

RESOLUTION NO. 3284

A RESOLUTION OF THE CITY OF WILSONVILLE AUTHORIZING SOUTH METRO AREA REGIONAL TRANSIT (SMART) TO PURCHASE TWO CNG FUELED, 20 PASSENGER BUSES FROM NW BUS SALES.

WHEREAS, a goal of SMART (South Metro Area Regional Transit) is to replace older buses with modern, more efficient buses meeting industry standards to ensure safe, reliable transportation for our passengers; and

WHEREAS, SMART has an immediate need for buses to replace aging, unreliable vehicles; and

WHEREAS, City staff has completed a competitive RFP process which met State, Federal, and City procurement requirements to guarantee fair and open competition; and

WHEREAS, staff received proposals from three different vendors; and

WHEREAS, NW Bus Sales was selected as the best value responsible bidder; and

WHEREAS, the Wilsonville City Council has duly appointed itself as the Local Contract Review Board, is authorized to award the purchase contract as recommended by staff.

NOW, THEREFORE, THE CITY OF WILSONVILLE RESOLVES AS FOLLOWS:

Section 1. Based on the above recitals, which are incorporated herein, the City Council, acting as the Local Contract Review Board, does hereby approve and authorize SMART to award a purchase contract for two 20 passenger CNG buses to NW Bus Sales, which contract is substantially similar to Exhibit A attached hereto.

Section 2. Effective Date. This Resolution is effective upon adoption.

ADOPTED by the Wilsonville City Council at a regular meeting thereof this 10th day of September, 2026, and filed with the Wilsonville City Recorder this date.

Signed by:

9FC7B198F01449B...
Shawn O'Neil, Mayor

ATTEST:

DocuSigned by:
Kimberly Veliz
E781DE10276B498...

Kimberly Veliz, MMC, City Recorder

SUMMARY OF VOTES:

Mayor O'Neil	Yes
Council President Berry	Yes
Councilor Cunningham	Yes
Councilor Scull	Yes
Councilor Shevlin	Yes

EXHIBIT:

A. Goods and Services Contract

CITY OF WILSONVILLE GOODS AND SERVICES CONTRACT

This Goods and Services Contract (“Contract”) for the CNG Cutaway Bus Purchase is made and entered into on _____ (“Effective Date”) by and between the **City of Wilsonville**, a municipal corporation of the State of Oregon (hereinafter referred to as the “City”), and **Northwest Bus Sales, Inc.**, a Washington corporation (hereinafter referred to as “Supplier”).

RECITALS

WHEREAS, the City wishes to purchase equipment that Supplier is capable of providing, under terms and conditions hereinafter described; and

WHEREAS, Supplier represents that Supplier is qualified to supply the equipment described herein on the basis of specialized experience and technical expertise; and

WHEREAS, Supplier is prepared to provide such services as the City does hereinafter require;

NOW, THEREFORE, in consideration of these mutual promises and the terms and conditions set forth herein, the parties agree as follows:

AGREEMENT

Section 1. Contract Documents

This Contract includes and incorporates by reference all of the foregoing recitals and all of the following additional documents: Request for Proposals - Purchase of CNG Cutaway Buses, dated June 10, 2026, and Supplier’s Proposal in response thereto (together with the Contract collectively referred to herein as “Contract Documents”). Supplier must be familiar with all of the foregoing and comply with them. All Contract Documents should be read in concert and Supplier is required to bring any perceived inconsistencies to the attention of the City before executing this Contract. In the event a provision of this Contract conflicts with standards or requirements contained in any of the foregoing Contract Documents, the provision that is more favorable to the City, as determined by the City, will apply.

Section 2. Goods Purchased

Supplier will supply two (2) CNG shuttle buses, as described in the Contract Documents and more particularly described in the Scope of Equipment attached hereto as **Exhibit A** and incorporated by reference herein (the “Equipment”).

Section 3. Equipment Price and Delivery Date

The price of the Equipment is **Four Hundred Four Thousand Nine Hundred Fifty Dollars (\$404,950)** and includes delivery to 28879 SW Boberg Road, Wilsonville, Oregon. Sale shall occur

upon inspection of the Equipment by the City and acceptance of delivery at the City location shown above. The City will pay Supplier in full within thirty (30) days of acceptance of delivery of the Equipment. Supplier will schedule a date and time for delivery. Delivery must occur on or before August 15, 2027.

The Equipment price is all-inclusive and includes, but is not limited to, all work-related costs, expenses, salaries or wages, plus fringe benefits and contributions, including payroll taxes, workers' compensation insurance, liability insurance, profit, pension benefits, and all other contributions and benefits, office expenses, travel expenses, mileage, and all other indirect and overhead charges, including, but not limited to, the Oregon Corporate Activity Tax (CAT) and any tariffs.

Section 4. Warranties

Equipment warranties are attached hereto as **Exhibit B**. Supplier hereby represents that Supplier will promptly and thoroughly perform all warranty services in Wilsonville, Oregon, or at another location mutually agreed upon, in writing, by the parties.

Section 5. Subcontractors and Assignments

Supplier shall not subcontract with others for any of the services prescribed herein. Supplier shall not assign any of Supplier's rights acquired hereunder without obtaining prior written approval from the City, which approval may be granted or denied in the City's sole discretion.

Section 6. Required Federal Provisions

This Contract is funded, in whole or in part, with federal funds. Supplier must therefore comply with all of the following required federal provisions, including provisions of the Federal Transit Administration (FTA):

6.1. **Access to Records.** The following federal access to records requirements apply to this Contract:

6.1.1. Record Retention. Supplier will retain, and will require its subcontractors of all tiers to retain, complete and readily accessible records related, in whole or in part, to this Contract, including, but not limited to, data, documents, reports, statistics, leases, subcontracts, sub-agreements, arrangements, other third party agreements of any type, and supporting materials related to those records.

6.1.2. Retention Period. Supplier agrees to comply with the record retention requirements in accordance with 2 CFR § 200.334. Supplier will maintain all books, records, accounts, and reports required under this Contract for a period of not less than three (3) years after the date of termination or expiration of this Contract, except in the event of litigation or settlement of claims arising from the performance of this Contract, in which case records will be retained until the City, South Metro Area Regional Transit (SMART), the FTA Administrator, the Comptroller General, or any of their duly authorized representatives, have disposed of all such litigation, appeals, claims, or exceptions related thereto.

6.1.3. Access to Records. Supplier agrees to provide sufficient access to the City, SMART, the FTA, or any of their duly authorized representatives, to inspect and audit records and information, including such records and information Supplier or its subcontractors may regard as confidential or proprietary, related to performance of this Contract in accordance with 2 CFR § 200.337. Supplier also agrees to permit any of the foregoing parties (at their own cost) to reproduce by any means whatsoever any excerpts and transcriptions as reasonably needed.

6.1.4. Access to the Sites of Performance. Supplier agrees to permit the City, SMART, the FTA, or any of their duly authorized representatives, access to the sites of performance under this Contract in accordance with 2 CFR § 200.337.

6.2. **Americans with Disabilities Act.** Supplier agrees to comply with all applicable requirements of Section 504 of the Rehabilitation Act of 1973, as amended, 29 USC § 794, which prohibits discrimination on the basis of handicaps, with the Americans with Disabilities Act of 1990 (ADA), as amended, 42 USC §§ 12101 *et seq.*, which requires that accessible facilities and services be made available to persons with disabilities, including any subsequent amendments to that Act, and with the Architectural Barriers Act of 1968, as amended, 42 USC §§ 4151 *et seq.*, which requires that buildings and public accommodations be accessible to persons with disabilities, including any subsequent amendments to that Act. In addition, Supplier agrees to comply with any and all applicable requirements issued by the FTA, United States Department of Transportation (DOT), U.S. Department of Justice (DOJ), U.S. General Services Administration (GSA), U.S. Equal Employment Opportunity Commission (EEOC), U.S. Federal Communications Commission (FCC), any subsequent amendments thereto, and any other nondiscrimination statutes that may apply to the Project.

6.3. **Bus Testing.** Supplier agrees to comply with the Bus Testing requirements under 49 USC § 5318(e) and the FTA's implementing regulation at 49 CFR Part 665 to ensure that the requisite testing is performed for all new bus models or any bus model with a major change in configuration or components, and that the bus model has achieved a passing score. Upon completion of the testing, Supplier shall obtain a copy of the bus testing report(s) from the operator of the testing facility and is required to provide a copy of the corresponding full bus testing report(s) and any applicable partial testing report(s) to the City, and make such report(s) publicly available, prior to final acceptance of the first vehicle by the City. The complete bus testing reporting requirements are provided in 49 CFR § 665.11.

6.4. **Build America, Buy America Act.** Construction materials used in the Project are subject to the domestic preference requirements of the Build America, Buy America Act, Pub. L. 117-58, div. G, tit. IX, §§ 70911-70927 (2021), as implemented by the U.S. Office of Management and Budget's "Buy America Preferences for Infrastructure Projects," 2 CFR Part 184. The City acknowledges that this Contract is neither a waiver of § 70914(a) nor a finding under § 70914(b). In accordance with 2 CFR § 184.2(a), the City shall apply the standards of 49 CFR Part 661 to iron, steel, and manufactured products.

6.5. **Buy America Requirements.** Supplier agrees to comply with 49 USC § 5323(j), 49 CFR Part 661, and 2 CFR § 200.322 Domestic preferences for procurements, which provide that federal funds may not be obligated unless all steel, iron, and manufactured products used in FTA-

funded projects are produced in the United States, unless a waiver has been granted by the FTA or the product is subject to a general waiver. General waivers are listed in 49 CFR § 661.7. Separate requirements for rolling stock are set out at 49 USC § 5323(j)(2)(C), 49 USC § 5323(u), and 49 CFR § 661.11 Rolling stock procurements. All steel must originate in the USA and not leave the USA at any point. Supplier must have submitted to the City the appropriate Buy America certification with its Proposal, as proposals that are not accompanied by a completed Buy America certification will be rejected as nonresponsive. See **Exhibit C**. For more information please see the FTA's Buy America webpage at <https://www.transit.dot.gov/buyamerica>.

6.6. Cargo Preference Requirements. Supplier agrees to: (a) use privately owned United States-Flag commercial vessels, if available, to ship at least fifty percent (50%) of any equipment, materials, or commodities procured, contracted for, or otherwise obtained with funds granted, guaranteed, loaned, or advanced by the U.S. Government under this Contract and which may be transported by ocean vessel (46 USC § 55305, and U.S. Maritime Administration regulations, "Cargo Preferences – U.S.-Flag Vessels," 46 CFR Part 381); (b) furnish, within twenty (20) days following the date of loading for shipments originating within the United States, or within thirty (30) working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of-lading in English for each shipment of cargo described in 46 CFR § 381.7(a)(1) to both the City (through the prime contractor in the case of subcontractor bills-of-lading) and the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590; and (c) include these requirements in all subcontracts issued pursuant to this Contract when the subcontract may involve the transport of equipment, material, or commodities by ocean vessel.

6.7. Changes to Federal Requirements. Federal requirements that apply to the City, the award of federal funds, the accompanying underlying agreement, and any amendments thereto may change due to changes in federal law, regulation, other requirements, or guidance, or changes in the City's underlying agreement, including any information incorporated by reference and made part of that underlying agreement; and applicable changes to those federal requirements will apply to this Contract and the parties thereto at any tier.

6.8. Civil Rights Laws and Regulations. The following federal civil rights laws and regulations and equal employment opportunity requirements apply to this Contract and any subcontracts. Supplier, and any subcontractor, agrees at all times to comply with all requirements prohibiting discrimination on the basis of race, color, or national origin of Title VI of the Civil Rights Act of 1964, as amended, 42 USC § 2000d, and U.S. DOT regulation, "Nondiscrimination in Federally-Assisted Programs of the Department of Transportation – Effectuation of Title VI of the Civil Rights Act," 49 CFR Part 21, and any implementing requirements the FTA may issue.

6.8.1. Nondiscrimination in Federal Public Transportation Programs. 49 USC § 5332, covering projects, programs, and activities financed under 49 USC Chapter 53, prohibits discrimination on the basis of race, color, religion, national origin, sex (including sexual orientation), disability, or age, and prohibits discrimination in employment or business opportunity. In addition, Supplier agrees to comply with applicable federal implementing regulations and other implementing requirements the FTA may issue.

6.8.2. Prohibition Against Employment Discrimination. In accordance with Title VII of the Civil Rights Act, as amended, 42 USC §§ 2000e *et seq.*, Title VI of the Civil Rights Act of 1964, 49 CFR Part 21, and federal transit laws at 49 USC § 5332, Supplier agrees to comply with all applicable equal employment opportunity requirements of the U.S. Department of Labor regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor" (41 CFR Chapter 60), and Executive Order No. 11246, "Equal Employment Opportunity in Federal Employment," September 24, 1965; 42 USC § 2000e note, as amended by any later Executive Order that amends or supersedes it, referenced in 42 USC § 2000e note. Supplier agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their sex, gender, race, color, creed, religion, marital status, age, disability, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to, the following: employment, promotion, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

6.8.3. Nondiscrimination on the Basis of Sex. Title IX of the Education Amendments of 1972, as amended, 20 USC §§ 1681 *et seq.*, and implementing federal regulations, "Nondiscrimination on the Basis of Sex in Education Programs or Activities Receiving Federal Financial Assistance," 49 CFR Part 25, prohibit discrimination on the basis of sex.

6.8.4. Nondiscrimination on the Basis of Age. The "Age Discrimination Act of 1975," as amended, 42 USC §§ 6101 *et seq.*, and Department of Health and Human Services implementing regulations, "Nondiscrimination on the Basis of Age in Programs or Activities Receiving Federal Financial Assistance," 45 CFR Part 90, prohibit discrimination by participants in federally assisted programs against individuals on the basis of age. The Age Discrimination in Employment Act (ADEA), 29 USC §§ 621 *et seq.*, and EEOC implementing regulations, "Age Discrimination in Employment Act," 29 CFR Part 1625, also prohibit employment discrimination against individuals age 40 and over on the basis of age.

6.8.5. Federal Protections for Individuals with Disabilities. The Americans with Disabilities Act of 1990 (ADA), as amended, 42 USC §§ 12101 *et seq.*, prohibits discrimination against qualified individuals with disabilities in programs, activities, and services, and imposes specific requirements on public and private entities. Supplier and any subcontractors must comply with their responsibilities under Titles I, II, III, IV, and V of the ADA in employment, public services, public accommodations, telecommunications, and other provisions, many of which are subject to regulations issued by other federal agencies.

6.9. Civil Rights and Equal Opportunity. The City is an Equal Opportunity Employer. As such, the City agrees to comply with all applicable federal civil rights laws and implementing regulations. Apart from inconsistent requirements imposed by federal laws or regulations, the City agrees to comply with the requirements of 49 USC § 5323(h)(3) by not using any federal assistance awarded by the FTA to support procurements using exclusionary or discriminatory specifications. Under this Contract, Supplier shall at all times comply with the following requirements and shall include these requirements in each subcontract entered into as part thereof.

6.9.1. Nondiscrimination. In accordance with federal transit law at 49 USC § 5332, Supplier agrees that it will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, sex, disability, or age. In addition, Supplier agrees to comply with applicable federal implementing regulations and other implementing requirements the FTA may issue.

6.9.2. Equal Employment Opportunity. In accordance with Title VII of the Civil Rights Act, as amended, 42 USC §§ 2000e *et seq.*, Title I of the Americans with Disabilities Act of 1990, as amended, 42 USC §§ 12101, *et seq.*, and federal transit laws at 49 USC § 5332, Supplier agrees to comply with all applicable equal employment opportunity requirements, without regard to their race, color, religion, national origin, or sex (including sexual orientation). In addition, Supplier agrees to comply with any implementing requirements the FTA may issue.

6.9.3. Age. In accordance with the Age Discrimination in Employment Act of 1967, as amended, 29 USC §§ 621-634, EEOC regulations, “Age Discrimination in Employment Act,” 29 CFR Part 1625, the Age Discrimination Act of 1975, as amended, 42 USC §§ 6101 *et seq.*, U.S. Department of Health and Human Services regulations, “Nondiscrimination on the Basis of Age in Programs or Activities Receiving Federal Financial Assistance,” 45 CFR Part 90, and federal transit law at 49 USC § 5332, Supplier agrees to refrain from discrimination against present and prospective employees on the basis of age. In addition, Supplier agrees to comply with any implementing requirements the FTA may issue.

6.9.4. Disabilities. In accordance with Section 504 of the Rehabilitation Act of 1973, as amended, 29 USC § 794, the Americans with Disabilities Act of 1990, as amended, 42 USC §§ 12101 *et seq.*, the Architectural Barriers Act of 1968, as amended, 42 USC §§ 4151 *et seq.*, and federal transit law at 49 USC § 5332, Supplier agrees that it will not discriminate against individuals on the basis of disability. In addition, Supplier agrees to comply with any implementing requirements the FTA may issue.

6.9.5. Federal Law and Public Policy Requirements. Supplier shall ensure that federal funding is expended in full accordance with the U.S. Constitution, federal law, and statutory and public policy requirements, including, but not limited to, those protecting free speech, religious liberty, public welfare, the environment, and prohibiting discrimination.

6.10. **Clean Air Act and Clean Water Act**. Supplier agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act, as amended, 42 USC §§ 7401 *et seq.*, and the Federal Water Pollution Control Act (commonly known as the Clean Water Act), as amended, 33 USC §§ 1251 *et seq.* Violations must be reported to the FTA and the Regional Office of the Environmental Protection Agency (EPA). Supplier agrees to report each violation to the City, and understands and agrees that the City will, in turn, report each violation, as required, to assure notification to the FTA, Federal Emergency Management Agency (FEMA), and the appropriate EPA Regional Office. Supplier will include these requirements in any subcontract exceeding \$150,000 which is financed, in whole or in part, with federal assistance provided by the FTA.

6.11. **Conformance with ITS National Architecture.** Any Intelligent Transportation Systems (ITS) projects shall conform to the National ITS Architecture and standards pursuant to 23 CFR § 940. Conformance with the National ITS Architecture is interpreted to mean the use of the National ITS Architecture to develop a regional ITS architecture in support of integration and the subsequent adherence of all ITS projects to that regional ITS architecture. Development of the regional ITS architecture should be consistent with the transportation planning process for Statewide and Metropolitan Transportation Planning, 49 CFR Parts 613 and 621.

6.12. **Contract Work Hours and Safety Standards Act.** This requirement applies to all FTA grant and cooperative agreement programs. For all contracts in excess of \$100,000 that involve the employment of mechanics or laborers, Supplier will comply with the Contract Work Hours and Safety Standards Act, 40 USC §§ 3701-3708, as supplemented by Department of Labor regulations at 29 CFR Part 5. *See* 2 CFR Part 200, Appendix II.

6.12.1. Overtime Requirements. Under 40 USC § 3702 of the Act, Supplier will compute the wages of every mechanic and laborer, including watchmen and guards, on the basis of a standard workweek of forty (40) hours. Work in excess of the standard workweek is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of forty (40) hours in the workweek. The requirements of 40 USC § 3704 are applicable to construction work and provide that no laborer or mechanic be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous. These requirements do not apply to the purchase of supplies or materials or articles ordinarily available on the open market, or to contracts for transportation or transmission of intelligence. The regulation at 29 CFR § 5.5(b) provides the required contract clause concerning compliance with the Contract Work Hours and Safety Standards Act.

6.12.2. Violations; Liability for Unpaid Wages; Liquidated Damages. In the event of any violation of the requirements of **Section 6.12.1**, Supplier and any subcontractor responsible therefor will be liable for the unpaid wages. In addition, Supplier and such subcontractor will be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the requirements of **Section 6.12.1**, in the sum of Ten Dollars (\$10) for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty (40) hours without payment of the overtime wages required by **Section 6.12.1**.

6.12.3. Withholding for Unpaid Wages and Liquidated Damages. The City shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by Supplier or its subcontractor under this Contract, any other federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of Supplier or its subcontractor for unpaid wages and liquidated damages as provided in **Section 6.12.2**.

6.12.4. **Subcontracts.** Supplier, or any subcontractor, shall insert in any subcontracts the clauses set forth in **Sections 6.12.1** through **6.12.3**, as well as a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. Supplier will be responsible for compliance by any subcontractor or lower tier subcontractor with the requirements set forth in **Sections 6.12.1** through **6.12.3**.

6.13. **Debarment and Suspension.** Supplier will comply with and facilitate compliance with U.S. DOT regulations, “Nonprocurement Suspension and Debarment,” 2 CFR Part 1200, which adopts and supplements the U.S. Office of Management and Budget (U.S. OMB) “Guidelines to Agencies on Government-wide Debarment and Suspension (Nonprocurement),” 2 CFR Part 180, which implement Executive Orders 12549 (31 USC § 6101 note, 51 Fed. Reg. 6370) and 12689 (31 USC § 6101 note, 54 Fed. Reg. 34131), “Debarment and Suspension.” A covered transaction (*see* 2 CFR §§ 180.220 and 1200.220) must not be entered into with any party listed on the government-wide exclusions in the System for Award Management (SAM). SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549. Supplier is required to verify that its principals, affiliates, and any subcontractors are eligible to participate in this federally funded Contract and are not presently declared by any federal department or agency to be debarred, suspended, proposed for debarment, voluntarily excluded, disqualified, or declared ineligible from participation in any federally assisted award.

