

**ROADWAY DESIGN UNIT**

MAR 03 2008

<input checked="" type="checkbox"/> ALLEN	<input checked="" type="checkbox"/> J. IS	<input checked="" type="checkbox"/> SYKES
<input checked="" type="checkbox"/> BREW	<input checked="" type="checkbox"/> C. HOUSER	<input checked="" type="checkbox"/> T. HOUSER
<input checked="" type="checkbox"/> COVERING	<input checked="" type="checkbox"/> D. TAYLOR	<input checked="" type="checkbox"/> GOODNIGHT
<input checked="" type="checkbox"/> J. MOORE	<input checked="" type="checkbox"/> C. HAIRE	<input checked="" type="checkbox"/> SPEER
<input checked="" type="checkbox"/> B. MOORE	<input checked="" type="checkbox"/> MICHAEL F. EAST	<input checked="" type="checkbox"/> THOMAS
<input checked="" type="checkbox"/> MUMFORD	<input type="checkbox"/> GOVERNOR	<input checked="" type="checkbox"/> WALLS
	<input type="checkbox"/> STEPHENSON	

PREPARE REPLY FOR \_\_\_\_\_ SIGNATURE  
 FYI  
 REVIEW/DISCUSS WITH \_\_\_\_\_



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

Highway Design  
HIGHWAY DESIGN BRAN

FEB 29 2008

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LYNDO TIPPETT  
SECRETARY

FYI  
 Take appropriate Action  
 Prepare reply for \_\_\_\_\_

February 27, 2008

MEMORANDUM TO:

Steve Varndoe, P.E., Chief Engineer-Operations  
 Jon Nance, P.E., Director of Field Operations  
 Lacy Love, P.E., Director of Asset Management  
 Debbie Barbour, P.E., Director of Preconstruction  
 Art McMillan, P.E., State Highway Design Engineer  
 Division Engineers

MAR 06 08

COPIES SENT

FROM:

*William F. Rosser*  
 William F. Rosser, P.E.  
 State Highway Administrator

SUBJECT:

NCDOT Guidelines for Median Separations at  
 Highway/Railway At-Grade Crossings

Attached are completed Guidelines for Median Separation at Highway/Railway At-Grade Crossings. These guidelines have been developed thru efforts of Rail Division – Engineering and Safety Branch with review by many Units/Divisions within our Department.

This is to request these guidelines be distributed within your respective organizations to be implemented consistently and uniformly to improve the safety of our rail crossings.

If I may be of further assistance, please advise.

WFR/sg

Attachment

cc: Lyndo Tippett, Secretary of Transportation  
 Dan DeVane, Chief Deputy Secretary  
 John Sullivan, P.E., FHWA Division Administrator  
 Kevin Lacy, P.E., State Traffic Engineer  
 Paul Worley, CPM, Director of Engineering and Safety  
 Patrick Simmons, Director of the Rail Division

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 RALEIGH NC



Nance  
Love  
Barbour

**Received**  
FEB 18 2008  
State Highway  
Administrator's Office

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

LYNDO TIPPETT  
SECRETARY

February 12, 2008

**Memorandum**

**To:** W. F. (Bill) Rosser, PE  
State Highway Administrator

**From:** Paul C. Worley, CPM  
Director – Engineering & Safety

**Subject:** NCDOT Guidelines for Median Separators at  
Highway/Railway At- Grade Crossings

Attached is a copy of the completed Guidelines for Median Separation at Highway/Railway At-Grade Crossings that are ready for implementation by the various NCDOT units.

The guidelines were developed with the assistance of Kathy Lassiter and Glenda Gibson of Gibson Engineers in order to provide consistent guidance for a median separation at highway-railway at-grade crossings where it is determined to be the appropriate safety improvement for the crossing. Once implemented, these guidelines should enable the treatments to be constructed in a more consistent and uniform manner across the state.

