North Carolina Department of Transportation

Transportation Mobility & Safety Division

Work Zone Traffic Control Section

Guidelines on the Use of Positive Protection & Mitigation Measures in Work Zones

Revision: January 2026

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Introduction

This document provides guidance to apply positive protection and mitigation measures in projects on the State Highway System based on requirements of the Federal Highway Administration (FHWA) Subpart K of the Title 23 Code of Federal Regulations (CFR). The intent is to use approved devices or other mitigation measures in projects on the State Highway System to reduce preventable injuries and deaths to workers.

For most short-duration maintenance work zone activities that do not receive Federal-aid funding, the documentation process detailed in these guidelines is not required. Refer to the *Roadway Standard Drawings* and the *Standard Specifications for Roads and Structures* for work zone protection procedures for maintenance work. The positive protection evaluation and mitigation measures information from these guidelines may be included as a reference in a future revision to the *Roadway Standard Drawings* and the *Standard Specifications for Roads and Structures*.

As allowed by the FHWA, blanket exceptions to the selected positive device or mitigation measure used may be included in future revisions of these guidelines.

These guidelines are not intended to be a rigid standard or policy; rather, they are guidelines to be used while exercising engineering judgment in applying them during project development activities and related construction and maintenance work zone activities.

These guidelines are not a stand-alone document and are intended to be used in conjunction with other traffic control standards and resources including the latest version of the following:

- NCDOT Standard Specifications for Roads and Structures (Standard Specifications)
- NCDOT Roadway Standard Drawings
- FHWA Manual on Uniform Traffic Control Devices (MUTCD) 11th Edition
- AASHTO A Policy on Geometric Design of Highways and Streets
- NCDOT Roadway Design Manual
- AASHTO Roadside Design Guide
- Americans with Disabilities Act (ADA)
- FHWA Standard Highway Signs
- NCDOT Design-Build Submittal Guidelines
- FHWA Rule on Work Zone Safety and Mobility (23 CFR 630 Subpart J and K)
- Transportation Research Board Highway Capacity Manual
- NCDOT Transportation Management Plans Design Manual

Federal Regulations

Subpart K of Title 23 Code of Federal Regulations (CFR) 630.1108 states:

At a minimum, agencies shall use positive protection devices in work zones with high anticipated operating speeds that provide workers no means of escape from motorized traffic intruding into the workspace unless an engineering study determines otherwise.

This requirement is applicable to all Federal-aid highway projects, and its application is encouraged on other projects as well.

As is standard practice by the NCDOT, positive protection devices shall be considered in other situations that place workers at increased risk from motorized traffic, and where positive protection devices offer the highest potential for increased safety for workers and road users.

Key Definitions

Positive Protection

In these guidelines, positive protection is defined as devices that contain and/or redirect vehicles and meet applicable crashworthiness evaluation criteria. While the FHWA does not require use of industry crashworthiness evaluation criteria, the NCDOT determines crashworthiness as passing MASH test TL-2 or TL-3.

Positive protection device bid items covered in this guidance include Portable Concrete Barriers (PCBs), Temporary Modular Barriers, Movable Barrier System, and Truck Mounted Attenuators (TMAs).

High Anticipated Operating Speed

Work zones with a pre-construction posted speed limit of 45 mph or greater are considered to have a high anticipated operating speed.

No Means of Escape

The NCDOT Work Zone Traffic Control Section defines “no means of escape” as:

No unimpeded path exists to escape an errant approaching vehicle. A viable means of escape must be available at all times.

“No Means of Escape” is not justification for use of Positive Protection on its own.

Evaluation Steps

Evaluate:

1. Type of work (such as structure, roadway, signal, etc.) - Consider positive protection where workers are exposed close to traffic for long durations. Examples include, bridge approach slab replacement, widening projects and shoulder maintenance. Consideration should be given to use of stationary impact attenuator vehicles during positive protection device installation and removal.
2. Exposure to high speed traffic - Worker exposure is greater in high speed work zones. Work zones with a pre-construction posted speed limit of 45 mph or greater are considered to have a high anticipated operating speed.
3. Vehicle Mix - Projects with a high percentage of trucks and heavy traffic may be good candidates for positive protection devices since heavy truck intrusion into the work zone will have greater impact to the work area.
4. Proximity to traffic - Identify locations where worker exposure is close to traffic lanes, particularly confined areas with limited escape paths. In confined areas a buffer space is likely not available to separate workers from motorists, (e.g., bridges or tunnels).
5. Time of day - Operation during different times of day are important in determining the positive protection device for a work zone. Consideration should be given to visibility during day and night-time operation when evaluating the need for a positive protection device.

6. Road user exposure to work zone - Consider positive protection to reduce exposure of road users to drop offs, side slopes that are steeper than 3:1, structures, falsework, temporary shoring, temporary supports, and construction equipment and materials.
7. Exposure of workers and motorists during positive protection placement and removal - Consideration should be given to protect workers and motorists during placement and removal of positive protection devices.
8. Roadway geometry - positive protection should be considered at locations with nonstandard curves, shoulders, sight distance or other nonstandard features near the work zone activity area.
9. Ingress and egress from work zone - Ingress and egress from the work zone should be considered when determining the appropriate positive protection device, appropriate mitigation measures, or both.
10. Options to reduce, then mitigate temporary exposure conditions for workers.
11. Project duration.
12. If the work zone is low or high exposure based on using the engineering analysis forms.
13. Mitigation measures in lieu of positive protection.
14. The use of a positive protection device to shield temporary fixed objects should be employed if it is not economically feasible to provide an alternate protection measure nor feasible to place the fixed object outside of the clear recovery zone.

Positive Protection on Projects

The analysis steps and forms detailed below serve as an acceptable engineering study for the specific intent of determining positive protection needs and for seeking exception to 23 CFR 630.1108.