Supplier is required to comply with Subpart C of 2 CFR Part 180, as supplemented by 2 CFR Part 1200, and must include the requirement to comply with Subpart C of 2 CFR Part 180 in any lower tier covered transaction it enters into to ensure compliance with federal debarment and suspension requirements and review of the SAM at <https://www.sam.gov>, if necessary to comply with U.S. DOT regulations, 2 CFR Part 1200. By signing and submitting its Proposal, Supplier has certified as follows:

The certification in this clause is a material representation of fact relied upon by the City. If it is later determined that Supplier knowingly rendered an erroneous certification, in addition to remedies available to the City, the federal government may pursue available remedies, including, but not limited to, suspension and/or debarment. Supplier agrees to comply with the requirements of 2 CFR Part 180, Subpart C, as supplemented by 2 CFR Part 1200, while this offer is valid and throughout the period of any contract that may arise from this offer. Supplier further agrees to include a provision requiring such compliance in its lower tier covered transactions.

6.14. **Disadvantaged Business Enterprises.** It is the policy of the FTA and the DOT that Disadvantaged Business Enterprises (DBE’s), as defined herein and in the federal regulations published at 49 CFR Part 26, shall have an equal opportunity to participate in DOT-assisted contracts. If the City must adopt a DBE program, the parties will execute a written amendment so that this Contract becomes subject to the City’s DBE program.

6.14.1. Supplier, and any subcontractor, shall not discriminate on the basis of race, color, national origin, or sex in the performance of this Contract. Supplier shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted

contracts. Failure by Supplier to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy as the City deems appropriate, which may include, but is not limited to (a) withholding monthly progress payments; (b) assessing sanctions; (c) liquidated damages; and/or (d) disqualifying Supplier from future bidding as non-responsible. 49 CFR § 26.13(b).

6.14.2. Supplier is required to pay any subcontractors performing work related to this Contract for satisfactory performance of that work no later than thirty (30) days after Supplier's receipt of payment for that work from the City. In addition, Supplier may not hold retainage from its subcontractors.

6.14.3. Supplier must promptly notify the City whenever a DBE subcontractor performing work related to this Contract is terminated or fails to complete its work, and must make good faith efforts to engage another DBE subcontractor to perform at least the same amount of work. Supplier may not terminate any DBE subcontractor and perform that work through its own forces or those of an affiliate without the prior written consent of the City.

6.15. **Domestic Preference for Procurements.** Supplier should, to the greatest extent practicable and consistent with law, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including, but not limited to, iron, aluminum, steel, cement, and other manufactured products). The requirements of this Section must be included in all subcontracts. For purposes of this Section (a) "produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States; and (b) "manufactured products" means items and construction materials composed, in whole or in part, of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

6.16. **Energy Conservation.** Supplier agrees to comply with mandatory standards and policies relating to energy efficiency, which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

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

6.18. **Federal Tax Liability and Recent Felony Convictions.** Supplier certifies that (a) Supplier does not have any unpaid federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability; and (b) Supplier was not convicted of a felony criminal violation under any federal law within the preceding twenty-four (24) months. If Supplier cannot so certify, the City must refer the matter to the FTA and not enter into this Contract without the FTA's written approval. Supplier agrees to include this requirement in any subcontract, at all lower tiers, without regard to the value of such subcontract.

6.19. Fly America. As used in this Section, (a) “international air transportation” means transportation by air between a place in the United States and a place outside the United States, or between two places both of which are outside of the United States; (b) “United States” means the 50 States, the District of Columbia, and outlying areas; and (c) “U.S.-flag air carrier” means an air carrier holding a certificate under 49 USC Chapter 411.

6.19.1. When federal funds are used to fund travel, Section 5 of the International Air Transportation Fair Competitive Practices Act of 1974, 49 USC § 40118 (Fly America Act), requires contractors, the City, and others to use U.S.-flag air carriers for U.S. Government-financed international air transportation of personnel (and their personal effects) or property, to the extent that service by those carriers is available. It requires the Comptroller General of the United States, in the absence of satisfactory proof of the necessity for foreign-flag air transportation, to disallow expenditures from funds, appropriated or otherwise established for the account of the United States, for international air transportation secured aboard a foreign-flag air carrier if a U.S.-flag air carrier is available to provide such services.

6.19.2. If available, Supplier, in performing work under this Contract, shall use U.S.-flag carriers for international air transportation of personnel (and their personal effects) or property. In the event Supplier selects a carrier other than a U.S.-flag air carrier for international air transportation, Supplier shall include a statement on vouchers involving such transportation essentially as follows:

Statement of Unavailability of U.S.-Flag Air Carriers

International air transportation of persons (and their personal effects) or property by U.S.-flag air carrier was not available or it was necessary to use foreign-flag air carrier service for the following reasons: [state reasons]. See Federal Acquisition Regulation (FAR) § 47.403.

6.19.3. Supplier shall include the substance of this Section, including this subsection, in each subcontract or purchase under this Contract that may involve international air transportation.

6.20. Incorporation of Federal Transit Administration Terms. The provisions in this Contract include, in part, certain Standard Terms and Conditions required under the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 CFR § 200, whether or not expressly set forth in the preceding contract provisions. All contractual provisions required by DOT, detailed in 2 CFR § 200 or as amended by 2 CFR § 1201, or the most recent version of FTA Circular 4220.1 are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Contract. Supplier shall not perform any act, fail to perform any act, or refuse to comply with any City requests which would cause the City to be in violation of the FTA terms and conditions.

6.21. Lobbying Restrictions. Supplier certifies, to the best of its knowledge and belief, that:

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

6.21.2. If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, Supplier will complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

6.21.3. Supplier shall file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed. An event that materially affects the accuracy of the information reported includes: (a) a cumulative increase of \$25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered federal action; (b) a change in any of the persons or individuals influencing or attempting to influence a covered federal action; or (c) a change in any of the officers, employees, or Members contacted to influence or attempt to influence a covered federal action.

6.21.4. Supplier will require that the language of this certification be included in the award documents for all sub-awards, at all tiers (including subcontracts, sub-grants, and contracts under grants, loans and cooperative agreements), and that all subcontractors shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure. Submitting an erroneous certification or disclosure constitutes a failure to file the required certification or disclosure, respectively. If Supplier fails to file a required certification or disclosure, the United States may pursue all available remedies, including those authorized by Section 1352, Title 31, U.S. Code.

6.22. No Government Obligation to Third Parties. The City and Supplier acknowledge and agree that, notwithstanding any concurrence by the federal government in or approval of the solicitation or award of this Contract, absent the express written consent by the federal government, the federal government is not a party to this Contract and shall not be subject to any obligations or liabilities to the City, Supplier, or any other party (whether or not a party to the contract) pertaining to any matter resulting from this Contract. Supplier agrees to include this clause in each subcontract financed, in whole or in part, with federal assistance provided by the FTA. Supplier further agrees

that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

6.23. Notice to Federal Transit Authority and U.S. Department of Transportation Inspector General of Information Related to Fraud, Waste, Abuse, or other Legal Matters. If a current or prospective legal matter that may affect the federal government emerges, the City must promptly notify the FTA Chief Counsel and FTA Regional Counsel for the region in which the City is located. The City must include a similar notification requirement in this Contract and must require Supplier to include an equivalent provision in its subcontracts at every tier, for any agreement that is a “covered transaction” according to 2 CFR §§ 180.220 and 1200.220.

6.23.1. The types of legal matters that require notification include, but are not limited to, a major dispute, breach, default, litigation, or naming the federal government as a party to litigation or a legal disagreement in any forum for any reason.

6.23.2. Matters that may affect the federal government include, but are not limited to, the federal government’s interests in the award of this Contract, the underlying grant agreement, and any amendments thereto, or the federal government’s administration or enforcement of federal laws, regulations, and requirements.

6.23.3. The City must promptly notify the U.S. DOT Inspector General, in addition to the FTA Chief Counsel or Regional Counsel for the region in which the City is located, if the City has knowledge of potential fraud, waste, or abuse occurring on a project receiving assistance from the FTA. The notification provision applies if a person has or may have submitted a false claim under the False Claims Act, 31 USC §§ 3729 *et seq.*, or has or may have committed a criminal or civil violation of law pertaining to such matters as fraud, conflict of interest, bribery, gratuity, or similar misconduct. This responsibility occurs whether the project is subject to this Contract or another agreement between the City and the FTA, or an agreement involving a principal, officer, employee, agent, or third-party participant of the City. It also applies to subcontractors at any tier. Knowledge, as used in this subsection, includes, but is not limited to, knowledge of a criminal or civil investigation by a federal, state, or local law enforcement or other investigative agency, a criminal indictment or civil complaint, or probable cause that could support a criminal indictment, or any other credible information in the possession of the City.

6.24. Pre-Award and Post-Delivery Audits of Rolling Stock Purchase. Supplier agrees to comply with 49 USC § 5323(m) and the FTA’s implementing regulation at 49 CFR Part 663. Supplier shall comply with the Buy America certification(s) submitted with its Proposal. Supplier agrees to participate and cooperate in any pre-award and post-delivery audits performed pursuant to 49 CFR Part 663 and related FTA guidance.

6.25. Program Fraud and False or Fraudulent Statements and Related Acts.

6.25.1. Supplier acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 USC §§ 3801 *et seq.*, and DOT regulations, “Program Fraud Civil Remedies,” 49 CFR Part 31, apply to its actions pertaining to this equipment purchase. Upon execution of this Contract, Supplier certifies or affirms the

truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to this Contract or the FTA assisted equipment purchase. In addition to other penalties that may be applicable, Supplier further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the federal government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on Supplier to the extent the federal government deems appropriate.

6.25.2. Supplier also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the federal government under a contract connected with a project that is financed, in whole or in part, with federal assistance originally awarded by the FTA under the authority of 49 USC Chapter 53, the federal government reserves the right to impose the penalties of 18 USC § 1001 and 49 USC § 5323(l) on Supplier, to the extent the federal government deems appropriate.

6.25.3. Supplier agrees to include the above two clauses in each subcontract financed, in whole or in part, with federal assistance provided by the FTA. Supplier further agrees that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

6.26. Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment.

6.26.1. Supplier and any subcontractor are prohibited from obligating or expending loan or grant funds to: (a) procure or obtain telecommunications equipment or services; (b) extend or renew a contract to procure or obtain covered telecommunications equipment or services; or (c) enter into a contract (or extend or renew a contract) to procure or obtain covered telecommunications equipment or services.

6.26.2. As described in *Public Law 115-232*, Section 889, “covered telecommunications equipment or services” means any of the following:

(a) Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities);

(b) For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities);

(c) Telecommunications or video surveillance services provided by such entities or using such equipment;

(d) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with

the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

6.26.3. For the purposes of this Section, “covered telecommunications equipment or services” also include systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

6.26.4. In implementing the prohibition under *Public Law 115-232*, Section 889, heads of executive agencies administering loan, grant, or subsidy programs must prioritize available funding and technical support to assist affected businesses, institutions, and organizations as is reasonably necessary for those affected entities to transition from covered communications equipment or services, to procure replacement equipment or services, and to ensure that communications service to users and customers is sustained.

6.26.5. When Supplier or any subcontractor accepts a loan or grant, it is certifying that it will comply with the prohibition on covered telecommunications equipment and services in this Section. Supplier or any subcontractor is not required to certify that funds will not be expended on covered telecommunications equipment or services beyond the certification provided upon accepting the loan or grant and those provided upon submitting payment requests and financial reports.

6.26.6. For additional information, see *Public Law 115-232*, Section 889, and 200.471.

6.27. **Prompt Payment.** Supplier is required to pay its subcontractors performing work related to this Contract for satisfactory performance of that work no later than thirty (30) days after Supplier’s receipt of payment for that work from the City. In addition, Supplier is required to return any retainage payments to those subcontractors within thirty (30) days after the subcontractor’s work related to this Contract is satisfactorily completed.

6.28. **Recovered Materials.** Supplier must comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, 42 USC § 6962. The requirements of Section 6002 include procuring only items designated in the guidelines of the EPA “Comprehensive Procurement Guideline for Products Containing Recovered Materials,” 40 CFR Part 247, that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines. Supplier agrees, to the greatest extent practicable and consistent with law, to purchase, acquire, or use products and services that can be reused, refurbished, or recycled; contain recycled content, are biobased, or are energy and water efficient; and are sustainable. This may include purchasing compostable items and other products and services that reduce the use of single-use plastic products. See Executive Order 14057, Section 101, Policy.

6.29. **Safe Operation of Motor Vehicles.**

6.29.1. Seat Belt Use. Supplier is encouraged to adopt and promote on-the-job seat belt use policies and programs for its employees and other personnel that operate company-owned vehicles, company-leased vehicles, company-rented vehicles, or personally operated vehicles. The terms “company-owned”, “company-leased”, and “company-rented” refer to vehicles owned, rented, or leased either by Supplier or the City.

6.29.2. Distracted Driving. Supplier agrees to adopt and enforce workplace safety policies to decrease crashes caused by distracted drivers, including policies that ban text messaging while using an electronic device supplied by an employer and driving a vehicle the driver owns or rents, a vehicle Supplier owns, leases, or rents, or a privately-owned vehicle when on official business in connection with the Work performed under this Contract.

6.30. **Simplified Acquisition Threshold**. Contracts for more than the simplified acquisition threshold, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils), as authorized by 41 USC § 1908 or otherwise set by law, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate. Note that the simplified acquisition threshold determines the procurement procedures that must be employed pursuant to 2 CFR §§ 200.317-200.327. The simplified acquisition threshold does not exempt a procurement from other eligibility or processes requirements that may apply. For example, Buy America’s eligibility and process requirements apply to any procurement in excess of \$150,000. 49 USC § 5323(j)(13).

6.31. **Trafficking in Persons.**

6.31.1. Supplier agrees that it and its employees that participate in the Project covered under this Contract may not:

6.31.1.1. Withhold monthly progress payments;

6.31.1.2. Engage in forms of trafficking in persons during the period of time that this Contract is in effect;

6.31.1.3. Procure a commercial sex act during the period of time that this Contract is in effect; or

6.31.1.4. Use forced labor in the performance of the Contract or any subcontracts thereunder.

6.31.2. Supplier agrees to comply, and assures the compliance of each subcontractor, with federal requirements and guidance, including:

6.31.2.1. Section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended, 22 USC § 7104(g); and

6.31.2.2. The terms of this Section, which have been derived from U.S. OMB regulatory guidance, “Award Term for Trafficking in Persons,” 2 CFR Part 175, per U.S. OMB’s direction.

6.31.3. Supplier agrees to, and assures that each subcontractor will:

6.31.3.1. Inform the FTA immediately of any information it receives from any source alleging a violation of the prohibitions listed in this clause; and

6.31.3.2. Include the substance of this clause in all agreements or subcontracts at every tier, including this requirement to flow down the clause.

6.32. **Violation and Breach of Contract; Termination.** The clauses concerning violation and breach of this Contract and termination of this Contract can be found in **Section 9**, below.

Section 7. Indemnity

Supplier acknowledges responsibility for liability arising out of the performance of this Contract, and shall defend, indemnify, and hold the City harmless from any and all liability, settlements, loss, costs, and expenses in connection with any action, suit, or claim to the extent directly or indirectly caused by Supplier’s negligent acts, omissions, errors, or willful or reckless misconduct pursuant to this Contract, or from Supplier’s failure to perform its responsibilities as set forth in this Contract. The review, approval, or acceptance by the City, its Project Manager, or any City employee of documents or other work performed, prepared, or submitted by Supplier shall not be considered a negligent act, error, omission, or willful misconduct on the part of the City, and none of the foregoing shall relieve Supplier of its responsibility to perform in full conformity with the City’s requirements, as set forth in this Contract, and to indemnify the City as provided above and to reimburse the City for any and all costs and damages suffered by the City as a result of Supplier’s negligent performance of this Contract. Supplier shall defend the City (using legal counsel reasonably acceptable to the City) against any claim that alleges negligent acts, omissions, errors, or willful or reckless misconduct by Supplier. As used herein, the term “Supplier” applies to Supplier and its own agents, employees, and suppliers.

Section 8. Insurance

8.1. **Business Automobile Liability Insurance.** If Supplier will be using a motor vehicle in the performance of the services herein, Supplier shall provide the City a certificate indicating that Supplier has business automobile liability coverage for all owned, hired, and non-owned vehicles. The Combined Single Limit per occurrence shall not be less than **Two Million Dollars (\$2,000,000)**.

8.2. **Workers’ Compensation Insurance.** Supplier and all employers providing work, labor, or materials under this Contract that are subject employers under the Oregon Workers’ Compensation Law shall comply with ORS 656.017, which requires them to provide workers’ compensation coverage that satisfies Oregon law for all their subject workers under ORS 656.126. Out-of-state employers must provide Oregon workers’ compensation coverage for their workers

who work at a single location within Oregon for more than thirty (30) days in a calendar year. Suppliers who perform work without the assistance or labor of any employee need not obtain such coverage. This shall include Employer's Liability Insurance with coverage limits of not less than **Five Hundred Thousand Dollars (\$500,000)** each accident.

8.3. **Certificates of Insurance.** As evidence of the insurance coverage required by this Contract, Supplier shall furnish a Certificate of Insurance to the City. This Contract shall not be effective until the required certificates have been received and approved by the City. Supplier agrees that it will not terminate or change its coverage during the term of this Contract without giving the City at least thirty (30) days' prior advance notice and Supplier will obtain an endorsement from its insurance carrier, in favor of the City, requiring the carrier to notify the City of any termination or change in insurance coverage that fails to meet the terms of this Contract, as provided above.

8.4. **Primary Coverage.** The coverage provided by the Business Automobile Liability policies shall be primary, and any other insurance carried by the City is excess. Supplier shall be responsible for any deductible amounts payable under all policies of insurance. If insurance policies are "Claims Made" policies, Supplier will be required to maintain such policies in full force and effect throughout any warranty period.

Section 9. Early Termination; Default

9.1. This Contract may be terminated prior to the expiration of the agreed upon terms:

9.1.1. By mutual written consent of the parties;

9.1.2. By the City, for any reason, and within its sole discretion, effective upon delivery of written notice to Supplier by mail or in person; or

9.1.3. By Supplier, effective upon seven (7) calendar days' prior written notice in the event of substantial failure by the City to perform in accordance with the terms through no fault of Supplier, where such default is not cured within the seven (7) calendar day period by the City. Withholding of disputed payment is not a default by the City.

9.2. Termination for Convenience. The City may terminate this Contract, in whole or in part, at any time by written notice to Supplier when it is deemed to be in the City's best interest. If the City terminates this Contract for its own convenience, not due to any default by Supplier, payment of Supplier shall be prorated to, and include the day of, termination and shall be in full satisfaction of all claims by Supplier against the City under this Contract. Supplier shall be paid its costs, including contract close-out costs, and profit on work performed up to the time of termination. Supplier shall promptly submit its termination claim to the City to be paid to Supplier. If Supplier has any property in its possession belonging to the City, Supplier will account for the same, and dispose of it in the manner the City directs.

9.3. Termination for Default. If Supplier fails to deliver supplies or to perform the services within the time specified in this Contract or any extension, or if Supplier fails to comply with any other provision of this Contract, the City may terminate this Contract for default. The City shall terminate by delivering to Supplier a Notice of Termination specifying the nature of the default.

Supplier will only be paid for supplies delivered and accepted, or services performed in accordance with the manner of performance set forth in this Contract. If after termination for failure to fulfill obligations under this Contract, it is determined that Supplier was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the Agency.

9.4. Opportunity to Cure. The City, in its sole discretion may, in the case of a termination for breach or default, allow Supplier a period of ten (10) calendar days to cure the default. In such case, the Notice of Termination will state the time period in which cure is permitted and other appropriate conditions. If Supplier notifies the City that it wishes to cure the default but cannot, in good faith, do so within the ten (10) calendar day cure period provided, then the City may elect, in its sole discretion, to extend the cure period to an agreed upon time period, which agreed upon extension must be in writing and signed by the parties prior to the expiration of the cure period. Unless a written extension to the time period to cure the default has been fully executed by the parties, if Supplier fails to cure to the City's satisfaction, the breach or default of any of the terms, covenants, or conditions of this Contract prior to expiration of the cure period, the Contract is automatically terminated without any further obligation to Supplier. Any such termination for default shall not in any way operate to preclude the City from also pursuing all remedies against Supplier and its sureties for said breach or default.

9.5. Procurement of Similar Services. If the City terminates this Contract, in whole or in part, due to default or failure of Supplier to perform services in accordance with the Contract, the City may procure, upon reasonable terms and in a reasonable manner, services similar to those so terminated. In addition to any other remedies the City may have, both at law and in equity, for breach of contract, Supplier shall be liable for all costs and damages incurred by the City as a result of the default by Supplier, including, but not limited to, all costs incurred by the City in procuring services from others as needed to complete this Contract. This Contract shall be in full force to the extent not terminated by written notice from the City to Supplier.

9.6. Waiver of Remedies for any Breach. In the event that the City elects to waive its remedies for any breach by Supplier of any covenant, term, or condition of this Contract, such waiver by the City shall not limit the City's remedies for any succeeding breach of that or of any other covenant, term, or condition of this Contract. Termination under any provision of this **Section 9** shall not affect any right, obligation, or liability of Supplier or the City that accrued prior to such termination.

