U.S. Department
of Transportation
Federal Highway Administration

April 6, 2006

400 Seventh St., S.W.
Washington, D.C. 20590

In Reply Refer To:
HSA-10/B-145

Ronald K. Faller, Ph.D., P.E.
Midwest Roadside Safety Facility
University of Nebraska, Lincoln
527 Nebraska Hall
P.O. Box 880529
Lincoln, Nebraska 68588-0529

Dear Dr. Faller:

Thank you for your letter of December 16, 2005, requesting the Federal Highway Administration (FHWA) acceptance of a Test Level 5 (TL-5) Bridge Rail developed in cooperation with the Nebraska Department of Roads. Accompanying your letter were reports of crash testing you conducted at the Midwest Roadside Safety Facility along with video and photographic documentation of the tests. You requested that we find this railing acceptable for use on the National Highway System (NHS) under the provisions of the National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

Introduction
The FHWA guidance on crash testing of roadside safety hardware is contained in a memorandum dated July 25, 1997, titled "INFORMATION: Identifying Acceptable Highway Safety Features."

A brief description of the barrier follows:

The 121-ft 6-in. long, aesthetic post and beam concrete bridge rail consisted of a "ribbed" reinforced concrete beam 14-in. wide by 30-in. deep with a 42-in. top mounting height which was cast in place with a 2-in. overhang on the front face of the posts parallel to the roadway and flush with the backside of the posts. The two "ribs" extend 1-½ in. from the face of the beam. Both upstream and downstream edges of the posts were tapered back 2 in. from the face of the post to minimize tire snagging of passenger vehicles. Fifteen bridge posts, measuring 10.5-in. wide by 30-in. long by 12-in. high, were used to support the bridge rail. Bridge posts were spaced 8 ft - 6 in. on centers along the length of the bridge railing. The concrete used for the bridge rail and posts had a minimum compressive strength of 5,000 psi.

A minimum concrete cover of 2 in. was used for all the rebar placed within the bridge rail and posts. All steel reinforcement in the bridge rail and posts was Grade 60 epoxy-coated rebar. The bridge rail and post dimensions, including reinforcement details, are shown in the enclosed drawings for reference.

Testing

Full-scale tractor-semi trailer testing was conducted on the barrier. The report explains that concrete barriers with similar features have been successfully crash tested with 820C and 2000P vehicles. We concur that the single TL-5 test is the only one required to qualify this barrier.

The test is summarized in the table below.

	NCHRP Report 350 Test 5-12
Report Number	TRP 03-148-05
Mass of Test Vehicle	35,822 kg (78,975 pounds)
Impact Speed	79.6 km/h (49.4 mph)
OIV Longitudinal	0.91 m/s (2.99 ft/s)
OIV Lateral	5.50 m/s (18.05 ft/s)
Ridedown Longitudinal	8.05 g's / -6.98 g's
Ridedown Lateral	6.06 g's / -7.91 g's
Dynamic Deflection	285 mm (11.2 in.)
Working Width	1916 mm (75.4 in.)

Findings

The test showed that the aesthetic open concrete bridgerail adequately contained and redirected the vehicle with controlled lateral displacements of the rail. There were no detached elements or fragments which showed potential for penetrating the occupant compartment nor presented undue hazard to other traffic. There were no deformations or intrusions into the passenger compartment that could have caused serious injury. The test vehicle did not penetrate or roll over the barrier, and it remained upright without intruding into adjacent traffic lanes. Vehicle roll, pitch, and yaw were good to moderate. As shown above, while the dynamic deflection was about 11 in., the Working Width (deflection plus vehicle overhang plus width of the rail system) was slightly over 6 ft.

The results of the testing met the NCHRP Report 350 requirements and, therefore, the device described above and detailed in the enclosed drawings is acceptable for use on the NHS as a TL-5 bridge rail, under the range of conditions tested, when proposed by a State.

Please note the following standard provisions that apply to the FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the barrier.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.

- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- Users will be expected to ensure that the materials in the constructed barrier have essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that the design will meet the crashworthiness requirements of the FHWA and the NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number B-145 shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

John R. Baxter, P.E.
Director, Office of Safety Design
Office of Safety

Enclosures

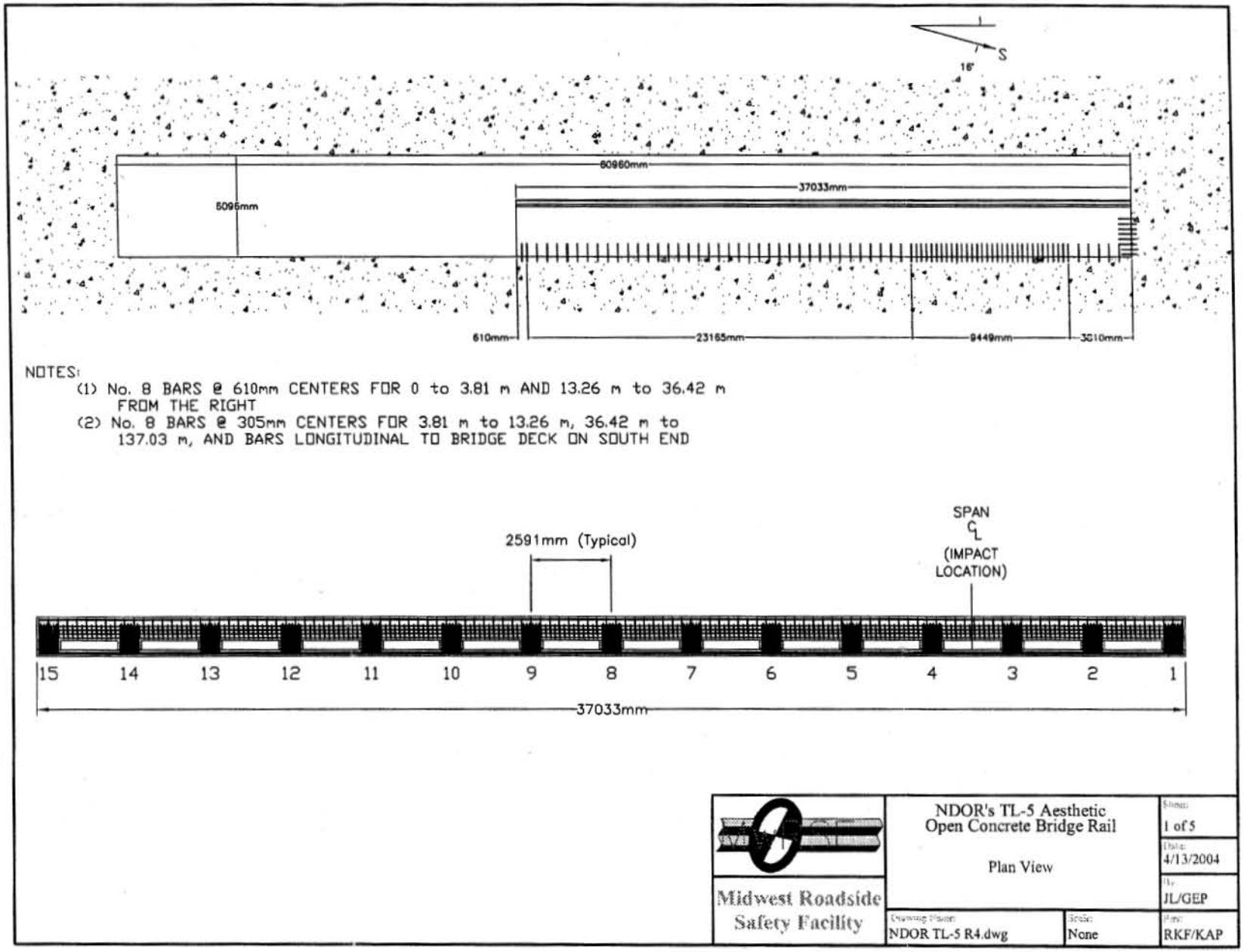


Figure 9. Layout for NDOR's TL-5 Aesthetic Open Concrete Bridge Rail

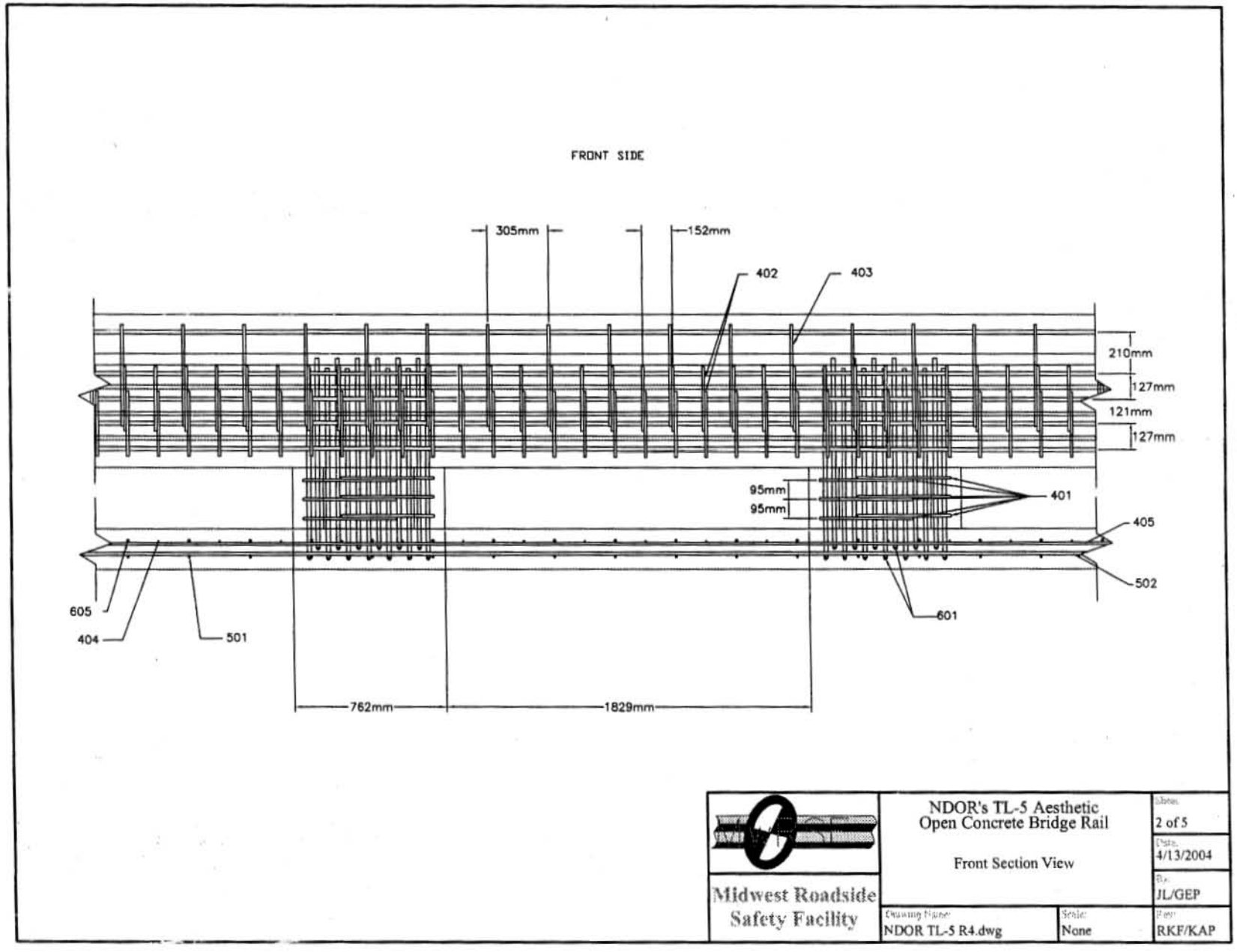
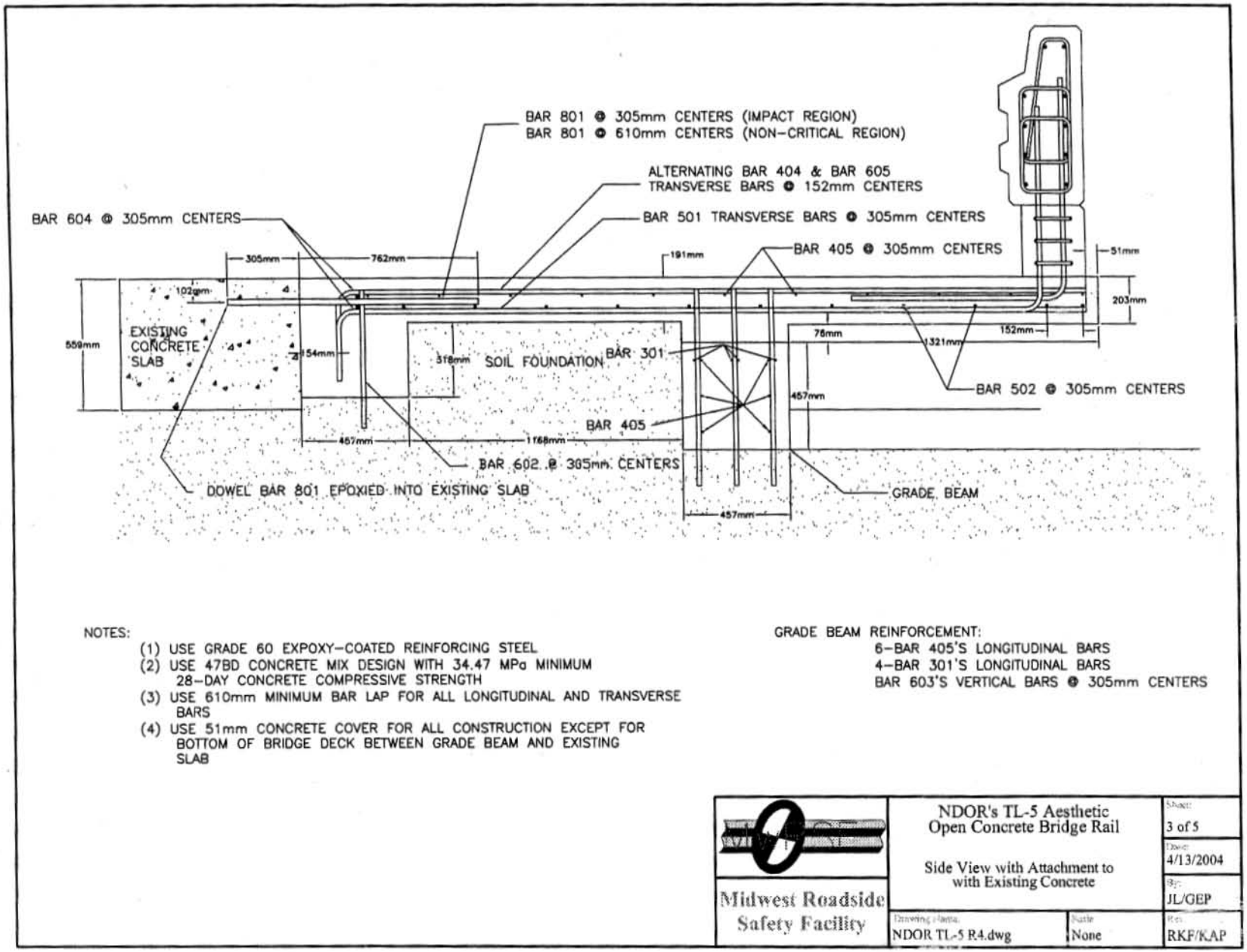


