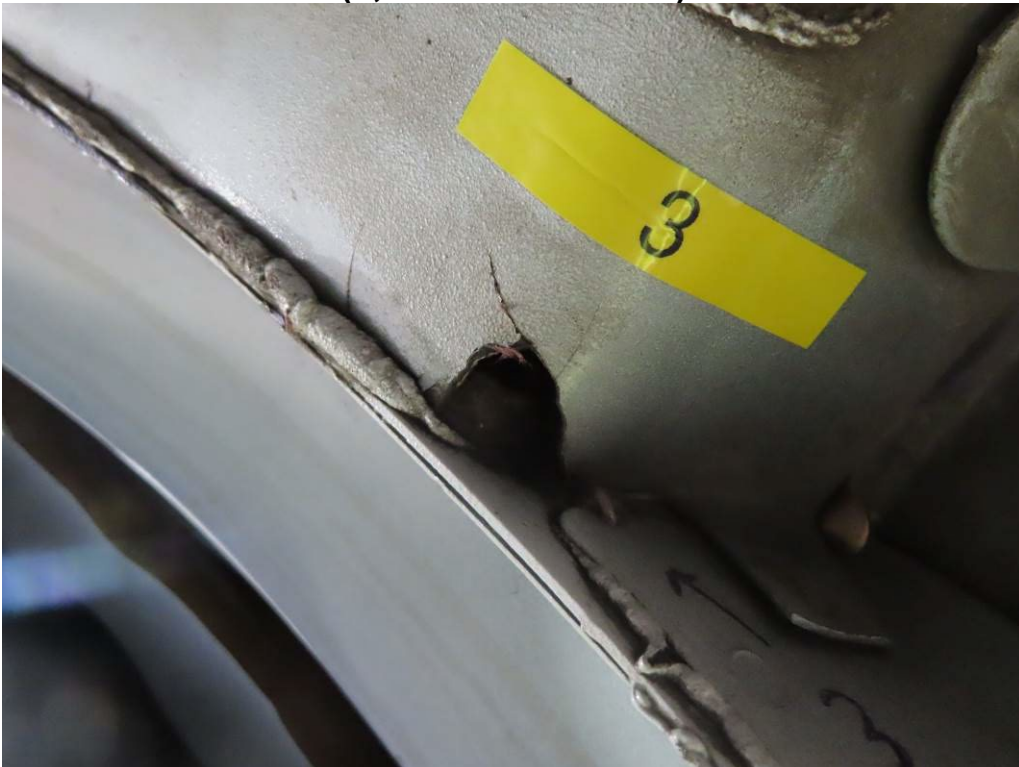


**SCREW FELL OUT OF TRANSITION PLATE ON ADA LIFT
(7,486 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**DAMAGED HOSE ON WASHER TANK
(7,486 TEST MILES)**



**CRACK #3 – FRONT CURBSIDE INNER FENDER IS PULLING
AWAY/CRACKED ON THE REAR LOWER SIDE
(7,486 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #4-3 – PREVIOUSLY WELDED CRACK IN BODY BELOW REAR
LEFT DRIVER’S SEAT BOLT CRACKED AGAIN
(7,486 TEST MILES)**



**CRACKS #52 & 53 – CRACKS IN REAR HEATSHIELD
ABOVE HORIZONTAL CROSSMEMBER
(7,486 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #53 – CRACK IN REAR HEATSHIELD
ABOVE HORIZONTAL CROSSMEMBER
(7,486 TEST MILES)**



**CRACK #22-2 – CROSSBEAM IN FRONT OF STREETSIDE REAR TIRES
HAS A BROKEN WELD THAT WAS PREVIOUSLY REPAIRED
(7,486 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #27-2 – PREVIOUSLY REPAIRED SPLIT IN HEATSHIELD
CRACKED AGAIN
(7,486 TEST MILES)**



**CRACKS #28 & 29 –ON THE BODY AT THE BACK OF THE CURBSIDE
FRONT INNER FENDER ABOVE FRAME RAIL
(7,486 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #30 – STREETSIDE BODY ABOVE THE FRAME RAIL
ADJACENT TO THE FORWARDMOST BODY MOUNT BUSHING
(7,486 TEST MILES)**



**CRACK #31-2– PREVIOUSLY REPAIRED SUPPORT GUSSET
ABOVE DRIVER'S DOOR CRACKED AGAIN
(7,486 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #59 – STEEL STRAP THAT WAS ADDED TO BODY
BEHIND DRIVER HAS CRAKED
(7,486 TEST MILES)**