Required Positive Protection Uses

Positive protection is almost always required on projects for the following conditions:

- Temporary shoring, falsework and temporary support protection
- Bridge widening or staged bridge construction
- Bridge rail replacement, (may include approach railing repair)
- Locations where existing highway safety features must be removed to perform the work (e.g., upgrading existing barrier)
- Protection of temporarily unprotected permanent obstacles
- Where material or equipment is stored within the clear recover zone .
- Excavations where the near edge of the excavation is within the clear recover zone from the edge of an open traffic lane

Typical Positive Protection Uses

Positive protection is typically used for the following work zone areas based on engineering assessment:

- Bridge column work
- Approach slab work and other bridge deck repair
- Channelization for cross-over detours
- Slab replacement and pavement dig outs/repair
- Roadway widening or median work

- Excavations adjacent to the traveled way
- Work performed on steep side slopes adjacent to the roadway
- Installation of overhead sign supports and foundations
- Staged pipe or culvert work
- Stored construction material or equipment
- Worker safety due to proximity of work next to live traffic lanes
- Separation of opposing traffic

Consideration of Other Road Users

It is not uncommon, particularly in urban areas, that road work and the associated use of positive protection may affect existing pedestrian or bicyclist facilities. It is important that the mobility needs of all road users, including bicyclists and pedestrians be considered. All considerations should be compliant with Americans with Disabilities Act (ADA) requirements. Positive protection should be used in such a way to accommodate pedestrians and bicyclists.

Mitigation Measures In Lieu of Positive Protection

Prior to specifying the use of a positive protection device, consideration should be given to alternatives which would avoid or minimize exposure for both workers and road users in work zones. Mitigation measures are to be used in lieu of a positive protection device when it is determined that placing a positive protection device may cause more exposure than not placing a positive protection device.

Below are mitigation measures that may be considered in various work zone:

1. Expanded work windows such as:
    a. Longer length of closure to enhance work productivity.
    b. Longer lane closure durations that allow work to be completed in fewer working days.
2. Removal of the hazard from the clear zone
3. Full road closure with traffic detoured offsite or connector/ramp closure.
4. Close additional travel lanes, use of buffer lanes to increase separation between workers and live traffic.
5. Helping all Workzones Keep Safe (HAWKS) program used to deter speeding and control traffic flow.
6. Use of traffic handling and traffic management plan techniques such as:
    a. Scheduling or sequencing phases of work (performing work during off-peak periods or when traffic volumes are lower).
    b. Onsite diversion (e.g., median crossover, alternate routes, temporary pavement, use of full depth shoulders for traffic; use of ramps as a diversion around a work zone at an interchange).
    c. Use of 4:1 (horizontal to vertical) or flatter slope in lieu of vertical drop off in an excavation to protect road users.
7. Automated flagger assistance devices or temporary portable signal systems.
8. Rolling road block operations, or traffic breaks.
9. Accelerated construction techniques
10. Intrusion alarms

Positive Protection Engineering Study

It is the responsibility of the project manager to coordinate with the Project Development Team (PDT), or design team, to verify that the final decision on use of positive protection devices is made collectively. This should include circulation and feedback from the PDT. It is the responsibility of the project manager to include the completed Positive Work Zone Protection Determination (PWZPD) form, see Appendix A, in the project history file for each applicable work zone location within the project limits either on a separate form per location or summarized on one form where multiple work zones of similar work and conditions are proposed. Any modification to the completed and approved PWZPD Form must be justified and approved on the Positive Work Zone Protection Supplement (PWZPS) Form by the resident engineer, see Appendix B, and filed in the project history file (e.g. the *Revisions* folder on the project site).

Documentation of the selected positive protection device or mitigation measure during the design phase is the responsibility of the project manager. The type of positive protection or mitigation measure used must be included in the project plans and/or specifications as appropriate.

The determination of the positive protection that is included in project plans is based on the following:

- Required use by policy and specifications
- Work zone activities engineering risk analysis
- Engineering judgement

The PWZPD form provides a standard format for providing the necessary documentation for positive protection. The PWZPD form allows the designer to perform the engineering study in determining the need for positive protection or mitigation measures for work zone activities by answering questions based on assessment of risk factors and totaling the risk assessment points for each factor. The project engineer then selects the appropriate positive protection or mitigation measures based on the *Evaluation Steps* or *Mitigation Measures* sections. The selected positive protection and mitigation measures are documented on PWZPD Form.

When the total point score for the work zone activity does not substantiate the use of positive protection the project engineer may determine that positive protection is necessary based on engineering judgement which must be documented on PWZPD Form.

If the project engineer has determined that an exception to the requirement for providing positive protection is necessary, then the reason for the exception must be provided on the PWZPD Form and approval of the exception by the Regional Work Zone Traffic Control (WZTC) Engineer or Regional Field Operations Engineer.

Step 1: Required positive protection

Refer to the *Positive Protection on Projects* section and fill in the check boxes on the PWZPD Form for any positive protection provided in the project plans based on NCDOT policies and specifications for required positive protection.

Step 2: Work Zone Activities Engineering Risk Analysis

An engineering study is required when seeking an exception for providing positive protection in work zones with high anticipated operating speeds that provide workers no means of escape from motorized traffic intruding into the workspace on Federal-aid projects.

Use of the analysis methodology below is encouraged on all NCDOT projects, especially where the need for positive protection is not clear.

Step 2.1: List Work Activities by Work Zone Location for Engineering Risk Analysis

List by work zone number on the PWZPD form the various major work activities by work zone location that will occur on the project, such as but not limited to, structure construction, bridge widening, sound wall construction, pavement widening, hot mix asphalt overlay, concrete slab replacement, pavement preservation treatment, landscaping or pavement delineation, etc.

For each work zone activity listed by location an engineering risk analysis must be performed to determine the required level of positive protection.

The following factors and risk ratings are considered in the engineering risk analysis for determining the required level of positive protection. For each of the five factors perform an assessment to determine the appropriate level of risk and record the information on PWZPD Form.

