

## 5.30 MULTILANE HIGHWAY TRAFFIC CONTROL ISSUES

### Median Crossings

Most projects on four-lane divided highways include *Standard Plan Note 253-1* which states "Contractor is prohibited from using any established or other type median crossover on the project unless specifically designated for the contractor's use by this plan." This note must be strictly enforced. **Only** in accord with the following conditions may contractors use a median crossover:

- When median side (passing) lane for both directions of travel is closed because of **necessary work activity**  
  
and,
- Crossover location is either specifically shown on plans or designated in writing by the project engineer. Approved crossover locations should be documented in the field book.

These conditions should limit unnecessary median crossings and should provide a safer traffic control zone for the public. This also applies to any inspection vehicles.

### Interstate Lane Closures

The Iowa State Patrol has relayed concerns to the Office of Construction regarding possible unnecessary lane closures for interstate work zones.

Typical situations brought to our attention include:

- When median ramp crossovers or mainline crossovers are constructed, typically the inside lane is closed using *Standard Road Plan TC-418*. If work itself does not require lane closure during weekends, holidays, or other non-work days, appropriate traffic control should be *Standard Road Plan TC-402*. This will allow weekend traffic to use both lanes.
- For a median flattening project, *Standard Road Plan TC-418* would be appropriate when work is underway. On weekends, holidays, or non-work days, traffic control should also be changed to *Standard Road Plan TC-402* to allow traffic to have both lanes available.

### Traffic Control Removal for Head-to-Head (two lane, two way) Projects

The procedure to remove traffic control devices from head-to-head (two lane, two way) projects has been accomplished differently across the state. To achieve uniform removal practices across the state, the Work Zone Traffic Safety Committee discussed the removal procedure and recommends the following steps be used to remove traffic control devices from head-to-head projects:

- Move diverted traffic stream back to its normal side of median
- Place a pair of drums in closed (passing) lane at 150 m (500 feet) intervals
- Remove all "Two Way Traffic" (W6-3) signs, leaving "Do Not Pass" (R4-1) signs in place
- Remove double yellow lines with simultaneous removal of tubular markers, "Do Not Pass" signs, and drums. At the same time yellow lines are removed, new white lane lines shall be painted. If lane line painting cannot be accomplished the same day as the double yellow lines are removed, 42 inch channelizers shall be placed at 24 m (80 feet) centers to effectively close passing lane

- Remove impact attenuator and all temporary barrier rail at upstream end
- Remove any advance construction work zone signing in the direction towards oncoming traffic

The entire removal operation shall proceed upstream towards traffic. This will ensure that motorists will have two clear open lanes once they pass traffic control removal operations. Tubular markers shall not be removed in any area until the double yellow lines are removed, unless they are replaced with 42 inch channelizers.

### **Tubular Markers**

[Specification Article 2528.03](#) requires tubular markers be covered with reflectorized sheeting. The specified height range is between 700 to 850 mm (28 to 34 inches), so most traffic control subcontractors reuse tubular markers hit by vehicles by cutting off the bottom 150 mm (6 inches). Since the bottom 150 mm (6 inches) of the tubular marker will eventually be cut off, this area does not need to be covered with reflectorized sheeting.

Many tubular markers used on projects are manufactured extruded plastic shapes. These shapes typically are not exactly round in order to provide for greater strength for the tubular marker. When non-round tubular markers are used on projects, care needs to be taken in their initial installation so that the tubular markers are placed on the centerline of the highway with the non-round side placed facing alternating directions from one tubular marker to the next. This placement orientation will optimize the overall retroreflectivity of the TL TWO (two-lane, two-way) delineation system.

### **Raised Pavement Markers**

Many interstate or other complex project traffic control plans include the use of raised pavement markers to supplement the temporary pavement markings for the project. Raised pavement markers are used in lane shifts or at crossover locations to enhance visibility of correct travel path through these areas. Raised pavement markers are very effective if they stay in correct location on pavement surface.

Off-tracking rear wheels on semi-trailers often dislodge raised pavement markers from the pavement surface. It is permissible to offset the location of the raised pavement markers up to 225 mm (9 inches) laterally away from the temporary pavement marking line to avoid the off-tracking rear trailer wheels. See [Standard Road Plan TC-61](#) for typical applications for median crossovers.

