ENGINEERING OPERATIONS COMMITTEE
MEETING MINUTES
JULY 19, 2023, 1 P.M. TO 3 P.M.
LOBBY CONFERENCE ROOM
WITH TEAMS OPTION

Present:	Mark Bott	Art Green	Dee Parker
	Gregg Brunner	Jason Gutting	Hal Zweng
	Mark Dionise	Ryan Mitchell	Brad Wagner
Absent:	Rebecca Curtis	Michael Townley	
	Greg Losch	Kim Zimmer	
Guests:	Athira Jayadevan	Clint Mayoral	Carlos Torres
	Dean Kanitz	Jonathon Smith	Dharmesh Valsadia

OLD BUSINESS

1. Approval of the June 22, 2023, meeting minutes – Gregg Brunner

   ACTION: Approved

2. Michigan Department of Transportation (MDOT) new materials and products – Jason Gutting

   New Material Monthly Report of Data
   - Number of Submittals Received
   - Number of Submittals Accepted
   - Number of Submittals Not Accepted

   Jason Gutting thanked attendees for their staff that serve as subject matter experts reviewing new material submittals

   ACTION: For information only

NEW BUSINESS

1. Safety Topic: Eyewear Safety-inside, outside, type of work, and at home – Jason Gutting

   ACTION: For information only

2. Use of Construction Manager/General Contractor (CMGC) for the partial full bridge replacement of (41131-R04) Martin Luther King Jr. (MLK) Street over US-131, City of Grand Rapids, Kent County – Clint Mayoral, Mike Wilson, Chuck Occhiuto

   Issue Statement: Request approval for the use of CMGC for the partial full bridge replacement of (41131-R04) MLK Jr. Street over US-131, City of Grand Rapids, Kent County.

   Major Issue(s)

   Procurement and Payment Technique(s): CMGC

   Recommendation Summary: The Grand Region would like to pursue the use of the CMGC Innovative Contracting method to facilitate the delivery of the subject project. Due to the constraints detailed below that the contractor will have placed on them to deliver the project, the region believes we will greatly benefit from developing and coordinating the project with the contractor as a member of the design team. The region is hoping to capture a strong understanding of how the contractor will operate, stage, and schedule the project so we can accurately communicate the details of the project to the city, railroads, and the local stakeholders; gain cost and schedule certainty; and validate the proposed design.

   Identification of Risk

   Permits: Railroad permit could be possible for utility crossings under the railroad tracks. It will be determined (TBD) during the design of the project.

   Environmental:
   - Historic – TBD during design, but coordination may be likely.
   - Archaeology – TBD during design, but coordination may be likely.
   - Detour – Maintaining traffic concepts will likely have a significant impact on the local network. Heavy coordination with the city is expected.
   - Noise – City noise variance will be required for the project.
   - Contamination – Per the Project Area Contamination Survey (PACS) report the project area is located in an area of the city that was historically heavily industrialized. Medium to deep excavations are expected for the project and areas of contamination could be encountered.
   - Environmental Justice (EJ) – Areas of EJ populations have been identified in the surrounding areas.

   Utilities:
   - Freeway lighting located on the structure. To be replaced in kind.
   - Local lighting under the structure. Impacts to be coordinated during design/construction.
   - City water main and sanitary sewers within the influence of the structure replacement. To be relocated with coordination with the city.
   - Communications fiber located adjacent to the existing railroad tracks.

Maintaining Traffic: Maintaining traffic concepts will require a full detour of MLK Jr. Street for the duration of the project. US-131 ramps at MLK Jr. Street will also likely see impacts since access to the construction site will be limited from the west.

Third Party Involvement:

Preliminary project coordination with the city and emergency response services has been initiated.

- As the design progresses, local businesses and stakeholders will have to be engaged on the project impacts.
- One local business that will require heavy coordination is the Founders Brewing Company Warehouse located at 900 Hynes Avenue NW. The project site divides their property and construction operations and will have significant impacts to the circulation of their distribution services. The project will have heavy coordination with this property owner for not only construction site operations, but also potentially some real estate involvement.

Right of Way (ROW): There is limited ROW within the limits of the existing structure. Uses adjacent to the structure include the following: US-131 ramp network; adjacent private and residential properties; and railroad ROW. The Region Real Estate Unit and the MDOT Office of Rail have already started coordination efforts.

Railroad: The three (3) railroad owners within the influence of the project are as follows: Grand Elk/WATCO RR; CSX RR; and Amtrak. Additionally, Amtrak also has operating rights over the CSX RR track. The MDOT Office of Rail has already started coordination efforts.

Other:

- Due to the limitations detailed above that will be placed on the contractor, one of the primary concerns of the project is how the contractor will operate the construction site, store his materials, and stage the construction.

- MLK Jr. Street is a significant local connector over US-131 for the city networks. The Grand Rapids Fire Department Station is also located adjacent to the structure and MLK Jr. Street is traditionally a key connection to US-131 for emergency response situations to either residents or vehicle incident responses on trunkline routes. An accurate message on the staging and schedule of the project would greatly assist in the coordination of the project with the city, Emergency Response Services, and the local stakeholders.

