IMPROVING WORKER SAFETY: ARE YOU USING THESE TEMPORARY TRAFFIC CONTROL DEVICES?

The BC Traffic Control Manual includes a number of traffic control devices beyond signs, cones and barriers that can help to mitigate traffic exposure risks.[1] When used in combination with other safety controls, these devices can reduce the risks of a worker being struck by a motor vehicle. There are also many other benefits:

- Worker exposure to high risk hazards is reduced, thereby improving worker safety and reducing injury rates.
- Enhanced worker safety leads to reduced costs such as lost productivity; finding and hiring replacement workers; accident investigation costs; business reputation impact; and higher insurance costs.
- Job bids can require the use of these devices.
- Resource allocation of scarce traffic control staff is improved.
- The potential for work delays, and for equipment damage or loss, are lessened due to smoother, and safer, traffic flows.
- Many of these devices continue to decline in cost as the number of suppliers increase.
- The newer devices are compact and easy to transport. They are quick to set up, and easy to use.

The chart on the following page outlines traffic control devices for typical road projects; find more details about each device throughout the document.

For more information:

ConeZoneBC.com

Traffic Control Manual for Work on Roadways

CONE ZONE = SLOW DOWN

[1] There may be instances where these devices are required.

BRITISH COLUMBIA | ROAD SAFETY AT WORK | WORK ZONE SAFETY ALLIANCE | BC Road Builders & Heavy Construction Association | BCCSA BC Construction Safety Alliance

IF YOUR PROJECT	CONSIDER THESE DEVICES as part of your traffic control plan.					
	Dynamic Message Signs	Flashing Arrow Boards	Temporary Rumble Strips	Crash Attenuators	Automated Flagger Assistance Devices	Portable Traffic Signals
						
Requires work activity near or at the road side	✓		✓	✓		
Impacts highway or roadway lane operations (e.g., partial/full lane closure)	✓	✓ (in arrow or caution mode, as appropriate)	✓			
Does not directly impact highway or roadway lane operations (e.g., shoulder work)	✓	✓ (in flashing caution mode, without arrowheads)		✓		
Requires a lane closure on a two- or multi-lane road	✓	✓	✓	✓		
Has no or limited escape routes for workers in the case of an errant vehicle in a stationary work zone	✓			✓	✓	✓
Requires single-lane alternating traffic in a short-duration, stationary work zone	✓		✓		✓	
Requires single-lane alternating traffic in a long-duration, stationary work zone	✓		✓		✓	✓
Requires work activity in a mobile or stationary high-speed work zone	✓ (truck-mounted if in a mobile zone)			✓		

Find out how, when and where to use these new or underutilized traffic control devices, below. See the **2020 Traffic Management Manual for Work on Roadways** for more details and sample traffic layouts.

DEVICE	PURPOSE	BENEFITS	HOW THE DEVICE PROTECTS WORKERS	FEATURES	USAGE CONSIDERATIONS	OPERATIONAL GUIDELINES
Dynamic Message Signs  A programmable temporary traffic control device (TCD) that displays messages (letters, symbols, graphics, or both). Also called a portable, changeable or variable message sign. 	**Provides information to road users in advance of the work zone** **Examples:** • to alert drivers of work zones ahead • to provide instructions and/or warnings re: nature of work and required action • to provide advance information re: road closures or traffic pattern changes • to note alternative routes that may minimize travel delays • to identify emergency conditions that require drivers to change their normal driving patterns	• Improves safety controls for roadside workers • Road users are better able to respond to road work in a safe and timely manner • Increased driver awareness/ expectations of delays or hazardous conditions may reduce driver frustration and may lead to safer driving behaviours • Road users may have the option to choose alternate routes, reducing traffic through the work zone • Traffic congestion (and therefore crash risk) may be reduced if drivers choose an alternate route or an alternative travel mode • A speed reader feature can help control speed of approaching drivers • Can display site or location specific information, thus eliminating the need for costly single use signs • Can stand alone 24/7; work crew needn't be present	• Road users are better prepared to modify behaviour when they encounter the work zone • Vehicle exposure is reduced If drivers choose an alternate route • Reduced need for driver / TCP interaction, as drivers are less likely to require additional clarification or instructions	• Can be mounted on a vehicle, trailer or other suitable support • Solar and/or battery powered • Can be programmed remotely through a satellite or data connection • Can also be permanently mounted as overhead signs	• Can be used for both minor and major projects • Applications include: speed reductions; traffic delays; adverse environmental conditions; surface or alignment changes; advance notice of ramp; lane or roadway closures; crash or incident management; road user pattern changes • Can be used for mobile or stationary operations • Can be quickly deployed • Can be used for short duration projects if truck-mounted • Two or more can be used on the same approach, as required • Can be used to simulate a flashing arrow board (FAB) • Should not be used if other TCDs adequately provide information the road user needs to travel safely	• Should always be used with appropriate channelizing devices and/or other TCDs, per the 2020 Traffic Management Manual for work on Roadways (TMM). • Messages must be clear and concise. See the TMM sec. 4.3 for standard wording and abbreviations, visibility and legibility standards, and other messaging guidelines.

