

FTA

FEDERAL TRANSIT ADMINISTRATION

FTA Bus Testing Program

“Pass/Fail”

Final Rule Overview

APTA Bus & Paratransit Conference

Marcel Belanger, Bus Testing Program Manager

FTA Office of Research, Demonstration, & Innovation

May 9, 2017



U.S. Department of Transportation
Federal Transit Administration

Bus Testing Program Background

(49 USC 5318 & 49 CFR Part 665)

- Established by law in 1989, FTA's Bus Testing Program provides objective test results to transit operators for bus procurement decision-making
- Legislation requires that all bus models sold to FTA grantees be tested at the designated Bus Testing Facility prior to disbursement of capital grant funds being applied the bus procurement
- A separate Bus Testing Report is published for each major bus model configuration
- Until the new Final Rule, the test reports were informational only – they were not scored, there were no performance standards, and a bus could neither “pass” nor “fail” Bus Testing

Current Bus Tests

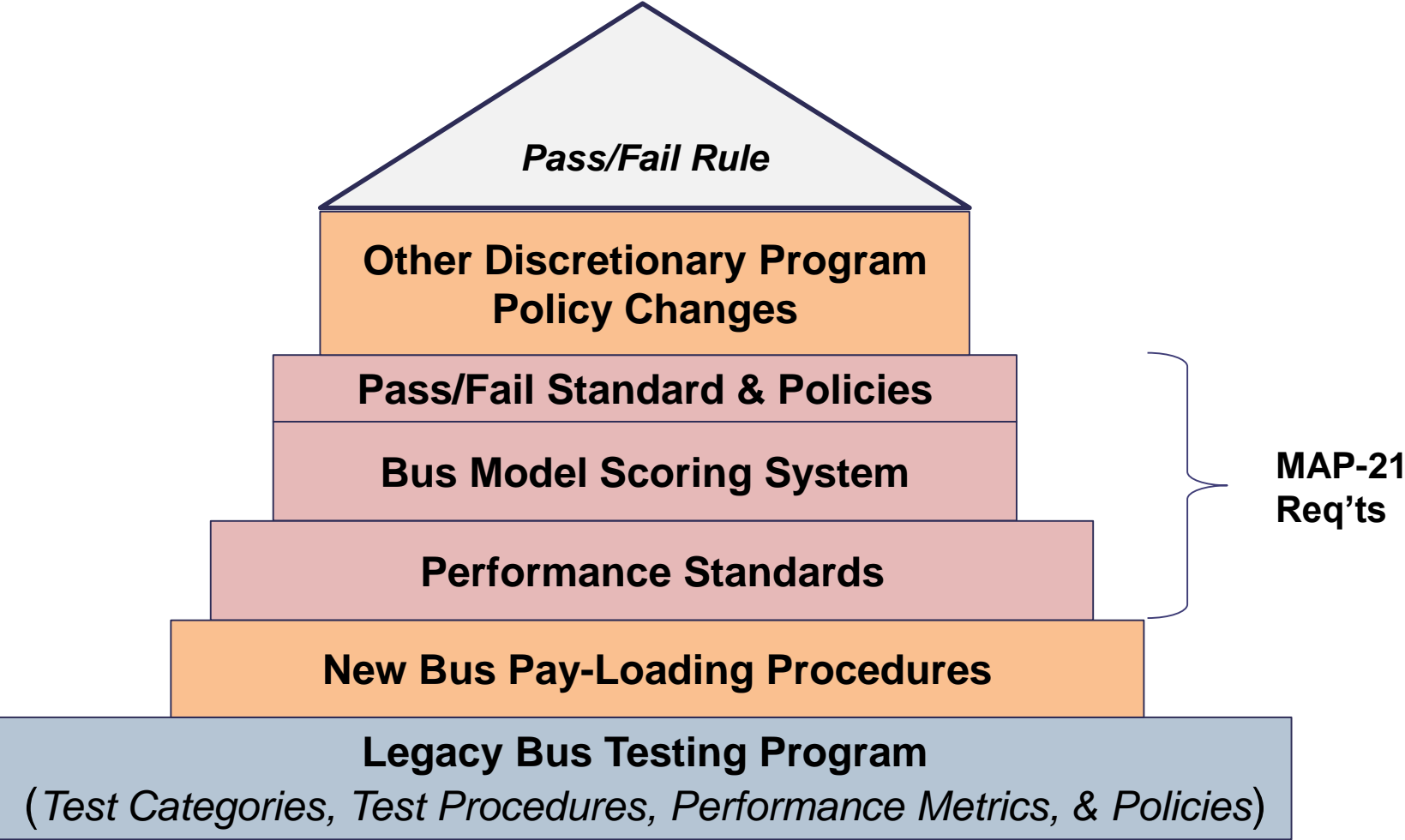
Test Category	Scope
Structural Integrity	Shakedown Distortion Towing Jacking Hoisting
Structural Durability	Accelerated Durability on Test Track
Maintainability	R&R Selected Components Record maintenance hours during Durability Test
Reliability	Record & Classify failures during durability test
Fuel Economy	Measure fuel economy over three simulated transit routes
Emissions	Measure tailpipe emissions over three simulated transit routes
Braking	Measure braking distance and stability under dry & wet conditions Verify parking brake performance
Noise	Measure internal & external noise when stationary and moving
Performance	Measure top speed, acceleration, and gradeability
Safety	Determine the lane change stability of a bus