A brief outline of the steps followed in the development of these guidelines is as follows:

- Guidelines were written under the direction of the Rail Division engineers.
- A committee was formed with preconstruction and division personnel to review and further develop the guidelines.
- The committee's comments were incorporated into the guidelines.
- A second review was conducted by the committee and comments were incorporated.
- Staff met with Traffic Operations to refine guidelines.
- The committee was convened for a third review.
- Debbie Barbour and Steve Varnedoe reviewed.
- Guidelines were distributed to the Division Engineers for review.
- Guidelines were presented at the Operations Staff Meeting.

**MAILING ADDRESS:**  
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TELEPHONE 919-715-8803  
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**LOCATION:**  
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862 CAPITAL BOULEVARD  
RALEIGH, NC 27603

- Further comments were incorporated.

We greatly appreciate the input and assistance of various engineers in the Division of Highways to develop these guidelines. We believe that we now have a better process and design that will make our crossings safer while lasting longer. If you have any questions, please give me a call.

Attachment

PW/kl

cc: Roberto Canales, PE, Deputy Secretary for Transit  
Patrick Simmons, Rail Division Director

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FOR REFERENCE ONLY

## **Guidelines for Median Separation at Highway-Railway At-Grade Crossing**

To protect the safety of the traveling public and the security and integrity of critical rail-highway at-grade junctures every effort should be made to discourage at grade rail crossings. The addition of travel lanes to existing at grade crossings should be avoided unless recommended by an engineering study. However, if after coordinating with the Rail Division, it is determined an at-grade crossing cannot be avoided or eliminated, and a median separation is deemed necessary and appropriate, the following guide should be used.

The intent of this guide is to establish the desirable conditions for the uniform and consistent layout and construction of median separations where it has been determined that a median separation is appropriate. This guide/design tool should be utilized with sound engineering judgment, sound design, and attention to costs.

The NCDOT Rail Division should be included in negotiations and decisions regarding at grade rail crossings. Decisions made regarding railroad crossings shall protect the traveling public, will be sensitive to the needs of the railroad and should be based on the best information and practices available.

Projects programmed in the Transportation Improvement Program (TIP) which may result in creating a new highway-railway at-grade crossing or affecting an existing crossing shall be coordinated with the Rail Division in the early project planning process. The Rail Division will be actively involved in all scoping meetings held by the Planning and Environmental Branch that have the potential to involve or affect an existing or proposed railroad crossing.

Division and local projects involving a railroad crossing will be coordinated with the Rail Division. It will be the responsibility of the Division Engineer to initiate contact and advise the Rail Division early in the process to determine the appropriate crossing treatment for the site conditions.

When an at grade railroad crossing is involved, it will be the responsibility of the Rail Division to research and obtain pertinent information from the railroad company such as number of trains, speed, and contact information for further coordination and provide it to the requesting party. It will also be the responsibility of the Rail Division to keep the appropriate Division Engineer informed of any railroad work being planned in their area even if it does not involve a TIP project. Within the limits of a TIP project, the Rail Division will assist the appropriate railroad company in making decisions concerning the appropriate improvements to the rail crossing.

Median separations can be used to physically discourage drivers from driving around crossing gates when it has been determined a median separator is the appropriate treatment based on an engineering evaluation.