Step 2.2: Duration of Work Zone Activity

The exposure of a worker being struck by an errant vehicle is roughly proportional to the amount of time unprotected workers are present at the site. Short duration work activity at a location such as joint repair, pavement resurfacing, or traffic control installation/removal, are lower risk and are less likely to justify the use of positive protection barrier systems, particularly if mitigation control measures are used. Stationary impact attenuator vehicles used as positive protection should be considered for short duration work and are regularly called for in the applicable Roadway Standard Drawings (RSDs).

The duration of work activity risk assessment rating is based on the work durations shown in Table 1.

Table 1: Work Duration Factor

Work Activity (duration)	Risk (rating)	Score
LONG-TERM STATIONARY WORK GREATER THAN SIX MONTHS	Extremely High	10
LONG-TERM STATIONARY WORK THREE TO SIX MONTHS	High	8
LONG-TERM STATIONARY WORK MORE THAN THREE DAYS AND LESS THAN THREE MONTHS	Moderate	6
INTERMEDIATE[1] STATIONARY WORK	Low	3
SHORT-TERM[2] STATIONARY, SHORT DURATION[3] AND MOVING CLOSURES	Extremely Low	0

Notes:

1. Work at a location more than one daylight period up to three days, or night-time work lasting more than one hour.
2. Daytime work that occupies a location for more than one hour within a single daylight period.
3. Work that occupies a location up to one hour.

Step 2.3: Worker Exposure

Work zone activities that place workers close to live high speed traffic lanes for extended periods are candidates for positive protection. As the lateral buffer space between an adjacent open traffic lane and workers decreases, the justification for using positive protection becomes stronger.

Worker exposure risk rating is based the lateral buffer space between workers and the adjacent open traffic lane, as shown in Table 2.

Table 2: Worker Exposure Factor

Lateral buffer space between workers and adjacent open traffic lane (feet)	Risk (rating)	Score
Less than 5	High	10
>5-15	Moderate	6
>15-30*	Low	3
>30*	Extremely Low	0

*30 feet is the clear zone for a posted speed limit of 60 mph or greater. See the *AASHTO Roadside Design Guide* for clear zone distances at lower speeds.

Step 2.4: Posted Speed (Before Work Activity Begins)

When evaluating for positive protection, use the posted speed limit from before work activity begins. Evaluation is to be based on the existing posted speed limits and not the work zone reduced speed limit.

The work zone speed assessment risk rating is based on the speeds shown in miles per hour, as seen in Table 3.

Table 3: Posted Speed Factor

Posted Speed (mph)	Risk (rating)	Score
55 OR GREATER	Extremely High	10
40-50	High	6
30-35	Moderate	3
25 OR LESS	Low	0

Step 2.6: Location of Work

Positive protection devices should be considered at sites where workers cannot easily escape the path of errant drivers.

The work location assessment risk rating is based on the location types shown below in Table 4.

Table 4: Location of Work Factor

Location (type)	Risk (rating)	Score
BRIDGE STRUCTURE, DROP-OFFS 30 INCHES OR GREATER, FILLS OR CUTS STEEPER THAN 3:1, OR CONFINED AREAS WITH NO ESCAPE ROUTE FOR WORKERS	High	10
AREAS WITH BARRIERS OR OTHER IMPEDIMENTS THAT HAVE A REASONABLE ESCAPE ROUTE FOR WORKERS	Moderate	6
AREAS THAT HAVE A VIABLE ESCAPE ROUTE	Low	3
OPEN AREA WITH MULTIPLE ESCAPE ROUTES FOR WORKERS	Extremely Low	0

Step 2.7: Risk Assessment Score

Total the points recorded for each factor to determine the risk assessment score for each work zone location, as seen below in Table 5.

Table 5: Risk Assessment Actions

Risk Assessment Score	Action to be Taken
29 or more	Positive protection devices required
12-28	Positive protection devices must be used where possible or mitigation is required to reduce worker exposure
11 or less	Use standard temporary traffic control

Fill in the appropriate box for the level of positive protection required for the work zone activity on the PWZPD Form.

Step 2.8: Determine the positive protection Device for Each Work Zone

Refer to the *NCDOT Transportation Management Plans Design Manual* for information regarding the various positive protection devices. For work zone activities with scores that require positive protection devices, determine the appropriate positive protection device to be used based on the *Evaluation Steps* section. If positive protection is not provided for a work zone activity with a total rating score of 12-28, provide the reason why positive protection is not feasible on the PWZPD Form.

Step 2.9: Determine Mitigation Measures for Work Zones

For work zone activities with scores that require mitigation measures, determine the appropriate mitigation measure(s) to be used based on the *Evaluation Steps* section. Selection of mitigation measures should be based on the mitigation measure information provided in the *Mitigation Measures* section.

Mitigation measures may also be applied in conjunction with positive protection devices within work zones. Fill in the appropriate check box for the mitigation measures provided in the project on the PWZPD Form.

Step 3: Exception to Required Use of Positive Protection

If the required positive protection is not feasible for a work zone activity the project engineer must provide the reason for an exception not to use the required positive protection. Provide the required documentation of the reason for not providing positive protection on the PWZPD Form.

Exceptions must be approved by the Regional WZTC Engineer or Regional Field Operations Engineer.

Step 4: Positive Protection Based on Engineering Judgement

There may be other considerations justifying the use of positive protection based on engineering judgment. It is possible that a site could include a situation that does not meet the criteria for positive protection based on the risk analysis procedure described above; however, positive protection is justified based on sound engineering judgment.