Pass/Fail Implementation

MAP-21 Section 5318 (2013)

- Congress mandated changes to the Bus Testing Program
- Establish **Performance Standards** for existing test categories:
 - Structural Integrity – Safety- Maintainability - Reliability*
 - Fuel Economy - Emissions – Noise - Performance*
- Establish a **Bus Model Scoring System**
- Establish a **Pass/Fail Standard** based on the scoring system

New Bus Testing Pass/Fail Final Rule



Bus Testing Pass/Fail Final Rule

- **NPRM Published**: June 23, 2015
- **Comments Posted**: September 3, 2015
- **Commenters**:
A total of 24 entities submitted written comments to the docket:
 - Transit Agencies (7)
 - APTA
 - Bus OEMs (4)
 - Fire Safety Industry (7)
 - Bus Remanufacturers (2)
 - Other Safety Product Industry (1)
 - Other Non-Transit Organization (2)
 - No Comments Received from Mid-Sized Bus OEMs
- **Final Rule Published**: August 1, 2016
- **Final Rule Effective Date**: October 31, 2016

Bus Testing Pass/Fail Final Rule

The Final Rule includes changes in four areas:

1. Performance Standards by Test Category
2. Bus Model Scoring System
3. Pass/Fail Standard and Policies
4. Changes to Program Administration and Test Procedure Details

Performance Standards

A total of 22 minimum performance standards were proposed across the eight test categories:

1. Structural Integrity
2. Safety
3. Maintainability
4. Reliability
5. Fuel Economy
6. Emissions
7. Noise
8. Performance

Bus Model Scoring System

- **Determination of Scores by Test Category**
 - Each test category has a maximum score value
 - Each performance standard has a fixed number of points awarded when the test results meet or exceed the standard
 - Several test categories assign additional pro-rated bonus points when the results exceed the standard.
- **Calculation of The Aggregate Score**
 - Base Score is the total points awarded for meeting the minimum performance standard (maximum is 60)
 - The total number of bonus points awarded is then added to the base score to determine the overall score
 - The scoring system has a maximum overall score of 100 points