Background/History:

Region/Transportation Service Center (TSC): Grand/Grand Rapids
Control Section: 41131
Job Number(s): 214959
Route: US-131

Project Location: Martin Luther King Jr. Street, City of Grand Rapids, Kent County
Work Description: Partial full replacement
Estimated Construction Cost: $28.875 M
Funding Type and Fiscal Year (Fed/state/local):

- Bridge Replacement and Preservation Template – FED/STATE
- FY 2025

Key Dates:

- PC – 11/22/2024
- Letting – 11/07/2025

Recommendations: The Innovative Contracting Committee (ICC) recommends the use of CMGC.

ACTION: Approved

3. Use of CMGC for the pavement reconstruction/rehabilitation and associated improvements on M-63/I-94BL in the City of St. Joseph, Berrien County – Jonathon Smith, Clint Mayoral, Steve Minton

Issue Statement: Request approval for the use of CMGC for the pavement reconstruction/ rehabilitation and associated improvements on M-63/I-94BL in the City of St. Joseph, Berrien County.

Major Issue(s): Procurement and payment technique(s): CMGC

Recommendation Summary: The Coloma Business Office/Southwest Region would like to pursue the use of the CMGC Innovative Contracting method to facilitate the delivery of the subject project. Due to the constraints detailed below that the MDOT construction staff and the contractor will have placed on them to deliver the project, the region believes the project will greatly benefit from developing and coordinating with the contractor as a member of the design team through the CMGC process. The region is hoping to capture a strong understanding of how the contractor will operate, stage, and schedule the project so we can accurately communicate the details of the project to the city and the local stakeholders, gain cost and schedule certainty, and validate the proposed design.

<u>Identification of Risk</u>

Permits: These are the possible permits needed per the proposed work:

- Part 301 (waterbody)
- Part 31 (floodplain)
- Part 41 (sanitary sewer)
- Part 399 (watermain work)
- National Pollutant Discharge Elimination System
- We will be evaluating the existing storm sewer outlets to the St. Joseph River and Morrison Channel and coordinate with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and the United States Army Corp of Engineers for any needed improvements.

Environmental:

- PACS – This will be completed. A Preliminary Site Investigation will be performed based on outcome.
- Water Quality – Will be looking into stormwater best management practices within this urban area and how they can be included within the proposed streetscaping. It is anticipated that the impervious area will decrease based on the preliminary scoping.
- Fauna – Depending on work for the storm water outlets, we may need to perform mussel surveys. Tree cutting restricted dates are required for the listed bat species.
- Historical – This will be a major impact for any streetscaping work as well as operational improvements based on the initial scoping review which identified several historic properties and a potential historic district.
- Archaeological – There are concerns with the proposed storm sewer, sanitary and water main work but impacts are minimal since a survey will not be feasible; construction advisory 2013-03 will be enforced.
- 4(f)/6(f) – There may be some impacts and early coordination will be key to mitigate issues.
- Social – Will need to maintain access to businesses and residences.

Utilities:

- Storm sewer, sanitary sewer and water main will all be replaced and are proposed to be relocated from their existing locations while meeting the EGLE separation requirements.
- It is anticipated there will be private utilities that will be impacted.

Maintaining Traffic:

- Maintaining traffic concept is to be determined.
- Part-width construction is desired to maintain two-way traffic in the city during the summer (tourist) season. Need to investigate if that is feasible with the proposed anticipated utility work. Will need to determine if any full closures and detours would be required for work and if so, what the impacts would be since all parallel roadways are city streets.

Third Party Involvement:

- Coordination with the city started in 2020 during the preliminary scoping phase and both MDOT and the city have remained in contact since regarding this project and have held various project update meetings thus far.
- The CMGC delivery method has been agreed to with the city since they will be participating in the preliminary engineering (PE) phase and this delivery method will have associated costs to the city.
- This project is setup with an early preliminary engineering (EPE) phase to complete field investigation work and hold stakeholder coordination events to determine the vision of the corridor. There are many competing interests within the city and having a finalized vision/layout heading into the PE phase stage will be very beneficial.

Right of Way:

- It is anticipated we will be replacing all sidewalk within the city limits as a part of the project based on the city's input during preliminary scoping. This will possibly require a combination of consents or proposed ROW. Other improvements throughout the

limits (utilities, operational, signals, signing, etc.) may also require a combination of consents or proposed ROW depending on their location and associated grading limits.
- Access management will be investigated to try and close any driveways that have access from alleys. Driveways that are larger than standard size will be investigated for right sizing.
- On-street parking is going to be investigated to determine if the existing 33 parking spots are needing to remain or they can be removed to increase the furnishing zone, pedestrian clear zone, or frontage zone there by allowing for pedestrian safety enhancements.

Railroad: N/A

Other:
- Due to the limitations detailed above that will be placed on the contractor, one of the primary concerns of the project is how the contractor will operate the construction site, store materials, stage the construction and the duration of construction.
- Every other year on even numbered years in May, a Senior PGA golfing event is held at the Jack Nicklaus Signature Golf Course in the City of Benton Harbor within one mile of these project limits. This event is a major draw for both the cities of Benton Harbor and St. Joseph, and we are targeting construction in 2027 to avoid impacts to this event.
- The city also holds a handful of events including the Blossomtime Festival/Grand Floral Parade (since 1906) and coordination with these events to the maximum extent feasible will need to take place. MDOT will work with the city to evaluate alternatives and ways to minimize impacts.
- The City of St. Joseph is a lakeshore summer tourist destination. The city would like assurances on schedule, staging, and accessibility throughout the project so they can successfully coordinate with local businesses and residents to minimize impacts as much as possible.

