



Minnesota Department of Transportation

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Memo

TO: Bridge Design Engineers

FROM: Kevin Western *Kevin Western*
State Bridge Design Engineer

DATE: December 23, 2011

MEMO TO DESIGNERS (2011-03): Interim Guidance for Installation of Temporary Barriers on Bridges and Approach Panels

Several months ago the portable precast barrier anchorage (Standard Detail B920) was temporarily put on hold due to a lack of validated information on the adequacy and performance of the anchors. Understanding that temporary installations will be needed until research and testing is complete, the Bridge R&D Committee met to establish interim guidance regarding the design and use of temporary precast concrete barriers on bridges and approach panels. This guidance was developed from our best past practices and draft research information. Over the upcoming months, we will be meeting with the Roadway Standards Unit and the Office of Construction and Innovative Contracting (OCIC) to develop new standards for bridge and non-bridge applications to address this issue.

Temporary traffic barriers can be used to prevent vehicles from encountering hazards such as large vertical drop-offs, entering a work area, or to separate lanes of two-way traffic. Barrier design and performance includes two significant considerations:

1. Lateral Deflection – The distance the barrier travels laterally, during impact, under the guidance of crash testing standards. Note that lateral deflection can be expected with an anchored barrier.
2. Buffer Area (Lateral) – The area behind the barrier, typically equal to the lateral deflection, must be free of storage items (material, equipment, etc.) that may hinder the barrier's crashworthiness. This applies to both anchored and unanchored barrier systems.

In addition to proper anchorage of the barrier, each of these considerations should be addressed prior to specifying the location and use of temporary barriers. Contractor and construction inspection personnel should also be familiar with the buffer area requirements. Barrier segments must be connected together to be effective. See MnDOT Standard Plate 8337 for barrier and connector pin details.

Given design speed and the existence of significant geometric elements (see list below), designers will determine possible combinations of barrier setback distance and anchoring to achieve an acceptable configuration. Note that any temporary barrier left in-place over the winter must be anchored. The following table illustrates potential acceptable combinations:



Minimum Distance from Edge of Deck to Back (Non-Traffic) Side of Barrier on Bridges and Approach Panels			
Construction Posted Speed Limit	50 mph or greater or with significant geometric elements*	40-45 mph	35 mph or less
Anchored	4'-0"	2'-0"	6"
Unanchored	N/A	6'-0"	3'-0"

*Significant geometric elements include installation on all interstate highways and curved alignments.

Designers may also choose to use a more restrictive setback distance for bridges where travel speeds may significantly exceed the posted speed limit, with heavy truck traffic, or where other situations may warrant increasing the dimensions in the chart above.

The following anchor requirements must be met if utilizing an anchored alternative:

- For each barrier segment, install three, 1½" diameter anchor rods (MnDOT Spec. 3385 Type A) on traffic side only.
- For bridge decks in good condition, chemical anchors shall have 5½" minimum embedment and 6" maximum embedment. Maximum depth of the hole shall be 1½ inches less than the slab depth to help ensure that the bottom of the slab doesn't spall or fracture during hole drilling.
- For approach panels with top and bottom mats of reinforcement, chemical anchors shall have 5½" minimum embedment.
- For approach panels with no reinforcement or only a bottom mat of reinforcement, chemical anchors shall have 9" minimum embedment.
- Chemical anchors may only be used where concrete is in good condition. Regional Bridge Engineer will confirm adequacy for installations on in-place bridges.
- Through-deck anchoring may be utilized on existing bridge decks in poor condition.
- For the minimum length noted above, the anchor manufacturer's minimum bond stress shall provide an ultimate (nominal) strength of 14 kips and will be proof tested to 7 kips. See the Special Provision for additional testing requirements.

These requirements are only valid when installing anchors on a reinforced bridge deck or approach panel. The anchorage provisions included here are not applicable for non-reinforced concrete or bituminous surfaces. Minimum deployment length and anchorage requirements past the end of the bridge and approach panels are to be determined by the roadway designer and shown in the traffic control plans.

