Pre-Qualification Structural Testing for Cutaway Buses Acquired by the State of Florida

1. Scope

Pre-Qualification Structural Testing for Cutaway Buses Acquired by the State of Florida (PRE-QUAL) applies to all cutaway type vehicles procured through FDOT TRIPS (Transit-Research-Inspection-Procurement Services) contracts that have not undergone the Rollover Crashworthiness Assessment for Cutaway Buses Acquired by the State of Florida (FL-STANDARD).

2. Purpose

The purpose of the PRE-QUAL tests is to ensure that all cutaway buses acquired through FDOT TRIPS contracts have a minimum level of structural integrity. PRE-QUAL results do not predict performance on the FL-STANDARD.

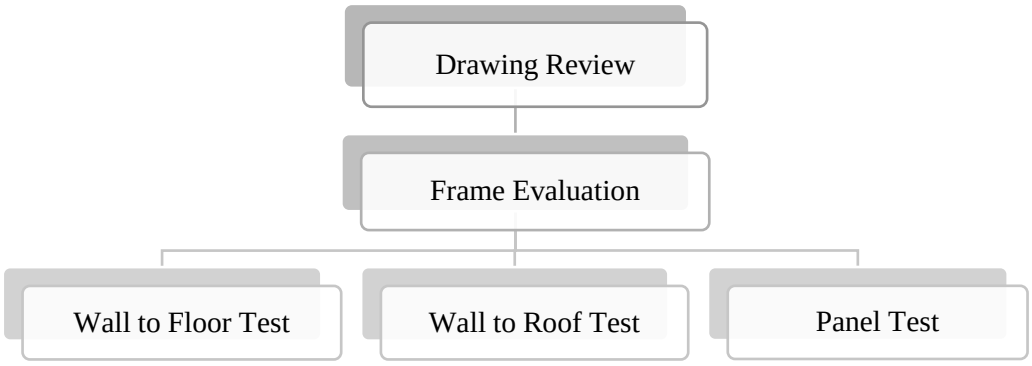

Figure 1: PRE-QUAL Testing Hierarchy

3. Approval

The PRE-QUAL process consists of five requirements as shown in Figure 1. All requirements must be successfully passed before a manufacturer is considered Pre-Qualified, after which FDOT will grant the manufacturer a Temporary Waiver Contract. The PRE-QUAL process must be completed prior to first build; no buses will be built until satisfactory results are obtained. The PRE-QUAL process is intended to be completed in 90 days. This time period assumes prompt supply of all required test materials by the manufacturer.

4. Requirements

More detailed descriptions of the required approval procedures may be found in the PRE-QUAL Test Procedure.

4.1. Drawing Review – The manufacturer will be required to provide complete assembly drawings of the passenger compartment frame for evaluation. The drawings must include a detailed description of all structural connections.

4.2. Frame Evaluation – The manufacturer will be required to provide a passenger compartment frame consisting of only structural tubing that includes the entry stairwell and front cap structure (if the flooring material is an integral part of the floor to wall connection, it should also be included) and one skinned sidewall panel. The frame and sidewall panel should be constructed

using normal production methods. These components will be delivered to FDOT Springhill Road Bus Testing Facility in Tallahassee, FL.

4.2.1 The provided frame will be compared with the assembly drawings. The frame will fail the evaluation if it is inconsistent with the previously provided assembly drawings or found not representative of normal production.

4.3. Wall to Floor (WF) Connection Test – The WF test is conducted to assess the strength of the sidewall to floor connection. In this test the floor portion of the test panel is fixed, and a force is then slowly applied to the sidewall portion. The applied load and the resulting rotation about the connection will be recorded simultaneously during the test. The energy required to rotate the sidewall through 16.7 deg. is then calculated and compared to the required threshold value. To account for different column spacing (and thus total number of columns in the frame), the threshold values are relative to the typical longitudinal distance between adjacent columns in the passenger compartment frame.

