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Bus Testing: Establishment of Performance Standards, a Bus Model Scoring System, a Pass/Fail Standard and Other Program Updates; Proposed Rule

DEPARTMENT OF TRANSPORTATION

Federal Transit Administration

49 CFR Part 665

[Docket No. FTA–2015–0019]

RIN 2132–AB11

Bus Testing: Establishment of Performance Standards, a Bus Model Scoring System, a Pass/Fail Standard and other Program Updates

AGENCY: Federal Transit Administration (FTA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: The Federal Transit Administration (FTA) proposes to establish a new pass/fail standard and new aggregated scoring system for buses and modified vans (hereafter referred to as ''bus'' or ''buses'') that are subject to FTA's bus testing program, as mandated by Section 20014 of the Moving Ahead for Progress in the 21st Century Act (MAP–21). The proposed pass/fail standard and scoring system address the following categories as required by MAP–21: structural integrity, safety, maintainability, reliability, fuel economy, emissions, noise, and performance. Once FTA issues a rule in final form, recipients will be prohibited from using FTA financial assistance to procure new buses that have not passed the test. FTA is also seeking comment on establishing testing requirements and a scoring system for remanufactured vehicles sold by third-party vendors and procured using FTA funding, which FTA plans to address in a subsequent rulemaking action. Finally, FTA is proposing to apply Buy America U.S. content requirements to buses submitted for testing.

DATES: Comments on this proposed rule must be received on or before August 24, 2015.

ADDRESSES: Please submit your comments (identified by the agency name and DOT Docket ID Number FTA–2015–0019 or RIN 2132–AB11) by only one of the following methods:

Electronic: Go to the Federal eRulemaking Portal at *www.regulations.gov* and follow the online instructions for submitting comments.

Mail: Docket Management Facility: U.S. Department of Transportation, 1200 New Jersey Avenue SE., West Building Ground Floor, Room W12–140, Washington, DC 20590–0001.

Hand Delivery or Courier: West Building Ground Floor, Room W12–140, 1200 New Jersey Avenue SE., between 9 a.m. and 5 p.m. ET, Monday through Friday, except Federal holidays.

Fax: 202–493–2251.

Additional instructions: You must include the agency name (Federal Transit Administration) and Docket number (FTA–2015–0019) for this notice at the beginning of your comments. If you wish to receive confirmation that FTA received your submission, please include a self-addressed stamped postcard. Note that all comments received will be posted without change to *http://www.regulations.gov.* Note that any personal information provided will be available to internet users.

Privacy Act: You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477) or you may visit *http://docketsinfo.dot.gov.*

Docket Access: For internet access to the docket to read background documents and comments received, go to *http://www.regulations.gov.* Background documents and comments received may also be viewed at the U.S. Department of Transportation Docket Operations, 1200 New Jersey Ave. SE., West Building Ground Floor, Room W12–140, Washington, DC 20590, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: For technical information, Gregory Rymarz, Bus Testing Program Manager, Office of Research, Demonstration and Innovation (TRI), (202) 366–6410, *gregory.rymarz@dot.gov.* For legal information, Richard Wong, Office of the Chief Counsel (TCC), (202) 366–0675, *richard.wong@dot.gov.*

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A. Executive Summary

Purpose

The purpose of this NPRM is to propose minimum performance standards, a scoring system, and a pass/fail threshold for new model transit buses procured with Federal Transit Administration (FTA) financial assistance authorized under 49 U.S.C. Chapter 53. Once FTA issues a rule in final form, FTA recipients will be prohibited from using FTA financial assistance to procure new buses that have not passed the test standard. The proposed standards and scoring system address the following categories: structural integrity, safety, maintainability, reliability, fuel economy, emissions, noise, and performance. The NPRM proposes that buses will need to pass a minimum performance standard in each of these categories in order to receive an overall passing score and be eligible for purchase using FTA financial assistance. The NPRM proposes that buses can achieve higher scores with higher performance in each category. The NPRM proposes a numerical scoring system based on a 100-point scale so that buyers can more effectively compare vehicles.

The NPRM proposes to adopt many of the existing testing procedures and standards used under the current bus testing program. However, the NPRM proposes some changes including: (1) new inspections at bus check-in to verify the bus configuration is within its weight capacity rating at its rated passenger load and an inspection to determine if the major components of the test bus match those identified in the Buy America pre-audit report; (2) elimination of the on-road fuel economy testing and substitute the fuel economy results obtained during the emissions test; and (3) revision to the payloading procedure to recognize the manufacturer's ''standee'' passenger rating. The proposed rule does not add any new tests to the existing bus testing program—in fact, the NPRM proposes to eliminate one test, the on-road fuel economy test, as equivalent data could

be derived from the more accurate dynamometer testing.

Because FTA provides financial assistance to State and local agencies operating public transportation systems, covering eighty percent (80%) of a vehicle's capital cost, while the State or local government provides a twenty percent (20%) matching share, there is a strong incentive by FTA and local agencies to ensure that those funds are used effectively and efficiently. As part of its stewardship of those funds, Congress directed FTA in 1987 to establish a bus testing program whereby new model buses would first be tested to ensure their ability to withstand the rigors of regular transit service before FTA funds would be spent on those vehicles. In the following years, FTA accumulated comprehensive test data on the scores of buses that had undergone testing, but the program did not assign a comparative ranking to the vehicles. Further, because the program was intended to provide information on a vehicle's performance and Congress did not authorize FTA to use the test data to disqualify a vehicle from participating in FTA-assisted procurements, FTA did not establish a pass/fail performance baseline. Since that time, several tested buses did not meet their expected service lives at the cost of millions of dollars to transit agencies and significant inconvenience to transit riders. In MAP–21, Congress directed FTA to establish a new pass/fail standard for tested buses, including a weighted scoring system that would assist transit bus buyers in selecting an appropriate vehicle. The proposed rule would establish a new scoring system and a pass/fail standard for buses tested under FTA's existing bus testing program, as well as make other administrative changes.

Legal Authority

Section 20014 of the Moving Ahead for Progress in the 21st Century Act (MAP–21) (Pub. L. 121–141), maintained the existing test categories of maintainability, reliability, safety, performance, structural integrity, fuel economy, emissions, and noise in 49 U.S.C. 5318(a). Section 20014 also expanded 49 U.S.C. 5318(e) by adding three new requirements on the use of Chapter 53 funding to acquire new bus models. The first is that new bus models meet performance standards for maintainability, reliability, performance (including braking performance), structural integrity, fuel economy, emissions, and noise. The second is that new bus models acquired with Chapter 53 funds meet the minimum safety performance standards established pursuant to paragraph 5329(b) Public Transportation Safety Program. The third is that the new bus model satisfies an overall pass/fail standard based on the weighted aggregate score derived from each of the existing test categories (maintainability, reliability, safety, performance (including braking performance), structural integrity, fuel economy, emissions, and noise).).

This notice does not address the establishment of the minimum safety performance standards for public transportation vehicles required under 49 U.S.C. 5329(b)(2)(C), which will be addressed in a subsequent rulemaking.

Summary of Key Provisions

The NPRM proposes to take the following actions, the first of which is required by MAP–21 as part of the new ''pass/fail'' requirement and the remainder of which are discretionary actions proposed by FTA to strengthen the program:

- Codify existing testing procedures and establish a minimum performance standards and a pass/fail scoring system for new bus models, with a minimum passing score of 60 points. A bus model could receive up to an additional 40 points based on its performance above the proposed minimum performance standard in particular test categories. Buses would need to achieve at least a minimum score in each category in order to pass the overall test and be eligible for procurement using FTA financial assistances.
- Establish check-in procedures, including FTA approval, for new bus models proposed for testing.
- Require transit vehicle manufacturers to submit Disadvantaged Business Enterprise (DBE) goals to FTA.
- Determine a new bus model's total passenger load based on the manufacturer's maximum passenger rating, including accommodations for standees.
- Establish a simulated passenger weight of 150 lbs. for seated and standing (standee) passengers, and a weight of 600 lbs. for passengers who use wheelchairs.
- Require test model buses to contain at least 60% domestic components, by cost, consistent with FTA Buy America domestic content requirements.
- The replacement of the on-road fuel economy test with the fuel economy testing already conducted during the emissions test on the chassis dynamometer.

The NPRM also seeks comments on establishing testing procedures, performance standards, and a scoring system for remanufactured vehicles sold by third-party vendors and procured using FTA assistance, which FTA plans to address in a subsequent rulemaking action.

Summary of Benefits and Costs

Table 1 below summarizes the potential benefits and costs of this proposed rule over 10 years and using a 3 and 7 percent discount rate that we were able to quantify. Quantified costs stem from shipping buses to the testing facility, manufacturer testing fees, having repair personnel for bus manufacturers available at the testing site, new paperwork requirements, and increases to the resources needed to operate the Bus Testing Program (which represents most of the quantified costs). Unquantified costs include remedial actions to buses that do not pass the proposed test (which may extend to all the buses in a model represented by the tested bus) and potential improvements to buses to obtain a higher testing score. However, given that 41 of 49 buses tested between January 2010 and February 2013 would have satisfied the proposed performance standards without any design changes, FTA believes that the proposed requirements would not drive systemic changes to all transit bus models. Quantified benefits are from a reduction in unscheduled maintenance costs.

TABLE 1—DISCOUNTED CASH FLOW ANALYSIS AND NET PRESENT VALUES

Year	Costs	Benefits	Net Cash Flow	Discount Rate	DCF @ 3%	Discount Rate	DCF @ 7%
1	109,171	531,990	422,819	0.03	410,504	0.07	395,158
2	109,171	531,990	422,819	0.03	398,547	0.07	369,306
3	109,171	531,990	422,819	0.03	386,939	0.07	345,146
4	109,171	531,990	422,819	0.03	375,669	0.07	322,567
5	109,171	531,990	422,819	0.03	364,727	0.07	301,464
6	109,171	531,990	422,819	0.03	354,104	0.07	281,742

TABLE 1—DISCOUNTED CASH FLOW ANALYSIS AND NET PRESENT VALUES—Continued

Year	Costs	Benefits	Net Cash Flow	Discount Rate	DCF @ 3%	Discount Rate	DCF @ 7%
7	109,171	531,990	422,819	0.03	343,791	0.07	263,310
8	109,171	531,990	422,819	0.03	333,777	0.07	246,085
9	109,171	531,990	422,819	0.03	324,056	0.07	229,986
10	109,171	531,990	422,819	0.03	314,617	0.07	214,940
				NPV	3,606,732	NPV	2,969,704

B. Background

FTA's grant programs, including those at 49 U.S.C. 5307, 5310, 5311 and 5339, assist transit agencies with procuring buses. The Federal transit program allows FTA to provide 80% funding for each bus. In 2013, for example FTA funds assisted in the procurement of 8934 new vehicles, of which approximately 5600 buses and modified vans were covered under the existing testing program. Historically, Section 317 of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (STURAA, Pub. Law 100–17) provided that no funds appropriated or made available under the Urban Mass Transportation Act of 1964, as amended, were to be obligated or expended for the acquisition of a new model bus after September 30, 1989, unless a bus of such model had been tested to ensure that the vehicle ''will be able to withstand the rigors of transit service'' (H. Rept. 100–27, p. 230). In subsection 317(b), Congress mandated seven specific test categories—maintainability, reliability, safety, performance, structural integrity, fuel economy, and noise—augmenting those tests with the addition of braking performance and emissions testing through section 6021 of the Intermodal Surface Transportation Efficiency Act of 1991 (Pub. L. 102–240). These requirements were subsequently codified at 49 U.S.C. 5318.

FTA issued its initial NPRM in May 1989 (54 FR 22716, May 25, 1989) and an interim Final Rule three months later (54 FR 35158, August 23, 1989), establishing a bus testing program that submitted vehicles to seven statutorily-mandated tests resulting in a test report and requiring transit bus manufacturers to submit that completed test report to transit agencies before FTA funds could be expended to purchase those vehicles. Although Congress did not authorize FTA to withhold financial assistance for a vehicle based on the data contained in a test report, FTA expected that the test report would provide accurate and reliable bus performance information to transit authorities that could be used in their purchasing and operational decisions.

Buses procured with FTA assistance are assigned a service life requirement that the recipient must keep the bus in active service for the specified period of time or mileage, whichever occurs first. FTA has five service life categories defined in the current Bus Testing Rule and in our capital program guidance publications:

(1) Large-size, heavy-duty transit buses (approximately 35′-40′ in length, as well as articulated buses) with a minimum service life of 12 years or 500,000 miles;

(2) Medium-size, heavy-duty transit buses (approximately 30′ in length) with a minimum service life of ten years or 350,000 miles;

(3) Medium-size, medium duty transit buses (approximately 30′ in length) with a minimum service life of seven years or 200,000 miles;

(4) Medium-size, light duty transit buses (approximately 25′-35′ in length) with a minimum service life of five years or 150,000 miles; and

(5) Other light duty vehicles such as small buses and regular and specialized vans with a minimum service life of four years or 100,000 miles.

This system successfully remained in place for over twenty years. During the intervening period, however, a handful of bus models that had documented problems in their test reports were able to enter transit service, most notably, a fleet of 226 articulated buses that one of the Nation's largest transit agencies ordered in 2001. After paying $87.7M of the $102.1M contract, the transit agency stopped payments in 2005 due to unresolved problems concerning the suspension systems and structural cracks around the articulation joint, near the axles, and in the rear door header, triggering years of litigation. In addition, in 2009, the transit agency abruptly pulled all of these models from service for safety concerns following a structural failure related to the articulation joint, resulting in lengthier and more crowded commutes for thousands of transit riders. In May 2012, a local court ruled that the transit agency could sell the buses for scrap metal, a move that generated only $1.2M for vehicles that had served barely half of their FTA-funded service lives.

The 2012 Moving Ahead for Progress in the 21st Century Act (MAP–21) amended section 5318 by adding new requirements to subsection 5318(e), *Acquiring New Bus Models,* including a bus model scoring system and a pass/fail standard based on the weighted aggregate score for each of the existing performance standards (maintainability, reliability, performance (including braking performance), structural integrity, fuel economy, emissions, and noise).

MAP–21 also amended 5318(e) to require that new bus models meet the minimum safety performance standards to be established by the Secretary of Transportation pursuant to 49 U.S.C. 5329(b). FTA began the process to establish these performance standards with the issuance of its Advance Notice of Proposed Rulemaking on Safety and Transit Asset Management,[1] but FTA has not completed this rulemaking. FTA will amend part 665 to establish those standards in a subsequent rulemaking. It is premature at this time for FTA to determine whether the existing safety tests will be incorporated into the new safety performance standards.

The primary purpose of this NPRM is to seek comment on FTA's proposed bus minimum performance standards, bus model scoring system and pass/fail standard. In developing the proposals contained in this NPRM, FTA engaged in extensive discussions with transit industry stakeholders through the use of public webinars, teleconferences, and presentations at industry conferences. On March 28, 2013, FTA outlined the new statutory mandate in a public webinar held in conjunction with the Bus Testing Program Steering Committee meeting organized by the Larson Transportation Institute (LTI) of the Penn State University, the operator of the Bus Testing facility. On May 7, 2013, FTA presented its proposals at the Bus and Paratransit Conference organized by the American Public Transportation Association (APTA), and again in a public webinar on May 28,

[1] 78 FR 61251 (Oct. 3, 2013).

2013, seeking comments on the proposed performance criteria, Bus Test Scoring System, and pass/fail Standard. In addition, LTI held a series of teleconferences in June 2013 with bus manufacturers to further address and refine the proposed performance standards, results scoring system and the pass/fail threshold. On September 26 and 27, 2013, FTA held two final public webinars to update stakeholders on the proposed performance standards, results scoring system and the pass/fail threshold and to solicit additional comments. Stakeholder contributions are reflected in the aggregate scoring system and pass/fail criteria contained in this NPRM. Participants in these public outreach efforts included transit vehicle manufacturers, component suppliers, public transit agencies, State departments of transportation, and FTA and Bus Testing Facility personnel.

In addition to implementing statutory mandates, FTA is proposing other administrative changes that would adjust the passenger payloading process to better reflect industry practice and ensure that buses tested at the facility comply with FTA Civil Rights and Buy America requirements regarding disadvantaged business enterprises and domestic content, respectively. FTA seeks comments on all of the proposals in this NPRM. In addition, FTA is seeking comment on establishing a bus testing requirement and scoring system for remanufactured buses sold by third parties and procured using FTA funds, which will be addressed in a subsequent rulemaking action.

C. Performance Standards by Test Category

In the current program, a standardized series of tests are conducted on new bus models and the results are published in a report for recipients to use for informing their procurement decisions.[2] There are no performance requirements that must be satisfied. The only ''requirement'' is that a new bus model have completed all of the tests required and that the test report has been published and received by the recipient prior to the disbursement of the FTA assistance for the bus procurement.

In formulating the proposed performance standards for the testing categories, FTA examined the test outcomes the testing center, located at the Larson Transportation Institute at Pennsylvania State University, currently reports for each test category to determine which of those were of such significance as to be considered ''standards''. A ''performance standard'' is defined as a transit bus characteristic that, if not met at the minimum level, would singularly indicate a bus model was at a high risk of not being able to provide adequate transit service throughout its required service life. Due to national variations in the types of bus transit service, climate, bus route characteristics, and ridership preferences driving the recipient's need for continued bus specification flexibility, FTA's goal for the proposed performance standards was to identify a minimum set of requirements currently measured and reported by the Bus Testing Program that, once satisfied, enabled all FTA recipients to obtain transit buses that operate safely on bus routes with adequate automotive performance, with the ability to reliably withstand the rigors of transit service over its required service life and to do so without excessive operating costs and excessive negative impact to the environment. To achieve this goal, FTA reviewed existing documented bus performance standards, such the APTA Standard Bus Procurement Guidelines and current Federal regulations with applicability to the current test categories. For test categories where no external performance standards already exist, FTA formulated proposed standards based on the demonstrated test performance of bus models that proved to be unsuitable in actual service. FTA incorporated external performance standards and formulated new performance standards that applied equally to all bus models. FTA requests comments on the appropriateness of applying all the proposed standards equally to all bus models, and any alternatives that may produce more useful testing outcomes.

To guide the development of the criteria for the proposed standards, FTA analyzed the results from 49 bus testing reports published from January 2010 through February 2013 in addition to the results from specific bus models tested prior to that three-year window that did not meet their expected service life once placed into actual service. The compiled data set from past tests was used as the primary source for setting the proposed performance criterion values.[3] The proposed criteria in each of the five industry sourced performance standards (*i.e.,* interior noise, exterior noise, acceleration, gradeability on a 2.5% grade and on a 10% grade) were also compared to the demonstrated test results to verify the validity of each industry standard. In one case, in the Performance test category, the industry standard for the sustained speed on a 10% grade has never been met by any 60-foot bus model. As a result, FTA is proposing a lower performance level as the standard based on the fact that a higher performance level, while technically feasible, was not historically required by the procuring agencies when procuring non-standard vehicles such as a 60-foot articulated bus.

C.1. Structural Integrity

The useful life of a transit bus is ultimately determined by the life of the vehicle structure. The reason being that the structure is the backbone to which all other vehicle subsystems and components are attached.[4] The structural integrity test category examines a bus model's response to a range of structural stressors. Under the existing bus testing program, the structural integrity test category is comprised of seven sub-test categories: Shakedown, Distortion, Static Towing, Dynamic Towing, Jacking, Hoisting, and Structural Durability. Each sub-test category has one or more proposed performance standards. In total, these tests simulate how a bus responds to a variety of events that are expected to occur during the service life of a typical transit bus. No changes to the current structural integrity test procedures are being proposed. The results from the existing test procedures will be used to assess compliance with the proposed structural integrity performance standards. The agency requests comments on these specific tests, as well as whether there are any other tests the agency should include as part of the structural integrity performance standard. To the extent possible, please provide data, studies, or other similar information to support your comments.

C.1.1. Shakedown Test

The Shakedown Test currently requires loading and unloading a bus up to three times with 2.5 times its gross passenger load and measuring the amount of resulting permanent bus frame/body deflection (*i.e.,* flexing under load and not returning to its original shape) that occurs after each load cycle.[5] The purpose of the test is to verify an adequate factor of safety for structural strength. The first load cycle is intended to settle out the structure. After the second loading, the resulting bending of the structure is measured,

[2] *http://www.altoonabustest.com/bus-tests.htm*

[3] The test results plots used for the setting of performance criteria and standards are available in the docket for this rulemaking.

[4] U.S. Department of Transportation, Federal Transit Administration, *Useful Life of Transit Buses and Vans,* Booz Allen Hamilton, Inc. Report Number FTA VA–26–7229–07.1, April 2007.

[5] *http://146.186.225.57/bus_tests_pdfs/5-1.shakedown.pdf*

and if none of the measurements exceed 0.005 inch, the test is finished. If any of the measured bending exceeds 0.005 inch after the second load cycle, a third load cycle is conducted and the deflections are measured again. The resulting permanent bending is measured, and if none exceed an additional 0.006 inch, the test is complete.

FTA proposes that a tested bus model would meet the Shakedown Test performance standard if the resulting permanent deflection is 0.006 inch (0.005 inch plus 0.001 inch for measurement uncertainty) or less after a third loading cycle as measured according to the current test procedure. Vehicles with deflections in excess of 0.006 would receive a failing score in this category, resulting in an overall failing score. The compiled results for the Shakedown Test revealed that most buses were within this limit after the second load cycle, and all buses were within 0.005 inch or less after the third loading cycle.

Overall, there was a minimal amount of comments received during the outreach sessions regarding the proposed Shakedown performance standard. FTA received a written comment from one bus manufacturer indicating that there is no specific reason for the standard being set at ±0.005 inch when ±0.100 inch should provide a sufficient limit. FTA chose not to adopt this suggestion as the proposed standard because 0.005 inch, which was taken from the First Article Inspection Test of the American Public Transportation Association's Bus Procurement Guidelines, has been used as the threshold for many years and all previously test buses were capable of meeting this requirement. FTA lacks information regarding the benefits and costs of its proposed standard and the benefits and costs of the suggested ±0.100 inch Shakedown test standard. FTA requests comment on the benefits and costs of its proposed shakedown testing procedure and standard, the commenter's suggestion to use ±0.100 as the performance standard or other alternatives.

C.1.2. Distortion Test

The objective of the existing Distortion Test is to observe the operation of various subsystems when the bus is placed in a longitudinal twist (simulating operation over a 6-inch tall curb or through a 6-inch deep pothole) and subjected to a water spray mechanism simulating rain and traffic spray.[6] FTA proposes that a tested bus model would meet the Distortion Test performance standard if all of the passenger doors and emergency exits, while under every longitudinal twist test condition, operate and fully open in the same manner as they do with the bus on a level surface. FTA is not aware of problems in its recipient bus fleets related to bus body distortion performance and concludes that bus models that are capable of maintaining normal operation of the doors and windows while under the distortion loadings under this test are capable of providing adequate distortion performance when in service. Bus testing results for distortion shows no issues with test vehicles meeting this proposed standard. During the outreach efforts, bus manufacturers, transit agencies and others involved in the transit industry concurred with this performance standard as sufficient to demonstrate that the bus structure would not deform to the point of preventing the safe egress of the vehicle under this level of static loading. FTA requests comments on the benefits and costs of its proposed distortion testing procedure and standard, as well as on alternatives.

C.1.3. Static Towing Test

The objective of the Static Towing Test is to determine the strength characteristics of the bus towing fixtures.[7] Having towing fixtures on the bus is essential for recovering buses that have gone off of the roadway and are immobilized. Without towing fixtures on the bus, vehicle recovery personnel would need to improvise a means of adequate mechanical connection to lift or pull the bus onto the road surface. This improvising can be dangerous to the recovery personnel and also can result in physical damage to the bus when a winch cable contacts the exterior bus in areas incapable of supporting those loads. Having towing provisions of adequate strength is also essential for the safe and effective recovery of immobilized buses.

FTA proposes that a tested bus model would meet the Static Towing Test performance standard if no failure of the towing fixtures and connecting structure occurs at pulling loads up to 120 percent of the bus curb weight. Failure is defined as any visible permanent deformation, yielding, or bending of the provision or other structural component. Cracks in welds will constitute test failure. This proposed requirement is consistent with section TS 25 of the APTA Standard Bus Procurement Guidelines and is consistent with how the test has been conducted since the inception of the Bus Testing Program.[8] Under the current test procedure, a load equal to 120 percent of the bus curb weight is applied to the towing provisions using a hydraulic cylinder and a load distribution yoke. The load is 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 is recorded.

FTA believes that the current static towing test has served the industry adequately as we are aware of no in-service problems with the towing fixtures of buses that meet the requirement. FTA also believes that the current test is not burdensome as it is scaled according to the curb weight of the bus and the vast majority of buses have historically satisfied this requirement. All the buses in the data analysis used for this rulemaking satisfied the current test. During the outreach sessions, FTA received no specific comments regarding the proposed static towing performance standard. FTA seeks comment on the benefits and costs of its proposed static towing testing procedure and standard, and alternatives.

C.1.4. Dynamic Towing Test

The objective of this test is to functionally verify that the bus is towable with a heavy-duty commercial vehicle wrecker when following the manufacturer's instructions and using the manufacturer supplied towing interfaces (if any).[9] The test represents the situation where a bus is positioned on a roadway or similar surface but is not operational and must be towed to the maintenance facility. The recovery vehicle (wrecker) is maneuvered into place so the lifting apparatus (''stinger'') goes under the front of the bus and interfaces with front and rear treads of the front tires allowing the front of the bus to be lifted from the road surface. The bus is towed for 5 miles, decoupled from the tow vehicle and inspected for

[6] *http://146.186.225.57/bus_tests_pdfs/5-2.distortion.pdf*

[7] *http://146.186.225.57/bus_tests_pdfs/5-3.statictow.pdf*

[8] ''Standard Bus Procurement Guidelines RFP'', American Public Transportation Association, *http://www.apta.com/resources/standards/Documents/APTA%20Bus%20Procurement%20Guidelines.docx.*

[9] *http://146.186.225.57/bus_tests_pdfs/5-4.dynamictow.pdf*

any damage or loss of normal bus functions. FTA proposes that a tested bus model would meet the Dynamic Towing Test performance standard if a proper connection was made between the heavy-duty wrecker and the test bus and no damage occurred to the bus while being towed.

