



Minnesota Department of Transportation
Office Memorandum

District: 3
Date: 01/18/2023
To: Doug Carter, State Geometrics Engineer
From: Luke Wehseler, Project Manager
Subject: **Design Memorandum
 With Design Exception**

State Project Number(s) & T.H./Interstate Number(s): 1805-80 TH 210

Federal Aid Project Number(s):

FHWA Contact:

County(s): Crow Wing **City(s):** Baxter, Brainerd

Type of Work: Grading, Mainline and Shoulder Reconstruction, Drainage, Utilities, Signals, Lighting, TMS, Bridge Redeck

Project Termini: Along TH 210, FROM Baxter Dr TO 700' East of Pine Shores Rd

Project Reference Point 121+50.00 To Reference Point 125+50.00

This project is scheduled for a September 26, 2025 letting.

Scoping and Design Standards Form(s) Attached:

Highway Design Standards Form

The Design Exceptions described in this Design Memo are recommended for approval by:

 Luke Wehseler, P.E.

 Date

I concur/approve:

 District Engineer/Assistant District Engineer

 Date

Design Exceptions approved by:

 State Design Engineer

 Date

PROJECT BACKGROUND

Washington Street (Highway 210) is a major travel corridor spanning west to east in Brainerd, MN. Highway 210 also serves as a major east-west arterial extending across north-central Minnesota. The study corridor extends from Baxter Drive on the west to Pine Shores Road on the east and includes a mix of primarily commercial land uses along with some residential and institutional uses. The road has the highest traffic volumes in Crow Wing County and is the only continuous east-west corridor in the City. There are currently limited provisions for pedestrians and bicyclists to travel along or cross-over the corridor.

The primary purpose of the corridor study is to better understand the community issues, needs and use of the roadway, assess improvement options, select a preferred alternative, and prepare a geometric layout. The focus of the future improvements is to improve pavement conditions and travel safety, accommodate ADA requirements, and enhance pedestrian and bicyclist accommodations.

The TH 210 corridor is divided into distinct segments: West, Central, Mall Area, East.

- The west segment is from Baxter Dr to the Mississippi River bridge and will be a pavement rehab with full walk/ADA replacement. The subsection from NW 4th St to the bridge will be reconstructed.
- The Central segment, from the river bridge to Kingwood St, is characterized by a tighter corridor (80') which is being repurposed by eliminating on street parking and widening walks on both sides with full reconstruction.
- The Mall Area segment is from Kingwood St to 10th Ave NE and focuses on the mall on the north side of TH 210 as a major trip generator. This segment will be fully reconstructed except for the first short stretch between Kingwood St and Gillis Ave.
- The east segment, from 10th Ave NE to east of Pine Shore Rd is a pavement rehab.

PROJECT INFORMATION

Highway Type

- () Two Lane Highway, Rural () Multi-lane Divided Highway, Rural (High Speed)
() Two Lane Highway, Urban () Multi-lane Divided Highway, Urban (High Speed)
() Freeway, Rural (X) Multi-lane Divided Highway, Urban (Low Speed)
() Freeway, Urban () Multi-lane Undivided Highway, Urban (Low Speed)

Functional Class

- (X) Principal Arterial () Minor Arterial () Collector
Number of Lanes () Two Lane (X) Four Lane () Six or eight lane
() Single-lane ramp () Multi-lane ramp
Terrain: (X) Level () Rolling () Mountainous

Traffic Volume:

ROUTE	SEGMENT DESCRIPTION	2019 AADT	2045 AADT
T.H. 210	Baxter Dr to N 4 th St	32,500	36,700
T.H. 210	N 4 th St to N 8 th St	26,000	29,400
T.H. 210	N 8 th St to N 4 th Ave	25,500	28,800
T.H. 210	N 4 th Ave to T.H. 25	17,100	19,300
T.H. 210	T.H. 25 to Pine Shores Rd	11,800	13,300

Based on: MnDOT Traffic Mapping Application AADT (2019)

Access Control (X) Full () Partial () none

Design Speed 35 mph (Baxter Drive to 8th Ave NE)
40 mph (8th Ave NE to Wonderland Park Rd)
50 mph (Wonderland Park Rd to Pine Shores Rd)
Posted Speed 35 mph (Baxter Drive to 4th Ave NE)
45 mph (4th Ave NE to 14th Ave NE)
50 mph (14th Ave NE to Pine Shores Rd)

- () Existing and Proposed Typical Sections are included in the appendix.
() Reduced layout is included in appendix.

BRIDGE PROJECT INFORMATION

- (X) This is a Bridge Preservation project
() This is a Bridge Improvement project
() This is a Bridge Replacement project
() This is a ramp bridge with radius of 190-ft or less, or volume of trucks greater than 10%.