Background/History:

Region/TSC: Southwest/Coloma
Control Section: 11053, 11013 and 11012
Job Number(s): 213168
Route: M-63 and I-94 BL

Project Location: The project is located on M-63/I-94 BL from Central Avenue to the Blossomland Bridge (Structure # 880) and I-94 BL (Ship Street and Port Street) to the Bicentennial Bridge (Structure # 778) in the City of St. Joseph, Berrien County, Michigan. The project length is 1.639 miles.

Work Description:
- Pavement reconstruction and rehabilitation
- Sidewalk replacement
- Curb and gutter replacement
- Sidewalk ramp upgrades
- Storm sewer replacement

- Water main replacement
- Sanitary sewer replacement
- Non-motorized improvements
- Streetscaping
- Permanent signing and pavement markings

Estimated Construction Cost: $22,800,146 (CON Road-$19,826,214 and CON-CE $2,973,932)

Funding Type and Fiscal Year (federal/state/local): Road-Rehabilitation and Reconstruction in FY 2026 (Fed 61.3%/State 10.3 /Local 28.4%)

Key Dates:

- EPE Phase begin – July/August 2023
- PE Phase begin – June 2024
- Base Plan Review – November 2024
- Plan Review – June 2025
- Final Project Coordination Review – December 2025
- Plan Completion – April 2026
- Letting – September 2026 (construction year 2027)

Recommendation(s): The ICC recommends the use of CMGC.

ACTION: Approved

4. Approval of two new Manual for Assessing Safety Hardware (MASH)-Compliant, Type 3 (double-sided) guardrail approach terminals: MATT and MAX-Tension Median – Carlos Torres

Issue Statement: MDOT approval of two new MASH-Compliant, Type 3 (double-sided) guardrail approach terminals: MATT and MAX-Tension Median.

Major Issue(s): MDOT's Barrier Advisory Committee (BAC) has completed its review of two new MASH-compliant Type 3 (double-sided) guardrail approach terminals: MATT, manufactured by Valtir, LLC, and MAX-Tension Median, manufactured by Lindsay Transportation Solutions, Inc. Both devices have been fully tested under MASH 2016 criteria and have received Federal Highway Administration (FHWA) eligibility letters. The BAC recommends approving the MATT and MAX-Tension Median to replace the currently approved National Cooperative Highway Research Program (NCHRP) 350 compliant Type 3 guardrail approach terminals identified in Standard Plan R-63 Series (i.e., CAT, manufactured by Valtir, and FLEAT-MT, manufactured by Road Systems, Inc.).

Valtir made a very minor change after crash testing the MATT terminal. The company symbol on the product decal was changed from the old Trinity Highway Products symbol to the new Valtir symbol. The BAC feels this change is so minor that a professional opinion letter or further testing is not warranted.

Background/History: MATT, by Valtir. The MATT terminal, manufactured by Valtir, LLC, was subjected to full-suite crash testing under MASH 2016, TL-3 criteria, and successfully passed all tests. The MATT terminal received FHWA eligibility letter CC-175, dated 1/30/23.

Modifications Made During Course of MATT Crash Testing

The following modifications were made during the course of crash testing. All of these modifications were documented in the crash test reported prepared by Applus IDIADA KARCO Engineering, LLC (KARCO), and submitted to the FHWA as part of the eligibility letter request for the MATT terminal.

Table 2 Multi-direction Soil Plates Modification

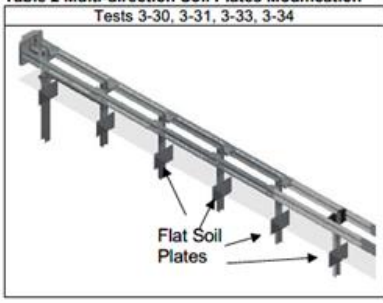
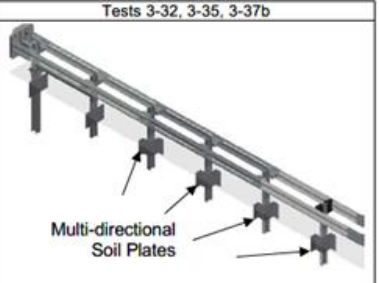
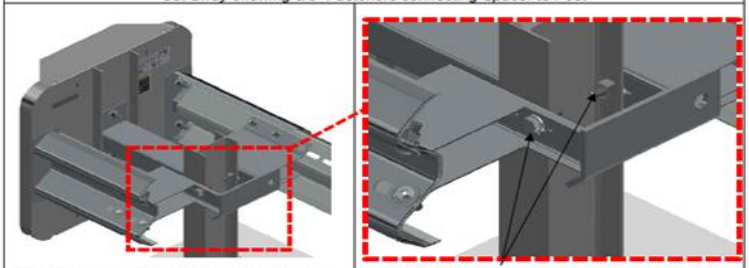
Tests 3-30, 3-31, 3-33, 3-34	Tests 3-32, 3-35, 3-37b
	