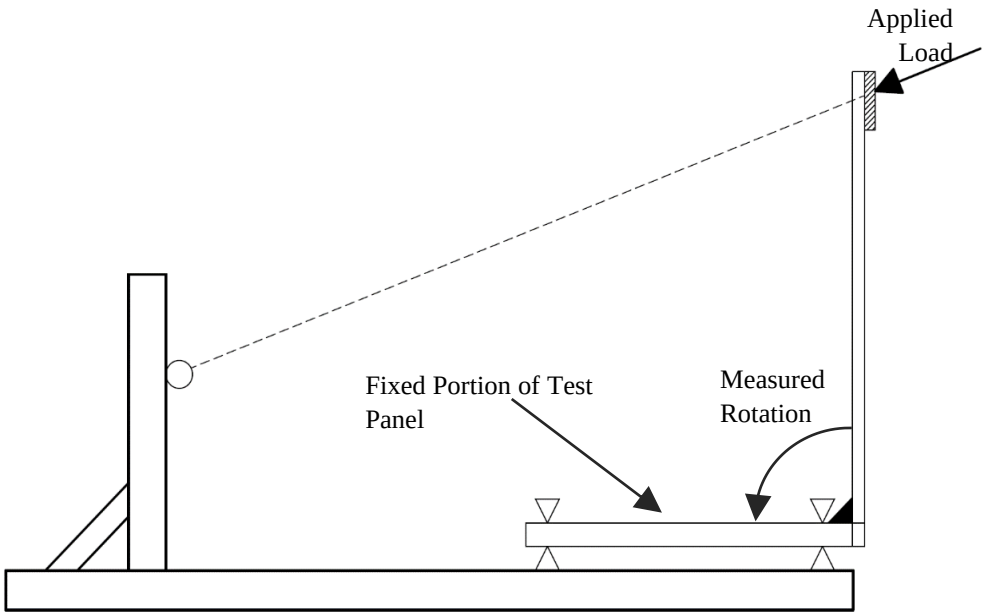

Figure 2: PRE-QUAL Connection Test

4.3.1 The test panel will include two adjacent sidewall columns plus 150mm to each side measured from the outside column face.

4.3.2. Application of loading may be in either direction (either towards or away from the inside face of the column).

4.3.3. A minimum of three WF connections cut from the provided body cage will be tested.

4.4. Wall to Roof (WR) Connection Test – The WR test is conducted to assess the strength of the sidewall to roof connection. In this test the roof portion of the test panel is fixed, and a force is then slowly applied to the sidewall portion. The applied load and the resulting rotation about the connection will be recorded simultaneously during the test. The energy required to rotate the sidewall through 23.0 deg. is then calculated and compared to the required threshold value. To account for different column spacing (and thus total number of columns in the frame), the

threshold values are relative to the typical longitudinal distance between adjacent columns in the passenger compartment frame.

4.4.1 The test panel will include two adjacent sidewall columns plus 150mm to each side measured from the outside column face.

4.4.2. Application of loading may be in either direction (either towards or away from the inside face of the column).

4.4.3. A minimum of three WR connections cut from the provided body cage will be tested.

4.5. Sidewall Panel Test – The Sidewall Panel test uses an impact hammer to dynamically deliver a calculated amount of kinetic energy to the test panel, as shown in Figure 3. The test energy is scaled according to the typical panel width of the passenger compartment (longitudinal distance between two adjacent columns). The resulting maximum permanent panel deflection is then measured after impact and compared to the threshold value.