Section 10. Survival

Termination under **Section 9** shall not affect any right, obligation, or liability of Supplier or the City that accrued prior to such termination. In particular, **Sections 7, 12, 13, and 14** will survive the expiration of the term of this Contract, or termination of this Contract under **Section 9**.

Section 11. Contract Modification; Change Orders

Any modification of the provisions of this Contract shall not be enforceable or binding unless reduced to writing and signed by both the City and Supplier.

Section 12. Notices

Any notice required or permitted under this Contract shall be in writing and shall be given when actually delivered in person or three (3) calendar days after having been deposited in the United States mail as first class mail or certified mail, return receipt requested, addressed to the addresses set forth below, or to such other address as one party may indicate by written notice to the other party.

To City: City of Wilsonville SMART
Attn: Scott Simonton, Fleet Manager
29799 SW Town Center Loop East
Wilsonville, OR 97070-9454

To Supplier: Northwest Bus Sales, Inc.
Attn: Rob Goolsby
33207 Pacific Hwy South
Federal Way, WA 98003

Section 13. Liquidated Damages

13.1. The City and Supplier recognize that time is of the essence of this Contract and that the City will suffer financial loss and public detriment if the buses are not delivered on time in accordance with this Contract. Both parties also recognize the delays, expenses, and difficulties involved in proving in a legal proceeding the actual loss suffered by the City if the buses are not delivered on time. Accordingly, instead of requiring any such proof, the City and Supplier agree that as Liquidated Damages for delay (but not as a penalty), Supplier shall pay the City the amount of **One Hundred Dollars (\$100)** per day for each and every day that expires after the agreed upon delivery date (“Liquidated Damages”).

13.2. The parties further agree that this amount of Liquidated Damages is a reasonable forecast of just compensation for the harm caused by any breach and that this harm is one which is impossible or very difficult to estimate. In addition to the Liquidated Damages above, Supplier shall reimburse the City for all costs incurred by the City for inspection and project management services required beyond the time specified for final delivery of the bus. If Supplier fails to reimburse the City directly, the City will deduct the cost from Supplier’s final pay request.

13.3. Supplier will not be responsible for Liquidated Damages or be deemed to be in default by reason of delays in performance due to reasons beyond Supplier’s reasonable control, including, but not limited to, strikes, lockouts, severe acts of nature, or actions of unrelated third parties not under Supplier’s direction and control that preclude Supplier from performing under the Contract (“Force Majeure”). In the case of the happening of any Force Majeure event, the time for completion of Supplier’s performance under the Contract will be extended accordingly and proportionately by the City, in writing, but the City will not be responsible for any additional costs as a result of the Force Majeure event. Poor weather conditions, unless extreme, lack of labor, supplies, materials, or the cost of any of the foregoing shall not be deemed a Force Majeure event.

Section 14. Miscellaneous Provisions

14.1. Integration. This Contract, including all exhibits attached hereto, contains the entire and integrated agreement between the parties and supersedes all prior written or oral discussions, representations, or agreements. In case of conflict among these or any other documents, the provisions of this Contract shall control, and the terms most favorable to the City, within the City's sole discretion, will apply.

14.2. Legal Effect and Assignment. This Contract shall be binding upon and inure to the benefit of the parties hereto and their respective heirs, personal representatives, successors, and assigns. This Contract may be enforced by an action at law or in equity.

14.3. Equal Opportunity. No person shall be discriminated against by Supplier in the performance of this Contract on the basis of sex, gender, race, color, creed, religion, marital status, age, disability, sexual orientation, gender identity, or national origin. Any violation of this provision shall be grounds for cancellation, termination, or suspension of the Contract, in whole or in part, by the City.

14.4. No Assignment. Supplier may not delegate the performance of any obligation to a third party unless mutually agreed, in writing.

14.5. Adherence to Law. Supplier shall adhere to all applicable federal and state laws, including, but not limited to, laws, rules, regulations, and policies concerning employer and employee relationships, workers' compensation, and minimum and prevailing wage requirements. Any certificates, licenses, or permits that Supplier is required by law to obtain or maintain in order to perform the services described in this Contract shall be obtained and maintained throughout the term of this Contract.

14.6. Governing Law. This Contract shall be construed in accordance with and governed by the laws of the State of Oregon, regardless of any conflicts of laws. All contractual provisions required by ORS Chapters 279A, 279B, 279C, and related Oregon Administrative Rules to be included in public agreements are hereby incorporated by reference and shall become a part of this Contract as if fully set forth herein.

14.7. Jurisdiction. Jurisdiction and venue for any dispute will be in Clackamas County Circuit Court.

14.8. Disputes. Disputes arising in the performance of this Contract that are not resolved by agreement of the parties shall be decided, in writing, by the authorized representative of the City. This decision shall be final and conclusive unless, within ten (10) days from the date of receipt of its copy, Supplier mails or otherwise furnishes a written appeal to the City's authorized representative. In connection with any such appeal, Supplier shall be afforded an opportunity to be heard and to offer evidence in support of its position. The decision of the City's authorized representative shall be binding upon Supplier, and Supplier shall abide by the decision.

14.9. Performance During Dispute. Unless otherwise directed by the City's authorized representative, Supplier shall continue performance under this Contract while matters in dispute are being resolved.

14.10. Claims for Damages. Should either party to this Contract suffer injury or damage to person or property because of any act or omission of the party or of any of its employees, agents, or others for whose acts the party is legally liable, a claim for damages therefore shall be made in writing to such other party within a reasonable time after the first observance of such injury or damage.

14.11. Rights and Remedies. Duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights, and remedies otherwise imposed or available by law.

14.12. Nonwaiver. Failure by either party at any time to require performance by the other party of any of the provisions of this Contract shall in no way affect the party's rights hereunder to enforce the same, nor shall any waiver by the party of the breach hereof be held to be a waiver of any succeeding breach or a waiver of this nonwaiver clause.

14.13. Severability. If any provision of this Contract is found to be void or unenforceable to any extent, it is the intent of the parties that the rest of the Contract shall remain in full force and effect, to the greatest extent allowed by law.

14.14. Modification. This Contract may not be modified except by written instrument executed by Supplier and the City.

14.15. Time of the Essence. Time is expressly made of the essence in the performance of this Contract.

14.16. Calculation of Time. Except where the reference is to business days, all periods of time referred to herein shall include Saturdays, Sundays, and legal holidays in the State of Oregon, except that if the last day of any period falls on any Saturday, Sunday, or legal holiday observed by the City, the period shall be extended to include the next day which is not a Saturday, Sunday, or legal holiday. Where the reference is to business days, periods of time referred to herein shall exclude Saturdays, Sundays, and legal holidays observed by the City. Whenever a time period is set forth in days in this Contract, the first day from which the designated period of time begins to run shall not be included.

14.17. Headings. Any titles of the sections of this Contract are inserted for convenience of reference only and shall be disregarded in construing or interpreting any of its provisions.

14.18. Number, Gender and Captions. In construing this Contract, it is understood that, if the context so requires, the singular pronoun shall be taken to mean and include the plural, the masculine, the feminine and the neuter, and that, generally, all grammatical changes shall be made, assumed, and implied to individuals and/or corporations and partnerships. All captions and paragraph headings used herein are intended solely for convenience of reference and shall in no way limit any of the provisions of this Contract.

14.19. Interpretation. As a further condition of this Contract, the City and Supplier acknowledge that this Contract shall be deemed and construed to have been prepared mutually by each party, and it shall be expressly agreed that any uncertainty or ambiguity existing therein shall not be construed against any party. In the event that any party shall take an action, whether judicial or otherwise, to enforce or interpret any of the terms of the contract, the prevailing party shall be entitled to recover from the other party all expenses which it may reasonably incur in taking such action, including attorney fees and costs, whether incurred in a court of law or otherwise.

14.20. Entire Agreement. This Contract, all documents attached to this Contract, and all Contract Documents and laws and regulations incorporated by reference herein, represent the entire agreement between the parties.

14.21. Counterparts. This Contract may be executed in one or more counterparts, each of which shall constitute an original Contract but all of which together shall constitute one and the same instrument.

14.22. Authority. Each party signing on behalf of Supplier and the City hereby warrants actual authority to bind their respective party.

IN WITNESS WHEREOF, the parties have executed this Contract as of the date first above written.

SUPPLIER:

CITY:

NORTHWEST BUS SALES, INC.

CITY OF WILSONVILLE

By: _____

By: _____

Name: _____

Name: _____

As Its: _____

As Its: _____

APPROVED AS TO FORM:

By: _____

Name: _____

City of Wilsonville Legal Counsel

EXHIBIT A

PROPOSAL FORM

Base price \$202,475

Specification	In base price? (Y/N)	Additional cost
Vehicle to be approximately 26 feet in length w/ 186" wheelbase Ford E-450 chassis (or approved equal).	Y	Note: Bid as 176" wheelbase per Q&A Request #4.
Desired seating capacity 21 (or 15+2). See desired floorplan, page 2.	Y	Note: Bid as 20passenger per Q&A Request #2.
Total of three (3) double passenger foldaway seats, creating two (2) wheelchair securement positions.	Y	
Floor mounted securement track to run full length of the foldaway seat area.	Y	
Power adjustable driver's seat. Seat to be upholstered in vinyl, color to be Transit gray.	Y	
Q straint QRT Deluxe securement straps to accommodate two (2) mobility devices (or approved equal).	Y	
Passenger seating to be Freedman Citi-seat (or approved equal) with level 1 vinyl upholstery, Oxen gray.	Y	
Fixed passenger seats to provide 26" hip to knee dimension.	Y	
Passenger seats shall be equipped with armrests on the aisle side (excluding foldaway seats).	Y	
Passenger seats to be equipped with grab handles on aisle side.	Y	
Delete passenger seatbelts.	Y	
Plexiglas driver modesty panel.	Y	
Minimum 36" electric passenger entrance door, 40" door preferred.	Y	
Braun NCL919 wheelchair lift (or approved equal). Lift to be mounted directly aft of passenger entrance door. Lift shall feature a dedicated entry door.	Y	
Emergency escape roof hatch.	Y	
Public address system with a minimum of one (1) auxiliary port.	Y	
Public address system to include six (6) speakers, evenly spaced in the ceiling of the bus.	Y	
Interior lighting shall be LED.	Y	
Interior advertising rail package.	Y	

Passenger signal system w/ stop requested sign, operated by pull cords (no touch tape) with one time only chime (dual chime for ADA positions). Stop requested light on dashboard.	Y	
Wheelchair door ajar warning light on dashboard.	Y	
Motorola APX 4500 two-way radio. Radio must meet current Clackamas County C800 digital specifications.	Y	
Hanover Displays amber LED front and side destination signs w/ software package (or approved equal).	Y	
REI HD5-600 six camera surveillance system with 750 GB storage drive (or approved equal), system to be Wi-Fi/GPS enabled.	Y	
Minimum 58,000 BTU A/C system. Skirt mounted condenser unit must be mounted fore of rear axle. Units mounted aft of rear axle will not be deemed acceptable. Roof mounted units may be considered, vendor to provide height dimension on any roof mounted A/C equipment.	Y	Note: Equipped with 80k system.
Minimum 40,000 BTU passenger cabin heater, under seat or floor mount acceptable.	Y	Note: Equipped with 70k heater.
ITS system: Customer will be adding ITS system post-delivery.	Y	
Gerflor anti-skid flooring (or approved equal), color Griffon gray, flooring material coved to seat rail.	Y	Note: Altro per Q&A Request #5.
Rubber step nosing, color to be safety yellow.	Y	
Standee line.	Y	
Vehicle to be equipped with OEM gaseous fuel prep package and dedicated 3600 lb. CNG conversion. All CNG components and installation to be factory approved and shall not void or otherwise impact factory chassis warranty.	Y	
CNG storage cylinder capacity to be a minimum of 40 GGE.	Y	
Charging system shall be supplied by chassis OEM in the highest amperage rating offered by the OEM.	Y	
Skirt mounted battery box with sliding battery tray.	Y	
Driver side running board.	Y	
Heated/remote exterior mirrors.	Y	
Electronic LED Yield sign wired to left turn signal.	Y	
Exterior LED lighting package.	Y	
Flush mounted or shielded LED side turn signals, midship mounted.	Y	
Docking lights for lift entrance.	Y	
Front standoff mount, capable of accepting owner supplied Sportworks Apex 3 bicycle rack.	Y	
Romeo Rim rear bumper (or approved equal).	Y	

Exterior paint color shall be fleet white.	Y	
5 lb. ABC fire extinguisher.	Y	
First aid kit.	Y	
Biohazard cleanup kit.	Y	
Total of three (3) ignition keys per bus.	Y	

Total price with options \$202,475



TURTLE TOP

FMVSS COMPLIANCE STATEMENT

Turtle Top (a division of Independent Protection Company) validates that vehicles up-fitted from incomplete vehicles, when completed; conform to all applicable Federal Motor Vehicle Safety Standards (FMVSS) in effect on the date of manufacturer and completion of the vehicle.

A handwritten signature in red ink, appearing to read 'Matthew Gaff', with a long, sweeping horizontal stroke extending to the right.

Matthew Gaff
Compliance Manager

Model Year 2026



FMVSS Compliance Summary - Model Year 2026

The following information describes briefly the FMVSS standards and the Compliance Action that has been taken by either Turtle Top, the chassis manufacturer, or both. This summary is not intended to replace the standards on file at Turtle Top, but is intended to briefly describe and summarize them.		
FMVSS No.	Standard Description	Compliance Action
101	Controls and Displays	Turtle Top does not alter the OEM controls or displays; compliance is deferred to the chassis manufacturer. Any controls, displays, and illumination added to the vehicle are subject to the standard and meet this standard.
102	Transmission Shift Position Sequence, Starter Interlock & Transmission Braking Effect	Compliance is deferred to the chassis manufacturer.
103	Windshield Defrosting and Defogging Systems	Compliance is deferred to the chassis manufacturer.
104	Windshield Wiping & Washing Systems	Compliance is deferred to the chassis manufacturer.
105	Hydraulic and Electric Brake Systems	Brake systems are not modified by Turtle Top. Test data kept on file for vehicles that have had the frame stretched.
106	Brake Hoses	Turtle Top does not alter brake hoses. Vehicles with stretched frames have additional lines installed by MOR/ryde using OEM components.
108	Lamps, Reflective Devices, and Associated Equipment	Turtle Top does not alter OEM lighting. Additional lighting such as brake, turn, clearance, and reverse lamps meet the standard. Data on file.
110	Tire Selection and Rims	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) meet this standard; compliance is the responsibility of Turtle Top.
111	Rearview Mirrors	All non-OEM mirrors installed by Turtle Top meet this standard and DOT regulations. Compliance is deferred to the chassis manufacturer for OEM mirrors installed on incomplete vehicles.
113	Hood Latch System	Compliance is deferred to the chassis manufacturer.
114	Theft Protection and Rollaway Prevention	All vehicles applicable to the standard (MPVs 10,000 lbs. or less) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.
116	Motor Vehicle Brake Fluids	Turtle Top does not alter brake systems. Vehicles with stretched frames have additional fluid added by MOR/ryde using OEM instruction and materials.
118	Power Operated Window, Partition, and Roof Panel Systems	All vehicles applicable to the standard (MPVs 10,000 lbs. or less) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.
119	New Pneumatic Tires for Motor Vehicles with a GVWR of more than 4,536 Kilograms (10,000 pounds)	All vehicles applicable to the standard (Buses and MPVs greater than 10,000 lbs.) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer. Turtle Top retains the OEM incomplete vehicle tires.

Matthew Gaff, Compliance Manager



FMVSS Compliance Summary - Model Year 2026

The following information describes briefly the FMVSS standards and the Compliance Action that has been taken by either Turtle Top, the chassis manufacturer, or both. This summary is not intended to replace the standards on file at Turtle Top, but is intended to briefly describe and summarize them.

FMVSS No.	Standard Description	Compliance Action
120	Tire Selection and Rims for Motor Vehicles with a GVWR of more than 4,536 kilograms (10,000 pounds)	All vehicles applicable to the standard (Buses and MPVs greater than 10,000 lbs.) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer. Turtle Top retains the OEM incomplete vehicle
121	Air Brake Systems	Brake systems are not modified by Turtle Top.
124	Accelerator Control Systems	Compliance is deferred to the chassis manufacturer.
125	Warning Devices	The standard applies to devices, without self-contained energy sources, that are designed to be carried in buses and trucks that have a gross vehicle weight rating greater than 10,000 lbs. GVWR. Compliance is the responsibility of Turtle Top.
126	Electronic Stability Control Systems	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) meet this standard; compliance is deferred to the chassis manufacturer.
131	School Bus Pedestrian Safety Devices	The standard is applicable to School Buses, but not to MF/SABs. Turtle Top does not manufacture School Buses.
138	Tire Pressure Monitoring Systems	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) meet this standard; compliance is deferred to the chassis manufacturer.
139	New Pneumatic Radial Tires for Light Vehicles	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) meet this standard; compliance is deferred to the chassis manufacturer. Turtle Top retains the OEM incomplete vehicle tires.
201	Occupant Protection in Interior Impact	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.
201U (S6)	Occupant Protection in Interior Impact - Upper Interior Head Impact Protection Requirements	All vehicles applicable to the standard (MPVs under 10,000 lbs.) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.
202a	Head Restraints	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.
203	Impact Protection for the Driver from the Steering Control System	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.
204	Steering Control Rearward Displacement	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less and an unloaded vehicle weight 5,500 lbs. or less) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.

Matthew Gaff, Compliance Manager



FMVSS Compliance Summary - Model Year 2026

The following information describes briefly the FMVSS standards and the Compliance Action that has been taken by either Turtle Top, the chassis manufacturer, or both. This summary is not intended to replace the standards on file at Turtle Top, but is intended to briefly describe and summarize them.

FMVSS No.	Standard Description	Compliance Action
205	Glazing Materials	No modifications are made to the OEM glazing materials. Additional glazing materials meet the standard. Test data on file.
206	Door Locks and Door Retention Components	All vehicles manufactured by Turtle Top (Buses and MPVs 10,000 lbs. or less) that are subject to this standard have no modifications made which affect compliance to the standard.
207	Seating Systems	All non-OEM seats installed by Turtle Top meet this standard; test data on file. Compliance is deferred to the chassis manufacturer for OEM seats installed in incomplete vehicles.
208	Occupant Crash Protection	No alterations are made to the OEM seat belts, air bag systems, or associated hardware. Any seat belt systems added meet the standard. Test data on file.
209	Seat Belt Assemblies	No alterations are made to the OEM seat belts or associated hardware. Any seat belt systems added meet the standard. Test data on file.
210	Seat Belt Assembly Anchorages	No alterations are made to the OEM front seat belts assemblies, anchorages, or associated hardware. Seat belt systems and their installation meet the standard. Test data on file.
212	Windshield Mounting	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.
213	Child Restraint Systems	Vehicles manufactured by Turtle Top that are subject to this standard (Buses and MPVs 10,000 lbs. or less) have seating installed that meets this standard.
214	Side Impact Protection	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.
217	Bus Emergency Exits and Window Retention and Release	No modifications are made to the OEM front door windows. Additional windows and doors meet the standard. Test data on file. Standard applicable to Buses.
219	Windshield Zone Intrusion	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.
220	School Bus Rollover Protection	The standard is applicable to School Buses and MFSABs. Turtle Top does not manufacture School Buses or MFSABs.
221	School Bus Body Joint Strength	The standard is applicable to School Buses and MFSABs. Turtle Top does not manufacture School Buses or MFSABs.

Matthew Gaff, Compliance Manager



FMVSS Compliance Summary - Model Year 2026

The following information describes briefly the FMVSS standards and the Compliance Action that has been taken by either Turtle Top, the chassis manufacturer, or both. This summary is not intended to replace the standards on file at Turtle Top, but is intended to briefly describe and summarize them.

FMVSS No.	Standard Description	Compliance Action
222	School Bus Passenger Seating and Crash Protection	The standard is applicable to School Buses and MFSABs. Turtle Top does not manufacture School Buses or MFSABs. Test data on file for S5.4.1.3 Wheelchair occupant restraint anchorages
225	Child Restraint Anchorage Systems	Vehicles manufactured by Turtle Top that are subject to this standard (Buses and MPVs 10,000 lbs. or less) have seating installed that meets this standard. Test data on file.
226	Ejection Mitigation	Standard establishes requirements for ejection mitigation systems to reduce the likelihood of complete and partial ejections of vehicle occupants through side windows during rollover or some impact events. Standard applies to passenger cars, trucks and buses with a GVWR of 10,000 lb or less. Excluded from this standard are law enforcement vehicles, correctional institution vehicles, taxis and limousines, if they have a fixed security partition separating the 1st and 2nd or 2nd and 3rd rows
301	Fuel System Integrity	All vehicles applicable to the standard (Buses and MPVs 10,000 lbs. or less) do not have alterations made that affect the compliance to this standard; compliance is deferred to the chassis manufacturer.
302	Flammability of Interior Materials	OEM interior materials not altered meet the standard. All materials installed in the interior of Turtle Top products meet the standard. Test data on file.
303	Fuel System Integrity of Compressed Natural Gas Vehicles	Standard applies to MPVs and buses with a GVWR of 10,000 pounds or less and use CNG as a motor fuel. Compliance is deferred to the CNG component and installation vendor.
304	Compressed Natural Gas Fuel Container Integrity	Standard applies to MPVs and buses that uses CNG as a motor fuel and to each container designed to store CNG as motor fuel on-board. Compliance is deferred to the CNG component and installation vendor.
305	Electric-powered Vehicles: Electrolyte Spillage and Electrical Shock Protection	Standard applies to MPVs and buses with a GVWR of 10,000 pounds or less that use electrical propulsion components. Turtle Top does not manufacturer vehicles 10,000 pounds or less with hybrid electrical technology.
403	Platform Lift Systems for Motor Vehicles	Compliance is deferred to the platform lift manufacturer.
404	Platform Lift Installations in Motor Vehicles	All platform lifts installed by Turtle Top meets this standard.