**CRACK #50– BODY ABOVE FRAME RAIL BETWEEN
BODY MOUNTS BEHIND CURBSIDE FRONT TIRE
(7,486 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #48 – WELD ON THE HEATSHIELD ABOVE CURBSIDE FRAME
RAIL INSIDE THE BODY MOUNT JUST FORWARD OF CRACK #27-2
(7,486 TEST MILES)**



**CRACK #54 – CRACK IN BODY BEHIND GRILLE IN FRONT
OF THE A/C CONDENSER
(7,486 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #55 – CRACK IN BODY BEHIND GRILLE IN FRONT
OF THE A/C CONDENSER
(7,486 TEST MILES)**



**CRACKS #62, 63, 64 & 65 – LOCATION OF CRACKS IN
DRIVER'S DOOR JAMB
(7,486 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACK #67 – CURBSIDE BACKSIDE OF INNER FENDER
UNDER CORNER OF WINDSHIELD
(7,486 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 operating profile, under specified operating conditions that are typical of transit bus operation. The results of this test may not represent actual mileage in transit service but will provide data that can be used by FTA Grantees to compare the efficiency of buses tested using this procedure.

6-II. TEST DESCRIPTION

This test was performed in the emissions bay of the LTI Vehicle Testing Laboratory. The Laboratory is equipped with a Horiba 500 HP, large-roll (72-inch diameter) chassis dynamometer suitable for heavy-vehicle emissions testing. The driving cycles are the Manhattan cycle, a low average speed, highly transient urban cycle (Figure 1), the Orange County Bus Cycle, a medium average speed transient urban cycle (Figure 2), and the EPA HD-UDDS Cycle, which consists of urban and highway driving segments (Figure 3). A fuel economy test was comprised of two runs for the three different driving cycles, and the average value was reported.

The test procedure for liquid-fueled buses such as this one uses a calibrated flowmeter system and/or a calibrated fuel weighing scale. The flowmeter system utilizes a precise four-piston positive displacement flow meter. The weighing scale system includes heat exchangers to maintain temperature in diesel and common-rail injection systems.

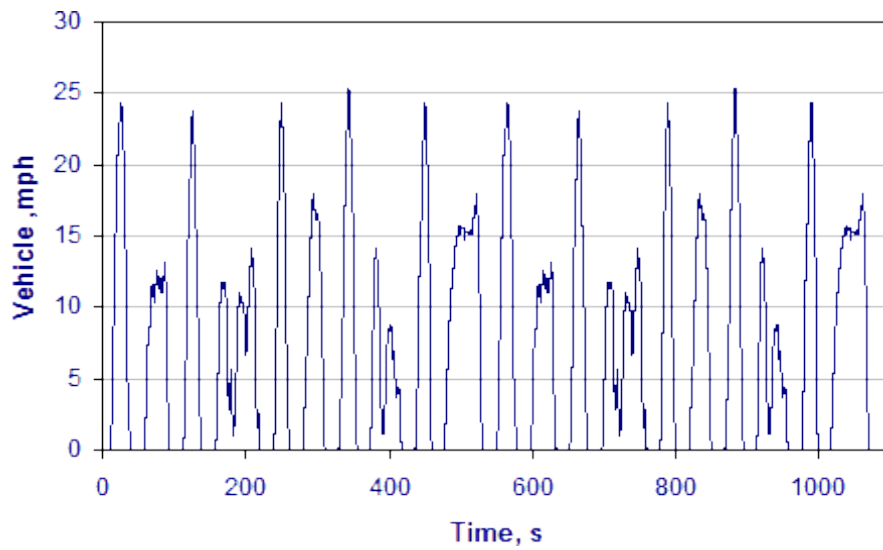


Figure 1. Manhattan Driving Cycle (duration 1089 sec, Maximum speed 25.4 mph, average speed 6.8 mph)

