

**SUPPLEMENT TO TRAFFIC SAFETY SYSTEMS GUIDANCE:
TEMPORARY BARRIER SYSTEMS**

April 20, 2022

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BACKGROUND

The Traffic Safety Systems Guidance (TSSG) supplement for temporary barrier systems is to be used until superseded by an updated TSSG from the current March 2019 version. This supplement may be updated to reflect the addition of new products to the Authorized Material List (AML) when they are approved for use on California's State Highway System.

A new set of *Revised Standard Specifications (RSS)* and *Standard Special Provisions (SSP)*, were implemented on October 18, 2021, and have been developed to address changes in crash testing standards as well as positive work zone protection of temporary barrier systems. See *RSS 1-1.01*, *RSS 12-3.20*, *RSS 12-4.03C(2)*, *RSS 48-2.02B(4)*, *RSS 48-2.03E*, *RSS 48-6.03A*, *RSS 83-3*, and *SSP 12-3.20*, to review the changes. Note that *RSS 83-3.02F* and *RSS 83-3.03A(12)* have been removed and are now "Reserved".

The implementation of the Manual for Assessing Safety Hardware (MASH) 2016 for crash testing standards is currently in process of replacement the previous NCHRP-350 standards. The transition to utilizing MASH approved Temporary Barriers will be a multi-year phase in process. Projects advertised through December 31, 2026 may continue to use the previous industry standard of Temporary Railing (Type K), also known as K-rail, in addition to any MASH approved temporary barriers. Projects advertised starting January 1, 2027 must use a MASH 2016 approved temporary barrier system. There are three proprietary temporary barriers currently on the AML- Highway Safety Features: JJ Hooks (concrete barrier); Defender (steel barrier); and Zoneguard(steel barrier). Newly approved proprietary and non-proprietary barriers may be included in the future.

Current approved barriers can be found at:

<https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/mets/highway-safety-features-a11y.pdf>

The Department has mandated change on the use of positive work zone protection methods with increased emphasis on:

- Applications that advance the Department's "Toward Zero Deaths" (TZD) goal (see *Design Information Bulletin (DIB) 91: Guidelines on the use of Positive Work Zone Protection (PWP) and Mitigation Measures*).
- Implementation of the MASH 2016 crash testing standards for all roadside safety hardware.
- Improved protective practice for construction zone workers (State, Consultant, and Contractor employees) working behind temporary barrier.

There are challenges involved with this process.

- K-rail can no longer be manufactured after December 31, 2019 for use on the State Highway System (SHS) per MASH Implementation Memo 12-30-2020 (<https://dot.ca.gov/-/media/dot-media/programs/safety-programs/documents/policy/memo-mash-workzone-device-implementation-12-30-20-a11y.pdf>) and per new SSP 12-3.20, which is binding on contractors. This means that stockpiles of K-rail will become less available as time progresses and contractors are already discussing shortfalls of available K-rail to the Department.
- New temporary barriers are proprietary systems that need to meet MASH requirements as well as be approved through the Department's Highway Safety Features New Products Committee (HSFNPC) review process.
 - JJ Hooks has agreed to licensure with a pre-cast concrete contractor to produce JJ Hooks for California.
 - Zoneguard is produced only by the manufacturer at this time.
 - Defender is produced only by the manufacturer at this time.
- New temporary barrier system requirements will have an impact on Stage Construction and Traffic Handling Plans, Traffic Management Planning (TMP), Time Related Overhead, Working Days, and potentially other project costs.
- Non-proprietary barriers are currently being developed/ reviewed for use on the SHS. If approved, Standard Plans will be developed in support of these barriers.

This document is intended to provide some background on the new RSS and application of all temporary barrier systems.

DEFINITIONS

For *Clear Area and Set Back* definitions see *RSS 12-3.20*.

Anchored (or Bolted) – Temporary barrier segments are anchored to Portland Cement Concrete (PCC) slabs or bridge decks.

Approach Zone - The area immediately upstream of a work zone. It is the first zone of consideration for shielding as a vehicle approaches the construction area. To account for vehicle departure angles and end of system barrier performance, protecting the *Work Zone* requires additional temporary barrier in the *Approach Zone*.

This area must be free of any storage, stockpile, vehicles, construction activity, or any other object or thing.

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Departure Zone - The area past the Work Zone and the trailing end of the Construction Area. Verify that the Departure Zone provides a minimum length of temporary barrier past the Work Zone for worker and project safety, and for the collision performance of the temporary barrier at the end of the *Work Zone*.

Freestanding - Temporary barrier that is not secured to the pavement, bridge deck, etc.

Intermediate-term stationary - Work at a location more than one daylight period up to three days, or night-time work lasting more than one hour.