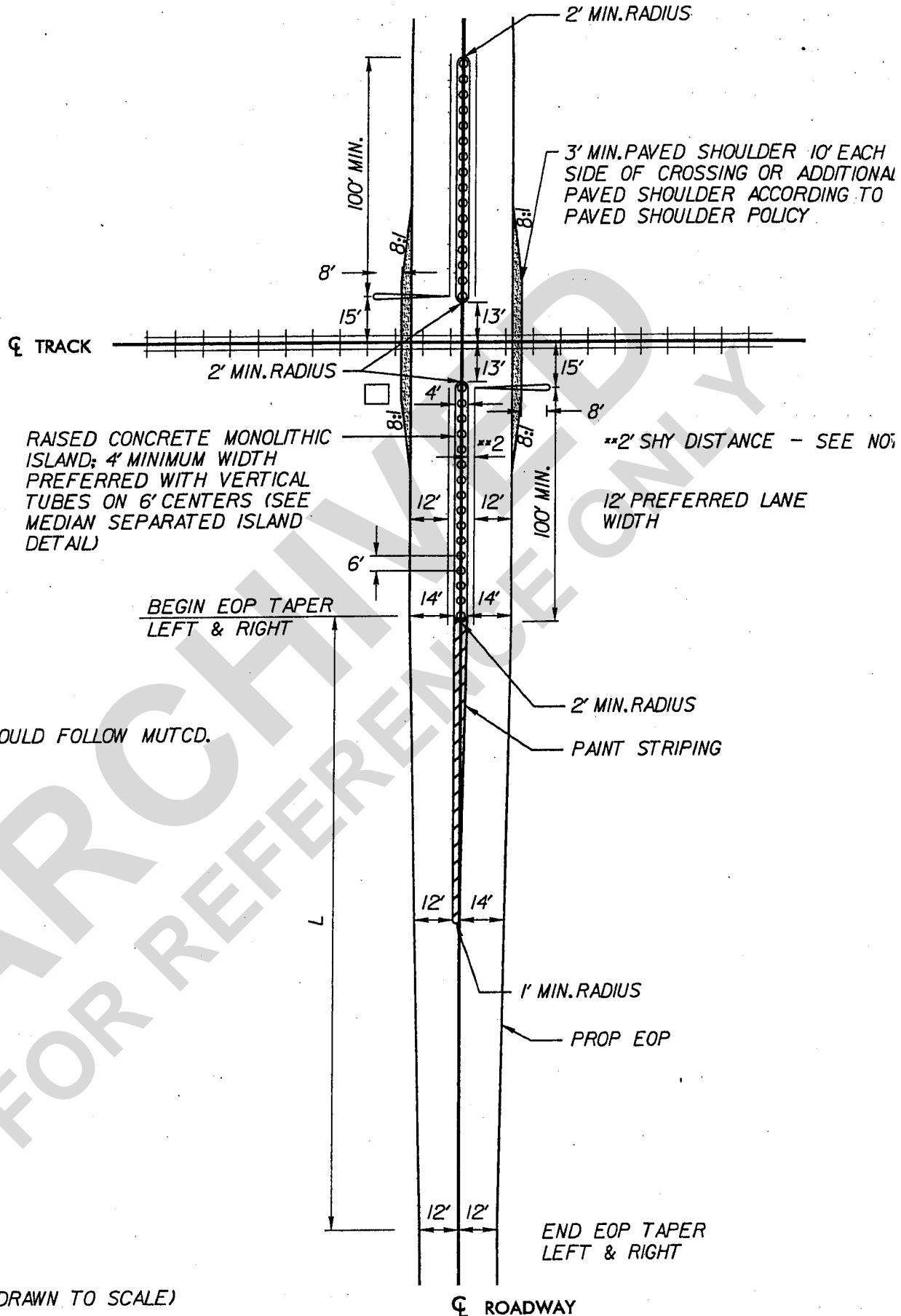
- After the decision is made to add a median separation, the following details should be used/referenced as a guide for the consistent design layout and construction of the median separation treatment.

- The detail for median separation should be used in conjunction with the appropriate The American Railway Engineering and Maintenance of Way Association (AREMA) and The American Association of State Highway Transportation Officials (AASHTO) guidelines and standards for new construction on TIP projects or when additional improvements are warranted, recommended and justified (within program and site constraints).
- If speeds exceed 40 mph, an advisory speed of 40 mph should be posted on the advance warning sign as deemed necessary and recommended by the Division Traffic Engineer. Cases involving speeds greater than 40 mph should be handled on a case by case basis and design features and advisories developed through coordination with appropriate Regional and Division Traffic Engineers.
- Shy distances should be increased beyond the minimal 2 foot offsets when variations in alignment (vertical/horizontal) introduce more navigational factors to the operators.
- Minimum Design Criteria should only be utilized when conditions physically restrict the use of recommended/preferred design criteria

Please refer to the Rail Division's website <http://www.bytrain.org/safety> for additional information.