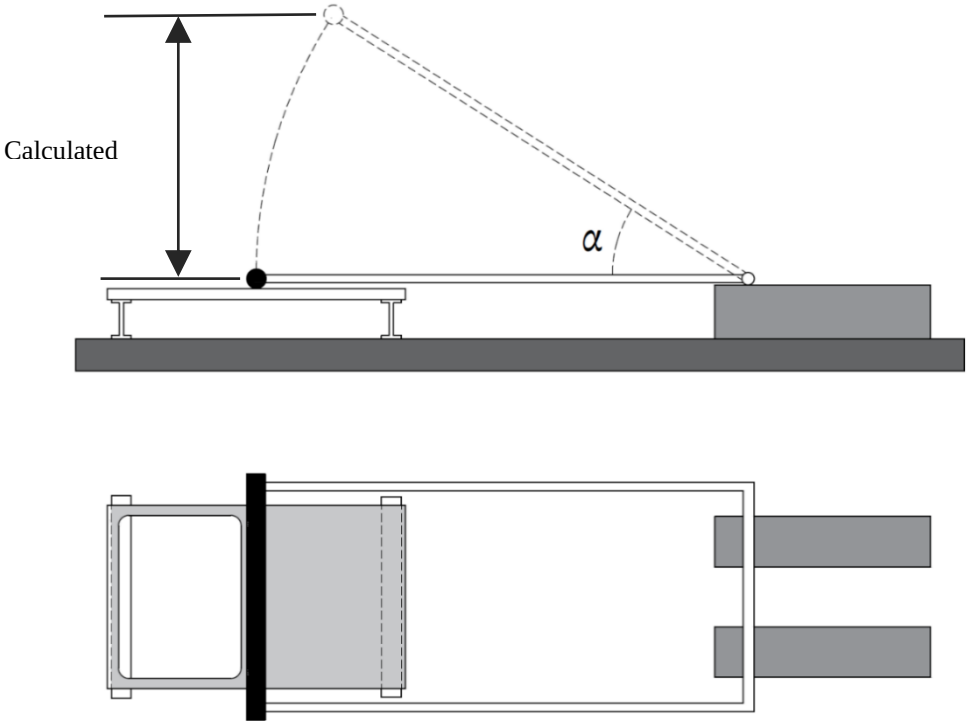

Figure 3: PRE-QUAL Sidewall Panel Test

4.5.1. The test panel will include two adjacent sidewall columns (plus 150mm of the sidewall structure on each side measured from the outside column face).

4.5.2. A minimum of two panels cut from the skinned sidewall will be tested.

4.5.3. The impact will be to the exterior side of the panel.

4.5.3. The hammer will be raised to the height calculated to deliver the required kinetic energy at initial impact with the test panel surface. It will then be cleanly released and allowed to fall under only the force of gravity until it impacts the test panel.

4.6 Required Test Thresholds – The WF, WR, and Sidewall Panel Test will each be considered "passed" if the average result of the tested samples from each test meets the requirements given in Table 1.

Table 1: PRE-QUAL Required Test Thresholds

Test	Required Threshold
Wall to Floor (WF)	≥ 300 J of energy (per meter of panel width) required to rotate the connection 16.7 degrees
Wall to Roof (WR)	≥ 450 J of energy (per meter of panel width) required to rotate the connection 23.0 degrees
Sidewall Panel Test	≤ 150 mm permanent deflection after impact with 600 J of kinetic energy (per meter of panel width)

5. PRE-QUAL Star Rating

In addition to pass or fail, the tested passenger compartment frame may earn up to five stars (*) as part of the FDOT TRIPS PRE-QUAL Star Rating. Stars will be awarded as shown in Table 2 using the average result for each test.

Table 2: PRE-QUAL Star Rating

Rating	Test	Required Threshold
*	Wall to Floor (WF)	≥ 375 J of energy (per meter of panel width) required to rotate the connection 16.7 degrees
**	Wall to Floor (WF)	≥ 450 J of energy (per meter of panel width) required to rotate the connection 16.7 degrees
*	Wall to Roof (WR)	≥ 560 J of energy (per meter of panel width) required to rotate the connection 23.0 degrees
**	Wall to Roof (WR)	≥ 670 J of energy (per meter of panel width) required to rotate the connection 23.0 degrees
*	Panel Test	≤ 100 mm permanent deflection after impact with 600 J of kinetic energy (per meter of panel width)

6. Disclaimer

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