REV 7/12-2-2025

Matthew Gaff, Compliance Manager



Northwest Bus Sales, Inc
33207 Pacific Highway South
Federal Way, WA 98003
Phone (253) 841-9997
Fax (253) 845-9384
www.nwbus.com

TVM / DBE Certification

Only eligible TVMs may bid on FTA-assisted transit vehicle procurements. Transit vehicle manufacturers that have submitted a goal methodology to FTA that has been approved, or has not been disapproved, at the time of solicitation are eligible to bid (49 CFR 26.49(a)(1)). To remain eligible, TVMs must submit their DBE goal methodology to FTA by August 1 of each year.

The DBE Interim Final Rule (IFR) issued on October 3, 2025, paused some reporting and submission requirements. Until further notice, TVMs are not required submit DBE goals. TVMs are not required to submit semiannual uniform reports until further notice.

A list of TVMs that have submitted a DBE goal methodology that FTA has not disapproved and are therefore eligible to bid or propose on FTA-assisted transit vehicle procurements can be found at <https://www.transit.dot.gov/regulations-and-guidance/civil-rights-ada/eligible-transit-vehicle-manufacturers>.

FEDERAL TRANSIT BUS TEST

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

**Manufacturer: Turtle Top, a Division of Independent
Protection Company, Inc.
Model: Terra Transit**

**Submitted for Testing in Service-Life Category
5 Year /150,000 Miles**

OCTOBER 2014

Report Number: LTI-BT-R1408

PENNS^TATE



**THE
LARSON
INSTITUTE**

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

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

FEDERAL TRANSIT BUS TEST

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

In accordance with CFR 49, Volume 7, Part 665

Manufacturer: Turtle Top, a Division of Independent
Protection Company, Inc.
67819 State Road 15
New Paris, IN 46553

Model: Terra Transit

Submitted for Testing in Service-Life Category
5 Year /150,000 Miles

Report Number: LTI-BT-R1408



Quality Authorization

Director, Bus Research
and Testing Center

Title

10/10/14

Date

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EXECUTIVE SUMMARY

Turtle Top, a Division of Independent Protection Company, Inc. submitted a model Terra Transit, gasoline-powered 21 seat (including the driver) 22-foot bus, for a 5 yr. /150,000 mile STURAA test. The odometer reading at the time of delivery was 492 miles. Testing started on August 5, 2014 and was completed on September 22, 2014. The Check-In section of the report provides a description of the bus and specifies its major components.

The primary part of the test program is the Structural Durability Test, which also provides the information for the Maintainability and Reliability results. The Structural Durability Test was started on August 13, 2014 and was completed on September 17, 2014.

The interior of the bus is configured with seating for 21 passengers including the driver. Note: this test bus is not designed to accommodate standing passengers. At 150 lbs. per person, this load results in a measured gross vehicle weight of 12,230 lbs. The first segment of the Structural Durability Test was performed with the bus loaded to a GVW of 12,230 lbs. Due to the design not accommodating standing passengers the middle seated load weight segment was performed at the same 12,230 lbs. The final segment was performed at a curb weight of 9,110 lbs. Durability driving resulted in unscheduled maintenance and failures that involved a variety of subsystems. A description of failures and a complete and detailed listing of scheduled and unscheduled maintenance is provided in the Maintainability section of this report.

Effective January 1, 2010 the Federal Transit Administration determined that the total number of simulated passengers used for loading all test vehicles will be based on the full complement of seats and free-floor space available for standing passengers (150 lbs per passenger). The passenger loading used for dynamic testing will not be reduced in order to comply with Gross Axle Weight Ratings (GAWR's) or the Gross Vehicle Weight Ratings (GVWR's) declared by the manufacturer. Cases where the loading exceeds the GAWR and/or the GVWR will be noted accordingly. During the testing program, all test vehicles transported or operated over public roadways will be loaded to comply with the GAWR and GVWR specified by the manufacturer.

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

The Reliability section compiles failures that occurred during Structural Durability Testing. Breakdowns are classified according to subsystems. The data in this section are arranged so that those subsystems with more frequent problems are apparent. The problems are also listed by class as defined in Section 2. The test bus encountered no Class 1 or Class 2 failures. Of the six reported failures, three were Class 3 and three were Class 4.

The Safety Test, (a double-lane change, obstacle avoidance test) was safely performed in both right-hand and left-hand directions up to a maximum test speed of 45 mph. The performance of the bus is illustrated by a speed vs. time plot. Acceleration and gradeability test data are provided in Section 4, Performance. The average time to obtain 50 mph was 15.69 seconds. The Stopping Distance phase of the Brake Test was completed with the following results; for the Uniform High Friction Test average stopping distances were 22.11' at 20 mph, 44.19' at 30 mph, 75.43' at 40 mph and 91.99' at 45 mph. The average stopping distance for the Uniform Low Friction Test was 25.35'. There was no deviation from the test lane during the performance of the Stopping Distance phase. During the Stability phase of Brake Testing the test bus experienced no deviation from the test lane but did experience pull to the left 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.

The Shakedown Test produced a maximum final loaded deflection of 0.178 inches with a permanent set ranging between -0.001 to 0.004 inches under a distributed static load of 7,875 lbs. The Distortion Test was completed with all subsystems, doors and escape mechanisms operating properly. No water leakage was observed throughout the test. All subsystems operated properly.

The test bus was not equipped with any type of tow eyes or tow hooks, therefore the Static Towing Test was not performed. The Dynamic Towing Test was performed by means of a front-lift tow. The towing interface was accomplished using a hydraulic under-lift wrecker. The bus was towed without incident and no damage resulted from the test. The manufacturer does not recommend towing the bus from the rear; therefore, a rear test was not performed. The Jacking and Hoisting Tests were also performed without incident. The bus was found to be stable on the jack stands, and the minimum jacking clearance observed with a tire deflated was 7.3 inches.

A Fuel Economy Test was run on simulated central business district, arterial, and commuter courses. The results were 7.28 mpg, 7.59 mpg, and 12.52 mpg respectively; with an overall average of 8.38 mpg.

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

ABBREVIATIONS

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

TEST BUS CHECK-IN

I. OBJECTIVE

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

II. TEST DESCRIPTION

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

III. DISCUSSION

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

The test bus consists of a Turtle Top, a Division of Independent Protection Company, Inc., model Terra Transit. The bus has a Ford OEM driver's and front passenger door, rear of the front axle. A cargo door is located in the center rear of the bus. Note; this test bus was not equipped with a handicap ramp or lift. Power is provided by a gasoline-fueled, Ford model 5.4 L EFI V8 engine coupled to a Ford model 5R110W 5 Speed Auto Trans NAAO transmission.

The measured curb weight is 3,250 lbs for the front axle and 5,860 lbs. for the rear axle. These combined weights provide a total measured curb weight of 9,110 lbs. There are 21 seats including the driver. Note; this test bus was not designed to accommodate standing passengers, therefore there is no standee count. Total passenger capacity is 21. Gross load is 150 lbs. x 21 = 3,150 lbs. At full capacity, the measured gross vehicle weight is 12,230 lbs.

VEHICLE DATA FORM

Page 1 of 7

Bus Number: 1408	Arrival Date: 08-05-14
Bus Manufacturer: Turtle Top	Vehicle Identification Number (VIN): 1FDEE4FL6EDA56696
Model Number: Terra Transit	Date: 08-05-14
Personnel: T.S. & S.R.	Chassis: Ford / E - 450

WEIGHT:

Individual Wheel Reactions:

Weights (lb)	Front Axle		Middle Axle		Rear Axle	
	Right	Left	Right	Left	Right	Left
CW	1,660	1,590	N/A	N/A	2,990	2,870
SLW	1,710	1,650	N/A	N/A	4,480	4,390
GVW	1,710	1,650	N/A	N/A	4,480	4,390

Total Weight Details:

Weight (lb)	CW	SLW	GVW	GAWR
Front Axle	3,250	3,360	3,360	5,000
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	5,860	8,870	8,870	9,600
Total	9,110	12,230	12,230	GVWR: 14,000

Dimensions:

Length (ft/in)	22 / 10.5
Width (in)	97.0
Height (in)	118.0
Front Overhang (in)	32.75
Rear Overhang (in)	83.5
Wheel Base (in)	158.25
Wheel Track (in)	Front: 69.0
	Rear: 77.8

VEHICLE DATA FORM

Page 2 of 7

Bus Number: 1408	Date: 08-05-14
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CLEARANCES:

Lowest Point Outside Front Axle	Location: Bumper	Clearance(in): 13.4
Lowest Point Outside Rear Axle	Location: Spring Hanger	Clearance(in): 9.7
Lowest Point between Axles	Location: Muffler	Clearance(in): 12.0
Ground Clearance at the center (in)	13.4	
Front Approach Angle (deg)	22.2	
Rear Approach Angle (deg)	14.6	
Ramp Clearance Angle (deg)	9.6	
Aisle Width (in)	18.8	
Inside Standing Height at Center Aisle (in)	76.9	

BODY DETAILS:

Body Structural Type	Integral		
Frame Material	Steel		
Body Material	Fiberglass		
Floor Material	Plywood		
Roof Material	Fiberglass		
Windows Type	☒ Fixed	☐ Movable	
Window Mfg./Model No.	CLEER VISION / AS3 DOT 960		
Number of Doors	<u>2</u> Front	<u>1</u> Rear	
Mfr. / Model No.	Driver: FOMOCO/ OEM Passenger: Turtle Top / Electric Bi-Fold 29" Rear Exit Door: Turtle Top / CRWH30		
Dimension of Each Door (in)	Front: 26.8 x 54.5	Rear: 30.4 x 55.9	Pass: 32.3 x 80.7
Passenger Seat Type	☐ Cantilever	☒ Pedestal	☐ Other (explain)
Mfr. / Model No.	Freedman Seating Co. / Featherweight Double High-Back Rigid		
Driver Seat Type	☐ Air	☒ Spring	☐ Other (explain)
Mfr. / Model No.	FOMOCO / E-Series Front Bucket Captain's Chair		
Number of Seats (including Driver)	21		

VEHICLE DATA FORM

Page 3 of 7

Bus Number: 1408	Date: 08-05-14
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BODY DETAILS (Contd..)

Free Floor Space (ft ²)	16.6
Height of Each Step at Normal Position (in)	Front 1. <u>14.4</u> 2. <u>9.0</u> 3. <u>9.85</u> 4. <u>N/A</u>
	Middle 1. <u>N/A</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
	Rear 1. <u>N/A</u> 2. <u>N/A</u> 3. <u>N/A</u> 4. <u>N/A</u>
Step Elevation Change - Kneeling (in)	N/A

ENGINE

Type	☐ C.I.	☐ Alternate Fuel	
	☒ S.I.	☐ Other (explain)	
Mfr. / Model No.	Ford / 5.4 L EFI V8		
Location	☒ Front	☐ Rear	☐ Other (explain)
Fuel Type	☒ Gasoline	☐ CNG	☐ Methanol
	☐ Diesel	☐ LNG	☐ Other (explain)
Fuel Tank Capacity (indicate units)	55 gallons		
Fuel Induction Type	☒ Injected	☐ Carburetion	
Fuel Injector Mfr. / Model No.	Ford / 5.4 L EFI V8		
Carburetor Mfr. / Model No.	N/A		
Fuel Pump Mfr. / Model No.	Ford / 5.4 L EFI V8		
Alternator (Generator) Mfr. / Model No.	FOMOCO/ DC2T-10300-BA		
Maximum Rated Output (Volts / Amps)	12 / 225		
Air Compressor Mfr. / Model No.	N/A		
Maximum Capacity (ft ³ / min)	N/A		
Starter Type	☒ Electrical	☐ Pneumatic	☐ Other (explain)
Starter Mfr. / Model No.	FOMOCO/ TN438000-D410		

VEHICLE DATA FORM

Page 4 of 7

Bus Number: 1408	Date: 08-05-14
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TRANSMISSION

Transmission Type	☐ Manual	☒ Automatic	
Mfr. / Model No.	Ford / 5R110W 5 speed Auto Trans NAAO		
Control Type	☒ Mechanical	☐ Electrical	☐ Other
Torque Converter Mfr. / Model No.	Ford / 5R110W 5 speed Auto Trans NAAO		
Integral Retarder Mfr. / Model No.	N/A		

SUSPENSION

Number of Axles	2		
Front Axle Type	☒ Independent	☐ Beam Axle	
Mfr. / Model No.	Dana / Ford p/n 3007 LH / 3006 RH		
Axle Ratio (if driven)	N/A		
Suspension Type	☐ Air	☒ Spring	☐ Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Motorcraft / 8C24-1804		
Middle Axle Type	☐ Independent	☐ Beam Axle	
Mfr. / Model No.	N/A		
Axle Ratio (if driven)	N/A		
Suspension Type	☐ Air	☐ Spring	☐ Other (explain)
No. of Shock Absorbers	N/A		
Mfr. / Model No.	N/A		
Rear Axle Type	☐ Independent	☒ Beam Axle	
Mfr. / Model No.	Dana / n/a		
Axle Ratio (if driven)	4.56		
Suspension Type	☐ Air	☒ Spring	☐ Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Motorcraft / 8C24-18080-DB		

VEHICLE DATA FORM

Page 5 of 7

Bus Number: 1408	Date: 08-05-14
------------------	----------------

WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Ford / Fumagalli 16 x 6.0
	Tire Mfr./ Model No.	Michelin / LT225/75 R16
Rear	Wheel Mfr./ Model No.	Ford / Fumagalli 16 x 6.0
	Tire Mfr./ Model No.	Michelin / LT225/75 R16

BRAKES

Front Axle Brakes Type	☐ Cam	☒ Disc	☐ Other (explain)
Mfr. / Model No.	FOMOCO / N/A		
Middle Axle Brakes Type	☐ Cam	☐ Disc	☐ Other (explain)
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	☐ Cam	☒ Disc	☐ Other (explain)
Mfr. / Model No.	FOMOCO / N/A		
Retarder Type	N/A		
Mfr. / Model No.	N/A		

HVAC

Heating System Type	☐ Air	☒ Water	☐ Other
Capacity (Btu/hr)	Passenger – 65,000		
Mfr. / Model No.	ACC Climate Control / 106062		
Air Conditioner	☒ Yes	☐ No	
Location	Front dash / roof at rear of bus		
Capacity (Btu/hr)	70,000		
A/C Compressor Mfr. / Model No.	Cab - OEM / FS18 Rear - ACC / ACNR236516-TT		

STEERING

Steering Gear Box Type	Hydraulic
Mfr. / Model No.	FOMOCO / N/A
Steering Wheel Diameter	15.5"
Number of turns (lock to lock)	4.0

VEHICLE DATA FORM

Page 6 of 7

Bus Number: 1408	Date: 08-05-14
------------------	----------------

OTHERS

Wheel Chair Ramps	Location: N/A	Type: N/A
Wheel Chair Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	N/A	
Emergency Exit	Location: Windows Doors	Number: 2 3

CAPACITIES

Fuel Tank Capacity (units)	55 gallons
Engine Crankcase Capacity (gallons)	Not available
Transmission Capacity (gallons)	Not available
Differential Capacity (gallons)	Not available
Cooling System Capacity (quarts)	Not available
Power Steering Fluid Capacity (quarts)	1.5

VEHICLE DATA FORM
Page 7 of 7

Bus Number: 1408	Date: 08-05-14
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List all spare parts, tools and manuals delivered with the bus.

Part Number	Description	Qty.
FA-1632B3	Air Filter	1
FL-8205	Oil Filter	1
FT-180-8C3Z-7A098-D	Transmission Filter	1
RS-E45-04-16	MOR / RYDE Suspension Kit	1

COMPONENT/SUBSYSTEM INSPECTION FORM

Page 1 of 1

Bus Number: 1408	Date: 08-05-14
------------------	----------------

Subsystem	Checked	Initials	Comments
Air Conditioning Heating and Ventilation	✓	T.S.	
Body and Sheet Metal	✓	T.S.	
Frame	✓	T.S.	
Steering	✓	T.S.	
Suspension	✓	T.S.	
Interior/Seating	✓	T.S.	
Axles	✓	T.S.	
Brakes	✓	T.S.	
Tires/Wheels	✓	T.S.	
Exhaust	✓	T.S.	
Fuel System	✓	T.S.	
Power Plant	✓	T.S.	
Accessories	✓	T.S.	
Lift System	✓	T.S.	N/A
Interior Fasteners	✓	T.S.	
Batteries	✓	T.S.	

CHECK - IN



**TURTLE TOP,
A DIVISION OF INDEPENDENT PROTECTION COMPANY, INC.
MODEL TERRA TRANSIT**



CHECK - IN CONT.

INCOMPLETE VEHICLE MFD. BY FORD MOTOR COMPANY

DATE: 02/14
 FRONT GAWR: 2268 KG (5000 LB)
 WITH LT225/75R16E 115/112R
 16x6.0K
 AT 520 kPa/ 75 PSI COLD
 VIN: 1FDEE4FL6EDA56696

GVWR: 6350 KG (14000 LB)
 REAR GAWR: 4355 KG (9600 LB)
 WITH LT225/75R16E 115/112R
 16x6.0K
 AT 550 kPa/ 80 PSI COLD

TIRES
RIMS

EXT PNT: YZ
 WB 158
 INT TR ME
 TP/PS
 R 5
 AXLE 83
 TR T
 SPR XXBB
 ULN
 DE414
 U05
 5USA-3520472-AA

RC: 86 DSO:

MADE IN U.S.A.

5USA-3520472-AA

INCOMPLETE VEHICLE TAG

MANUFACTURED BY: TURTLE TOP NEW PARIS, IN

GVWR 6356 KG(14000 LB)

GAWR FRONT 2270 KG(5000 LB) TIRES LT225/75R16E 115/112R 16x6.0K 517 KPA(75 PSI)

COLD INFLATION PRESSURE

GAWR INTERM KG(LB) TIRES KPA(PSI)

COLD INFLATION PRESSURE

GAWR REAR 4358 KG(9600 LB) TIRES LT225/75R16E 115/112R 16x6.0K 552 KPA(80 PSI)

COLD INFLATION PRESSURE

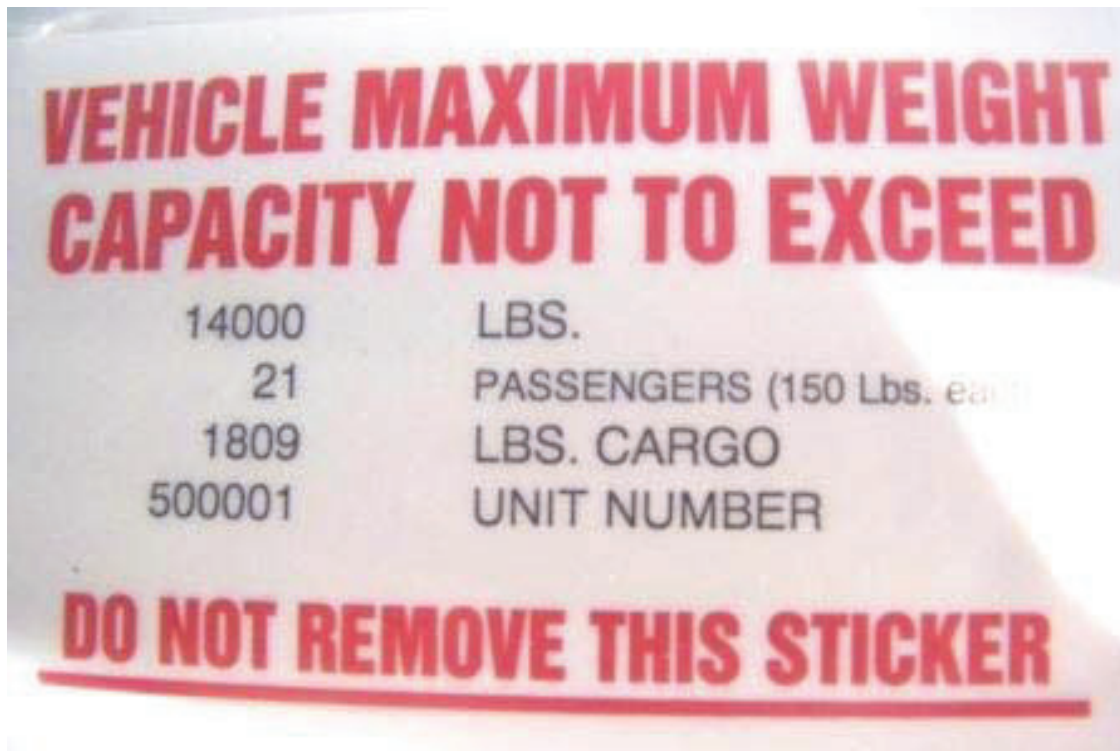
THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS
 PREVENTION STANDARDS IF APPLICABLE] IN EFFECT IN 7/2014

V.I.N 1FDEE4FL6EDA56696

TYPE

VIN TAG

CHECK - IN CONT.