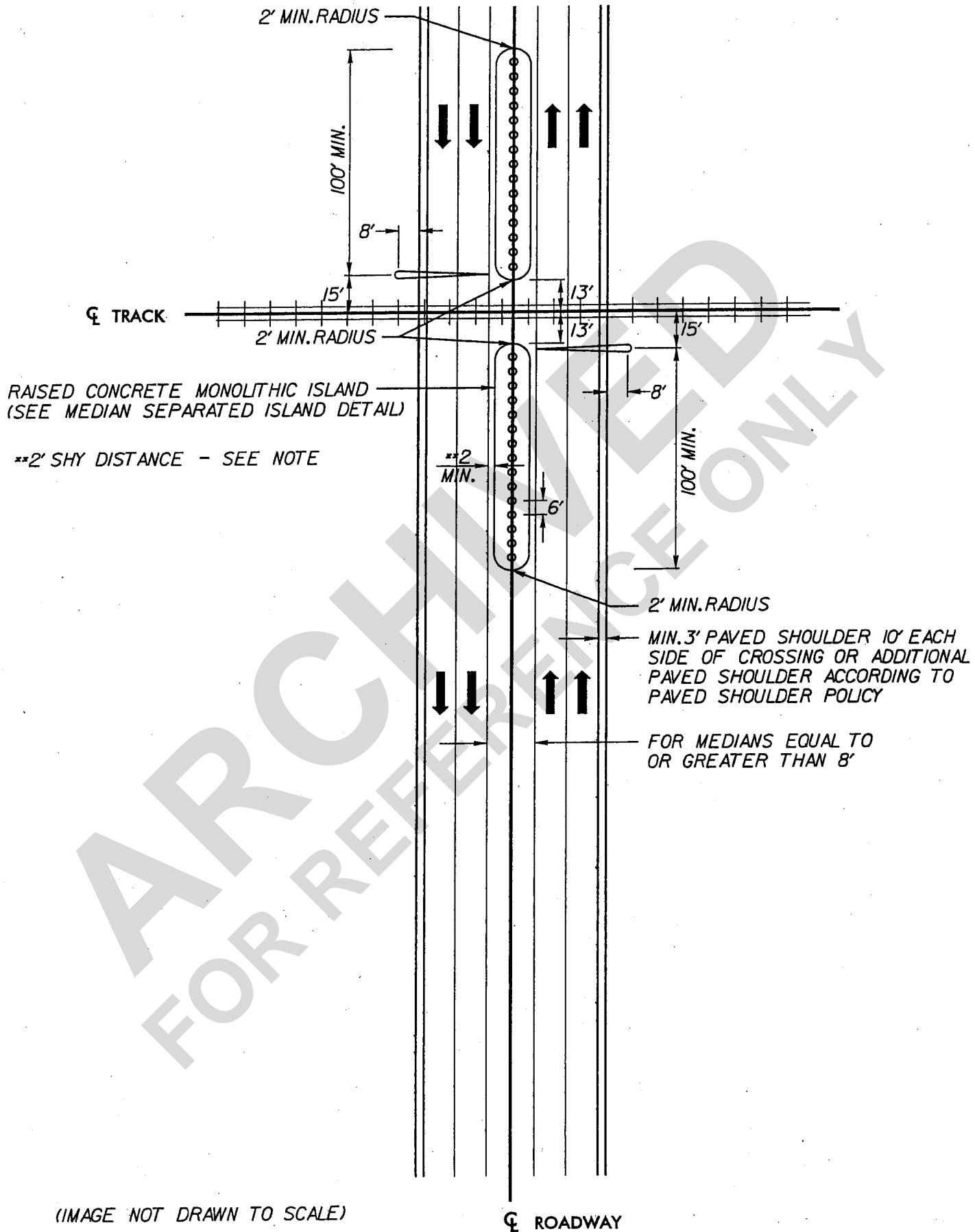
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# SEPARATION FOR TWO LANE RAILROAD CROSSING