Length of Application - The total length of temporary barrier required to effectively shield a work zone area. This includes the Approach Zone, the Work Zone, and the Departure Zone. The length needed may be more than the Minimum System Length. See Figure 3.

Long-term stationary - Work duration more than three days.

Minimum Application Length- Includes the Approach Zone length, the Work Zone length, and the Departure Zone length.

Minimum System Length - Manufacturers of temporary barrier have independently crash tested their systems using a minimum length of system necessary to pass MASH requirements.

Offset – Offset is the distance measured from the back toe of a temporary water filled crash cushion to the fixed barrier or dike and is required to allow for expected crash cushion performance during an impact. See Figure 3.

Pinned or Interlocking Connection – How segments of temporary barrier are connected together.

Staked – Temporary barrier segments are staked to asphalt.

Work Zone - The area that should be shielded to provide worker and project safety as construction work is being accomplished.

Working Width – The maximum dynamic lateral position of any major part of the barrier system or vehicle during or post-collision. This measurement is relevant to the pre-impact position of the front toe of the barrier. See Figure 2.

Figure 1: Clear Area Example

(Note: This shows barrier at initial placement for measurement of Clear Area)

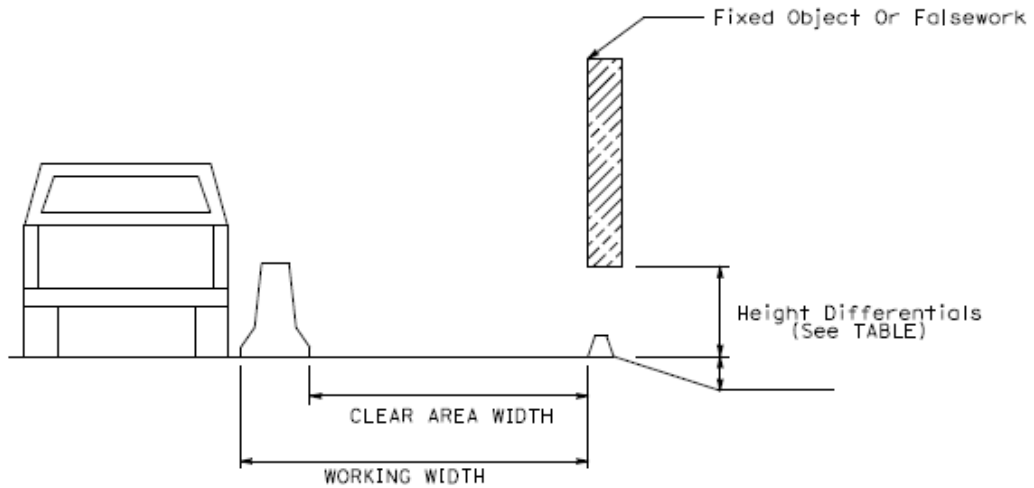


Figure 2: Working Width

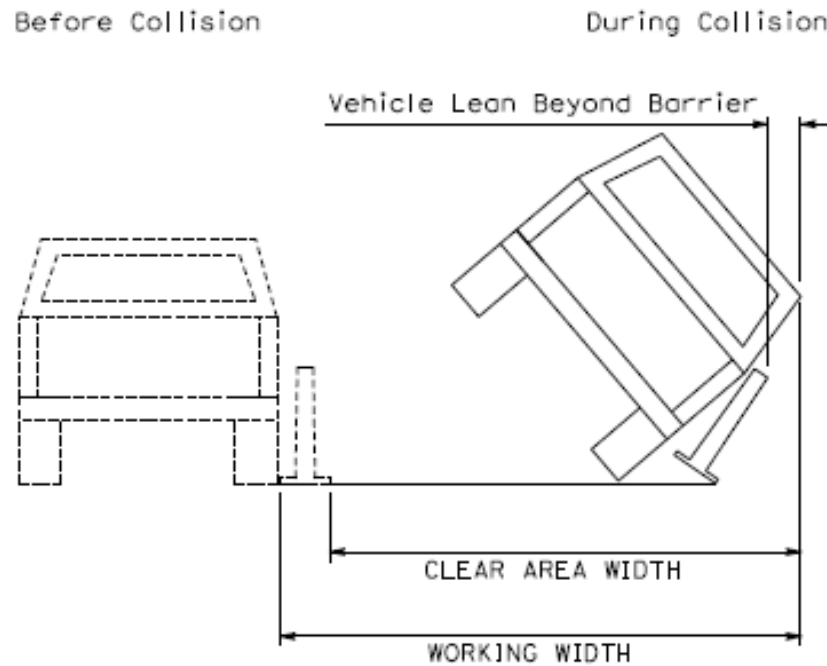
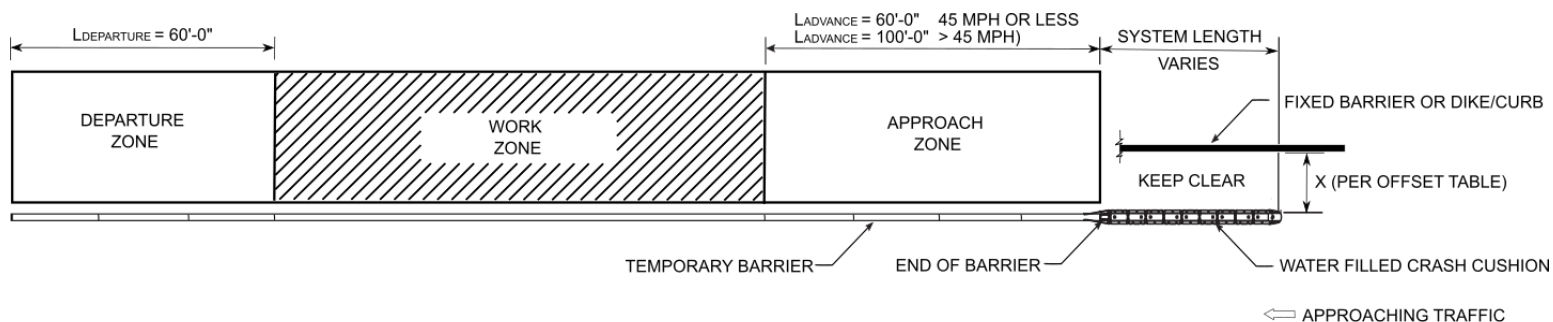