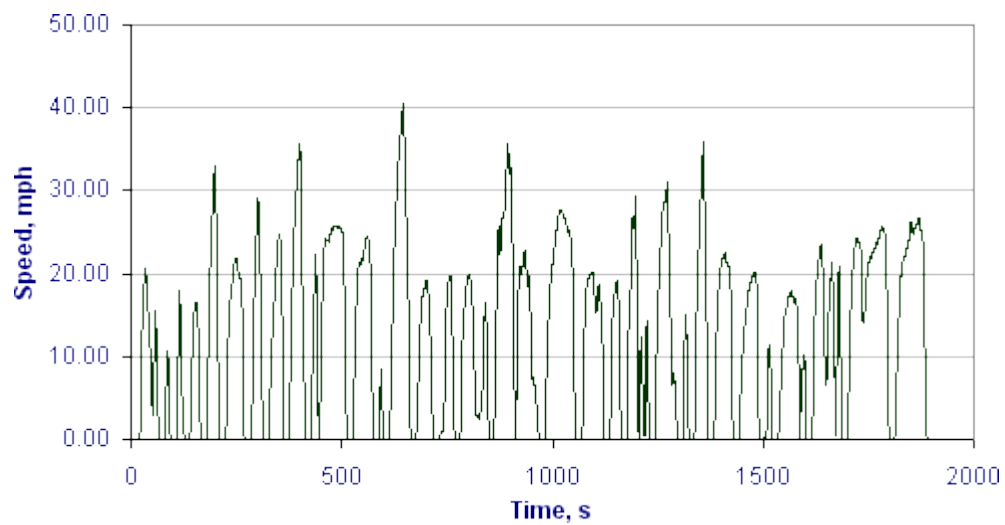


Figure 2. Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41 mph, Average Speed 12 mph).

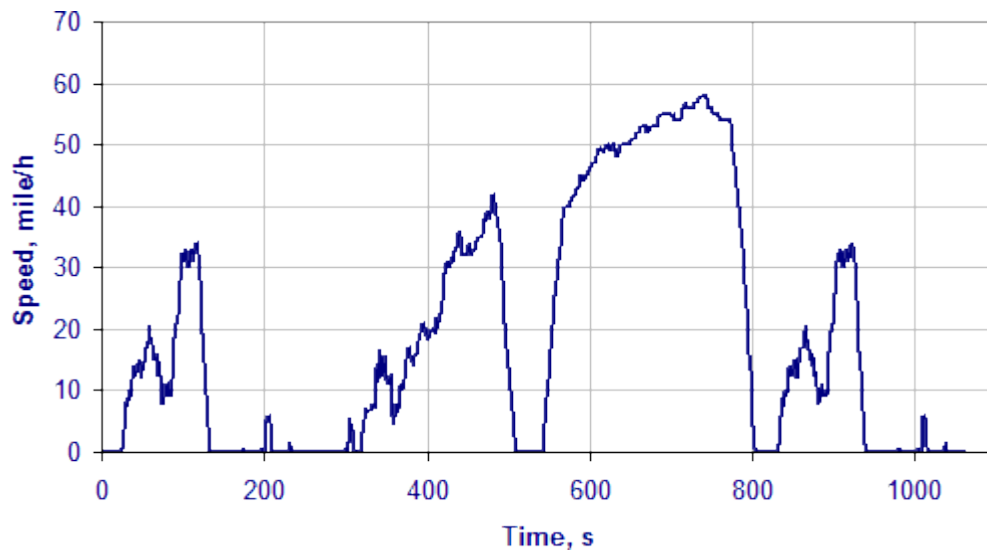


Figure 3. HD-UDDS Cycle (duration 1060 seconds, Maximum Speed 58 mph, Average Speed 18.86 mph).

6-III. DISCUSSION

The driving cycle consists of three simulated transit driving cycles: Manhattan, Orange County Bus Cycle and the HD-UDDS, as described in 6-II. The fuel consumption for each driving cycle and idle was measured.

An extensive pretest maintenance check was 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 Form. Finally, the summary sheet provides the average fuel consumption for the three test cycles and for a 20-minute idle. **The average fuel consumption for the Manhattan, OCBC and the HD-UDDS were 4.7 mpg, 6.5 mpg and 8.1 mpg respectively. For idle, the fuel consumption was 0.74 gal/hr.**

FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Page 1 of 3

Bus Number: 2024-04	Date: 09/09/24	SLW (lb.): 13,420
Personnel: J.M., P.D., T.G. & S.R.		