## **5.31 CHANGEABLE MESSAGE SIGN GUIDELINES**

More projects are using Iowa DOT or contractor furnished changeable message signs. These CMS units are intended to be used for incident management traffic control, advance lane closure information or other additional motorist information that needs to be timely, emergency response, temporary road closures for bridge beam replacement, temporary utility crossing requiring road closure, and for other emergency related road closings.

If CMS units are used according to detail sheets contained in project plans, the word message **shall** be according to the plan sheet requirements. CMS units used for incident management traffic control for major interstate reconstruction projects should have the word message approved by the State Traffic Engineer, since the appropriate message will vary from project to project. CMS units used for all other situations should also have the word messages approved by the State Traffic Engineer. Proposed word messages should be limited to a maximum of 2 panels and usually 8 words or less per panel.

Additional information relating to the use and operational guidelines for the Department's CMS units is included in the Guidelines for Changeable Message Signs. This guideline is available from the State Traffic Engineer, Office of Traffic and Safety at (515)239-1513.

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Distribution of Department owned CMS units used for project purposes will be under control of the district traffic technicians. The traffic technicians will coordinate the logistics and placement of the portable CMS units used on construction projects statewide. Repair costs for Department owned CMS units used for project related incident management can be charged against project funds using the appropriate documentation.

Additional information relating to the use and operational guidelines for CMS units is included in the Guidelines for Changeable Message Signs. This guideline is under the auspices of the Office of Traffic and Safety. Comments regarding the Guidelines should be directed to the State Traffic Engineer at 515/239-1513.

## **5.32 ARROW DISPLAYS**

### **Solar Assisted Arrow Displays**

Solar assisted arrow displays have been effectively used in Iowa since 1991. A listing of approved solar assisted arrow displays is found in [Materials I.M. 486.12](#). Manufacturers of solar assisted arrow displays not currently approved for project use may contact the State Traffic Engineer at 515/239-1513 to schedule a field review in order to be on the approved list.

If any solar assisted arrow display fails to perform adequately in a field situation, it shall immediately be removed and replaced with a different arrow display. The Office of Construction should be informed if any approved solar assisted arrow display fails to perform so that the deficient arrow display model can be deleted from the approved list.

### **Vehicle Mounted Light Bars**

Some traffic control manufacturers are producing small, vehicle mounted light bars to be used as an arrow display. Typical units are the Arrowstik<sup>TM</sup> or Traffic Guide<sup>TM</sup>. These types of arrow displays do not meet the minimum requirements of the specifications which require the use of Type C arrow displays ~~should be used~~ on high speed, high volume roadways. A Type C arrow display is required to be 2.4 m x 1.2 m (96 inches x 48 inches) in size. Therefore, these smaller light bars are not acceptable for use on our projects as arrow displays. They may be used in a wigwag or non-directional mode as an additional warning device.

## **5.33 TEMPORARY CONCRETE BARRIER RAIL**

Temporary barrier rail is used on projects to protect the work area from traffic intrusion. Traffic that contacts the barrier is deflected along the barrier without being bounced back into open traffic with minimal barrier offset. Iowa uses an F-shape temporary concrete barrier rail system that is

NCHRP 350 approved. This barrier uses a pin/loop connection between sections and is capable of being tied down to the underlying pavement.

Temporary concrete barrier rail is typically used in the following applications:

- To separate two-way high volume traffic
- To prevent motorist intrusion into a potentially hazardous work area
- To provide positive protection for workers in the work area
- To protect the highway facility itself, such as temporary structural shoring

Temporary barrier rail is a hazard in itself. Temporary barrier rail should not normally be used where it is a greater hazard than what it is protecting. At least 0.6 m (2 feet) clearance should be provided behind the rail for drop-offs less than 600 mm (24 inches). At least 1.2 m (4 feet) clearance should be provided behind the rail for drop-offs greater than 600 mm (24 inches). When these conditions cannot be met, the temporary barrier rail should be tied down to the underlying pavement according to details provided in [Standard Road Plan RE-71](#).

If location is such that [Standard Road Plan RE-71](#) cannot be used to properly anchor the temporary barrier rail, contact the Office of Construction for additional details. On projects where field conditions result in a drop-off as described above but do not include [Standard Road Plan RE-71](#), the tie-down devices necessary will be extra work.