Table 3 Revised Fasteners at Posts 1 and 2

Test 3-30, 3-31, 3-33, 3-34

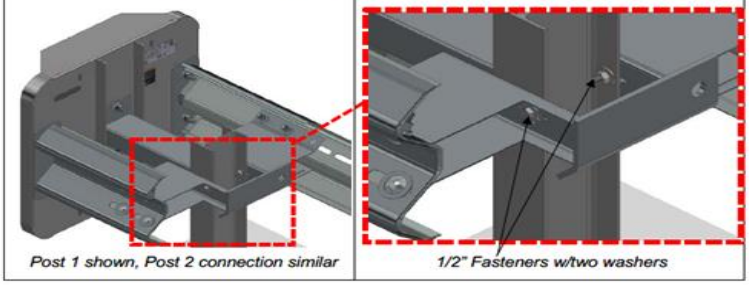
Cut-away showing 5/8" Fasteners connecting Spacer to Post



Post 1 shown, Post 2 connection similar | *5/8" Fasteners w/one washer*

Test 3-32, 3-35, 3-37b

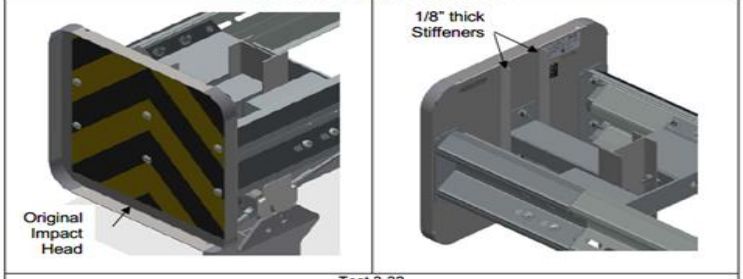
Cut-away showing 1/2" Fasteners connecting Spacer to Post



Post 1 shown, Post 2 connection similar | *1/2" Fasteners w/two washers*

Table 4 Revised Impact Head design

Test 3-30, 3-31, 3-33, 3-34, 3-35, 3-37b



Test 3-32

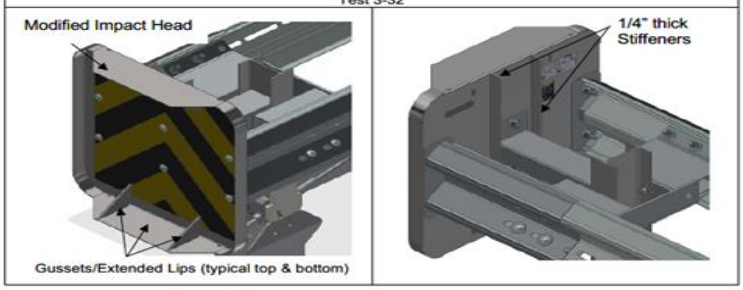


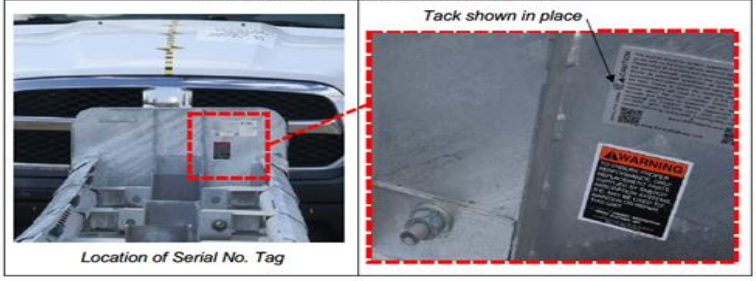
Table 5 Missing Tacks attaching Serial No. Tag

Test 3-32

Pre-test photos showing missing Tacks

Test 3-30, 3-31, 3-33, 3-34, 3-35, 3-37b

Pre-test photos from Test 3-31 with Tacks in place



Modifications Made to MATT After Requesting FHWA Eligibility Letter

On 4/20/23, Valtir wrote a letter to Carlos Torres (MDOT) identifying changes made to the MATT terminal after the FHWA eligibility letter for the MATT terminal was requested. Valtir indicated the two decals on the MATT impact head were rebranded to show the Valtir logo, since Trinity Highway Products was rebranded as Valtir. The decals used during crash testing showed the Trinity Highway Products logo. Also, it was noted that the dimensions of the decals remained unchanged. The BAC believes this modification is so minor that additional supporting documentation and/or testing is unnecessary.

Old MATT Decal with Trinity Highway Products Logo

New MATT Decal with Valtir Logo

MAX-Tension Median, by Lindsay Transportation Solutions

The MAX-Tension Median terminal, manufactured by Lindsay Transportation Solutions, Inc. (LTS), was subjected to full-suite crash testing under MASH 2016, TL-3 criteria, and successfully passed all tests. The MAX-Tension Median terminal received FHWA eligibility letter CC-141, dated 1/10/18.

Modifications Made During Course of MAX-Tension Median Crash Testing

Tests 3-31, 3-32, 3-33, 3-34, 3-35 and 3-37b used composite blockouts. However, Tests 3-30 and 3-37a were performed with wood blockouts to demonstrate they do not have a negative impact on the crash performance of the system.

Furthermore, except for Test 3-37b, all tests included a delineation bracket (i.e., object marker). It was mentioned in the report that exclusion of the object marker does not affect the performance of the system.