FUEL SYSTEM	OK
Install fuel measurement system	✓
Replace fuel filter	N/A
Check for fuel leaks	✓
Specify fuel type (Gasoline)	✓
Remarks: None noted.	
BRAKES/TIRES	OK
Inspect hoses	✓
Inspect brakes	✓
Check tire inflation pressures (mfg. specs.)	✓
Check tire wear (less than 50%)	✓
Remarks: Tire Tread depth: Front 6/32, Rear 12/32 – All tire PSI @ 80 PSI.	
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: 2024-04	Date: 09/09/24
Personnel: J.M., P.D., T.G. & S.R.	
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: Not needed per manufacturer's recommended service intervals.	
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	N/A
Replace differential lubrication including axles	N/A
Remarks: Lubricated fittings, differential lubrication not recommended per	
manufacturer's service intervals, changed oil and filter for engine.	

FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Page 3 of 3

Bus Number: 2024-04	Date: 09/09/24
Personnel: J.M., P.D., T.G. & S.R.	
EXHAUST/EMISSION SYSTEM	OK
Check for exhaust leaks	✓
Remarks: None noted.	
ENGINE	OK
Replace air filter	✓
Inspect air compressor and air system	N/A
Inspect vacuum system, if applicable	N/A
Check and adjust all drive belts	✓
Check cold start assist, if applicable	N/A
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: No comment.	

FUEL ECONOMY PRE-TEST INSPECTION FORM

Page 1 of 1

Bus Number: 2024-04	Date: 09/11/24
Personnel: J.M., P.D., T.G., S.R. & G.C.	
PRE-WARM-UP	If OK, Initial
Fuel Economy Pre-Test Maintenance Form is complete	J.M.
Cold tire pressure (psi): Front <u>80</u> Middle <u>N/A</u> Rear <u>80</u>	J.M.
Engine oil level	J.M.
Engine coolant level	J.M.
Interior and exterior lights on, evaporator fan on	J.M.
Fuel economy instrumentation installed and working properly.	J.M.
Fuel line -- no leaks or kinks	J.M.
Bus is loaded to SLW during coast down	J.M.
WARM-UP	If OK, Initial
Air conditioning off	G.C.
Exterior & Interior light on	G.C.
Defroster off	G.C.
Fuel line -- no leaks or kinks	G.C.
Do not drive with left foot on brake	G.C.

FUEL ECONOMY DATA FORM
(Gaseous and Liquid fuels)

Page 1 of 1

Bus Number: 2024-04	Manufacturer: High Level Enterprises, Inc.	Date: 09/11/24
Fuel Type: Gasoline	Personnel: S.B. & S.I.	
Temperature (°F): 77.5	Humidity (%): 57	Barometric Pressure (inHg): 28.9
SLW (lb.): 13,420		

Cycle	Manhattan	Orange County	HD-UDDS	Idle
Fuel Consumption mpg	4.7	6.5	8.1	0.74 G/hr

Comments: None noted.

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 was measured at several locations with the bus operating under the following three conditions:

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

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

7.1-III. DISCUSSION

For the first part, the overall average of the six measurements was 48.7 dB(A); ranging from 47.0 dB(A) at the driver's seat to 49.9 dB(A) at the front passenger seats. The interior ambient noise level for this test was less than 30 dB(A).

For the second part, the interior noise level ranged from 73.4 dB(A) at the middle passenger seats to 76.3 dB(A) at the driver's seat. The overall average was 75.1 dB(A). The interior ambient noise level for this test was less than 30 dB(A).

No vibrations or rattles were noted during the third part of this test. This bus passed this section of the test.

INTERIOR NOISE TEST DATA FORM

Test Condition 1: 80 dB(A) Stationary White Noise

Page 1 of 3

Bus Number: 2024-04	Date: 06/13/24
Personnel: T.G., S.R. & F.T.	
Temperature (°F): 81	Humidity (%): 45
Wind Speed (mph): 6	Wind Direction: SSW
Barometric Pressure (mbar): 1014	
Interior Ambient Noise Level dB(A): less than 30	Exterior Ambient Noise Level dB(A): 39.9
Microphone Height During Testing (in): 45	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	47.0
Front Passenger Seats	49.9
In Line with Front Speaker	47.9
In Line with Middle Speaker	48.7
In Line with Rear Speaker	49.0
Rear Passenger Seats	49.4

Comments: None noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 2: 0 to 35 mph Acceleration Test
Page 2 of 3

Bus Number: 2024-04	Date: 06/13/24
Personnel: T.G., S.R., F.T. & G.C.	
Temperature (°F): 76	Humidity (%): 58
Wind Speed (mph): 5	Wind Direction: SSW
Barometric Pressure (mbar): 1015	
Interior Ambient Noise Level dB(A): Less than 30	Exterior Ambient Noise Level dB(A): 39.6
Microphone Height During Testing (in): 45"	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	76.3
Front Passenger Seats	75.1
Middle Passenger Seats	73.4
Rear Passenger Seats	75.5