Figure 3: Length of Application



OFFSET TABLE

	CASE 1 UNOBSTRUCTED	CASE 2 PARALLEL TO FIXED BARRIER	CASE 3 PARALLEL TO DIKE/CURB
WATER FILLED CRASH CUSHION	N/A	X = 1'-0" to 2'-0" OR GREATER THAN 7'-0"	X = 0' to 4'-0" OR GREATER THAN 7'-6" (X CANNOT BE BETWEEN 4'-1" AND 7'-6")

The Offset Table provides conditions and offset distances for the water filled crash cushions to function correctly. The offsets listed do not cover every condition that may exist within the field but cover typical conditions. Other conditions that may arise should be discussed with the District Traffic Safety Systems Coordinator.

Three cases are shown to provide clarity on how the table is utilized:

- Case 1 is where no obstruction exists behind the water filled crash cushion. This generally means there is a flat plane with no physical obstructions within the system length of the water filled crash cushion for a width of 15 feet or more.
- Case 2 covers the placement of temporary barrier systems and a water filled crash cushion parallel to a fixed barrier. **In this case an offset distance between 1' and 2' or an offset greater than 7'-0" shall be provided. For Case 2 the offset distance shall not be between 0' to 1', or between 2'-1" and 7' under any circumstance.**
- Case 3 covers the placement of temporary barrier systems and a water filled crash cushion parallel to a dike or curb. **In this case an offset distance from 0'-0" to 4'-0" may be applied or an offset distance greater than 7'-6" shall be provided. The offset distance shall not be between 4'-1" and 7'-6" under any circumstance for Case 3.**

TEMPORARY BARRIER SYSTEMS

Temporary Barrier Systems (Portable Barrier) are used for shielding highway workers, work zones, and for emergency applications. These systems are designed as non-gating (see *TSSG Section 3.5* for definition on “non-gating”). Temporary barrier systems are intended to be short term applications of less than 5 years. See *TSSG Section 4.5 Criteria for Choice of Type*, for additional information. Temporary barriers are also utilized to separate opposing or same direction traffic. Tight radius curves may be prohibitive for standard length segments of some temporary barrier systems. In these tighter radius curves, shorter lengths of temporary barrier segments can be used if that specific temporary barrier system has a shorter length approved through the HSFNPC. Staking and anchoring configuration requirements vary, depending on the system. Refer to *RSS 12-3.20 Temporary Barrier Systems* for staking and anchoring configurations. At the time of writing this Guidance, the only MASH 2016 approved temporary barrier systems available are proprietary and can be located on the AML website, under the *Highway Safety Features* section at:

<https://dot.ca.gov/programs/engineering-services/authorized-materials-lists>

Department approved drawings can be found on the HQ Division of Safety Programs website under *List of MASH Devices*, and then under “*Temporary Longitudinal Barriers*” at:

<https://dot.ca.gov/programs/safety-programs/mash>

Each of these systems have been evaluated and crash tested under MASH crash testing standards and have further been reviewed and approved by the HSFNPC for use in California. K-rail was crash tested under NCHRP-350 crash testing standards. JJ Hooks, Zoneguard, and Defender were tested under MASH 2016 crash testing standards. K-rail is being phased out over the next several years because it does not meet MASH 2016 crash testing standards. If you have questions on MASH 2016 crash testing standards contact your District Traffic Safety Systems Coordinator.