() Preliminary Bridge Plan is included in appendix

Railroad: () Yes (X) No
If yes: () Highway over RR () Highway under RR

Bridge is over:
() Non-navigable waterway (X) Navigable waterway () Trunk Highway () Local road

Special lanes on bridge: () Auxiliary lanes () Exit or Entrance ramps extending onto bridge

Median curb present: (X) Yes () No
() Bridge is less than 250-ft. long and with no single span greater than 200-ft.
(X) Bridge is greater than 250-ft. long or with a single span greater than 200-ft.

DESIGN STANDARDS

Based on the criteria in [Design Standards and Exceptions for Controlling Design Criteria](#), this project will be designed to MnDOT's Preservation Standards from Baxter Dr to NW 4th St and from 10th Ave NE to east of Pine Shore Rd; and will be designed to MnDOT's New Construction / Reconstruction Standards from the NW 4th St to 10th Ave NE.

PRESERVATION PROJECTS

Safety Considerations

During project scoping, safety was considered.

Crash clusters and/or problems within the project limits were identified using crash data from January 1, 2014, through December 31, 2018, provided by MnDOT. The type and severity of crashes were reviewed, and crash rates were calculated for each study intersection. There was a total of 526 crashes over the 5 years analyzed along the 3.9-mile section of TH 210.

- A total of 82 non-intersection related crashes occurred along the study corridor. Two segments of TH 210 had crash rates above the critical rate or within 10%.
 - Between Chippewa Street and N 1st Street/East River Road: there were 8 non-intersection crashes that occurred on this short segment; the crash rate is 2.09, which is higher than the critical rate of 1.17. With 6 private accesses on this block, 4 of the 8 crashes were related to vehicles entering or exiting the driveways.
 - Between N 10th Street and Kingwood Street: there were 7 non-intersection crashes that occurred on this short, curved segment; the crash rate is 1.58, which is just under the critical rate of 1.70. While there are four private accesses on this segment, none of the crashes were related to access. The crashes involved icy conditions (2), vehicles losing control (2), vehicle malfunctions (1), vehicle speeds (1), and driving intoxication (1).
- A total of 444 intersection crashes occurred along the study corridor. One intersection has a crash rate above the critical rate, and six intersection rates are within 15% of the critical rate.
 - TH 210 at NW 4th Street (Traffic Signal) – Crash Rate 0.94, Critical Rate 0.95
 - 74 total crashes.

- TH 210 at N 4th Street (Traffic Signal) – Crash Rate 0.87, Critical Rate 0.99
 - 49 total crashes.
 - TH 210 at N 6th Street (Traffic Signal) – Crash Rate 1.06, Critical Rate 0.99
 - 61 total crashes.
 - TH 210 at Gillis Ave/13th St SE (Traffic Signal) – Crash Rate 0.99, Critical Rate 1.01
 - 51 total crashes.
 - TH 210 at 1st Ave NE (Minor Street Stop) – Crash Rate 0.30, Critical Rate 0.36
 - The railroad crossing at this intersection was removed in October 2019, therefore, the previous safety concern at the intersection has been removed.
 - TH 210 at TH 25 Entrance (Minor Street Stop) – Crash Rate 0.36, Critical Rate 0.39
 - Intersection closed in 2017; therefore, the safety concern has been removed.
 - TH 210 at 8th Ave NE (Traffic Signal) – Crash Rate 0.94, Critical Rate 0.95
 - 28 total crashes.
- The corridor had 1 fatal crash and 3 Severity A (incapacitating injury) crashes. A total of 10 crashes involved pedestrians or bicycles.

The following safety improvements will be completed:

- Install raised median
- Replace TWLTL with raised median
- Lane width reduction (12 ft to 11 ft)
- Convert stop control to RI/RO
- Convert open median to directional (3/4 Access)
- Install right turn lane
- Install flashing yellow arrow (FYA) with time of day
- Install 3" yellow retroreflective tape to signals

Controlling Criteria – Less Than New Construction/Reconstruction Standard

The only existing design exception is with the preservation segment at the east end of the corridor.

DESIGN EXCEPTIONS

List of Design Exception(s):

- I. Superelevation
 - Standard: 0.041 ft/ft for 2,817' radius at 50 mph design speed
 - Existing: 0.035 ft/ft (instead of standard 0.041 ft/ft) for 2,817 radius
 - Proposed: perpetuate existing, 0.035 ft/ft from RP 125.050 to RP 125.300

Justification of Design Exception(s):

1. Alternatives considered – Meeting the design standard and the proposed design were the two alternatives considered.
2. Cost comparison – The cost to meet the superelevation standards for these horizontal curves would have required reconstruction of the mainline pavement and would add between \$0.6M – \$1.0M. The proposed design perpetuates the existing superelevation condition as the work in these locations is only resurfacing and not reconstruction.