Although it is not possible to create a comprehensive list of all higher-risk situations, some examples include:

- Roadways with nonstandard curves, shoulders, sight distance or other nonstandard features near the work zone activity area.
- Locations where ramps or lane closure merges could adversely affect traffic flow.
- When operating two-way traffic on one side of a divided highway in median crossover lane closure conditions, consider further temporary speed reduction and use of positive protection separating opposing directions of traffic (e.g. RSD 1101.03 Sheet 4 of 9)

Step 5: Project Engineer or Project Sponsor Seal and Signature

The PWZPD form documents the engineering study completed by an appropriate licensed engineer. Therefore, the project engineer must provide a seal and signature on the document.

Step 6: Exception Approval

If the project engineer has determined that an exception to the requirement for providing positive protection is necessary, then the engineer is required to seek approval by the Regional WZTC Engineer or Regional Field Operations Engineer on the PWZPD Form.

Step 7: Document Retention

Include the completed and signed PWZPD Form, including any approved exception in the project history file and resident engineer's file.

Documenting Revisions, Additions or Exceptions to Positive Protection During Construction and Other Work Activities

During construction and other work activities, changes to positive protection may occur due to ordered changes or differing site conditions. During construction the resident engineer is responsible for documenting revisions, additions, or exceptions for positive protection or mitigation measures. Collaboration with the Regional WZTC Engineer or the Regional Field Operations Engineer is encouraged.

The PWZPS form in Appendix B provides a standard format for providing the necessary documentation for changes to positive protection during construction. The PWZPS form allows the resident engineer to modify positive protection based on:

- Required use by policy and specifications
- Work zone activity engineering risk analysis
- Engineering judgement

An engineering risk analysis must be performed on the PWZPS form similar to the analysis performed during the design of the project on the PWZPD form to determine changes in the need for positive protection or mitigation measures during construction and other work activities.

If the resident engineer has determined that an exception to providing positive protection included in the contract bid documents is necessary, then the reason for the exception must be provided on PWZPS form and approval of the exception by the Regional WZTC Engineer or the Regional Field Operations Engineer is required.

When a positive protection supplement is necessary the resident engineer should work with the project engineer to determine who is best suited to complete the documentation. Changes to work zones and work activities that are requested by design should include the completed PWZPS form.

For guidance on completing PWZPS form, refer to the *Positive Protection Engineering Analysis* section.

The completed and signed PWZPD form, including any approved exception is to be filed in the project file. Provide a copy of the completed PWZPS form to the project engineer and ensure a copy is placed in the project revisions file.

Appendix A: Positive Work Zone Protection Determination Form

Positive Work Zone Protection Determination Form

			Date
To Project File and Resident Engineer Pending File	DIVISION		FEDERAL-AID NUMBER
	COUNTY	ROUTE	TIP NUMBER
FROM Project Engineer or Project Sponsor	BEGIN POST MILE		END POST MILE

REQUIRED POSITIVE WORK ZONE PROTECTION

Project requires positive work zone protection for the following: (Check all that apply.)

- ☐ High anticipated operating speeds with no means of escape
- ☐ Falsework and/or temporary shoring protection
- ☐ Bridge widening
- ☐ Bridge rail replacement
- ☐ Locations where existing positive protection devices must be removed to perform the work.
- ☐ Protection of temporarily unprotected permanent obstacles
- ☐ Where material or equipment is stored within the distances set by speed in Section 1101-8 of the *Standard Specifications for Roads and Structures*. E.g. within 40' for a posted speed limit of 60 mph or higher.
- ☐ Excavations where the near edge of the excavation is within 15 feet from the edge of an open traffic lane
- ☐ When work operations create a drop-off that requires positive protection per Section 2.4 of the *TMP Design* Manual. E.g. more than 3 inches with a slope steeper than 6:1 within 8 feet of the edge of a traffic lane.
- ☐ None

WORK ACTIVITIES REQUIRING WORK ZONE ENGINEERING RISK ASSESMENT

WORK ZONE NUMBER	ROUTE	DIRECTION	BEGIN STA	END STA	DURATION (Days)
	LOCATION		WORK ACTIVITY		PHASE/STEP NUMBER
WORK ZONE NUMBER	ROUTE	DIRECTION	BEGIN STA	END STA	DURATION (Days)
	LOCATION		WORK ACTIVITY		PHASE/STEPNUMBER
WORK ZONE NUMBER	ROUTE	DIRECTION	BEGIN STA	END STA	DURATION (Days)
	LOCATION		WORK ACTIVITY		PHASE/STEP NUMBER

Appendix A: Positive Work Zone Protection Determination Form

DIVISION	TIP NUMBER	COUNTY	ROUTE	BEGIN	END

WORK ZONE ENGINEERING RISK ANALYSIS RATING

WORK ZONE NUMBER	ROUTE	DIRECTION	BEGIN POST MILE	END POST MILE	DURATION (Days)
	LOCATION		WORK ZONE ACTIVITY		STAGE/PHASE NUMBER

For each factor based on your assessment choose which condition best describes the work area.

	FACTOR 1– DURATION OF SPECIFIC WORK ZONE ACTIVITY	POINTS	RATING
CHOOSE ONE CONDITION	LONG-TERM STATIONARY WORK DURATION GREATER THAN SIX MONTHS	10	
	LONG-TERM STATIONARY WORK DURATION OF THREE MONTHS TO SIX MONTHS	8	
	LONG-TERM STATIONARY WORK DURATION MORE THAN THREE DAYS AND LESS THAN THREE MONTHS	6	
	INTERMEDIATE STATIONARY WORK (Incl. night-time work lasting more than 1 hour)	3	
	SHORT-TERM STATIONARY, SHORT DURATION AND MOVING OPERATIONS	0	

	FACTOR 2 -WORKER EXPOSURE	POINTS	RATING
CHOOSE ONE CONDITION	WORKERS ARE EXPECTED TO BE WITHIN 5 FEET	10	
	WORKERS ARE EXPECTED TO BE WITHIN >5-15 FEET	6	
	WORKERS ARE EXPECTED TO BE OUTSIDE OF >15 FEET, BUT WITHIN THE AASHTO CLEAR ZONE (e.g. 30 feet at ≥60 mph)	3	
	WORKERS ARE EXPECTED TO BE OUTSIDE OF THE AASHTO CLEAR ZONE (e.g. >30 feet at ≥60 mph)	0	

