

SECTION 145 Traffic Control

CMM provisions mobilized by contract:

[CMM 145.12.5](#).....*Quality Standards for Temporary Concrete Barrier*

145.1 General

[Standard spec 104.6](#) provides for three types of traffic control situations. These are road closed to traffic, road closed to through traffic, and road open to all traffic.

145.2 Road Closed To Traffic

When the contract provides that the road or portions of the road be closed to all traffic, the contractor must furnish, erect, and maintain the traffic control devices at the project termini and at intersecting roads along the project as provided in the contract or directed by the project engineer. A road closed to all traffic means that the traveling public is not allowed on that portion of the road. However, the contractor is still responsible for protecting motorists and pedestrians that may enter the work zone from possible hazards.

When closing the road or portions of the road to all traffic, the local emergency agencies, postal authorities, school bus companies, etc. should be notified by the project engineer in advance of the closing so they can determine alternate routes.

145.3 Road closed to Through Traffic

Closed to through traffic means that only those vehicles with a destination to, from, or within the work zone are allowed.

When the contract provides that the road or portions of the road be closed to through traffic, the contractor must furnish, erect, and maintain the traffic control devices at the project termini and at intersecting roads along the project as provided in the contract or required by the project engineer. The contractor must also furnish, erect, and maintain traffic control devices within the project limits as required for the safe accommodation of local traffic.

When a road is closed to through traffic, apply [standard spec 104.6.1.2.3](#) drop-off provisions where work is occurring in spot locations while other portions of the roadway are undisturbed. In this condition drivers may not notice outside of the signs that any work is being done.

Example

Consider a culvert replacement with a mill and overlay. The culverts will get replaced individually within a closed roadway but the surface outside of the culvert work is largely untouched. The only indication of work to a driver would be the spot locations where the culverts have been replaced. In this case the full drop-off spec applies.

When a road is closed to through traffic, and the original driving surface is completely obliterated, the application of [standard spec 104.6.1.2.3](#) may be limited. Safe accommodation must still be provided to the road users but the standard spec provisions would be difficult to follow, such as:

- Many roadways that are closed to through traffic could have speed limit signs removed.
- If the pavement surface has been removed, temporary concrete barrier could not be used because it is not crash tested for that application.
- There would also be difficulty in defining the adjacent lane if the pavement is removed.

Efforts still need to be taken to delineate hazards with drums or barricades to warn local traffic of exposed drainage structures and other possible hazards.

The contractor must at all times conduct the work in a manner to provide safe, reasonably-direct, all-weather, 24-hour pedestrian and vehicular access to abutting properties along the highway being improved.

145.4 Road Open to all Traffic

When the contract provides for the maintenance of all traffic over or along the road while undergoing improvement or reconstruction, the road must be kept open to all traffic, and the contractor must keep the portions of the road being used by public traffic in a condition that pedestrian and vehicular traffic will be safely and adequately accommodated. The project engineer should make a daily inspection of the road condition.

The contractor must furnish, erect, and maintain traffic control devices as required for the safe accommodation of the traffic.

145.5 Worker Safety

Federal regulation 23 CFR Part 634 mandates that workers within the right of way of a highway project wear high-visibility safety apparel meeting performance class 2 or 3 requirements of the ANSI/ISEA 107-2004. [CMM 135](#) contains further safety guidance.

145.6 Traffic Control Plan

All projects require a traffic control plan (TCP) to be included as part of the PS&E. The TCP is developed to be consistent with the prosecution and progress, utility coordination, and traffic provisions of the contract.

The contractor is responsible for implementation of the TCP. The project engineer will monitor the work of the contractor in this regard, and will ensure that required traffic controls are established at the start of the project and are properly maintained and operated during the time the control situation exists. The controls are to remain in place only as long as necessary and must be immediately removed thereafter. Where operations are performed in stages, only those devices pertinent to that particular stage must be used to avoid confusing the motorist.

During the daily inspection, the project engineer should look for signage and barriers that are within the right-of-way that could cause a safety problem for the traveling public. Such things as signage or barrels that are not needed, not properly anchored or not properly stored should be removed from the right-of-way to prevent potential hazards for the public. Consult [standard spec 643](#) for each project regarding allowable timeframes for signage and barriers use when construction is inactive.

Instead of implementing the adopted TCP elements in the contract, the contractor can choose to develop other measures if they can achieve the required results more expeditiously. Contractor-developed TCP's are subject to the same reviews and approvals as other contract changes.

All aspects of the traffic plan including signing, barricading, flagging, traffic handling, and blockading of streets should be discussed, explained, and coordinated with appropriate local officials, especially when urban projects are involved.

The project engineer should contact the region traffic section and local law enforcement officials to solicit their assistance in evaluating effectiveness of the traffic control operations, and to obtain written reports of crashes occurring in the work zone and immediate project vicinity, during the life of the project. The project engineer will notify the Bureau of Traffic Operations by sending an email to DOTWorkZoneCrashes@dot.wi.gov with details of the crash.

In addition to implementing any necessary corrective actions, the project engineer should provide any crash reports to the project manager on a weekly basis. If necessary, the project's crash situation will be reviewed by representatives of the region, as appropriate, in cooperation with the traffic engineering section.

This review will be done for the purpose of evaluating the crash frequency and severity occurring on the project and determining appropriate action necessary to remedy the contributing deficiency. Findings will be documented by the region, with copies furnished to appropriate statewide bureaus, enabling necessary corrective actions to be implemented on future projects and ensuring the overall effectiveness of the TCP program.

Further information on traffic control plans can be found in [FDM 11-50-20](#) and on Traffic Special provision in [FDM 19-15-20](#). Federal regulation 23 CFR 630 Subpart K mandates that traffic control be administered in the same manner as any other contract item. The contractor is expected to be aware of specific contract requirements and any revisions necessary to meet the terms of the contract.

145.7 Detours

145.7.1 For State Trunk Highway Projects

During construction or improvement of state trunk highways, when the contract requires closing the road to through traffic, the contractor is responsible for providing detours to route traffic. Selection of the detour route is generally determined before award of contract, and whenever practicable, routing of the detour will be over state trunk highways. The project engineer will decide when contract operations requiring the closing of the road will start, and when applicable will notify the region office in sufficient time to provide for public information and any coordination needed for the detour.

When officially marked and designated detours are routed over roads that are not a part of the state trunk highway system, statute 84.20 provides the department is liable for any damage to the roads resulting from their use as detours and requires that upon ending their use as detours, they must be restored to a condition at least equal to that existing just before their use as a detour.

Local roads required for detours may first be surfaced or otherwise conditioned to the extent determined necessary to adequately provide for the detoured traffic. Construction funds will be used for the improvement work, which can be performed by service and supply contract or by private contract. Normal maintenance work on detours is provided through the department.