While the proposed standard is not necessarily rigorous, as all buses in the data analysis were dynamically towable, it is very important that the bus is towable according to the manufacturer's instructions, that it is interoperable with common commercial vehicle recovery vehicles, and that no damage to the bus in is incurred during the dynamic towing exercise. During the outreach sessions, FTA received no comments regarding this proposed performance standard. However, FTA seeks comment on the benefits and costs of the proposed dynamic towing testing procedure and standard, and alternatives.

C.1.5. Hydraulic Jacking Test

The objective of this test is to assess the feasibility of hydraulically hoisting the bus with a portable hydraulic jack to a height sufficient to replace a deflated tire.[10] FTA proposes that the bus model would meet the Hydraulic Jacking Test performance standard if the bus can be safely raised and lowered using a portable jack, at each wheel position, to successfully replace a deflated tire without any permanent frame or body damage to the bus. This proposed standard is based on historic bus testing procedure and results for the jacking subtest. The proposed standard is also consistent with section TS 26 in the APTA Standard Bus Procurement Guidelines. During the outreach sessions, FTA received no comments regarding this proposed performance standard. However, FTA seeks comment on its proposed standard in this NPRM.

C.1.6. Hoisting Test

The objective of this test is to assess for possible damage or deformation caused by the jack stands on the jacking pads.[11] FTA proposes that a tested bus model would meet the Hoisting Test performance standard if the bus can be hoisted and placed on jack stands without significant resulting permanent frame or body damage to the bus frame or bus body and that it is stable while on the jack stands. Up to 0.25 inch of plastic deformation of the frame structure directly at the point of jack contact will be allowed. Bulging or cracking anywhere on the frame or body structure while supported by the jack will constitute a failure. This proposed standard is based on the elemental need to be able to safely hoist a bus to enable the effective maintenance of the bus. The proposed standard is consistent with historic bus testing procedure and results for the hoisting subtest and is consistent with section TS 27 in the APTA Standard Bus Procurement Guidelines. FTA is not aware of any in-service hoisting issues with buses that have been tested and have met the proposed standard. There were no comments regarding this proposed standard during the industry outreach sessions. However, FTA seeks comments on the benefits and costs of its proposal, and alternatives.

C.1.7. Structural Durability Test

The objective of this test is to perform an accelerated durability test that simulates the cumulative road shock and vibration a transit bus experiences over 25 percent of its rated service life distance in miles.[12] The current Bus Testing Rule outlines five bus service life categories: four years or 100,000 miles; five years or 150,000 miles; seven years or 200,000 miles; ten years or 350,000 miles; and twelve years or 500,000 miles. The bus manufacturer specifies the service life category for the bus model submitted for testing. Once successfully tested, that bus model is eligible for bus procurements of the same service life length or less. FTA is not proposing any changes to these service life categories. The *Useful Life of Transit Buses and Vans* report from 2007 compared the actual bus retirement ages of buses in the various service life categories and found that the buses were being kept in service beyond their minimum service requirements. The results are shown in Table 3.

TABLE 3—AVERAGE BUS RETIREMENT AGES[13]

Vehicle category/minimum retirement age	Average retirement age (Years)	Share of active vehicles that are:	
		One or more years past the retirement minimum	Three or more years past the retirement minimum
12-Year Bus	15.1	19%	9%
10-Year Bus	*	7%	4%
7-Year Bus	8.2	12%	3%
5-Year Bus/Van*	5.9	23%	5%
4-Year Van	5.6	29%	10%

* Average retirement age estimates for this vehicle category is not available.

FTA proposes a Structural Durability Test performance standard requiring that, at the completion of the Structural Durability Test, there are no ''uncorrected'' failures in the bus frame, body structure, and the propulsion system. An uncorrected failure is a failure that was detected during the test that has not been successfully eliminated through a design, manufacturing process, or quality control improvement and has been successfully validated with sufficient durability testing. Structural durability validation of powertrain failures is defined as 1.5 times the durability test distance from the accumulated test distance at the first occurrence of the failure, but no greater than an additional 100 percent of the original durability test length. FTA will bear 80 percent of the cost associated with one additional durability validation test if FTA believes that the proposed modification has merit and will pass the test on a subsequent attempt. Durability validation of frame and body structure

[10] *http://146.186.225.57/bus_tests_pdfs/5-5.jacking.pdf.*

[11] *http://146.186.225.57/bus_tests_pdfs/5-6.hoisting.pdf.*

[12] *http://146.186.225.57/bus_tests_pdfs/5-7.durability.pdf*

[13] U.S. Department of Transportation, Federal Transit Administration, *Useful Life of Transit Buses and Vans*, Booz Allen Hamilton, Inc. Report Number FTA VA–26–7229–07.1, April 2007.

failures will require that the durability test is started over from the beginning after the application of the design or production process modification.

FTA strongly believes that a bus should not develop any significant failures or defects in the frame or body structure over the course of structural durability testing (the first 25 percent of its rated service life). There are several reasons for this belief:

(1) Structural cracks, structural bending, and structural failures that impede safe operation of the vehicle, delamination, and other material deteriorations could continue to propagate with continued shock and vibration input and other environmental exposure throughout the bus life.

(2) Cracks in structural elements may indicate that the bus design, materials, and/or manufacturing techniques are inadequate for transit service. With the proposed change in the bus payloading procedures contained in this notice, buses would no longer be tested in an ''overloaded'' condition beyond their Gross Vehicle Weight Rating (GVWR) or Gross Axle Weight Rating (GAWR) and, as a result, cracks in the frame or body would not be attributed to overloading.

(3) Repairs of structural and body cracks, deformation, or delamination may require specialized skills and tools that are beyond the capability of a common transit bus maintenance facility. Repairs of this nature can be expensive and outside the scope of the typical maintenance budget and can remove a bus from service for extended periods.

The proposed structural durability performance standard includes the chassis frame, the bus body structure, and all external and internal load-bearing elements that are either welded or adhesively attached to the frame and/or body structure. Major chassis or body structures that are primarily assembled using fasteners such as screws, bolts or rivets are also included in this performance standard.

FTA also strongly believes that a bus should not exhibit any propulsion system failures during the first 25 percent of its rated service life. Durability failures of the propulsion system are expensive to repair and cause disruptions in service. Failures of the bus powertrain revealed during the durability test will likely occur in actual transit service and may lead to more serious recurring problems later in its service life. Buses with systemic powertrain problems are often retired early due to their financial and operational liability to the operating transit agency. The proposed propulsion system durability performance standard includes but is not necessarily limited to all components of the energy/fuel storage, delivery, and management systems; engine or drive motor and related controller and management systems; power transmission systems (transmission, driveshaft(s), and drive axle(s)); and cooling systems. Certain essential proprietary off-board equipment required to operate advanced-technology buses may also be considered to be part of the propulsion system.

In setting the proposed durability performance standard, FTA desires to limit costs and risks. If FTA were to propose a more stringent standard, the length of the durability test would increase, which means that the costs of the testing program would also increase, and the cost of buses may increase as well and for no certain benefit. On the other hand, a less stringent testing standard that allows one or more uncorrected failures, or a less stringent testing procedure, would expose FTA and its recipients to greater risk. The existence of even one major uncorrected failure mode in the bus frame, body structure, or powertrain is enough to cause a bus to fail to meet its service life requirements. We note that some vehicles that would not have passed the proposed durability standard during testing have experienced problems once placed into transit service and have had difficulty meeting their specified service life, requiring more maintenance than is typical.

FTA believes that the proposed performance standards for durability are necessary and achievable. Overall, our analyses of the 49 recent tests indicate that there are examples of bus types and sizes of each group that have proven capable of satisfying the proposed performance standards. The analysis further indicated that six bus models experienced either structural failures or powertrain failures. Of those six, FTA believes that three would have needed additional durability testing after the design changes were applied. FTA, though, does not have information concerning whether subsequent production buses were changed as a result of the testing and requests comment on whether any of the 6 models that failed were modified prior to delivery to transit agencies.

FTA received comments regarding durability testing and the associated performance standards that are assessed from these test results (Durability, Reliability, and Maintainability). One commenter recommended that FTA provide the same 80 percent cost match for the test fees associated with additional durability testing. FTA is willing to provide the 80 percent cost match for any necessary additional durability testing. The commenter also requested that FTA commit to discussing the path forward for resolving a durability failure with the bus manufacturer within three business days. Another commenter highlighted the increased level of risk to a bus manufacturer of introducing new components and subsystems and new technology in general that the proposed standards for Durability, Reliability, and Maintainability create. FTA agrees that once a set of standards become effective, the risk to bus manufacturers, component suppliers, and technology developers may increase and that this is appropriate. The Bus Testing Program is the point-of-entry to the FTA bus capital program where bus models can be procured with FTA funding once testing is completed. Entities may use non-FTA funds to procure buses that have not completed and passed the testing program, but they do so at their own risk.

To encourage innovation, FTA has a prototype waiver policy available for the introduction of new bus technologies.[14] This waiver, if awarded, allows for up to five buses to be procured without the requirement for testing. FTA seeks comments regarding whether a new policy for the management of the risk associated with introducing new bus components and technologies to the new production models is needed once the final durability performance standards become effective. FTA is interested in suggestions regarding a graduated service life requirement and other strategies for sharing technological risk within the bus capital program.

FTA seeks additional comments regarding the proposed Durability performance standards. FTA seeks comments on the benefits and costs of its proposed durability testing procedure and standard, and alternatives. Do commenters have information to determine the extent to which the proposed testing process reasonably simulates real-life use of buses? Does the current and proposed testing process result in manufactures using parts that are more or less durable than needed?

C.2. Safety

Currently, only a lane change stability test is performed in the Safety test category. However, since the objective of this test category is to document the safety performance of the test bus, FTA proposes to move the braking performance tests into the Safety test

[14] *http://www.fta.dot.gov/12351_8875.html*

category. Additionally, FTA proposes to address safety related bus failures identified during any of the tests in the Safety test category. Currently, the significant safety hazards are addressed in the Reliability test category. FTA believes that these tests should be included in the Safety test category because that while braking performance can be considered a bus performance issue and the existence of safety hazards can be considered for their Reliability impact, they are first and foremost related to safety. Table 4 outlines the current and proposed test categories for these tests.

TABLE 4—CURRENT AND PROPOSED SAFETY SUB-TEST CATEGORIES

Subtest	Current test category	Proposed test category
Class 1 (safety hazards) Reliability Failures.	Reliability	Safety
Stability	Safety	Safety
Braking:	Performance.	Safety
Stopping Distance.		
Split Coefficient Surface.		
Parking Brake.		

Inserting them in the Safety test category will provide our recipients a greater holistic view of the safety of the bus. FTA seeks comments about moving the braking test result from the Performance test category and the Class 1 test results from the Reliability test category into the Safety test category. The proposed performance standards for the Safety test category are based on tests currently conducted and reported under the Performance and the Reliability test categories. No new tests are being proposed for the Safety test category in this notice. FTA notes that these tests are not intended to fulfill the mandate found in 49 U.S.C. 5329(b)(2)(C) that the agency promulgate minimum safety performance standards for transit vehicles. Once those standards are finalized via a separate rulemaking action, per section 5318(e)(1)(B)(ii), transit agencies will only be able to purchase vehicles using FTA funds that meet those standards. However, meeting those standards will not be included in the ''pass/fail'' score discussed in this rulemaking. Bus Testing Rule will be revised accordingly in order to accommodate the standards promulgated under 49 U.S.C. 5329(b)(2)(C). FTA proposes a total of five performance standards for the Safety test category.

C.2.1. Hazards

The first Safety performance standard titled ''Hazards'' addresses hazardous bus performance failures to include those failures that, when they occur, could result in a loss of vehicle control; serious injury to the driver, passengers, pedestrians, and/or other motorists; and/or property damage or loss due to collision or fire. The performance standard establishes that at the completion of testing there are no uncorrected Class 1 reliability failure modes remaining. Examples of Class 1 reliability failures include a loss of braking capability, a loss of power steering assist or all steering control, an unsecure windshield or side window failure, the failure of a passenger seat or seat mount, a fuel or other flammable fluid or gaseous substance leak, exposed or frayed electrical conductors, electrical short circuits, mechanical failures of energy storage system components and their mounting structures, and any instance of fire. Similar to the Durability test and Reliability test performance standards, an uncorrected failure mode is a failure that occurred during the test that has not been successfully eliminated through a design, manufacturing process, or quality control improvement that has been successfully validated through further testing. Validation of the corrected failure mode requires repeating all tests where the failure mode occurred. For Class 1 failure modes that occur during durability testing and were not classified as durability failures, sufficient validation is defined as 1.5 times the durability test length from the accumulated test length at the first occurrence of the failure mode, but no greater than an additional 100 percent of the original durability test length. This proposed standard is based on historic bus testing results for durability and reliability that have shown that most test vehicles have no issues meeting this proposed standard. FTA seeks comments on the benefits and costs of the proposed hazards testing procedure and standard, and alternatives.

C.2.2. Stability

The second proposed safety performance standard addresses the dynamic stability of the bus. The Bus Testing Program has used a double-lane change test procedure to assess the stability of buses. This obstacle avoidance maneuver procedure simultaneously challenges the roll stability, yaw stability, steering rate, the operator's workstation design, and the outward visibility of the bus.[15] The lane change maneuvers start at a speed of 20 miles per hour (mph) and continue up to a potential maximum of 45 mph. For each test speed, a bus must remain within the designated lane change test course and not experience any wheel liftoff from the road surface for the test run to be considered successful. For the Stability performance standard, FTA proposes that all buses must successfully negotiate the current lane change test course at a speed of at least 45 mph without lifting a wheel off the ground, striking any of the cones, or exceeding the boundaries of the test lane. This proposed standard reflects the current definition of success for the stability test and no current bus models have failed this requirement. FTA believes the proposed standard is appropriate as it tests the buses within the upper end of their operating speed spectrum. FTA is not aware of in service instability issues with buses that have satisfied this standard thereby providing an impetus for proposing a more stringent standard. FTA is not aware of reasons to propose a lower standard either.

FTA is aware of other test methodologies that examine the dynamic stability characteristics of medium and heavy vehicles. The single-lane change and the slalom course are operational-style tests that use the speed through the test course as the primary performance metric like the current double-lane change test. FTA feels that the double-lane change test is more appropriate as buses most often need to return to lane of travel they were operating within just before the obstacle avoidance maneuver and is therefore more operationally relevant. Similar to the double-lane change, the slalom maneuver alternates the dynamic lateral loading of the bus during the maneuver but the lack of a one lane width of lateral offset during the maneuver makes the test less representative of real-world conditions. FTA is aware of engineering tests that can be used to characterize specific bus stability parameters. The constant radius turn test is used to determine a vehicle's maximum lateral acceleration potential and its inherent propensity for understeering or oversteering behavior throughout its range of lateral acceleration. The ''fishhook'' and ''sine-with-dwell'' maneuvers can be used to induce vehicle instability in a vehicle and then assess the ability of the stability control system to manage the

[15] *http://146.186.225.57/bus_tests_pdfs/3.safety.pdf*

response of the test vehicle. While these types of tests can provide significant insight into vehicle behavior they are not necessarily operationally relevant to transit bus consumers. Additionally, in order to execute these maneuvers, the use of vehicle safety outriggers, additional instrumentation, and potentially greater expanses of pavement surface are required which increases the cost and time required to conduct the tests. FTA has not analyzed the benefits and costs of these alternative testing procedures due to insufficient data, but FTA believes that the double-lane change test remains the best option for the needs of the Bus Testing Program. FTA received no specific comments regarding the proposed Stability performance standard during the industry outreach events.

FTA also acknowledges the National Highway Traffic Safety Administration's (NHTSA's) proposed rule to require electronic stability control on large buses under the proposed Federal Motor Vehicle Safety Standard (FMVSS) 136.[16] Under this proposed rule, all buses over 26,000 lbs gross vehicle weight rating (GVWR) would be required to have an electronic stability control system (ESC) with specific capabilities and a demonstrated ability to control the bus's stability within specified limits during a defined test maneuver that challenges the stability of the bus, forcing the ESC system to respond. The proposed requirements of FMVSS 136 do not apply to ''urban'' transit buses. Overall, if the requirements included in the proposal are finalized it is expected that some of the buses tested in this program will have an ESC system and some will not. FTA considered two different options for harmonizing the Bus Testing Stability performance standard with that of FMVSS 136.

The first option considered was replacing the current Stability test with the proposed FMVSS 136 tests and performance requirements for all buses. This option was rejected for several reasons.

1. For buses so equipped, ESC will ensure that they are stable. Our current stability test demonstrates whether a bus can safely execute a double lane change without reducing velocity. Without a minimum speed requirement that ensures a minimum level of agility, like that proposed for the double-lance change test, it would be possible for ill-handling buses to pass through the Bus Testing Program and enter transit service.

2. The estimated cost of executing the proposed 136 test is 5 times greater ($15,000 vs. $3,000) than the cost of the current Bus Testing program stability test. This new test would impact the program budget forcing FTA to reduce testing in other areas.

3. For buses without ESC, the test results would not be operationally meaningful. This reduces the value of the information to the transit industry.

Another option is test and apply the proposed Stability performance standard only to those bus models that do not fall under the scope of the proposed FMVSS 136 (urban transit buses and buses less than 26,000 lbs). Buses that are subject to FMVSS 136 and are certified as compliant by their manufacturer would be given an automatic pass for ''Stability''. While this option is more practical for the test program, as it eliminates the need to conduct the FMVSS 136 tests, it still could allow a poor handling bus through the testing program. The proposed FMVSS 136 standard affects two types of buses that are used by transit; the over-the-road motorcoach, and the large Class 7 cutaway chassis buses. While it is unlikely that a motorcoach will be placed into regular fixed route transit service where a bus's agility is more important, some Class 7 cutaway buses are used for fixed route service.

Past Stability test results indicate that all bus models are capable of safely executing the double-lane-change test at 45 mph. As a result, FTA believes that probability of an ESC system intervening during this test is low for current production bus models. Therefore, FTA believes that applying the proposed Stability performance standard of 45 mph through the double lane-change test course to all buses, regardless of whether or not they are equipped with ESC, is the best option. However, since the inherent stability performance characteristics of future bus models are unknown, FTA seeks comments regarding the different options for integrating the proposed FMVSS 136 into the Bus Testing Program, including the benefits and costs and those of alternatives. FTA also seeks comments in general on the benefits and costs of its proposed Stability procedure and test, and alternatives.

C.2.3 Braking Performance

FTA proposes three performance standards for the braking performance of new bus models based on the test results obtained from the current brake performance tests.[17] The first is for the stopping distance on a dry level surface. The second is for the directional stability of the bus while stopping on a level split coefficient friction surface. The last one addresses the performance of the parking brake with the bus on a grade.

C.2.3.1 Stopping Distance

The purpose of this test is to assess the straight line stopping capability of a bus model on a level high friction surface at initial speeds of 20, 30, 40, and 45 mph and on a level low friction surface at 20 mph. FTA proposes a stopping distance performance standard that every new bus model satisfies the stopping distance requirement of Federal Motor Vehicle Safety Standard (FMVSS) 105 Hydraulic and electric brake systems (49 CFR 571.105) and FMVSS 121 Air Brake Systems (49 CFR 571.121) of stopping within 158 feet from a speed of 45 mph on dry level road surface.

FTA proposes that although a bus model may fail to stop within 158 feet from a speed of 45 mph, a passing result from an applicable documented FMVSS 105 or 121 certification test conducted by an independent test organization can be used instead. FTA offers this alternative compliance option due to the fact that the Bus Testing Program does not conduct the brake burnish procedure specified in the FMVSS for the considerations of cost and time. The data analysis revealed that three of 49 buses recently tested would have failed this standard based on the Bus Testing results alone. Their average stopping distances from 45 mph were 160, 171, and 189 feet. FTA believes that these three failures could have been resolved through leveraging a FMVSS compliance test report or by repeating the brake testing, and that no mechanical changes would have been necessary in order to pass the proposed test.

After one of the outreach sessions, FTA received written comments from one source regarding the proposed stopping distance performance standard. The commenter recommended a braking distance performance standard of 200 feet from a speed of 45 mph for heavy-duty transit buses due to the fact that the FMVSS burnishing procedure is not conducted prior to conducting the

[16] ''Federal Motor Vehicle Safety Standards; Electronic Stability Control Systems for Heavy Vehicles'', Notice of Proposed Rulemaking, National Highway Traffic Safety Administration, May 23, 2012, *https://www.federalregister.gov/articles/2012/05/23/2012-12212/federal-motor-vehicle-safety-standards-electronic-stability-control-systems-for-heavy-vehicles*

[17] *http://146.186.225.57/bus_tests_pdfs/4.2Performance-BrakeTest.pdf*

stopping distance tests. FTA believes that by allowing the use of an FMVSS certification test result as an alternate data source we have addressed the commenter's issue and at the same time not lowered the bar for braking performance below the FMVSS threshold. FTA seeks comments on the benefits and costs of proposed stopping distance performance standard, and alternatives.

C.2.3.2 Braking Stability

The purpose of the braking stability test is to determine the ability of a bus model to stay within a standard lane width during a maximum effort panic stop from 30 mph with one side of the bus on a high friction surface the other on a low friction surface. The proposed performance standard for braking stability is that the bus remains within a 12-foot lane width during the split coefficient friction brake stops as conducted under the current Bus Testing Program procedure. The data analysis revealed that all buses satisfied this proposed performance standard. FTA received no comments regarding braking stability. FTA requests comments on the benefits and costs of its proposed braking stability test procedure and standard, and alternatives.

C.2.3.3 Parking Brake

The third proposed performance standard is that the parking brake holds the bus stationary on a 20-percent grade while facing uphill and downhill for 5 minutes each in accordance with FMVSS 105 and 121.

The data analysis revealed that all buses satisfied this proposed performance standard. FTA received no comments regarding the parking brake performance standard.

C.3. Maintainability

The objective of this test is to examine the amount and types of maintenance required to keep the test bus in a fault-free operating state. Selected components (*e.g.*, transmission, alternator, windshield wiper motor, and other comparable components that serve the same functions replaced over a vehicle's lifespan on the bus) are removed and replaced, and the total time required to complete this task is recorded.[18] The amount of time necessary to conduct the scheduled servicing, as defined by the bus manufacturer, is recorded throughout the duration of the test. All unscheduled maintenance activities (*i.e.*, failures the occur during the testing) are documented as well, including the length of time for each maintenance action, as transit vehicle agencies noted unscheduled maintenance needs was a significant operating constraint.[19]

FTA proposes a maintainability performance standard for the total unscheduled maintenance time of no greater than 125 hours over the full course of all of the tests. Unscheduled maintenance time is a function of the reliability of the bus and the amount of labor required to resolve its malfunctions and is a significant indicator for the operating cost of the bus. FTA selected a standard of 125 hours after reviewing the bus testing results for all bus models that meet the proposed reliability performance standard (no more than two Class 2 reliability failures (a failure resulting in a maintenance road call to repair or tow the bus) and meet the proposed durability standards (no uncorrected frame and body structure failures or powertrain failures remaining at the completion of testing. during the test. Buses that required more than 125 hours of unscheduled hours during the test have been problematic in transit service and have usually not provided the full specified useful service life. Three buses from the study group of 49 would not meet this proposed performance standard. However, these same three bus models also fail the proposed durability requirements. Assuming the durability failures would be verified as ''corrected'' during the subsequent retesting, this proposed standard would likely be met.

FTA considered proposing a graduated performance standard based on the expectation that the amount of unscheduled maintenance is directly proportional to the amount of bus operation and hence its service life category. However, a plot of the total unscheduled maintenance results for buses with no greater than two Class 2 failures tested in 2010 revealed a uniform distribution of test results that was not directly proportional to the length of the service life. The proposed 125-hour standard would apply to all service life categories as all durability tests represent 25 percent of the vehicle's designated service life.

FTA received written comments from two sources on this subject during our outreach activities. One commenter recommended that specific limits need to be established for ''consumable'' parts so that shocks or bump stops are not replaced every 1000 miles to hide a deficiency in reliability during the test that could later impact the total unscheduled maintenance hours significantly. The commenter concurred with using a maximum of 125 hours for the unscheduled maintenance scale. The commenter also recommended having the component removal and replace times account for 20 percent of the points for this test category and the remaining points from the total unscheduled maintenance hours. FTA considered proposing limits on the replacement rates of certain ''consumable'' components but thought that limiting the total amount of unscheduled maintenance accumulated during the test was an adequate disincentive to ''over-maintain'' the bus. At the time of the comments regarding the component removal and replace times were submitted, FTA was considering a potential performance standard for this test or including it in the discretionary scoring for Maintainability. FTA chose not to propose including the component removal and replace (R&R) times in the pass/fail scoring system at all. FTA felt that the past test results that this metric did not show significant difference between bus models. Additionally, R&R times are only relevant if that component needs to be replaced multiple times throughout the bus's life. The R&R time for components that fail during the test are already captured in the unscheduled maintenance times.

Another commenter highlighted the concern that new bus models that introduce a new technology or even just a new component could significantly raise the risk of failing the test in the durability, reliability, or maintainability test categories. Overall, FTA agrees with this observation. The Bus Testing Program serves as the point of entry to unlimited bus production volumes for FTA recipients. These issues are already addressed in existing bus testing policies. The program's partial testing policies delineate between component changes that are ''major'' and need to be tested and those component changes that do not trigger additional testing.[20] Bus models employing new bus technologies may be eligible for a prototype waiver that allows a small quantity of buses to be procured without the need for testing.[21]

FTA seeks additional comments concerning the benefits and costs of its proposed performance standard for Maintainability, as well as on alternatives. In addition, FTA seeks comment on whether the proposed 125-

[18] *http://146.186.225.57/bus_tests_pdfs/1-3.replacementandrepairsubsystems.pdf*

[19] *http://146.186.225.57/bus_tests_pdfs/1-2.servicing_pm_and_repair.pdf*

[20] *http://www.fta.dot.gov/12351_8867.html*

[21] *http://www.fta.dot.gov/12351_8875.html*

hour standard may have adverse unintended consequences.

C.4. Reliability

The objective of this test category is to document and classify each of the operational reliability failures of a bus model while it undergoes the tests in the other test categories. As expected, most of the reliability failure incidents occur during the durability test portion of the structural integrity test category. However, all of failures throughout the test are documented. Specifically, the reliability failures are identified by subsystem and cumulative test distance at the time of failure, and the associated repair and down time for each failure is documented.[22] Table 5 is an example of the product of this analysis.