	FACTOR 3 – POSTED SPEED (Prior to Construction or Work Activity)	POINTS	RATING
CHOOSE ONE CONDITION	POSTED SPEED IS 55 MPH OR GREATER	10	
	POSTED SPEED IS 40 MPH – 50 MPH	6	
	POSTED SPEED IS 30 MPH OR 35 MPH	3	
	POSTED SPEED IS 25 MPH OR LESS	0	

	FACTOR 4 – LOCATION OF WORK	POINTS	RATING
CHOOSE ONE CONDITION	BRIDGE STRUCTURE, DROP-OFFS 30 INCHES OR GREATER, FILLS OR CUTS STEEPER THAN 3:1, OR CONFINED AREAS WITH NO ESCAPE ROUTE FOR WORKERS	10	
	AREAS WITH BARRIERS OR OTHER IMPEDIMENTS THAT HAVE A REASONABLE ESCAPE ROUTE FOR WORKERS	6	
	AREAS THAT HAVE A VIABLE ESCAPE ROUTE	3	
	OPEN AREA WITH MULTIPLE ESCAPE ROUTES FOR WORKERS	0	
		TOTAL SCORE:	

Appendix A: Positive Work Zone Protection Determination Form

DIVISION	TIP NUMBER	COUNTY	ROUTE	BEGIN	END

Based on total point score for the work activity and location determine the action to be taken.

Score	Action to be Taken
29 or more	Positive work zone protection devices required
12-28	Positive work zone protection devices must be used where possible or mitigation measures are required to reduce worker exposure
11 or less	Use standard temporary traffic control

POSITIVE WORK ZONE PROTECTION DETERMINATION

WORK ZONE NUMBER	ROUTE	DIRECTION	BEGIN POST MILE	END POST MILE	DURATION (Days)
	LOCATION		WORK ACTIVITY		STAGE/PHASE NUMBER
TOTAL SCORE	☐ Positive Work Zone Protection Required ☐ Positive Work Zone Protection or Mitigation Measures Required ☐ Standard Temporary Traffic Control Required				

POSITIVE WORK ZONE PROTECTION

The following positive work zone protection will be used on this contract:

- ☐ Portable Concrete Barrier
- ☐ Temporary Modular Barrier
- ☐ Movable Barrier System
- ☐ Truck Mounted Attenuator

MITIGATION MEASURES

The following mitigation measures will be used on this contract:

- ☐ Expanded Work Windows
- ☐ Full Road Closure

MITIGATION MEASURES (CONTINUED)

- ☐ Buffer Lanes
- ☐ Helping All Work Zones Keep Safe (HAWKS) Program
- ☐ Traffic Handling/Transportation Management Techniques
- ☐ Automated Flagger Assistance Devices
- ☐ Portable Changeable Message Sign
- ☐ Rolling Stops, or Traffic Breaks
- ☐ Accelerated Construction Techniques
- ☐ Portable Transverse Rumble Strips
- ☐ Intrusion Alarms

If positive work zone protection is not provided for rating score of 12-28 provide reason why:

Reason:

EXCEPTION* TO USE OF REQUIRED POSITIVE WORK ZONE PROTECTION

Exception to not provide required positive work zone protection when rating score is 29 or more:

Reason for exception to provide positive work zone protection:

* Exception must be approved by the Regional WZTC Engineer or Field Operations Engineer

Appendix A: Positive Work Zone Protection Determination Form

DIVISION	TIP NUMBER	COUNTY	ROUTE	BEGIN	END

POSITIVE WORK ZONE PROTECTION BASED ON ENGINEERING JUDGEMENT

ROUTE	DIRECTION	BEGIN	END	DURATION (Days)

LOCATION	WORK ACTIVITY	PHASE/STEP NUMBER

Reason for providing positive work zone protection:

Positive Work Zone Protection Provided:

ENGINEER DETERMINATION OF POSITIVE WORK ZONE PROTECTION

SEAL

Registered Civil Engineer Date

I have evaluated the project positive work zone protection and determined the appropriate requirements to incorporate into the contract as shown on this form.

SIGNATURE	PRINT NAME	DATE

MUST BE COMPLETED FOR EXCEPTIONS ONLY

REGIONAL WZTC ENGINEER or REGIONAL FIELD OPERATIONS ENGINEER

☐ Exception to providing positive work zone protection is concurred based on the above reasons.

SIGNATURE	PRINT NAME	DATE

GENERAL INFORMATION

- This form is to provide documentation that a project complies with the policy for providing positive work zone protection.
- Positive work zone protection is required based on:
  - NCDOT policies and specifications
  - Work zone activity engineering risk analysis
  - Engineering judgement
- Refer to the *Guidelines on the Use of Positive Protection & Mitigation Measures in Work Zones*.

FORM (To be completed by the project engineer or project sponsor)

- **DIVISION:** Enter the division number of the project.
- **FEDERAL-AID NUMBER:** Enter the Federal-aid number.
- **COUNTY:** Enter the county where the project is located.
- **ROUTE:** Enter the route number for the project.
- **TIP Number:** Enter the TIP number.
- **BEGIN/END:** Enter the begin and end points for the project limits (e.g. MM or cross street).

REQUIRED POSITIVE WORK ZONE PROTECTION

- Check boxes for positive work zone protection provided for in the project plans based on NCDOT policies and specifications for required positive protection.