Before roads that are not state trunk highways are officially marked and used as detours, the project engineer needs to make a condition survey, recording the type, width, thickness, condition of the

surfacing, condition of drainage structures, and other features of the road that may be affected by the detoured traffic. The project engineer should take photographs when practicable, unless other region personnel have previously made the condition survey. When the road is finished being used as a detour, a condition survey will again be made to determine whether or not any restoration work will be required. Construction funds will be used for restoration work performed by service and supply contract. The project engineer should consider including a representative of region maintenance and of the local maintaining authority as part of the condition survey team.

During the construction of a state highway project, drivers frequently make extensive use of roads that are not officially marked detours by their own accord and preference. Use of these roads instead of the officially marked detour is not a responsibility of the department.

145.7.2 For Local Road Projects

Where the contract provides for closing county highways or local roads or streets, the need for and the selection of a detour route is generally determined before award of the contract. The contractor, when specified in the contract, or the agency in charge of the closed road, will be responsible for detour signing.

The project engineer will decide when contract operations requiring closing of the road or street will start, and will notify the maintaining agency in sufficient time for erection of the detour signing if the detour signing is not part of the work under the contract.

Detours for county highways and local roads and streets may be routed over state trunk highways with prior approval of the department. Signing for the detour must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) and must not interfere with signing already in place on the state trunk highway.

Correction of damage or deterioration to roads and streets used as detour routes for projects on county highways and local roads and streets will not be the responsibility of the contractor or the department, but will be the responsibility of the local unit of government.

145.7.3 Review of Detour Routes on Local Roads

Frequently, it becomes necessary for a local unit of government (municipality, town, or county) to close a road under its jurisdiction to allow the reconstruction of that road. A detour is then established to accommodate the rerouted flow of traffic.

Under Wisconsin law, a local unit of government is responsible for the detour of a route under its jurisdiction. For that reason, WisDOT traditionally has made only informal reviews of these detours as a courtesy to the local unit of government, and only after being requested to do so by the local agency. To aid WisDOT personnel performing these reviews, the following procedure has been established. It will apply only to those formal detours set up to accommodate traffic rerouted as a result of federally-funded projects that WisDOT is responsible for administering.

1. Upon being notified that a detour route is about to be placed in service, a WisDOT representative (typically, the project engineer) should arrange to drive the entire route in company with the responsible local official to ensure the detour will operate safely.
2. The field review should be made immediately before placing the detour in operation.
3. Traffic signing and pavement marking should be reviewed along the entire length of the detour. Capacity of the route to accommodate both its normal traffic demand and the detoured traffic should be considered.
4. The WisDOT representative should offer suggestions where improvement is considered necessary.
5. The WisDOT representative should enter both the results of the field review and suggestions offered into the project diary.

Follow-up review by WisDOT of the detour operation and maintenance will be appropriate if requested by the maintaining authority.

145.8 Transportation Management Plan (TMP)

145.8.1 General

In addition to implementation and monitoring of the traffic control plan, there may be public information and outreach, transportation operations, and incident management elements of the TMP to implement. The contractor is responsible to implement any requirements specified in the contract. Other elements related to public information and coordination with law enforcement, local agencies, and other projects are typically the responsibility of the project engineer or other region staff. Before the TMP is implemented, it is advisable to identify key personnel and their responsibilities and provide contact information.

The project engineer and the contractor may discuss and agree (preferably at the preconstruction meeting) on how emergency operations will be carried out. If the project stipulates that a daily log of traffic control operations be kept, document this requirement in the implementation plan and share information

with parties before beginning construction activities. Identify the line of authority for both department and contractor personnel responsible for traffic control. Also identify personnel assigned the TMP monitoring responsibility.

Use the WisTMP System to find the TMP, located here:

<http://transportal.cee.wisc.edu/tmp/>

145.8.2 Monitor TMP

Refer to appropriate WisDOT policies, standards, and procedures for TMP monitoring. [FDM 11-50-5](#) and [FDM 11-50-10](#) provide guidance on the TMP process and components. Monitoring may be as simple as a daily or weekly traffic control review log or more complex for projects requiring TMP type 4. Review changes with the contractor. Follow FDM 11-50-5.14 for certain changes that may require documentation, and an amendment to the TMP. Document the changes in the WisTMP System.

Some elements of TMP strategies such as media releases, notifications to target groups, brochures, flyers, newsletters, etc., may need early distribution. Additionally, motorist notification, installation of fixed message signs, signing of detour routes, putting changeable message signs in place, and work zone ITS require lead time.

During construction, the region should assign an individual to collect data on the TMP. The data collected may be used to prepare a report on the successes and challenges of the TMP. The data collected may include:

- Verification of work zone setup.
- Changes that were made during construction.
- Changes that were made to the original TMP (include successes or failures).
- Public/motorist reaction.
- Identification of peak hours.
- Average daily delays experienced, i.e., queues.
- Frequency of complaints and the nature of the complaints.
- Crash occurrence (type and frequency).
- Surveys/feedback.
- A track of implementation cost.
- Person(s) responsible for the implementation of TMP.

145.8.3 Post Construction Project Evaluation

TMP strategies should be linked to measures of performance to determine how effective the applied strategy was in promoting safety and mobility at a work zone. Use the data collected while monitoring the TMP during construction to assess the quality, performance, and effectiveness of the TMP in achieving project objectives.

Performance measures are typically applied to fulfill four functions:

- To continuously improve services, i.e. to understand how the strategy is performing and whether modification of its application is necessary to improve performance;
- To strengthen accountability of either the department's or the contractor's personnel to ensure the strategy is achieving the desired effect;
- To communicate the results of strategies to the public, stakeholders, and upper management, and;
- To provide better information for effective decision-making and resource allocation in the future.

Performance measures for work zones differ from one project to the next. For example, car-pooling usage would be used to measure the effectiveness of a TMP mitigation strategy such as ride share incentives. Additionally, a work zone may include new strategies, such as new technology (ITS) or innovative contracting strategies. In these instances, a unique performance measure may be developed to evaluate the effectiveness of the new strategy.

The post construction report should provide brief discussion on the following areas:

- Overall statement reflecting the usefulness of the TMP.
- The changes that were made to correct oversights in the TMP.
- Changes to the original TMP and how successful those changes were.
- Public reaction to the TMP from comments, feedback, or surveys.
- Average delay time (how often the 15 minutes criteria was exceeded and the steps taken to remedy the situation).
- Frequency of complaints made about the project, the nature of the complaints, and how they were resolved.

- Type of crashes/incidents that occurred during construction, and how they were resolved.
- Recommendations or suggestions for future projects.
- Highlight the areas of the TMP that were successfully implemented.

Attach the post construction report to the TMP in the WisTMP System.

Once the project is complete, the TMP must have its status in the WisTMP System changed to Complete. The Project Manager must perform a "Mark as Completed" action in the WisTMP System.

145.9 Traffic Control Devices

145.9.1 General Requirements

Before allowing work operations to start or to continue, the project engineer should ensure that the contractor provides effective and credible signing and properly installs warning signs, barricades, changeable message signs, arrow panels, and other traffic control devices according to project plans, the MUTCD, Work Zone Safety handbook, or other approved plans. If a flagger is required, flagging operations must be performed in accordance with the WisDOT flagger handbook. The contractor must provide adequate warning to the traveling public of any obstruction in the road or work operations that may be a hazard to traffic.