**CARGO/PASSENGER CARRYING CAPACITY LABEL
TEST BUS IS NOT DESIGNED TO ACCOMMODATE
STANDING PASSENGERES**



OPERATOR'S AREA

CHECK - IN CONT.



INTERIOR VIEW FRONT-TO-REAR



INTERIOR VIEW REAR-TO-FRONT

CHECK - IN CONT.



ENGINE COMPARTMENT

1. MAINTAINABILITY

1.1 ACCESSIBILITY OF COMPONENTS AND SUBSYSTEMS

1.1-I. TEST OBJECTIVE

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

1.1-II. TEST DESCRIPTION

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

1.1-III. DISCUSSION

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

ACCESSIBILITY DATA FORM

Page 1 of 2

Bus Number: 1408	Date: 09-19-14
------------------	----------------

Component	Checked	Initials	Comments
ENGINE :			
Oil Dipstick	✓	T.S.	
Oil Filler Hole	✓	T.S.	
Oil Drain Plug	✓	T.S.	
Oil Filter	✓	T.S.	
Fuel Filter	✓	T.S.	
Air Filter	✓	T.S.	
Belts	✓	T.S.	
Coolant Level	✓	T.S.	
Coolant Filler Hole	✓	T.S.	
Coolant Drain	✓	T.S.	
Spark / Glow Plugs	✓	T.S.	Spark plugs
Alternator	✓	T.S.	
Diagnostic Interface Connector	✓	T.S.	
TRANSMISSION :			
Fluid Dip-Stick	✓	T.S.	
Filler Hole	✓	T.S.	
Drain Plug	✓	T.S.	
SUSPENSION :			
Bushings	✓	T.S.	
Shock Absorbers	✓	T.S.	
Air Springs	✓	T.S.	N/A
Leveling Valves	✓	T.S.	N/A
Grease Fittings	✓	T.S.	

ACCESSIBILITY DATA FORM

Page 2 of 2

Bus Number: 1408	Date: 09-19-14
------------------	----------------

Component	Checked	Initials	Comments
HVAC :			
A/C Compressor	✓	T.S.	
Filters	✓	T.S.	
Fans	✓	T.S.	
ELECTRICAL SYSTEM :			
Fuses	✓	T.S.	
Batteries	✓	T.S.	
Voltage regulator	✓	T.S.	
Voltage Converters	✓	T.S.	
Lighting	✓	T.S.	
MISCELLANEOUS :			
Brakes	✓	T.S.	
Handicap Lifts/Ramps	✓	T.S.	N/A
Instruments	✓	T.S.	
Axles	✓	T.S.	
Exhaust	✓	T.S.	
Fuel System	✓	T.S.	
OTHERS :			

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

1.2-I. TEST OBJECTIVE

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

1.2.-II. TEST DESCRIPTION

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

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

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

- A. Service
 1. Fueling
 2. Consumable checks
 3. Interior cleaning
- B. Preventive Maintenance
 4. Brake adjustments
 5. Lubrication
 6. 3,000 mi (or equivalent) inspection

7. Oil and filter change inspection
8. Major inspection
9. Tune-up

C. Periodic Repairs

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

1.2-III. DISCUSSION

Servicing and preventive maintenance were performed at manufacturer-specified intervals. The following Scheduled Maintenance Form lists the mileage, items serviced, the service interval, and amount of time required to perform the maintenance. Table 1 is a list of the lubricating products used in servicing. Finally, the Unscheduled Maintenance List along with Unscheduled Maintenance-related photographs is included in Section 5.7, Structural Durability. This list supplies information related to failures that occurred during the durability portion of testing. The Unscheduled Maintenance List includes the date and mileage at which the malfunction occurred, a description of the malfunction and repair, and the time required to perform the repair.

(Page 1 of 1)
SCHEDULED MAINTENANCE
TURTLE TOP #1408

DATE	TEST MILES	SERVICE	ACTIVITY	MAN HOURS	DOWN TIME
08-21-14	1,569	P.M./Inspection	Linkage, tie rods, universal/u-joints all lubed; all fluids checked.	4.00	4.00
08-26-14	2,329	P.M./Inspection	Linkage, tie rods, universal/u-joints all lubed; all fluids checked.	4.00	4.00
09-02-14	3,325	P.M./Inspection Fuel Economy Prep	Linkage, tie rods, universal/u-joints all lubed; all fluids checked. Oil changed. Oil, fuel, and air filters changed. Transmission oil and filter changed.	8.00	8.00
09-12-14	4,382	P.M./Inspection	Linkage, tie rods, universal/u-joints all lubed; all fluids checked.	4.00	4.00
09-17-14	5,091	P.M./Inspection	Linkage, tie rods, universal/u-joints all lubed; all fluids checked.	4.00	4.00

Table 1. STANDARD LUBRICANTS

The following is a list of Texaco lubricant products used in bus testing conducted by the Penn State University Altoona Bus Testing Center:

<u>ITEM</u>	<u>PRODUCT CODE</u>	<u>TEXACO DESCRIPTION</u>
Engine oil	#2112	URSA Super Plus SAE 30
Transmission oil	#1866	Automatic Trans Fluid Mercon/Dexron II Multipurpose
Gear oil	#2316	Multigear Lubricant EP SAE 80W90
Wheel bearing & Chassis grease	#1935	Starplex II

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

1.3-I. TEST OBJECTIVE

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

1.3-II. TEST DESCRIPTION

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

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

1.3-III. DISCUSSION

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

MAN HOURS

Right rear tailpipe hanger	2.00
----------------------------	------

At the end of the test, the remaining items on the list were removed and replaced. The transmission assembly took 8.00 man-hours (two men @ 4.00 hrs.) to remove and replace. The time required for repair/replacement of the four remaining components is given on the following Repair and/or Replacement Form.

REPLACEMENT AND/OR REPAIR FORM

Page 1 of 1

Subsystem	Replacement Time
Transmission	8.00 man hours
Wiper Motor	0.50 man hours
Starter	0.50 man hours
Alternator	0.75 man hours
Batteries	0.50 man hours

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS



TRANSMISSION REMOVAL AND REPLACEMENT (8.00 MAN HOURS)



WIPER MOTOR REMOVAL AND REPLACEMENT (0.50 MAN HOURS)

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS CONT.



STARTER REMOVAL AND REPLACEMENT (0.50 MAN HOURS)



ALTERNATOR REMOVAL AND REPLACEMENT (0.75 MAN 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, man-hours to repair, and hours out of service are recorded on the Reliability Data Form.

CLASS OF FAILURES

Classes of failures are described below:

- (a) Class 1: Physical Safety. A failure that could lead directly to passenger or driver injury and represents a severe crash situation.
- (b) Class 2: Road Call. A failure resulting in an en route interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.
- (c) Class 3: Bus Change. A failure that requires removal of the bus from service during its assignments. The bus is operable to a rendezvous point with a replacement bus.
- (d) Class 4: Bad Order. A failure that does not require removal of the bus from service during its assignments but does degrade coach operation. The failure shall be reported by driver, inspector, or hostler.

2-III. DISCUSSION

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

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

The classification of repairs according to subsystem is intended to emphasize those systems which had persistent minor or more serious problems. There were no Class 1 or 2 failures. All three Class 3 failures occurred in the exhaust system. These, and the remaining three Class 4 failures are available for review in the Unscheduled Maintenance List, located in Section 5.7 Structural Durability.

RELIABILITY DATA FORMS**Page 1 of 1**

Bus Number : 1408	Date: 9-17-14
Personnel: Bob Reifsteck	

Failure type			
Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physica l Safety

Subsystem	Mileage	Mileage	Mileage	Mileage	Man Hours	Down Time
Exhaust system		593			0.50	0.50
		1,331			2.00	1.00
		1,569			1.00	1.00
Body	1,569				1.00	1.00
	1,569				1.00	1.00
Driveline	1,569				1.00	1.00

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

3-I. TEST OBJECTIVE

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

3-II. TEST DESCRIPTION

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

3-III. DISCUSSION

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

SAFETY DATA FORM

Page 1 of 1

Bus Number: 1408	Date: 08-26-14
Personnel: T.S., S.R. & R.S.	

Temperature (°F): 71	Humidity (%): 72
Wind Direction: SSW	Wind Speed (mph): 5
Barometric Pressure (in.Hg): 30.22	

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 bus maintained a safe position through all portions of the test.	
Comments of the tire/ground contact patch: The bus maintained tire/ground	
contact through all portions of the test.	

3. SAFETY



RIGHT - HAND APPROACH



LEFT - HAND APPROACH

4.0 PERFORMANCE

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

4.1-I. TEST OBJECTIVE

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

4.1-II. TEST DESCRIPTION

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

4.1-III. DISCUSSION

This test consists of three runs in both the clockwise and counterclockwise directions on the Test Track. Velocity versus time data is obtained for each run and results are averaged together to minimize any test variability which might be introduced by wind or other external factors. The test was performed up to a maximum speed of 50 mph. The fitted curve of velocity vs. time is attached, followed by the calculated gradeability results. The average time to obtain 50 mph was 15.69 seconds.

PERFORMANCE DATA FORM

Page 1 of 1

Bus Number: 1408		Date: 08-26-14	
Personnel: T.S., S.R. & R.S.			
Temperature (°F): 71		Humidity (%): 72	
Wind Direction: SSW		Wind Speed (mph): 6	
Barometric Pressure (in.Hg): 30.22			
		INITIALS:	
Ventilation fans-ON HIGH	✓Checked	T.S.	
Heater pump motor-Off	✓Checked	T.S.	
Defroster-OFF	✓Checked	T.S.	
Exterior and interior lights-ON	✓Checked	T.S.	
Windows and doors-CLOSED	✓Checked	T.S.	
ACCELERATION, GRADEABILITY, TOP SPEED			
Counter Clockwise Recorded Interval Times			
Speed	Run 1	Run 2	Run 3
10 mph	1.82	1.96	1.93
20 mph	4.68	4.46	4.58
30 mph	7.37	7.26	7.15
40 mph	10.96	10.82	11.00
Top Test Speed(mph) 50	16.15	15.94	16.08
Clockwise Recorded Interval Times			
Speed	Run 1	Run 2	Run 3
10 mph	1.90	2.03	2.08
20 mph	4.26	4.18	4.33
30 mph	6.95	7.47	6.94
40 mph	10.53	10.77	10.50
Top Test Speed(mph) 50	15.21	15.50	15.26

PERFORMANCE SUMMARY SHEET

BUS MANUFACTURER :Turtle Top
 BUS MODEL :Terra Transit

BUS NUMBER :1408
 TEST DATE :08/26/14

TEST CONDITIONS :

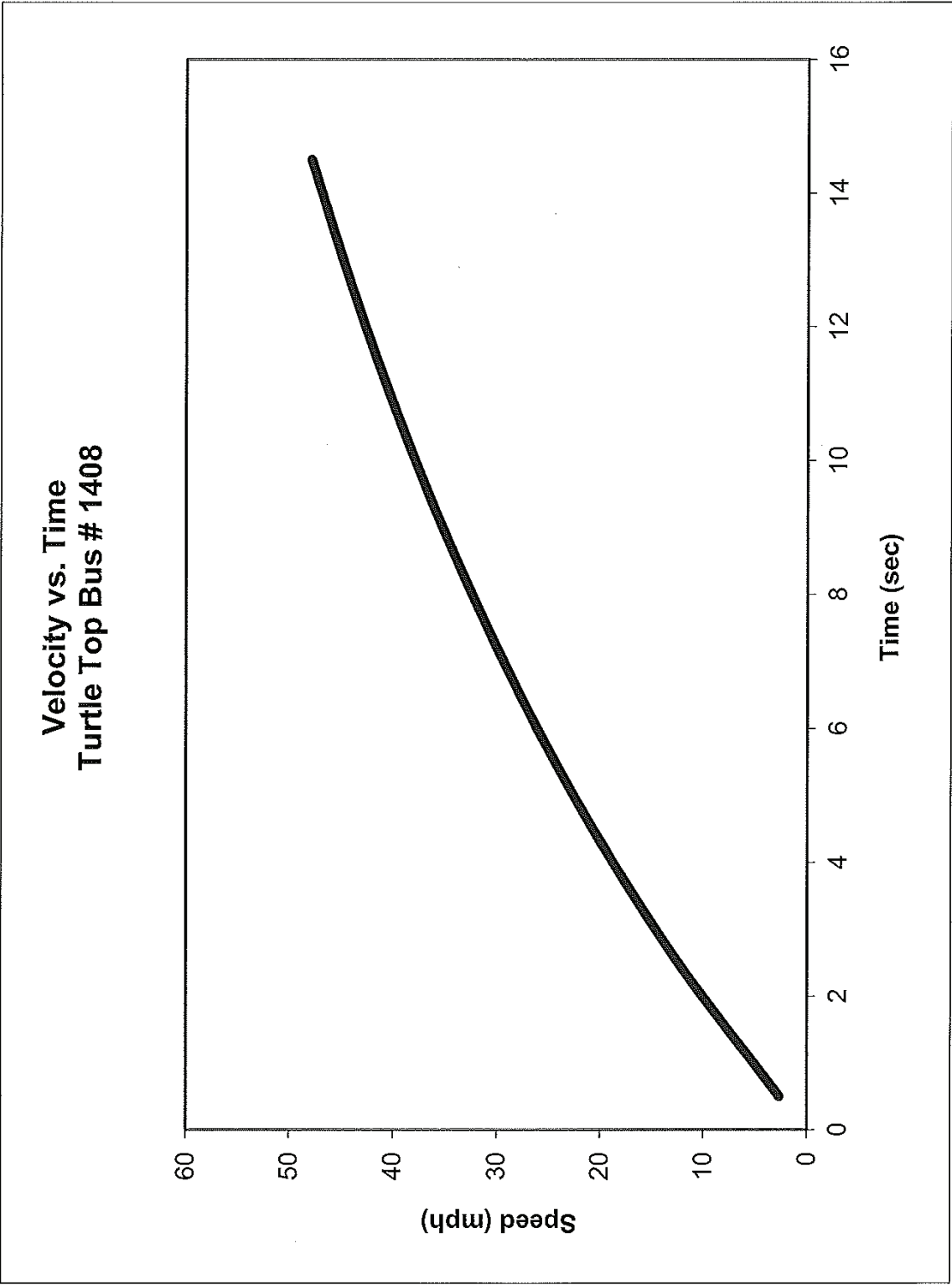
 TEMPERATURE (DEG F) : 71.0
 WIND DIRECTION : SSW
 WIND SPEED (MPH) : 6.0
 HUMIDITY (%) : 72
 BAROMETRIC PRESSURE (IN. HG) : 30.2

(MPH)	AVERAGE TIME (SEC)		
	CCW DIRECTION	CW DIRECTION	TOTAL
10.0	1.90	2.00	1.95
20.0	4.57	4.26	4.42
30.0	7.26	7.12	7.19
40.0	10.93	10.60	10.76
50.0	16.06	15.32	15.69

TEST SUMMARY :

VEHICLE SPEED (MPH)	TIME (SEC)	ACCELERATION (FT/SEC^2)	MAX. GRADE (%)
1.0	.18	7.9	25.4
5.0	.95	7.5	23.8
10.0	1.97	6.8	21.8
15.0	3.09	6.3	19.8
20.0	4.33	5.7	17.9
25.0	5.69	5.1	16.1
30.0	7.21	4.6	14.3
35.0	8.92	4.0	12.7
40.0	10.85	3.5	11.1
45.0	13.07	3.1	9.6
50.0	15.64	2.6	8.2

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



4.0 PERFORMANCE

4.2 Performance - Bus Braking

4.2 I. TEST OBJECTIVE

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

4.2 II. TEST DESCRIPTION

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

The brake testing procedure comprises three phases:

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

Stopping Distance Tests

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

The tests will be conducted as follows:

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

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

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

Stability Tests

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

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

Parking Brake Test

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

4.2-III. DISCUSSION

The Stopping Distance phase of the Brake Test was completed with the following results; for the Uniform High Friction Test average stopping distances were 22.11' at 20 mph, 44.19' at 30 mph, 75.43' at 40 mph and 91.99' at 45 mph. The average stopping distance for the Uniform Low Friction Test was 25.35'. There was no deviation from the test lane during the performance of the Stopping Distance phase.

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

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

Table 4.2-6. Braking Test Data Forms

Page 1 of 3

Bus Number: 1408	Date: 08-27-14
Personnel: T.S., S.R. & M.H.	
Amb. Temperature (°F): 79	Wind Speed (mph): 8
Wind Direction: SSW	Pavement Temp (°F) Start: 105 End: 114

TIRE INFLATION PRESSURE (psi):				
Tire Type: Front: Michelin LTX LT225/75R16 Rear: Michelin LTX LT225/75R16				
	Left Tire(s)		Right Tire(s)	
Front	80		80	
	Inner	Outer	Inner	Outer
Rear	80	80	80	80
Rear	N/A	N/A	N/A	N/A

AXLE LOADS (lb)		
	Left	Right
Front	1650	1710
Rear	4390	4480

FINAL INSPECTION	
Bus Number: 1408	Date: 8-27-14
Personnel: T.S., S.R. & M.H.	

Table 4.2-7. Record of All Braking System Faults/Repairs.
Page 2 of 3

Date	Personnel	Fault/Repair	Description
08/27/14	T.S., S.R. & M.H.	None.	None noted.

Table 4.2-8.1. Stopping Distance Test Results Form

Page 3 of 3

Stopping Distance (ft)					
Vehicle Direction	CW	CCW	CW	CCW	
Speed (mph)	Stop 1	Stop 2	Stop 3	Stop 4	Average
20 (dry)	23.18	20.12	22.06	23.11	22.11
30 (dry)	47.21	43.74	45.53	40.31	44.19
40 (dry)	72.81	71.92	76.29	80.72	75.43
45 (dry)	96.81	86.61	98.65	85.89	91.99
20 (wet)	26.55	24.87	25.60	24.41	25.35

Table 4.2-8.2. Stability Test Results Form

Stability Test Results (Split Friction Road surface)		
Vehicle Direction	Attempt	Did test bus stay in 12' lane? (yes/no)
CW	1	Yes
	2	Yes
CCW	1	Yes
	2	Yes

Table 4.2-8.3. Parking Brake Test Form

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

4.2 Performance - Bus Braking



TEST BUS HELD UP AND DOWN ON 20% GRADE



5.1 STRUCTURAL INTEGRITY

5.1 STRUCTURAL STRENGTH AND DISTORTION TESTS – STRUCTURAL SHAKEDOWN TEST

5.1-I. DISCUSSION

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

5.1-II. TEST DESCRIPTION

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

5.1-III. DISCUSSION

This test was performed based on a maximum passenger capacity of 21 people including the driver. The resulting test load is $(21 \times 375 \text{ lbs.}) = 7,875 \text{ lb.}$ The load is distributed evenly over the passenger space. Deflection data before and after each loading and unloading sequence is provided on the Structural Shakedown Data Form.

The unloaded height after each test becomes the original height for the next test. Some initial settling is expected due to undercoat compression, etc. After each loading cycle, the deflection of each reference point is determined. The bus is then unloaded and the residual (permanent) deflection is recorded. On the final test, the maximum loaded deflection was 0.178 Inches at reference point 7. The maximum permanent deflection after the final loading sequence ranged from -0.001 Inches at reference points 1 and 4 to 0.004 inches at reference points 6 and 7.