WORK ACTIVITIES REQUIRING WORK ZONE ENGINEERING RISK ASSESMENT

- Determine the various major work activities by work zone location that will occur on the project, such as, structure construction, bridge widening, sound wall construction, pavement widening, hot mix asphalt overlay, concrete slab replacement or landscaping.
- List by work zone each work zone activity and provide the following information:
  - **ROUTE:** Enter the route number for the project.
  - **DIRECTION:** Enter direction of travel.
  - **BEGIN/END:** Enter the begin and end stations for the activities requiring a risk assessment.
  - **DURATION:** How many days will work activity affect traffic.
  - **WORK ACTIVITY:** Enter the type of work activity for the entire project or phase/stage of the project.

WORK ACTIVITIES REQUIRING WORK ZONE ENGINEERING RISK ASSESMENT CONTINUED

- **LOCATION:** Enter general description of the location of the work.
- **STAGE/PHASE NUMBER:** For multiple work activities at the same location, enter the stage or phase number for the work activity.

WORK ZONE ENGINEERING RISK ANALYSIS RATING

- For each work zone activity, perform a work zone engineering risk analysis to determine if positive work zone protection, mitigation measures or standard traffic control is required.
- For the work zone risk analysis, the definitions for work duration are:
  - Long-term stationary is work that occupies a location more than six months.
  - Long-term stationary work duration of three to six months.
  - Long-term stationary work duration more than three days and less than three months.
  - 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.
  - Short-term stationary daytime work that occupies a location for more than one hour within a single daylight period, short duration work that occupies a location up to one hour, or mobile is work that moves intermittently or continuously.
- For each factor of a work zone activity risk analysis, choose which condition best describes each work zone based on your risk assessment.
  - FACTOR 1: Check “box” for the estimated duration of the work activity.
  - FACTOR 2: Check “box” based on worker exposure.
  - FACTOR 3: Check “box” based on posted speed limit prior to construction or work activity.
  - FACTOR 4: Check “box” based on location of work.
  - Enter the points for each factor in the factor points column based on the condition box checked for the work zone activity.
  - Total the points from the five factors to determine the risk score for the work zone activity.

POSITIVE WORK ZONE PROTECTION DETERMINATION

- Based on the risk assessment rating total score, check the “box” for the required action to be taken:
  - 29 or more – Positive work zone protection is required
  - 12 - 28 - Positive work zone protection or mitigation measure is required to reduce worker exposure
  - 11 or less -Standard temporary traffic control is required.
- Check the “box” of appropriate positive work zone protection devices to be included in the contract specifications and bid items.
- Check the “box” of appropriate mitigation measures that will be included in the contract specifications and bid items.
- If positive protection is not provided for rating of 12-28 provide reason why positive protection is not feasible in the box provided.
- Provide reason for exception to not providing positive work zone protection when rating is 29 or more as required by the policy in the box provided.

POSITIVE WORK ZONE PROTECTION BASED ON ENGINEERING JUDGEMENT

- When use of positive work zone protection is based on engineering judgement the document the reason why the use of positive protection is necessary and the type of positive protection that will be used. The documentation must include the location information and work activity.
- List by work zone each work zone activity and provide the following information:
  - **ROUTE:** Enter the route number for the project.
  - **DIRECTION:** Enter direction of travel.
  - **BEGIN / END:** Enter the begin and end post miles for the project limits.
  - **DURATION:** How many days will work activity affect traffic.
  - **WORK ACTIVITY:** Enter the type of work activity for the entire project or phase/stage of the project.
  - **LOCATION:** Enter general description of the location of the work.
  - **PHASE/STEP NUMBER:** For multiple work activities at the same location, enter the phase or step number for the work activity.

ENGINEER DETERMINATION OF POSITIVE WORK ZONE PROTECTION

Project positive work zone protection determination must be sealed by a registered professional engineer.

- **REGISTRATION SEAL:** Complete the registration seal by providing the name, registration number and expiration date of the engineer responsible for preparing the project positive work zone protection determination.
- **PROJECT ENGINEER:** Signature and printed name.
- **DATE:** Date signed.

REGIONAL WZTC ENGINEER or REGIONAL FIELD OPERATIONS ENGINEER

This section must be completed for exceptions only.

- **APPROVAL:** Check the box for exception approval.
- **APPROVER:** Signature and printed name.
- **DATE:** Date signed.

Appendix B: Positive Work Zone Protection Supplement Form

Positive Work Zone Protection Supplement Form

				Date
To Project File		DIVISION		FEDERAL-AID NUMBER
FROM		COUNTY	ROUTE	TIP NUMBER
		BEGIN		END

WORK ZONE INFORMATION

WORK ZONE NUMBER	ROUTE	DIRECTION	BEGIN STA	END STA	DURATION (Days)
	LOCATION		WORK ACTIVITY		PHASE/STEP NUMBER

SUPPLEMENT TYPE

This positive work zone protection supplement provides for a positive work zone protection: (check one)

☐ Addition
☐ Revision
☐ Exception

SUPPLEMENT JUSTIFICATION

BASIS FOR POSITIVE WORK ZONE PROTECTION

The positive work zone protection supplement is based on: (Check one)

☐ Required use by policy and specifications
☐ Work zone activity engineering risk analysis
☐ Engineering judgement

Positive work zone protection supplement is required because:

Reason:

Positive work zone protection to be used:

Mitigation measure to be used:

POSITIVE WORK ZONE PROTECTION EXCEPTION* ☐ Not Required

Deleting positive work zone protection provided for the contract is required because:

Reason:

* Exception must be approved by the Regional WZTC Engineer or Regional Field Operations Engineer.

Appendix B: Positive Work Zone Protection Supplement Form

DIVISION	TIP NUMBER	COUNTY	ROUTE	BEGIN	END

WORK ZONE ENGINEERING RISK ANALYSIS RATING ☐ Not Required

WORK ZONE NUMBER	ROUTE	DIRECTION	BEGIN STA	END STA	DURATION (Days)
	LOCATION		WORK ACTIVITY		PHASE/STEP NUMBER

For each factor based on your assessment choose which condition best describes the work area.