There are three configurations for temporary barrier: Freestanding, Staked, and Anchored. The applicability is based on *Clear Area* available. Select a configuration and *Clear Area* width that will accommodate as many temporary barrier system types as possible to allow contractors more options, which should lead to lower temporary barrier systems Bid Item costs. Staked configurations are used on asphalt concrete pavement and anchored configurations are used on PCC pavement, structure approach slabs, and bridge decks. Temporary barrier systems must be shown on the contract Traffic Handling plans. The *Clear Area* width and type of barrier configuration “Temporary Barrier”, “Temporary Barrier (Staked)” or “Temporary Barrier (Anchored)” identified must be shown on the project plans for each temporary barrier location.

If only one proprietary temporary barrier can be used due to roadway constraints, the engineer must process a Public Interest Finding (PIF) to document the decision. If project constraints

require exclusive use of K-rail as the only alternative for temporary barrier, no PIF is required. If this situation occurs the project plans need to show specifically what type of temporary barrier is allowed.

A project may also eliminate the possibility of using a specific type of barrier. Examples would be having two way opposing traffic on either side of the barrier (which will eliminate JJ Hooks in almost all instances) or placement of temporary barrier on concrete surfaces (which eliminates use of Defender, see below).

In the above situations, the RSS/SSP will require editing to remove consideration of one or more temporary barriers for use on the project. Temporary concrete barrier has been the industry standard for many years. Typically, 80 to 120 feet is delivered to the job site per truck load. Concrete barrier has glare screen applicability, and typically drainage scuppers are part of the temporary concrete barrier design.

Another type of temporary barrier are steel barriers. These barriers are lighter in weight and can generally be easily moved. Steel temporary barriers have an advantage over their concrete counterpart by allowing significantly more barrier to be delivered to the job site in a single truck load which allows for quicker on-site placement/removal of barrier. Temporary steel barriers come in various shapes and sizes. Usually, scuppers for drainage are not a feature of steel barriers.

Caltrans approved temporary crash cushions, such as temporary sand barrel arrays or water filled crash cushions must be used in conjunction with the temporary barrier systems to shield the approach ends of the barrier in accordance with *Standard Specification (SS) 7-1.04 Public Safety*.

Use of Temporary Barrier as a Semi-Permanent Barrier

Temporary barrier systems designed and used to shield construction work zones are intended to be used as a short-term application only for the project duration. Use of temporary barrier placed as a semi-permanent barrier, not associated with an active construction project, (as discussed in *TSSG Section 4.5.4*) to shield an active slide area, rock fall area, or use as a temporary median barrier, etc. are also limited to five years but initial approval for use must be requested via *TSSG Appendix A* for HQ Safety approval. The expectation is that if placed as a semi-permanent barrier, the barrier shall remain in place only for the duration of time necessary to plan, program and deliver a project with a permanent barrier to replace the semi-permanent barrier at the location.

Use of Temporary Barrier Systems in Proximity to Entrance-Ramps or Driveways

Decision and stopping site distances should be considered for placement of temporary barrier systems. Consider a driver in a compact car on the on-ramp and the barrier (or temporary traffic screen) is extended up into the gore point area where the driver needs to make a decision on merging with thru traffic. This may require consideration of extended closures to perform work in proximity to the ramp so there is not a long-term reduction in decision sight distance. Similarly, for driveways, temporary barrier may need to be placed further from the driveway, especially if vertical or horizontal curves are present, to allow for adequate decision sight distance.

Specific Temporary Barrier System Types

Temporary Railing (Type K)

Temporary Railing (Type K) (or K-rail) is a non-proprietary temporary portable concrete barrier that met NCHRP-350 crash testing requirements. K-rail does not pass MASH crash testing and in accordance with the MASH implementation requirements, is being phased out of use by the Department. K-rail can continue to be included on projects that advertise through December 31, 2026. K-Rail can no longer be manufactured for use on the State Highway System (SHS) in accordance with the Implementation of MASH for Temporary Traffic Control Devices Memorandum dated December 2020. See Table 1 below for additional information.

Placement – on PCC, asphalt, or a compacted surface

Segment Length – 20 feet

Width at Base of Barrier – 2 feet

Glare Screen – Yes

Minimum radius – 165 feet radius

Traffic on Both Sides of Barrier – Yes, two configurations:

- For installations with a minimum of 1 foot or up to 2 feet of setback from the Edge of Travel Way (ETW) to the barrier toe requires staking or anchoring for each end segment and every other segment with four stakes. This will require a minimum of 4 feet between ETW and ETW.
- For installations where setback is greater than 2 feet from ETW to toe of temporary barrier, staking or anchoring is not required. This configuration will require a minimum of 6 feet between ETW and ETW. Contact the District Traffic Safety Systems Coordinator when lanes are less than 11 feet.