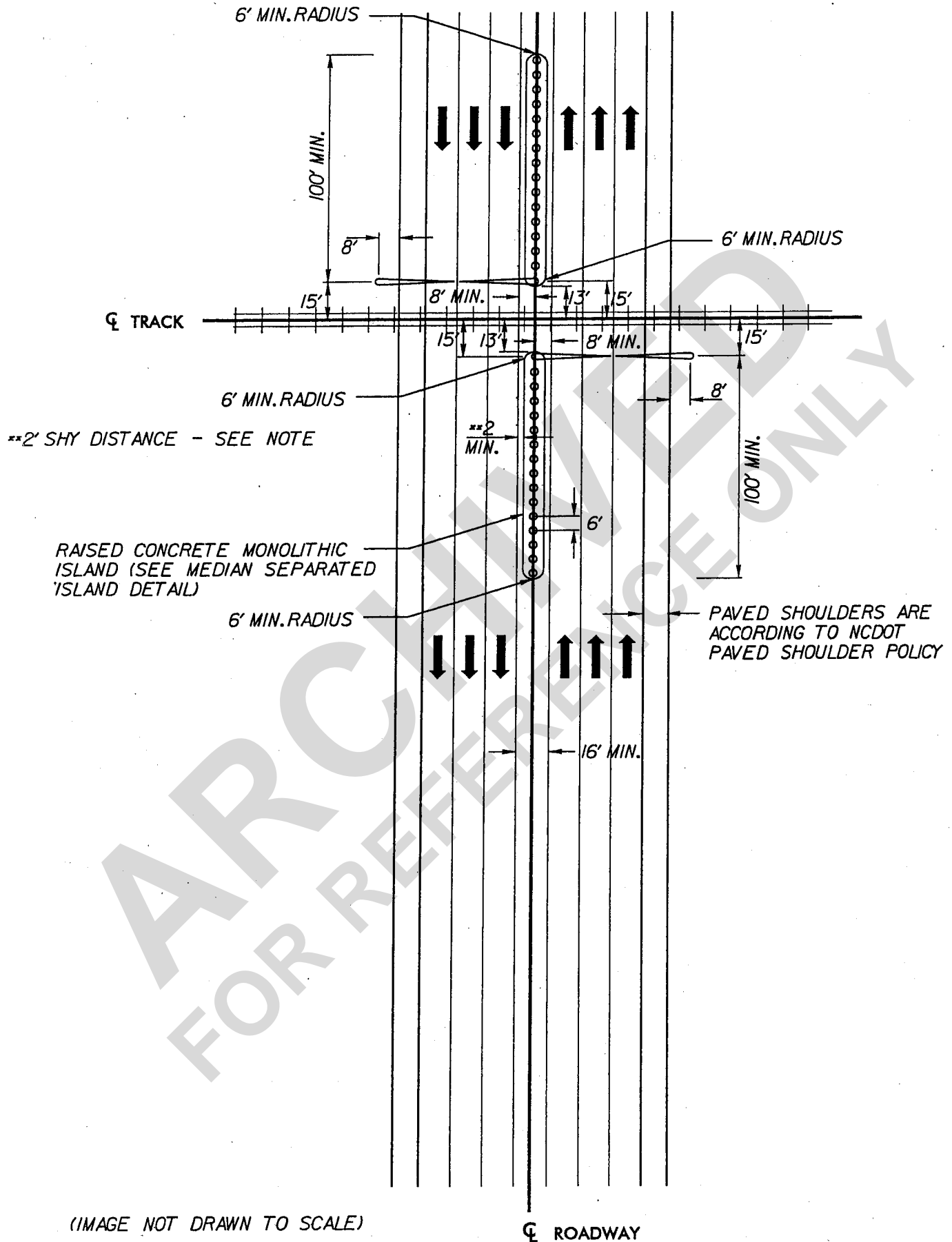
(IMAGE NOT DRAWN TO SCALE)