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• Top (BC Ministry of Transportation and Infrastructure)
• Bottom (Mainroad Group)

DEVICE	PURPOSE	BENEFITS	HOW THE DEVICE PROTECTS WORKERS	FEATURES	USAGE CONSIDERATIONS	OPERATIONAL GUIDELINES

Flashing Arrow Board (FAB)
 
A programmable sign used primarily to display directional arrows.
 
	Directs traffic from a closed lane into another available lane
	Without directional arrows, can also be used as an alert or caution system for road users
	Examples:
	• road repair
	• guardrail repair
	• utility works
	In caution mode:
	• roadside work on or near the shoulder
	• to Indicate road closure ahead at an intersection
		• Improves safety controls for roadside workers
		• Improved visibility of FAB vs. TCP provides more time and clarity for road users to respond
		• Can be used for 24/7 hour operations when trailer-mounted
			• Removes the need for a Traffic Control Person (TCP)
			• Prevents TCPs from working where there may be no easy escape route
				• Can be mounted on a vehicle, trailer or other suitable support
				• Usually rectangular, with size dependent on roadway speeds
				• Can also be arrow-shaped
				• Can have flashing or sequential displays
				• A Dynamic Message Sign (DMS) can simulate an arrow board display
					• Can be used for mobile or stationary operations
					• Can be used on all types of roads, from low-speed urban streets to high-speed, high-volume roadways
					• Can be used day and night
					• Can be used for multiple lane closures. (A separate FAB is required for each lane being closed)
					• Required for high speed lane closures (≥ 70km/h)
						• Should always be used with appropriate signs, channelizing devices and/or other TCDs
						• Size, legibility and other requirements dependent on roadway classification and speed
						  • a FAB should not be used in directional display mode when:
						  • a TCP is controlling traffic on what is normally a two-lane, two-way roadway
						  • a lane closure is not required
						  • all work is on or outside the shoulder, and there is no need to close the adjacent travel lane.
						• See the 2020 TMM sec.4.6 for setup and operational guidelines.

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DEVICE	PURPOSE	BENEFITS	HOW THE DEVICE PROTECTS WORKERS	FEATURES	USAGE CONSIDERATIONS	OPERATIONAL GUIDELINES

Temporary Rumble Strips
 
Raised strips placed on the roadway surface that produces noise and vibration when driven on.
 