Test 3-30 (wood blocks & object marker

Test 3-37b (composite blocks & no marker)

Modifications Made After Requesting FHWA Eligibility Letter

On 5/4/23, LTS wrote a letter to Carlos Torres certifying the MAX-Tension Median has not been modified since the original request for an eligibility letter from the FHWA. The device is essentially the same as was successfully crash tested under MASH 2016 criteria.

Recommendation(s):

1. Approve the MATT and MAX-Tension Median terminals for statewide use as Type 3 (double-sided) guardrail approach terminals and add them to Standard Plan R-63 Series.
2. Remove the currently approved NCHRP 350 compliant Type 3 terminals (i.e., CAT and FLEAT-MT) from Standard Plan R-63 Series.
3. Develop a new frequently used special provisions (FUSP) for MASH-compliant Type 3 guardrail approach terminals, similar to the FUSP for Type 2M guardrail approach terminals (20SP-807F-01), requiring the following items from contractors:
   - Provide detailed drawings of the selected guardrail approach terminal(s) prepared by the respective guardrail approach terminal manufacturer(s).
   - Provide installation and maintenance manuals for the selected guardrail approach terminal(s) prepared by the respective guardrail approach terminal manufacturer(s).
   - Provide staff that have been trained by the respective guardrail terminal manufacturer(s) to install the guardrail terminal(s) utilized on the project.
   - Provide the guardrail terminal manufacturer's installation checklist, completed, and signed by the contractor, for each individual guardrail terminal installed.

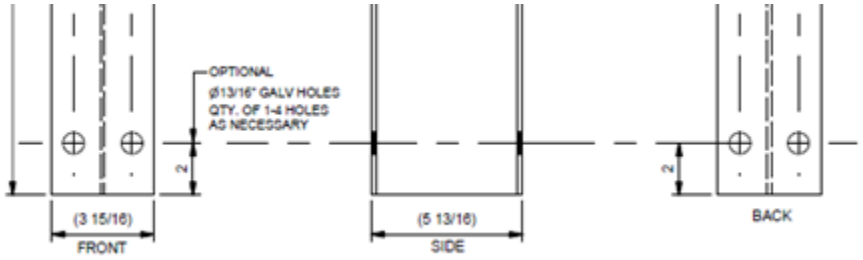
Status: New

ACTION: Approved

5. Addition of optional galvanizing holes on steel guardrail posts longer than six feet – Carlos Torres

Issue Statement: Addition of optional galvanizing holes on steel guardrail posts longer than six feet.

Major Issues: Valtir, LLC, requested that MDOT allow the placement of one to four optional 3/4" or 13/16" diameter holes two to three inches from the bottom of steel guardrail posts greater than six feet in length.



According to Valtir, the holes at the bottom of each post allow the posts to be assembled as a batch prior to placement in a galvanizing tank, and this simplifies the galvanizing process. Also, this process allows the posts to hang horizontally in the galvanizing kettle and makes the galvanizing process much safer for the workers involved, especially when working with posts greater than six feet in length.

On 10/8/19, William Williams of the Texas A&M Transportation Institute (TTI) wrote an e-mail to Carlos Torres and Greg Neece (Valtir) indicating that TTI didn't feel that the addition of one to four optional galvanizing holes at the bottom of a 9'-0" long steel guardrail post would affect the performance of the post with respect to MASH criteria. Therefore, the decision to allow the installation of optional galvanizing holes is based on a professional opinion made by TTI in the form of an e-mail.

Background/History: Valtir provided the image below of a batch of guardrail posts prior to placement in a galvanizing tank. In order to do this, holes most be installed at the top and bottom of each post. Arranging the posts in this manner prior to galvanizing is a much safer operation according to Valtir.

Valtir is requesting the placement of optional galvanizing holes on all steel guardrail posts greater than six feet in length. This is due to the way posts are galvanized and the dimensions of galvanizing kettles. Typically, galvanizing kettles are between seven and a half feet and nine feet in depth. When the posts are longer than the kettle is deep, vertical post placement requires that the posts be placed on the bottom of the kettle and leaned to immerse them in the zinc. This does three things:

- Stirs up the "Dross" (a by-product of the metallurgical bonded process of hot-dip galvanizing, consisting primarily of iron oxide) from the bottom of the kettle, which then can adhere to the post in the form of small pimples or spots on the post. While not rejectable, the resulting zinc coating is not as smooth.
- It can result in premature failure of the zinc tank, as it puts additional stresses in the steel jacket (typically three inches thick) of the kettle. Keeping in mind the zinc kettle is operated at about 840-850 degrees, typically steel melts at ~2500 degrees, so 850 degrees is about one-third of the temperature steel melting temperature. Over a period of time, this creates a bowing of the bottom plate of the kettle.
- It uses up valuable space in the zinc kettle, which is inefficient. The zinc kettle is the bottleneck in every galvanizing operation.

Arranging the posts horizontally prior to galvanization eliminates these potential issues.

Feedback from Other State Departments of Transportation (DOT)
The BAC received responses from 12 states. Five states do not allow additional post holes and seven do, but the ones that do allow the holes to be installed in a variety of different configurations, mostly to allow for raising the guardrail for future overlays, etc., or for other features such as rub rails. Since 2020, Washington State DOT (WSDOT) has allowed the use of steel guardrail long posts with one to four optional galvanizing holes punched in the bottom of each post. To WSDOT's knowledge, they haven't had any installation issues while installing posts in hard/frozen soil or striking a hard object (i.e., WSDOT's headquarters office has not heard of any installation issues cropping up from regional construction offices or maintenance offices). But they indicated that Washington State is a more temperate state than Michigan and does not typically have winter seasons as cold as Michigan, so they typically don't have too many issues with frozen soil.