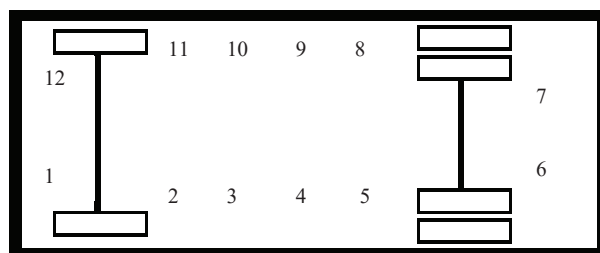
STRUCTURAL SHAKEDOWN DATA FORM

Page 1 of 2

Bus Number: 1408	Date: 08-12-14
Personnel: S.R., E.D., E.L. & P.D.	Temperature (°F): 68
Loading Sequence: ☒ 1 ☐ 2 ☐ 3 (check one) Test Load (lbs.): 7,875 (21 seated)	

Indicate Approximate Location of Each Reference Point

Right

Front
of
Bus

Left

Top View

Reference Point No.	A (in) Original Height	B (in) Loaded Height	B-A (in) Loaded Deflection	C (in) Unloaded Height	C-A (in) Permanent Deflection
1	0	-.043	-.043	.009	.009
2	0	.031	.031	.005	.005
3	0	.057	.057	.009	.009
4	0	.052	.052	.001	.001
5	0	.050	.050	.010	.010
6	0	.199	.199	.020	.020
7	0	.202	.202	.004	.004
8	0	.049	.049	.007	.007
9	0	.057	.057	.008	.008
10	0	.049	.049	.007	.007
11	0	.017	.017	.000	.000
12	0	-.055	-.055	.002	.002

STRUCTURAL SHAKEDOWN DATA FORM

Page 2 of 2

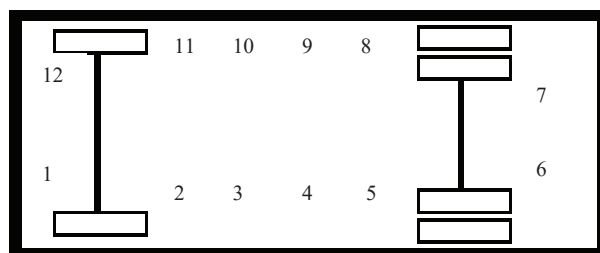
Bus Number: 1408	Date: 08-12-14
Personnel: S.R.,E.D.,E.L.& P.D.	Temperature (°F): 68
Loading Sequence: ☐ 1 ☒ 2 ☐ 3 (check one) Test Load (lbs.): 7,875 (21 seated)	

Indicate Approximate Location of Each Reference Point

Right

Front
of
Bus

Left



Top View

Reference Point No.	A (in) Original Height	B (in) Loaded Height	B-A (in) Loaded Deflection	C (in) Unloaded Height	C-A (in) Permanent Deflection
1	.009	-.004	-.013	.008	-.001
2	.005	.032	.027	.006	.001
3	.009	.061	.052	.010	.001
4	.001	.055	.054	.000	-.001
5	.010	.059	.049	.011	.001
6	.020	.170	.150	.024	.004
7	.004	.182	.178	.008	.004
8	.007	.058	.051	.007	.000
9	.008	.065	.057	.008	.000
10	.007	.053	.046	.007	.000
11	.000	.019	.019	.000	.000
12	.002	-.053	-.055	.003	.001

5.1 STRUCTURAL SHAKEDOWN TEST



DIAL INDICATORS IN POSITION



**BUS LOADED TO 2.5 TIMES GVL
(7,875 LBS)**

5.2 STRUCTURAL STRENGTH AND DISTORTION TESTS - STRUCTURAL DISTORTION

5.2-I. TEST OBJECTIVE

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

5.2-II. TEST DESCRIPTION

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

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

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

5.2-III. DISCUSSION

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

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

DISTORTION TEST INSPECTION FORM

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

Page 1 of 10

Bus Number: 1408	Date: 08-13-14
Personnel: T.S., S.R., E.D. & E.L.	Temperature(°F): 69

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 N/A	☐ 6 in higher	☐ 6 in lower
Left center N/A	☐ 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.
☒ Handicapped Device/ Special Seating	No deficiencies.
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

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

Page 2 of 10

Bus Number: 1408	Date: 08-13-14
Personnel: T.S., S.R., E.D. & E.L.	Temperature(°F): 69

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 N/A	☐ 6 in higher	☐ 6 in lower
Left center N/A	☐ 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.
☒ Handicapped Device/ Special Seating	No deficiencies.
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

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

Page 3 of 10

Bus Number: 1408	Date: 08-13-14
Personnel: T.S., S.R., E.D. & E.L.	Temperature(°F): 69

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 N/A	☐ 6 in higher	☐ 6 in lower
Left center N/A	☐ 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.
☒ Handicapped Device/ Special Seating	No deficiencies.
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

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

Page 4 of 10

Bus Number: 1408	Date: 08-13-14
Personnel: T.S.,S.R.,E.D. & E.L.	Temperature(°F): 69

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 N/A	☐ 6 in higher	☐ 6 in lower
Left center N/A	☐ 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.
■ Handicapped Device/ Special Seating	No deficiencies.
■ Undercarriage	No deficiencies.
■ Service Doors	No deficiencies.
■ Body	No deficiencies.
■ Windows/ Body Leakage	No deficiencies.
■ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

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

Page 5 of 10

Bus Number: 1408	Date: 8-13-14
Personnel: T.S.,S.R.,E.D. & E.L.	Temperature(°F): 69

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 N/A	☐ 6 in higher	☐ 6 in lower
Left center N/A	☐ 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.
■ Handicapped Device/ Special Seating	No deficiencies.
■ Undercarriage	No deficiencies.
■ Service Doors	No deficiencies.
■ Body	No deficiencies.
■ Windows/ Body Leakage	No deficiencies.
■ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

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

Page 6 of 10

Bus Number: 1408	Date: 08-13-14
Personnel: T.S.,S.R.,E.D. & E.L.	Temperature(°F): 69

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 N/A	☐ 6 in higher	☐ 6 in lower
Left center N/A	☐ 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.
■ Handicapped Device/ Special Seating	No deficiencies.
■ Undercarriage	No deficiencies.
■ Service Doors	No deficiencies.
■ Body	No deficiencies.
■ Windows/ Body Leakage	No deficiencies.
■ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

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

Page 7 of 10

Bus Number: 1408	Date: 08-13-14
Personnel: T.S.,S.R.,E.D. & E.L.	Temperature(°F): 69

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 N/A	☐ 6 in higher	☐ 6 in lower
Left center N/A	☐ 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.
■ Handicapped Device/ Special Seating	No deficiencies.
■ Undercarriage	No deficiencies.
■ Service Doors	No deficiencies.
■ Body	No deficiencies.
■ Windows/ Body Leakage	No deficiencies.
■ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

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

Page 8 of 10

Bus Number: 1408	Date: 08-13-14
Personnel: T.S.,S.R.,E.D. & E.L.	Temperature(°F): 69

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 N/A	☐ 6 in higher	☐ 6 in lower
Left center N/A	☐ 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.
■ Handicapped Device/ Special Seating	No deficiencies.
■ Undercarriage	No deficiencies.
■ Service Doors	No deficiencies.
■ Body	No deficiencies.
■ Windows/ Body Leakage	No deficiencies.
■ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

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

Page 9 of 10

Bus Number: 1408	Date: 08-13-14
Personnel: T.S.,S.R.,E.D. & E.L.	Temperature(°F): 69

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 N/A	☐ 6 in higher	☐ 6 in lower
Left center N/A	☐ 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.
■ Handicapped Device/ Special Seating	No deficiencies.
■ Undercarriage	No deficiencies.
■ Service Doors	No deficiencies.
■ Body	No deficiencies.
■ Windows/ Body Leakage	No deficiencies.
■ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

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

Page 10 of 10

Bus Number: 1408	Date: 08-13-14
Personnel: T.S.,S.R.,E.D. & E.L.	Temperature(°F): 69

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 N/A	☐ 6 in higher	☐ 6 in lower
Left center N/A	☐ 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.
☒ Handicapped Device/ Special Seating	No deficiencies.
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

5.2 STRUCTURAL DISTORTION TEST



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

5.3-III. DISCUSSION

The test bus submitted for testing was not equipped with any type of tow eyes or tow hooks, therefore the Static Towing Test was not performed.

5.4 STRUCTURAL STRENGTH AND DISTORTION TESTS - DYNAMIC TOWING TEST

5.4-I. TEST OBJECTIVE

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

5.4-II. TEST DESCRIPTION

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

5.4-III. DISCUSSION

The bus was towed using a heavy-duty wrecker. The towing interface was accomplished by incorporating a hydraulic under lift. A front lift tow was performed. Rear towing is not recommended. No problems, deformation, or damage was noted during testing.

DYNAMIC TOWING TEST DATA FORM

Page 1 of 1

Bus Number: 1408	Date: 09/09/14
Personnel: T.S., S.R. & J.P.	

Temperature (°F): 67	Wind Speed (mph): 5
Wind Direction: E	

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 front-lift tow was performed incorporating a hydraulic under lift wrecker.
Description and location of any structural damage: None noted.
General Comments: No problems with the towing interface or towing procedures were encountered.

5.4 DYNAMIC TOWING TEST



TOWING INTERFACE



TEST BUS IN TOW

5.5 STRUCTURAL STRENGTH AND DISTORTION TESTS – JACKING TEST

5.5-I. TEST OBJECTIVE

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

5.5-II. TEST DESCRIPTION

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

5.5-III. DISCUSSION

The jack used for this test has a minimum height of 8.75 inches. During the deflated portion of the test, the jacking point clearances ranged from 7.3 inches to 14.1 inches. No deformation or damage was observed during testing. A complete listing of jacking point clearances is provided in the Jacking Test Data Form.

JACKING CLEARANCE SUMMARY

Condition	Frame Point Clearance
Front axle – one tire flat	13.8"
Rear axle – one tire flat	14.1"
Rear axle – two tires flat	12.2"

JACKING TEST DATA FORM

Page 1 of 1

Bus Number: 1408	Date: 08-11-14
Personnel: E.D. & E.L.	Temperature (°F): 78

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

Deflated Tire	Jacking Pad Clearance Body/Frame (in)	Jacking Pad Clearance Axle/Suspension (in)	Comments
Right front	15.9 " I 13.9 " D	11.5 " I 9.0 " D	Body & Suspension
Left front	15.9 " I 13.8 " D	11.6 " I 9.0 " D	Body & Suspension
Right rear—outside	14.7 " I 14.1 " D	9.8 " I 9.2 " D	Body & Suspension
Right rear—both	14.7 " I 12.2 " D	9.8 " I 7.3 " D	Body & Suspension
Left rear—outside	14.6 " I 14.1 " D	10.0 " I 9.4 " D	Body & Suspension
Left rear—both	14.6 " I 12.4 " D	10.0 " I 7.7 " D	Body & Suspension
Right middle or tag—outside	NA	NA	
Right middle or tag—both	NA	NA	
Left middle or tag—outside	NA	NA	
Left middle or tag—both	NA	NA	
Additional comments of any deformation or difficulty during jacking:			
None noted.			

5.6 STRUCTURAL STRENGTH AND DISTORTION TESTS - HOISTING TEST

5.6-I. TEST OBJECTIVE

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

5.6-II. TEST DESCRIPTION

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

5.6-III. DISCUSSION

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

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

HOISTING TEST DATA FORM
Page 1 of 1

Bus Number: 1408	Date: 08-11-14
Personnel: E.D. & E.L.	Temperature (°F): 78

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 front and rear wheels are supported by the jack stands:
None noted.

5.7 STRUCTURAL DURABILITY TEST

5.7-I. TEST OBJECTIVE

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

5.7-II. TEST DESCRIPTION

The test vehicle is driven a total of 5,050 miles; approximately 3,750 miles on the PSBRTF Durability Test Track and approximately 1,300 miscellaneous other miles. The test will be conducted with the bus operated under three different loading conditions. The first segment will consist of approximately 2,125 miles with the bus operated at GVW. The second segment will consist of approximately 800 miles with the bus operated at SLW. The remainder of the test, approximately 2,125 miles, will be conducted with the bus loaded to CW. If GVW exceeds the axle design weights, then the load will be adjusted to the axle design weights and the change will be recorded. All subsystems are run during these tests in their normal operating modes. All recommended manufacturers servicing is to be followed and noted on the vehicle maintainability log. Servicing items accelerated by the durability tests will be compressed by 10:1; all others will be done on a 1:1 mi/mi basis. Unscheduled breakdowns and repairs are recorded on the same log as are any unusual occurrences as noted by the driver. Once a week the test vehicle shall be washed down and thoroughly inspected for any signs of failure.

5.7-III. DISCUSSION

The Structural Durability Test was started on August 13, 2014 and was conducted until September 17, 2014. The first 2,125 miles were performed at a GVW of 12,230 lbs. and completed on August 22, 2014. The next 800 mile SLW segment was performed at the same 12,230 lbs and completed on September 4, 2014. Note; this test bus is not designed to accommodate standing passengers. Therefore, GVW and SLW are the same 12,230 lbs. The final 2,125 mile segment was performed at a CW of 9,110 lbs and completed on September 17, 2014.

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

Turtle Top # 1408

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
08/11/2014 TO 08/17/14	532.00	70.00	602.00
08/18/2014 TO 08/24/14	1129.00	148.00	1277.00
08/25/2014 TO 08/31/14	379.00	1067.00	1446.00
09/01/2014 TO 09/07/14	81.00	47.00	128.00
09/08/2014 TO 09/14/14	1019.00	0.00	1019.00
09/15/2014 TO 09/21/14	619.00	0.00	619.00
TOTAL	3759.00	1332.00	5091.00

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

STANDARD OPERATING SCHEDULE

Monday through Friday		
	HOUR	ACTION
Shift 1	midnight	D
	1:40 am	C
	1:50 am	B
	2:00 am	D
	3:35 am	C
	3:45 am	B
	4:05 am	D
	5:40 am	C
	5:50 am	B
	6:00 am	D
	7:40 am	C
Shift 2	7:50 am	F
	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
Shift 3	3:40 pm	C
	3:50 pm	F
	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