	• Used to alert drivers to a changing roadway environment (e.g., unexpected alignment changes, potential stop conditions)
	• Also used as an audible vehicle detection device for roadside workers
	Examples:
	• lane closures
	• routine maintenance projects
	• paving operations
	• emergency traffic control
		• Improves safety controls for roadside workers
		• Noise alerts work crews of vehicles in vicinity
		• Drivers can better respond to work zone conditions
		• A 2017 study[1] found the following occurred as vehicles approached temporary rumble strips in advance of a work zone:
		  • increased driver braking
		  • minimal driver avoidance
		  • reduced vehicle speeds
			• Road users are more alert and attentive through the work zone
			• Alerts potentially higher-risk drivers; e.g., those that may be inattentive, distracted or fatigued
			• Work crews are better able to detect vehicle presence
				• Typically supplied in sections that fit together to cover lane width
				• Also available in folded strips
				• Non-slip surface to keep strip in place
				• Quick to install and remove; no special equipment required
				• Storage device can be retrofitted to truck
				• Generates sound and vibration similar to permanent strips
					• Ideal for both short- and long-duration work
					• Can be used in both mobile and stationary work zones
					• Not suitable for intersections, pedestrian crossings or on sharp vertical / horizontal curves
						• Should always be used with appropriate signs, channelizing devices and/or other TCDs
						• May be hazardous for motorcyclists and bicyclists
						• See the 2020 TMM (sec. 4.11.4) for installation guidelines

[1] *Field Measurements on the Effect of Temporary Rumble Strips in Work Zone Flagging Operations. Iowa State University, Institute for Transportation, May 2017.*

Photo credits:
• Top (ATS Traffic)
• Bottom (BC Ministry of Transportation and Infrastructure)

DEVICE	PURPOSE	BENEFITS	HOW THE DEVICE PROTECTS WORKERS	FEATURES	USAGE CONSIDERATIONS	OPERATIONAL GUIDELINES
Truck/trailer mounted Crash Attenuators (TMAs)  An energy-absorbing device attached to the rear of work vehicles, e.g., those that are prone to being struck from behind. 	• Used to protect exposed and non-exposed (e.g., in-cab) workers and/or equipment from errant vehicles. **Examples:** • roadway maintenance work • utility work • sweeper truck and snowplow operations	• Improves safety controls for roadside workers • Improves driver and passenger safety in the case of a crash • Minimizes financial impacts due to reduced work vehicle damage in the case of an errant vehicle	• Reduces potential of errant vehicles entering work zone, as TMA absorbs crash impact and stops vehicle • Lessens crash impact for in-cab workers from errant vehicles	• Can be truck-mounted or trailer mounted • Crushable crumple zone absorbs kinetic energy on impact, reducing crash severity • Hydraulic system	• Can be used where a buffer vehicle, or additional protection for workers and the work zone, is required • Can be used in both mobile and stationary operations • Often used on shadow vehicles in mobile, high speed (≥ 70km/h) operations • Ideal for use in high speed environments and/or mobile operations where workers are most vulnerable • Workers must work away from the front of this equipment (or any buffer vehicle) due to the "skid-forward distance" - the amount of distance the vehicle will move forward if struck • A FAB can also be used on the host truck, as required • Works best with heavier vehicles; truck may roll forward if hit, but vehicle's weight will reduce the distance	• Should always be used with appropriate signs, channelizing devices and/or other TCDs • May be a contractual obligation by the Road Authority, as required • Attenuators must meet prescribed crash levels (see the 2020 TMM, sec 4.11.8)

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DEVICE	PURPOSE	BENEFITS	HOW THE DEVICE PROTECTS WORKERS	FEATURES	USAGE CONSIDERATIONS	OPERATIONAL GUIDELINES

Automated Flagger Assistance Devices (AFAD)
 
A portable, automated flagging machine, operated by a trained TCP via remote control.
 