TABLE 5—RELIABILITY ANALYSIS EXAMPLE

Subsystem	Failure type				Maintenance labor-hours	Downtime
	Class 4	Class 3	Class 2	Class 1		
	Distance (mi)	Distance (mi)	Distance (mi)	Distance (mi)		
Drive System		821			2.0	1.0
		1,857			2.0	6.0
		1,860			4.0	24.0
		1,860			6.0	12.0
		6,542			8.0	24.0
			9,725		25.0	144.0
			14,252		20.0	2,712.0

The current bus testing program categorizes a failure during the test into one of the following four classes:

1. Class 1: A malfunction that could lead to a loss of bus control; in serious injury to the driver, passengers, pedestrians, or other motorists; and in property damage or loss due to collision or fire.

2. Class 2: A malfunction that results in test interruption because the bus cannot be operated. Service is discontinued until the bus is repaired at the site of the malfunction or it is towed to a service workshop. An in-service bus that experiences a Class 2 failure would require a road call (*i.e.*, a mechanical failure on the road that requires towing or repairs, but there is no immediate safety risk to the driver and/or passengers).

3. Class 3: A malfunction that results in temporary interruption of testing, and the bus must be returned to a service workshop for repair. An in-service bus that experienced a Class 3 failure could be driven safely to a rendezvous site for a bus swap.

4. Class 4: A malfunction that degrades bus operations but does not require immediate removal of the bus from testing. An in-service bus that experienced a Class 4 failure could complete its shift.

FTA proposes a reliability performance standard for the accumulation of no uncorrected Class 1 and not more than two uncorrected Class 2 reliability failure modes at the completion of the test. This proposed standard allows up to two Class 2 failures resulting from flat tires, failed coolant and hydraulic hoses, broken accessory drive belts, failed Starting, Lighting, and Ignition (SLI) batteries (common 12-volt batteries used for engine starting and general electrical system use, not traction batteries used for electric bus propulsion) or other externally sourced, high-volume components whose designs and quality control may be beyond the direct control of the bus manufacturers. This proposed standard is based on the past reliability test results for buses that did not have systemic problems with completing their service life requirements in service. The analysis of bus testing results indicates that one bus out of the 49 studied would fail the Class 2 requirement. However, FTA believes that had this requirement existed at the time of that test the manufacturer would have sought to remedy and validate at least one of Class 2 failure modes prior to the end of the test.

FTA chose to propose placing a performance standard for Class 1 reliability failures in the Safety test category and not in the Reliability test category so that these results would not be double-counted in the proposed Bus Model Scoring System. For completeness, the Reliability section of the test report will continue to report the details of all Class 1 failures. FTA also chose not to propose any performance standards for Class 3 and 4 reliability failures. The primary impact of these failure modes is increased unscheduled maintenance which is addressed with the proposed Maintainability performance standard. FTA seeks comments regarding the adequacy and reasonableness of the treatment of the Class 3 and Class 4 reliability test results.

FTA received written comments regarding the proposed Reliability performance standards. The commenter concurred with the proposed requirements of no uncorrected Class 1 and no more than two uncorrected Class 2 failures existing at the completion of the test. The commenter asked that FTA commit to a review of these failures, the proposed remedies, and the amount of validation test distance required within three business days to minimize the impact to the testing schedule. They also recommended that any additional testing required to validate design changes necessary to meet the Reliability performance standards be shared between FTA and the manufacturer at the same 80/20 percent split as the rest of the test. FTA seeks comments regarding the benefits and costs of the proposed Reliability performance standards, as well as on alternatives.

C.5. Fuel Economy

FTA proposes that the performance standard for the Fuel Economy test category is that every new bus model would satisfy the requirements of NHTSA's Medium and Heavy-Duty Vehicle Fuel Efficiency Program (49 CFR part 535) for the model year in which it is produced. In this program, transit buses are classified as ''heavy-duty vocational vehicles'' with voluntary standards starting with the 2013 model year and mandatory

[22] *http://146.186.225.57/bus_tests_pdfs/2.reliability.pdf*

standards starting in model year 2016. Correspondingly, this proposed performance standard becomes effective for the Bus Testing Program in 2016. Because buses will be required to comply with these regulations for model year 2016, this proposal would only have costs or benefits if recipients decide to purchase buses that perform better than the minimum standard based on the testing results. The current fuel economy testing conducted in the Bus Testing Program does not address this standard and would not be used for determining compliance. The manufacturer documentation used to demonstrate compliance with the NHTSA program would be the same basis for the Bus Testing Program determining compliance with its fuel economy standard. The Bus Testing Program fuel economy test results would be used to award additional points above the base score as is discussed in paragraph D.1.5 of this notice. No comments were received from stakeholders as this proposal was developed after the outreach sessions. Initially, FTA had proposed a set of minimum performance standards for fuel economy based on the test results produced by the program. FTA seeks public comment on the benefits and costs of its proposed fuel economy standard, as well as on alternatives.

C.6. Emissions

To protect public health and welfare, Congress enacted the Clean Air Act (CAA) and its subsequent amendments. The CAA Amendments of 1970 directed the Environmental Protection Agency (EPA) to use scientific data to set and revise national ambient air quality standards (NAAQS) for specific widespread and common pollutants, making major revisions in 1977 and 1990. Currently, the EPA has air quality standards in place for six common ''criteria pollutants:'' particulate matter, ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. Implementation of the standards is a joint responsibility of the States and EPA, with States responsible for developing enforceable State implementation plans that meet national standards. If a State fails to adopt and implement an adequate plan, EPA is required to issue a Federal implementation plan.

FTA proposes that the performance standard for the Emissions test category be that every new bus model would satisfy all of the applicable EPA exhaust emissions requirements for heavy-duty vehicles for the model year in which it is produced. Because buses are currently required to comply with these requirements, this proposal would only have costs or benefits if recipients decide to purchase buses that perform better than the minimum standard based on the testing results. The EPA divides heavy-duty vehicle exhaust emissions into two groups, criteria pollutants, and green-house gas pollutants. Exhaust emissions of nitrogen oxides (NO_X), non-methane hydrocarbons (HC), particulate matter (PM), and carbon monoxide (CO) are considered ''criteria pollutants'' and the standards for governing these pollutants are provided in 40 CFR part 86. Exhaust emissions of carbon dioxide (CO_2), methane (CH_4), and nitrogen dioxide (N_2O) are considered ''greenhouse gas pollutants,'' the standards for which are outlined in 40 CFR part 1037. Bus manufacturers currently leverage a ''pass-through'' compliance from the engine manufacturer, chassis manufacturer, or alternative fuel conversion supplier to demonstrate compliance with 40 CFR part 86. For the greenhouse gas emissions standard, 40 CFR part 1037, bus manufacturers must provide the bus models specific results generated by the Greenhouse Gas Emissions Model (GEM) to the EPA or leverage the chassis original equipment manufacturer (OEM) certification for those bus models built upon an incomplete OEM chassis.

While the Bus Testing Program currently measures all of these exhaust emissions except for N_2O, the testing is conducted at the vehicle level using transit specific driving cycles and is not suitable for determining compliance with the EPA exhaust emissions requirements. The Bus Testing Program emissions test was designed to provide accurate data measured over transit specific duty-cycles to facilitate direct comparisons between bus models. Instead of using the Bus Testing Program emissions test results to address the EPA requirements, FTA proposes that the bus manufacturer documentation already being used to demonstrate compliance with the EPA requirements also be the basis for the Bus Testing Program to determine compliance with its Emissions performance standard. The Bus Testing Program emissions test results would be used to award additional points above the base score as is discussed in paragraph D.1.6 of this notice. FTA did not receive comments for this proposal as it was not discussed during the outreach sessions. FTA had initially proposed a performance standard for each category of exhaust emissions currently measured by the test program. FTA seeks public comment on the benefits and costs of its proposed emissions standard, as well as on alternatives.

C.7. Noise

The objective of this test category is to measure the noise levels inside and outside of the bus in various operating modes. There are a total of six different noise test procedures currently conducted. The interior noise testing includes measuring the ambient noise level inside the bus as it is being subjected to 80 dB of white noise from outside the bus, measuring the noise levels inside the bus as it accelerates from a standstill to 35 mph, and qualitatively identifies any specific types of noise such as rattles, wind noise, or resonant vibrations that occur at specific speeds, throttle positions, gear ranges, etc. The exterior noise testing measures the noise levels projected into the outside environment from the bus as it accelerates from a steady speed at full throttle, as it accelerates from a standstill to 35 mph under full throttle, and when stationary with the engine at three different throttle settings. FTA plans to continue testing and reporting on the six different noise test procedures as is current practice. However, performance standards are not proposed for all six tests.

To formulate Noise performance standards, FTA reviewed the test results for buses tested in 2010 and later. FTA also reviewed the APTA Standard Bus Procurement Guidelines and its recommended specifications for bus noise performance, as well as from other Federal agencies such as the National Institute for Occupational Safety and Health (NIOSH), the Federal agency responsible for workplace safety research, and the EPA, the Federal agency responsible for environmental health standards.

FTA found that while the APTA guidelines set an interior noise threshold of 80 dB(A) (decibels, A-weighted—a relative measure of the loudness of sounds as perceived by the human ear) for passenger seating locations and 75 dB(A) for the driver area, they were designed to address procurements of urban transit buses between 30 and 60 feet in length and do not address buses of shorter length, such as cutaway buses, which are of a different body design and whose engines are typically located forward in the cab of the vehicle, rather than in the rear of the bus.

FTA examined other noise performance standards to determine whether elevating the driver area noise level above 75 dB(A) posed an unacceptable hazard for the driver. The

NIOSH recommended exposure limit (REL) for occupational noise exposure is 85 dB(A), over an 8-hour time-weighted average. Exposures at and above this level are considered hazardous by NIOSH. Although bus drivers can be exposed to interior bus noise for 8 hours a day, the bus noise level is transient, peaking only during acceleration. Thus, setting the performance standard at 80 dB(A) would ensure that the NIOSH recommended exposure limit is not exceeded.

The APTA exterior noise threshold of 83 dB(A) while accelerating from a full stop is consistent with EPA regulation, which addresses transient external noise levels by commercial vehicles found in section 202.20(b) of 40 CFR part 202. This section provides: ''No motor carrier subject to these regulations shall operate any motor vehicle of a type to which this regulation is applicable which at any time or under any condition of highway grade, load, acceleration or deceleration generates a sound level in excess of 83 dB(A) measured on an open site with fast meter response at 50 feet from the centerline of lane of travel on highways with speed limits of 35 mph or less; or 87 dB(A) measured on an open site with fast meter response at 50 feet from the centerline of lane of travel on highways with speed limits of more than 35 mph.'' The current Bus Testing program conducts this test in the same manner at a speed up to 35 mph.

Therefore, FTA proposes that the interior and exterior noise measured during the maximum acceleration of the test bus from 0 to 35 mph would be basis for the noise performance test.[23] [24] The proposed performance standard would be 80 dB(A) for interior noise throughout the interior of the vehicle and 83 dB(A) for exterior noise as measured by the current test procedures. The noise test data analysis of 49 recent bus models indicates that two cutaway chassis buses exceed the proposed interior noise performance at the driver's position by 4 dB (measured 84 dB versus the 80 dB limit). FTA believes that this level could be reduced to 80 dB or lower by the application of sound absorption materials between the engine compartment and floor areas and the driver's workstation. FTA requests comments on the cost of adding this sound absorption material to a bus. None of the 49 buses would fail the proposed exterior noise performance standard.

FTA received some verbal and written comments regarding the noise testing and the proposed performance standards. During the earlier outreach sessions, FTA had discussed the proposed performance standards that it was considering for each of the six noise tests that are currently performed. Comments from transit agencies indicated that they focused on the noise test results for the noise produced when a bus is accelerating from a stop. One bus manufacturer concurred with the proposed noise test performance standards. FTA seeks comments concerning the benefits and costs of its proposed Noise performance standards and testing procedures, and alternatives.

C.8. Performance

The objective of this test is to investigate and document the automotive performance of the bus including its maximum speed, acceleration, and gradeability (grade climbing ability). These three factors are critical for buses to perform as needed for transient recipients: speed is important if the bus will be used in commuter service on highways, acceleration is important after being stopped or when entering traffic, and gradeability is important for those cities not located on flat terrain.

FTA is proposing three performance standards for the Performance test category: one for acceleration, and two for gradeability. A performance standard for the maximum speed on a level road surface is not proposed. The stability performance standard in the Safety test category already requires all buses to be able to maintain 45 mph throughout the lane change test. FTA believes that 45 mph is an adequate maximum speed that all transit buses need to satisfy. FTA understands that there are bus routes that require a speed greater than 45 mph. The Bus Testing Program requirements do not preclude transit agencies from procuring buses with a speed capability greater than 45 mph.

The proposed Acceleration performance standard would establish that every bus be capable of achieving a speed of 30 mph from rest in no greater than 18 seconds, which is consistent with Standard 7.3.1, Table 3, of the APTA Guidelines. FTA does not know the original basis for the acceleration requirement. Our speculation is that, when it was formulated, it was based on the capability of a popular bus model that transit agencies felt provided adequate performance.

The proposed Gradeability performance standards would establish that every bus shall be capable of sustaining at least 40 mph on a 2.5 percent grade, and at least 10 mph on a 10 percent grade. The proposed gradeability on a 2.5 percent grade performance standards is sourced from the APTA Standard Bus Procurement Guidelines. While this same source recommends a minimum speed of 15 mph on a 10 percent grade, FTA proposes a performance standard of 10 mph on a 10 percent grade to account for the typical measured test performance of the 60-foot articulated buses and to allow manufacturers to optimize the powertrain fuel economy of 40-foot buses for transit applications that do not require significant gradeability performance.

These proposed performance requirements are not particularly rigorous as they were set to allow for the optimization for fuel economy, given transit agency requirements. Additionally, as with any of the tests proposed today, these performance standards do not preclude transit agencies from procuring bus models that have greater performance capability. These proposed standards are consistent with bus testing results that have shown that most test vehicles would likely not have significant difficulty meeting these proposed standards.

The data analysis of the acceleration results for 49 recent bus tests showed that two buses failed to meet the proposed acceleration standard. One, a full electric bus, recorded a time of 18.6 seconds. FTA believes that with a software adjustment to the powertrain control system this particular bus could have reduced its acceleration time to 18 seconds or less. This adjustment would not have a significant cost. The other bus, a 60-foot articulated bus, achieved 30 mph in 19.6 seconds. This diesel-powered bus was equipped with a relatively small displacement engine for the 60-foot bus class. A numerically higher final drive ratio could have been fitted to the bus to reduce its acceleration time, as well as improve its gradeability, at the expense of maximum speed and fuel economy, but no additional equipment cost.

The data analysis for maximum speed on a 2.5 percent grade indicates that all 49 buses would satisfy the proposed requirement of 45 mph. A few buses were just at the threshold of this requirement. The data analysis for the maximum speed on a 10 percent grade reveals that three buses, one 40-foot diesel, one 40-foot electric, and the same 60-foot bus that failed the acceleration requirement failed to achieve 10 mph on a 10 percent grade. Of these three, the 40-foot diesel was the closest, at 7.5 mph, to achieving the

[23] *http://146.186.225.57/bus_tests_pdfs/7–1.interiornoise.pdf*

[24] *http://146.186.225.57/bus_tests_pdfs/7–2.exteriornoise.pdf*

proposed standard. Other 40-foot buses with similar powertrains were capable of meeting this requirement, perhaps indicating that the engine in this particular bus was not operating at full capability. The next slowest bus was an electric bus performing at 5 mph. This particular bus has been confirmed by one operating agency as having poor hill climbing ability, making it unsuitable for several routes in their area.

FTA received several comments and recommendations regarding the proposed acceleration and gradeability performance testing and standards. During the outreach sessions, bus manufacturers endorsed the proposed acceleration requirement as it competes directly with fuel economy performance, citing that they have never had a customer ask for more acceleration than the APTA standard but always have customers asking for more fuel economy. Several bus manufacturers disagreed with the proposed gradeability requirement of 15 mph on a 10 percent grade for heavy-duty buses as most U.S. roadways are limited to a 6 percent grade. One manufacturer provided a summary of the buses tested that could not achieve 15 mph on a 10 percent grade. Two bus manufacturers recommended that FTA and LTI find a new method of determining gradeability performance as the current analytical method that uses the acceleration cannot account for how the new adaptive transmissions perform when the bus is on an actual grade leading to potentially erroneous test results. Based on these comments and its own data analysis, FTA adjusted the performance requirement for speed on a 10 percent grade down to 10 mph. Additionally, FTA and LTI have been working towards a new gradeability testing methodology using the chassis dynamometer to replicate the grade specific gravitational forces. However, we are not yet ready to propose this methodology. FTA seeks comments regarding the benefits and costs of its proposed acceleration and gradeability performance standards, as well as on alternatives.

D. Bus Model Scoring System

MAP–21 requires that FTA include a Bus Model Scoring System that produces an aggregate score that uses test categories and considers the relative importance of each such testing category. FTA proposes a scoring system where the maximum aggregate score is 100 points. The scoring system and maximum points available in each test category are shown in Table D.1. The points available in each test category reflect FTA's concerns as the primary provider of Federal assistance for the procurement of new bus models—namely, that they can operate safely on bus routes with adequate automotive performance, reliably withstand the rigors of transit service over their required service lives and to do so without excessive operating costs and excessive negative impact to the environment. The other test categories required in MAP–21 and proposed today, including noise, emissions, and fuel economy, are also of great importance for the agency, transit agencies and the public, but, as noted, are within the primary regulatory responsibilities of other Federal agencies.

A total of 54 points has been proposed across test categories that assess the capability of a bus model to reliably withstand continuous transit service for the duration of its service life, with only a reasonable level of maintenance required to sustain a state of good repair (structural integrity—30 points, maintainability—16 points, and reliability—8 points). A total of 20 points is assigned to safety, another FTA priority. The environmental sustainability characteristics of fuel economy and emissions are assigned 7 points each. Bus noise characteristics are assigned a total of 7 points. Lastly, the automotive performance characteristics of bus models are assigned a total of 5 points. FTA requests comments on its proposed scoring system. In particular, FTA seeks information on whether there are alternative scoring systems that would better enable recipients to compare buses, and whether categories should be weighted differently.

TABLE D–1—WEIGHTED TEST RESULTS SCORING SYSTEM

Test category	Potential awarded for meeting each performance standard		Potential points for performance above the standard	Total point weighting by category
	Shakedown	1.0		
	Distortion	1.0		
	Static Towing	1.0		
Structural Integrity	Dynamic Towing	0	1.0	30
	Jacking	1.0		
	Hoisting	1.0		
	Durability-Structural	12.0		
	Durability—Powertrain	12.0		
	Hazards	10.0	0	
Safety	Stability	2.5	0	20
	Braking	5.5	2.0	
Maintainability	Total unscheduled maintenance hours	2.0	14.0	16
Reliability	Number of Class 2 reliability failures	2.0	6.0	8
	Liquid fuels.			
	CNG.			
Fuel Economy	Hydrogen	1.0	6.0	7
	Electric.			
	CO_2		4.0	
	CO		0.4	
	Total hydrocarbon		0.4	
Emissions	Non-methane hydrocarbon	1.0	0.4	7
	Nitrogen oxides		0.4	
	Particulates		0.4	
Noise	Interior Noise (0–35 mph)	0.5	3.0	7
	Exterior Noise (0–35 mph)	0.5	3.0	
	Acceleration 0–30 mph	1.5		
Performance	Gradeability 2.5%	1.5	0	5
	Gradeability 10%	2.0		
Total		60	40	100

Determination Of Scores By Test Category

FTA proposes that the test results for each proposed performance standard be used to generate the score for each test category. To receive a numerical score, a bus model must satisfy each proposed performance standard at least at the minimum level. FTA proposes scoring of the results in two steps: First a base score is awarded for the satisfaction of each performance standard; second, additional prorated points would be awarded when the performance of the bus model exceeds specific performance standards in the Safety, Maintainability, Reliability, Fuel Economy, Emissions, and Noise test categories as identified in Table D–2. FTA believes that while bus models that only just satisfy the performance standards at the minimum level should be capable of providing adequate transit service, performance above the performance standard in fifteen specific areas provides additional benefit to transit through increased safety and reliability, reduced operating costs and reduced negative impact on the environment. In these fifteen prorated performance categories, FTA believes that the maximum identified performance levels would not be exceeded by any current bus model. Additional details on the scoring of test results by test category are provided in the following sections.

TABLE D-2: Performance Standards, Scoring System, and Pass/Fail

Test Category		Performance Standard	All Performance Standards Met?		
			No	*Yes* → Assess Score	
				Base Score	+ Prorated Points for Measured Test Performance
Structural Integrity (30 pts.)	Shakedown	Maximum permanent chassis deflection ≤ 0.006 inch after 3 load cycles		1.0	
	Distortion	All exits remain operational under each distortion loading condition		1.0	
	Static Towing	No significant deformation under 120% curb weight load		1.0	
	Dynamic Towing	Bus is towable with standard wrecker		1.0	
	Jacking	Bus is liftable with a standard jack		1.0	
	Hoisting	Bus stable on jacks		1.0	
	Durability	No uncorrected frame & body structure failures remaining at completion of test		12.0	
		No uncorrected powertrain failures remaining at completion of test		12.0	
Safety (20 pts.)	Hazards	No uncorrected Class 1 reliability failures remaining at test completion		10.0	
	Stability	Lane change speed no less than 45 mph		2.5	
	Braking	Stopping distance from 45 mph within 158 feet as per FMVSS 105 & FMVSS 121		0.5	Stopping distance from 45 mph (ft) 158 — 80; Points: 0.0 — 2.0
		Bus remains within lane during split coefficient brake stops		2.5	
		Parking brake holds on 20% grade		2.5	
Maintainability (16 pts.)		Accumulation of no more than 125 hours of unscheduled maintenance		2.0	Hours: 125 — 0; Points: 0.0 — 14.0
Reliability (8 pts.)		No more than 2 uncorrected Class 2 failures remaining at completion of test		2.0	Failures: 2 — 0; Points: 0.0 — 6.0

Fuel Economy (7 pts.) **(Only 1 fuel type scored)**	**Liquid Fuels** (Diesel, Gasoline, LPG, LNG)	**Compliant with 49 CFR Part 535 MEDIUM- AND HEAVY-DUTY VEHICLE FUEL EFFICIENCY PROGRAM-** ***Heavy-Duty Vocational Vehicle Fuel Consumption Standards***	**1.0**	MPG: 1 — 13; Points: 0.0 — 6.0
	CNG			SCF/mi: 50 — 10; Points: 0.0 — 6.0
	Hydrogen			SCF/mi: 98 — 15; Points: 0.0 — 6.0
	Electric			kW-hr/mi: 3 — 1; Points: 0.0 — 6.0
Emissions (7 pts.) **(All emissions categories scored)**	**Carbon Dioxide (CO_2)**	**Compliant with all applicable EPA exhaust emissions regulations at date of manufacture including:** **40 CFR Part 86 CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES** **40 CFR Part 1037 CONTROL OF EMISSIONS FROM NEW HEAVY-DUTY MOTOR VEHICLES**	**1.0**	Grams/mi: 4000 — 0; Points: 0.0 — 4.0
	Carbon Monoxide (CO)			Grams/mi: 20 — 0; Points: 0.0 — 0.4
	Total Hydrocarbon (THC)			Grams/mi: 3 — 0; Points: 0.0 — 0.4
	Non-Methane Hydrocarbon (NMHC)			Grams/mi: 3 — 0; Points: 0.0 — 0.4
	Nitrogen Oxides (NOx)			Grams/mi: 2 — 0; Points: 0.0 — 0.4
	Particulate Matter (PM)			Grams/mi: 0.1 — 0; Points: 0.0 — 0.4
Noise (7 pts.)	**Interior - acceleration 0-35 mph**	**No greater than 80 decibels (dB(A))**	**0.5**	dB(A): 80 — 30; Points: 0.0 — 3.0
	Exterior - acceleration 0-35 mph	**No greater than 83 decibels (dB(A))**	**0.5**	dB(A): 83 — 50; Points: 0.0 — 3.0
Performance (5 pts.)	**Acceleration**	**Time from 0-30 mph no greater than 18 sec**	**1.5**	
	Gradeability	**Sustained speed on 2.5% grade no less than 40 mph**	**1.5**	
		Sustained speed on 10% grade no less than 10 mph	**2.0**	
Overall Result		**FAIL** / **PASS**	**60**	+ 0 — 40
		Maximum Aggregate Score	**100**	

D.1.1. Structural Integrity Tests

FTA believes that no discretionary points are available for performance above the standard because of a transit vehicle must meet these baseline requirements in order to meet its expected service life.

D.1.2 Safety Tests

The proposed scoring of the Safety Test is as shown in Table D–2. A total of 2.0 discretionary points are available. The Safety Test sub-categories are a collection of safety related bus characteristics that are currently examined in other test categories. Under the current rule, only the Lane Change

Stability Test is included in the Safety test category. The first proposed Safety test sub-category is Hazards. The performance standard for Hazards would require that all bus models have no Class 1 failures at the completion of the test that remained uncorrected. Bus models that satisfy this requirement would receive 10 points. The Stability performance standard would require that a bus model achieve a lane change speed of no less than 45 mph with the bus under control and all wheels on the ground throughout the maneuver. A bus that satisfies the stability standard would receive 2.5 points. There are three safety test sub-categories addressing the braking performance of a bus model. The first Braking performance standard would require the bus to stop from 45 mph in no greater than 158 feet. Bus models that require less than 158 feet to stop would receive 0.5 base points and up to an additional 2.0 prorated points if the bus stops in 80 feet or less. The average test result from this report would be used to award the score. The second Braking performance standard addresses the ability of a bus model to remain within a 12 foot road lane width during a split coefficient brake stop. A bus model that stays within the lane of travel during the stop would receive 2.5 points. The third Braking performance standard addresses the ability of the parking brake to hold the bus stationary on a 20-percent grade while facing uphill and downhill for 5 minutes each. Bus models that satisfy this requirement would be awarded 2.5 points.

D.1.3. Maintainability Test

The proposed scoring of the Maintainability Test is shown in Table D–2. A total of 16 points is available in this category. The maintainability performance standard would be set at no greater than 125 hours of unscheduled maintenance activity over the course of the test. All bus models that accumulate no more than 125 hours of unscheduled maintenance would receive 2.0 base points.

FTA believes that maintainability performance above the level set by the performance standard provides additional benefit to the transit industry. FTA is proposing that bus models that accumulate no unscheduled maintenance hours during the test would receive an additional 14 points. Test results between 125 and zero hours would receive an additional prorated amount of points between 0.0 and 14.0. For example, a bus that accumulated 25 hours would receive 13.2 points (2.0 + (125–25)/125)*14 = 13.2) and a bus that accumulated 100 hours would receive 4.8 points (2.0 + (125–100)/125)*14 = 4.8).