JJ Hooks Temporary Portable Concrete Barrier

JJ Hooks is a proprietary temporary portable concrete barrier that has passed MASH testing. See Table 1 below for additional information.

Placement – on PCC or asphalt only

Segment Length – 12.5 feet and 20 feet

Width at Base of barrier – 24 inches (2 feet)

Glare Screen – Yes

Minimum Radius – 12 foot segment is a 100 foot radius, 20 foot segment is a 165-foot radius

Traffic on Both Sides of Barrier – Not as a single run of barrier. However, two (2) independent runs of staked or anchored barrier with 1 foot of clear space between them, and 1 foot of setback from barrier toe on traffic side to ETW on each run of barrier. This configuration will require 7 feet of width from ETW to ETW. Additionally, a freestanding side by side configuration is available if the separation distance between runs of barrier is a minimum of 3 feet, and an overall required distance of 9 feet from ETW to ETW. This will require additional width, double the cost of barrier, and add an increase to working days and Traffic Control Systems and Time Related Overhead costs related to placement/removal. For these reasons, this side by side barrier configuration should only be a consideration after all other options are deemed not feasible.

Zoneguard Temporary Portable Steel Barrier

Zoneguard is a proprietary temporary portable steel barrier that has passed MASH testing. See Table 1 below for additional information.

Placement – on PCC or asphalt only

Segment Length - 50 feet

Width at Base of Barrier – 27.56 inches (2 feet 3 9/16 inches)

Glare Screen – No

Minimum Radius – 50 foot segment down to 800 feet radius, with special systems that allow down to 250 feet radius, but the manufacturer has to be contacted

Traffic on Both Sides of Barrier – For Zoneguard Minimum Deflection System: Yes, but this requires a 2-foot setback from the barrier toe on the traffic side to ETW on both sides of barrier. This configuration requires 6.3 feet from ETW to ETW.

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Defender Temporary Portable Steel Barrier

Defender is a proprietary temporary portable steel barrier that has passed MASH testing. See Table 1 below for additional information.

Placement – on asphalt only

Segment Length – 12 feet 9.56 inches (12.8 feet)

Width at Base of Barrier – 26.75 inches (2 feet 2- $\frac{3}{4}$ inches)

Glare Screen – No

Minimum Radius – 12.8 feet segment down to 755 feet radius

Traffic on Both Sides of Barrier – For Defender LDS System: Yes, but this requires a 3 feet setback from the ETW to the barrier toe on both sides of barrier. This configuration requires 8.2 feet from ETW to ETW.

**Table 1: Staking/Anchoring, Approach, Work, and Departure Zone Lengths
for Temporary Barrier Systems**

Barrier	Number of Stakes/Anchor Bolts per Panel or Segment		Minimum System Length (ft)	Minimum Barrier Length Approaching Work Zone(ft) - Posted Speed 45 MPH or less	Minimum Barrier Length Approaching Work Zone(ft) - Posted Speed greater than 45 MPH	Minimum Barrier Length Departing Work Zone (ft)
12.5 -foot temporary concrete barrier with "J" hooks	Stakes	3	200	60	100	60
	Anchors	2				
20-foot temporary concrete barrier with "J" hooks	Stakes	4	200	60	100	60
	Anchors	3				
50-foot temporary steel barrier	Staked or Anchored Every 33 feet		250	60	100	60
	Staked or Anchored Every 250 feet					
12.8-foot temporary steel barrier	Staked or Anchored Every 30 feet		256	60	100	60
	Staked or Anchored Every 158 feet		320			
20-foot Type K temporary railing	Stakes	2	160	60	100	60
	Anchors	2				

Table 1A: Other Temporary Barrier Considerations

Barrier	Single Run of Barrier with Traffic on Both Sides of Barrier	Minimum Curve Radius for Installation (ft)	Minimum Required Setback (ft)
12.5-foot temporary concrete barrier with "J" hooks	No ¹	100	No
20-foot temporary concrete barrier with "J" hooks	No	165	No
50-foot temporary steel barrier	Yes	800 ²	2
12.8-foot temporary steel barrier	Yes	755	3
20-foot Type K temporary railing	Yes	165	1 ³

¹ See JJ Hooks Temporary Barrier discussion above.

² Refer to discussion on Zoneguard above for further information.