Professional Opinions
As indicated previously, on 10/8/19, William Williams (TTI) wrote an e-mail to Carlos Torres and Greg Neece (Valtir) indicating that TTI didn't feel that the addition of one to four optional galvanizing holes at the bottom of a 9'-0" long steel guardrail post would affect the performance of the post with respect to MASH criteria.

Also, the Midwest Roadside Safety Facility (MwRSF), an ISO 17025 certified crash testing facility, issued a response pertaining to steel guardrail posts with additional holes in the Q&A section of their website. MwRSF responded that the extra holes will not affect guardrail performance. View Q&A | University of Nebraska–Lincoln (unl.edu)

This information suggests allowing an additional one to four galvanizing holes at the bottom of a guardrail post should not affect guardrail performance or crashworthiness.

Recommendation(s): Make changes to Standard Plan R-60 allowing one to four optional 3/4" or 13/16" diameter holes to be placed two to three inches from the bottom of steel guardrail posts longer than six feet.

Status: New

ACTION: Approved

6. Review and approval of 24-inch-wide QuadGuard® M10 impact attenuator – Carlos Torres

Issue Statement: Review and approval of 24-inch-wide QuadGuard® M10 impact attenuator

Major Issue(s): Received FHWA eligibility letter in 2011 but was not subjected to the full suite of MASH crash tests. The 24-inch wide QuadGuard® M10 impact attenuator, manufactured by Valtir, LLC, formerly known as Trinity Highway Products (THP), received a FHWA Eligibility Letter CC-112 in 2011 and, to date, the letter remains in effect. However, two tests (MASH Test 3-30 and 3-35, respectively) were waived. FHWA Letter CC-112 explains that MASH Test 3-30 was waived because Test 3-32 was considered the "worst case," and Test 3-35 was omitted because it was considered to be equivalent to Test 3-36 due to the lateral stiffness of the QuadGuard® M10. It should be noted that full suite crash testing was not a requirement for a FHWA eligibility letter in 2011.

Product Modifications Made After Issuance of FHWA Letter CC-112. In February 2020, THP (Valtir) implemented the following modifications to the QuadGuard® M10 attenuator:

- Replaced and relocated an adhesive-backed product decal with new aluminum data tag permanently attached via two metal tacks.
- Updated the nose assembly with revamped nose attachment fasteners to raise the nose cartridge to same height as the other cartridges.
- Utilized a universal backup to standardize hardware within the QuadGuard® family of products.
- Utilized universal diaphragms to standardize hardware within the QuadGuard® family of products.

In 2019, Trinity Highway Projects (THP) (Valtir) voluntarily conducted four MASH 2016 crash tests (Tests 3-30, 3-31, 3-32, and 3-33) to validate these modifications. The four crash tests were conducted by Applus IDIADA KARCO Engineering, an independent ISO 17025 certified crash testing facility, and all four tests passed. However, the following design modifications were made during the course of the four crash tests:

- Nose Assembly Design Modification. According to KARCO's crash test report, "The nose cartridge retention bracket had additional washers installed on Tests 3-30 and 3-31. These washers are not documented as part of the design, and they are not necessary. Their presence had no effect on the outcome of Tests 3-30 and 3-31."
- Backup Assembly Design Modification. According to KARCO's crash test report: "The system backups used in Tests 3-31, 3-32, and 3-33 had extra holes to allow

component interchangeability with the TL-3 QuadGuard® M10, Elite. The diaphragms used in all four of the tests, likewise, had these holes. The system backup used in Test 3-30 did not have these holes, but other than the absence of these holes, the design was the same. We believe the absence of the holes in the system backup in Test 3-30 had no effect on the outcome of the test."

