



U.S. Department  
of Transportation  
**Federal Highway  
Administration**

AUG 29 1996

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

Refer to: HNG-14

Charles E. Dougan, Ph.D., P.E.  
Manager of Research and Materials  
Bureau of Engineering and Highway Operations  
Connecticut Department of Transportation  
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Newington, Connecticut 06131-7546

Dear Dr. Dougan:

Your August 21 letter to Mr. Gerald L. Eller, Director, Office of Engineering requested the Federal Highway Administration's (FHWA) acceptance of an aesthetic steel post supported timber guardrail developed for use on the Merritt Parkway in Connecticut. Included with your letter were plan sheets and specifications for the Merritt Parkway Guardrail (MPG), an April 1996 test report by Bullard, Menges, and Alberson of the Texas Transportation Institute entitled "Testing and Evaluation of the Merritt Parkway Guiderail," and a composite videotape showing each of the tests that were run.

The MPG consists of a 152-mm x 305-mm timber rail element backed by a steel strap and splice plates. This rail is supported by W150 x 22.5 steel posts at a 2896-mm spacing and set with the top of the rail at a height of 762 mm above the pavement surface. Wood blockouts measuring 100 mm x 200 mm x 280 mm separate the rail from the steel posts. Details of the design are shown in Enclosure 1. A transition design, shown in Enclosure 2 was also tested.

Enclosure 3 is a summary of the National Cooperative Highway Research Program (NCHRP) Report 350 testing that was done. We note that the basic design was successfully tested with both the 820-kg car and the 2000-kg pickup truck (tests 3-10 and 3-11, respectively). Test 3-11 was also run on the basic design set 300 mm behind a slope-face, 100-mm high curb, and test 3-21 was run on the transition design. We concur that the pickup truck test is the critical one in these last two cases, and that tests 3-10 and 3-20 with the 820-kg car are not necessary. However, in the case of the transition design, a note should be added to the plan requiring that the granite transition curbing be backfilled

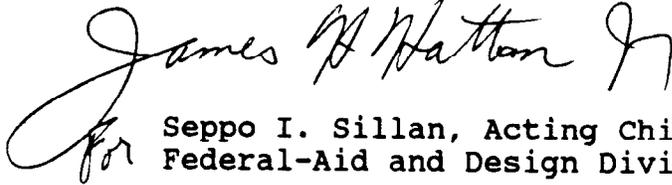
to its top to minimize the likelihood of a small car's wheel becoming jammed between the back of this curb and the bottom of the timber rail element.

Based on our review of the test results, we find that the MPG meets the appropriate evaluation criteria for an NCHRP Report 350 Test Level 3 (TL-3) traffic barrier and may be used on the National Highway System (NHS) when such use is requested by a highway agency. We understand that the MPG is a non-proprietary product and that interested agencies may contact the Connecticut Department of Transportation to obtain copies of specifications and full size drawings.

We note that you intend to conduct an in-service evaluation of the MPG as recommended in the NCHRP Report 350. Two items of particular interest, in addition to crash performance and repair costs, are the initial cost of the system and the long-term durability of the weathering steel used for the backing plates, splices, and posts.

You also asked our opinion on the possible effect on performance of horizontal grooves on the upper sloped face of an F-shape concrete safety barrier. Tests conducted several years ago have led some research engineers to conclude that a "rough" faced barrier allows an impacting vehicle to climb higher up the wall, possibly leading to a rollover in the case of shorter wheelbase, front-wheel drive vehicles. Horizontal grooves in the barrier could produce the same undesirable results in relatively shallow-angle impacts. Thus, we recommend that this seemingly minor design modification be tested prior to use, or that a vertical-faced barrier be considered instead.

Sincerely yours,

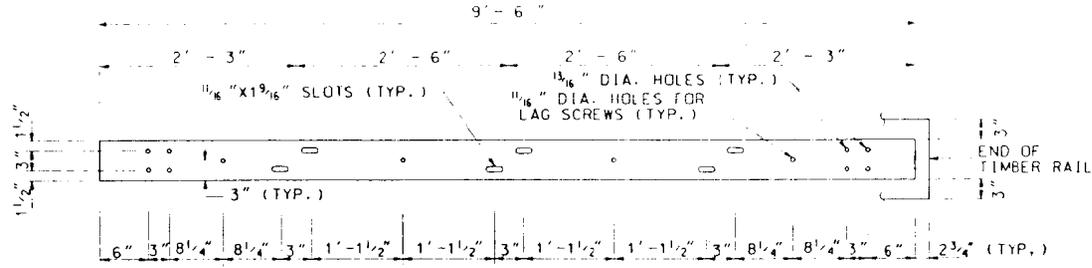
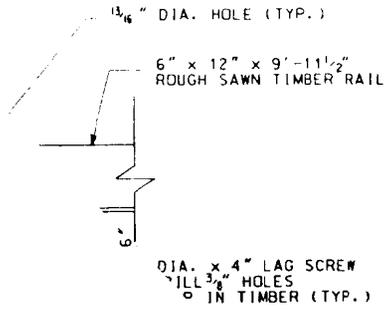