³ For lane widths less than 11 feet, consult District Traffic Safety Systems Coordinator

Table 2: Temporary Barrier Systems Clear Area Width Requirements

Barrier	Configuration	Height differentials 3 feet or less (ft)	Height differentials greater than 3 ft up to 8 feet (ft)	Edge of deck or height differentials greater than 8 feet (ft)	Fixed objects, falsework members or temporary supports ^a (ft)
12.5-foot temporary concrete barrier with "J" hooks	Freestanding	3	4	8	7
	3 stakes per segment traffic side	1	1	2	3
	2 anchor bolts per segment traffic side	1	1	2	3
20-foot temporary concrete barrier with "J" hooks	Freestanding	3	4	8	7
	4 stakes per segment traffic side	1	1	2	3
	3 anchor bolts per segment traffic side	1	1	2	3
50-foot temporary steel barrier	Staked or anchor bolted at both ends only	6	7	8	9
	Staked or anchor bolted every 250 feet	4	6	8	9
	Staked or anchor bolted every 33 feet	1	1	3	4
12.8-foot temporary steel barrier	Staked every 30 feet (Maximum Spacing)	1	2	4	5

Barrier	Configuration	Height differentials 3 feet or less (ft)	Height differentials greater than 3 ft up to 8 feet (ft)	Edge of deck or height differentials greater than 8 feet (ft)	Fixed objects, falsework members or temporary supports ^a (ft)
12.8-foot temporary steel barrier	Staked every 158 feet (Maximum Spacing)	6	7	10	10
20-foot Type K temporary railing	Freestanding	2	3	8	7
	2 stakes or 2 anchor bolts per segment traffic side	1	1	3	4
	4 stakes or 4 anchor bolts per segment	N/A	N/A	3	3

Note: Refer to SSP 12-3.20 for the minimum clear area width between the temporary barrier and the falsework or temporary support at constricted locations for various types of barriers.

APPLICATION – DESIGN CONSIDERATIONS

Consideration of need for temporary barrier systems would be based with the design engineer and on guidelines set forth in *DIB-91*.

Temporary barrier systems provide effective positive separation between traffic and work areas. Temporary barrier systems may be used to protect vehicles from hazards, such as: height differential drop-offs (excavations or open edge of deck); embankments; and permanent or temporary fixed objects, or to separate traffic in certain temporary traffic control applications. Temporary barrier systems provide worker protection from errant vehicles entering stationary work zone areas during intermediate and long-term construction activities.

Temporary barrier systems have the potential to reduce the severity of crashes and protect workers from errant vehicles. Impacting a temporary barrier system is generally considered more desirable than impacting hazards behind the temporary barrier system, which may be more severe than impacting the temporary barrier system. When considering the use of

temporary barrier systems, the Designer must also evaluate the requirements for placement and removal of the temporary barrier system, which add to the exposure and risk for both the traveling public and the workers placing and removing the barrier.

Typical Use:

- Projects where the work zone width is limited, placing workers close to live traffic.
- Where motorists can drift off of or depart from the traveled way encountering pavement height differentials, structure falsework, or heavy equipment operations.
- For unprotected fixed objects and blunt ends, such as bridge railings, barrier, guardrails, and sign foundations or contractor material or equipment that are exposed because of construction activities or are within 15 feet of an open travel lane (*SS 7-1.04*).
- For counterflow traffic to separate traffic in opposing directions.
- For excavations where the near edge of the excavation is within 15 feet from the edge of an open traffic lane (*SS 7-1.04*) except where steel plate covers or a slope of 4:1 (horizontal : vertical) or less are authorized (*SS 10-1.02E Excavation*).
- Where construction activities create a height differential greater than 0.15 feet within 15 feet of the edge of a traffic lane (*SS 7-1.04*).

Temporary Barrier Bearing Surface

This varies by barrier system:

- K-rail can be placed on a compacted surface, PCC or asphalt.
- Zoneguard must be placed on only PCC or asphalt.
- JJ Hooks must be placed on only PCC or asphalt. The asphalt must be at least 2 inches thick with at least 6 inches of compacted subbase.
- Defender must be placed on asphalt surfaces only with a minimum of 4 inches structural thickness of asphalt.

Due to the *Clear Area* requirements it may be necessary to construct temporary widening, where possible, to provide more through travel lane width. Consult with the TMP unit early in the project development process to discuss proposed lane width requirements.

The *Clear Area* behind the back toe of barrier should be 10:1 or flatter on a firm, stable, compacted surface to allow the barrier to slide smoothly at initial impact point.

Clear Area Width Requirements

A risk-based approach is taken to determine acceptable deflection.

This risk-based approach for determining clear area width is applied to the following four conditions where temporary barrier systems are required:

1. Fixed objects, falsework or temporary supports.
2. Edge of bridge deck or height differentials greater than 8 feet, including downward slopes steeper than 2:1 greater than 8 feet vertical.
3. Height differentials greater than 3 feet and up to 8 feet, including downward slopes steeper than 2:1 greater than 3 feet vertical.
4. Height Differentials 3 feet or less, including downward slopes steeper than 4:1 up to 3 feet vertical.