D.1.4. Reliability Test

The proposed scoring of the Reliability Test is shown in Table D–2. A total of eight points are available in this category. The proposed performance standard allows for accumulation of up to two uncorrected Class 2 failures at the completion of the test. All bus models that have two uncorrected Class 2 failures or fewer would receive 2.0 base points.

FTA believes that reliability performance above the level set by the performance standard provides additional benefit to the transit industry such as fewer road calls and service disruptions. As a result, FTA is proposing that if a bus model accumulated no Class 2 failures throughout the test it would receive an additional 6.0 points. A bus model that accumulates one uncorrected Class 2 failure would receive a total of 5.0 points (2.0 base points + 3.0 prorated points) by linearly prorating the points between two and zero failures.

D.1.5. Fuel Economy Test

The proposed scoring of the Fuel Economy Test is as shown in Table D–2. A total of 7.0 points is available in this category. The proposed scoring is a summation of the base score awarded for satisfying the applicable vocational vehicle fuel efficiency requirements from 49 CFR part 535 and the additional points awarded based on the results of the Bus Testing Program fuel economy test.

The fuel economy testing would consist of operating the new bus models on a chassis dynamometer over three different driving cycles (Manhattan, Orange County Bus Cycle, and the Heavy-Duty Urban Dynamometer Driving Schedule (HD–UDDS)). The driving cycles were selected during the emissions test development process to simulate a range of transit bus operating routes.[25] All new bus models would be tested over these cycles regardless of their weight or passenger capacity. During the test, only the energy consumed to provide bus propulsion would be measured. The fuel efficiency impact of heating or cooling the bus interior, while potentially significant, would not be evaluated during the test as the test facility does not provide a controlled ambient environment in the dynamometer facility.

[25] West Virginia University, Center for Alternative Fuels, Engines & Emissions, *Transit Vehicle Emissions Program,* Dr. Scott Wayne, FTA Project No. WV–26–7008, May 2013.

The fuel economy testing accommodates a wide range of fuel sources and propulsion technologies. Transit buses historically have been produced in relatively low volumes totaling about 5,000 units of all types annually. Due to these low volumes, the majority of buses rely on the medium and heavy-duty truck powertrain and incomplete chassis vehicle supplier marketplace from which to source their bus propulsion systems. The current OEM powertrain market supplies complete gasoline and diesel powered cutaway chassis for body-on-frame buses. The OEMs also supply diesel and natural gas engines combined with traditional mechanical (automatic) and hybrid-electric transmissions with energy storage systems for the heavy-duty urban transit bus manufacturers. Additionally, there are third-party alternative fuel conversion suppliers that provide compressed natural gas (CNG) and liquefied petroleum gas (LPG (propane)) conversions of OEM gasoline cutaway chassis used by the bus manufacturers. Hybrid-electric and full electric conversions of OEM cutaway chassis are also available in the market. Heavy-duty bus OEMs are now developing and producing their own full electric and hydrogen fuel-cell electric powertrains in low volumes.

FTA used the Bus Testing Program fuel economy results from 2010 and newer bus models to establish the proposed fuel economy and fuel consumption scoring scales. The test results for the 2010 and newer bus models reflect the current state of bus propulsion technologies that are compliant with current EPA emissions laws and their impact on transit bus fuel economy. FTA is proposing four different scales to score the fuel economy results based on the bus model fuel type: liquid fuel (gasoline, diesel, propane and liquefied natural gas); CNG; hydrogen; and electric. For each proposed scale, the minimum was based on the measured or estimated fuel economy/fuel consumption of the largest transit buses—that is, a 60-foot long articulated bus, for each fuel type category. The scale maximum of each fuel scoring category was based on actual or estimated maximum results for each fuel type category with an additional margin to allow for future improvements in fuel efficiency. In formulating the proposed fuel economy scoring system, FTA focused on the intended purpose of providing information for bus model procurement decisions and fleet-level decisions about fueling infrastructure investments and bus operations.

Commonly, bus procurement solicitations already specify the length, the passenger capacity, and the fuel type. It is unlikely that transit agencies would be comparing bus testing fuel economy results for buses of different fuel types and significantly different passenger capacities when reviewing bids. Bus fleet strategy parameters such as bus design type (heavy-duty urban, cutaway, or paratransit), passenger capacity, and bus fuel type are usually decided prior to issuing a bus procurement request for proposal (RFP). Once the desired fuel has been decided, minimization of the overall fuel cost is the objective. However, this cost includes several variables including the unit price of the fuel, the amortized cost of any fuel specific fueling infrastructure, and the fuel efficiency of the bus models over its intended transit routes. Of these considerations, only the fuel efficiency of the bus is addressed by the Bus Testing Program, as fuel prices—including alternative fuels and electricity—are subject to market forces. Fueling infrastructure requirements vary by the type of fuel used, the size of the bus fleet, and the characteristics of the bus routes. Due to the existence of these and many other variables that affect fuel operating costs FTA believes it is not critical to use an identical measure to score the fuel economy of the four fuel types.

FTA considered other fuel economy scoring systems recommended by the bus manufacturers and their powertrain suppliers. FTA considered a universal energy efficiency scoring scale like British Thermal Units (BTUs) per mile or diesel miles per gallon equivalent, etc. This type of scale was rejected as it does not take into account the other variables related to fuel cost (*e.g.,* regional pricing differences, availability of fueling infrastructure, etc.), the change in relative efficiency between fuel types when operating in extreme climates, particularly in cold climates, and due to the significantly greater efficiency of electric buses, the resulting loss in granularity of the scale would greatly minimize the difference in score between bus models of similar size and fuel type, which defeats the objective of the program. We also considered a passenger miles per gallon or equivalent fuel consumption version of this metric. This type of metric was rejected as it assumes that buses are always operating with a full passenger load, that it would show that larger buses are more efficient even though they consume more fuel, which is counter-intuitive to consumers. FTA believes this metric could motivate bus manufacturers to over-maximize the passenger capacity of their bus model submitted for testing. This metric would also penalize bus models submitted for testing that employed a seating layout that was optimized for passengers who use wheelchairs, as the resulting total passenger capacity would be lower than that of the same bus model optimized for seated or standing passengers. FTA considered a ton-miles per gallon metric but this was rejected as it again would indicate that heavier buses are more efficient even though they consume more fuel. Lastly, FTA considered the merits of establishing multiple scoring scales based on bus size or bus passenger capacity. This approach could further increase the granularity of the scoring, highlighting differences between similar bus models. However, this type of scoring system was rejected due to concerns about manufacturers artificially manipulating the characteristics of the test bus to gain entry into the category that had most advantageous scoring system.

The proposed base score for satisfying the performance standard is 1.0 point. The remaining 6.0 points would be determined based on one of the applicable scales for the dominant fuel type of the bus model. For liquid-fueled buses, the average miles per gallon measured would be scored from the range of 1 mile per gallon (MPG) to a maximum of 13 MPG. All bus models that average 1 MPG or less would be awarded the base points. Bus models that average 13 MPG or more would be awarded an additional 6.0 points. Test results between 1 and 13 MPG would be awarded a prorated score between 0.0 and 6.0.

All CNG-fueled bus models that consume an average of 50 standard cubic feet per mile (SCF/mile) or more would receive the base score. An additional 6.0 points would be awarded for a test result of 10 SCF/mile or less. (Note: since the SCF/mile metric is a consumption metric, numerically lower values of SCF/mile would indicate greater efficiency). Test results between 50 and 10 SCF/mile would receive an additional amount of points prorated between 0.0 and 6.0.

All hydrogen-fueled bus models that consume an average of 98 standard cubic feet per mile (SCF/mile) or more during the test would receive the base score. An additional 6.0 points would be awarded for a test result of 15 SCF/mile or less. Test results between 98 and 15 SCF/mile would receive an additional amount of points prorated between 0.0 and 6.0. The hydrogen scoring scale was developed by a relative comparison of the measured performance of hydrogen fuel-cell powered 40-foot buses during National Fuel Cell Bus Program demonstrations and scaling the results for a 60-foot bus model.

Bus models whose primary source of power is electricity would be scored based on the consumption metric of kiloWatt-hours per mile (kW-hr/mile). Test results of 3 kW-hr/mile or greater would receive the base score. Averaged test results of 1 kW-hr/mile or less would be awarded an additional 6.0. (Note: Since the kW-hr/mile metric is a energy consumption metric, not a fuel economy metric, numerically lower values of kW-hr/mile indicate greater efficiency). Test results between 3 and 1 kW-hr/mile would receive an additional score prorated from 0.0 to 6.0.

D.1.6. Emissions Tests

The proposed scoring of the Emissions test results is shown in Table D.-2. A total of seven points would be available in this category. The proposed scoring is based on a combination of satisfying the emissions performance standard and the test results for six measured emission products averaged over the Manhattan, Orange County, and HD–UDDS transit bus driving test cycles. A base score of 1.0 point would be awarded to each new bus model that meets all applicable EPA exhaust emissions standards. The remaining six points available are distributed among the six exhaust emission categories measured during the transit specific Bus Testing Program emissions test with 4.0 points available in the carbon dioxide (CO2) category and 0.4 points available in each of the five other categories of carbon monoxide (CO), total hydrocarbon (THC), non-methane hydrocarbon (NMHC), nitrogen oxides (NOx), and particulate matter (PM). The CO2 category was assigned 10 times the available points of the other categories due to the fact that, while it is now regulated by the EPA, the gross amount of these emissions is significantly greater than the others and CO2 emissions vary among similar size bus models based on their fuel type and propulsion technology. FTA would like to highlight the difference in CO2 emissions between bus models.

The scoring scale for each category of exhaust emissions was developed from the test results of the 49 bus models tested since 2010. These bus models represent the current state of production bus emissions performance. The results for all current bus models would fall within the range of the performance bounds proposed. Bus Models with overall test results for CO2 emissions of 4,000 grams per mile or greater would

receive the base score and an averaged test result of zero grams per mile will be awarded an additional 4.0 points. Averaged test results between 4,000 and 0 grams per mile would receive an additional amount of points prorated between 0.0 and 4.0. Test results for carbon monoxide emissions of 20 grams per mile or greater would receive the base score and an averaged test result of zero grams per mile would be awarded an additional 0.4 points. Averaged test results between 20 and 0 grams per mile would receive an additional amount of points prorated between 0.0 and 0.4.

Test results for total hydrocarbon emissions of 3 grams per mile or greater would receive the base score and an averaged test result of zero grams per mile would be awarded an additional 0.4 points. Averaged test results between 3 and 0 grams per mile would receive an additional amount of points prorated between 0.0 and 0.4.

Test results for non-methane hydrocarbon emissions of 3 grams per mile would receive the base score and an averaged test result of zero grams per mile would be awarded an additional 0.4 points. Averaged test results between 3 and 0 grams per mile would receive an additional amount of points prorated between 0.0 and 0.4.

Test results for oxides of nitrogen emissions of 2 grams per mile or greater would receive the base score and an averaged test result of zero grams per mile would be awarded an additional 0.4 points. Averaged test results between 2 and 0 grams per mile would receive an additional amount of points prorated between 0.0 and 0.4.

Test results for particulate emissions of 0.1 grams per mile or greater would receive the base score and an averaged test result of zero grams per mile would be awarded an additional 0.4 points. Averaged test results between 0.1 and 0 grams per mile would receive an additional amount of points prorated between 0.0 and 0.4.

D.1.7. Noise Tests

The proposed scoring of the Noise Test results is as shown in Table D–2. The Noise Test category would be worth a total of 7 points with 3.5 points assigned to interior noise level and 3.5 points to the exterior noise level. Both noise performance standards address the noise levels produced by the bus while accelerating from 0 to 35 mph at its maximum rate. Test results for interior noise at or below the performance standard threshold of 80 decibels would receive 0.5 base points and test result of 30 decibels would be awarded an additional 3.0 points. Test results between 80 and 30 decibels would receive an additional amount of points prorated between 0.0 and 3.0. Test results for exterior noise at the performance standard threshold of 83 decibels would receive 0.5 base points and test result of 50 decibels would be awarded an additional 3.0 points. Test results between 83 and 50 decibels would receive an additional amount of points prorated between 0.0 and 3.0.

D.1.8. Performance Tests

The proposed scoring of the three Performance Tests is as shown in Table D.2. A total of five points would be available in this test category. The first sub-category tests the acceleration from 0–30 mph. A bus that accelerates to 30 mph in no greater than 18 seconds would satisfy the performance standard and receive 1.5 points. The maximum sustained speed on a 2.5 percent grade is the next sub-category. A bus model that is determined to be capable of sustaining no less than 40 mph on a 2.5 percent grade would satisfy the standard and receive 1.5 points. The maximum sustained speed on a 10 percent grade is the next sub-category. A bus model that is determined to be capable of sustaining no less than 10 mph on a 10 percent grade would satisfy the standard and receive 2.0 points. No discretionary points were assigned to this test category. FTA believes that performance in this category above the proposed performance standards is not necessarily beneficial to all transit agencies.

D.2. Calculation of the Aggregate Score

The aggregate score would be the summation of all of the individual test sub-category scores. The raw aggregate score would be rounded to the nearest whole number by rounding down when the first digit to the right of the decimal point is below 5 and rounding up when the first digit to the right of the decimal point is 5 or greater. Table D–3 presents the scoring for two bus models within the study group, report numbers PTI–BT–1007 and PTI–BT–1108. Both buses are 40-foot heavy-duty diesel-hybrid electric bus models with a 12-year service life.

TABLE D-3: Test Results Scoring of Two Bus Models

Test Category		Performance Standard	Report No. PTI-BT-1007		Report No. PTI-BT-1108	
			Performance Standard Met	Result / Points Awarded	Performance Standard Met	Result / Points Awarded
Structural Integrity	Shakedown	Maximum permanent chassis deflection ≤ 0.006 inch after 3 load cycles	Met		Met	
	Distortion	All exits remain operational under each distortion loading condition	Met		Met	
	Static Towing	No significant deformation under 120% curb weight load	Met		Met	
	Dynamic Towing	Bus is towable with standard wrecker	Met		Met	
	Jacking	Bus is liftable with a standard jack	Met		Met	
	Hoisting	Bus stable on jacks	Met		Met	
	Durability	No uncorrected frame & body structure failures remaining at completion of test	Met		Met	
		No uncorrected powertrain failures remaining at completion of test	Met		Not Met	
Safety	Hazards	No uncorrected Class 1 reliability failures remaining at test completion	Met		Met	
	Stability	Lane change speed no less than 45 mph	Met		Met	
	Braking	Stopping distance from 45 mph within 158 feet as per FMVSS 105 & FMVSS 121	Met	143.19 ft 0.38	NA-Bus Could not achieve 45 mph	NA 0.00
		Bus remains within lane during split coefficient brake stops	Met		Met	
		Parking brake holds on 20% grade	Met		Met	
Maintainability		Accumulation of no more than 125 hours of unscheduled maintenance	Met	25 11.20	Not Met	180 0.00
Reliability		No more than 2 uncorrected Class 2 failures remaining at completion of test	Met	0 6.00	Met	2 0.00

TABLE D-3: Test Results Scoring of Two Bus Models (Cont'd) Test Category	Performance Standard	Test Results Scoring Scale	Report No. PTI-BT-1007		Report No. PTI-BT-1108	
			Performance Standard Met	Result Points Awarded	Performance Standard Met	Result Points Awarded
Fuel Economy	Compliant with 49 CFR Part 535 MEDIUM- AND HEAVY-DUTY VEHICLE FUEL EFFICIENCY PROGRAM- *Heavy-Duty Vocational Vehicle Fuel Consumption Standards*	Liquid Fuels: 1-13 mpg/ 0.0-6.0 points	NA- Met	4.71 avg	NA-Met	3.15 avg
				1.86		1.08
		Compressed Natural Gas 50-10 SCF/mi/ 0.0-6.0 points				
		Hydrogen 98-15 SCF/mi/ 0.0-6.0 points				
		Electric 3-1 kW-hr/mi/0.0-6.0 points				
Emissions	40 CFR Part 86 CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES Or 40 CFR Part 1037 CONTROL OF EMISSIONS FROM NEW HEAVY-DUTY MOTOR VEHICLES	Carbon Dioxide (CO_2) Grams/mi: 4000-0/ 0.0-4.0 points	Met	2063 avg	Met	3251 avg
				1.94		0.75
		Carbon Monoxide (CO) Grams/mi: 20- 0/ 0.0-0.4 points		0.15 avg		1.97 avg
				0.40		0.36
		Total Hydrocarbon (THC) Grams/mi: 3- 0/ 0.0-0.4 points		0.01 avg		0.10 avg
				0.40		0.39
		Non-Methane Hydrocarbon (NMHC) Grams/mi: 3- 0/ 0.0-0.4 points		0.01 avg		0.10 avg
				0.40		0.39
		Nitrogen Oxides (NOx) Grams/mi: 2-0/ 0.0-0.4 points		0.74 avg		14.25 avg
				0.25		0.00
		Particulate Matter (PM)		0.006 avg		0.02 avg

		Grams/mi: 0.1-0 / 0.0-0.4 points		0.38		0.32
Test Category	Performance Standard	Test Results Scoring Scale	Report No. PTI-BT-1007		Report No. PTI-BT-1108	
			Performance Standard Met	Result / Points Awarded	Performance Standard Met	Result / Points Awarded
Interior Noise	No greater than 80 decibels (dB)	80-30 dB/0.0-3.0 points	Met	77.2 dB / 0.17	Met	71.2 dB / 0.53
Exterior Noise	No greater than 83 decibels (dB)	83-50 dB/0.0-3.0 points	Met	65.8 dB / 1.56	Met	62.9 dB / 1.83
Accel-eration	0-30 mph ≤ 18 seconds		Met		Met	
Grade-ability	Speed on 2.5% ≥ 40mph		Met		Met	
	Speed on 10% ≥ 10mph		Met		Not met	
Are all performance standards met?			Yes		No	
Overall Result			Pass		Fail	
Scoring Subtotals			60	24.9		
Aggregate Score			85		Fail	

E. Pass/Fail Standard

In order to allow an amount of discretionary points available that provides meaningful dispersion of test scores and to maintain the test category scoring weights consistent with the relative importance between test categories, FTA proposes a pass/fail standard of 60 points. Under the proposed Bus Model Scoring System, a total of 60 points is achieved when a bus model meets, but does not anywhere exceed, the minimum requirements of each of the performance standards.

With regard to the testing at issue in this rulemaking, in order for a bus to be eligible for FTA funding, MAP–21 now requires that it meet two criteria. First, under paragraph 5318(e)(1), FTA funding is allowed only if the ''bus . . . met . . . performance standards for maintainability, reliability, performance (including braking performance), structural integrity, fuel economy, emissions, and noise, as established by the Secretary by rule.'' That is, a bus would be required to at least meet the minimum standards proposed in today's NPRM. Second, under paragraph 5318(e)(2), the bus also would need to pass the proposed ''Bus Model Scoring System'' based on the bus' aggregate score. With the proposed pass/fail standard, FTA is choosing to link those two requirements. Without the two requirements being linked, FTA believes it would not be possible to establish a pass/fail standard that requires some level of performance above the minimum levels established by the performance standards. However, FTA seeks comment on whether or not there are alternatives to this approach. Additionally, FTA proposes that, to eliminate confusion for recipients, a bus model that fails to satisfy one or more performance standards would not be issued an overall score until the failures are resolved. This is necessary to prevent the situation where a bus model fails an essential performance standard but scored very high in one or more other categories, potentially elevating the aggregate score above 60.

E.1. Effective Date of Pass/Fail Requirements

The performance standards, Bus Model Scoring System, and pass/fail standard would become effective ninety days after the final rule is published and would apply to both new bus models and previously tested bus models subsequently produced with major changes that require partial testing. The date of the signed contract for testing would determine the applicability of the new rule to a bus model.

E.2. Resolving the Failure To Meet a Performance Standard

When a new bus model undergoing testing fails to meet any one of the minimum performance standards, testing would be halted, pending a review of the test result by the Bus Testing Facility operator, the FTA Bus Testing Program Manager, and the bus manufacturer. Except for the test categories of Structural Integrity Test, Maintainability Test, and Reliability Test, FTA proposes that for test results that achieve 95 percent or greater of the value set for the performance standard but fail to meet the standard, that the test would be conducted one additional time at no additional cost to the manufacturer. For failures to meet the performance standards in the Structural Integrity Test, Maintainability Test, and Reliability Test, FTA proposes that a manufacturer propose and implement a design remedy to directly address the failure and then repeat the test(s) necessary to validate the design remedy. The FTA Bus Testing Program would bear 80 percent of the costs associated with one re-test in these test categories. If the proposed bus modifications necessary to remedy a performance standard failure are considered a ''major'' change in configuration or component, additional testing may be required.

E.3. Scoring of New Partial Tests

Existing bus models that undergo major changes in configuration or component (as defined in 665.5) that would require partial testing after the effective date of this rule would be scored based on the results for the new tests conducted and on the older test results that did not need to be repeated. During the partial test determination process, FTA would review the existing test data for that bus model and may require the retesting in categories where the existing report indicates a failure to meet a performance standard, in addition to the test categories affected by the major change in configuration.

TABLE E–1—PARTIAL RETEST REQUIREMENTS EXAMPLE

Test category	Original Bus Report No. PTI-BT-1007	Partial Bus Report No. PTI-BT-1007-P
Structural Integrity		
Shakedown	Met	No Retest Required.
Distortion	Met	No Retest Required.
Static Towing	Met	No Retest Required.
Dynamic Towing	Met	No Retest Required.
Jacking	Met	No Retest Required.
Hoisting	Met	No Retest Required.
Durability	Met	No Retest Required.
Safety		
Hazards	Met	No Retest Required.
Stability	Met	No Retest Required.
Braking	Met	Retest.
Maintainability	Met	No Retest Required.
Reliability	Met	No Retest Required.
Fuel Economy	Met	Retest.
Emissions	Met	Retest.
Interior Noise	Met	Retest.
Exterior Noise	Met	Retest.
Acceleration	Met	No Retest Required.
Gradeability	Met	No Retest Required.
Are All Performance Standards Met?	Yes	Yes.
Overall Results	Pass	Pass.
Scoring Subtotals	24.9	25.4.
Aggregate Score	85	85.

E.4. Scoring of Existing Bus Models

Due to the administrative and financial burden of retesting all existing transit buses under the testing program proposed in today's NPRM, FTA proposes that buses with a valid test report conducted under the current testing program would remain eligible for FTA financial assistance until the bus undergoes a major change in component or configuration, because a major change in the configuration or a component might invalidate the data contained in its test report that was based upon a particular component (*e.g.* engine) or configuration (*e.g.,* front- vs. rear-mounted engine). A major change is currently defined by the Bus Testing Program rule (49 CFR 665) as:

(1) *Major change in chassis design* means, for vehicles manufactured on a third-party chassis, a change in frame structure, material or configuration, or a change in chassis suspension type;

(2) *Major change in components* means:

(a) For those vehicles that are not manufactured on a third-party chassis, a change in a vehicle's engine, axle, transmission, suspension, or steering components;

(b) For those that are manufactured on a third-party chassis, a change in the vehicle's chassis from one major design to another;

(3) *Major change in configuration* means a change that is expected to have a significant impact on vehicle handling and stability or structural integrity.

For the benefit of purchasers, FTA proposes that the data from existing test reports would be evaluated using the new criteria to calculate an aggregate score, with the resulting amended test report reflecting the vehicle's performance using the new criteria, along with new scores for any additional partial tests that conform with the new criteria. The amended report would apply the scoring system

adopted in the final rule and generate an aggregate score for the applicable performance standards.

E.5. Re-Testing of Existing Bus Models To Raise the Overall Score

FTA would approve the execution of one partial test of an existing bus model that has undergone non-major changes (*e.g.,* adjusting engine or transmission control software in order to improve mileage, replacing wall insulation in order to further reduce interior noise) in anticipation of achieving a higher aggregate score. Existing bus models that undergo major configuration changes would continue to be eligible for partial testing. If a bus fails to obtain a passing score, the vehicle is ineligible to participate in FTA-assisted procurements.

F. Other Proposed Program Changes

F.1. Bus Payloading Procedures

There are three bus loading conditions currently employed during the testing process. Portions of the Durability Test are performed at curb weight (CW = bus weight including maximum fuel, oil, and coolant; but without passengers or driver), seated load weight (SLW = 150 pounds load in each passenger seat and 600 pounds per wheelchair position), and at gross vehicle weight (GVW = seated load weight plus 150 pounds for every 1.5 square feet of free floor space). Under the current Bus Testing Rule, loading to GVW is performed even if the gross vehicle weight rating (GVWR) or the axle weight ratings (GAWR) have been exceeded. While this loading procedure is a good approximation of the potential peak passenger loads in actual transit service, it creates some negative impacts that are difficult to resolve. For instance, not all buses are designed for transporting standing passengers and those that are not designed for standees could be loaded beyond the ratings of the chassis components. Thus, analysis of durability and reliability failures during the test will be confounded by the overloading, and the bus model's ability to satisfy the performance standards at its rated load is unknown. Additionally, a bus model's compliance with FMVSS in an overloaded condition is also unknown, as bus chassis and chassis component warranties are contingent upon their usage within their weight ratings.

Therefore, we propose to modify the existing test to only load the bus up to its maximum weight rating, in contrast to the current procedure of loading the vehicle with a full complement of seated and standing passengers, even if this would exceed the vehicle's weight rating. By testing within the rated passenger capacity of the bus model, all manufacturers would be treated equally as they would be specifying the capacity of their bus models. Under the proposed performance standards, FTA would require that Durability and Class 2 Reliability failures be remedied by the end of the test. Vehicle manufacturers should be aware that chassis and chassis component suppliers might not offer any remedies to these failures if they believe that overloading is causing the failure.

FTA proposes the following changes to the bus payloading procedure:

(1) Manufacturers are to specify, on the interior bulkhead of the bus, the maximum number of standee passengers their bus model is designed to carry.

(2) The maximum number of standee passenger loadings would be based on 150 pounds and 1.5 square feet of free floor space per standee passenger.

(3) Free floor space would exclude the designated areas for wheelchair passengers, ingress/egress areas, area under seats, area occupied by feet of seated passengers, and the vestibule area.

(4) Seated Load Weight (SLW) would be 150 pounds for every passenger seat, the driver's position, 600 pounds per wheelchair position, plus the curb weight of the bus.