With the release of this memo, Standard Detail B920 (see attached) will be reactivated for use. Note that the details have been modified to reference this memo. Please see me if you have questions on these guidelines.

cc: C. Harer/Design Consultants

M. Elle

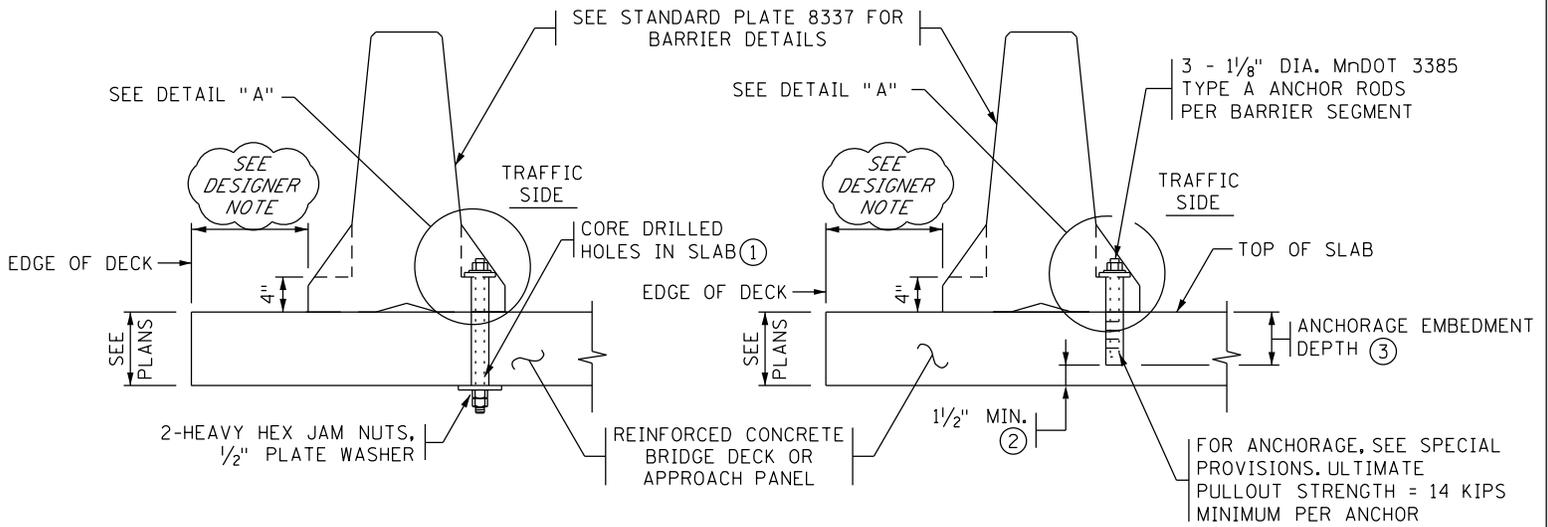
J. Rosenow

C. Mittelstadt

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Page 2 of 2

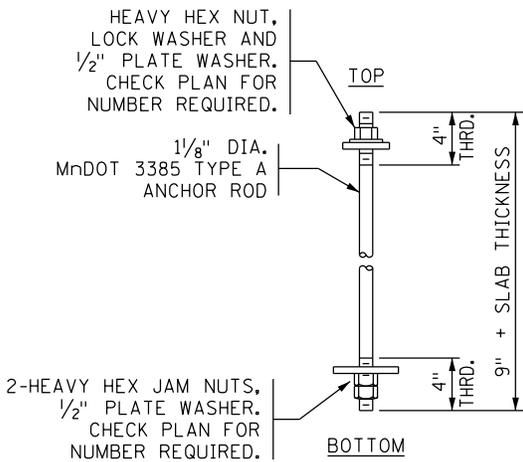




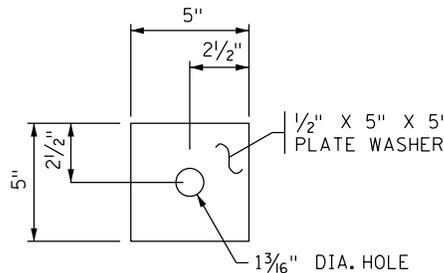
OPTION 1
DO NOT USE ON NEW DECK

OPTION 2

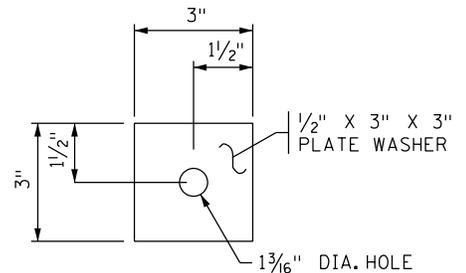
ANCHORAGE DETAILS
REINFORCEMENT NOT SHOWN