Clear area width is also dependent on three temporary barrier system conditions:

1. Freestanding
2. Staked in AC
3. Anchored or bolted to PCC

The clear area width risk analysis includes the following considerations:

Fixed Objects Falsework Members or Temporary Supports

For temporary barrier placed in front of fixed objects, falsework, or temporary supports the clear area width is based on the working width with additional width to account for trucks leaning over the temporary barrier system so that the vehicle will have minimal chance to contact the fixed object, falsework or temporary support. Temporary falsework is at risk for collapse if displaced or hit by an impacting vehicle. As a result, the risk to workers and traffic is increased. Therefore, Clear Area width was increased to reduce (minimize) risk.

Edge of Deck or Height Differentials Greater Than 8 Feet

When temporary barrier systems are used adjacent to an unprotected edge of bridge deck or excavation the risk of the entire run of temporary barrier system falling off the edge of deck or increased height differential requires the deflection limits be set to preclude such behavior in almost all impact scenarios. Clear Area width was increased to reduce (minimize) risk.

For temporary barrier systems placed at locations with height differential greater than 3 feet and less than 8 feet consider the improbability of any impact to public or infrastructure above or below the placement, but still has a elevation difference high enough to have potential higher risk if the temporary barrier should fall off its foundation base. The Clear Area width for

this category is more in-line with actual crash tested values.

Height Differentials 3 Feet or Less

Temporary barrier systems that are used in this category may experience higher lateral deflections which are considered acceptable when balanced with the limitations of construction. These considerations were used to accept a slightly higher risk of deflection by reducing the *Working Width* values and include:

- positive work zone protection
- probability of high degree angle of impact
- reduced speed in work zones
- center of gravity of barrier and deflection required for redirection
- available area to accommodate *Clear Area* and construction activities
- keeping the roadway open for travel
- damage to or replacement of temporary barrier systems

Flare/Taper/Skew Rates

Temporary barrier can be flared, tapered, or skewed at a maximum of 15:1 for Construction Zone speed limits between 46 MPH and 60 MPH. For Construction Zone speed limits set for 45MPH or less, a flare rate of 10:1 may be used. Flare rate is usually used to place the approach end of temporary barrier to 15 feet off the ETW or to accommodate lane shifts or drops. Flatter flare rates can be used for lane shifts or drops to closely mimic delineation requirements shown on *Standard Plan (SP) T9* as long as they don't exceed Table 3 Construction Temporary Barrier Flare Rates.

Table 3: Construction Zone Temporary Barrier Flare Rates

Speed in MPH	Flare/ Taper
0 to 45 MPH	10:1 or flatter
46 to 60 MPH	15:1 or flatter
61 to 70 MPH	20:1 or flatter

Use of Crash Cushions and Required Alignment

Temporary crash cushions are MASH 2016 crash tested and approved to attach to temporary barrier systems that are placed in tangential alignment with the crash cushion. If a temporary barrier system is used in a flared or taper configuration, then at the end of the taper place a minimum of 20 feet of temporary barrier system in tangential alignment with the temporary crash cushion modules and parallel with the ETW. To reduce nuisance impacts with temporary crash cushions, set back the traffic side edge of the crash cushion and adjoining minimum 20 feet of temporary barrier system up to 2 feet in parallel alignment from the ETW where possible. This will reduce repair/replacement costs and additional Traffic Control Systems costs as well as worker exposure for crash cushion maintenance and/or replacement. A minimum of 20 feet of temporary concrete barrier must be anchored or staked prior to the temporary crash cushion for the temporary crash cushion to perform upon impact as designed. For K-Rail place 4 stakes/anchors and for JJ Hooks place a minimum of 6 stakes/anchors. For steel barriers, follow manufacturers end segment staking requirements.

Traffic on Both Sides of Temporary Barrier

When temporary barrier systems are used to separate traffic between lanes there must be a *Set Back* from the ETW to the traffic side toe of barrier so that any impacts should minimize barrier deflection into adjacent traffic. The addition of another foot of setback for each side of temporary barrier toe to ETW line should be considered if lane widths are proposed to be less than 11 feet wide. Consult with the District Traffic Safety Systems Coordinator.

Temporary Traffic Screen (see SP T4 Temporary Traffic Screen)

Temporary Traffic Screen is often referred to as “Glare Screen”. The most widespread use is to limit headlight glare during opposing operations where it is necessary to run two-way traffic on one side of a divided highway. Another application is to reduce glare when there are roadway elevation differences, particularly if the headlights for traffic in one direction will be at an elevation that is close to eye level for traffic in the opposite direction. Another related use is to block the view of floodlights used to illuminate night work activities, stockpiles, or batch plants and reduce glare to traffic when the glare cannot be eliminated by adjusting the direction or angle of the floodlights.