(5) Gross Weight (GW) would be SLW plus the total standee weight (product of 150 pounds * maximum (rated) number of standees).

The ability of a bus model to carry its full complement of seated, wheelchair, and standee passengers would be assessed by measuring the weight at each wheel position with the bus loaded to GW and comparing to the GVWR, the GAWRs, and the maximum wheel and tire load ratings. Buses that exceed any of their ratings when loaded to GW would not be tested until the passenger rating is within the rated weight capacity of the bus. FTA seeks comment on these proposed changes.

FTA is also proposing changing the definition of *Curb Weight* in the 665.5 of the rule from ''*Curb weight* means the weight of the empty, ready-to-operate bus plus driver and fuel.'' to ''*Curb weight* means the bus weight including maximum fuel, oil, and coolant; but without passengers or driver.'' so that it is the same as used in the current Bus Testing Program procedures and consistent with automotive industry practice. This change results in no new costs as the current practice remains the same.

F.2. Elimination of On-Road Fuel Economy Testing

FTA proposes that the Fuel Economy Test only be performed on the chassis dynamometer in conjunction with the emissions testing. The bus testing facility operator has been measuring fuel economy performance on both the test track and on the chassis dynamometer since the emission testing capability became available in 2010. A chassis dynamometer is a device used to replicate the motion resisting forces that act on a vehicle when it is driven. A chassis dynamometer consists of a large diameter drum, a drive system, and a control system. The drum is mounted indoors in the floor of the emissions test laboratory. The bus drive wheels are placed directly onto the top of the drum and the bus is physically restrained in place with chains and ratcheting straps. During the fuel economy/emissions testing the bus is driven at the speeds prescribed by each test duty cycle. The dynamometer applies a resistive load as it spins that replicates the total motion resistance the bus would experience if it was actually on a road.

While the duty cycles used in the dynamometer-based emission testing are not the same as those used during the on-road testing, they have proven to be comparable. The on-road (test track) fuel economy test determines fuel economy over three different duty cycles:

1. ''Central Business District (CBD)'' phase of 2 miles with 7 stops per mile and a top speed of 20 mph;

2. ''Arterial'' phase of 2 miles with 2 stops per mile and a top speed of 40 mph;

3. ''Commuter'' phase of 4 miles with 1 stop and a maximum speed of 40 mph.

The dynamometer fuel economy test is also conducted over three different duty cycles:

1. ''Manhattan'' phase of 2 miles with 9.5 stops per mile and a top speed of 25 mph;

2. ''Orange County Bus Cycle'' phase of 6 miles with 5 stops per mile and a top speed of 41 mph;

3. ''HD–UDDS'' phase of 5 miles with 2 stops per mile and a max speed of 58 mph. The CBD and the Manhattan cycles represent urban bus operation, the Arterial and the Orange County Bus Cycle represent suburban or express operation, and the Commuter and HD–UDDS cycles represent commuter type bus operations. While the test results for the same bus model will not be same for both urban, suburban, and commuter tests (on-track vs. dyno), the rank order relationships of the resulting fuel efficiencies has proven to be the same with the urban having the lowest and

the commuter having the highest. There is no compelling need for the dyno test cycles to be exactly the same as the on-track testing. Maintaining three distinct test cycles for our transit consumers is the primary objective.

FTA believes that the test results from the dynamometer test would be more accurate and more consistent than the on-road results, since the variables of wind and ambient temperature range are minimized or eliminated. The Manhattan and the Orange County Bus Cycle are real world measured duty cycles. The CBD, Arterial, and the Commuter are analytical representations of the real world that took into consideration the limitations of conducting the test on the test track. Elimination of the on-road fuel economy test would also reduce test program costs and shorten the length of the overall test schedule. FTA requests comments on this proposal.

F.3. Bus Passenger Load for Emissions Testing

The current Emissions test specifies a bus payload equal to two-thirds of the maximum seated passenger load. The origin of this requirement was from previous heavy vehicle exhaust emissions research.[26] FTA proposes that the Emission test be conducted at seated load weight (SLW), instead of two-thirds SLW, to enhance the efficiency of the testing process. In this way time and labor costs are reduced for bringing the SLW down to two-thirds SLW. This change results in a 4–6 percent increase in the total test weight, thereby slightly reducing measured fuel economy and slightly increasing emissions. All of the other bus performance tests are conducted at SLW. Maintaining consistency with past emission research does not provide additional value to the Bus Testing Program. Additionally, the Bus Testing Program Emissions test is not used to determine regulatory compliance other than the proposed performance standards in this notice. The proposed Emission performance standards were formulated to allow for the slight increase in vehicle test weight that this change would impart. FTA requests comments on this proposal.

F.4. Bus Testing Entrance Requirements

Currently, an entity desiring to test a bus enters into a contract with the bus testing facility operator, without any pre-approval or pre-authorization from FTA. Therefore, FTA proposes new procedural requirements for a bus to enter the Bus Testing Program as follows: 1) Bus models submitted for testing must be from a transit vehicle manufacturer (TVM) whose Disadvantaged Business Enterprise (DBE) goals have been submitted to FTA, consistent with 49 CFR Part 26 *Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs.* 2) Test model buses also must comply with applicable NHTSA requirements in 49 CFR Part 566 *Manufacturer Identification;* 49 CFR Part 567 *Certification;* and 49 CFR Part 568 *Vehicle Manufactured in Two or More Stages—All Incomplete, Intermediate and Final-Stage Manufacturers of Vehicle Manufactured in Two or More Stages.*

In order to commence testing, FTA proposes that test model buses would also need to identify the maximum quantity of standee passengers, be capable of negotiating the Durability Test course at the requisite test speed under all conditions of loading (curb weight, seated load weight, and gross weight), and be capable of following the test duty cycles used for Fuel Economy and Emissions Test within the established test procedure standard for allowable speed deviation.

F.5. Buy America

Lastly, FTA is proposing that bus models submitted for testing satisfy the domestic content requirement of FTA's Buy America regulation (see 49 CFR 661.11, *Rolling Stock Procurements*). FTA believes this change would not be a significant impediment to commencing testing, as section 665.11 of the bus testing regulation already requires test models to be ''substantially fabricated and assembled using the techniques, tooling, and materials that will be used in production of subsequent uses of that model.'' This change would ensure that the buses and components tested would be similar, if not identical to, the vehicles ultimately manufactured for FTA recipients. FTA does not expect any change to the component costs because the test buses will be identical to the production models, however, FTA is seeking comment regarding component changes that might result in incremental costs to vehicle manufacturers.

F.6. Scheduling of Testing

Currently, the scheduling of a full test can be accomplished by going directly the facility operator and completing a bus testing contract and submitting other required documentation (*http://www.altoonabustest.com/schedule_testing*). Request for partial testing must go to the FTA Bus Testing Program Manager first for a determination of the set of tests necessary to bring the new bus model configuration into compliance with the rule with respect to its major changes in configuration. The bus manufacturer then submits the partial testing determination letter provided by FTA to the facility operator to schedule the partial test program.

FTA proposes that all requests for full or partial testing be submitted to the FTA Bus Testing Program Manager for review prior to scheduling a test with the Bus Testing Facility operator. All requests shall provide: A detailed description of the new bus model (or previously tested bus model incorporating major changes) to be tested; the service life category of the bus; engineering level documentation characterizing all major changes to the bus model, and documentation that demonstrates satisfaction of each one of the testing requirements outlined in paragraph 665.11(a). FTA would review the request and determine if the bus model is eligible for testing and which tests need to be performed. FTA would prepare a written response to the requester for use in scheduling the required testing with the Bus Testing Facility.

F.7. Test Requirements Review Milestone

FTA proposes the addition of a Test Requirements Review Milestone that examines the results from the initial check-in inspections of the bus (which occurs when the bus first arrives at the testing facility), passenger payloading results, and the results of initial testing operations. The purpose of this milestone is to verify that the bus matches the bus documented in the test request and has satisfied the program entrance criteria prior to the expenditure of FTA program funding on this bus model. The intent of this Test Requirements Review Milestone is to ensure that buses submitted to the Program are ready for testing. The review would be conducted during the expenditure of the 20 percent manufacturer fee and before the expenditure of the 80 percent Federal matching program funding. If the bus has met all of the requirements 49 CFR 665.11, testing of the bus model would continue.

F.8. Penalty for Unauthorized Maintenance and Modification

Unauthorized maintenance and repairs by bus manufacturer representatives, such as the replacement of vehicle parts or repairs that were not captured by the bus testing facility

[26] West Virginia University, Center for Alternative Fuels, Engines & Emissions, *Transit Vehicle Emissions Program,* Dr. Scott Wayne, FTA Project No. WV–26–7008, May 2013.

operator and recorded into the test report can lead to erroneous test results that are not reflective of the bus model in its documented configuration. To prevent this situation, FTA proposes that the Bus Testing Facility operator investigate each occurrence of unsupervised maintenance and repairs and determine the potential impact to the validity of the test results. Tests where the results may have been impacted would be repeated at the manufacturer's expense. Undocumented bus modifications can also lead to results that do not reflect accurately the performance capability of the documented configuration of the bus. FTA proposes that the facility operator perform all modifications on the test vehicle, consistent with the manufacturer's specifications, unless the operator determines that the nature of the modification is best performed by the manufacturer under the operator's supervision. Significant vehicle modifications performed after the test has started would first require review and approval by FTA. If the modification is determined to be a major change, some or all of the tests already completed may need to be repeated or extended. Additionally, the facility operator would halt testing after the occurrence of unapproved or unsupervised test vehicle modifications. The vehicle manufacturer would submit a new test request to FTA that addresses all the requirements in 49 CFR 665.11 to reenter the Bus Testing Program.

F.9 Testing of Remanufactured Buses

FTA is not proposing the application of the Bus Testing Program requirements to remanufactured bus models in this NPRM. However, FTA is seeking comments related to the testing and the appropriate service life expectations of remanufactured buses. Previously performed in-house by transit agencies or by their contractor as part of one's fleet maintenance, rebuilt (''remanufactured'') used transit buses are now being sold to FTA recipients by third-parties as an alternative to acquiring a newly-manufactured bus model. Bus testing requirements have never been applied to rebuilt or remanufactured buses (in-house or contracted) by the transit operators regardless of the level of configuration changes performed, as this was part of a transit agency's asset management obligations and the overall grant program risk was considered low. The availability of fully depreciated (service life requirement satisfied) used transit bus models with sound (at least perceived sound) structures at a low cost enables a potentially attractive value proposition to transit operators and enables a new business opportunity for bus rebuilders.

The current Bus Testing Program policy for new and used bus models is presented in Table F.9–1. Used buses and remanufactured bus models that retain their production design configuration are not subject to additional testing as long as the bus model already underwent a full test. Remanufactured bus models with a major change in configuration procured using procedures employed to acquiring new buses could be treated as ''new'' bus models and subject to testing. However, the regulation does not identify a service life requirement. For these reasons, FTA has not applied the program requirements to remanufactured bus models. However, FTA seeks external input regarding the expectations and requirements for remanufactured bus models.

Specifically, FTA seeks answers and comments to these questions:

1. What, if any, problems are recipients experiencing with remanufactured buses? For example, are remanufactured buses being prematurely retired compared to reasonable expectations and in light of the assumed reduced purchase cost? Do such buses need more maintenance than should be reasonably expected?

2. If recipients are experiencing problems with remanufactured buses, can the problems be addressed by subjecting the buses to FTA testing and scoring? If so, what standards should FTA use for testing?

3. What types of buses and how many are being remanufactured annually?

4. What actions are performed when remanufacturing a bus?

5. What are common entrance criteria for a used bus entering into the remanufacturing process? Mileage limits? Age? Usage history?

6. What structural inspection techniques are employed during the selection of candidate buses?

7. Should FTA apply Bus Testing requirements to all remanufactured buses or just the ones procured through a bus acquisition project?

8. What service life length should be applied to remanufactured buses?

9. Is a prorated service life requirement based on the ratio of the acquisition cost as compared to a similar new bus model appropriate?

10. What information is available for estimating the benefits and costs of testing requirements and a scoring system for remanufactured buses?

TABLE F.9–1—CURRENT BUS TESTING REQUIREMENTS FOR ALL BUS ACQUISITION PROJECTS SUBSIDIZED WITH FTA CAPITAL GRANTS

	Completely new bus model	Existing bus model with a ''major'' change	New and used bus models	Used bus model (remanufactured with no design changes)	Used bus model (remanufactured with a major change)
Required Testing	Full test (all test categories).	Partial test to address design changes. Durability test required only If the chassis or body structure was altered or structure is loaded beyond the load level of the original test.	No testing if the model has been through a full test already.		Meets the definition of a ''new bus model''. Full or partial testing is required. Durability test required only If the chassis or body structure was altered or structure is loaded beyond the load level of the original test.

TABLE F.9–1—CURRENT BUS TESTING REQUIREMENTS FOR ALL BUS ACQUISITION PROJECTS SUBSIDIZED WITH FTA CAPITAL GRANTS—Continued

	Completely new bus model	Existing bus model with a "major" change	New and used bus models	Used bus model (remanufactured with no design changes)	Used bus model (remanufactured with a major change)
Durability Test Length ..... Ex: A 12-year/500,000 mile service life bus will be tested the equivalent of 125,000 miles (25% of 500K). Actual durability test distance is 12,500 miles as the test track was designed to provide a 1 to 10 mile acceleration factor.).	25% of manufacturer designated or [1] minimum required service life distance, whichever is greater.				Undetermined.

G. Section By Section Analysis

Section 665.1 Purpose

FTA proposes to amend the purpose of the regulation to reflect a new pass/fail test and scoring system.

Section 665.3 Scope

FTA proposes no changes, as the requirements of this part continue to apply to recipients of Federal financial assistance under 49 U.S.C. Chapter 53.

Section 665.5 Definitions

FTA proposes changing the definition of *Curb Weight* from ''Curb weight means the weight of the empty, ready-to-operate bus plus driver and fuel.'' to ''*Curb weight* means the weight of the bus including maximum fuel, oil, and coolant; but without passengers or driver.''

FTA proposes changing the definition of *Gross Weight* from ''Gross weight, also gross vehicle weight, means the curb weight of the bus plus passengers simulated by adding 150 pounds of ballast to each seating position and 150 pounds for each standing position (assumed to be each 1.5 square feet of free floor space).'' to ''the seated load weight of the bus plus 150 pounds of ballast for each rated standee passenger, up to and including, the maximum rated standee passenger capacity identified on the bus interior bulkhead''.

FTA proposes changing the definition of *Seated Load Weight* from ''Seated load weight means the weight of the bus plus driver, fuel, and seated passengers simulated by adding 150 pounds of ballast to each seating position.'' to ''the curb weight of the bus plus seated passengers simulated by adding 150 pounds of ballast to each seating position and 600 pounds per wheelchair position.'' This 600 pound figure is based on the minimum load-bearing capacity for wheelchair lifts and ramps in the USDOT's accessible bus specifications at 49 CFR § 38.23(b)(1) and (c)(1).

Section 665.7 Certification of compliance

FTA proposes to amend this section to reflect that the recipient must certify that a bus has received a passing test score, but acknowledges that parties may seek assistance from FTA, consistent with FTA's role in reviewing partial testing requests as described in section 661.11(d). FTA is also removing the term ''Grantee'' from the section heading and throughout this part, as FTA now uses the term ''recipient.''

Section 665.11 Testing requirements

FTA proposes additional requirements for a bus to enter the Bus Testing Program. New bus models submitted for testing would be from a Transit Vehicle Manufacturer that has submitted its DBE goals to FTA consistent with 49 CFR part 26. Test model buses would also comply with applicable requirements in 49 CFR part 566 *Manufacturer Identification*; 49 CFR part 567 *Certification*; and 49 CFR part 568 *Vehicle Manufactured in Two or More Stages—All Incomplete, Intermediate and Final-Stage Manufacturers of Vehicle Manufactured in Two or More Stages.* Bus models would also need to have the maximum rated quantity of standee passengers identified on the interior bulkhead in 2 inch tall or greater characters, be capable of negotiating the Durability Test course at the requisite test speed under all conditions of loading (curb weight, SLW, and GVW), and be capable of following the test duty cycles used for Fuel Economy and Emissions Tests within the test procedure for allowable speed deviation. Lastly, bus models submitted would satisfy the domestic content requirements for rolling stock in 49 CFR part 661, *Buy America Requirements.*

Section 665.13 Test report and manufacturer certification

FTA proposes adding language to this section for a requirement for the Bus Testing Facility operator to score the test results using the performance standards and scoring system outlined in Appendix A of this part. FTA also proposes that the bus testing facility operator obtain approval of the Bus Testing Report by the bus manufacturer and by FTA prior to its release and publication. Finally, FTA proposes that the bus testing facility operator to make the test results available electronically to supplement the printed copies.

Section 665.21 Scheduling

FTA proposes that all requests for testing, including requests for full or partial testing, be submitted to the FTA Bus Testing Program Manager prior to scheduling with the Bus Testing Facility operator. All test requests would provide: a detailed description of the new bus model to be tested, the service life category of the bus, engineering level documentation characterizing all major changes to the bus model, and documentation that demonstrates satisfaction of each one of the testing requirements outlined in paragraph 665.11(a). FTA would review the test request and determine if the bus model is eligible for testing and which tests need to be performed. FTA would prepare a written response to the requester for use in scheduling the required testing with the Bus Testing Facility operator.

Section 665.23 Fees

FTA is proposing a requirement that the manufacturer's share of the test fee would be expended first during the testing procedure and that the bus testing facility operator would obtain approval from FTA prior to committing FTA program funds.

Section 665.25 Transportation of Vehicle

FTA is not proposing any changes.

Section 665.27 Procedures During Testing

FTA is proposing additional language for this section to require the Bus Testing Facility operator to inspect the bus model configuration upon arrival to compare it to that submitted in the test request; to compare the gross vehicle weight and gross axle weights to the ratings on the bus; to determine if the bus model can negotiate the test track and maintain proper test speed over the durability, fuel economy and emission drive cycles; and to provide these results to the bus manufacturer and FTA prior to conducting testing using FTA program funds.

FTA is also proposing additional language that requires the Bus Testing Facility operator to investigate each occurrence of unsupervised maintenance and assess the impact on the validity of the test results and to repeat any impacted test results at the manufacturer's expense. FTA proposes additional language to address modifications to bus models undergoing testing. Specifically, this section requires that the Bus Testing Facility operator perform or supervise and document the performance of bus modifications only after the modifications have been reviewed and approved by FTA. The language also states that testing would be halted after the occurrence of unsupervised bus modifications. The Bus Testing Facility operator would not continue testing until FTA has issued a testing determination regarding the modifications.

FTA proposes moving the test requirements from Appendix A into section 665.27 and assigning performance standards to each of the test categories as MAP–21 requires. FTA proposes amending the Performance Test category by removing the language regarding the Braking Performance Test and moving it into the Safety Test category. FTA also proposes adding the requirement for a review of the Class 1 failures documented in the Reliability Test category to the Safety Test category.

Appendix A to Part 665—Bus Model Scoring System and the Pass/Fail Standard

FTA proposes adding a bus model scoring system and Pass/Fail Standard to Appendix A of Part 665 to outline the requirements of the Bus Model Scoring System and the Pass/Fail Standard.

H. Regulatory Analyses And Notices

H.1. Executive Orders 13563 and 12866 and DOT Regulatory Policies and Procedures.

This rulemaking is a significant regulatory action within the meaning of Executive Orders 13563 and 12866, and FTA has determined that it is also significant under DOT regulatory policies and procedures because of substantial State, local government, congressional, and public interest. However, this rule is not ''economically significant,'' as defined in Executive Order 12866.

This section explains: the purpose of the Bus Testing Program, why we are proposing a pass/fail requirement with a point-based system and how that fits within our mission, the alternative scoring systems we considered, the logic that we employed in determining the weights assigned to the different test categories, our rationale for prioritizing use of the manufacturer's portion of the testing fee, and our analysis of the costs and benefits.

Purpose of the Bus Testing Program

The Bus Testing Program was originally created to provide transit agencies an independent source of bus performance results that could be used to inform their bus procurement decisions. Without the program, transit agencies would have to rely on either manufacturer supplied information, information supplied by third parties (FTA is not aware of third parties currently providing performance information about buses), information from their own pilot bus demonstrations potentially supplemented with specific engineering laboratory test procedures, or on the experiences from other agencies with a particular bus model. Without a centralized independent testing program, FTA believes the introduction of new bus models would be limited, as the perceived procurement risk would be high. As a result, successful bus adaptation to new transit requirements would be slowed considerably.

Once the Bus Testing Program was established, the availability of a test report was considered an adequate safeguard from catastrophic and systemic failures of portions of a bus fleet. For popular bus types where there are several competing bus models, FTA believes this assumption holds true. However, for less common bus types, where there are at times only one or two manufacturers capable of supplying, the risk of the new bus model may be overshadowed by the risk to an agency of not having a new replacement for the buses they are currently operating. The proposed Pass/Fail rule was designed prevent the risk of an inadequate bus model from being overshadowed by other priorities, such as financial resources available for new buses, vis a vis funds available for maintaining existing vehicles in a state of good repair.

Alternative Scoring Systems Considered

While reviewing and developing scoring systems to meet the MAP–21 requirements, FTA considered a number of alternatives. To begin, we considered the importance of the entirety of the safety tests within the existing Bus Testing Program. Noting how integral to the Bus Testing Program each of the testing categories were, we wanted to ensure that the buses that were tested, at the very least, met all of the minimum performance standards, regardless of the scoring system that we adopted. Stated differently, we resolved that the scoring system would have to preclude a bus model from passing the test solely by attaining additional points in other categories (while failing in one or more key categories), resulting in points greater than the threshold that we set for the pass/fail standard. We also wanted to ensure that whatever system we adopted would be relatively simple, straightforward, and easy to understand, and provide meaningful information to both transit agencies and manufacturers. As discussed below, using these principles, we assessed various systems that we could adopt or implement to meet the requirements of MAP–21.

We first considered various qualitative systems. We reviewed a ''five-tier'' based system, as used by other organizations. We liked the simplicity of the five-star system for grading buses that met the minimum requirement of passing all of the tests. While our review of various systems indicated that such qualitative systems are simple to implement, they can be very subjective. Moreover, the five-tier system did not capture the level of detail and differential information that we desired to convey to the transit industry and manufacturers. We also reviewed and considered an ''A to D'' based grading system. Again, while this would have resulted in a fairly simple and straightforward system, it did not convey the level of information or the level of detail that was our goal. Thus, we rejected these two qualitative systems. While they were simple, straightforward, and easy to understand, they did not meet our goal of providing meaningful information to transit agencies and manufacturers.

Next, we considered quantitative point-based systems with the minimum threshold requirement of passing all of the tests. We considered various scales. We rejected a 50-point based scale for lack of simplicity. We considered an 80-point scale (10 points for each test category) and rejected it because it did not capture the relative importance or weighting of the categories. We also considered various levels for the pass/fail threshold for each of the scales. Finally, we settled on a 100-point scale due to its universality. FTA initially considered a minimum passing score of 40 points, believing the 60 discretionary points would provide purchasers with a greater range with which to evaluate different vehicles, but given the grading systems used in schools and other applications, FTA established a minimum passing threshold of 60 points with 40 discretionary points. This quantitative scale with the minimum threshold of passing all of the tests met all of our goals that the scoring system is relatively simple, straightforward, and easy to understand, and will provide meaningful information to transit agencies and manufacturers.

Logic Used to Determine Weighting for Tests and Sub-Tests

After deciding to propose a 100-point scale for the Bus Testing Program, we had to weigh the importance of each of the test categories within the Bus Testing Program. After much deliberation and consultation, we determined that the Structural Integrity and Safety Tests were the most important components of the Bus Testing Program, as both were critical to the operation of the vehicle while on the road. Therefore, we allotted 50 of the total 100 points to these two tests. Between the two tests, we determined that, while both were important, the Structural Integrity Test was more important than the Safety Test, based on its greater importance in evaluating a vehicle's construction and design. Hence, we assigned 60 percent of the points for these tests to the Structural Integrity Test and the remaining 40 percent to the Safety Test.

Within the Structural Integrity Test are seven sub-tests categories, of which six are pass/fail tests. Thus, we allotted one point each for the Shakedown, Distortion, Static Towing, Dynamic Towing, Hydraulic Jacking, and Hoisting Tests. The Durability Test, as the most important component of the Structural Integrity Test, received the remaining 24 points. Within these Durability Tests, we allocated body and power train failures equal accord and each category received 12 points based on their importance to daily operation.

For the Safety sub-tests, we determined that the Hazards Test was as important as the other two sub-tests within this category and allotted it one-half of the total 20 points. The Stability and Braking Tests have three component tests that require a pass/fail grading and one that is a performance based allocation. We valued each of these tests equally, based on their relative importance when evaluating a vehicle. Hence, we apportioned 25 percent of the remaining points to each test.

For the Maintainability and Reliability Tests, we assessed the Maintainability Test to be twice as important as the Reliability Test, but both tests to be as important as the remaining tests, as both directly affect a transit agency's operating costs. Maintainability reflects how much time and resources the transit agency should expect to budget over the course of a vehicle's service life to perform routine maintenance, and reliability reflects a vehicle's ability to meet its service life requirements without significant service disruptions caused by unscheduled maintenance. For ease of assigning points within the weightings, we allocated 24 points (or just less than one-half of the 50 points for the remaining tests) to these two tests. Hence, within our weighting scheme, the Maintainability Test received 16 percent of the total points and the Reliability Test received eight percent of the total points.

Assessing the remaining four tests, Fuel Economy, Emissions, Noise, and Performance Tests, we determined that each was about the same level of importance based on comments from transit agencies, but that two, Fuel Economy and Emissions Tests, were slightly more important in terms of helping a transit agency to budget for a vehicle's fuel consumption over its lifetime and in calculating the vehicle's incremental benefit towards meeting Clean Air Act requirements. Therefore, as opposed to assigning equal weighting to each of the remaining tests, we allocated slightly more weight to the Fuel Economy and Emissions Tests than the Noise and Performance Tests. This resulted in a point allocation of seven points or 27 percent of the remaining points for to the Fuel Economy and Emissions Tests and an average of six points or 23 percent of the remaining points for the Noise and Performance Tests.

The Fuel Economy Test allocates points on a performance basis determined by the output of the type of fuel. For the Emissions Tests, we apportioned one-half point for each of the five Emissions Tests that are already regulated by other Federal agencies and the remaining points for the Carbon Dioxide Test. This weighting for carbon dioxide captures the importance of alternative fuels with respect to greenhouse gases.