# SEPARATION FOR FOUR/FIVE LANE RAILROAD CROSSING



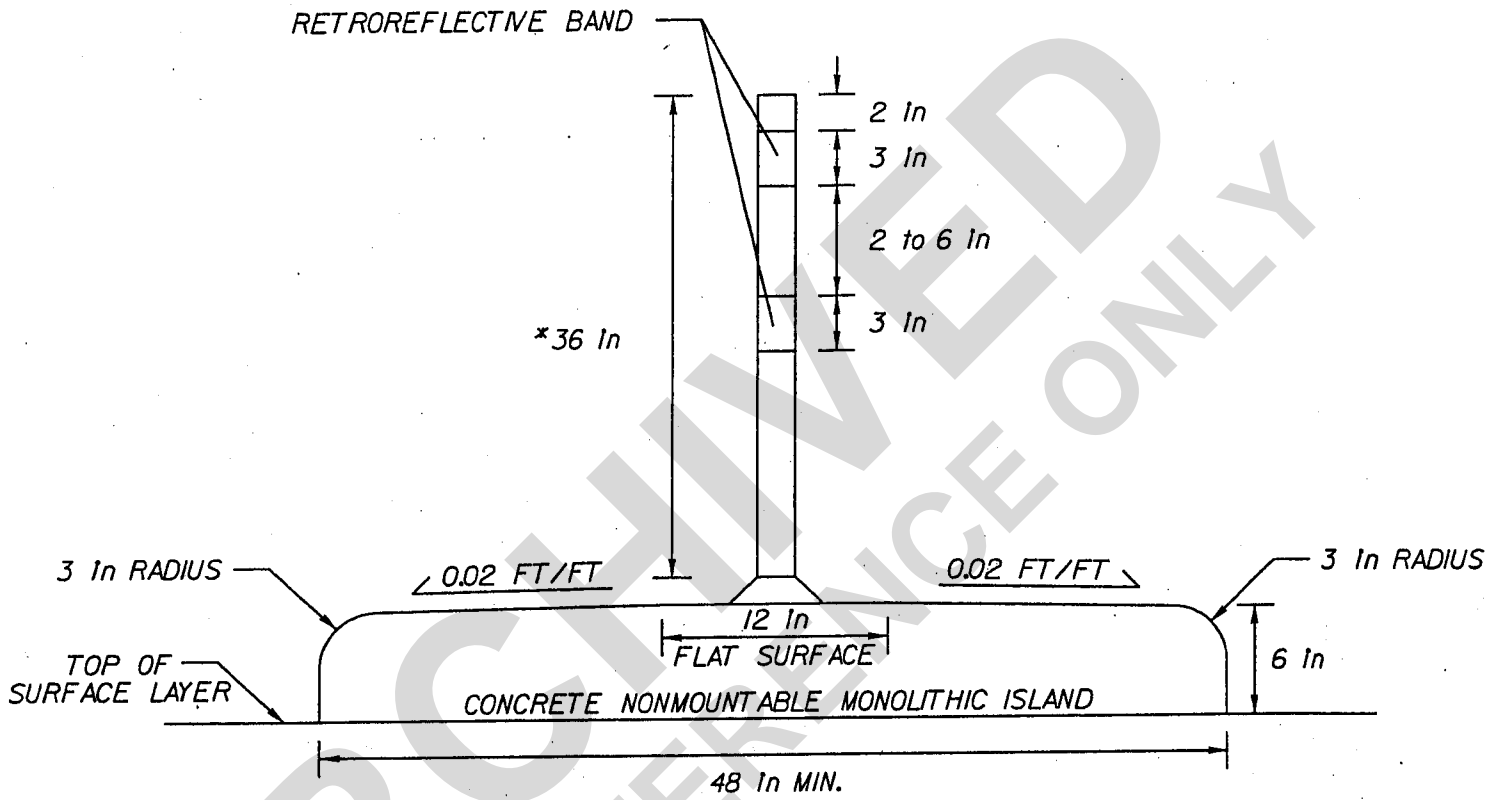
(IMAGE NOT DRAWN TO SCALE)

# TYPICAL MEDIAN SEPARATION WITH MAST AND GATE





# TYPICAL TUBULAR MARKER



\*36 In height may be reduced upon further coordination with the Rail Division if the crossing has a lot of use by oversized vehicles.