Comments: None noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 3: Audible Vibration Test
Page 3 of 3

Bus Number: 2024-04	Date: 06/12/24
Personnel: T.G., S.R., F.T. & J.S.	
Temperature (°F): 75	

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	None noted.	None noted.
Windows and Doors	None noted.	None noted.
Seats and Wheelchair lifts	W/C Lift	Squeaking
Other	None noted.	None noted.

Comment on any other vibration or noise source which may have occurred
that is not described above: None noted.
Comments: 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 was operated at a SLW in three different conditions using a smooth, straight and level roadway:

1. Accelerating at full throttle from a constant speed starting from 35 mph.
2. Accelerating at full throttle from standstill.
3. Stationary, with the engine at low idle, high idle, and wide-open throttle, where applicable. In addition, the bus was tested with and without the air conditioning operating.

The test site is at the Larson Transportation Institute Test Track and the test procedures were performed 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 was used to measure the noise level.

During the test, special attention was 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 36.3 dB(A), the average of the two highest readings obtained while accelerating from a constant speed was 72.2 dB(A) on the right side and 76.1 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 38.8 dB(A), the average of the two highest readings obtained were 73.9 dB(A) on the right side and 78.8 dB(A) on the left side.

With the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 55.9 dB(A) at low idle, 64.1 dB(A) at high idle, and 67.9 dB(A) at wide open throttle. With the accessories and air conditioning off, the readings averaged 48.6 dB(A) at low idle, 60.1 at high idle, and 66.1 dB(A) at wide open throttle. The exterior ambient noise level measured during this test was 33.1dB(A).

This bus passed this section of the test.

EXTERIOR NOISE TEST DATA FORM

Accelerating from Constant Speed

Page 1 of 3

Bus Number: 2024-04		Date: 06/13/24	
Personnel: T.G., S.R., F.T. & G.C.			
Temperature (°F): 65		Humidity (%): 59	
Wind Speed (mph): 3		Wind Direction: SSW	
Barometric Pressure (mbar): 1015			
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: 36.6 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	71.5	1	74.1
2	70.8	2	74.6
3	72.2	3	74.8
4	72.1	4	75.8
5	72.0	5	76.3
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 = 72.2 dB(A)		Average of two highest actual noise levels = 76.1 dB(A)	
Final Sound Level Meter Calibration Check: 93.9 dB(A)			
Comments: None noted.			

EXTERIOR NOISE TEST DATA FORM

Accelerating from Standstill

Page 2 of 3

Bus Number: 2024-04		Date: 06/13/24	
Personnel: T.G., S.R., F.T. & G.C.			
Temperature (°F): 70		Humidity (%): 59	
Wind Speed (mph): 2		Wind Direction: SSW	
Barometric Pressure (mbar): 1015			
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: 38.8 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	73.7	1	
2	73.7	2	
3	73.7	3	
4	73.9	4	
5	73.8	5	
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 = 73.9 dB(A)		Average of two highest actual noise levels = 78.8 dB(A)	
Final Sound Level Meter Calibration Check: 93.9 dB(A)			
Comments: None noted.			

EXTERIOR NOISE TEST DATA FORM

Stationary

Page 3 of 3

Bus Number: 2024-04		Date: 07/23/24	
Personnel: F.T., R.M. & J.S.			
Temperature (°F): 80		Humidity (%): 60	
Wind Speed (mph): 4		Wind Direction: WNW	
Barometric Pressure (mbar): 978			
Initial Sound Level Meter Calibration: 93.9 dB(A)			
Exterior Ambient Noise Level: 33.1 dB(A)			
Air Conditioning ON			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	750	55.3	56.5
High Idle	1500	63.6	64.5
Wide Open Throttle	3000	67.4	68.4
Air Conditioning OFF			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	750	47.7	49.5
High Idle	1500	61.7	58.5
Wide Open Throttle	3000	66.7	65.4
Final Sound Level Meter Calibration Check: 93.9 dB(A)			
Comments: None noted.			

7.2 EXTERIOR NOISE TESTS



TEST BUS UNDERGOING EXTERIOR NOISE TESTING

8.0 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 on an engine by itself on a dynamometer operating under the Federal Test Protocol.