The Noise Test allocates points on a performance basis determined by the level of decibels produced. We weighted the Interior Noise and Exterior Noise Test equally (3.5 points each). As for the Performance Test, we weighted the bus model performance on a 2.5 percent grade and the performance during the acceleration test as being equally important and together being worth 60 percent of the five points available. The performance on a 10 percent grade was valued at 40 percent of the Performance test category.

Testing Fee Prioritization

In order to preclude buses that are not ready to complete the Bus Testing Program, the NPRM proposes to exhaust the manufacturer's 20 percent contribution for the total testing fee prior to employing funds from FTA's 80 percent contribution. This prioritizing of the manufacturers' portion of the test fee is purposed to incentivize manufacturers to ensure that the bus model submitted will, at a minimum, clear the initial check-in inspections, passenger payloading, and initial testing operations. FTA estimates that, depending on the bus model, nearly 20 percent of the testing fee should encompass the check-in process and threshold tests.

Based on previous testing experience, FTA determined that bus models that fail these preliminary activities will not perform well during subsequent tests. This proposed policy minimizes the cost to FTA from bus models submitted before they are ready for testing, thereby conserving Federal resources and ensuring that the proper incentive structures are in place. This will encourage manufacturers to ensure their product can withstand the rigors of bus testing. FTA would continue to pay the 80 percent Federal match for one retest and would contribute no Federal funds for a third test or subsequent tests required to pass the instant test.

Benefit-Cost Analysis

This section contains FTA's analysis of the benefits and costs of the proposed rule. FTA estimated the proposed rule's benefits and costs through two steps: First, FTA identified and analyzed the benefits and costs of the existing Bus Testing program (baseline). Second,

FTA identified and analyzed the expected benefits and costs of the proposed rule relative to the baseline. To determine the benefits and costs of the proposed rule, FTA reviewed the test data for all bus models that had been tested at the Bus Testing Facility between January 2010, when the Environmental Protection Agency's (EPA's) current Diesel Engine Emission Standards took effect (40 CFR part 86, as amended, 66 FR 5002, January 18, 2001), and February 2013, when this rulemaking commenced. The resulting diesel engine exhaust after-treatment systems used to satisfy the 2010 requirements potentially impacted the reliability, maintainability, fuel economy, emissions, and noise test results for a portion of the 49 buses. Additionally, there were OEM product updates to many of the medium-duty chassis used by the five, seven, and ten year service life buses that would affect test results in several test categories. A total of 49 buses had been tested over this period. FTA believes that the test results for these 49 bus models tested since 2010 provide the best available source of information for determining the cost of the proposed rule on future buses that would be tested (and the models they represent). All bus types and sizes are included in the group of 49, from accessible vans to 60-foot articulated bus models. Buses fueled by compressed natural gas (CNG), electricity, diesel, gasoline, and liquefied petroleum gas (LPG) were present within this group. To determine qualitative benefits, FTA also examined the test results and the transit experience with two bus models tested (prior to 2010) that failed to meet their service life requirements in transit service. FTA has placed the test results of the buses that it analyzed in the docket for this rulemaking.

A summary of the results of our cost analysis is presented in Table H–1. Eight categories of costs were identified, analyzed, and annualized:

1. *Cost of Required Bus Design Changes:* This category is the estimated annual cost of applying the design changes and components necessary to comply with all of the proposed performance standards to all affected bus models produced in one year.

2. *Lost Value of Test Buses:* This category estimates the depreciation cost of a bus subjected to the testing process. For each of the 49 buses models tested from 2010 through 2012, the full retail value was estimated by identifying a recent purchase value from the 2013 APTA Fleet Report and applying a depreciation factor of 50% to bus models that underwent a durability test and a factor of 20% for bus models that only underwent performance and other non-durability related tests.

3. *Shipping of Test Buses:* This category estimates the cost of shipping the test buses to the Bus Testing and Research Center and back to the manufacturer. The actual/estimated distance that each of the 49 bus models traveled was determined and was used for our calculations. Table H–0 presents this data.

TABLE H–0—DISTANCE TRAVELED TO AND FROM TEST CENTER

Report No.	Service life	Actual/estimated shipping distance to and from test center	Shipped via truck to and from test center
1001	7	490	
1002	7	490	
1003	12	549	
1004	7	490	
1005	7	1014	
1006	10	490	
1007	12	310	
1008	7	490	
1009	7	490	
1010	10	975	
1011	12	780	
1012	7	490	
1014	7	490	
1015	12	1400	
1016	12	1400	X
1017	4	490	
1101	12	1400	
1102	7	490	
1103	7	1112	
1104	10	490	
1105	7	1112	
1106	7	490	
1107	12	574	X
1108	12	482	
1109	12	2676	X
1110	10	490	
1111	7	490	
1112	7	490	
1113	7	430	
1114	7	490	
1115	4	1112	
1116	7	1112	
1117	12	310	
1118	12	1400	X
1120	7	490	
1201	7	490	
1202	12	310	
1203	7	430	

TABLE H–0—DISTANCE TRAVELED TO AND FROM TEST CENTER—Continued

Report No.	Service life	Actual/estimated shipping distance to and from test center	Shipped via truck to and from test center
1204	7	1112	
1205	12	1400	
1206	12	2676	X
1207	7	1112	
1208	7	430	
1210	7	1112	
1211	12	1400	
1212	7	955	
1213	12	482	
1214	7	1112	X
1215	4	490	

For 10-, 7-, 5-, and 4-year buses, a cost of $2.00 per mile was used to estimate the shipping cost. This cost is based on a recent shipment of a mid-sized bus on a truck. For heavy-duty 12-year diesel fueled buses, a cost of $1.61 per mile was used to cover the costs of driving the bus to the test center and back. The estimated fuel costs were calculated using the bus model's measured highway fuel economy and a fuel price of $3.00 per gallon was added. For heavy-duty buses powered by natural gas or electricity, a shipping cost of $4.00 per mile was applied. This cost represents the cost to ship these bus models on a truck.

4. *Parts Consumed:* This cost category is for the cost of parts consumed during the test. FTA seeks comments on the average cost of parts consumed during the test process as FTA had no data on which it could estimate those costs.

5. *On-Site Personnel:* This cost category is for the cost of maintaining manufacturer personnel on-site at the test center. For each test of a heavy-duty bus, the cost of a mechanic's labor ($20.35 an hour), lodging, and per diem at State College, PA for three full months. Manufacturer personnel are often on-site during the testing of heavy-duty bus models.

6. *Paperwork Burden:* This cost category covers the costs to manufacturers of providing mandatory information to the Bus Testing Program.

7. *Manufacturer Testing Fees:* This cost category covers the 20 percent testing fees that the manufacturers pay to have testing conducted.

8. *FTA Program Cost:* This cost category covers the funding provided by FTA to cover 80 percent of the costs associated with testing a bus model.

FTA estimates the costs of the existing Bus Testing Program are as follows: The maximum total annual program cost is $3,750,000 with 80 percent ($3,000,000) covered by FTA and 20 percent ($750,000) paid by transit vehicle manufacturers who submit a bus for testing. The current Paperwork Reduction Act reportable costs are $9,016. The estimated annual cost of on-site manufacturer personnel is estimated to be $76,673. The value of the parts consumed in the testing process is unknown. The annual estimated bus shipping costs for the current program is $63,743.

The estimated annual test bus depreciation cost is $1,591,714. The annual cost of bus design improvements as a result of the current program is assumed zero as there are no minimum performance standards requirements. For the purpose of this analysis, FTA assumes that manufacturers do not take remedial action to buses when defects are identified through testing. FTA also assumes that there are zero costs resulting from buses being designed or manufactured differently in response to the existing testing requirements. FTA seeks comments on both these assumptions.

To estimate the costs of the proposed rule, FTA first identified all of the bus models in the study group of 49 that would fail to meet the proposed standards. The most significant cost, of those FTA was able to estimate, was the cost of retesting to validate the remedies needed to achieve passing test results. The testing fees for the program are broken down by test and sub-test categories, with manufacturers charged fees only for the tests that must be conducted. The fee schedule for the current program is shown in Table H–3. Next, FTA determined the performance issues that need to be remedied and the tests that would need to be repeated. Then FTA estimated the costs for retesting, and in two cases, the cost of a potential remedy. FTA provides a summary of this analysis in Table H–4.

TABLE H-1: Summary of Cost Analysis Results (all values in $)

Item		Cost of Required Bus Design Changes	Lost Value of Test Buses	Shipping of Test Bus	Parts Consumed	On-Site Personnel test bus	Paper-work Burden	Manufacturer Testing Fees	FTA Program Cost
Baseline - Current Program		0	1,591,714	63,743	unknown	76,673	9,016	750,000	3,000,000
Proposed MAP-21 Minimum Performance Standards and Scoring Systems		unknown	0	2,209	unknown	5,103	767	33,362	133,448
Proposed Discretionary Program Changes		58,038	0	0	0	0	2,810	-15,328	-61,310
	Revised Bus Payloading Procedures	58,038	0	0	0	0	1,488	-74	-294
	Elimination of On-Road Fuel Economy Test	0	0	0	0	0	0	-16,000	-64,000
	Revised Bus Passenger Load for Emissions Testing	0	0	0	0	0	0	-118	-470
	Bus Testing Entrance Requirements	0	0	0	0	0	0	664	2,654
	Revisions to the Scheduling of Testing Requirements	0	0	0	0	0	1,322	0	0
	Test Requirements Review Milestone	0	0	0	0	0	0	0	0
	Penalty for Unauthorized Maintenance and Modification	0	0	0	0	0	0	200	800
Estimated Program Costs (Baseline and all Proposals)		unknown	1,591,714	65,952	unknown	81,776	12,593	768,034	3,072,138
								Total	5,592,207
								Baseline Total	5,483,036
								Incremental Program Cost	109,171

The results from this analysis indicate that annual costs would increase in several areas. The impact of the proposed performances standards to the FTA program cost is estimated to be $133,448. A total of $33,362 in additional manufacturer's fees would be collected from the additional tests. An additional paperwork burden of $767 would be incurred from the required failure analysis and remedy proposal process. An additional $5,103 would be expended for on-site personnel expenses incurred performing test bus modifications at the test site. An unknown amount of additional parts and components would be consumed during the retesting. FTA estimates that one of the eight failed buses would be returned to the manufacturer for systemic modifications incurring additional round-trip shipping expenses of $2,034. FTA believes that the retesting process will not depreciate the test bus an additional amount beyond the first test. In many cases the test bus may be worth more once the failure modes have been resolved and test buses have inherent remaining value in the future as testing mules. FTA is not able to quantify the additional cost of remedying buses in response to failing one or more performance standards. Nor is FTA able to estimate potential costs from design or manufacture changes made to buses to obtain higher testing scores. FTA seeks comments on the extent of such costs and requests information to develop estimates. However, FTA believes there are no additional costs to the program from implementing the proposed Bus Model Scoring System. The scores will be calculated automatically once the test results are finalized.

FTA also analyzed the costs of the discretionary program changes proposed in this NPRM. The proposed rule would modify two test procedures (payloading and emissions test payload) but does not impose any completely new testing procedures, and would eliminate the On-Road Fuel Economy Test procedure, thereby reducing the aggregate costs currently associated with the Bus Testing Program. For the revised bus payloading procedures, FTA estimates an annual decrease in the program cost of $294 and a decrease in testing fees of $74. These are a result of labor cost savings from loading the mid-sized buses with fewer or no simulated standee passengers. FTA estimates an increase in the annual paperwork burden of $1,488 from the increased manufacturer labor required to determine and report to FTA the total passenger capacity of new bus models submitted to the program. The only other cost identified with this proposal is the new requirement to add a placard on the interior bulkhead of the bus identifying the maximum standee passenger rating in 2 inch or taller letters. FTA estimates the annual cost impact to new bus models is $58,038. This cost analysis is presented in Table H–2.

TABLE H–2—COST OF STANDEE PASSENGER RATING PLACARD ($)

Standee Rating Placard (source: *www.edecals.com* using a 2.5 inch tall lettering stating "XX Standees Maximum") Labor rate assumes a category of "assembler and fabricator" from bls.gov	Estimated cost per decal (using a quantity of 500)	Labor rate (hr)	Labor amount to install (hr)	Estimated cost per bus	Total annual cost
annual cost for new production transit buses (5600 units a year)	8.99	13.74	0.10	10.36	58,038

TABLE H–3—CURRENT BUS TESTING PROGRAM COSTS AND FEES

Test	500,000 mi—12 year service life	350,000 mi—10 year service life	200,000 mi—7 year service life	150,000 mi—5 year service life	100,000 mi—4 year service life
Check-In	3,000	3,000	3,000	3,000	3,000
Inspect for Accessibility	1,500	1,500	1,500	1,500	1,500
Maintainability (scheduled and unscheduled)	Included in the durability test cost				
Selected Maintainability	4,500	4,500	4,500	4,500	4,500
Reliability	Included in the durability test cost				
Safety	3,000	3,000	3,000	3,000	3,000
Performance	3,000	3,000	3,000	3,000	3,000
Brake	3,100	3,100	3,100	3,100	3,100
Shakedown	6,000	6,000	6,000	6,000	6,000
Distortion	3,000	3,000	3,000	3,000	3,000
Static Towing	1,500	1,500	1,500	1,500	1,500
Dynamic Towing	1,500	1,500	1,500	1,500	1,500
Jacking	1,500	1,500	1,500	1,500	1,500
Hoisting	1,500	1,500	1,500	1,500	1,500
Structural Durability	117,890	85,270	55,760	40,060	25,970
Fuel Economy	6,000	6,000	6,000	6,000	6,000
Interior Noise	1,500	1,500	1,500	1,500	1,500
Exterior Noise	1,500	1,500	1,500	1,500	1,500
Emissions	44,000	44,000	44,000	44,000	44,000
Total for Full Testing (100%)	203,990	171,370	141,860	77,660	60,570
Manufacturer's Portion Fee (20%)	40,798	34,274	28,372	15,532	12,114

TABLE H–4—SUMMARY OF THE COSTS FOR RETESTING FAILED BUS MODELS

Bus (report number)	Failed test category	Cost of required bus design changes	Lost value of test buses	Shipping of test bus back to manufacturer for modifications and return to Altoona	Additional parts consumed	On-site personnel	Paper-work burden	Testing fees (20%)	FTA program cost
Cost of remedying and retesting bus models (2010–2013) that would fail a proposed performance standard ($)									
PTI–BT–1214	Structural durability.	unknown—upper body structure failing.	0	0	unknown	4,374	215	11,152	44,608
PTI–BT–1208	Structural durability.	unknown—body structure cracks.	0	0	unknown	4,374	215	11,152	44,608

TABLE H–4—SUMMARY OF THE COSTS FOR RETESTING FAILED BUS MODELS—Continued

Bus (report number)	Failed test category	Cost of required bus design changes	Lost value of test buses	Shipping of test bus back to manufacturer for modifications and return to Altoona	Additional parts consumed	On-site personnel	Paper-work burden	Testing fees (20%)	FTA program cost
PTI–BT–1110	Structural durability.	unknown—body to frame interface is cracking. Potentially need a new bus body mount design..	0	0	unknown	4,374	215	17,054	68,216
PTI–BT–1108	Powertrain durability.	unknown—multiple different powertrain failure modes need to be remedied.	0	2034	unknown	.....	710	23,578	94,312
	Maintainability	if powertrain durability failures are corrected this standard would be met as well.	0	0	unknown	.....	0	0	0
PTI–BT–1108	Performance	unknown—the maximum propulsion power delivered to the wheels needs to be increased.	0	0	unknown	.....	0	600	2,400
PTI–BT–1009	Powertrain durability.	unknown—multiple different powertrain failure modes need to be remedied.	0	0	unknown	2,187	215	11,152	44,608
PTI–BT–1107	Structural durability.	$130—radius rod mount was rewelded to correct manufacturing defect.	0	0	.....	.....	42	0	0
	Powertrain durability.	unknown—multiple different powertrain failure modes need to be remedied. Transmission cradle was the primary issue.	0	4,592	unknown	.....	380	23,578	94,312
	Performance	unknown—the maximum propulsion power delivered to the wheels needs to be increased.	0	.....	unknown	.....	42	600	2,400
	Safety-braking	additional test trials needed to achieve greater brake lining contact with brake rotors.	0	0	0	0	0	620	2,480
PTI–BT–1107	Maintainability	0—if the powertrain durability failures are corrected this standard would be met as well.	0	0	unknown	.....	0	0	0

TABLE H–4—SUMMARY OF THE COSTS FOR RETESTING FAILED BUS MODELS—Continued

Bus (report number)	Failed test category	Cost of required bus design changes	Lost value of test buses	Shipping of test bus back to manufacturer for modifications and return to Altoona	Additional parts consumed	On-site personnel	Paper-work burden	Testing fees (20%)	FTA program cost
PTI–BT–1006	Interior Noise	$211—this trolley bus exceeded the proposed interior noise standard by 4 dB at the driver's seating position. Commercially available (dynamat xtreme) sound dampening material applied to the floor and engine cover area would reduce the average noise level by 5 dB. 20 square feet of this material costs $170.00 retail and a two hours of mechanic labor (2 × 20.35 = 40.70) to install.	0	0	0	0	133	300	1,200
PTI–BT–1010	Interior Noise	$211—this trolley bus exceeded the proposed interior noise standard by 4 dB at the driver's seating position. Commercially available (dynamat xtreme) sound dampening material applied to the floor and engine cover area would reduce the average noise level by 5 dB. 20 square feet of this material costs $170.00 retail and a two hours of mechanic labor (2 × 20.35 = 40.70) to install..	0	0	0	0	133	300	1,200
	Total Cost ($)	unknown	0	6,626	0	15,309	2,300	100,086	400,344
	Annual Cost ($) ..	unknown	0	2,209	0	5,103	767	33,362	133,448

The annual cost savings of eliminating the on-road fuel economy test is $64,000 for the FTA program and $16,000 in manufacturer test fees. FTA estimated that 15 on-road fuel economy tests would be eliminated annually and the cost of the dynamometer based fuel economy test is already captured in the cost for the emissions test. One full electric bus is expected to be tested annually. Electric bus models do not need to undergo emissions testing. As a result, the cost for conducting one electric bus fuel economy test was not eliminated.

FTA is also proposing changing the bus passenger load for the emissions test from ⅔ seated load weight to full seated load weight. FTA estimates a cost reduction of $470 for the FTA program portion and $118 in reduced fees to the manufacturers. The cost savings is derived from eliminating the labor of unloading and reloading ⅓ of the seated passenger load as all of the other non-durability performance tests are conducted at full seated load.

The proposed program entrance requirements are expected to increase the annual FTA program costs by $2,654 and require $664 in additional manufacturer costs. The additional costs are a result of the proposed Buy America bus configuration inspections conducted at bus check-in. The details

of this cost analysis are outlined in Table H–5.

TABLE H–5—BUY AMERICA CONFIGURATION INSPECTION COST

Labor category	Hourly rate	Source	Total hours per bus	Cost
diesel auto service tech	20.35	bls.gov	4	81.40
technical writer	31.49	bls.gov	4	125.96
			Cost per bus	207.36
			Total annual cost (16 buses)	$3,318

The proposed revisions to the test scheduling process are expected to increase the annual paperwork burden to bus manufacturers by $1,322. The test entrance requirements review milestone is not expected to add any costs to the program as only FTA will be reviewing the results of the check-in process and determining the outcome of the milestone review.

Lastly, the annual cost of the proposed penalty for unauthorized maintenance and modification is estimated to be $800 for the FTA program cost portion and $200 in fees to the manufacturers. The costs were determined by amortizing the cost of test track upgrades for physical security and surveillance over a 10-year period.

A summary of the estimated annual benefits of the Bus Testing Program is presented in Table H–6. Seven categories of program benefits were identified and analyzed:

1. *Greater probability of meeting service life and reduced unscheduled maintenance:* This category estimates the annual benefits achieved by all of the NPRM proposals that potentially improve the probability new model bus models entering the fleet will satisfy their service life requirement and the benefits obtained through a reduction of unscheduled maintenance in actual service. While we provide a potential estimate of this benefit, we do not include it in our quantitative analysis, but note that this will most likely be a cost reduction (qualitative benefit) to the industry.

2. *Reduced safety risk:* This category estimates the benefits derived from the NPRM proposals that reduce the safety risk of new bus models entering transit service.

3. *Improved recipient awareness and accuracy of total bus passenger capacity:* This category of benefits examines the benefits obtained from determining and communicating the rated standee passenger capacity of a bus to recipients to inform their procurement process and their bus operations.

4. Improved recipient knowledge of Buy America and Bus Testing production configuration: This category improves knowledge of both Buy America and the Bus Testing provisions herein. We do not quantify these benefits.

5. *Increased confidence the delivered production buses will perform the same as the test bus:* This category examines the benefits of the proposals in increasing the understanding and confidence that the bus model a recipient procures and is delivered matches the bus tested with respect to its design configuration and major components. FTA requests comments on the extent recipients or the public is concerned that tested buses may not meet Buy America requirements.

6. *Faster comprehension of test results/scores and motivation for improved bus performance:* This category examines the benefits derived from the proposals to increase the speed and depth of comprehension of the bus testing results.

7. *Simplified test scheduling process and elimination of unnecessary testing:* This category examines the benefits of maintaining one point and process of program entry and the benefits of eliminating unnecessary testing.

FTA was unable to provide monetized benefits for many of the benefit categories. For many of the categories where FTA believes there are benefits but was unable to quantify, the result is identified as ''unknown''. For categories where FTA believes there is no benefit, the result was identified as ''0''. The benefits of a greater probability of bus models meeting their service life was quantified, but only to inform our qualitative assumptions. FTA seeks comments related to the benefits of categories with an ''unknown'' result.

Overall, FTA believes that the current program provides potential benefits in all of the seven categories identified when the information generated by the program is used in the procurement decision process. FTA is not aware of any means to determine these benefits, but FTA believes the proposed minimum performance standards will reduce safety risks, reduce unscheduled maintenance, and ensure a greater probability of a bus model meeting its expected service life.

TABLE H–6—SUMMARY OF THE ESTIMATED ANNUAL BENEFITS FOR ALL PROPOSALS

Item	Greater probability of meeting service life and reduced unscheduled maintenance	Reduced safety risk	Grantee awareness and accuracy of total bus passenger capacity	Improved grantee knowledge of Buy America and bus testing production configuration	Increased confidence the delivered production buses will perform the same as the text bus	Faster comprehension of test scores and motivation for improved bus performance	Simplified test scheduling and process & elimination of unnecessary testing
Baseline—Current Program.	unknown	unknown	unknown	unknown	unknown	unknown	unknown
Proposed MAP–21 Minimum Performance Standards.	Cost reduction	unknown	0	0	0	0	0
Proposed Scoring System.	unknown	unknown	0	0	0	unknown	0

TABLE H–6—SUMMARY OF THE ESTIMATED ANNUAL BENEFITS FOR ALL PROPOSALS—Continued

Item	Greater probability of meeting service life and reduced unscheduled maintenance	Reduced safety risk	Grantee awareness and accuracy of total bus passenger capacity	Improved grantee knowledge of Buy America and bus testing production configuration	Increased confidence the delivered production buses will perform the same as the text bus	Faster comprehension of test scores and motivation for improved bus performance	Simplified test scheduling and process & elimination of unnecessary testing
Proposed Discretionary Program Changes.	.....	.....	.....	.....	.....	.....	
Revised Bus Payloading Procedures.	unknown	unknown	unknown	0	0	0	0
Elimination of On-Road Fuel Economy Test.	0	0	0	0	unknown	0	Cost reduction
Revised Bus Passenger Load for Emissions Testing.	0	0	0	0	0	0	Cost reduction
Bus Testing Entrance Requirements.	0	unknown	unknown	unknown	unknown	0	unknown
Revisions to the Scheduling of Testing Requirements.	0	0	0	0	0	0	unknown
Test Requirements Review Milestone.	0	0	0	0	0	0	unknown
Penalty for Unauthorized Maintenance and Modification.	unknown	unknown	unknown	unknown	unknown	unknown	0
Estimated Program Benefit (Baseline and all Proposals).	Cost reduction	unknown	unknown	unknown	unknown	unknown	Cost reduction

TABLE H–7—BENEFITS ACHIEVED FROM THE MINIMUM PERFORMANCE STANDARDS

Projected benefit from the service life loss prevention resulting from the proposed durability requirements

Bus size	Service life category (yrs)	# of units sold in 2013 [1]	# of models tested 2010–2012	# of tested models that failed durability (structural or powertrain)	Estimated quantity of buses sold in 2013 that have failed the proposed durability standard	Average new bus value [2] ($)	Estimated annual service life value loss (assumes bus retirement at 50% life) ($)	Total cost of new transit buses procured in 2013
> 55 foot articulated ...	12	172	2	0	0	760,766	0	130,851,752
45 foot	12	18	2	0	0	449,712	0	8,094,816
40 foot	12	1,906	10	1	38	439,954	8,385,523	838,552,324
35 foot	12	373	2	1	37	286,972	5,352,028	107,040,556
30 foot	10	283	4	1	14	207,528	1,468,261	58,730,424
< 27 foot	4, 5, 7	2,892	29	3	60	62,410	1,867,135	180,489,720
Total	.....	5,644	49	6	149	.....	17,072,947	1,323,759,592

[1] Table 9A, FY 2013: *http://www.fta.dot.gov/about_FTA_16073.html.*
[2] See APTA Public Transportation Vehicle Database. *http://www.apta.com/resources/statistics/Pages/OtherAPTAStatistics.aspx.*

FTA is not able to provide a monetized value for the safety risk reduction. Further, we have estimated potential benefits of bus models meeting their service life requirements, but we used this to inform our qualitative assumption that there would be aggregate benefits to the industry. We did not include this in our quantitative calculations because we were uncertain of the potential aggregate savings on a year-to-year basis into the future as the industry adapts to the instant rulemaking. The results of this analysis are presented in Table H–7.