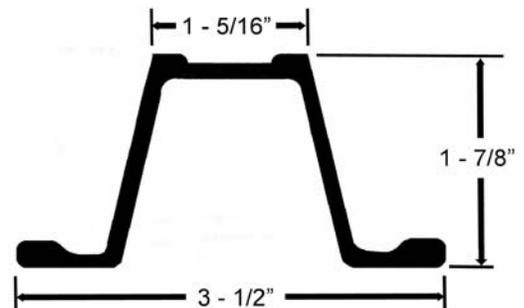
### 5.34 SIGN MOUNTING TYPES

[Specification Article 2528.02](#) states that signs for traffic control zones in duration for 4 calendar days or longer are required to be post mounted. Signs for traffic control zones in duration shorter than 4 calendar days may either be post mounted or skid mounted. The intent of this specification is to require post mounting of signs where the project is not a moving or temporary situation. The 4 calendar days should be based on the planned construction operation for the specific traffic control zone setup. Weather delays shall not require that skid mounted signs be changed to post mounted signs to meet the intent of this specification. All post mounted signs are required to be mounted 2.15 m (7 feet) above the surface of the pavement according to the specifications.

In urban areas, signs that require post mounting may be skid mounted at the post mounting heights required in the MUTCD provided that skid mounting devices are NCHRP 350 compliant, so they would not become a hazard if hit by vehicles.

#### U Channel Posts

[Specification 2528.02](#) allows 3 pound per foot U Channel posts as one of the three post mounting options for work zone signs. An easy way to determine if the supplied post is a 3 pound per foot post, use the image at right and dimensions as a guide.



### 5.35 REMOVAL OF TEMPORARY PAVEMENT MARKINGS

Temporary pavement markings are necessary for most construction projects. Typical locations include runarounds, diversions, stage construction, etc. When temporary pavement markings are placed, they will eventually be removed as part of the project.

Removal depends on the type of pavement marking material placed and type of surface to which it is attached (new or old, HMA or PCC). Two types of temporary pavement markings are currently used: removable pavement marking tape and heavy metal free waterborne paint.

#### Pavement Marking Removal Characteristics

Each temporary pavement marking material has its own removal characteristics:

- **Removable Pavement Marking Tape**

This material has an average thickness of  $8 \times 10^{-3}$  to  $2 \times 10^{-2}$  mm (30 to 70 mils). It is precoated with pressure sensitive adhesive, adheres well under traffic, and also removes without a trace. This is the only material now available for use on diagonal lines per [Specification 2527.06](#). This material is the most expensive of the two temporary pavement marking materials.

- **Temporary Painted Pavement Markings**

This material is the most commonly used material for temporary pavement marking due to its economical price. It requires removal according to [Specification Article 2527.03.B](#). Temporary painted pavement marking materials must satisfy requirements of [Specification Sections 4183 and 4184](#).

- **Removable, Non-reflective, Preformed Tape**

In lieu of removing the existing permanent pavement markings, contractors may elect to cover them with removable, non-reflective, preformed tape. This material is designed to be applied over the existing markings and then can easily be removed from the pavement's surface without damaging the underlying pavement markings. It is rather expensive, but it does have the advantage of not requiring removal, installation, and re-removal of a pavement marking to delineate the construction work zone.

#### Disposal of Removed Pavement Marking Materials

All pavement marking removal operations shall be completed in accordance with [Specification Article 2527.03.B](#). This article requires that removal operations be essentially dust free and collect all of the removed product from the road surface. Typical pavement marking removal operations consist of dry vacuum grinding, shot blasting, or water blasting. All removed pavement marking materials shall be disposed according to the following Iowa DNR requirements:

- Pavement marking waste (including water) may remain on the roadside (granular or earth shoulders and foreslopes) with the following exceptions, as long as it is removed from the pavement surface itself. The waste may not be discharged directly into a stream or storm

sewer or where it would likely runoff into a waterway. Linear disposal of pavement marking waste along the roadside should not cause any noticeable build-up of waste material.

- On all bridges, and within 100 feet of bridges, pavement marking waste should be retained and may be released outside of these areas as long as the discharge does not cause a noticeable build-up of waste material or where it would likely runoff into a waterway. For these areas, pavement marking waste may also be collected and disposed at a permitted landfill.
- In areas with storm sewer drainage from the roadway, the pavement marking waste material must be collected. This collected waste must be disposed at a permitted landfill after all water in the waste, if any, has been decanted from the waste. Process water and decanted water must be disposed at a wastewater treatment facility.