Performance Standards and Sample Scoring

BUS												
Test category	Standard	Base Pts.	Bonus Pts	Range	Range	Test Data	Score	FAIL				
1. Maintainability	Unscheduled maint.	< 125 hours	2	14	0	125	4	15.552				
2. Reliability	# Class 2 failures	< 2 Uncorrected	2	6	0	2	0	8				
3. Safety	Hazards	No uncorrected Class 1	10	0	P	F	P	10				
	Stability	Lane change, 45 mph?	2.5	0	P	F	P	2.5				
	Braking	< 158 feet at 45mph	0.5	2	80	158	95	2.11538				
		Holds Lane, Split coefficient	2.5	0	P	F	p	2.5				
	Parking brake, 20% grade	2.5	0	P	F	p	2.5					
4. Performance	Acceleration 0-30 mph	less than 30 sec	1.5	0	P	F	p	1.5				
	Gradeability 2.5%	more than 40 mph	1.5	0	P	F	p	1.5				
	Gradeability 10%	more than 10 mph	2	0	P	F	p	2				
5. Structural Integrity	Distortion	Exits are operational	1	0	P	F	p	1				
	Static Towing	No significant deformation	1	0	P	F	p	1				
	Dynamic Towing	Towable with std. wrecker	1	0	P	F	p	1				
	Jacking	Liftable with std. jack	1	0	P	F	p	1				
	Hoisting	Stable on jacks	1	0	P	F	p	1				
	Durability-Structural	No uncorrected failures	13	0	P	F	p	13				
	Durability-Powertrain	No uncorrected failures	12	0	P	F	p	12				
6. Fuel Economy	Liquid fuels	1-13mpg	1	6	1	13	10	5.5				
	CNG	10-50 scf/mi			10	50	DATA	0				
	Hydrogen	15-98 cf/mi			15	98	DATA	0				
	Electric	1-3 kWh/mi			1	3	DATA	0				
7. Noise	Int. Noise (0-35 mph)	less than 80 db	0.5	3	30	80	65	1.4				
	Ext. Noise (0-35 mph)	less than 83 db	0.5	3	50	83	70	1.68182				
8. Emissions	CO ₂	0-4000 g/mi	1	4	0	4000	0	5				
	CO	0-20 g/mi					0.4	0	20	0	0.4	
	Total hydrocarbon	0-3 g/mi					0.4	0	3	0	0.4	
	NMHC	0-3 g/mi					0.4	0	3	0	0.4	
	Nitrogen oxides	0-3 g/mi					0.4	0	2	0	0.4	
	Particulates	0-0.1 g/m					0.4	0	0.1	0	0.4	
Total			33	18				93.7492				

Changes to Program Administration

- **Bus Testing Entrance Requirements (§ 665.11)**
 - Certification of FMVSS compliance
 - Verification that TVM has submitted DBE goals to FTA
 - Declaration of standee capacity (placard verified at check-in)
 - Certification that test bus is substantially representative of production models, and identification of country-of-origin of major components
 - Service life categories now referenced (FTA Circular 5010)
- **Scheduling of Testing (§ 665.21)**
 - All requests for full and partial testing must be reviewed and authorized by FTA Bus Testing Program Manager
 - This written authorization from FTA must be provided to the Bus Testing Center in order to schedule a test

Changes to Program Administration (cont.)

- **Test Requirements Review Milestone (§ 665.27)**
 - The Bus Testing Center Operator will compare the test bus to the configuration described in the test authorization
 - The Operator will evaluate whether the test bus will be within its axle and gross weight limits, whether it can successfully negotiate the test track, and whether it can meet the minimum performance demands of the duty cycles used in testing
 - The Operator will notify FTA of any problems with the above prior to expending FTA funds on testing of a bus model
- **Penalty for Unauthorized Maintenance and Modification**
 - Any unauthorized maintenance and/or modifications performed by a vehicle manufacturer may be grounds for repeating the affected tests at the manufacturer's expense