(IMAGE NOT DRAWN TO SCALE)

# TYPICAL MEDIAN SEPARATED ISLAND DETAIL

7

100' MIN. RECOMMENDED

RAILROAD CROSSING

2' MIN. RADIUS

REINFORCING BARS

REINFORCING BARS

REINFORCING BARS

REINFORCING BARS

REINFORCING BARS

REINFORCING BARS

REINFORCING BARS

REINFORCING BARS

REINFORCING BARS

6'

10' TRANSITION

2' MIN. RADIUS PAINTED AREA

VARIABLE (4' MIN.)

2' FLAT SURFACE

.02

.02

3' RADIUS

SECTION B

NON-MOUNTABLE 5" MONOLITHIC CONCRETE ISLAND

VARIABLE (4' MIN.)

2' FLAT SURFACE

.02

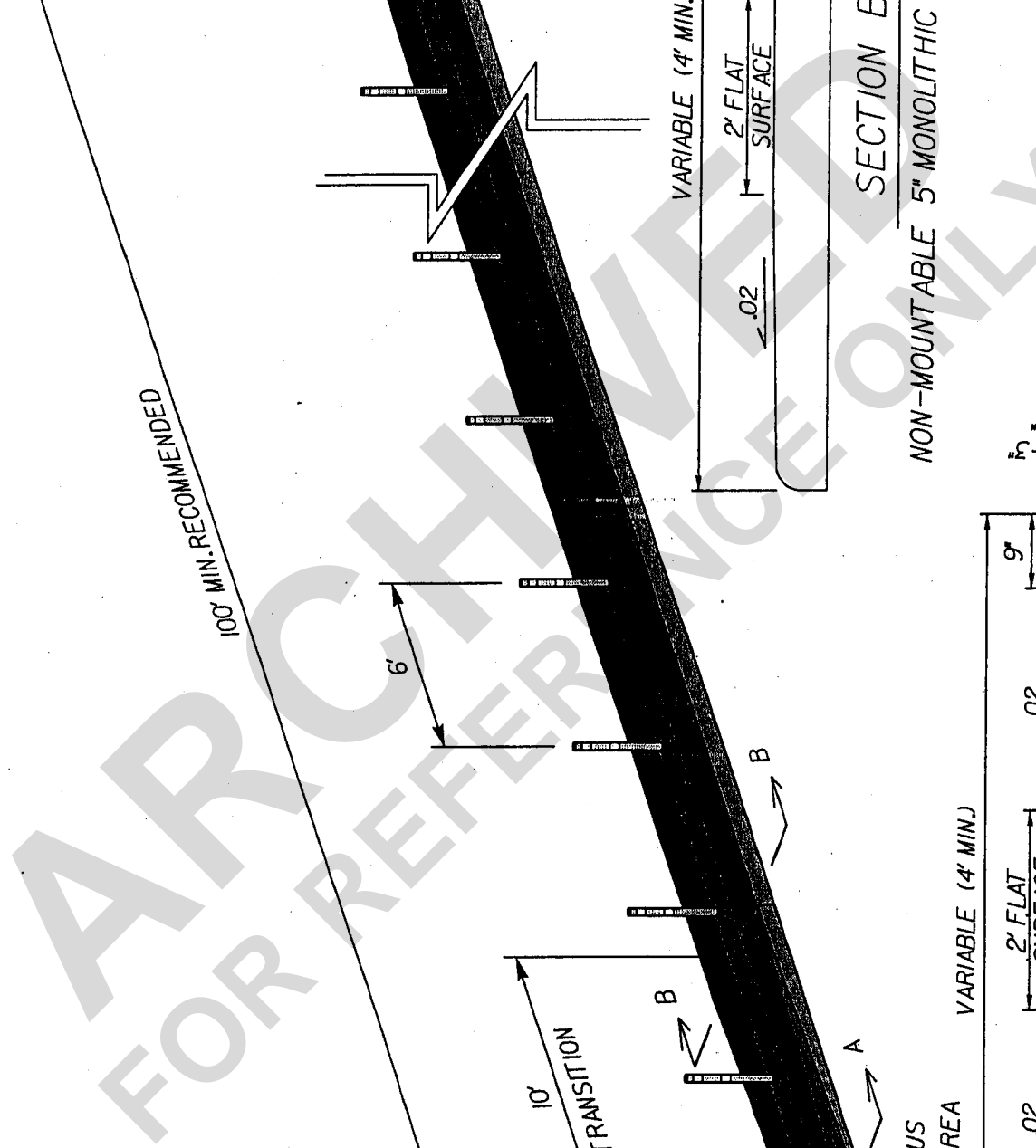
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2' RADIUS 1.75" RADIUS