### **5.36 NCHRP 350 CRASHWORTHY WORK ZONE DEVICES**

NCHRP 350 (National Cooperative Highway Research Program 350) Report is the national standard for crash testing work zone signs and devices. The FHWA, in a letter to the Department on August 28, 1998 mandates that all work zone signs and devices being used on the National Highway System be NCHRP 350 compliant. The letter divided the various types of signs and devices into four categories. The Department has determined that all work zone signs and devices used on the entire Department administered highway system be NCHRP 350 compliant. This DOES NOT include county roads or city streets.

The four categories of work zone devices are defined as follows:

- Category 1 includes those items that are small and lightweight, channelizing and delineating devices that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or years of demonstrable safe performance. These include cones, tubular markers, flexible delineator posts, and plastic drums with no attachments.
- Category 2 includes devices that are not expected to produce significant vehicular velocity change, but may otherwise be hazardous. Examples of this class are barricades, portable sign supports, intrusion alarms, and drums, vertical panels, or cones with lights. Testing of devices in this category will be required. However, they may qualify for the reduced testing requirements.
- Category 3 is for hardware that is expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. Hardware in this category must be tested to the full requirement of NCHRP 350. Barriers, fixed sign supports, crash cushions, and other work zone devices not meeting the definitions of Category 1 or 2 are examples from this category.
- Category 4 includes portable or trailer-mounted devices such as Arrow Displays, Temporary Traffic Signals, Area Lighting Supports, and Portable Changeable Message Signs.

Specification requirements for NCHRP 350 compliant devices are found in [Specification Article 2528.01, sixth and seventh paragraphs](#). A list of FHWA approved NCHRP 350 compliant devices can be found through the Internet at:

<http://safety.fhwa.dot.gov/fourthlevel/hardware/wzd.htm>

Contractors have the responsibility to provide documentation to the administering RCE Office that all work zone signs and devices used on the contract are NCHRP 350 compliant. This

documentation should be on contractor letterhead and shall include the vendor's self-certification for Category I signs and devices and the FHWA "WZ-XX" acceptance memorandum for Category II signs and devices. A sample documentation letter is included in [Appendix 5-4](#).

### **5.37 INSTALLATION OF TRAFFIC CONTROL ZONES**

Temporary traffic control devices are always installed in the direction that traffic flows...that is, "downstream." The first device placed on the roadway is the first advance warning sign, typically the "ROAD WORK AHEAD" sign. The installation then proceeds with the signs in the advance warning zone and continues through the transition zone into the actual work area and finishes in the termination zone.

All vehicles used to carry the temporary traffic control devices need to be parked in a safe location such as on the shoulder or at a field entrance, or parked legally at a marked parking stall or on the curb line in urban areas. These vehicles should display their four way flashers and any amber flashing or rotating warning lights.

All semi-permanent or permanent traffic control zones should be reviewed prior to the actual installation time. This review should consist of "pre-marking" the location of all signs and devices. Pre-marking sign and device locations early should help to determine if corrections or modifications need to be made to the traffic control plan included in the contract documents. Any corrections necessary should be according to [Construction Manual Section 5.22](#).

### **5.38 SIGNALIZED VS. FLAGGER CONTROLLED HAUL ROAD CROSSINGS**

The Office of Design typically determines the need for haul road crossings during project design. These crossings are decided to be either a signalized or flagger controlled crossing based on factors such as economic analysis, safety concerns, and project uniformity. Occasionally necessary haul road crossings are not included in the plans or field conditions are different from plan details and additional haul road crossings need to be added.

When haul road crossings are added in the field, RCE offices should review the flow chart in [Appendix 5-7](#) to determine the appropriate haul road crossing to use. Questions pertaining to haul road crossings should be referred to the Office of Construction.

### **5.39 TRAFFIC CONTROL EVALUATION REPORTING FORM**

The Construction Traffic Control Process Improvement Team has developed the Traffic Control Evaluation Report (Form 830437) to help foster better communication between the contracting authority and the contractor regarding traffic control operation and effectiveness. A copy of this form is found in [Appendix 5-10](#).

The intent of the form is to provide contractors with an easily understood evaluation during any point of time while a project is under construction. Use of this form should help modify a contractor's performance by documenting the engineer's concern during a project. As stated on the form, the use of this form and its distribution is solely between the engineer and contractor. Additional distribution is not needed.

Instructions for completing the form are shown on the backside of the form.