The "Quality Guidelines for Temporary Traffic Control Devices" handbook published by American Traffic Safety Services Association (ATSSA) is available at the traffic section of each region office. The handbook shows three levels of device quality: acceptable, marginal, and unacceptable. A traffic control device introduced to the work site must be in acceptable condition. It may degrade to marginal quality during the project, but once an item has been determined to be unacceptable it must be replaced with an acceptable device.

Temporary traffic control devices must be monitored and maintained throughout the course of construction, including utility and maintenance operations. The contractor is required to provide a level of inspection necessary to ensure ongoing compliance with the quality guidelines.

Where the traffic is maintained on a construction project, advance warning is required sufficiently in advance of construction operations to alert drivers in time for them to become aware of conditions ahead before entering the work area. The number of signs and their proper positions relative to the work area will be largely influenced by the type, volume, and rate of speed of the prevailing traffic. Projects carrying large volumes of traffic at relatively high speed will require more and larger signs at greater spacing than is required for those having comparatively light and slow traffic. Refer to Part VI of MUTCD produced by FHWA.

145.9.2 Responsibility for Signs

The responsibility for the maintenance of signs and other traffic warning devices varies, dependent upon whether the highway through the project is open to traffic, closed to through traffic, or closed to local and through traffic.

When the project is constructed under traffic, the contractor is responsible for furnishing, erecting, and maintaining approved warning signs informing the public of construction operations and associated traffic hazards.

When the work of detour signing is not included in the contract and the highway is closed to through traffic or to local and through traffic, and traffic is detoured, the applicable governmental unit is responsible for furnishing, erecting, and maintaining signs along the detour and on the regular route of the highway approaching the beginning and end of the detour.

The contractor is required to furnish, erect, and maintain appropriate signs at each end of the project and at each intermediate crossroad. The contractor is solely responsible for construction signs within the closed section of the highway that may be necessary to protect the work and safeguard the local traffic, and for the signs that may be necessary on intermediate crossroads where traffic is allowed to cross the project.

The state or other public body having jurisdiction over the highway involved must authorize using regulatory signs. The contract may require the contractor to provide and maintain regulatory signs.

If signing is not to be installed by the contractor, the project engineer should notify the region office or maintaining agency early of the signing requirements on the project so proper signing can be erected. In the case of a major sign change, such as moving traffic from one roadway to another, the project engineer should notify the region office or maintaining agency sufficiently in advance of the anticipated time of the change to arrange for the fulfillment of this responsibility.

The department will pay for covering signs under the Traffic Control Covering Signs bid items. The intent is to pay for sign covering required to conform to the contract traffic control and staging plans as modified

by the project engineer in the field. The department will not measure sign covering dictated by the contractor's operations.

For example, if the contractor were to install a Signal Ahead sign and the traffic signals were not yet operational, this permanent sign would be required to be covered. However, the department would not measure this sign covering because it was installed for the convenience of the contractor. Another instance where sign covering would not be measured is if the sign were a part of the detour signing. For example, if a permanent assembly had a left arrow and the detour required an ahead arrow, then the ahead arrow would only be paid for as a detour sign and not as a sign covering.

Temporary signs used for contractor operations will also not be paid for under sign covering. Throughout a project's construction stages there may be temporary lane closure warning signs or set-up and take down of traffic control. These temporary signs could be covered if used again, but this would be incidental to traffic control.

145.9.3 Responsibility for Barricades

The standard specs and plans require that the contractor must provide, erect, and maintain substantial barricades conforming to the requirements of the plans and MUTCD at intersecting roads and at each end of the closed section of highway. The plans and the MUTCD provide that the barricades normally must be Type III barricades meeting plan requirements.

Usually, the contractor will be required to place the mainline barricade at the beginning and end of the project. The contractor may also be directed to place and maintain partial barricades a nominal distance in advance of the beginning of the project at logical points such as the first intersection road or at other major intersecting roads.

145.9.4 Responsibility for Shielding Drop-offs and Other Hazards

If a change from the original contract staging and traffic control plans becomes necessary, the contractor is responsible to provide safety measures for the traveling public. Drop-offs and other hazards may need to be shielded using longitudinal temporary traffic barriers. The duration of the hazard and depth of the drop-off both factor into the justification for using longitudinal temporary traffic barriers.

According to 23 CFR 630.1108, using longitudinal temporary traffic barriers must be based on an engineering study. Also refer to MUTCD Section 6F. The temporary barrier must be designed following the guidelines in [FDM 11-50-35](#). The department will not pay for the cost of the installation unless it is responsible for the change that caused the additional work. Refer to Temporary Concrete Barrier in this section for more details.

145.9.5 Covering Conflicting Signs

Conflicting permanent signs are to be covered and indicated on the traffic control sheets. Under some circumstances, there may be multiple cycles of covering and uncovering throughout the course of construction staging. The sign covering will be measured separately for each cover/uncover cycle. In addition, the number of cycles should be listed in the quantities and, if necessary, should indicate the stage in which the sign will be covered and uncovered. [Standard spec 643.3.4.3](#) explains further cover installation and maintenance details.

The intent is to pay for sign covering required to conform to the contract traffic control and staging plans as modified by the project engineer in the field. The project engineer will not measure sign covering dictated by the contractor's operations. For example, if the contractor were to install a Signal Ahead sign and the traffic signals were not yet operational, this permanent sign would be required to be covered. However, the department would not measure this sign covering because it was installed for the convenience of the contractor. Another instance where sign covering would not be measured is if the sign were a part of the detour signing. For example, if a permanent assembly had a left arrow and the detour required an ahead arrow, then the ahead arrow would only be paid for as a detour sign and not as a sign covering. [Standard spec 643.5.3](#) provides additional covering sign payment details.

Temporary signs used for contractor operations will also not be paid for under sign covering. Throughout a project's construction stages there may be temporary lane closure warning signs or set-up and take down of traffic control. These temporary signs could be covered if used again, but this would be incidental to traffic control.

145.9.6 Review of Traffic Control

[Standard spec 643.3](#) requires the contractor to review traffic control devices immediately after each setup and as often as necessary for location, position, visibility, adequacy, and manner of use. The contractor should provide the project engineer with the name and telephone number of a representative responsible for emergency correction of the devices. The project engineer or designated WisDOT staff person should review the devices at least once every 24 hours during the workweek. The "Work Zone Traffic Control

Inspection Checklist," has been created to assist the review process. Copies of the checklist are available from the region office, or in the pantry software. A joint review with the contractor can be mutually beneficial. Both night and day review should be made and documented in the project diary.