3. Comparison of safety performance – According to NCHRP 783 *Evaluation of the 13 Controlling Criteria for Geometric Design*, no CMFs are available and no trends are known for the safety effects of superelevation on roadway types other than rural two-lane highways.
4. Comparison of operational performance – According to NCHRP 783 *Evaluation of the 13 Controlling Criteria for Geometric Design*, the HCM, nor any other available source indicates that superelevation has a quantifiable effect on traffic operations.
5. Compatibility with adjacent sections of roadway – The adjacent sections of roadway meet the superelevation standards.
6. Any proposed mitigation measures – paved shoulders.
7. Any other pertinent impacts –Additional traffic impacts.

LAYOUT STATUS

- ☐ A geometric layout is not required for this project.
☒ A Level 1 Geometric Layout (and profile) ☐ will be prepared for this project
☒ has been prepared for this project

The layout has received Mn/DOT:

- ☐ Staff review and concurrence ☐ Staff approval (approved __/__/__)

Municipal consent (layout approval) is required: YES ☒ NO ☐

If YES, Municipal consent has been obtained: YES _____ received on __/__/__
NO ☒

INTERSTATE/STRAHNET SYSTEM

☒ This project does not involve work on the Interstate/STRAHNET system.

- ☐ This project involves work on the Interstate/STRAHNET system. At the completion of this project:
- ☐ All bridges will meet the 16-foot standard for vertical clearance over Interstate highways.
 - ☐ All bridges over designated OSOW Super Load Corridors will meet the 16 feet 6 inch standard for vertical clearance.
 - ☐ The vertical clearance of the bridge(s) **is less than 16 feet** and will remain unchanged. FHWA will be requested to coordinate with the Department of Defense/MTMCTEA at least three months before letting.

TRAFFIC HANDLING DURING CONSTRUCTION

To be determined during final design, but assume constructed half at a time, one lane both directions with minor local detours for the construction of the roundabouts. Possible directional detours.

BICYCLE and PEDESTRIAN CONSIDERATIONS

- ☒ Bicycles are legally permitted on this roadway.
☒ Preliminary layouts have been provided to the CO Bicycle/Pedestrian Section for comment.
☒ Improvements to bicycle/pedestrian access are planned for this project.
☐ Existing access for bicycles or pedestrians will be eliminated by this project.

Highway Design Standard Form

Critical Design Element	Existing Condition, Minimum	Proposed Condition, Minimum	MnDOT Standard for New Construction/ Reconstruction	Road Design Manual or LRFD Bridge Design Manual or Technical Memorandum
Design Speed	Design Speed selected for this project is 35 mph from Baxter Dr to 8 th Ave NE 40 mph from 8 th Ave NE to Wonderland Park Rd 50 mph from Wonderland Park Rd to Pine Shores Rd			TM 17-13-TS-06
Lane Width	12 ft	11 ft	11 ft min. 12 ft max.	TM 18-08-TS-06
Shoulder Width: - Right ≤ 45 mph > 45 mph - Left ≤ 45 mph > 45 mph	2 ft paved 2 ft paved 2 ft paved 4 ft paved	2 ft paved 2 ft paved 1 ft paved 2 ft paved	1-2 ft paved 2-3 ft paved 1-2 ft paved 2-3 ft paved	TM 17-12-TS-05
Design Loading Structural Capacity	N/A	N/A	All new bridges: HL-93 Minimum design load	LRFD Bridge Design Manual, Article 3.4 (Scroll to Page 3.4)
# Stopping Sight Distance 35 mph 40 mph 50 mph	394 ft 640 ft 425 ft	373 ft 640 ft 425 ft	250 ft min 360 ft min 425 ft min	Tables 2-5.08A & B (Chapter 2, Page 37)
Horizontal Curve, Radius 35 mph 40 mph 50 mph	525 ft 1,081 ft 1,102 ft	525 ft 1,081 ft 1,102 ft	348 ft min 600 ft min 758 ft min.	RDM Chapter 3-2
Maximum Grade	3.27% maximum	3.53% maximum	7% maximum	Table 3-4.02A (Chapter 3, Page 3-4(2))
Cross Slope	0.015 - 0.020 ft/ft	0.015 - 0.020 ft/ft	0.015 – 0.020 ft/ft	RDM Chapter 4-3
Superelevation	*0.035 ft/ft	*0.035 ft/ft	0.041 ft/ft	RDM Chapter 3-3
Vertical Clearance • Highway under bridge • Railroad under bridge • Highway under sign or pedestrian bridge	N/A ft N/A ft N/A ft	N/A ft N/A ft N/A ft	16 ft - 4 in 23 ft - 0 in 17 ft - 4 in	LRFD Bridge Design Manual, Table 2.1.3.1 (Page 11)

Stopping sight distance applies to horizontal and vertical alignments **except for sag vertical curves**.

* An asterisk in front of the proposed condition indicates a Design Exception.