- THP (Valtir) did not conduct the full suite of crash tests in the latest round of crash testing. THP (Valtir) indicated that MASH 2016 Tests 3-34, 3-35, 3-36, 3-37a, and 3-38 were omitted in the latest round of crash testing. THP's (Valtir's) explanation for this was that that they had reached out to Applus IDIADA KARCO Engineering, LLC to run four tests (i.e., Tests 3-30, 31, 32, and 33) to validate the system's end-on performance. Due to the nature of the modifications made to the system, THP (Valtir) felt that the redirection performance of the system (validated by Tests 3-34 through 3-37a) remained unchanged, so THP (Valtir) felt that Tests 3-34 through 3-37a were unnecessary. Based on the Test 3-31 data, KARCO ran the calculations to determine if Test 3-38 was required and it was concluded that Test 3-38 was not required and ultimately waived, as indicated in Section 3.1 of the 3-31 Crash Test Report from KARCO. THP (Valtir) opted not to conduct the full MASH 2016 crash test matrix since THP (Valtir) did not intend to submit the product to FHWA for a new eligibility letter. Since the FHWA no longer reviews product modifications, THP (Valtir) would have to treat the modified attenuator as a new product with a new product name (i.e., rebranding) which, according to THP (Valtir), was not in their best interest at the time.
- Also, since Tests 3-34, 3-36, and 3-37a were conducted on the original QuadGuard® M10 under MASH 2009 criteria, THP (Valtir) is implying there are no significant differences between the MASH 2009 and MASH 2016 impact attenuator crash testing matrices that would warrant repeating these tests under MASH 2016 criteria.
- Transitions: FHWA Eligibility Letter CC-112 indicates that transitions to safety-shape concrete median barrier, guardrail (w-beam and thrie-beam), single-slope concrete barrier, and vertical concrete barrier are included as part of the eligibility letter for use with the QuadGuard® M10. However, the only transition that was crash tested in 2010 was a 27 ¾" tall w-beam guardrail transition. FHWA Letter CC-112 states that the w-beam guardrail transition represents the worst-case condition for pocketing and snagging, and a successful Test 3-37 would serve to represent all of the transitions identified in the letter: safety-shape concrete median barrier; guardrail (w-beam and thrie-beam); single-slope concrete barrier; and vertical concrete barrier.
- In 2019, THP (Valtir) voluntarily conducted MASH 2016 Test 3-37a on a safety-shape concrete median barrier transition and a 31" tall w-beam guardrail transition. Both tests passed.
- To date, crash testing has not been conducted on transitions to vertical concrete barrier or thrie-beam guardrail. On 8/5/20, THP (Valtir) sent an e-mail to MDOT indicating: "Our decision not to conduct the Vertical Face transition test was based on the positive results of both the guardrail and concrete median transition tests. Both transitions have vertical elements that are representative of a vertical-face barrier transition. In addition, FHWA Letter CC-112 states that the QuadGuard® transition to vertical wall was accepted with the MASH QuadGuard®. No changes have been made to this transition so additional testing was not warranted."

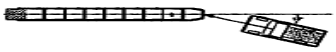
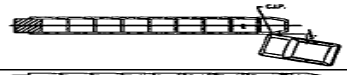
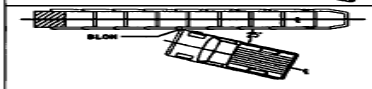
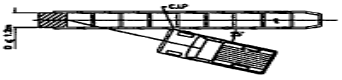
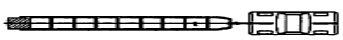
- In conclusion, while all of the transitions identified in FHWA Letter CC-112 are eligible for federal aid reimbursement, some of these transitions have not been crash tested. Furthermore, of the three that were crash tested, one was tested under MASH 2009 criteria, and two were tested under MASH 2016 criteria. Nevertheless, THP (Valtir) is implying there are no significant differences between the MASH 2009 and MASH 2016 impact attenuator crash testing matrices that would warrant repeating any MASH 2009 tests under MASH 2016 criteria.
- Professional Opinion Letter from Applus IDIADA KARCO Engineering: THP (Valtir) provided a signed professional opinion letter, dated 8/30/20, from Applus IDIADA KARCO Engineering, an independent ISO 17025 certified crash testing facility. The letter describes the modifications made to the QuadGuard® M10, the crash tests performed on the QuadGuard® M10 (i.e., Tests 3-30. 31, 32, and 33), and indicates that MASH Tests 3-34, 35, 36, and 37 do not need to be repeated. Most importantly, the letter clearly states the QuadGuard® M10 is MASH 2016 compliant and no further testing is necessary.

Background/History:

Product Description-The 24" wide QuadGuard® M10 impact attenuator, manufactured by Trinity Highway Products (THP), is a standard impact attenuator consisting of a steel framework and a series of disposable energy-absorbing cartridges. The QuadGuard® M10 is intended to be the MASH-compliant replacement of the NCHRP 350 compliant QuadGuard® and QuadGuard® II. The QuadGuard® and QuadGuard® II have been MDOT-approved products for many years, and MDOT currently has many QuadGuard® and QuadGuard® II installations throughout the state.

The 24" wide QuadGuard® M10 is available in MASH, TL-2 and MASH, TL-3 versions. Also, THP has transitions available for the 24-inch wide QuadGuard® M10 for transitioning to guardrail, safety-shape (e.g., NJ-shape and F-shape) concrete barrier, and vertical face concrete barrier (used primarily when the attenuator is exposed to bidirectional traffic to minimize snagging).

MASH, TL-3 Crash Testing Matrix for Impact Attenuators and Summary of Testing Completed in 2010.

Illustration	Test #	Completed	Notes
	3-30	NO	Test 3-32 was completed as "Worst Case" for 1100C.
	3-31	YES	Passed all ORV's. 6-Bay 610 mm [24 inches] Narrow System was tested and passed all Occupant Risk Values.
	3-32	YES	Passed all ORV's. 5-Bay 914 mm [36 inches] Narrow System was tested.
	3-33	NO	Test 3-31 tested system capacity for 2270P and is considered worst case.
	3-34	YES	Passed all ORV's. 5-Bay 610 mm [24 inches] Narrow System was tested.
	3-35	NO	Due to the lateral stiffness of the QuadGuard M10, this test is the same as test 3-36 and can be waived.
	3-36	YES	Passed all ORV's. 5-Bay 610 mm [24 inches] Narrow System with no new nose brackets was tested.
	3-37	YES	Passed all ORV's. 6-Bay 610 mm [24 inches] Narrow System attached to a w-beam transition.
	3-38	YES	The recommended MASH analysis was completed and all calculated ORV's passed.