On many sections of streets or highways open to local traffic or being constructed under traffic, other contractors, utilities, or governmental agencies will need to do work related or unrelated to the project. They must employ standard and adequate signing, barricading, and other warning devices to protect their particular work zone. The traffic control devices employed by third parties must not conflict with each other or with traffic control devices in place and provided by the contractor. The project engineer should be informed of all work planned by others and should arrange to coordinate the traffic control measures and the work, in cooperation with the contractor.

[Standard spec 107.9](#) provides that vehicle and equipment parking, and storage of equipment and materials must be accomplished without undue distraction of motorists from traffic control devices and minimizing hazards to motorists, pedestrians, and workers. Parking and storage sites should be reviewed for potential hazards to motorists in conjunction with the regular signing review by the contractor and the project engineer.

145.9.7 Maintaining Traffic Control Devices

Maintenance of traffic control devices is incidental to the specific items as specified under [standard spec 643.5.2](#).

145.9.8 Responsibility of Channelizing Devices

The contractor is required to use the traffic control devices that are shown in the plan. Traffic Control Drums are not to be substituted by 42-inch cones because cones use only half the spacing of drums.

145.10 Maintenance of Traffic During Suspension

During periods of suspension of work operations, [standard spec 104.6.6](#) provides that the contractor must make passable and must open to traffic portions of the highway under improvement and temporary roadways or portions thereof as may be agreed upon between the contractor and project engineer for temporary accommodation of necessary traffic during the period of suspension.

Making the roadway passable will include such work as removing stored material or equipment or other obstacles and smoothing, shaping, and preparing the traveled way to a condition suitable for traffic.

The contractor is required to furnish and maintain lights, barricades, and warning signs required by the contract and approved by the project engineer for protection of the work and safety and convenience of the traveling public.

Upon resumption of work operations, the contractor must, at the contractor's cost, remove work or material used in the temporary maintenance, if required by the project engineer. However, the contractor must be reimbursed for additional materials and work required due to traffic use, in accordance with [standard spec 104.2](#), Extra Work.

When the suspension is not provided for in the contract and is beyond the control and not the fault of the contractor, expenses incurred by the contractor in maintaining the required traffic control devices will be reimbursed as provided in [standard spec 104.2](#) and [standard spec 104.6](#).

If there is more than one contractor with a contract for improvement of the highway, the project engineer will determine the responsibility of each contractor for lights, barricades, and warning signs during periods of suspension of work operations and use by traffic.

During that time of use by traffic, the maintenance of the surface of the traveled way will be the responsibility of the governmental unit charged with maintenance of the highway.

145.11 Traffic Damage Claims

It is the policy of the department to bill contractors for damages caused by their construction operations to signs and other traffic control device installations. Any time a contractor removes signs and fails to reinstall them properly, or if a contractor incurs damages to signs or other traffic control devices as a result of operations, those costs should be billed to the contractor under a damage claim. Accordingly, the project engineer should record pertinent information relative to the damages or incurred costs as discussed in [CMM 155](#). The project engineer should document communications with the contractor and subcontractors regarding work zone traffic control device quality, adequacy, and appropriateness. This information should be given to the region.

145.12 Temporary Concrete Barrier

145.12.1 General Considerations

The installation of temporary concrete barrier involves many project- or site-specific details that will need evaluation. If the construction staff discovers a problem, it is recommended that they discuss it with the

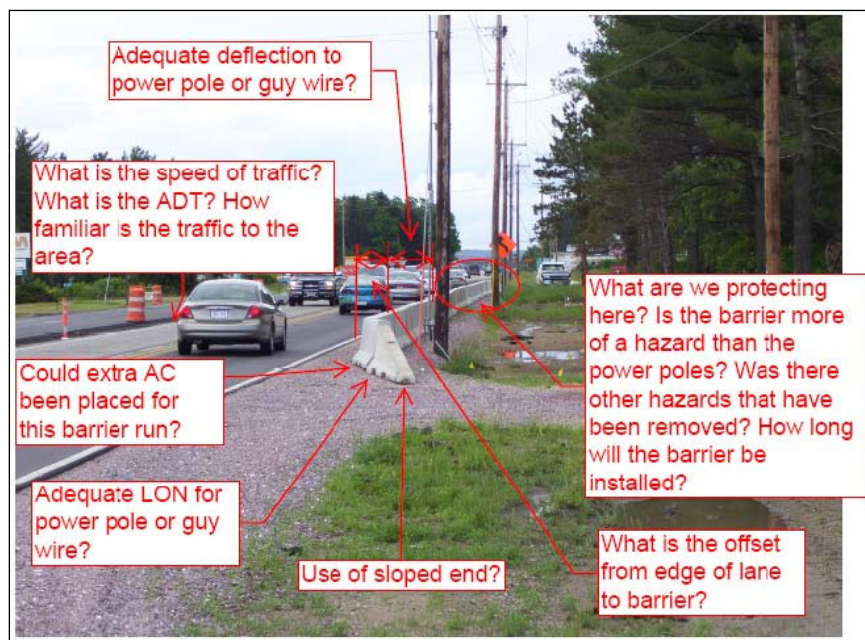
designer and region staff. Before installing temporary concrete barrier on a project, field staff should consider the following points:

1. Consider Alternatives
 - If it's not possible to install concrete barrier on pavement, but there is adequate deflection and the barrier is required for a long duration, beam guard may be a better alternative than concrete barrier. Beam guard has less chance of causing injury to vehicle occupants than concrete barrier.
 - Consider additional delineation or paint to reduce the chance of a vehicle hitting a hazard or barrier.
2. Determine the Nature of the Hazard
 - Some hazards have a higher probability of causing a fatality at any speed (cliffs, deep water, flammable liquid tanks, hazardous chemicals...) and additional protection would be warranted. The distance from the roadway to the hazard is important to determine the need for barrier. See [FDM 11-50-35](#).
3. Reduce Duration
 - Look into the potential to reduce the duration that the barrier is needed, by accelerating work operations or using other construction techniques.
4. Reduce Speed
 - Determine if there is a potential to reduce speed in the area using regulatory signs, police enforcement, pavement markings, or delineators to reduce speed.
5. Calculate Length of Need (LON)
 - Calculate and document length of need (LON) for each barrier installation. See [FDM 11-45-30.3.1.2](#) for LON calculation method, and [FDM 11-50-35](#) for information on construction clear zone recommendations. If a barrier does not have appropriate LON, a vehicle could enter the work area and endanger vehicle occupants and construction staff.
 - If concrete barrier does not have adequate LON:
 - Consider beam guard and short-radius beam guard.
 - Consider additional delineation or paint to reduce the chance of a vehicle going behind the barrier.
 - Install additional barrier to get adequate LON.
 - Temporarily move access to provide room for additional barrier.
 - There may be situations where it is not possible to provide LON for a work area. Document why LON could not be provided, what alternatives or mitigation strategies were investigated, and why a particular alternative was selected.
 - The distance from the first full height barrier section to the LON point of temporary barrier is 8 sections for free standing sections, or to the LON point of the crash cushion.
6. Install on Pavement
 - Temporary barrier should be installed on asphalt or concrete. Crash tests to evaluate performance of concrete barrier were performed on asphalt and concrete. Provide 2" of asphalt for the barrier to rest on.
 - Avoid placing barrier on base course or grass. Placing concrete barrier on base course or grass will reduce the amount of contact the barrier has with the ground. This will increase deflection during impact, and it may cause the barrier to dig into the ground and tip over (i.e. increase the potential of a vehicle rolling over the top of barrier).
 - If the nature of the worksite prohibits installation of the barrier on pavement, other mitigation strategies should be investigated, including temporary guardrail marking and delineation. Document what alternatives or mitigation strategies were investigated and why a particular alternative was selected.
 - Placing the barrier on a firmly compacted, drainable base course would be preferred over placing the barrier on grass (i.e. less chance of the barrier digging into the soft soil). If placement on base course or grass is the only option, allow for more barrier deflection.
 - If possible, move the barrier to get it on asphalt or concrete. If the barrier is already installed, removing it to install asphalt, and reinstalling the barrier may not be practical, depending on how much barrier would need to be moved.