The analysis presented in Table H–7 used the 2013 transit bus procurement data outlined in Table 9A in the FY 2013 FTA statistical summaries by bus size category and quantity. This analysis also estimated the average cost of a bus model in each size category using the cost information in Table 9A. FTA then determined the quantity of bus models tested in each of the size categories from 2010–2012 (49 buses total) and the number of those that failed the proposed durability performance standard (6). FTA estimated the quantity of bus models sold in 2013 that would have been restricted from FTA recipients in each bus size category. This estimate assumes that 20 percent of the bus models sold in 2013 were bus models tested between 2010 and 2012. The other 80 percent of the sales were assumed to consist of existing bus models tested prior to 2010. FTA then estimated the projected quantity of failing buses by applying a ratio of the number of tested buses that would fail the proposed durability standard by the number of bus models tested in that size category to 20 percent of the 2013 bus sales figures. This resulting quantity of buses was multiplied by the average monetary value of that bus size category

and divided by two to obtain the average amount of service life value lost assuming that each of the failed buses only satisfied 50 percent of their service life requirement. FTA notes that this analysis assumes that all six models were not modified by the manufacturer prior to procurement, as the agency has no information concerning whether or not any modifications did in fact occur. If modifications did occur, then the potential benefits discussed here may be overstated.

We note here that though we conducted this analysis, we did not include these values in our quantitative calculation of benefits. We conducted this analysis to inform our qualitative assumption of potential benefits. We found, as shown above in Table H–6, that potential for a major cost reduction for the industry is great, but we are uncertain of the potential aggregate savings on a year-to-year basis into the future as the industry adapts to the requirements enumerated herein. FTA seeks comments on this analysis.

As another baseline, the lost service life value of two tested bus models known to have failed in service but outside the study window from 2010–2012 was also estimated. The results of this analysis are presented in Table H–8. Again, while we performed this analysis, we did not include these values in our quantitative calculation of benefits. We used this analysis to inform our qualitative assumption of potential benefits. We found again, as shown in Table H–8, that the potential for a major cost reduction for the industry is great, but we are uncertain of the potential aggregate savings on a year-to-year basis into the future as the industry adapts to the requirements enumerated herein. FTA seeks comment on this analysis.

TABLE H–8—ESTIMATED SERVICE LIFE VALUE LOSS OF TWO FAILED BUS MODELS

Estimated benefits from Service Life Loss Prevention of Proposed Durability Requirements with known bus models that failed in service from 2003 to 2013

Bus size	Quantity	Initial bus value ($)	Estimated annual service life value loss (assumes bus retirement at 50% life) ($)
60 foot articulated	226	451,328	51,000,064
23 foot hybrid electric	70	150,000	5,250,000
Total Service Value Loss			56,250,064
Estimated Annual Loss over 2003–2013			5,625,006

FTA, though, was able to estimate the quantified benefits provided by the proposed durability performance standards in the form of reduced unscheduled maintenance, which we estimate to be $531,990 per year. FTA was only able to estimate the reduction in labor costs and not the associated reduction in the costs of replacement components. The basis for the reduction in labor costs was the estimated reduction in unscheduled maintenance hours after the design remedies for structural and powertrain durability were applied to the failing bus models identified in the study group. The results of this analysis are presented in Table H–9.

TABLE H–9—BENEFITS FROM REDUCED UNSCHEDULED MAINTENANCE

[Benefit Derived from reduced bus maintenance requirements as a result of proposed durability standards]

Bus size	Service life category (yrs)	# of tested models that failed durability (structural or powertrain)	Average unscheduled maintenance hours per bus eliminated by durability standard during test (25% service life)	Average unscheduled maintenance hours per bus avoided over 50% service life (until early retirement)	Estimated quantity of buses sold in 2013 that have failed the proposed durability standard	Benefit from the reduction in maintenance hours @ 20.35/hr (diesel service technician) ($)	Benefit from the reduction in the amount of components replaced
> 55 foot articulated	12	0	0	0	0	0	unknown
45 foot	12	0	0	0	0	0	unknown
40 foot	12	1	103	206	38	159,300	unknown
35 ft	12	1	113	226	37	170,167	unknown
30 ft	10	1	4	8	14	2,279	unknown
< 27 foot	4, 5, 7	3	82	164	60	200,244	unknown
Total		6			149	531,990	

FTA believes the proposed results scoring system will provide benefits in the areas of reduced unscheduled maintenance, reduced safety risk, with the faster comprehension of test results, and provide industry motivation to seek bus models with higher test scores. FTA seeks comments on the benefits of the proposed scoring system as it is currently unable to quantify these benefits.

FTA is confident the proposed revisions to the bus payloading procedures that require the posting of the maximum rated standee passenger load on the interior bus bulkhead will provide benefits in the areas of greater probability of a bus meeting its service life requirements, reduced amounts of unscheduled maintenance, reduced safety risk, and greater understanding of the total rated bus passenger capacity.

FTA believes that eliminating the current on-road fuel economy test and only publishing the fuel economy test results from the dynamometer based test will provide recipients more realistic

and reliable test results than the current on-road fuel economy test. Having only one set of fuel economy test results will also eliminate the potential confusion to recipients and manufacturers with respect to the scoring of the test results. FTA was unable to quantify the benefits, beyond the program cost reduction, of eliminating the on-road fuel economy test.

For the proposal to revise the bus passenger load for the emissions testing to seated load weight instead of the ⅔ seated load weight that was unique in the emission test. The benefit of this change is a minor cost reduction from the reduced labor of unloading and loading ⅓ of the seated load weight just for this test. FTA does not expect any other benefits from this proposal.

The proposed program entrance requirements are expected to provide benefits with reduced safety risk, greater awareness and accuracy of the bus passenger capacity, greater understanding of the Buy America compliant bus configuration with respect to major component systems, and prevents unnecessary retesting due to bus production configuration anomalies discovered during or after the test is completed. FTA was unable to quantify these benefits.

The primary benefit of the revisions to the scheduling of testing requirements is that the process will be same whether it is a request for full testing or partial testing. By establishing a single point of entry for the program there will be less confusion about the program requirements and the process and consistency in the resulting determinations. FTA was not able to quantify this benefit.

The benefit of the proposed test requirements review milestone is a program event that will deliver the benefits of the bus entrance requirements. This event will provide all testing stakeholders (manufacturer, bus testing facility operator, FTA, and potentially a recipient) a clear understanding of a new bus model's program eligibility and readiness for testing. FTA did not quantify the benefit of this proposal.

The proposed penalty for unauthorized maintenance and modification is the repeat of all potentially affected tests. This proposal provides benefits in all the categories identified except with the ''simplified test scheduling and elimination of unnecessary testing'' category. FTA was not able to directly quantify these benefits.

Using a 3 and 7 percent discount rate over a ten-year analysis period using the information developed above, FTA calculates that the Net Present Value of the changes encompassed within this proposed rule would yield a positive $3,606,732 at 3 percent discount and a positive $2,969,704 at 7 percent discount. Table H–10 shows our DCF analysis.

TABLE H–10—DISCOUNTED CASH FLOW ANALYSIS AND NET PRESENT VALUES

Year	Costs	Benefits	Net cash flow	Discount rate	DCF @ 3%	Discount rate	DCF @ 7%
1	$109,171	$531,990	$422,819	0.03	$410,504	0.07	$395,158
2	109,171	531,990	422,819	0.03	398,547	0.07	369,306
3	109,171	531,990	422,819	0.03	386,939	0.07	345,146
4	109,171	531,990	422,819	0.03	375,669	0.07	322,567
5	109,171	531,990	422,819	0.03	364,727	0.07	301,464
6	109,171	531,990	422,819	0.03	354,104	0.07	281,742
7	109,171	531,990	422,819	0.03	343,791	0.07	263,310
8	109,171	531,990	422,819	0.03	333,777	0.07	246,085
9	109,171	531,990	422,819	0.03	324,056	0.07	229,986
10	109,171	531,990	422,819	0.03	314,617	0.07	214,940
				NPV	3,606,732	NPV	2,969,704

H.2. Executive Order 13132 (Federalism)

This NPRM has been analyzed in accordance with the principles and criteria contained in Executive Order 13132 (''Federalism'''). This NPRM does not include any regulation that has substantial direct effects on the States, the relationship between the national government and the States, or the distribution of power and responsibilities among the various levels of government. Therefore, the consultation and funding requirements of Executive Order 13132 do not apply.

H.3. Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments)

This NPRM has been analyzed in accordance with the principles and criteria contained in Executive Order 13175 (''Consultation and Coordination with Indian Tribal Governments''). Because this NPRM does not have tribal implications and does not impose direct compliance costs, the funding and consultation requirements of Executive Order 13175 do not apply.

H.4. Executive Order 13272 (Intergovernmental Review)

The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal programs and activities do not apply to this rulemaking as the bus testing program does not involve direct Federal assistance, nor does it involve direct Federal development.

H.5. Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601–611) requires each agency to analyze regulations and proposals to assess their impact on small businesses and other small entities to determine whether the rule or proposal will have a significant economic impact on a substantial number of small entities. Although the testing requirement imposes minor compliance costs on the regulated industry, including bus manufacturers who meet the definition of ''small businesses,'' Congress has authorized FTA to pay 80% of the bus manufacturer's testing fee, defraying the direct financial impact on these entities. FTA has estimated the additional costs and the projected benefits of this proposed rule, above. I hereby certify that this rulemaking would not have a significant economic impact on a substantial number of small entities.

H.6. Unfunded Mandates Reform Act of 1995

The Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1532, *et seq.*) requires agencies to evaluate whether an agency action would result in the expenditure by State, local and tribal governments, in the aggregate, or by the private sector, of $151 million or more (as adjusted for inflation) in any one year, and if so, to take steps to minimize these unfunded mandates. FTA does not believe the

proposed rulemaking would result in expenditures exceeding this level.

H.7. Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501–3520), a Federal agency must obtain approval from OMB before conducting or sponsoring a collection of information as defined by the PRA. Because the proposed regulation contains a new provision that would require manufacturers to provide technical specifications regarding their vehicles to FTA in order to receive approval to proceed with testing, FTA will submit a revised information collection estimate to OMB.

In compliance with the PRA, we announce that FTA is seeking comment on a new information collection.

Agency: Federal Transit Administration.

Title: Bus Testing Program.

Type of Request: Modified information collection.

OMB Control Number: 2132–0550.

Form Number: Not assigned.

Requested Expiration Date of Approval

Three years from the date of approval.

Summary of the Collection of Information.

In accordance with the Paperwork Reduction Act of 1995, this notice announces the intention of the Federal Transit Administration (FTA) to request the Office of Management and Budget (OMB) to update the following information collections for the FTA Bus Testing Program. The information to be collected for the Bus Testing Program is necessary to ensure that buses have been tested at the Bus Testing Center for maintainability, reliability, safety, performance (including braking performance), structural integrity, fuel economy, emissions, and noise and have met the required performance standards.

Description of the Need for the Information and Use of the Information

Title 49 U.S.C. Section 5323(c) provides that no federal funds appropriated or made available after September 30, 1989, may be obligated or expended for the acquisition of a new bus model (including any model using alternative fuels) unless the bus has met the requirements of FTA's Bus Testing Program. Title 49 U.S.C. Section 5318(a) further specifies that each new bus model is to be tested for maintainability, reliability, safety, performance (including braking performance), structural integrity, fuel economy, emissions, and noise. In addition, any existing bus models being produced with a major change must also comply with the requirements of the Bus Testing Program. Upon completion of the testing of the vehicle, a bus testing report is provided to the manufacturer. 49 CFR part 665.7(a) states that a recipient of federal funds must certify that any new bus model acquired with FTA financial assistance has been tested in accordance with the requirements of Part 665, and that the recipient has received a copy of the applicable Bus Testing Report before expenditure of any FTA funding on a bus.

The Bus Testing Program (often referred to as ''Altoona Testing'' due to the location of the primary test facility) is operated by The Thomas D. Larson Pennsylvania Transportation Institute (LTI), an interdisciplinary research unit of The Pennsylvania State University in the College of Engineering. Founded in 1989, LTI operates the Bus Testing Center, conducts the tests, and documents the test results under a cooperative agreement with the Federal Transit Administration (FTA).

The Bus Testing Program has proven to be valuable to the transit industry. As of March 31, 2015, testing has been completed on 437 buses with a total of 9,214 bus malfunctions identified. Of those malfunctions, 44 could have resulted in serious injuries or significant property damage had they occurred in revenue service. Many of the other malfunctions would adversely impact transit service (*e.g.,* resulting in mechanical breakdowns and stranded passengers), and all would increase maintenance costs by requiring corrective maintenance actions. By testing new bus models before they are purchased, recipients and manufacturers can often address problems before the fleet is built, potentially saving the federal government and grant recipients considerable money and time and avoiding inconveniencing passengers. The information collected by the Bus Testing Program is used to: (1) Determine the eligibility of a new bus model for testing as per 49 CFR 665.11; (2) determine the amount of testing necessary; (3) satisfy the legal and administrative requirements necessary for the Bus Testing Facility to schedule the testing of a new bus model; (4) to collect new bus model design, and component information for inclusion in the final report; (5) determine compliance with the fuel economy and emissions performance standards; and (6) determine the maximum rated standee passenger capacity of a new bus model.

Information addressing items 1 and 2 will be collected by FTA through a standardized electronic form to be available on the FTA internet site and used by FTA to process the request for new bus model testing. An outline of this proposed standard form is included as an information collection instrument in the ROCIS system. From the information collected on the standardized form and previous bus model testing history, if any, FTA will determine the amount of testing that is necessary. Once complete, FTA will provide the testing determination results to the requester and to the Bus Testing Facility operator if testing is required. If FTA determines that no testing is required, no additional information is collected for that request.

In order to schedule a bus test at the Bus Testing Center (item 3), bus manufacturers must submit a variety of information to LTI. The steps for submitting a vehicle for testing are outlined on LTI's Web site at *http://146.186.225.57/schedule_testing.* The first piece of information that must be submitted is two signed copies of the testing contract. The contract outlines that LTI is the official operator of the bus testing facility and that they are under a cooperative agreement with FTA to conduct testing of transit vehicles in accordance with FTA regulations and the established testing procedures. The contract can be found as an information collection instrument in the ROCIS system and online at *http://146.186.225.57/scheduling_pdfs/Contract_Dec_2013.pdf.* Additional information that must be submitted before testing begins includes; a spare parts inventory list, evidence of adequate liability and physical damage insurance coverage on the bus, and a check for the manufacturer's share of the testing fee.

To address item 4, bus manufacturers are required to complete the bus model information template. This information can be submitted at the time of test scheduling or later, as it is included in the final bus testing report to document the bus configuration tested. This template is included as an information collection instrument in the ROCIS system. For item 5, bus manufacturers need to submit a copy of their compliance documentation prepared to address the applicable Federal requirements of 49 CFR part 535, 40 CFR part 86, and 40 CFR part 1037 as evidence of satisfying the proposed FTA performance standards for ''Fuel Economy'' and ''Emissions'' outlined in the Bus Testing Pass/Fail NPRM.

The Pass/Fail NPRM also proposes that bus manufacturers identify the

maximum rated standee passenger capacity on the front interior bulkhead. This rating will be used for the purposes of payloading the test bus and will also inform FTA recipients about the total rated passenger capacity of the new bus models.

Description of the Likely Respondents

Bus manufacturers are the primary respondents.

Estimate of the Total Annual Reporting and Recordkeeping Burden Resulting From the Collection of Information

The hourly burden and cost to respondents is driven by the information collected during the test request process, the test scheduling process, and the report preparation and the pass/fail compliance process. The program averages 46 requests for testing annually and assumed that the number of test requests will remain at 46 annually. FTA estimates that with the use of a new standardized form for requesting testing, that all 46 requests will require 0.75 hour for the respondent to complete regardless if the request is for full or partial testing. The estimated hourly burden and annualized cost to respondents for the test request process is outlined in Table H–10 below. The estimates assume that a mechanical engineer will complete the standardized test request form.

On average annual basis, five test requests were of a higher level of complexity that FTA needed more information in order to assess the scope of the partial test program. The additional information consists of engineering drawings, 3–D depictions, finite element analyses, sub-system specifications, and similar documents. These items are already part of the bus manufacturers' normal product development process and FTA believes it would not require significant additional time or costs to create. FTA estimates that each of these five expanded information collections required an additional 4 hours each to prepare and send to FTA. Labor categories and rates from the Bureau of Labor Statistics (*http://www.bls.gov/oes/current/*) were used to estimate the annual labor costs.

TABLE H–10—ESTIMATED COST AND BURDEN OF THE TEST REQUEST PROCESS

Item	Labor category (BLS code/title)	Labor rate ($/hr) (May 2013 BLS statistic)	Time (hrs)	Annual quantity	Total annual hours	Total annual cost ($)
Standardized test request form.	17–2141 Mechanical engineer.	41.31	0.75	46	34.5	1425.20
Partial Test Determination Request (Expanded).	17–2141 Mechanical Engineer.	41.31	4.0	5	20.0	826.20
Total Annual Partial Test Determination Request Burden.	.....	.....	.....	.....	54.5	$2251.40

The estimated hourly and cost burden related to scheduling a bus for testing with the bus testing facility operator is presented in Table H–11 (see below). FTA estimates that a lawyer, accountant, mechanical engineer, and admin personnel will be involved in the preparation of the request. An average of 16 tests is scheduled with LTI annually

TABLE H–11—ESTIMATED LABOR BURDEN AND COST FOR THE TEST SCHEDULING PROCESS

Item	Labor category (BLS code/title)	Labor rate ($/hr) (May 2013 BLS statistic)	Preparation time (hrs)	Cost ($)
Testing Contract	23–1011 Lawyer	63.46	1.0	63.46
Proof of Insurance	23–1011 Lawyer	63.46	1.0	63.46
Payment Check	13–2011 Accountant	34.86	1.0	34.86
Spare Parts Inventory List	17–2141 Mechanical Engineer	41.31	3.0	123.93
Bus Design Characteristics Information	17–2141 Mechanical Engineer	41.31	2.5	103.28
Assembling/Mailing of Test Scheduling Package	43–000 Office/Admin Support	16.78	1.5	25.17
Postage for package	.....	.....	.....	8.63
Total burden per test request	10.0	422.79		
Total Annual Burden (16 tests a year)	160.0	$6764.64		

There is an additional paperwork burden associated with submitting documentation to FTA and the Bus Testing Facility operator for the retesting of a failed performance standard. Bus manufacturers will need to submit to FTA a failure analysis and a proposed corrective action report for bus models that fail to meet one or more of the proposed performance standards. They will also need to submit additional test fees associated with the tests that are repeated. The estimated burden and cost is presented in Table H–12. Over the three-year study period, seven bus models would have required a request for retesting resulting in an average of 2.33 requests annually.

TABLE H–12—ESTIMATED BURDEN AND COST FOR THE REQUEST OF RETESTING TO ADDRESS A FAILED PERFORMANCE STANDARD

Item	Labor category (BLS code/title)	Labor rate ($/hr) (May 2013 BLS statistic)	Preparation time (hrs)	Cost ($)
Payment Check for Retesting Fees	13–2011 Accountant	34.86	0.5	17.43
Check Mailing	43–000 Office/Admin Support	16.78	1.0	16.78
Postage for package				5.60
Preparation of Failure Analysis and Modification Proposal.	17–2141 Mechanical Engineer	41.31	7.0	289.17
Total burden per test request	8.5	328.98		
Total Annual Burden (2.33 retest requests a year).	20	$766.52		

One of the proposed revisions to the payloading process requires that the maximum standee passenger rating be placarded inside on the front bulkhead of the test bus. The estimated cost and labor burden for this information collection is presented in Table H–13.

TABLE H–13—ESTIMATED BURDEN AND COST FOR THE REVISED BUS PAYLOADING PROCEDURES

Item	Labor category (BLS code/title)	Labor rate ($/hr) (May 2013 BLS statistic)	Preparation time (hrs)	Cost ($)
Maximum Standee Passenger Capacity Calculation.	17–2141 Mechanical Engineer	41.31	2.0	82.62
Placard (source: www.edecals.com using a 2.5 inch tall lettering stating "XX Standees Maximum" and a quantity of 500).				8.99
Installation of Placard	51–2099 Assembler and Fabricator	13.74	0.10	1.37
Total burden per test bus	2.10	92.98		
Total Annual Burden (16 buses)	33.6	$1487.68		

The proposed revisions to test scheduling (49 CFR 665.11) introduce additional documentation requirements during the test requesting process. The manufacturer must verify that the vehicle complies with applicable FMVSS requirements and that the vehicle meets the Buy America content requirements in 49 CFR 661.11. The estimated cost and labor burden of these requirements for this information collection is presented in Table H–14.

TABLE H–14—ESTIMATED BURDEN AND COST FOR THE REVISED TEST SCHEDULING REQUIREMENTS

Item	Labor category (BLS code/title)	Labor rate ($/hr) (May 2013 BLS statistic)	Preparation time (hrs)	Cost ($)
Submission of Documentation for 49 CFR part 565 Vehicle Identification Number Requirements; 49 CFR part 566 Manufacturer Identification; 49 CFR part 567 Certification; and where applicable, 49 CFR part 568 Vehicle Manufactured in Two or More Stages—All Incomplete, Intermediate and Final-Stage Manufacturers of Vehicle Manufactured in Two or More Stages.	17–2141 Mechanical Engineer	41.31	1.0	41.31
Submission of Documentation for Buy America U.S. content requirements of 49 CFR § 661.11, Rolling Stock Procurements.	17–2141 Mechanical Engineer	41.31	1.0	41.31
Total burden per test bus	2.0	82.62		
Total Annual Burden (16 buses)	32.0	$1321.92		

The total burden and cost for this NPRM is summarized in Table H–15. FTA estimates the total annual burden and cost of the information collections resulting from the proposals in this NPRM as 300 hours and $12,593. The previous burden estimate for the existing program was 210 hours and $9,016.

TABLE H–15—TOTAL ESTIMATED ANNUAL BURDEN AND COST OF THE PROPOSED BUS TESTING PASS/FAIL NPRM

Information collection	Annual burden (hr)	Annual cost ($)
Test Request Process	54.5	$2251.40
Test Scheduling Process	160.0	6764.64
Request of Retesting to Address a Failed Performance Standard	20	766.52
Revised Bus Payloading Procedures	33.6	1487.68
Revised Test Scheduling Requirements	32.0	1321.92
Total	300.1	12,592.16

Comments are invited on:

- Whether the collection of information is necessary for the proper performance of the functions of the Department, including whether the information will have practical utility.
- Whether the Department's estimate for the burden of the information collection is accurate.
- Ways to minimize the burden of the collection of information on respondents, including the use of automated collection techniques or other forms of information technology.

Please submit any comments, identified by the docket number in the heading of this document, by any of the methods described in the **ADDRESSES** section of this document. Comments are due by August 24, 2015.

H.8. Regulation Identifier Number (RIN)

A regulation identifier number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN number contained in the heading of this document may be used to cross-reference this action with the Unified Agenda.

H.9. National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321–4347), requires Federal agencies to consider the consequences of major federal actions and prepare a detailed statement on actions significantly affecting the quality of the human environment. FTA has determined that this rulemaking is categorically excluded pursuant to 23 CFR 771.118(c)(4).

H.10. Privacy Act

Anyone is able to search the electronic form for all comments received into any of our dockets by the name of the individual submitting the comments (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70; Pages 19477–78) or you may visit *www.regulations.gov.*

H.11. Executive Order 12898 (Environmental Justice)

Executive Order 12898, ''Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,'' and DOT Order 5610.2(a), ''Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (see, *www.fhwa.dot.gov/environment/environmental_justice/ej_at_dot/order_56102a/index.cfm*), require DOT agencies to achieve environmental justice (EJ) as part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects, including interrelated social and economic effects, of their programs, policies, and activities on minority populations and low-income populations in the United States. The DOT Order requires DOT agencies to address compliance with the Executive Order and the DOT Order in all rulemaking activities. To meet this goal, FTA has issued additional final guidance in the form of a circular (Circular 4703.1, ''*FTA Policy Guidance for Federal Transit Recipients,''* July 17, 2012; *http://www.fta.dot.gov/legislation_law/12349_14740.html*), to implement Executive Order 12898 and DOT Order 5610.2(a).

FTA evaluated this proposed rule under the Executive Order, the DOT Order, and the FTA Circular. Environmental justice principles, in the context of establishing a quantitative scoring system for public transit vehicles, fall outside the scope of applicability.

Nothing inherent in this proposed regulations would disproportionately impact minority or low income populations, as the primary parties affected by this proposal are those transit vehicle manufactures who would be subject to the bus testing procedures and the new quantitative scoring system. FTA has determined that the proposed regulations, if finalized as proposed, would not cause disproportionately high and adverse human health and environmental effects on minority or low income populations.

List of Subjects in 49 CFR Part 665

Buses, Grant programs—transportation, Public transportation, Motor vehicle safety, Reporting and recordkeeping requirements.

Issued in Washington, DC, under the authority delegated at 49 CFR 1.91.

Therese McMillan,

Acting Administrator.

For the reasons stated in the preamble and under the authority of 49 U.S.C. 5323(c), 5318, and the delegations at 49 CFR 1.91, the Federal Transit Administration proposes to revise Part 665 of Title 49, Code of Federal Regulations, to read as follows:

PART 665—BUS TESTING

Subpart A—General

Sec.
665.1 Purpose.
665.3 Scope.
665.5 Definitions.
665.7 Certification of compliance.

Subpart B—Bus Testing Procedures

665.11 Testing requirements.
665.13 Test report and manufacturer certification.

Subpart C—Operations

665.21 Scheduling.
665.23 Fees.
665.25 Transportation of vehicle.
665.27 Procedures during testing.
Appendix A to Part 665—Bus Model Scoring System and Pass/Fail Standard

Authority: 49 U.S.C. 5318 and 49 CFR 1.91.

Subpart A—General

§ 665.1 Purpose.

An applicant for Federal financial assistance for the purchase or lease of buses with funds obligated by the FTA shall certify to the FTA that any new bus model acquired with such assistance has been tested and has received a passing test score in accordance with this part. This part contains the information necessary for a

recipient to ensure compliance with this provision.

§ 665.3 Scope.

This part shall apply to an entity receiving Federal financial assistance under 49 U.S.C. Chapter 53.

§ 665.5 Definitions. As used in this part—

Administrator means the Administrator of the Federal Transit Administration or the Administrator's designee.

Automotive means that the bus is not continuously dependent on external power or guidance for normal operation. Intermittent use of external power shall not automatically exclude a bus of its automotive character or the testing requirement.

Bus means a rubber-tired automotive vehicle used for the provision of public transportation service by or for a recipient of FTA financial assistance.

Bus model means a bus design or variation of a bus design usually designated by the manufacturer by a specific name and/or model number.

Bus Testing Facility means the facility used by the entity selected by FTA to conduct the bus testing program, including test track facilities operated in connection with the program.