OPTION 1 ANCHOR
(3 PER BARRIER SEGMENT)



BOTTOM PLATE WASHER
(ONLY USED FOR OPTION 1)



TOP PLATE WASHER

NOTES:

ALL HARDWARE TO BE GALVANIZED PER MnDOT 3392.
ALL STRUCTURAL STEEL TO BE MnDOT 3306 UNLESS OTHERWISE NOTED.

COST OF ANCHORAGES, ANCHOR REMOVAL AND GROUTING OF HOLE ARE INCIDENTAL TO THE COST OF PLACING THE TEMPORARY PORTABLE PRECAST BARRIER.

PIN BARRIERS TOGETHER PER MnDOT STANDARD PLATE 8337.

THROUGH BOLT ANCHORS MUST BE USED IF THE DECK IS PENETRATED DURING DRILLING PROCESS.

DO NOT USE ON BRIDGES OR APPROACH PANELS WITH A BITUMINOUS OVERLAY.

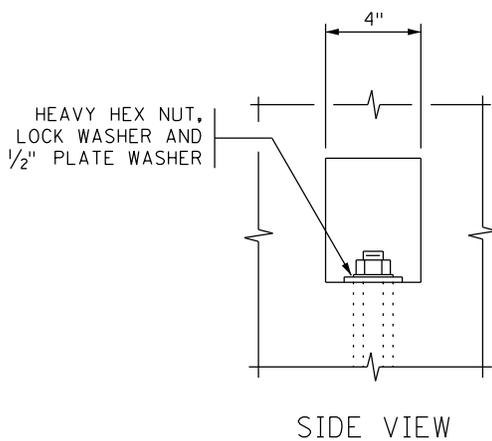
REFER TO TRAFFIC CONTROL PLANS FOR DEPLOYMENT LENGTH AND BARRIER TERMINATION REQUIREMENTS.

ANCHOR ON TRAFFIC SIDE OF BARRIER ONLY.

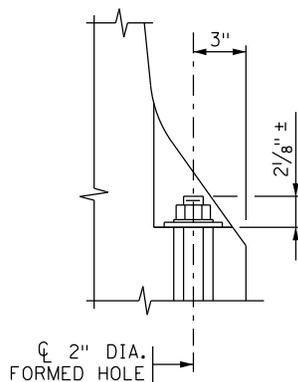
FILL ANCHORAGE HOLES WITH AN APPROVED EPOXY GROUT AFTER THE PORTABLE BARRIERS ARE REMOVED.

SEE SPECIAL PROVISIONS FOR BARRIER REMOVAL REQUIREMENTS.

- ① PERCUSSION DRILLING OF THESE HOLES IS NOT PERMITTED.
- ② 1 1/2" MINIMUM TO PREVENT BOTTOM OF SLAB FROM SPALLING OR FRACTURING DURING DRILLING.
- ③ 5 1/2" MINIMUM AND 6" MAXIMUM FOR BRIDGE DECKS WITH TOP MAT REINFORCEMENT AND SOUND CONCRETE. 9" MINIMUM AND 10 1/2" MAXIMUM FOR SOUND CONCRETE APPROACH PANELS.



SIDE VIEW



DETAIL "A"

TEXT IN ITALICS ARE DESIGNER NOTES. REMOVE PRIOR TO PLOTTING FINAL PLAN.

REFER TO MnDOT LRFD MANUAL "MEMO TO DESIGNERS (2011-03)" FOR GUIDANCE ON EDGE DISTANCE.

APPROVED: DECEMBER 21, 2011

Nancy Saubenberg
STATE BRIDGE ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
TEMPORARY PORTABLE PRECAST CONCRETE
BARRIER ANCHORAGE
(TEMPORARY USAGE IN LIMITED BARRIER DISPLACEMENT AREAS)

REVISED

DETAIL NO.

B920