Figure 10. NDOR's TL-5 Aesthetic Open Concrete Bridge Rail Design Details



NOTES:

(1) USE GRADE 60 EXPOXY-COATED REINFORCING STEEL
(2) USE 47BD CONCRETE MIX DESIGN WITH 34.47 MPa MINIMUM 28-DAY CONCRETE COMPRESSIVE STRENGTH
(3) USE 610mm MINIMUM BAR LAP FOR ALL LONGITUDINAL AND TRANSVERSE BARS
(4) USE 51mm CONCRETE COVER FOR ALL CONSTRUCTION EXCEPT FOR BOTTOM OF BRIDGE DECK BETWEEN GRADE BEAM AND EXISTING SLAB

GRADE BEAM REINFORCEMENT:
6-BAR 405'S LONGITUDINAL BARS
4-BAR 301'S LONGITUDINAL BARS
BAR 603'S VERTICAL BARS @ 305mm CENTERS

Midwest Roadside Safety Facility	NDOR's TL-5 Aesthetic Open Concrete Bridge Rail Side View with Attachment to with Existing Concrete	Sheet: 3 of 5 Date: 4/13/2004 By: JL/GEP
	Drawing Name: NDOR TL-5 R4.dwg Note: None	Rev: RKF/KAP

Figure 11. NDOR's TL-5 Aesthetic Open Concrete Bridge Rail Attachment to Existing Concrete Design Details

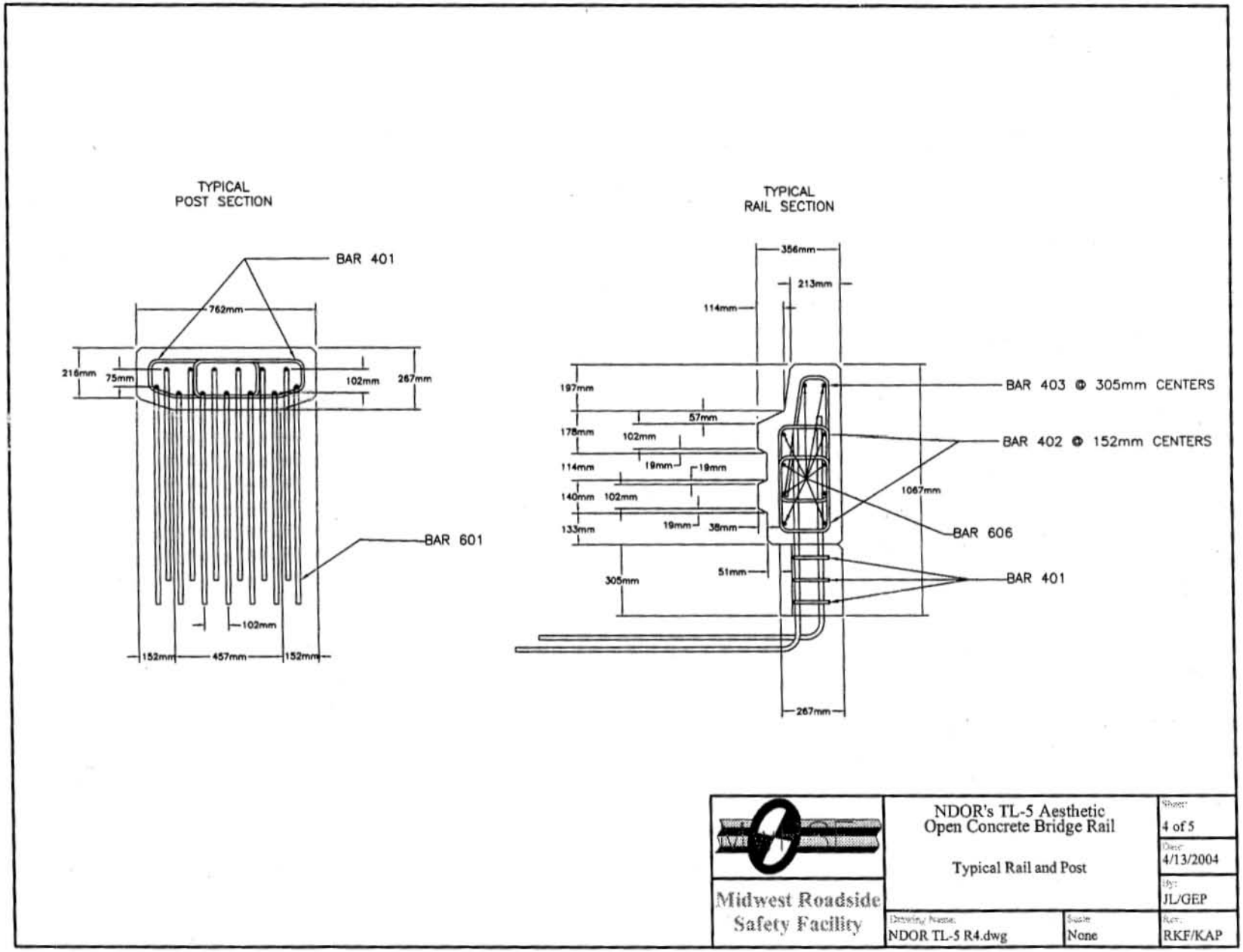


Figure 12. NDOR's TL-5 Aesthetic Open Concrete Bridge Rail Design Typical Rail and Post Details