145.12.2 Example Installation

Figure 145-1 is an example to educate staff and consultants on what to look for when installing barrier. It is possible that there are project specific details that the photo does not properly show that could justify this barrier installation.

FIGURE 145-1 Example Installation



145.12.3 Connecting Barrier

Make sure that both sets of connecting loops (top and bottom) have the connection pin installed, as shown in figure 145-2. If the connection pin is not installed, the joint may fail during an impact, or the barrier may not deflect properly. If the barrier does not deflect properly during an impact, the vehicle may impact a blunt end or go over the barrier. FHWA has done a project visit and found this to be a problem. Figure 145-3 shows an improperly installed connection pin (i.e. the top plate of the connection pin needs to be flush with the top connection loop).

FIGURE 145-2 Connecting Concrete Barrier

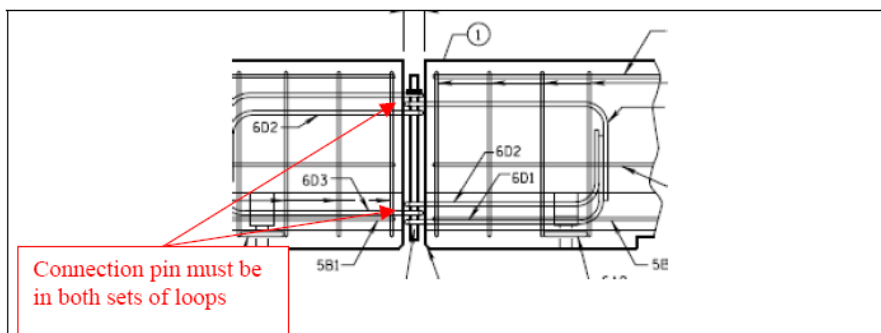
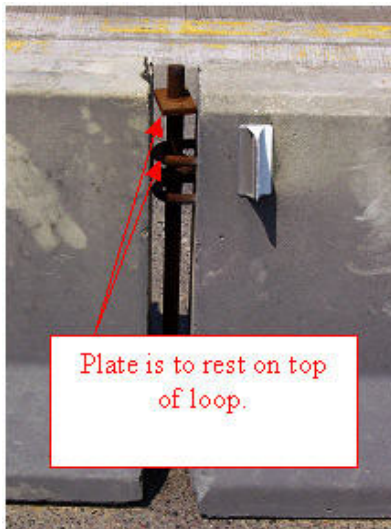


FIGURE 145-3 Improperly Connected Barrier

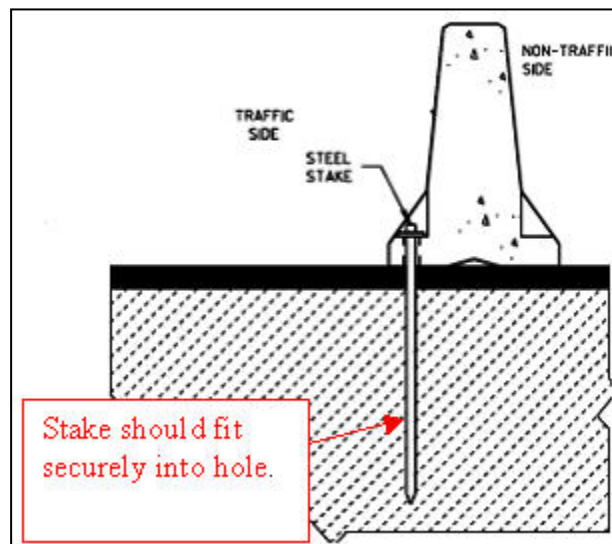


145.12.4 Anchoring Barrier

When anchoring the barrier to the pavement, make sure that the stake or anchor fits snugly into the hole, as shown in figure 145-4. A stake or anchor that is loosely installed will not function correctly.

Only 12.5' long barrier may be anchored. 10' temporary barrier is not to be anchored even if it has anchoring holes. If no or reduced deflection is required, only 12.5' long barrier may be used and anchored in accordance with the standard detail drawing.

FIGURE 145-4 Anchoring Concrete Barrier



145.12.5 Temporary Barrier Acceptability

The quality standards for temporary barrier defined in 145.12.5 are mobilized by the contract in [standard spec 603.3.2.1](#).

Criteria in this section describe deficiencies in temporary concrete barrier, and the effect on the quality and usability of the barrier. The guidance is based on three levels of device quality: acceptable, marginal, and unacceptable. Temporary concrete barrier introduced to the work site must be in acceptable condition. It may degrade to marginal quality during the project, but once the barrier has been determined to be unacceptable it must be replaced with acceptable barrier.

Temporary concrete barrier must be monitored and maintained throughout the course of construction. The contractor is required to provide a level of inspection necessary to ensure ongoing compliance with the quality guidelines.

145.12.5.1 Loop Damage

A loop that is out of alignment may fracture during an impact because the steel has become brittle. The barrier shown in figure 145-5 is unacceptable. If the steel loop is not firmly connected to the concrete barrier, it may break free on the next impact. The barrier section with the loop shown in figure 145-6 is unacceptable.

145.12.5.2 End Section Loss

Section loss near the joints may lead to joint failure or allow the joint to rotate too much during an impact, increasing the potential for barrier failure or injury to a vehicle occupant. Exposed steel near the end section will reduce the barrier's connection strength. figure 145-5, figure 145-6 and figure 145-7 show barriers that have excessive end section damage.

