April 30, 2002

Larry F. Sutherland
Deputy Director, Office of Roadway Engineering Services
Ohio Department of Transportation
P.O. Box 899
Columbus, Ohio 43216-0899

Dear Mr. Sutherland:

In your April 3 letter, you requested the Federal Highway Administration’s (FHWA) acceptance of the Ohio Department of Transportation’s Thrie-beam transition to a vertical concrete parapet as a National Cooperative Highway Research Program (NCHRP) Report 350 transition design at test level 4 (TL-4). Mr. Powers independently received copies of the Texas Transportation Institute (TTI) test reports dated August 2001, entitled “NCHRP Report 350 Test 3-21 on the Ohio Type 1 Transition from Thrie Beam to Concrete Parapet with Asphalt Curb” and February 2002, entitled “NCHRP Report 350 Test 4-22 on the Ohio Type 1 Transition from Thrie Beam to Concrete Parapet with Asphalt Curb” and videotapes of the two tests that were conducted.

The tested transition design consists of 3810 mm of nested Thrie-beam rail bolted to a vertical-faced concrete parapet at the bridge end and connected to standard w-beam barrier with a 12-gauge symmetric w-beam to Thrie-beam transition piece on the approach end. The first post was approximately 1.26 m from the parapet and the second post 952.5 mm from the first. Both posts were 2440-mm long W200 x 35.9 steel posts. The next three posts were also on 952.5-mm centers, with post no. 3 being a 2440-mm long W150 x 37 and post nos. 4 and 5 being the same size, but only 1830-mm long. Post no. 6 was the same size and length as posts 4 and 5, but with a 1905-mm spacing. All remaining posts were standard strong posts on 1905-mm centers. All posts used routed wood offset blocks. A 7.1-m long, 100-mm high and 152-mm wide asphalt curb was installed with its traffic face 25 mm in front of the Thrie-beam. Enclosure 1 shows these and other design details.

Tests 3-21 (pickup truck) and 4-22 (single unit truck) were conducted on the Ohio transition design and the summary results are shown in Enclosure 2. All evaluation criteria were met, although the passenger compartment intrusion in the pickup truck was judged to be marginal. I am aware that the same test, but without the asphalt curb, resulted in unacceptable passenger compartment intrusion. Thus the 100-mm high curb is an essential design element. This curb can be made of asphalt, as tested, or it may be a concrete curb. You may wish to specify a curb higher than 100 mm to reduce wheel snagging on the concrete parapet and enhance overall crash performance. You should also consider specifying a 10-gauge w-beam to Thrie-beam transition piece in your
design. Tests by other agencies have shown that a 12-gauge piece is not stiff enough when connected directly to nested Thrie-beam and can tear when struck at that location.

Based on the reported test results, and subject to your consideration of the above recommendations, I conclude that your Thrie-beam transition design satisfies the evaluation criteria for an NCHRP Report 350 test level 4 (TL-4) transition and may be used on the National Highway System.

Sincerely yours,

(original signed by A. George Ostensen)

A. George Ostensen
Program Manager, Safety

2 Enclosures
### General Information
- **Test Agency**: Texas Transportation Institute
- **Test No.**: 401021-5
- **Date**: 07/03/01

### Test Article
- **Type**: Transition
- **Name**: Ohio Type 1 Transition
- **Installation Length (m)**: 33.7
- **Material or Key Elements**: Nested Thrie Beam Transition to Concrete Parapet with Asphalt Curb
- **Soil Type and Condition**: Standard Soil, Dry

### Test Vehicle
- **Type**: Production
- **Designation**: 2000P
- **Model**: 1996 Chevrolet 2500 pickup truck
- **Mass (kg)**:
  - Curb: 1897
  - Test Inertial: 2000
  - Dummy: 76
  - Gross Static: 2076

### Impact Conditions
- **Speed (km/h)**: 100.4
- **Angle (deg)**: 25.8

### Exit Conditions
- **Speed (km/h)**: 72.4
- **Angle (deg)**: 16.0

### Occupant Risk Values
- **Impact Velocity (m/s)**:
  - x-direction: 6.2
  - y-direction: 8.9
- **THIV (km/h)**: 38.6
- **Ridedown Accelerations (g's)**:
  - x-direction: -14.5
  - y-direction: 11.0
  - PHD (g's): 14.9
  - ASI: 1.95
- **Max. 0.050-s Average (g's)**:
  - x-direction: -9.9
  - y-direction: 15.2
  - z-direction: 6.7

### Post-Impact Behavior (during 1.0 s after impact)
- **Max. Yaw Angle (deg)**: 83
- **Max. Pitch Angle (deg)**: -16
- **Max. Roll Angle (deg)**: -20

### Test Article Deflections (m)
- **Dynamic**: 0.25
- **Permanent**: 0.55
- **Working Width**: 0.47

### Vehicle Damage
- **Exterior**:
  - VDS: 11FQ3
  - CDC: 11FLEK2
  & 11LYEW2
- **Maximum Exterior Vehicle Crush (mm)**: 570
- **Interior**:
  - OCDI: FS0214100
  - Max. Occ. Compart. Deformation (mm): 120

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Summary of results for test 401021-2a, NCHRP Report 350 test 4-22.