for Seppo I. Sillan, Acting Chief  
Federal-Aid and Design Division

3 Enclosures

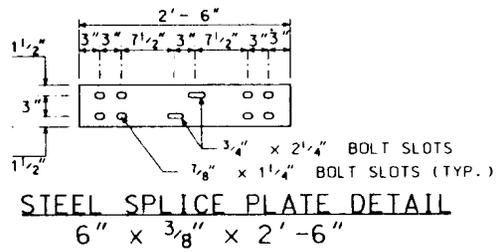
# MERRITT PARKWAY GUIDERAIL

NOT TO SCALE



**STEEL RAIL DETAIL**  
6" x 3/8" x 9'-6"

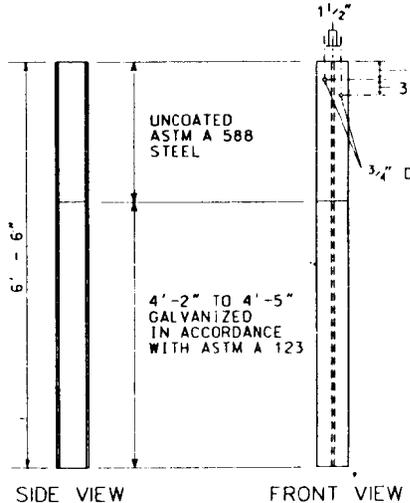
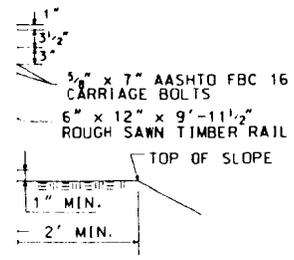
BLOCKOUT



## NOTES

- MATERIALS AND CONSTRUCTION OF THE MERRITT PARKWAY GUIDERAIL SHALL CONFORM TO PROVISION NO. XXX. 9100524
- DELINEATOR REFLECTORS SHALL BE BROWN PLASTIC INVERTED T SECTIONS CONFORMING TO DURAFLEX CORP. SLEXX 2020, OR APPROVED EQUAL. REFLECTIVE SHEETING SHALL BE SQUARE AND A MINIMUM OF 9 SQUARE INCHES, AND CONFORM TO SECTION M.18.09. DELINEATORS SHALL BE ATTACHED WITH FOUR (4) 1"-LONG, GALVANIZED WOOD SCREWS. REFLECTORS SHALL BE SPACED IN ACCORDANCE WITH THE TABLE, AND POSITIONED PERPENDICULAR TO THE ADJACENT EDGE OF LANE. DO NOT ATTACH REFLECTORS ON FLAIR OR TERMINAL SECTIONS. REFLECTIVE SHEETING SHALL BE SILVER-WHITE ON ALL RAIL SECTIONS ADJACENT TO THE RIGHT SHOULDER, AND YELLOW ON RAIL SECTIONS ADJACENT TO THE LEFT SHOULDER OF TRAVEL LANES.
- 3/8" DIA. x 4" LAG SCREW AND WASHER SHALL BE INSTALLED IN PLACE OF THE 3/4" DIA. x 13" CARRIAGE BOLT IN THE ABSENCE OF ANY MID-RAIL POST CONNECTION.
- ALL CONNECTION HARDWARE SHALL BE SUFFICIENTLY TIGHTENED TO ACCOMMODATE FOR SHRINKAGE OF THE WOOD ELEMENTS.

- AASHTO FBC20 CARRIAGE BOLT NUT & WASHER
- DELINEATOR REFLECTOR
- 4" x 8" x 11" WOOD BLOCKOUT



**TABLE 1**

DELINEATOR SPACING SCHEDULE	
RADIUS OF CURVE	DELINEATOR SPACING
150 FT	10 FT
300 FT	20 FT
500 FT OR FLATTER	50 FT

MERRITT PARKWAY GUIDERAIL STANDARD DETAILS



REVISIONS		
NO.	DATE	DESCRIPTION

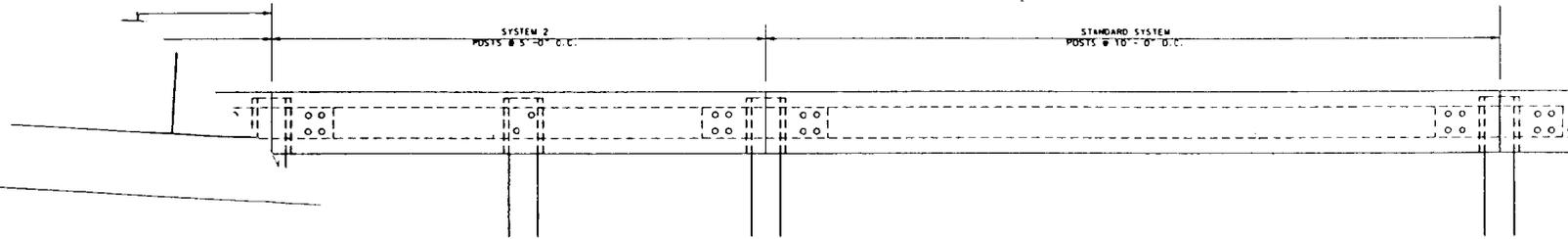
MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED ON THIS SHEET.