FIGURE 145-5 Loop Out of Alignment



FIGURE 145-6 Loop Not Firmly Connected to Barrier

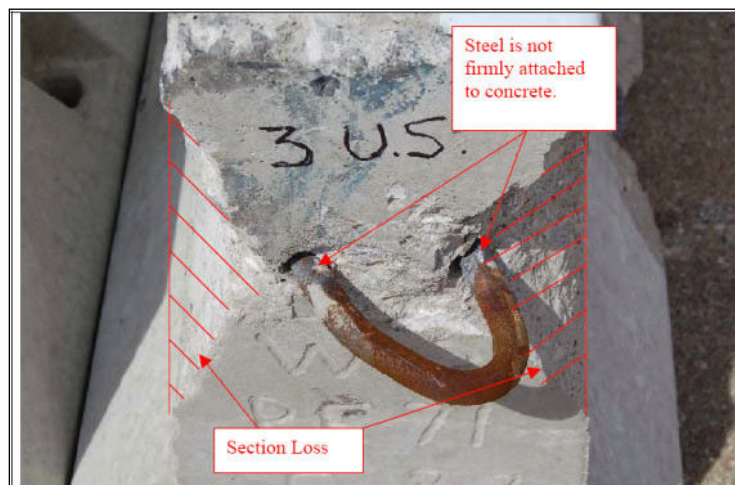


FIGURE 145-7 Exposed Steel and Section Loss Near End Section



145.12.5.3 Anchor Hole Damage

Exposed steel near the anchor hole can cause a barrier to fail during impact. Figure 145-8 shows a barrier with exposed steel and cracking of the concrete near the anchor hole. The barrier is unacceptable for a barrier requiring anchoring. If a barrier does not require anchoring and there is no other damage to the barrier, the barrier would be considered marginal.

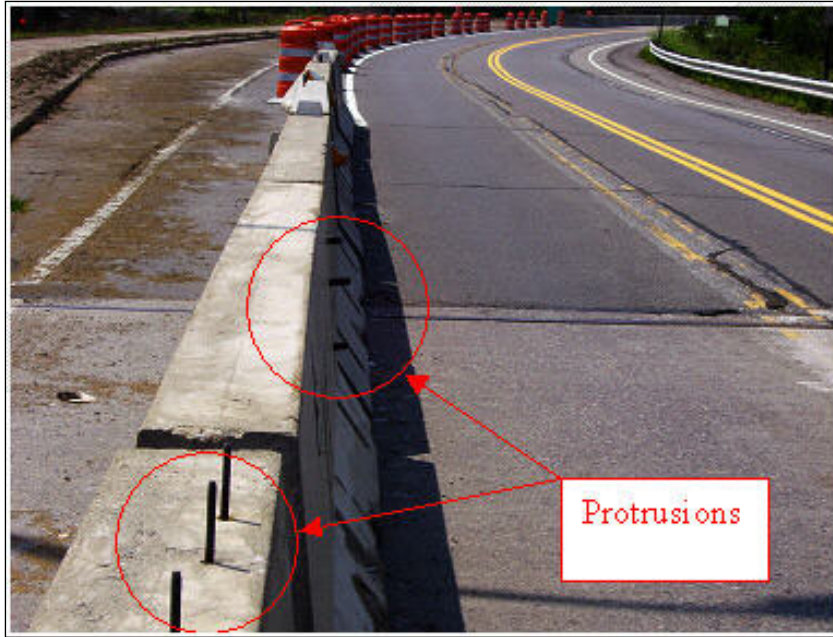
FIGURE 145-8 Anchor Hole Damage



145.12.5.4 Protrusion On Barrier

Protrusions (e.g. signs, steel bars...) are not acceptable on temporary barrier, because they are snag hazards for an impacting vehicle and can potentially expose an occupant's head to a spearing hazard. Figure 145-9 shows both vertical and horizontal protrusions on a barrier. Mounting signs on temporary barrier should be limited to areas where there are not other options. Document why it was necessary to place sign on a barrier.

FIGURE 145-9 Vertical and Horizontal Protrusions on Temporary Barrier



145.12.5.5 Exposed Steel Reinforcement

Figure 145-10 and figure 145-11 show barrier with exposed reinforcement steel. Barrier with this amount of exposed reinforcement are more likely to have insufficient strength to contain or redirect a vehicle during an impact. Barriers in this condition must not be used in areas where anchoring to a bridge deck or pavement is required. In the best-case non-anchoring scenario, this barrier would be considered marginal.

FIGURE 145-10 Exposed Steel Reinforcement



FIGURE 145-11 Exposed Steel Reinforcement



145.12.5.6 Delineation

The standard details require delineation of the temporary barrier. Have contractor provide delineation on barriers. Delineation helps to prevent impacts with the barrier.

145.12.5.7 Cracking

Cracks that are being tightly compressed by the barrier's reinforcement may be acceptable providing that the barrier does not have other damage (e.g. anchor hole damage, end section loss, loop damage...) and that the barrier does not require anchoring. Barriers that have open cracks with the cracks extending completely through the barrier should not be accepted. Barriers that have cracks that are not tightly compressed and do not extend completely through the barrier are marginal, and are not be used in areas where barrier requires anchoring.

145.12.5.8 Spalling or Chipping

The acceptability of spalling or chipping allowed on the face of temporary barrier depends on the quality (e.g. overall shape, depth, texture...), quantity, and location. Spalling or chipping that compromises the overall profile of the barrier or causes a potential snag point during an impact is unacceptable. Spalling or chipping that is greater than 4" in width and abrupt in character is unacceptable. Figures 145-12 through 145-15 show barriers with spalling or chipping issues. Note that the marginal spalling and chipping could be considered unacceptable if the deepest portion of the spalling/chipping was located closer to the anchoring to pavement hole.