The Bus Testing Center emissions test is a measurement of the gaseous engine emissions CO, CO₂, NO_x, HC and particulates (diesel vehicles) produced by a complete 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 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 the emissions of buses tested under a range of consistent operating conditions.

8-II. TEST DESCRIPTION

This test was performed in the emissions bay of the LTI Vehicle Testing Laboratory. The Laboratory is equipped with a Horiba 500 HP, large-roll (72-inch diameter) chassis dynamometer suitable for heavy-vehicle emissions testing. The emissions laboratory provides capability for testing heavy-duty diesel, gasoline, 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 dilution tunnel and a constant volume sampling (CVS) emissions measurement 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 was performed as soon as practical 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, a medium average speed transient urban cycle (Figure 2), and the EPA HD-UDDS Cycle, which consists of urban and highway driving segments (Figure 3). An emissions test was comprised of two runs for each of the three different driving cycles, and the average values were reported. Test results reported include the average grams per mile value for each of the gaseous emissions of carbon dioxide, carbon monoxide, oxides of nitrogen, total hydrocarbons and non-methane hydrocarbons. In addition,

emissions of particulate matter will also be reported for diesel fuel 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.

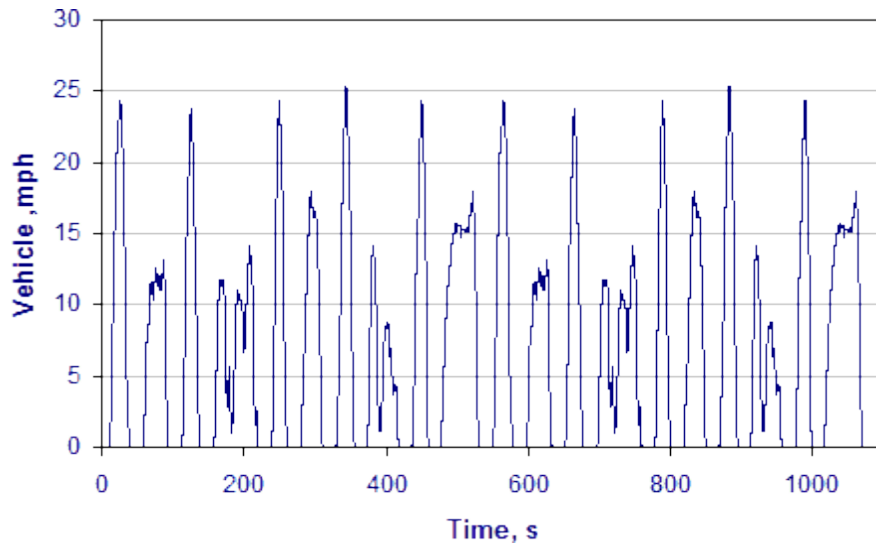


Figure 8.1. *Manhattan Driving Cycle (Duration 1089 sec, Maximum Speed 25.4 mph, Average Speed 6.8 mph)*

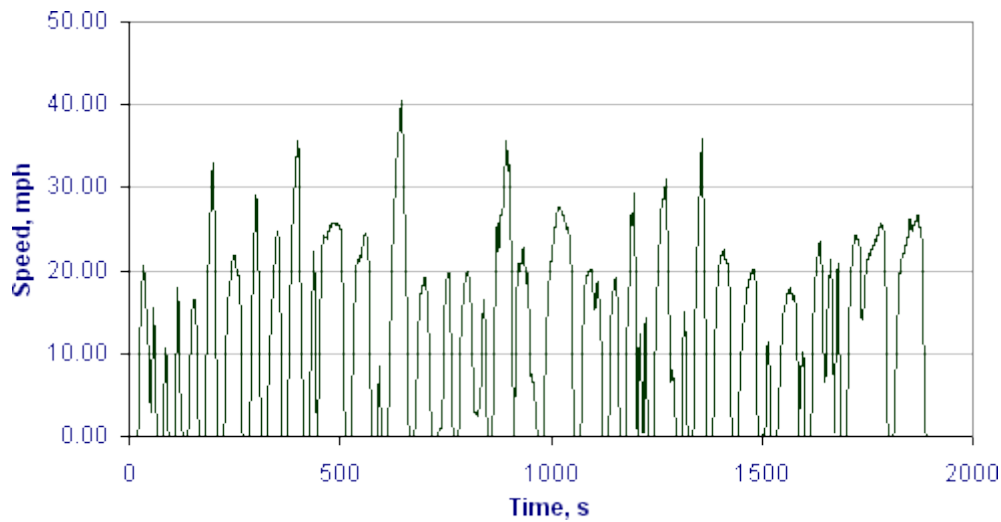


Figure 8.2. *Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41 mph, Average Speed 12 mph)*