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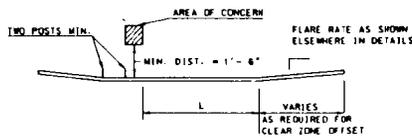
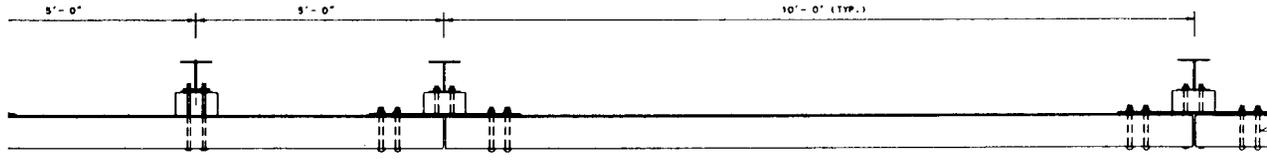
# MERRITT PARKWAY GUIDERAIL

NOT TO SCALE

1	STATE	LOUISIANA	FED. AID PROJ. NO.	PROJ. NO.	YEAR	ROUTE NO.	SHEET NO.	TOTAL SHEETS
1	CONTRACT							



2N  
LEADING END  
PARAPET

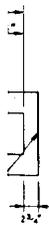


NOTE:  
ELEVATION VIEW ASSUMES MAXIMUM STIFFNESS AND MINIMUM DEFLECTION SUCH AS IS NECESSARY AT APPROACH TO PARAPETS.

Minimum Anticipated Deflection	Area of Concern Plus 2 Posts (Lead Section)	SYSTEM 3 # 6x15 Posts 2'-6" O.C.	SYSTEM 2 # 6x15 Posts 5'-0" O.C.	Standard System # 6x15 Posts 10'-0" O.C.	Total Length Min. Value Of L'
1'-0"±	System 3	10'-0" Min.	10'-0" Min.	50'-0"	70'-0"
2'-6"	System 2	—	10'-0" Min.	60'-0"	70'-0"
4'-0"	Standard System	—	—	70'-0"	70'-0"

NOTES:

- DRAWING DENOTES ATTACHMENT TO PROPOSED PARAPET. AT EXISTING PARAPET ATTACH USING DOT APPROVED CHEMICAL ANCHORS.
- 3/8" DIA. X 4" LAG SCREW AND WASHER SHALL BE INSTALLED IN PLACE OF THE 5/8" DIA. X 13" CARRIAGE BOLT IN THE ABSENCE OF ANY MID-RAIL POST CONNECTION.



REVISIONS			
NO.	DATE	DESCRIPTION	REV. SHEET NO.

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CADD FILE: WY15.DWG: TMB.DWG

APPROACH TO FIXED OBJECTS AND PARAPETS

**CONNECTICUT DEPARTMENT OF TRANSPORTATION**  
 Division of Research  
 August 1996

**Merritt Parkway Guiderail (MPG)**  
 NCHRP Report 350, Test Level 3 Crash Tests

**Summary of Results**

<b>NCHRP Report 350 Test Designation</b>	<b>3-11 No Curb</b>	<b>3-10 No Curb</b>	<b>3-11 With Curb</b>	<b>3-21 Transition</b>
<b>Vehicle Mass (kg)</b>	2000	896	2000	2000
<b>Impact Velocity (km/h)</b>	100.02	99.29	99.33	101.96
<b>Impact Angle (degrees)</b>	25.20	20.30	25.24	26.38
<b>Impact Location</b>	0 mm upstream from a post.	1800 mm upstream from a post.	0 mm upstream from a post.	1880 mm from end of rigid barrier.
<b>Lateral Dynamic Deflection (mm)</b>	1150	750	1020	150
<b>Occupant Impact Velocity (m/s)</b>				
<b>Longitudinal (max. allowable=12)</b>	8.09	5.99	6.96	9.22
<b>Lateral (max. allowable=12)</b>	4.25	5.27	4.78	7.91
<b>Occupant Ridedown Acceleration (peak 10 ms avg g's)</b>				
<b>Longitudinal (max. allowable=20)</b>	-9.58	-4.27	-10.12	-8.15
<b>Lateral (max. allowable=20)</b>	-10.13	8.23	-10.16	-10.38
<b>Exit Angle (degrees)</b>	0.50	8.80	12.53	9.20
<b>Exit Velocity (km/h)</b>	40.90	76.20	59.37	56.93
<b>Assessment</b>	Passed all requirements	Passed all requirements	Passed all requirements	Passed all requirements