FIGURE 145-12 Unacceptable Chipping and Spalling

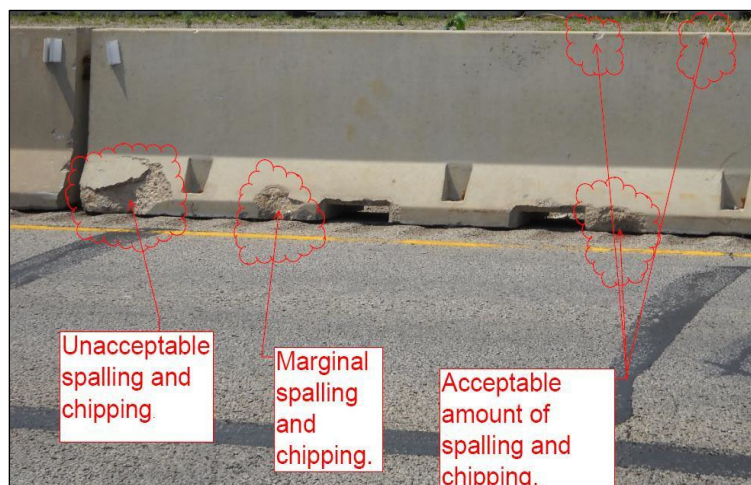


FIGURE 145-13 Top View of Barrier with Significant Chipping

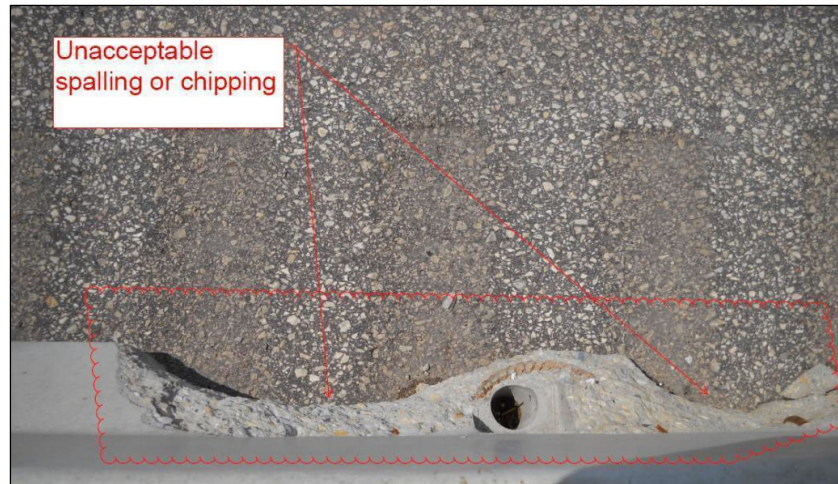


FIGURE 145-14 Spalling, Chipping, and End Section Loss

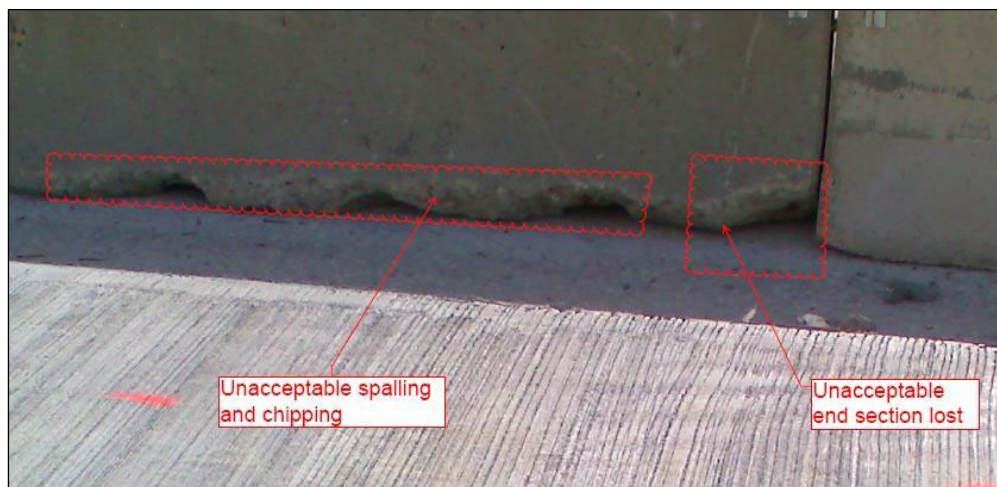


FIGURE 145-15 Chipping and Spalling



145.12.5.9 Snag Points

If a longitudinal opening is 4" or greater width it is a potential snag point and is unacceptable. Perpendicular differences in barriers of 2 inches or greater are also considered snag points that are unacceptable. Figures 145-16 through 145-18 show examples of unacceptable snag points.

FIGURE 145-16 Potential Snag Point Caused by Different Barrier Styles Not Matching Up



FIGURE 145-17 Barrier Offset Creates a Snag Point

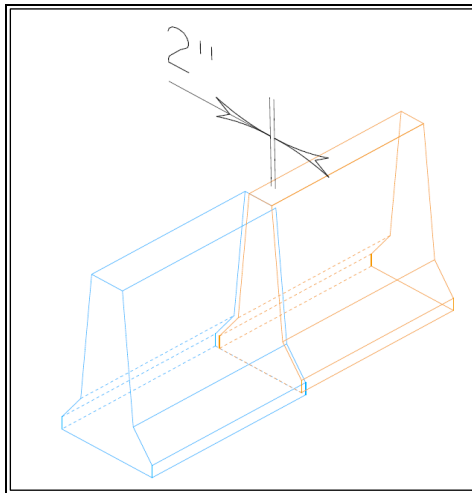
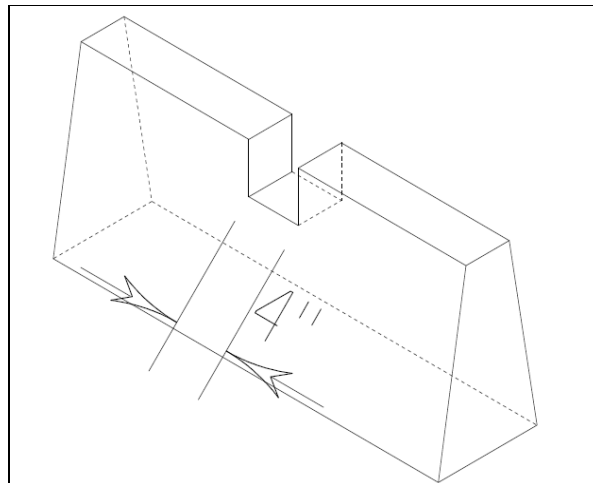


FIGURE 145-18 Opening in Barrier Causes Snag Point



145.12.6 Installation Issues

145.12.6.1 Lack of Proper End Treatment

Figure 145-19 shows two issues that deal with installation of a temporary barrier. The installation lacks proper end treatment (e.g. crash cushion required on high speed facilities, or a sloped end treatment on

low speed facilities). There is an object within the deflection distance of the barrier and the object is too close to the termination of the barrier. Length of need (LON) before hazards is discussed in this chapter in an above section and in [FDM 11-45-30.3.1.2](#).

FIGURE 145-19 Improper Termination of Barrier and Object within Deflection Distance



145.12.6.2 Barrier Incompatibility

It's important to note that 10' temporary concrete barrier cannot be connected to 12.5' concrete barrier.

145.12.6.3 Gaps in Barrier Run

Gapping of a temporary barrier run (see figure 145-20) should not be allowed. If an errant vehicle impacted the downstream barrier run, the barrier would deflect significantly further than normal and expose the blunt end of the upstream end of the barrier run.

FIGURE 145-20 Gap in Barrier



145.12.6.4 Proper Clearance Behind Barrier

Placing materials or equipment within 2' of free standing temporary barrier (see figure 145-21) should be avoided. Material may cause the barrier to do any of the following:

- Rotate during impact (i.e. causing the errant vehicle to ramp up over the barrier).
- Have the free standing temporary barrier form a pocket during an impact (i.e. significantly increasing the probability of a severe collision).
- Expose a snag point at a barrier joint.

FIGURE 145-21 Insufficient Clearance Behind Temporary Barrier



145.12.6.5 Proper Side of Barrier Facing Traffic (12.5 foot Barrier Only)

10' temporary concrete barrier can be flipped around (i.e. what was the traffic side can become the backside of the barrier). 12.5' temporary concrete barrier cannot be flipped around. If 12.5' temporary barrier is flipped around the end section loop bars will not match up correctly (see figure 145-22). 12.5' temporary barrier may not function as intended if the separate sections of barrier are not connected properly.