Bus Testing Report means the complete test report for a bus model, documenting the results of performing the complete set of bus tests on a bus model.

Curb weight means the weight of the bus including maximum fuel, oil, and coolant; but without passengers or driver.

Emissions means the components of the engine tailpipe exhaust that are regulated by the United States Environmental Protection Agency (EPA), plus carbon dioxide (CO2) and methane (CH4).

Emissions control system means the components on a bus whose primary purpose is to minimize regulated emissions before they exit the tailpipe. This definition does not include components that contribute to low emissions as a side effect of the manner in which they perform their primary function (*e.g.,* fuel injectors or combustion chambers).

Final acceptance means the formal approval by the recipient that the vehicle has met all of its bid specifications and the recipient has received proper title.

Gross weight (Gross Vehicle Weight, or GVW) means the seated load weight of the bus plus 150 pounds of ballast for each standee passenger, up to and including, the maximum rated standee passenger capacity identified on the bus interior bulkhead.

Hybrid means a propulsion system that combines two power sources, at least one of which is capable of capturing, storing, and re-using energy.

Major change in chassis design means, for vehicles manufactured on a third-party chassis, a change in frame structure, material or configuration, or a change in chassis suspension type.

Major change in components means:

(1) For those vehicles that are not manufactured on a third-party chassis, a change in a vehicle's engine, axle, transmission, suspension, or steering components;

(2) For those that are manufactured on a third-party chassis, a change in the vehicle's chassis from one major design to another.

Major change in configuration means a change that is expected to have a significant impact on vehicle handling and stability or structural integrity.

Modified third-party chassis or van means a vehicle that is manufactured from an incomplete, partially assembled third-party chassis or van as provided by an OEM to a small bus manufacturer. This includes vehicles whose chassis structure has been modified to include: a tandem or tag axle; a drop or lowered floor; changes to the GVWR from the OEM rating; or other modifications that are not made in strict conformance with the OEM's modifications guidelines where they exist.

New bus model means a bus model that—

(1) Has not been used in public transportation service in the United States before October 1, 1988; or

(2) Has been used in such service but which after September 30, 1988, is being produced with a major change in configuration or a major change in components; or

Operator means the operator of the Bus Testing Facility.

Original equipment manufacturer (OEM) means the original manufacturer of a chassis or van supplied as a complete or incomplete vehicle to a bus manufacturer.

Parking brake means a system that prevents the bus from moving when parked by preventing the wheels from rotating.

Partial testing means the performance of only that subset of the complete set of bus tests in which significantly different data would reasonably be expected compared to the data obtained in previous full testing of the baseline bus model at the Bus Testing Facility.

Partial testing report, also *partial test report,* means a report documenting, for a previously-tested bus model that is produced with major changes, the results of performing only that subset of the complete set of bus tests in which significantly different data would reasonably be expected as a result of the changes made to the bus from the configuration documented in the original full Bus Testing Report. A partial testing report is not valid unless accompanied by the corresponding full Bus Testing Report for the corresponding baseline bus configuration.

Public transportation service means the operation of a vehicle that provides general or special service to the public on a regular and continuing basis consistent with 49 U.S.C. Chapter 53.

Recipient means an entity that receives funds under 49 U.S.C. Chapter 53, either directly from FTA or through a direct recipient.

Regenerative braking system means a system that decelerates a bus by recovering its kinetic energy for on-board storage and subsequent use.

Retarder means a system other than the service brakes that slows a bus by dissipating kinetic energy.

Seated load weight means the curb weight of the bus plus the seated passenger load simulated by adding 150 pounds of ballast to each seating position and 600 pounds per wheelchair position.

Service brake(s) means the primary system used by the driver during normal operation to reduce the speed of a moving bus and to allow the driver to bring the bus to a controlled stop and hold it there. Service brakes may be supplemented by retarders or by regenerative braking systems.

Small bus manufacturer means a secondary market assembler that acquires a chassis or van from an OEM for subsequent modification or assembly and sale as 5-year/150,000-mile or 4-year/100,000-mile minimum service life vehicle.

Tailpipe emissions means the exhaust constituents actually emitted to the atmosphere at the exit of the vehicle tailpipe or corresponding system.

Third party chassis means a commercially available chassis whose design, manufacturing, and quality control are performed by an entity independent of the bus manufacturer.

Unmodified mass-produced van means a van that is mass-produced, complete and fully assembled as provided by an OEM. This shall include vans with raised roofs, and/or wheelchair lifts, or ramps that are installed by the OEM or by a party other than the OEM provided that the installation of these components is completed in strict conformance with the OEM modification guidelines.

Unmodified third-party chassis means a third-party chassis that either has not been modified, or has been modified in strict conformance with the OEM's modification guidelines.

§ 665.7 Certification of compliance.

(a) In each application to FTA for the purchase or lease of any new bus model, or any bus model with a major change in configuration or components to be acquired or leased with funds obligated by the FTA, the recipient shall certify that the bus was tested at the Bus Testing Facility and that the bus received a passing test score as required in this part. The recipient shall receive the appropriate full Bus Testing Report and any applicable partial testing report(s) before final acceptance of the first vehicle.

(b) In dealing with a bus manufacturer or dealer, the recipient shall be responsible for determining whether a vehicle to be acquired requires full testing or partial testing or has already satisfied the requirements of this part. A bus manufacturer or recipient may request guidance from FTA.

Subpart B—Bus Testing Procedures

§ 665.11 Testing requirements.

(a) In order to be tested at the Bus Testing Facility, a new model bus shall—

(1) Be a single model that complies with NHTSA requirements at 49 CFR part 565 *Vehicle Identification Number Requirements;* 49 CFR part 566 *Manufacturer Identification;* 49 CFR part 567 *Certification;* and where applicable, 49 CFR part 568 *Vehicle Manufactured in Two or More Stages—All Incomplete, Intermediate and Final-Stage Manufacturers of Vehicle Manufactured in Two or More Stages;*

(2) Have been produced by an entity whose Disadvantaged Business Enterprise DBE goals have been submitted to FTA pursuant to 49 CFR part 26;

(3) Identify the maximum rated quantity of standee passengers on the interior bulkhead in 2 inch tall or greater characters;

(4) Meet all applicable Federal Motor Vehicle Safety Standards, as defined by the National Highway Traffic Safety Administration in part 571 of this title;

(5) Meet the Buy America U.S. content requirements of § 661.11 of this chapter; and

(6) Be substantially fabricated and assembled using the techniques, tooling, and materials that will be used in production of subsequent buses of that model.

(b) If the new bus model has not previously been tested at the Bus Testing Facility, then the new bus model shall undergo the full tests requirements for Maintainability, Reliability, Safety, Performance (including Braking Performance), Structural Integrity, Fuel Economy, Noise, and Emissions Tests.

(c) If the new bus model has not previously been tested at the Bus Testing Facility and is being produced on a third-party chassis that has been previously tested on another bus model at the Bus Testing Facility, then the new bus model may undergo partial testing in place of full testing.

(d) If the new bus model has previously been tested at the Bus Testing Facility, but is subsequently manufactured with a major change in chassis or components, then the new bus model may undergo partial testing in place of full testing.

(e) The following vehicle types shall be tested:

(1) Large-size, heavy-duty transit buses (approximately 35′–40′ in length, as well as articulated buses) with a minimum service life of 12 years or 500,000 miles;

(2) Medium-size, heavy-duty transit buses (approximately 30′ in length) with a minimum service life of ten years or 350,000 miles;

(3) Medium-size, medium duty transit buses (approximately 30′ in length) with a minimum service life of seven years or 200,000 miles;

(4) Medium-size, light duty transit buses (approximately 25′–35′ in length) with a minimum service life of five years or 150,000 miles; and

(5) Other light duty vehicles such as small buses and regular and modified and unmodified vans with a minimum service life of four years or 100,000 miles.

(f) Tests performed in a higher service life category (*i.e.,* longer service life) need not be repeated when the same bus model is used in lesser service life applications.

§ 665.13 Test report and manufacturer certification.

(a) The operator of the Bus Testing Facility shall implement the performance standards and scoring system set forth in this part.

(b) Upon completion of testing, the operator of the facility shall provide the scored test results and the resulting test report to the entity that submitted the bus for testing and to FTA. The test report will be available to recipients only after both the bus manufacturer and FTA have approved it for release. If the bus manufacturer declines to release the report, or if the bus did not achieve a passing test score, the vehicle will be ineligible for FTA financial assistance.

(c)(1) A manufacturer or dealer of a new bus model or a bus produced with a major change in component or configuration shall provide a copy of the corresponding full Bus Testing Report and any applicable partial testing report(s) to a recipient during the point in the procurement process specified by the recipient, but in all cases before final acceptance of the first bus by the recipient.

(2) A manufacturer who releases a report under paragraph (c)(1) of this section also shall provide notice to the operator of the facility that the test results and the test report are to be made available to the public.

(d) If a tested bus model with a Bus Testing Report undergoes a subsequent major change in component or configuration, the manufacturer or dealer shall advise the recipient during the procurement process and shall include a description of the change. Any party may ask FTA for confirmation regarding the scope of the change.

(e) A Bus Testing Report shall be available publicly once the bus manufacturer makes it available during a recipient's procurement process. The operator of the facility shall have copies of all the publicly available reports available for distribution. The operator shall make the final test results from the approved report available electronically and accessible over the internet.

(f) The Bus Testing Report and the test results are the only official information and documentation that shall be made publicly available in connection with any bus model tested at the Bus Testing Facility.

Subpart C—Operations

§ 665.21 Scheduling.

(a) All requests for testing, including requests for full, partial, or repeat testing, shall be submitted to the FTA Bus Testing Program Manager for review prior to scheduling with the operator of the Bus Testing Facility. All test requests shall provide: a detailed description of the new bus model to be tested; the service life category of the bus; engineering level documentation characterizing all major changes to the bus model; and documentation that demonstrates satisfaction of each one of the testing requirements outlined in § 665.11(a).

(b) FTA will review the request and determine if the bus model is eligible for testing and which tests must be performed. FTA will prepare a written response to the requester for use in scheduling the required testing.

(c) To schedule a bus for testing, a manufacturer shall contact the operator of the Bus Testing Facility and provide the FTA response to the test request. Contact information and procedures for scheduling testing are available on the operator's Bus Testing Web site, *http://www.altoonabustest.com.*

(d) Upon contacting the operator, the operator shall provide the manufacturer with the following:

(1) A draft contract for the testing;

(2) A fee schedule; and

(3) The test procedures for the tests that will be conducted on the vehicle.

(e) The operator shall process vehicles FTA has approved for testing in the order in which the contracts are signed.

§ 665.23 Fees.

(a) The operator shall charge fees in accordance with a schedule approved by FTA, which shall include different fees for partial testing.

(b) Fees shall be prorated for a vehicle withdrawn from the Bus Testing Facility before the completion of testing.

(c) The manufacturer's portion of the test fee shall be used first during the conduct of testing. The operator of the Bus Testing Facility shall obtain approval from FTA prior to continuing testing of each bus model at the Bus Testing Program's expense after the manufacturer's fee has been expended.

§ 665.25 Transportation of vehicle.

A manufacturer shall be responsible for transporting its vehicle to and from the Bus Testing Facility at the beginning and completion of the testing at the manufacturer's own risk and expense.

§ 665.27 Procedures during testing.

(a) Upon receipt of a bus approved for testing the operator of the Bus Testing Facility shall:

(1) Inspect the bus design configuration and compare it to the configuration documented in the test request;

(2) Determine if the bus, when loaded to Gross Weight, does not exceed its Gross Vehicle Weight Rating, Gross Axle Weight Ratings, or maximum tire load ratings;

(3) Determine if the bus is capable of negotiating the durability test track at curb weight, seated load weight, and Gross Vehicle Weight;

(4) Determine if the bus is capable of performing the Fuel Economy and Emissions Test duty cycles within the established standards for speed deviation.

(b) The operator shall present the results obtained from the activities of § 665.27(a) and present them to the bus manufacturer and the FTA Bus Testing Program Manager for review prior to initiating testing using the Bus Testing Program funds.

(c) The operator shall perform all maintenance and repairs on the test vehicle, consistent with the manufacturer's specifications, unless the operator determines that the nature of the maintenance or repair is best performed by the manufacturer under the operator's supervision.

(d) The manufacturer shall be permitted to observe all tests. The manufacturer shall not provide maintenance or service unless requested to do so by the operator.

(e) The operator shall investigate each occurrence of unauthorized maintenance and repairs and determine the potential impact to the validity of the test results. Tests where the results could have been impacted must be repeated at the manufacturer's expense.

(f) The operator shall perform all modifications on the test vehicle, consistent with the manufacturer's specifications, unless the operator determines that the nature of the modification is best performed by the manufacturer under the operator's supervision. All vehicle modifications performed after the test has started will first require review and approval by FTA. If the modification is determined to be a major change, some or all of the tests already completed shall be repeated or extended at FTA's discretion.

(g) The operator shall halt testing after any occurrence of unapproved, unauthorized, or unsupervised test vehicle modifications. Following an occurrence of unapproved or unsupervised test vehicle modifications, the vehicle manufacturer shall submit a new test request to FTA that addresses all the requirements in 665.11 to reenter the Bus Testing Program.

(h) The operator shall perform eight categories of tests on new bus models. The eight tests and their corresponding performance standards are described in the following paragraphs.

(1) *Maintainability Test—(i)* The Maintainability test shall include bus servicing, preventive maintenance, inspection, and repair. It shall also include the removal and reinstallation of the engine and drive-train components that would be expected to require replacement during the bus's normal life cycle. Much of the maintainability data should be obtained during the Bus Durability Test. All servicing, preventive maintenance, and repair actions shall be recorded and reported. These actions shall be performed by test facility staff, although manufacturers shall be allowed to maintain a representative on-site during the testing. Test facility staff may require a manufacturer to provide vehicle servicing or repair under the supervision of the facility staff. Since the operator may not be familiar with the detailed design of all new bus models that are tested, tests to determine the time and skill required for removing and reinstalling an engine, a transmission, or other major propulsion system components may require advice from the bus manufacturer. All routine and corrective maintenance shall be carried out by the operator in accordance with the manufacturer's specifications.

(ii) The Maintainability Test Report shall include the frequency, personnel hours, and replacement parts or supplies required for each action during the test. The accessibility of selected components and other observations that could be important to a bus purchaser shall be included in the report.

(iii) The performance standard for Maintainability is that no greater than 125 hours of total unscheduled maintenance shall be accumulated over the execution of a full test.

(2) *Reliability Test*—(i) Reliability shall not be a separate test, but shall be addressed by recording all bus failures and breakdowns during all other testing. The detected bus failures, repair time, and the actions required to return the bus to operation shall be presented in the report.

(ii) The performance standard for Reliability is that the vehicle under test experience no more than one uncorrected Class 1 failure and two uncorrected Class 2 failures over the execution of a full test. Class 1 failures are addressed in the Safety Test, below. An uncorrected Class 2 failure is a failure mode not addressed by a design or component modification that would cause a transit vehicle to be unable to complete its transit route and require towing or on-route repairs. A failure is considered corrected when a design or component modification is validated through sufficient remaining or additional reliability testing in which the failure does not reoccur.

(3) *Safety Test*—(i) The Safety Test shall consist of a Handling and Stability Test, a Braking Performance Test, and a review of the Class 1 reliability failures that occurred during the test.

(ii) The Handling and Stability Test shall be an obstacle avoidance double-lane change test performed on a smooth and level test track. 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. Bus speed shall be

held constant throughout a given test run. Individual test runs shall be made at increasing speeds up to a specified maximum or until the bus can no longer be operated safely over the course, whichever speed is lower. Both left- and right-hand lane changes shall be tested. The performance standard is that the test vehicle can safely negotiate and remain within the lane change test course at a speed of no less than 45 mph.

(iii) The functionality and performance of the service, regenerative (if applicable), and parking brake systems shall be evaluated at the test track. The test bus shall be subjected to a series of brake stops from specified speeds on high, low, and split-friction surfaces. The parking brake shall be evaluated with the bus parked facing both up and down a steep grade. There are three performance standards for braking. The stopping distance from a speed of 45 mph on a high friction surface shall satisfy the bus stopping distance requirements of FMVSS 105 or 121 as applicable. The bus shall remain within a standard 12-foot lane width during split coefficient brake stops. The parking brake shall hold the test vehicle stationary on a 20 percent grade facing up and down the grade for a period of 5 minutes.

(iv) A review of all the Class 1 failures that occurred during the test shall be conducted as part of the Safety Test. Class 1 failures include those failures that, when they occur, could result in a loss of vehicle control; in serious injury to the driver, passengers, pedestrians, or other motorists; and in property damage or loss due to collision or fire. The performance standard is that at the completion of testing with no uncorrected Class 1 failure modes. A failure is considered corrected when a design or component modification is validated through sufficient remaining or additional Reliability Tests in which the failure does not reoccur over a number of miles equal to or greater than the additional failure up to 100% of the durability test mileage for the service life category of the tested bus.

(4) *Performance Test*—(i) The Performance Test shall measure the maximum acceleration, speed, and gradeability capability of the test vehicle. In determining the transit vehicle's maximum acceleration and speed, the bus shall be accelerated at full throttle from rest until it achieves its maximum speed on a level roadway. The performance standard for acceleration is that the maximum time that the test vehicle requires to achieve 30 mph is 18 seconds on a level grade. The gradeability test of the test vehicle shall be calculated based on the data measured on a level grade during the Acceleration Test. The performance standard for the gradeability test is that the test vehicle achieves a sustained speed of at least 40 mph on a 2.5 percent grade and a sustained speed of at least 10 mph on a 10 percent grade.

(ii) [Reserved].

(5) Structural Integrity Test—Seven individual Structural Integrity Tests shall be performed.

(i) Shakedown Test—A shakedown of the bus structure shall be conducted by loading and unloading the bus with a distributed load equal to 2.5 times the load applied for the gross weight portions of testing. The bus shall then be unloaded and inspected for any permanent deformation on the floor or coach structure. This test shall be repeated a second time, and shall be repeated one more time if the permanent deflections vary significantly between the first and second tests. The performance standard shall be that the maximum measured permanent deflection is no greater than 0.006 inch after the third loading cycle.

(ii) Distortion Test—The bus shall be loaded to GVW, with one wheel on top of a curb and then in a pothole. This test shall be repeated for all four wheels. The test verifies:

(A) Normal operation of the steering mechanism and;

(B) Operability of all passenger doors, passenger escape mechanisms, windows, and service doors. A water leak test shall be conducted in each suspension travel condition. The performance standard shall be that all vehicle passenger exits remain operational throughout the test.

(iii) Static Tow Test—Using a load-equalizing towing sling, a static tension load equal to 1.2 times the curb weight shall be applied to the bus towing fixtures (front and rear). The load shall be removed and the two eyes and adjoining structure inspected for damages or permanent deformations. The performance standard shall be that no permanent deformation is experienced at static loads up to 1.2 times the vehicle curb weight.

(iv) Dynamic Tow Test—The bus shall be towed at CW with a heavy wrecker truck for 5 miles at 20 mph and then inspected for structural damage or permanent deformation. The performance standard shall be that the vehicle is towable with a standard commercial vehicle wrecker without experiencing any permanent damage to the vehicle.

(v) Jacking Test—With the bus at CW, probable damages and clearance issues due to tire deflating and hydraulic jacking shall be assessed. The performance standard shall be that the vehicle is capable of being lifted with a standard commercial vehicle hydraulic jack.

(vi) Hoisting Test—With the bus at CW, possible damages or deformation associated with lifting the bus on a two post hoist system or supporting it on jack stands shall be assessed. The performance standard shall be that the vehicle is capable of being supported by jack stands rated for the vehicle's weight. (vii) *Structural Durability Test*—The Structural Durability Test shall be performed on the durability course at the test track, simulating twenty-five percent of the vehicle's normal service life. The bus structure shall be inspected regularly during the test, and the mileage and identification of any structural anomalies and failures shall be reported in the Reliability Test. There shall be two performance standards for the Durability Test, one to address the vehicle frame and body structure and one to address the bus propulsion system. The performance standard for the vehicle frame and body structure shall be that there are no uncorrected failure modes of the vehicle frame and body structure at the completion of the full vehicle test. The performance standard for the vehicle propulsion system is that there are no uncorrected powertrain failure modes at the completion of a full test.

(6) *Noise Test*—(i) The Noise Test shall measure interior noise and vibration while the bus is idling (or in a comparable operating mode) and driving, and also shall measure the transmission of exterior noise to the interior while the bus is not running. The exterior noise shall be measured as the bus is operated past a stationary measurement instrument. There shall be two minimum noise performance standards: One to address the maximum interior noise during vehicle acceleration from a stop, and one to address the maximum exterior noise during vehicle acceleration from a stop. The performance standard for interior noise while the vehicle accelerates from 0–35 mph shall be no greater than 80 decibels A-weighted. The performance standard for exterior noise while the vehicle accelerates from 0–35 miles per hour shall be no greater than 83 decibels A-weighted.

(ii)—[Reserved]

(7) *Emissions Test*—(i) The Emissions Test shall measure tailpipe emissions of those exhaust constituents regulated by the United States EPA for transit bus emissions, plus carbon dioxide (CO_2) and methane (CH_4), as the bus is operated over specific repeatable transit

vehicle driving cycles. The Emissions test shall be conducted using an emission testing laboratory equipped with a chassis dynamometer capable of both absorbing and applying power.

(ii) The Emissions Test is not a certification test, and is designed only to enable FTA recipients to relatively compare the emissions of buses operating on the same set of typical transit driving cycles. The results of this test are not directly comparable to emissions measurements reported to other agencies, such as the EPA, or for other purposes.

(iii) The emissions performance standard shall be the prevailing EPA emissions requirements for heavy-duty vehicles outlined in 40 CFR part 86 and 40 CFR part 1037.

Appendix A to Part 665—Bus Model Scoring System and the Pass/Fail Standard

1. Bus Model Scoring System

The Bus Model Scoring System shall be used to score the test results using the performance standards in each category. A bus model that fails to meet a minimum performance standard shall be deemed to have failed the test and will not receive an aggregate score. For buses that have passed all the minimum performance standards, an aggregate score shall be generated and presented in each Bus Testing Report. A bus model that just satisfies the minimum baseline performance standard and does not exceed any of the standards shall receive a score of 60. The maximum score a bus model shall receive is 100. The minimum and maximum points available in each test category shall be as shown below in Table A.

2. Pass/Fail Standard

The passing standard shall be a score of 60. Bus models that fail to meet one or more of the minimum baseline performance standards will be ineligible to obtain an aggregate passing score.

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TABLE A: Performance Standards, Scoring System, and Pass/Fail

Test Category		Performance Standard	All Performance Standards Met?		
			No	*Yes* → Assess Score	
				Base Score	+ Prorated Points for Measured Test Performance
Structural Integrity (30 pts.)	Shakedown	Maximum permanent chassis deflection ≤ 0.006 inch after 3 load cycles		1.0	
	Distortion	All exits remain operational under each distortion loading condition		1.0	
	Static Towing	No significant deformation under 120% curb weight load		1.0	
	Dynamic Towing	Bus is towable with standard wrecker		1.0	
	Jacking	Bus is liftable with a standard jack		1.0	
	Hoisting	Bus stable on jacks		1.0	
	Durability	No uncorrected frame & body structure failures remaining at completion of test		12.0	
		No uncorrected powertrain failures remaining at completion of test		12.0	
Safety (20 pts.)	Hazards	No uncorrected Class 1 reliability failures remaining at test completion		10.0	
	Stability	Lane change speed no less than 45 mph		2.5	
	Braking	Stopping distance from 45 mph within 158 feet as per FMVSS 105 & FMVSS 121		0.5	Stopping distance from 45 mph (ft) 158 — 80; Points: 0.0 — 2.0
		Bus remains within lane during split coefficient brake stops		2.5	
		Parking brake holds on 20% grade		2.5	
Maintainability (16 pts.)		Accumulation of no more than 125 hours of unscheduled maintenance		2.0	Hours: 125 — 0; Points: 0.0 — 14.0
Reliability (8 pts.)		No more than 2 uncorrected Class 2 failures remaining at completion of test		2.0	Failures: 2 — 0; Points: 0.0 — 6.0

Fuel Economy (7 pts.) **(Only 1 fuel type scored)**	**Liquid Fuels** (Diesel, Gasoline, LPG, LNG)	**Compliant with 49 CFR Part 535 MEDIUM- AND HEAVY-DUTY VEHICLE FUEL EFFICIENCY PROGRAM-** ***Heavy-Duty Vocational Vehicle Fuel Consumption Standards***	**1.0**	MPG: 1 13 Points: 0.0 6.0
	CNG			SCF/mi: 50 10 Points: 0.0 6.0
	Hydrogen			SCF/mi: 98 15 Points: 0.0 6.0
	Electric			kW-hr/mi: 3 1 Points: 0.0 6.0
Emissions (7 pts.) **(All emissions categories scored)**	**Carbon Dioxide (CO_2)**	**Compliant with all applicable EPA exhaust emissions regulations at date of manufacture including:** **40 CFR Part 86 CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES** **40 CFR Part 1037 CONTROL OF EMISSIONS FROM NEW HEAVY-DUTY MOTOR VEHICLES**	**1.0**	Grams/mi: 4000 0 Points: 0.0 4.0
	Carbon Monoxide (CO)			Grams/mi: 20 0 Points: 0.0 0.4
	Total Hydrocarbon (THC)			Grams/mi: 3 0 Points: 0.0 0.4
	Non-Methane Hydrocarbon (NMHC)			Grams/mi: 3 0 Points: 0.0 0.4
	Nitrogen Oxides (NOx)			Grams/mi: 2 0 Points: 0.0 0.4
	Particulate Matter (PM)			Grams/mi: 0.1 0 Points: 0.0 0.4
Noise (7 pts.)	**Interior - acceleration 0-35 mph**	**No greater than 80 decibels (dB(A))**	**0.5**	dB(A): 80 30 Points: 0.0 3.0
	Exterior - acceleration 0-35 mph	**No greater than 83 decibels (dB(A))**	**0.5**	dB(A): 83 50 Points: 0.0 3.0
Performance (5 pts.)	**Acceleration**	**Time from 0-30 mph no greater than 18 sec**	**1.5**	
	Gradeability	**Sustained speed on 2.5% grade no less than 40 mph**	**1.5**	
		Sustained speed on 10% grade no less than 10 mph	**2.0**	
Overall Result		**FAIL**	**60**	**+ 0 40**
		PASS		
		Maximum Aggregate Score	**100**	

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