FACTOR 1– DURATION OF SPECIFIC WORK ACTIVITY		POINTS	RATING
CHOOSE ONE CONDITION	LONG-TERM STATIONARY WORK DURATION GREATER THAN SIX MONTHS	10	
	LONG-TERM STATIONARY WORK DURATION OF THREE MONTHS TO SIX MONTHS	8	
	LONG-TERM STATIONARY WORK DURATION MORE THAN THREE DAYS AND LESS THAN THREE MONTHS	6	
	INTERMEDIATE STATIONARY WORK (Incl. night-time work lasting more than 1 hour)	3	
	SHORT-TERM STATIONARY, SHORT DURATION AND MOVING CLOSURES	0	

FACTOR 2 -WORKER EXPOSURE		POINTS	RATING
CHOOSE ONE CONDITION	WORKERS ARE EXPECTED TO BE WITHIN 5 FEET	10	
	WORKERS ARE EXPECTED TO BE WITHIN >5-15 FEET	6	
	WORKERS ARE EXPECTED TO BE OUTSIDE OF >15 FEET, BUT WITHIN THE AASHTO CLEAR ZONE (e.g. 30 feet at ≥60 mph)	3	
	WORKERS ARE EXPECTED TO BE OUTSIDE OF THE AASHTO CLEAR ZONE (e.g. >30 feet at ≥60 mph)	0	

FACTOR 3 - POSTED SPEED (Prior to Construction or WORK ACTIVITY)		POINTS	RATING
CHOOSE ONE CONDITION	POSTED SPEED IS 55 MPH OR GREATER	10	
	POSTED SPEED IS 40 MPH – 50 MPH	6	
	POSTED SPEED IS 30 MPH OR 35 MPH	3	
	POSTED SPEED IS 25 MPH OR LESS	0	

FACTOR 4 – LOCATION OF WORK		POINTS	RATING
CHOOSE ONE CONDITION	BRIDGE STRUCTURE, DROP-OFFS 30 INCHES OR GREATER, FILLS OR CUTS STEEPER THAN 3:1, OR CONFINED AREAS WITH NO ESCAPE ROUTE FOR WORKERS	10	
	AREAS WITH BARRIERS OR OTHER IMPEDIMENTS THAT HAVE A REASONABLE ESCAPE ROUTE FOR WORKERS	6	
	AREAS THAT HAVE A VIABLE ESCAPE ROUTE	3	
	OPEN AREA WITH MULTIPLE ESCAPE ROUTES FOR WORKERS	0	
		TOTAL SCORE:	

Appendix B: Positive Work Zone Protection Supplement Form

DIVISION	FEDERAL-AID NUMBER	COUNTY	ROUTE	BEGIN	END

Based on total point score for the work activity and location determine the action to be taken.

Score	Action to be Taken
29 or more	Positive work zone protection devices required
12-28	Positive work zone protection devices must be used where possible or mitigation measures are required to reduce worker exposure
11 or less	Use standard temporary traffic control

POSITIVE WORK ZONE PROTECTION DETERMINATION

WORK ZONE NUMBER	ROUTE	DIRECTION	BEGIN STA	END STA	DURATION (Days)
	LOCATION		WORK ACTIVITY		PHASE/STEP NUMBER

TOTAL SCORE

- ☐ Positive Work Zone Protection Required
- ☐ Positive Work Zone Protection or Mitigation Measures Required
- ☐ Standard Traffic Control Required

POSITIVE WORK ZONE PROTECTION

The following positive work zone protection will be used on this contract:

- ☐ Portable Concrete Barrier
- ☐ Temporary Modular Barrier
- ☐ Movable Barrier System
- ☐ Truck Mounted Attenuator

MITIGATION MEASURES

The following mitigation measures will be used on this contract:

- ☐ Expanded Work Windows
- ☐ Full Road Closure

MITIGATION MEASURES (CONTINUED)

- ☐ Buffer Lanes
- ☐ Helping All Work Zones Keep Safe (HAWKS) Program
- ☐ Traffic Handling/Transportation Management Techniques
- ☐ Automated Flagger Assistance Devices
- ☐ Portable Changeable Message Sign
- ☐ Rolling Stops, or Traffic Breaks
- ☐ Accelerated Construction Techniques
- ☐ Portable Transverse Rumble Strips
- ☐ Intrusion Alarms

If positive work zone protection is not provided for rating score of 12-28 provide reason why:

Reason:

EXCEPTION* TO USE OF REQUIRED POSITIVE WORK ZONE PROTECTION

Exception to not provide required positive work zone protection when rating score is 29 or more:

Reason for exception to provide positive work zone protection:

* Exception must be approved by the Regional WZTC Engineer or Regional Field Operations Engineer

Appendix B: Positive Work Zone Protection Supplement Form

DIVISION	TIP NUMBER	COUNTY	ROUTE	BEGIN	END

POSITIVE WORK ZONE PROTECTION BASED ON ENGINEERING JUDGEMENT

☐ Not Required

ROUTE	DIRECTION	BEGIN STA	END STA	DURATION (Days)
LOCATION		WORK ACTIVITY		PHASE/STEP NUMBER

Reason for providing positive work zone protection:

Positive Work Zone Protection Provided:

ENGINEER POSITIVE WORK ZONE PROTECTION SUPPLEMENT

SEAL

Registered Civil Engineer Date

I have evaluated the project positive work zone protection and determined the appropriate requirements to incorporate into the contract as shown on this form.

SIGNATURE	PRINT NAME	DATE

MUST BE COMPLETED FOR EXCEPTIONS ONLY

REGIONAL WZTC ENGINEER or REGIONAL FIELD OPERATIONS ENGINEER

☐ Exception to providing positive work zone protection is granted based on the reasons shown above.