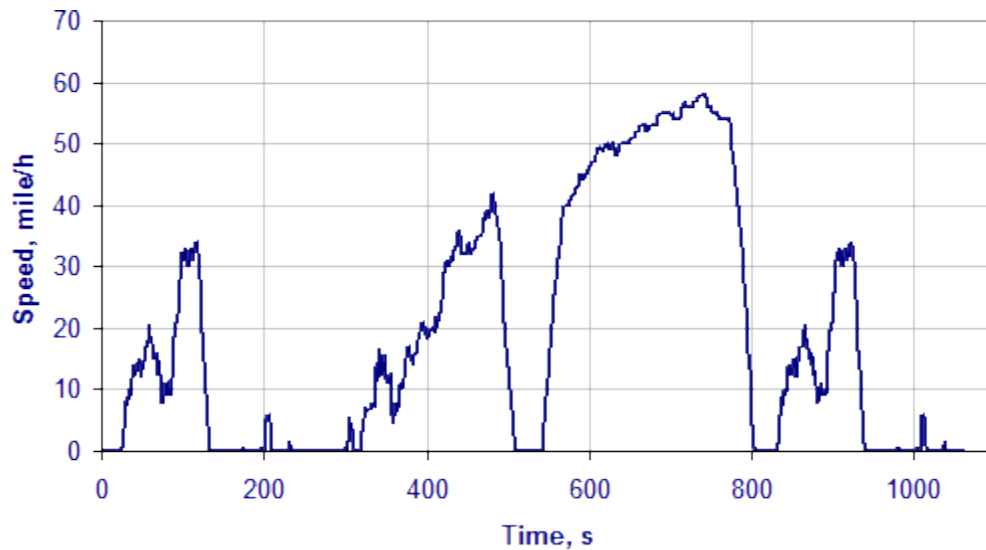


Figure 8.3. HD-UDDS Cycle (Duration 1060 seconds, Maximum Speed 58 mph, Average Speed 18.86 mph)

8-III. TEST ARTICLE

The test article is a High Level Enterprises, Inc., 16 + 2WC model transit bus equipped with a gasoline fueled Ford Motor Co. 7.3L motor. The bus was tested on September 11, 2024 with the odometer reading 7,885 miles.

8-IV. TEST EQUIPMENT

Testing was performed in the LTI Vehicle Testing Laboratory emissions testing bay. The test bay is equipped with a Horiba 500 HP 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 returned to 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

The test bus was 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 is 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 the Emissions test. Both the Fuel Economy Pre-Test Maintenance Form and the Fuel Economy Pre-Test Inspection Form are found in section 6, Fuel Economy Test.

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 consisted of driving the bus for 20 minutes at approximately 40 mph on the chassis dynamometer. During emissions testing, the test driver followed the prescribed driving cycle by watching the speed trace and instructions on the Horiba Drivers-Aid monitor which is placed in front of the windshield. The CDCTS computer monitored the test and collected data for calculation of emissions at the end of the test.

This bus was tested for emissions at seated load weight. The emissions data was obtained at the following conditions:

1. Air conditioning off
2. Heater off
3. Defroster off
4. Exterior and interior lights on
5. Windows and Doors closed
6. Seated load weight

The test tanks or the bus fuel tank(s) were filled prior to the fuel economy test with gasoline.

8-VI. DISCUSSION

Table 8.1 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 8.1 Emissions Test Results

Test Completed at SLW: 13,420 lb.			
Driving Cycle	Manhattan	Orange County Bus	UDDS
CO₂, gm/mi	1,734	1,100	871
CO, gm/mi	2.3	0.6	1.1
THC, gm/mi	0.05	0.02	0.02
NMHC, gm/mi	0.04	0.02	0.02
NO_x, gm/mi	0.00	0.00	0.00
Particulates. gm/mi	N/A	N/A	N/A

8. EMISSIONS TEST



BUS TESTED ON CHASSIS DYNAMOMETER FOR PERFORMANCE, FUEL ECONOMY AND EMISSIONS