TUBULAR W-BEAM BRIDGE RAIL

SUMMARY REPORT
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Tubular W-Beam Bridge Rail After Crash Test

Cooperative Research Program of the
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Tubular W-Beam Bridge Rail

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Bridge engineers of the Texas State Department of Highways and Public Transportation (SDHPT) have long desired a low service level bridge rail for use on culverts and low bridges. It was desired that such a rail would be economical and compatible in strength and stiffness with the standard Texas Guard Fence (12 ga. W-beam, mounted on 7 in. diameter timber or W6 × 8.5 steel post at 6 ft-3 in. spacing).

Present bridge rails designed according to AASHTO Standard Specifications for Highway Bridges (12th edition) are expensive, very stiff and rigid, and require special transitions to join them with the standard flexible guardrail on each end.

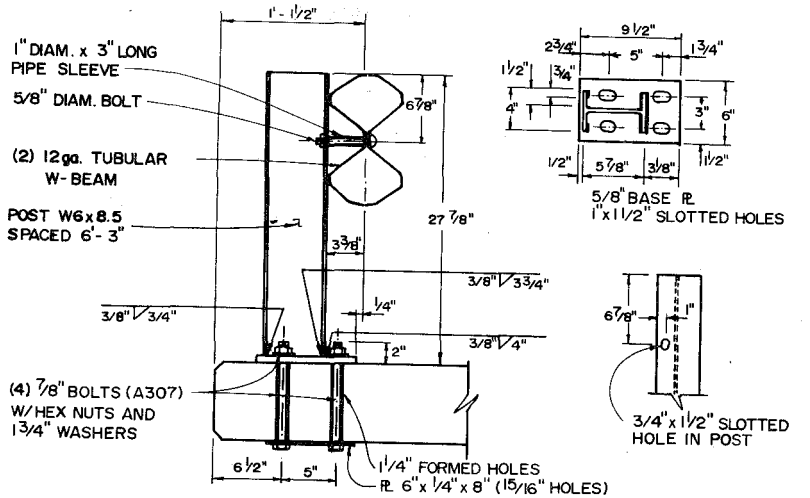
The Tubular W-Beam bridge rail presented here does not meet the elastic analysis and allowable stress design requirements of AASHTO, but it does meet the full-scale vehicle crash test and performance requirements of such bridge rails and, consequently, is exempt from the allowable stress design requirements.

The Tubular W-Beam bridge rail consists of standard guardrail posts W6 × 8.5 spaced 1.9 m (6 ft-3 in.) with a breakaway welded connection. The breakaway feature is achieved by completely welding up the tension flange and only slightly welding the inside of the compression flange and providing no weld on the web.

Since the posts are relatively weak, a strong beam is needed to minimize or control the lateral deflection of the barrier. A Tubular W-Beam was fabricated by welding two standard 12 ga. W-beams back to back. The Tubular W-Beam is about four times stronger than a single W-beam when one compares section moduli. In practice, however, it is much greater than four times as strong because the Tubular W-Beam does not collapse or lose its shape on vehicle impact as does the standard W-beam. The Tubular W-Beam also has similar benefits as a blocked out rail since it is 15 cm (6.5 in.) thick.

The Tubular W-Beam bridge rail was installed on a simulated bridge 17.4 m (57 ft) long.

The Tubular W-Beam bridge rail met the crash test perform-



POST IS INTENDED TO BREAK FREE FROM BASE PLATE UNDER IMPACT. IT IS THEREFORE NECESSARY THAT THE WELD SIZES AND LENGTHS SHOWN NOT BE EXCEEDED.

POST HEIGHT SHALL BE INCREASED 2" FOR STRUCTURE WITH PLANNED OVERLAY.

RAILING SHALL HAVE 6'-3" POST SPACING AND MAY BE INSTALLED ON CULVERTS OR BRIDGES WITH STRUCTURE LENGTHS LESS THAN 75 ft.. A MIN OF 25 ft OF STANDARD GUARDRAIL SHALL BE LOCATED AT EACH RAIL END. ADDITIONAL WOOD OR STEEL POSTS AT 6'-3" CENTERS SHALL BE PLACED AS NEEDED ON THE APPROACHES ALONG WITH APPROPRIATE TERMINAL TREATMENTS.

NO ELASTOMERIC PADS TO BE USED. LEVEL BASE PLATE WITH GROUT IF NECESSARY.

Figure 1. Tubular W-Beam Bridge Rail.

ance requirements of the AASHTO Standard Specifications for Highway Bridges, 12th Edition, 1977. The new rail smoothly redirected a 2041 kg (4500 lb) vehicle traveling 99.1 km/hr (61.6 mph) and impacting the rail at 27.5 degrees. The 1034 kg (2280 lb) vehicle traveling 93.3 km/hr (58 mph) was also smoothly redirected in a 14-degree impact. This satisfactory performance exempts the rail from the allowable stress requirements of Article 1.1.8 entitled "Railings" of AASHTO.

These crash test results indicate that the Tubular W-Beam rail is compatible in strength and stiffness with the standard Texas Guard Fence and therefore should not require any special transition such as closer post spacing. This bridge rail should be suitable for use on culverts and low bridges.

A copy of the full report of findings may be obtained by addressing your requests as follows:

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