List of Additional MASH, TL-3 Crash Tests Conducted After Issuance of FHWA Letter CC-112 (full crash test reports available upon request):

1. MASH 2016, Test 3-30
   - Device Tested: 24" wide QuadGuard® M10
   - Testing Facility: Applus IDIADA KARCO Engineering
   - Test date: 5/15/19
   - Result: Passed
2. MASH 2016, Test 3-31
   - Device Tested: 24" wide QuadGuard® M10
   - Testing Facility: Applus IDIADA KARCO Engineering
   - Test date: 5/16/19
   - Result: Passed
3. MASH 2016, Test 3-32
   - Device Tested: 24" wide QuadGuard® M10
   - Testing Facility: Applus IDIADA KARCO Engineering
   - Test date: 5/31/19
   - Result: Passed
4. MASH 2016, Test 3-33
   - Device Tested: 24" wide QuadGuard® M10
   - Testing Facility: Applus IDIADA KARCO Engineering
   - Test date: 6/1/19
   - Result: Passed

5. MASH 2016, Test 3-37a (Pickup Truck)
   - Device Tested: 24" wide QuadGuard® M10 Transition to Safety-Shape Concrete Median Barrier
   - Testing Facility: Applus IDIADA KARCO Engineering
   - Test date: 6/17/19
   - Result: Passed
6. MASH 2016, Test 3-37a (Pickup Truck)
   - Device Tested: 24" wide QuadGuard® M10 Transition to 31" Tall W-Beam Guardrail
   - Testing Facility: Southwest Research Institute (SwRI)
   - Test date: 4/15/19
   - Result: Passed

Supporting Documentation:
- FHWA Letter CC-112
- Professional Opinion Letter from KARCO, dated 8/30/20
- Cover Letter from Paul Kruse (THP) to Carlos Torres, dated 4/23/20
- E-mail from Paul Kruse (THP) to Carlos Torres, dated 8/31/20
- New Materials Product Evaluation Request Form for 24" wide QuadGuard® M10, dated 4/23/20

It should be noted that the New Materials Product Evaluation Request Form from April 2020 indicated five other states have approved the 24" wide QuadGuard® M10: California; Florida; Maryland; Maine; and Virginia.

Recommendation(s): Approve the 24" wide QuadGuard® M10 impact attenuator and all associated transitions based on (1) FHWA eligibility letter CC-112, and (2) the 8/30/20 professional opinion letter from Applus IDIADA KARCO Engineering indicating that the QuadGuard® M10 is MASH 2016 compliant and no further testing is necessary.

Status: New

ACTION: Approved

7. Road Diet of approximately 3,500 feet on US-12 at M-60 interchange, with a center left-turn lane at Frantz Drive, Milton Township, Cass County – Dharmesh Valsadia, Athira Jayadevan

   Issue Statement: Road Diet (four to two lane) of approximately 3500 feet on US-12 at M-60 interchange, with a center left-turn lane at Frantz Drive, Milton Township, Cass County

   Route: US-12
   Job Number: 207365 (Pavement Marking)
   Construction: September 2023

   Major Issue(s): Through Cass County, US-12 is a two-lane roadway with 55 mph speed limit. The proposed conversion is a short four lane section of US-12 located through the interchange area of M-60 and US-12 with the west end at the Berrien County line and the

east end merging with the two-lane section of US-12. This stretch has a lot of speeding and passing through the interchange ramps where vehicles are merging and exiting or entering ramps.

Background/History: This stretch of roadway has a 2022 annual average daily traffic of 9,651 vehicles per day. A pattern of rear end left turning crashes was observed near the south-east end of segment on eastbound US-12 near Frantz Road intersection resulting in serious injuries and a pattern of high-speed crashes were observed at the merge area of US-12 off ramp to eastbound US-12.

A safety and operational analysis of the corridor concludes that road diet will mitigate the existing crash pattern, and that impacts to traffic operations from removing a through lane in each direction were predicted to be insignificant.

The road diet is one of the safety recommendations that resulted from a road safety audit. Milton Township board voted on the resolution of support in April 2022. The Kalamazoo TSC hosted a public open house on June 20, 2023, and comments in favor of the proposed restriping were echoed.

Per the completed Road Diet Checklist, the proposed lane conversion does not present any significant operational or geometric concerns. The proposal is expected to improve the safety of the corridor by reducing the speed differential and eliminate high-speed passing maneuvers, improving overall safety.

Recommendation(s): The proposed project meets the requirements of the Road Diet Checklist, and the Kalamazoo TSC recommends implementing the road diet on US-12.

ACTION: For information Only

APPROVED
By Michael Townely at 2:41 pm, 8/29/23

Michael Townley, Secretary
Engineering Operations Committee

RA:lrb

cc: EOC Members
Meeting Guests
Region Engineers (MDOT)
Assoc. Region Engineers (MDOT)
TSC Managers (MDOT)
L. Doyle (MDOT)
L. Mester (MDOT)
C. Newell (MDOT)
V. Zokvic (MDOT)
M. Ackerson-Ware (MRPA)
T. Burch (FHWA)
R. Brenke (ACEC)
D. DeGraaf (MCA)
C. Mills (APAM)
D. Needham (MAA)
R. Vandeventer (MITA)