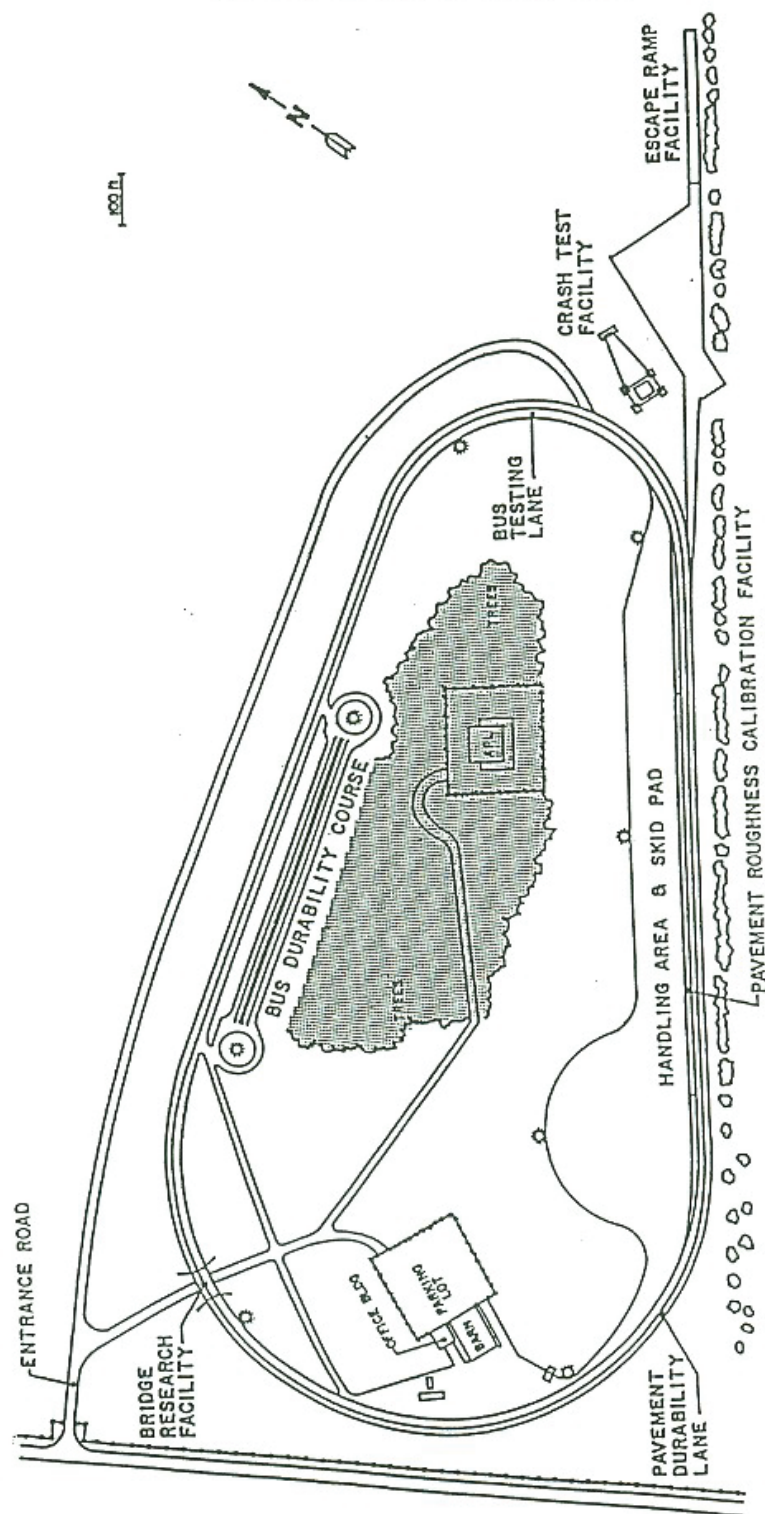
B—Break

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

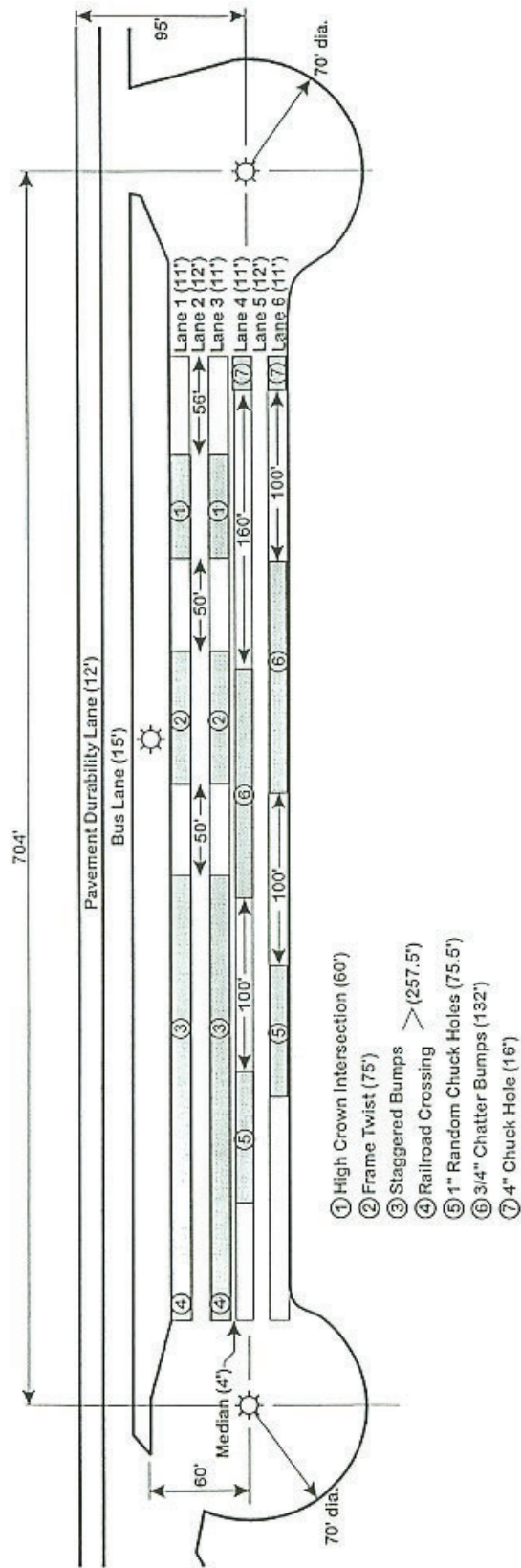
D—Drive bus as specified by procedure

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

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



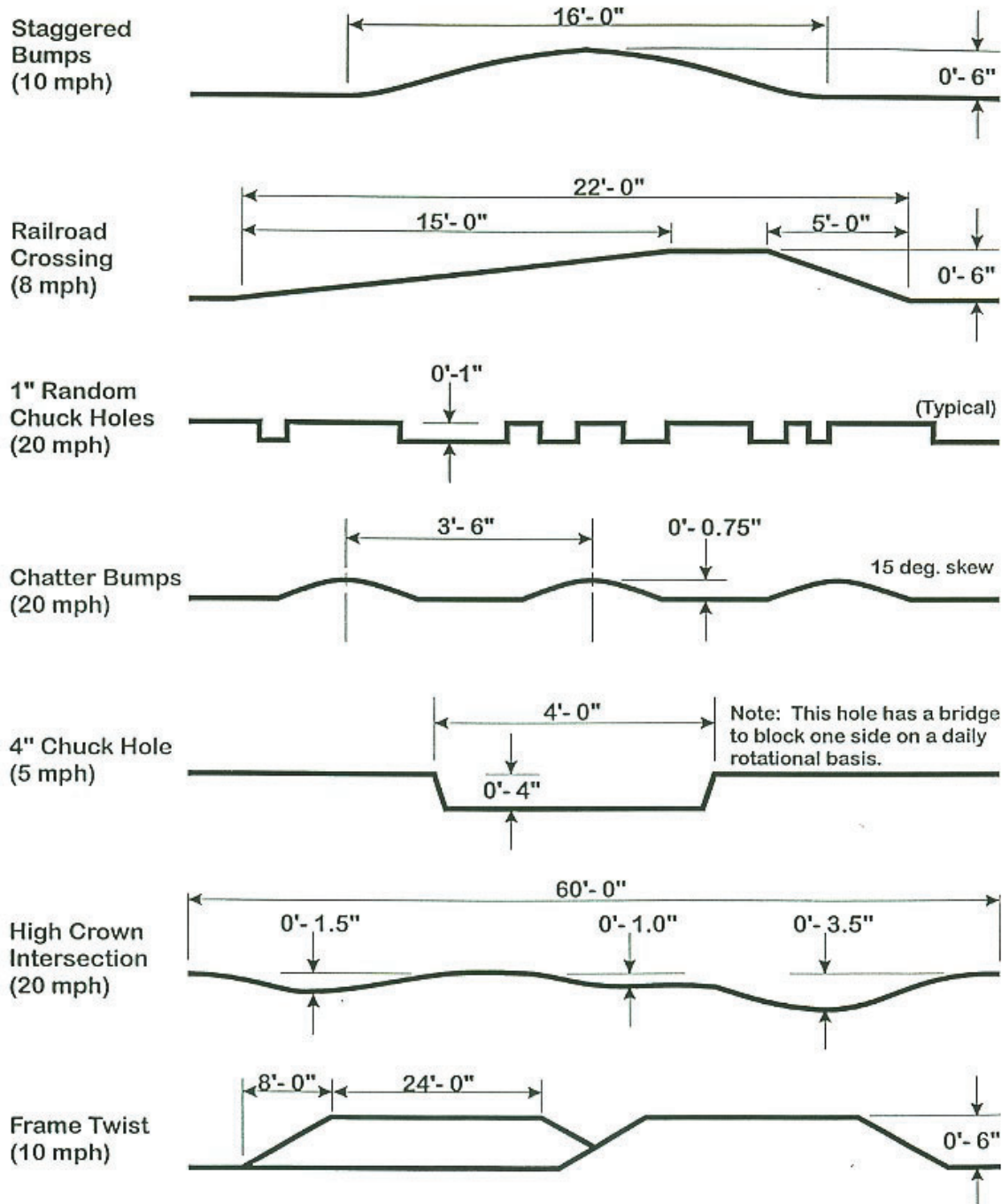
BUS TESTING AND RESEARCH TEST TRACK
UNIVERSITY PARK, PA



Plan View

Vehicle Durability Test Track

The Pennsylvania Transportation Institute
Penn State



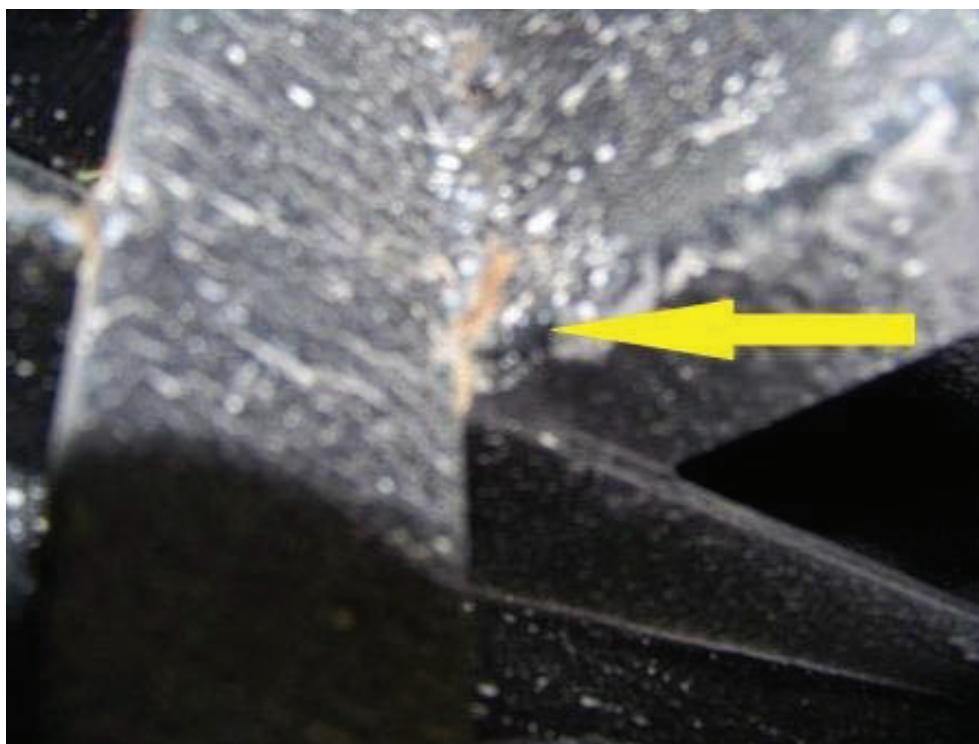
Durability Element Profiles

The Pennsylvania Transportation Institute
 Penn State

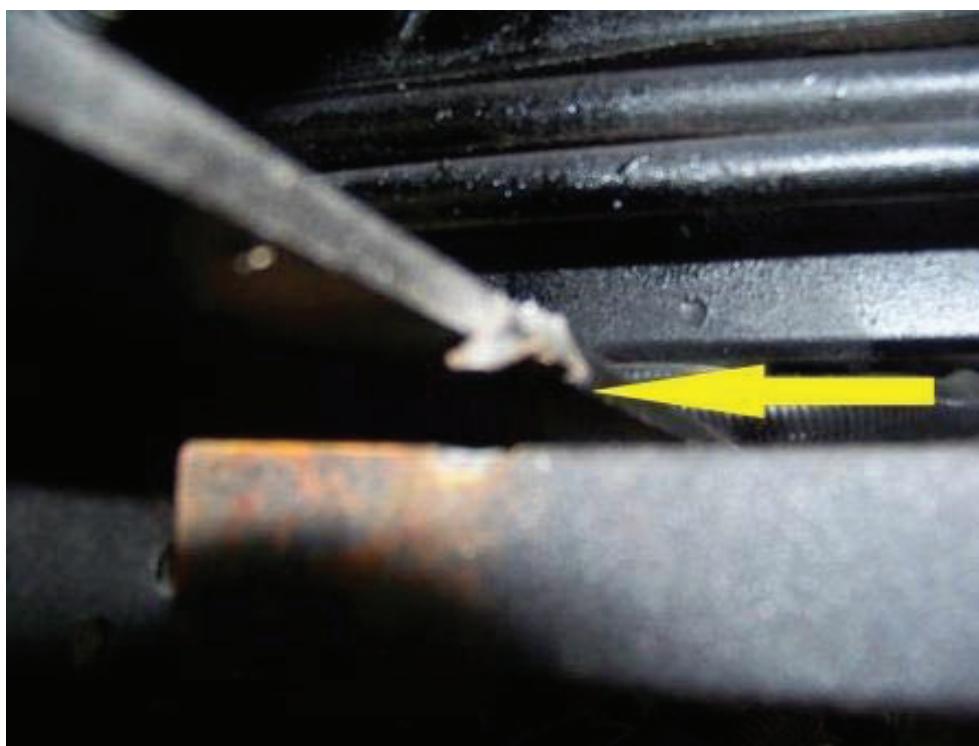
(Page 1 of 1)
UNSCHEDULED MAINTENANCE
TURTLE TOP #1408

DATE	TEST MILES	SERVICE	ACTIVITY	MAN HOURS	DOWN TIME
08-15-14	593	Right side rear exhaust hanger is cracked.	Exhaust hanger welded/repaired.	0.50	0.50
08-20-14	1,331	The right rear tailpipe hanger is broken.	Right rear tailpipe hanger replaced.	2.00	1.00
08-21-14	1,569	The driveshaft safety strap is broken on the left side.	Safety strap welded/repaired.	1.00	1.00
08-21-14	1,569	The rear exhaust hanger bracket is broken.	Exhaust bracket welded/repaired.	1.00	1.00
08-21-14	1,569	The left and right side bumper brackets are cracked.	Left and right side bumper brackets welded/repaired.	1.00	1.00
08-21-14	1,569	The left rear lower body support by the left rear tire is cracked.	Body support welded/repaired.	1.00	1.00

UNSCHEDULED MAINTENANCE



**CRACKED RIGHT REAR TAILPIPE HANGER
(1,331 TEST MILES)**

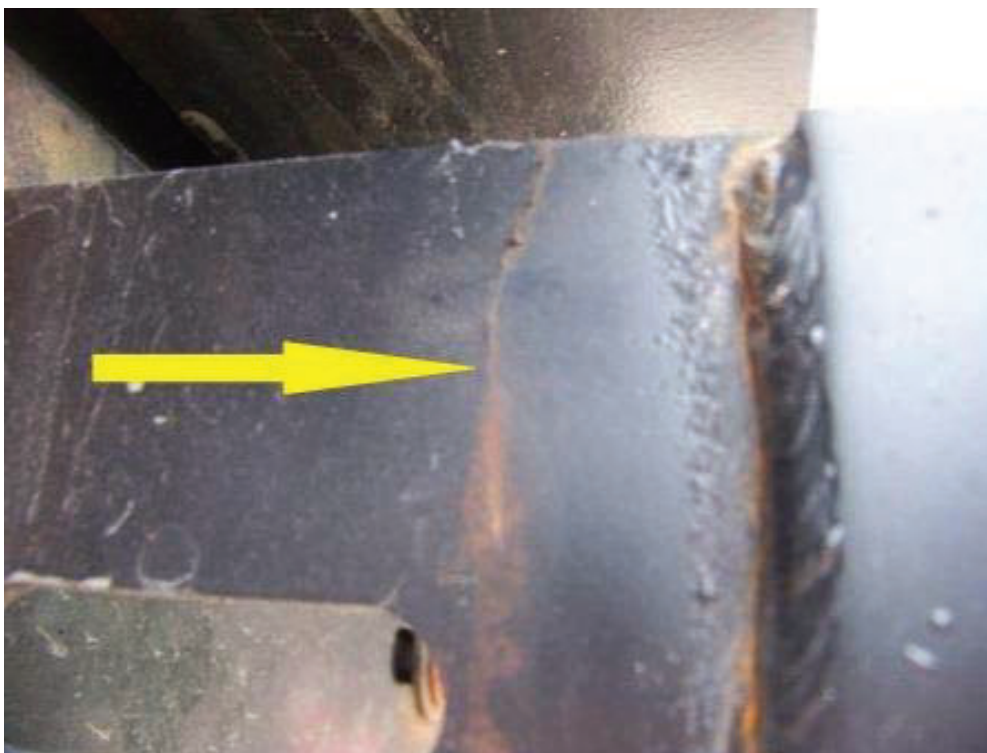


**BROKEN DRIVESHAFT SAFETY STRAP
(1,569 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CRACKED LEFT AND RIGHT SIDE BUMPER BRACKETS
(1,569 TEST MILES)**



UNSCHEDULED MAINTENANCE CONT.



**CRACKED LEFT REAR LOWER BODY SUPPORT
(1569 TEST MILES)**

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

6-I. TEST OBJECTIVE

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

6-II. TEST DESCRIPTION

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

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

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

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

Several changes were made to the Fuel Economy Measurement Test (Engineering Type) For Trucks and Buses: SAE 1376 July 82:

1. Sections 1.1, and 1.2 only apply to diesel, gasoline, methanol, and any other fuel in the liquid state (excluding cryogenic fuels).

1.1 SAE 1376 July 82 requires the use of at least a 16-gal fuel tank. Such a fuel tank when full would weigh approximately 160 lb. It is judged that a 12-gal tank weighing approximately 120 lb will be sufficient for this test and much easier for the technician and test personnel to handle.

1.2 SAE 1376 July 82 mentions the use of a mechanical scale or a flowmeter system. This test procedure uses a load cell readout combination that provides an accuracy of 0.5 percent in weight and permits on-board weighing of the gravimetric tanks at the end of each phase. This modification permits the determination of a fuel economy value for each phase as well as the overall cycle.

2. Section 2.1 applies to compressed natural gas (CNG), liquefied natural gas (LNG), cryogenic fuels, and other fuels in the vapor state.

2.1 A laminar type flowmeter will be used to determine the fuel consumption. The pressure and temperature across the flow element will be monitored by the flow computer. The flow computer will use this data to calculate the gas flow rate. The flow computer will also display the flow rate (scfm) as well as the total fuel used (scf). The total fuel used (scf) for each phase will be recorded on the Fuel Economy Data Form.

3. Use both Sections 1 and 2 for dual fuel systems.

FUEL ECONOMY CALCULATION PROCEDURE

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

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

The fuel economy correction consists of three steps:

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

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

$$FE_{o_{mi/lb}} = \text{Observed fuel economy} = \frac{\text{miles}}{\text{lb of fuel}}$$

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

$$FE_{o_{mpg}} = FE_{c_{mi/lb}} \times G_s \times G_w$$

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

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

$$FE_c = FE_{o_{mpg}} \times \frac{Q}{H}$$

where

H = Volumetric heating value of test fuel [BTU/gal]
 Q = Volumetric heating value of standard reference fuel

Combining steps 1-3 yields

$$\Rightarrow FE_c = \frac{\text{miles}}{\text{lbs}} \times (G_s \times G_w) \times \frac{Q}{H}$$

- 4.) Covert the fuel economy from mpg to an energy equivalent of miles per BTU. Since the number would be extremely small in magnitude, the energy equivalent will be represented as miles/BTUx10⁶.

Eq = Energy equivalent of converting mpg to mile/BTUx10⁶.

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

B. CNG, LNG, cryogenic and other fuels in the vapor state.

The reported fuel economy is based on the following: measured test quantities-- distance traveled (miles) and fuel consumed (scf); density of test fuel, and volumetric heating value (BTU/lb) of test fuel at standard conditions ($P=14.73$ psia and $T=60^\circ\text{F}$). These combine to give a fuel economy in miles per lb. The energy equivalent

(mile/BTUx10⁶) will also be provided so that the results can be compared to buses that use other fuels.

- 1.) Divide the number of miles of the phase by the number of standard cubic feet (scf) of fuel consumed.

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

$$FEo_{mi/scf} = \text{Observed fuel economy} = \frac{\text{miles}}{\text{scf of fuel}}$$

- 2.) Convert the observed fuel economy to miles per lb by dividing FEO by the density of the test fuel at standard conditions (Lb/ft³).

Note: The density of test fuel must be determined at standard conditions as described above. If the density is not defined at the above standard conditions, then a correction will be needed before the fuel economy can be calculated.

$$FEo_{mi/lb} = FEO / Gm$$

where Gm = Density of test fuel at standard conditions

- 3.) Convert the observed fuel economy (FEomi/lb) to an energy equivalent of (miles/BTUx10⁶) by dividing the observed fuel economy (FEomi/lb) by the heating value of the test fuel at standard conditions.

$$Eq = ((FEomi/lb)/H) \times 10^6$$

where

Eq = Energy equivalent of miles/lb to mile/BTUx10⁶
H = Volumetric heating value of test fuel at standard conditions

6-III. DISCUSSION

This is a comparative test of fuel economy using gasoline fuel with a heating value of 19,355 btu/lb. The driving cycle consists of Central Business District (CBD), Arterial (ART), and Commuter (COM) phases as described in 6-II. The fuel consumption for each driving cycle and for idle is measured separately. The results are corrected to a reference fuel with a volumetric heating value of 126,700.0 btu/gal.

An extensive pretest maintenance check is made including the replacement of all lubrication fluids. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection. The next sheet shows the correction calculation for the test fuel. The next four Fuel Economy Forms provide the data from the four test runs. Finally, the summary sheet provides the average fuel consumption. The overall average is based on total fuel and total mileage for each phase. The overall average fuel consumption values were; CBD – 7.28 mpg, ART – 7.59 mpg, and COM – 12.52 mpg. Average fuel consumption at idle was 0.54 gph.

FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Page 1 of 3

Bus Number: 1408	Date: 9-2-14	SLW (lbs): 12,230
Personnel: S.R., E.L., T.G. & E.D.		

FUEL SYSTEM	OK	Date	Initials
Install fuel measurement system	✓	9/3/14	E.D.
Replace fuel filter	✓	9/3/14	E.D.
Check for fuel leaks	✓	9/3/14	E.D.
Specify fuel type (refer to fuel analysis)	Gasoline		
Remarks: None noted.			
BRAKES/TIRES	OK	Date	Initials
Inspect hoses	✓	9/2/14	S.R.
Inspect brakes	✓	9/2/14	S.R.
Relube wheel bearings	✓	9/2/14	S.R.
Check tire inflation pressures (mfg. specs.)	✓	9/2/14	S.R.
Remarks: None noted.			
COOLING SYSTEM	OK	Date	Initials
Check hoses and connections	✓	9/2/14	S.R.
Check system for coolant leaks	✓	9/2/14	S.R.
Remarks: None noted.			

FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Page 2 of 3

Bus Number: 1408		Date: 9/2/14	
Personnel: S.R., E.L. & T.G.			
ELECTRICAL SYSTEMS		OK	Date
Check battery		✓	9/2/14
Inspect wiring		✓	9/2/14
Inspect terminals		✓	9/2/14
Check lighting		✓	9/2/14
Remarks: None noted.			
DRIVE SYSTEM		OK	Date
Drain transmission fluid		✓	9/2/14
Replace filter/gasket		✓	9/2/14
Check hoses and connections		✓	9/2/14
Replace transmission fluid		✓	9/2/14
Check for fluid leaks		✓	9/2/14
Remarks: None noted.			
LUBRICATION		OK	Date
Drain crankcase oil		✓	9/2/14
Replace filters		✓	9/2/14
Replace crankcase oil		✓	9/2/14
Check for oil leaks		✓	9/2/14
Check oil level		✓	9/2/14
Lube all chassis grease fittings		✓	9/2/14
Lube universal joints		✓	9/2/14
Replace differential lube including axles		✓	9/2/14
Remarks: None noted.			

FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Page 3 of 3

Bus Number: 1408		Date: 9-2-14	
Personnel: S.R., E.L. & T.G.			
EXHAUST/EMISSION SYSTEM		OK	Date
Check for exhaust leaks		✓	9/2/14
Remarks: None noted.			
ENGINE		OK	Date
Replace air filter		✓	9/2/14
Inspect air compressor and air system		✓	9/2/14
Inspect vacuum system, if applicable		✓	9/2/14
Check and adjust all drive belts		✓	9/2/14
Check cold start assist, if applicable		✓	9/2/14
Remarks: None noted.			
STEERING SYSTEM		OK	Date
Check power steering hoses and connectors		✓	9/2/14
Service fluid level		✓	9/2/14
Check power steering operation		✓	9/2/14
Remarks: None noted.			
		OK	Date
Ballast bus to seated load weight		✓	9/2/14
TEST DRIVE		OK	Date
Check brake operation		✓	9/2/14
Check transmission operation		✓	9/2/14
Remarks: None noted.			

FUEL ECONOMY PRE-TEST INSPECTION FORM

Page 1 of 1

Bus Number: 1408	Date: 9/4/14
Personnel: T.S., S.R. & C.S.	
PRE WARM-UP	If OK, Initial
Fuel Economy Pre-Test Maintenance Form is complete	S.R.
Cold tire pressure (psi): Front <u>75</u> Middle <u>N/A</u> Rear <u>80</u>	S.R.
Tire wear:	S.R.
Engine oil level	S.R.
Engine coolant level	S.R.
Interior and exterior lights on, evaporator fan on	S.R.
Fuel economy instrumentation installed and working properly.	S.R.
Fuel line -- no leaks or kinks	S.R.
Speed measuring system installed on bus. Speed indicator installed in front of bus and accessible to TECH and Driver.	S.R.
Bus is loaded to SLW	S.R.
WARM-UP	If OK, Initial
Bus driven for at least one hour warm-up	S.R.
No extensive or black smoke from exhaust	S.R.
POST WARM-UP	If OK, Initial
Warm tire pressure (psi): Front <u>80</u> Middle <u>N/A</u> Rear <u>84</u>	S.R.
Environmental conditions Average wind speed <12 mph and maximum gusts <15 mph Ambient temperature between 30°F(-1C°) and 90°F(32°C) Track surface is dry Track is free of extraneous material and clear of interfering traffic	S.R.

FUEL ECONOMY DATA FORM (Liquid Fuels)

Page 1 of 4

Bus Number: 1408		Manufacturer: Turtle Top		Date: 9/4/14	
Run Number: 1		Personnel: T.S., S.R. & C.S.			
Test Direction: ☐ CW or ☒ CCW		Temperature (°F): 63		Humidity (%): 89	
SLW (lbs): 12,230		Wind Speed (mph) & Direction: Calm		Barometric Pressure (in.Hg): 30.20	

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Flow Meter Reading (gals)		Fuel Used (gals)
	Start	Finish			Start	Finish	
CBD #1	0	9:10	9:10	24.7	0	.279	.279
ART #1	0	4:03	4:03	24.4	0	.273	.273
CBD #2	0	9:02	9:02	24.3	0	.277	.277
ART #2	0	4:03	4:03	25.2	0	.269	.269
CBD #3	0	8:53	8:53	25.6	0	.278	.278
COMMUTER	0	6:01	6:01	26.3	0	.329	.329
Total Fuel = 1.705 gals							

20 minute idle : Total Fuel Used = .190 gals
Heating Value = 19,355 BTU/LB
Comments: None noted.

FUEL ECONOMY DATA FORM (Liquid Fuels)

Page 2 of 4

Bus Number: 1408		Manufacturer: Turtle Top		Date: 9/4/14			
Run Number: 2		Personnel: T.S., S.R. & C.S.					
Test Direction: ☒ CW or ☐ CCW		Temperature (°F): 65		Humidity (%): 86			
SLW (lbs): 12,230		Wind Speed (mph) & Direction: 2 / N		Barometric Pressure (in.Hg): 30.20			
Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Flow Meter Reading (gals)		Fuel Used (gals)
	Start	Finish			Start	Finish	
CBD #1	0	9:02	9:02	27.9	0	.270	.270
ART #1	0	4:04	4:04	29.9	0	.258	.258
CBD #2	0	8:54	8:54	29.7	0	.275	.275
ART #2	0	4:07	4:07	30.2	0	.257	.257
CBD #3	0	8:50	8:50	30.1	0	.277	.277
COMMUTER	0	6:02	6:02	31.3	0	.320	.320
Total Fuel = 1.657 gals							
20 minute idle : Total Fuel Used = N/A gals							
Heating Value = 19,355 BTU/LB							
Comments: None noted.							