SP T4 does not address the use of traffic screen with traffic on both sides of the barrier. For this application, the plywood screen is placed on the work area side of the barrier (See *SP T4* Section A-A and Work Area). Even if the traffic screen plywood panels are alternated, so that

half the exposure is on either side of through traffic, there is still a potential to have the traffic screen fall into traffic. Proprietary products are available which mount a base to the top of the barrier and create a glare screen. Because of the size and weight difference between the plywood panels and the blades, should a collision occur, it is preferable to have a blade fall into the live traffic lane. Consult with your District Traffic Safety Systems Coordinator for more information on this issue.

Typical Use

Locations that potentially justify using glare screens:

- Near crossovers and other sites with opposing traffic.
- In advance and through horizontal curves, and in advance of lane tapers adjacent to the work area.
- Near fixed-locations where extended work activities are in close proximity to traffic, such as bridge deck construction or center median work.
- In freeway median or shoulder areas where drivers can readily see construction activities and may be distracted (gawking) by the progress or action.

(Note: Verify that decision sight distance requirements are met when using glare screen on the approach to on ramps, secondary roads or driveways, such that the 42-inch eye height and *HDM Table 201.7, Decision Sight Distance* standards are met.)

EXCEPTIONS TO TRAFFIC SAFETY SYSTEMS STANDARDS (ETSSS)

Please refer to Traffic Safety Systems Guidance, Appendix A for documenting requests for exceptions as described below. For additional information and current updates see the current *TSSG, Section 1.3 Traffic Safety System Standards*.

Clear Area Width

The *Clear Area Width* value obtained from the *RSS 12-3.20* using project specific geometrics should be maintained while temporary barrier is being utilized. Construction and construction activities are permitted within the Clear Area during Working Hours, but work should be isolated to one area at a time, if possible. An Exception to Traffic Safety Systems Standards form should be filled out for approval by District Traffic Safety Engineer if *Clear Area Width* cannot be met.

Length of Application

The Length of Application for temporary barrier includes the Approach Zone, Work Zone, and Departure Zones. Shielding these areas is critical for both the safety of workers behind temporary barrier, for drivers traveling parallel to the Work Zone, and for the proper function of the temporary barrier system and any attached safety devices.

Example Length of Application: The possibility of an errant vehicle to gate through a crash cushion and travel behind the temporary barrier into the Approach Zone needs to be considered. To account for the run-out-length of an errant vehicle Figure 3 and Table 1 of these guidelines should be implemented. If the run-out length cannot be obtained in a project, an Exception to Traffic Safety Systems Standards should be approved by the District Traffic Safety Engineer.

Minimum System Length

Table 1A Minimum System Length shows the minimum lengths of each temporary barrier to perform as crash tested to meet MASH standards. In restrictive conditions where *Minimum System Length* cannot be achieved, an ETSSS should be approved by the District Traffic Safety Engineer. Reduced lengths of temporary barrier must be temporary concrete barrier systems only.

Example: A temporary barrier meets clear width requirements for shielding falsework under an Overcrossing structure. The total length of barrier required for Approach, Work, and Departure Zone areas is 150 feet and there is only enough room to accommodate 150 feet of temporary barrier. None of the available temporary barriers have a Minimum System Length less than 160 feet. A District Traffic Safety Engineer should sign off on the reduced minimum system length with documentation and an ETSSS.

Barrier Height and Paving Adjacent to Barriers

There are new requirements dealing with barrier height and paving adjacent to barriers:

- A minimum barrier height of 31.5 inches must be maintained.
- For paving activities adjacent to temporary barrier, do not pave within 2 feet of the barrier segments. For paving under the temporary barrier, remove and reset the barrier.

If temporary barrier system height from foundation base to top of temporary barrier, within 2 feet of the toe of the temporary barrier, is reduced to below 31.5 inches, an ETSSS should be processed.

Temporary Crash Cushion Offset

The Offset Table, contained within Figure 3 above, provides conditions and offset distances for water filled crash cushions to function correctly. Within the *Offset Table* there are Cases representing how to place a temporary crash cushion next to other barriers or dikes/ curbs. Any exceptions to Case 2 or 3 placement of temporary crash cushions will be processed through the HQ Safety Devices Branch Chief, as described in the *TSSG, Section 1.3*. These **Shall** conditions are as follows:

- Case 2 covers the placement of temporary barrier systems and a water filled crash cushion parallel to a fixed barrier. **In this case an offset distance between 1' and 2' or an offset greater than 7'-0" shall be provided. For Case 2 the offset distance shall not be between 0' to 1', or between 2'-1" and 7' under any circumstance.**
- Case 3 covers the placement of temporary barrier systems and a water filled crash cushion parallel to a dike or curb. **In this case an offset distance from 0'-0" to 4'-0" may be applied or an offset distance greater than 7'-6" shall be provided. The offset distance shall not be between 4'-1" and 7'-6" under any circumstance for Case 3.**