	• Used instead of a TCP to stop traffic in a work zone
	Examples:
	• bridge repair
	• guardrail repair
	• pavement patching
		• Improves safety controls for roadside workers
		• Road users may see the AFAD from a further distance than they would a TCP and thus be better able to respond to road work in a safe and timely manner
		• A 2017 study[2] found that an AFAD can:
		  • lower approach speeds from road users
		  • encourage road users to stop further back from the AFAD than a TCP
		• Improved productivity when one TCP can operate two devices
			• Minimizes the TCP's direct exposure to traffic by positioning him/her outside the travel lane
			• Prevents TCPs from working where there may be no easy escape route
			• Minimizes the TCP's exposure to construction vehicles that are manoeuvring in the work zone
				• Has a red circular lens, a yellow circular lens, and a gate arm
				• Operated via remote control
				• Can be solar and/or battery powered
				• Available in a narrow width to accommodate narrow road shoulders
				• Some designs are especially portable and compact; and can be positioned, programmed and in use within minutes
				• Can be used at night with appropriate overhead lighting
					• May only be used on two-lane, two-way roadways and on multilane roadways that have been reduced to one lane.
					• Ideal for short-duration, stationary use.
					• Especially good where a clear escape path for a TCP is not available in the case of an errant vehicle.
					• An AFAD can be used at each end of the work zone, or at one end with a TCP flagging at the other end.
					• Maximum speed limit is 70 km/h. High-speed roadways require a speed reduction.
					• Road users may be unfamiliar with AFADs. Consider cautionary msg via DMS; consider monitoring road user behaviour on initial operation.
						• Should always be used with appropriate signs, channelizing devices and/or other TCDs
						• A TCP trained in AFAD operation is required to operate the AFAD
						• The preferred operating option is to have two TCPs, each operating an AFAD at either end of the work zone, particularly on high-volume roadways and in more complex work zones
						• One TCP can operate two AFADs in simpler, low-volume situations with good sight lines
						• See the 2020 TMM, sec.4.7 for placement/ operational guidelines and equipment criteria
						• If a long-duration stationary project, consider using a portable traffic signal (PTS)

[2] *Evaluation of Automated Flagger Assistance Devices. University of Missouri, August 2017. Retrieved from* https://library.modot.mo.gov/RDT/reports/TR201717/cmr17-010.pdf

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DEVICE	PURPOSE	BENEFITS	HOW THE DEVICE PROTECTS WORKERS	FEATURES	USAGE CONSIDERATIONS	OPERATIONAL GUIDELINES

Portable Traffic Signals (PTS)
 
A portable set of red, yellow, and green lights on the road or in an intersection used to temporarily control the flow of vehicles and/or pedestrians.
 
	• Used to regulate single-lane alternating traffic, primarily in longer-term work zones
	Examples:
	• bridge repair
	• rural construction environments
		• Improves safety controls for roadside workers
		• Improved visibility for road users
		• Improved understanding for road users
		• Eliminates the need for long-term / overnight TCP resources
		• Improved productivity, as workers can be deployed for other functions
			• Removes the need for a TCP
			• Prevents TCPs from working at night and/or in low light conditions
			• Prevents TCPs from working where there may be no easy escape route
			• Prevents TCPs from working near construction vehicles
				• 2 signal heads; one overhead, one side-mounted
				• Can be generator, solar and/or battery powered
				• Radio interface typically used for communication between a pair of signals
				• Adjustable signal timing to suit local conditions (e.g., geometric such as sight distance; operational such as traffic volume)
				• Manual override to hold signal on green
				• Can revert to flashing red mode if a fault is detected
					• A pair of signals is typically used
					• Some set-up time and equipment hauling required
					• Most suitable for long-duration, stationary work
					• May not be appropriate in work zones with several public or construction traffic access and egress points
					• Pedestrian routes may require alternate pedestrian routes/ signals
					• Need to consider:
					  • traffic volumes
					  • vehicle speeds
					  • work operations
					  • pedestrian traffic
					  • signal timing
					  • sight distance restrictions
					  • affected side streets and driveways
						• Road Authority approval is required prior to use
						• A timing signal plan is required for long-duration work and/or in high speed environments (≥ 70km/h)
						• Should be inspected at least once daily to ensure good operating condition
						• Traffic control drums required on approach side; other TCDs may be required as appropriate
						• Advanced warning flashers may be required in some circumstances
						• See the 2020 TMM, sec.4.8 for placement/ operational guidelines and timing plan requirements

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