FUEL ECONOMY DATA FORM (Liquid Fuels)

Page 3 of 4

Bus Number: 1408		Manufacturer: Turtle Top		Date: 9/4/14			
Run Number: 3		Personnel: T.S., S.R. & C.S.					
Test Direction: ☐ CW or ☒ CCW		Temperature (°F): 75		Humidity (%): 78			
SLW (lbs): 12,230		Wind Speed (mph) & Direction: 6/W/SW		Barometric Pressure (in.Hg): 30.17			
Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Flow Meter Reading (gals)		Fuel Used (gals)
	Start	Finish			Start	Finish	
CBD #1	0	8:52	8:52	30.1	0	.274	.274
ART #1	0	4:04	4:04	32.4	0	.266	.266
CBD #2	0	8:38	8:38	31.8	0	.277	.277
ART #2	0	3:56	3:56	32.4	0	.277	.277
CBD #3	0	8:51	8:51	31.8	0	.276	.276
COMMUTER	0	5:57	5:57	32.9	0	.322	.322
Total Fuel = 1.692 gals							
20 minute idle : Total Fuel Used = N/A gals							
Heating Value = 19,355 BTU/LB							
Comments: None noted.							

FUEL ECONOMY DATA FORM (Liquid Fuels)

Page 4 of 4

Bus Number: 1408		Manufacturer: Turtle Top		Date: 9/4/14			
Run Number: 4		Personnel: T.S., S.R. & C.S.					
Test Direction: ☒ CW or ☐ CCW		Temperature (°F): 77		Humidity (%): 73			
SLW (lbs): 12,230		Wind Speed (mph) & Direction: 9/SSW		Barometric Pressure (in.Hg): 30.18			
Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Flow Meter Reading (gals)		Fuel Used (gals)
	Start	Finish			Start	Finish	
CBD #1	0	8:44	8:44	32.6	0	.271	.271
ART #1	0	4:02	4:02	34.0	0	.256	.256
CBD #2	0	8:42	8:42	33.6	0	.275	.275
ART #2	0	3:59	3:59	34.1	0	.265	.265
CBD #3	0	8:30	8:30	34.4	0	.286	.286
COMMUTER	0	6:01	6:01	35.4	0	.315	.315
Total Fuel = 1.668 gals							
20 minute idle : Total Fuel Used = .189 gals							
Heating Value = 19,355 BTU/LB							
Comments: None noted.							

FUEL ECONOMY SUMMARY SHEET

BUS MANUFACTURER : Turtle Top BUS NUMBER: 1408
 BUS MODEL : Terra Transit TEST DATE : 09/04/14

FUEL TYPE : GASOLINE
 SP. GRAVITY : .7339
 HEATING VALUE : 19355.00 BTU/lb.
 FUEL TEMPERATURE : 86.00 deg. F
 Standard Conditions: 60 deg. F and 14.7 psi
 Density of Water : 8.3373 lb./gallon at 60 deg. F

CYCLE	TOTAL FUEL USED (GAL)	TOTAL MILES	FUEL ECONOMY MPG (Measured)	FUEL ECONOMY MPG (Corrected)
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Run # :1, CCW

CBD	.834	5.73	6.871	7.24
ART	.542	3.82	7.048	7.42
COM	.329	3.82	11.611	12.23
TOTAL	1.705	13.37	7.842	8.26

Run # :2, CW

CBD	.822	5.73	6.971	7.34
ART	.515	3.82	7.417	7.81
COM	.320	3.82	11.938	12.57
TOTAL	1.657	13.37	8.069	8.50

Run # :3, CCW

CBD	.827	5.73	6.929	7.30
ART	.543	3.82	7.035	7.41
COM	.322	3.82	11.863	12.49
TOTAL	1.692	13.37	7.902	8.32

Run # :4, CW

CBD	.832	5.73	6.887	7.25
ART	.521	3.82	7.332	7.72
COM	.315	3.82	12.127	12.77
TOTAL	1.668	13.37	8.016	8.44

IDLE CONSUMPTION (MEASURED)

First 20 Minutes Data: .19GAL Last 20 Minutes Data: .19GAL
 Average Idle Consumption: .57GAL/Hr.

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

Run 1: -1.5 Run 2: 1.4 Run 3: -.7 Run 4: .7

SUMMARY (CORRECTED VALUES)

Average Idle Consumption : .54 G/Hr
 Average CBD Phase Consumption : 7.28 MPG
 Average Arterial Phase Consumption: 7.59 MPG
 Average Commuter Phase Consumption: 12.52 MPG
 Overall Average Fuel Consumption : 8.38 MPG
 Overall Average Fuel Consumption : 70.76 Miles/ Million BTU

7. NOISE

7.1 INTERIOR NOISE AND VIBRATION TESTS

7.1-I. TEST OBJECTIVE

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

7.1-II. TEST DESCRIPTION

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

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

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

7.1-III. DISCUSSION

This test is performed in three parts. The first part exposes the exterior of the vehicle to 80.0 dB(A) on the left side of the bus and the noise transmitted to the interior is measured. The overall average of the six measurements was 46.0 dB(A); ranging from 44.8 dB(A) at the driver's seat to 47.4 dB(A) in line with the front speaker. The interior ambient noise level for this test was < 30.0 dB(A).

The second test measures interior noise during acceleration from 0 to 35 mph. This noise level ranged from 71.2 dB(A) at the rear passenger seats to 75.9 dB(A) at the driver's seat. The overall average was 73.7 dB(A). The interior ambient noise level for this test was < 30.0 dB(A).

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

INTERIOR NOISE TEST DATA FORM

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

Page 1 of 3

Bus Number: 1408	Date: 08-05-14
Personnel: T.S. & S.R.	
Temperature (°F): 65	Humidity (%): 76
Wind Speed (mph): < 12.0	Wind Direction: W
Barometric Pressure (in.Hg): 28.97	
Initial Sound Level Meter Calibration: ■ checked by: S.R.	
Interior Ambient Noise Level dB(A): < 30.0	Exterior Ambient Noise Level dB(A): 42.8
Microphone Height During Testing (in): 29" from seat cushion.	

Measurement Location	Measured Sound Level dB(A)
Driver's Seat	44.8
Front Passenger Seats	46.9
In Line with Front Speaker	47.4
In Line with Middle Speaker	46.6
In Line with Rear Speaker	45.1
Rear Passenger Seats	45.2

Final Sound Level Meter Calibration: ■ checked by: S.R.

Comments: All readings taken in the center aisle.
Remarks/comments/recommended changes: None noted.

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

Bus Number: 1408	Date: 08-26-14
Personnel: T.S., S.R. & R.S.	
Temperature (°F): 72	Humidity (%): 73
Wind Speed (mph): <12	Wind Direction: WSW
Barometric Pressure (in.Hg): 30.22	
Initial Sound Level Meter Calibration: ■ checked by: T.S.	
Interior Ambient Noise Level dB(A): 93.8	Exterior Ambient Noise Level dB(A): 43.6
Microphone Height During Testing (in): 29" from seat cushion	

Measurement Location	Measured Sound Level dB(A)
Driver's Seat	75.9
Front Passenger Seats	74.6
Middle Passenger Seats	73.1
Rear Passenger Seats	71.2

Final Sound Level Meter Calibration: ■ checked by: T.S.

Comments: All readings taken in the center aisle.
Remarks/comments/recommended changes: None noted.

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

Bus Number: 1408	Date: 08-26-14
Personnel: T.S., S.R. & R.S.	
Temperature (°F): 78	Humidity (%): 73
Wind Speed (mph): <12	Wind Direction: WSW
Barometric Pressure (in.Hg): 30.22	

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

Source of Noise	Location
Engine and Accessories	None
Windows and Doors	None
Seats and Wheel Chair lifts	None

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 will be operated at a SLW in three different conditions using a smooth, straight and level roadway:

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

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

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

During the test, special attention should be paid to:

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

7.2-III. DISCUSSION

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

With an exterior ambient noise level of 45.1 dB(A), the average test result obtained while accelerating from a constant speed was 67.8 dB(A) on the right side and 69.5 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 49.4 dB(A), the average of the results obtained were 69.9 dB(A) on the right side and 72.4 dB(A) on the left side.

With the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 55.3 dB(A) at low idle and 67.2 dB(A) at wide open throttle. With the accessories and air conditioning off, the readings averaged 5.6 dB(A) lower at low idle and 1.7 dB(A) lower at wide open throttle. The exterior ambient noise level measured during this test was 94.4 dB(A). Note; this test bus was not equipped with a high idle mode.

EXTERIOR NOISE TEST DATA FORM

Accelerating from Constant Speed

Page 1 of 3

Bus Number: 1408	Date: 08-26-14
Personnel: T.S. & S.R.	
Temperature (°F): 75	Humidity (%): 53
Wind Speed (mph): < 12	Wind Direction: SW
Barometric Pressure (in.Hg): 30.22	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■ checked by: S.R.	
Initial Sound Level Meter Calibration: ■ checked by: T.S.	
Exterior Ambient Noise Level dB(A): 45.1	

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	66.1	1	67.9
2	64.9	2	68.8
3	66.7	3	68.8
4	67.3	4	70.1
5	68.2	5	68.2
Average of two highest actual noise levels = 67.8 dB(A)		Average of two highest actual noise levels = 69.5 dB(A)	
Final Sound Level Meter Calibration Check: ■ checked by: T.S.			
Comments: None noted.			

EXTERIOR NOISE TEST DATA FORM

Accelerating from Standstill

Page 2 of 3

Bus Number: 1408	Date: 08-26-14
Personnel: T.S., S.R. & R.S.	
Temperature (°F): 75	Humidity (%): 53
Wind Speed (mph): < 12	Wind Direction: SW
Barometric Pressure (in.Hg): 30.22	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■ checked by: S.R.	
Initial Sound Level Meter Calibration: ■ checked by: T.S.	
Exterior Ambient Noise Level dB(A): 49.4	

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	69.9	1	71.4
2	69.6	2	72.2
3	69.6	3	72.0
4	69.6	4	71.8
5	69.9	5	72.5
Average of two highest actual noise levels = 69.9 dB(A)		Average of two highest actual noise levels = 72.4 dB(A)	
Final Sound Level Meter Calibration Check: ■ checked by: T.S.			
Comments: None noted.			

EXTERIOR NOISE TEST DATA FORM**Stationary**

Page 3 of 3

Bus Number: 1408		Date: 08-26-14	
Personnel: T.S. & S.R.			
Temperature (°F): 77		Humidity (%): 53	
Wind Speed (mph): <12		Wind Direction: SW	
Barometric Pressure (in.Hg.): 30.20			
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■ checked by: T.S.			
Initial Sound Level Meter Calibration: ■ checked by: T.S.			
Exterior Ambient Noise Level dB(A): 94.4			
Accessories and Air Conditioning ON			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	625	53.8	56.8
High Idle	N/A	N/A	N/A
Wide Open Throttle	3,236	66.0	68.3
Accessories and Air Conditioning OFF			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	630	48.5	50.8
High Idle	N/A	N/A	N/A
Wide Open Throttle	3,336	64.8	66.2
Final Sound Level Meter Calibration Check: ■ checked by: T.S.			
Comments: This vehicle is not equipped with high-idle.			

7.2 EXTERIOR NOISE TESTS



**TEST BUS UNDERGOING
EXTERIOR NOISE TESTING**



	d	a/
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EXHIBIT B



Northwest Bus Sales, Inc
33207 Pacific Highway South
Federal Way, WA 98003
Phone (253) 841-9997
Fax (253) 845-9384
www.nwbus.com

August 19, 2026

To: Scott Simonton
City of Wilsonville

From: Rob Goolsby – Northwest Bus Sales

Re: RFP 06102026, Warranty and Repair

Dear Scott:

Northwest Bus Sales takes the quality of our buses very seriously and understands the frustration of a problem on a new bus- We believe that the sale does not stop at delivery. While the first point of contact for any technical or warranty issues will be our excellent sales staff, Northwest Bus Sales' parts and service department has direct lines of communications with each of our manufacturers. All calls will be answered or returned within 1 hour during business hours. In urgent cases, a call can be made to the salesman during non-business hours, who can attempt to coordinate immediate assistance.

Northwest Bus Sales is able to perform a wide variety of warranty repairs in house. We stock many of the most commonly needed parts, and in these cases, a warranty repair can be completed in as little as 1-2 days. If parts need to be ordered, they are shipped expedited and typically can be repaired in 5-7 business days.

In the case where a more hands on approach is necessary, Northwest Bus Sales will arrange a site visit with the customer or will coordinate with a local repair facility.

From the moment we are notified of a potential problem, the wheels are set in motion to find a solution. Our sales staff will communicate with our service department to find the quickest, most effective and efficient solution to the problem. Many times, a problem can be resolved with a phone call between our service staff and the on-site mechanic.

For remote locations, our customers can contact us and troubleshoot the problem directly with our service department staff who will either answer their call immediately, or return the call

within 1 hour. Warranty repairs can be completed by the customer's on-staff mechanic or an OEM or third-party repair facility (with prior authorization). Parts and labor costs will be reimbursed at book hours for the repair. We are fully committed to assisting our customers when problems arise - warranty or not.

A call to our office (800-231-7099) will always be answered during business hours, and our wonderful receptionist will be able to connect customers with their salesperson, the parts department or the service department.

While all of our vehicles carry a comprehensive warranty by default, extended warranty coverage is available covering a variety of components and terms. Please see the attached warranty sheets per manufacturer and extended warranty options.

Certain actions may void warranty coverage. Typically, any modification to a system, lack of recommended maintenance or neglect has the potential to void coverage. We encourage our customers to check with us prior to making any changes or modifications to chassis components or auxiliary systems on the bus.

Thank you,

Rob Goolsby
Northwest Bus Sales
253-841-9997
rob@nwbus.com



Division of Independent Protection Co., Inc.
67819 State Road 15, New Paris, Indiana 46553
Phone: 800-296-2105

LIMITED COMMERCIAL WARRANTY

WHAT DOES THIS WARRANTY COVER?

Turtle Top Division of Independent Protection Company, Inc., (referred to hereafter as "company") warrants to the original retail purchaser (referred to hereafter as "you") that your Turtle Top unit shall, under normal use and service, be free of substantial defect in materials or workmanship which are attributable to us and which you report to us within the warranty period.

The warranty period with respect to the bus body components of your Turtle Top Vanterra, VT3, Odyssey, OdysseyXLand Terra Transit unit extends FIVE (5) years from the date when the unit is delivered to you or until the unit has been driven 100,000 miles, if sooner.

WHAT DOES THIS WARRANTY NOT COVER?

This warranty does not cover:

1. Defects in the aesthetics or physical appearance of the unit over time.
2. Deterioration due to normal use, wear and tear, and exposure to the elements.
3. Damages due to negligent use, misuse, abuse, accidents, acts of God or other contingencies beyond our control.
4. Defects in the products that have been repaired, altered or modified without our approval including added equipment.
5. Defects in the chassis and other parts and accessories not manufactured by us unless the defects result from our installation of such parts and accessories. We will not pay for or perform repairs made necessary by reason of failure to follow ordinary maintenance procedures.

HOW DO YOU GET WARRANTY SERVICE?

To obtain warranty service, you must report the problem to the selling distributor within the warranty period. Only our warranty manager at our factory has the authority to approve warranty service, so if you report to your selling distributor, the distributor will relay the report to our warranty manager using documented policy with the business agreement between company and selling distributor. You must make the unit available for examination at the distributor if requested. If our warranty manager approves warranty service, you must present the unit for service at the distributor or at any service facility designated by us or the distributor, and you must leave the unit for a sufficient time to effect service.

You must provide the following information when reporting any problem to your selling distributor:

1. Vehicle Unit Number
2. Vehicle Identification Number
3. Current Mileage

In the following cases listed below-these companies choose to work directly to handle warranty involving their product. In some cases these companies offer standard and extended warranty on their product that may be chose at time of order. To expedite the coverage process please contact the following manufacturers of equipment individually to attain what warranty applies to your product. In the event that you receive unsatisfactory service, please contact Turtle Top and we will assist in assuring coverage.

1. Air conditioning – (Trans-Air): 1-800-673-2446, (ACC Climate Control): 1-800-462-6322, (ACT): 1-877-228-4247
2. Lifts – (Braun Corporation): 1-800-THE-LIFT, (Ricon Corporation): 1-800-322-2884
3. Suspension – (Mor/Ryde RL): 1-574-293-1581
4. Lift Electronics/High Idle Control – (Intermotive Vehicle Controls): 1-800-969-6080 Ask for Tech Support

WHAT WILL WE DO TO CORRECT DEFECTS?

We will repair or replace, at our option, without charge for parts or labor, any defective part covered by this warranty.

WHAT WILL WE NOT DO?

We will not replace the unit or refund the purchase price. We will not provide or pay for transportation of the unit to or from the service facility designated. We will not pay for loss of time; loss of use; loss of revenues, salaries or commissions; towing charges; bus fares; car rentals; gasoline expense; telephone charges; inconvenience or other incidental damages. REPAIR OR REPLACEMENT OF DEFECTIVE PARTS IS THE EXCLUSIVE REMEDY UNDER THIS WRITTEN WARRANTY OR ANY IMPLIED WARRANTY. WE WILL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM BREACH OF THIS WRITTEN WARRANTY.

WHAT OTHER CONDITIONS OR LIMITATIONS AFFECT YOUR RIGHTS?

THIS WRITTEN WARRANTY IS MADE IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. NO IMPLIED WARRANTY OF MERCHANTABILITY IS MADE.

This written warranty constitutes the entire agreement between you and company. We do not authorize any person to create for us any other obligation or liability in connection with your Turtle Top unit.

Any action against us based on this warranty (or any implied warranty asserted by you despite the foregoing disclaimer) must be commenced within one year after the accrual thereof and must be prosecuted in a state or federal court, which sits in Indiana. This warranty shall be construed and enforced in accordance with the laws of the State of Indiana.

WHAT DO YOU DO IF A SEPARATELY WARRANTED PART IS DEFECTIVE?

Our warranty does not cover defects in the chassis and other parts and accessories not manufactured by us unless the defects result from our installation of such parts and accessories. These items may be warranted by the manufacturers of them, and if a written warranty with respect to a particular item is available, **a copy of that warranty has been included in your owner's packet.** Refer to the applicable written warranty for an explanation of the procedure you should follow in order to obtain warranty service. **We do not adopt the warranties of other manufacturers or assume any responsibility with respect to such warranties.**



Issued to:

Date issued:

Turtle Top Body Number:

Chassis VIN:

BUY AMERICA CERTIFICATION

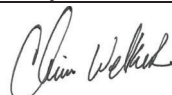
Certification Requirement for the Procurement of Steel, Iron, or Manufactured Products

SMART Bus Purchase

CERTIFICATE OF COMPLIANCE WITH BUY AMERICA REQUIREMENTS:

The bidder or offeror hereby certifies that it will comply with the requirements of 49 USC 5323(j), and the applicable regulations in 49 CFR Part 661.

Date: July 27, 2026

Signature: 

Company: Northwest Bus Sales, Inc.

Name: Chris Welker

Title: Sales

CERTIFICATE OF NON-COMPLIANCE WITH BUY AMERICA REQUIREMENTS:

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 USC 5323(j), but it may qualify for an exception to the requirement pursuant to 49 USC 5323(j)(2), as amended, and the applicable regulations in 49 CFR 661.7.

Date: _____

Signature: _____

Company: _____

Name: _____

Title: _____



Division of Independent Protection Co., Inc.
67819 State Road 15
New Paris, Indiana USA 46553

7/24/26

BUY AMERICA PRE-AWARD Wilsonville NWBS

First Article VIN TBD

Model: 2026 Turtle Top TTMD

COMPONENT OR SYSTEM	MANUFACTURER	COUNTRY OF ORIGIN	PERCENTAGE OF TOTAL MATERIAL	Cost
Ford E-450 Chassis	Ford Motor Company	U.S.	46.05%	\$ 43,500.00
Cage Structure	Turtle Top	U.S.	13.12%	\$ 12,396.32
Windows - Passenger Compt.	Lippert Components	U.S.	0.78%	\$ 733.58
Electric Entrance Door	A&M Systems	U.S.	0.79%	\$ 746.03
Fiberglass Components	Betterway	U.S.	1.99%	\$ 1,876.63
HELP Bumper	Romeo RIM	U.S.	0.56%	\$ 531.22
HVAC	Spheros	U.S.	3.84%	\$ 3,627.25
Interlock, door Interlock, BobE Module	Intermotive/LCS	U.S.	0.40%	\$ 377.37
WC Door	Lippert Componets	U.S.	0.78%	\$ 735.02
Wheelchair Lift	Braun	U.S.	4.24%	\$ 4,010.00
Escape Hatch	Spheros	U.S.	0.16%	\$ 148.00
Seating Systems, Belt Monitor, CRS	Freedman Seating Company	U.S.	10.75%	\$ 10,155.50
Total U.S. Content			83.46%	\$ 78,836.92

Transit buses manufactured by Turtle Top are a minimum 70% domestic (United States) origin as defined in the Code of Federal Regulations 49 CFR 661, Buy America Requirements.

Final Assembly Location: New Paris, Indiana, USA

A description of final assembly activities are outlined in a separate document.

U.S Material Cost	\$78,836.92	83%
Foreign Material Cost	\$15,628.83	17%
Total Material Cost	\$94,465.75	100%
Total Assembly Cost	\$18,421.30	

Matthew Gaff
Compliance Manager and DBE Liaison Officer
Turtle Top
This document contains confidential information.

Validation Signature:

M. Sausaman
General Manager

Phone: 574 831-4340

Fax: 574 831-4349

E-Mail: mattg@turtletop.com

Website: www.turtletop.com