Changes to Test Procedures

- **Gross Vehicle Weight determination**
 - Vehicle manufacturer specifies maximum standee capacity
- **Bus Passenger Load for Emissions Testing**
 - Changed from 2/3 SLW to SLW
- **Bus Passenger Load For Brake Performance Testing**
 - The stopping distance performance standard will be assessed with the bus loaded to SLW
 - Additional brake performance data will be collected with the bus loaded to GVW
- **Measurement of Noise Levels During Audible Noise Test**
 - Interior noise levels will be measured while the bus operates over the road segment and on the test track. There is no minimum performance standard or scoring associated with this test
- **Elimination of Shakedown and On-Road Fuel Economy Tests**

Testing of Remanufactured Buses

- **Considered but not included in the Final Rule**
- **Will be reviewed in the future**

LoNo-CAP Program

- **Distinct from, but complements the FTA Bus Testing Program**
- **New program authorized under Section 5312(h) by the FAST Act**
- **Voluntary program to test components for low- and no-emission (LoNo) buses**
- **FTA funding of \$15 million is authorized at \$3 million per year from FY 2016 – FY2020**
- **FTA pays 50% of established component test fees; entity having component tested pays remaining cost**
- **Competitive Notice of Funding Opportunity published in Federal Register on September 29, 2016**
 - “Institutions of higher education” are only eligible recipients
 - The facility operating the Section 5318 (“Altoona”) Bus Testing Facility was specifically excluded from eligibility
- **In January 2017, FTA announced selection of The Ohio State University and Auburn University to conduct LoNo-CAP testing**

Thank You

For more information contact:

Marcel Belanger, Bus Testing Program Manager

marcel.belanger@dot.gov

www.transit.dot.gov/research-innovation/bus-testing

www.altoonabustest.com

Additional Information

Program Changes

Bus Payloading Procedures

- 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.**

Program Changes

Elimination of Shakedown and On-Road Fuel Economy Tests

- The Shakedown test is redundant to the durability test and, historically, no buses have exhibited permanent deformation in this test.
- 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.
- 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.

Program Changes

Bus Passenger Load for Emissions Testing

- Uses Seated Load Weight passenger load instead of 2/3 SLW
- Provides consistency with other test conditions.
- Eliminates additional time and cost associated with a loading condition only used for this test.

Program Changes

New Bus Testing Entrance Requirements from § 665.11

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) Be substantially fabricated and assembled using the techniques, tooling, and materials that will be used in production of subsequent buses of that model with the manufacturing point of origin for the bus structure, the axles, the foundation brakes, the propulsion power system and auxiliary power systems (engine, transmission, traction batteries, electric motor(s), fuel cell(s)), and the primary energy storage and delivery systems (fuel tanks, fuel injectors & manifolds, and the fuel injection electronic control unit) identified in the test request submitted to FTA during the scheduling process.

FTA will assess these requirements when new requests for testing are received.

Program Changes

Scheduling of Testing from § 665.21-

(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 paragraph 665.11(a).

(b) FTA will review the request, determine if the bus model is eligible for testing, and provide an initial response within five (5) business days. 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.

FTA will field all requests for testing first. Once approved, FTA will forward to LTI-BTRC for completion of requisite documentation.

Program Changes

Pre-test Requirements Review from § 665.27

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. 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. FTA will provide a written response within five (5) business days to authorize the start of testing or to request clarification for any discrepancies noted from the activities of 665.27(a). Testing can commence after five (5) business days if FTA does not provide a response.

Program Changes

Penalty for Unauthorized Maintenance and Modification from § 665.27(g)

- 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.
- Test areas need to have an adequate level of security control and monitoring to identify occurrences of unauthorized maintenance and modification.

Program Changes

Measurement of Noise During Audible Noise Test

- The interior noise levels will be measured while the bus operates over the road segment and on the test track. There is no minimum performance standard or scoring associated with this test
- Noise testing of an electric bus will not be conducted while it is being charged.

Program Changes

Bus Passenger Load for Brake Performance Testing

- The stopping distance performance standard will be assessed using the test results with the bus loaded to seated load weight.
- The test center will conduct an additional set of brake stops at gross passenger load.