SECTION A

MOUNTABLE 5" MONOLITHIC CONCRETE ISLAND

NOTES: THE APPROACH END OF THE ISLAND (MOUNTABLE SECTION) SHOULD BE LOCATED A MINIMUM OF 100' FROM THE GATE ARM. (SEE NOTE) THE MOUNTABLE SECTION OF THE



## Notes

Per Federal Railway Administration Code of Federal Regulations (49 CFR Appendix A to Parts 222-229) "Medians or channelization devices must extend at least 100' from the gate arm, or if there is an intersection within 100' of the gate, the median or channelization device must extend at least 60 feet from the gate arm."

The preferred island length is 100' from the gate; however higher traffic volumes or higher truck traffic may warrant that the island's length be increased to a logical termination point such as the next intersection, drive etc. Any deviation below this minimum will be coordinated with the Rail Division.

The recommended and preferred island width is 4' minimum. If coordinated with the Rail Division, the width may possibly be reduced to 2' with vertical markers when improvements are warranted but there are constraints that prevent using the preferred width. When the island is less than 4' wide, the island should be keyed in on the last layer of pavement surface course. When the island is 4' wide or greater, it can be surface mounted on top of the pavement using spikes in accordance with the current Roadway Standard Drawings.

The minimum shy distance is 2' as referenced in AASHTO. This should be increased to desirable/recommended values as conditions beyond minimum are encountered.

In multilane situations, where signals and gates are required in the median, the island width should be a minimum of 12' with the appropriate shy distances.

A keep right sign shall be used on islands greater than or equal to 4'. Where 4' is not available, a divided highway advisory sign should be placed on the approach shoulder.

To improve night visibility and navigation around the island, it is recommend using 3 reflective markers on the end cap of median or painting the end cap of median.

Drainage issues in conjunction with the island should be addressed according to design policy.

Resurfacing will reduce the effective island height. It may be necessary to readjust island to preserve non mountable 6" face.

## Minimum Lane and Shoulder Widths for Railroad Crossing Improvements\*

Use the following chart in conjunction with the above details when improvements are recommended, but funds are not available to improve the existing highway to the geometric standards desirable for reconstruction and new highway construction.

Design Speed	Current ADT	Arterial		Collector		Local	
		Lane Width	Shoulder	Lane Width	Shoulder	Lane Width	Shoulder
Under 50 mph (Level and Rolling Terrain)	0 - 1000	11	4	10	3	10	3
	1000 - 2000	11	4	10	3	10	3
	over 2000	12	6	11	6	11	6
50 mph & over (Level and Rolling Terrain)	0 - 1000	11	4	11	3	10	3
	1000 - 2000	12	6	11	4	11	3
	over 2000	12	6	11	6	11	6
Under 50 mph (Mountainous Terrain)	0 - 1000	10	3	10	3	10	3
	1000 - 2000	11	3	10	3	10	3
	over 2000	12	6	11	6	11	4
50 mph and over (Mountainous Terrain)	0 - 1000	11	3	11	3	10	3
	1000 - 2000	11	3	11	3	10	3
	over 2000	12	6	11	6	11	4

### NOTES:

- Shoulder dimensions indicate graded widths and include paved shoulder widths.
- Where guardrail is to be installed, graded shoulder width must be increased by 3 feet.
- Where truck traffic (TTST and Duals) volume exceeds 10% of current ADT, lane widths should be increased by 1' to a maximum of 12'. 12' lane width should be used on routes designated as part of the National Truck Network.
- For current ADT less than 1000, paved shoulders are not recommended.  
For current ADT between 1000 - 3000, 2' paved shoulders are recommended.  
For current ADT over 3000, 4' paved shoulders should be used.

\*See Division of Highways, RRR Guide, April 2004, Page 14