SIGNATURE	PRINT NAME	DATE

GENERAL INFORMATION

- This form is to provide documentation when an addition, revision or exception is required on a project for compliance with the policy for providing positive work zone protection.
- Positive work zone protection is required based on:
  - NCDOT policies and specifications
  - Work zone activity engineering risk analysis
  - Engineering judgement
- Refer to *Guidelines on the Use of Positive Protection & Mitigation Measures in Work Zones*.

FORM (To be completed by the resident engineer or project sponsor.)

- **FROM:** Enter the name and title of the resident engineer or project engineer that prepared the positive work zone protection supplement.
- **DIVISION:** Enter the division number of the project.
- **EXPENDITURE AUTHORIZATION:** Enter the project expenditure authorization
- **COUNTY:** Enter the county where the project is located.
- **ROUTE:** Enter the route number for the project.
- **TIP NUMBER:** Enter the TIP number.
- **BEGIN / END:** Enter the begin and end for the project limits (e.g MM or cross street).

WORK ZONE INFORMATION

- **WORK ZONE NUMBER:** Enter the work zone number from the original determination form with S added. For example, original work zone number was “23” supplement number is “23S.” For a new work zone enter number with “N”, example 44N.
- **ROUTE:** Enter the route number for the project.
- **DIRECTION:** Enter direction of travel.
- **BEGIN POST MILE / END POST MILE:** Enter the begin and end post miles for the project limits.
- **DURATION:** How many days will work activity affect traffic.
- **WORK ACTIVITY:** Enter the type of work activity for the entire project or phase/stage of the project.
- **LOCATION:** Enter general description of the location of the work.
- **PHASE/STEP NUMBER:** For multiple work activities at the same location, enter the phase or step number for the work activity.

SUPPLEMENT JUSTIFICATION

- **SUPPLEMENT TYPE:** Check the “box” that identifies the type of supplement.
- **BASIS FOR POSITIVE WORK ZONE PROTECTION:** Check the “box” that is the basis for the positive work zone protection that is being addressed by this positive work zone protection supplement.
- **REASON FOR SUPPLEMENT:** Provide the reason why this positive work zone protection supplement is necessary.
- **POSITIVE WORK ZONE PROTECTION TO BE USED:** Enter the positive work zone protection that is going to be used based on this supplement.
- **MITIGATION MEASURE TO BE USED:** Enter the mitigation measure that is going to be used based on this supplement.

WORK ACTIVITIES REQUIRING WORK ZONE ENGINEERING RISK ASSESMENT

- If “not required” is checked this section of the form will collapse.
- Work zone information should be entered as instructed above.

WORK ZONE ENGINEERING RISK ANALYSIS RATING

- For each work zone activity, perform a work zone engineering risk analysis to determine if positive work zone protection, mitigation measures or standard traffic control is required.
- Refer to *Positive Protection Engineering Analysis* of the *Guidelines on the Use of Positive Protection & Mitigation Measures in Work Zones* for how to perform the engineering risk analysis.
- For the work zone risk analysis, the definitions for work duration are:
  - Long-term stationary is work that occupies a location more than six months.
  - Long-term stationary work duration of three to six months.
  - Long-term stationary work duration more than three days and less than three months.
  - Intermediate-term stationary work at a location more than one daylight period up to three days, or night-time (hours of darkness per CVC definition) work lasting more than one hour.
  - Short-term stationary daytime work that occupies a location for more than one hour within a single daylight period, short duration work that occupies a location up to one hour, or mobile is work that moves intermittently or continuously.
- For each factor of a work zone activity risk analysis, choose which condition best describes each work zone based on your risk assessment.
  - FACTOR 1: Check “box” for the estimated duration of the work activity.
  - FACTOR 2: Check “box” based on worker exposure.
  - FACTOR 3: Check “box” based on posted speed limit prior to construction or work activity.
  - FACTOR 4: Check “box” based on location of work.
  - Enter the points for each factor in the factor points column based on the condition box checked for the work zone activity.
  - Total the points from the five factors to determine the risk score for the work zone activity.

POSITIVE WORK ZONE PROTECTION DETERMINATION

- Based on the risk assessment rating total score, check the “box” for the required action to be taken:
  - 29 or more – Positive work zone protection is required
  - 12 - 28 - Positive work zone protection or mitigation measure is required to reduce worker exposure
  - 11 or less -Standard temporary traffic control is required.
- Check the “box” of appropriate positive work zone protection devices to be included in the contract specifications and bid items.
- Check the “box” of appropriate mitigation measures that will be included in the contract specifications and bid items.

POSITIVE WORK ZONE PROTECTION DETERMINATION CONTINUED

- If positive protection is not provided for rating of 12-28 provide reason why positive protection is not feasible in the box provided.
- Provide reason for exception to not providing positive work zone protection when rating is 29 or more as required by the policy in the box provided.

POSITIVE WORK ZONE PROTECTION BASED ON ENGINEERING JUDGEMENT

- When use of positive work zone protection is based on engineering judgement you must document the reason why the use of positive work zone protection is necessary and the type of positive work zone protection that will be used. The documentation must include the work zone location information and work activity.
- If "not required" is checked this section of the form will collapse.
- Work zone information should be self-populated by the form. If not self-populated follow the instructions under work zone information.

ENGINEER POSITIVE WORK ZONE PROTECTION SUPPLEMENT

Project positive work zone protection supplement must be sealed by a Registered Professional Engineer.

- **REGISTRATION SEAL:** Complete the registration seal by providing the name, registration number and expiration date of the engineer responsible for preparing the positive work zone protection supplement.
- **ENGINEER:** Signature and printed name of engineer that prepared the positive work zone protection supplement.
- **DATE:** Date signed by the engineer.

REGIONAL WZTC ENGINEER or REGIONAL FIELD OPERATIONS ENGINEER APPROVAL OF EXCEPTIONS (Section must be completed for exceptions only.)

- **APPROVAL:** Check the box for exception approval.
- **APPROVER:** Signature and printed name.
- **DATE:** Date signed.