FIGURE 145-22 Improper Connection of 12.5' Temporary Barrier



145.12.6.6 Barrier Not Matching Standard Detail Drawing

During the summer of 2009, FHWA and WisDOT staff saw various styles of 10' barrier that did not match the department's SDD for 10' temporary barrier (See figure 145-23).

FIGURE 145-23 Barrier Not Matching Standard Details



145.12.7 Barrier Substitution

Due to lack of compatibility in pinning WisDOT temporary barrier to Illinois temporary barrier and anchoring Illinois temporary barrier to pavement, WisDOT has decided that Illinois barrier is not allowed on WisDOT projects.

If a contractor wishes to substitute a different temporary barrier than the most current SDD it is the contractor's responsibility to provide the following before installation:

- Design drawings from manufacturer or state for the proposed barrier
- Connection details between individual barrier sections
- Anchoring to pavement or bridge deck details
- Crash test documentation, including crash testing condition and deflection information
- Location or locations where proposed design will be installed

Details provided by contractor must be continuously used in any given run of temporary barrier.

Project staff should review the substitution with region staff and BPD before accepting a different barrier design from the plan. If the barrier requires to be anchored to a pavement or bridge deck, then a passing crash test showing barrier connected to the pavement or bridge deck is required.

If the contractor is using a temporary crash cushion ask for manufacturer's installation instructions. Some manufacturers require the first temporary barrier after the crash cushion to be anchored to the pavement.

145.12.8 Barrier Removal

Bureau of Project Development is in the process of modifying the stake design to make it easier to remove the stake.

Be careful when removing anchored barrier that is state owned or being reused on a project. Avoid lifting the whole barrier vertically to loosen the stakes or anchors. This removal method stresses the anchor holes and the loop connectors.

145.13 Pedestrian Accommodation in Work Zones

The contractor should not use tape, rope, barrels, or plastic chain strung between devices; they need to provide devices to protect pedestrians against excavation or drop-offs.

The contractor should regularly inspect and maintain the pedestrian pathway to ensure the pedestrian accessibility required under the contract and as directed by the project engineer.

The project engineer should both walk the pedestrian route and drive the adjacent active roadways during inspection to review the below items to assure both the pedestrian and driving public can see each other without any obstacles.

- Check that the walkway is smooth, continuous, slip resistant, and hard throughout the entire length of the temporary pedestrian facility.
- Check that there are no obstacles on the pedestrian route. For example, verify the pedestrian route is clear of dirt/mud, poles, and construction materials. Such things as scaffolding, fencing, excavated material, broken sidewalk concrete slabs, tree stumps, parked cars, work vehicles on path, or any other miscellaneous objects, should be removed.
- Check that there are no objects protruding into the pedestrian route. (Minimum 4ft clear width)

- Check that no roadside hazard has been installed or overlooked.
- Check that no natural feature (e.g., bank rock or major tree) results in loss of visibility.
- Check that the pedestrian route, including curb ramps, is able to adequately drain.
- Check effectiveness of any treatment put in place to counter climatic conditions.
- If an alternate circulation path is being used, check that the new route includes accessible features present in the existing pedestrian route. For example, check width, slope, etc.
- Check that the curb ramps are provided when the route (either existing or alternate path) crosses a curb.
- Check that level landings are provided as needed.
- Check that crosswalks are clearly marked, especially when relocated.
- Check that drivers are aware of the potential of crossing pedestrians at an intersection.
- Check that signs and pavement markings are correctly in place.
- Check that appropriate signs have been used.
- Check that signs will remain visible at all times.
- Check that old delineation (signs, markings) has been removed or covered and is not likely to confuse pedestrians.
- Check that markings as installed have sufficient contrast with the surfacing and are clear of debris.
- Check alignment and general correctness of installation and that applicable signal heads are visible from each approach at the appropriate distances.
- Check the safe operation of signals and associated equipment.
- If a sidewalk is closed, check that the appropriate traffic control devices are present. ([SDD 15D30](#) can aid in identifying required signs and devices.)
- Check that the sight lines for pedestrians-motorists within a pedestrian route are sufficient such that both can identify the other when turning or crossing.
- Check that all users are considered within the project area.
- Check that pedestrian routes are continuous and accessible by all pedestrians.

145.14 Flagging

Flagging is a dangerous activity and the project engineer must make sure the operation is being performed correctly. Field staff should familiarize themselves with the Wisconsin Flagging Handbook available online at:

<https://wisconsindot.gov/dtsdManuals/traffic-ops/manuals-and-standards/flagger.pdf>

Before the flagging operation begins, ask to see the flaggers certification. The contractor may present all the certifications at the preconstruction meeting or the flaggers may show a certification card with their name, instructor name, date of certification, and expiration date. Flaggers must be properly trained and are required to be certified. Do not allow flagging operations to begin until certified flaggers are available. The flagging techniques, proper equipment, and PPE can be found in the Wisconsin Flagging Handbook.

All flagging operations must have the proper advance warning. This can be found on [SDD 15c12](#). Ideally this will be set up and taken down as the flaggers move, however, the signs may be taken down or set up within 1/2 hour of the work starting or stopping.

Make sure the flaggers have positioned themselves correctly to give themselves an escape route from an errant vehicle and so they can be seen by drivers. Flaggers are not allowed to sit/lean on chairs or in/on vehicles while the operation is being conducted. Make sure the flaggers are paying attention to traffic and not distracted.

Temporary Portable Rumble Strips (TPRS) are required for all flagging operations. The TPRS have a spacing requirement based on the posted speed limit. Make sure the TPRS have been installed according to the manufacturers recommendations. This also includes the strips being installed with the correct side up, and on the proper surface. Monitor the TPRS for movement and have the contractor adjust when necessary. TPRS are not required for roads with speeds limits of 35 mph or less. Do not use TPRS on loose gravel or milled surfaces because of excessive movement of the strips.

For flagging operations with two or more flaggers, radios must be used for communication.

When the flagging operation exceeds 2 miles, a pilot car must be used to better guide traffic through the work zone and control speeds. As with any longer flagging operation, the length of queues must be considered. Direct the contractor to adjust the flagging operation if queuing exceeds the advance warning.

Additional flaggers are needed at intersections. A single flagger may be sufficient at an intersection, however at higher volume side roads, an additional flagger may be needed if they cannot control all the approaches. The flaggers may use flags at intersections.

If the project will be intersecting a railroad, make sure to contact the railroad company for any further requirements. An additional flagger may be needed at the railroad tracks to stop traffic for trains and to prevent drivers from stopping on the tracks.

Flagging at night will require the flaggers to be illuminated properly as to not blind drivers.

Costs associated with flagging are incidental to the construction. This includes the signs, temporary portable rumble strips, flaggers, pilot cars and other necessary equipment. The signs shown on [SDD 15c12](#) are incidental to the work and are not paid for as they may be frequently moved over the course of the day, unless the W20-1A Road Work Ahead is placed as part of another traffic control detail. Other signs that warn of specific road conditions such as Grooved Pavement, Loose Gravel and Bump, are paid for separately as Traffic Control Signs.