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SAFETY POLICY & PROCEDURE

Silica Exposure Control Plan SPP# 1926.1153A

NCDOT Written Silica Exposure Control Plan

Created: March 2018
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Revision: 4

Introduction

This Written Exposure Control Plan is to be used department wide by NCDOT, along with SPP 1926.1153, to ensure compliance with OSHA's 29 CFR 1926.1153 Respirable Crystalline Silica Standard for Construction, 29 CFR 1910.1053 Respirable Crystalline Silica Standard for General Industry, and Maritime regulations for respirable crystalline silica. The establishment and implementation of this plan specifically satisfies the w*ritten exposure control plan* requirements described in 29 CFR 1926.1153(g) and 29 CFR 1910.1053(f)(2).
This plan will be reviewed and redistributed at least annually.

This plan describes all foreseeable tasks that could reasonably be expected to expose employees to hazardous levels of respirable crystalline silica. For each task, a general description of the following is provided:

- Tasks that involve potential exposure
- Engineering and work practice controls
- Respiratory protection / other PPE
- Housekeeping
- Procedures for restricting work access

This Written Exposure Control Plan is to be made readily available for examination and copying, upon request, to each employee covered by Safety Policy and Procedure (SPP) 1926.1153, their designated representatives, the Assistant Secretary, and the Director. When performing the listed activities, strict adherence to this Written Exposure Control Plan is required to ensure the protection of employees. If the controls for a listed task are unable to be implemented, or if a potentially hazardous silica-related activity is not listed in this plan, please contact the divisional safety engineer or one of the following Safety and Risk Management personnel:

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†: task is listed in Table I
®: task requires respiratory protection at all times

NCDOT Written Silica Exposure Control Plan

List of Tasks

Description of Task**: Abrasive blasting** of concrete bridge deck joints during bridge maintenance operations. ® 6

Description of Task: **Materials and Testing** (M&T) quality assurance testing of concrete materials (includes sifting/transferring of aggregate, operation of Gilson/Silent Sifter machinery, and drilling of concrete cores). 7

Description of Task: **Hand-mixing pre-packaged, bagged grout, quikrete or concrete** (all cementitious, silica-containing material) for outdoor road and bridge maintenance and repair operations. ® 8

Description of Task: **Using a rotary or hammer drill** to drill holes in asphalt or concrete (includes installation of sign posts and flexible delineators, drilling holes for anchor bolts required for mounting traffic signal cabinets, and drilling anchor bolt holes and during concrete form work construction during bridge maintenance operations). † 10

Description of Task: **Using a rotary or hammer drill** to drill holes in asphalt or concrete *without the use of a dust suppression system.* ® 11

Description of Task: **Using a dowel drill** to drill holes in asphalt or concrete (i.e. gang drilling). † ® 12

Description of Task: **Manually clearing bridge shoulders** with shovels and blowers. 14

Description of Task: Using **handheld grinders** for scoring, grinding and shaping concrete (e.g. bridge substructure repair). † 15

Description of Task: Spray application of aggregate-pitch mixture for spot patching (e.g. *Durapatching*). 17

Description of Task: Using **handheld grinders** for mortar removal (i.e. tuckpointing). † ® 18

Description of Task: Sawing/cutting concrete or asphalt slabs, pavement, sidewalks or curb using a **handheld power saw** during road and bridge maintenance operations or maintenance of signal loops (wet methods). † 19

Description of Task: Sawing/cutting concrete, brick, or asphalt using **a handheld power saw** where neither water integration nor vacuum system is feasible. ® 20

Description of Task: Sawing/cutting concrete, brick, or asphalt using a **handheld power saw** with vacuum system and blade diameter <8 inches. † 21

Description of Task: Sawing/cutting concrete, brick, or asphalt using a **handheld power saw** with integrated vacuum system and blade diameter >8 inches. 22

Description of Task: Using heavy equipment and utility vehicles (dozers, track hoes, backhoes, sweepers) for **grading and excavating during road and bridge maintenance and construction operations**. This includes the operation of a motor grader for blading gravel roads. † 24

Description of Task: Using **heavy equipment and utility vehicles (e.g. hoe-ram, rock-ripper)** for the fracturing or abrading of rock and soil, demolishing concrete masonry structures, or loading, dumping, and removing demolition debris during road and bridge maintenance and construction operations. † 25

Description of Task: **Inspection of contract operations** which generate silica dust as outlined in OSHA' s 1926.1153, Respirable Crystalline Silica Standard for Construction. 26

†: task is listed in Table I

®: task requires respiratory protection at all times

Description of Task: Using **jackhammers and/or handheld powered chipping tools** for road, bridge and traffic services maintenance, repair, and installation operations (including bridge repair and
maintenance: decks, barrier rails, parapet, beams, approach slabs and piers, median barrier rails, roadway repairs and maintenance: sidewalks, curb and gutter, minor drainage structures or manholes, islands, median and shoulder drainage ditches, and traffic services: traffic sign installation) with an integrated water suppression or dust collection system. † 27

Description of Task: Using a **small drivable milling machine** (less than half-lane) with integrated water suppression system for milling asphalt pavement during road and bridge maintenance operations, and for the removal of pavement marking paint or thermoplastic during traffic services operations. This includes the use of a skid steer with milling attachment. †.....29

Description of Task: Grinding to remove pavement marking paint or thermo-plastic from asphalt or concrete roadways using a **walk-behind milling machine** during traffic services operations with either an integrated water suppression or dust collection system. † 30

Description of Task: Sawing/cutting concrete or asphalt slabs, pavement, sidewalks, or curbs using a **walk behind saw** with integrated water suppression system during road and bridge maintenance operations. † 30

†: task is listed in Table I
®: task requires respiratory protection at all times

Acronyms/Definitions

- **APF**: Assigned Protection Factor; the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program.

- **APF-10**: Any air purifying particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter- mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

- **APF-25**: Any loose-fitting powered air-purifying respirator with a high-efficiency particulate filter.

- **HEPA**: (High Efficiency Particulate Air) a HEPA filter is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH particulate filters are the N100, R100, and P100 filters.

- **PAPR: (**Powered Air Purifying Respirator) a loose-fitting, positive pressure, battery-powered respirator which does not require a fit test.

- **SPP 1926.1153**: NCDOT's internal Safety Policy and Procedure on Silica in Construction, based on OSHA standard 29 CFR 1926.1153.

- **SPP 1910.134**: NCDOT's internal Safety Policy and Procedure on Respiratory Protection, based on OSHA standard 29 CFR 1910.134.

- **Table I**: OSHA-provided guidance for specific task engineering controls necessary for compliance with the silica standard. Table I is provided as an attachment to this plan.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Abrasive blasting of concrete bridge deck joints during bridge maintenance operations. ®

Engineering and Work Practice Controls:

- Table I in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction does not include this task.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task. Employees will be informed of the hazards associated with the operation and controls to be utilized to eliminate or reduce the risk of silica exposure. A competent person will be designated to monitor the operation and perform re- assessments when necessary.

Respiratory Protection:

- **Respiratory protection will be required at all times, regardless of the duration of the operation.**
- Respiratory protection is to consist of a supplied air respirator with helmet and protective apron.
- The respirator shall be used in accordance with the manufacturer's instructions and the NCDOT Respiratory SPP 1910.134.
    - Only employees that have been medically cleared are permitted to use a respirator.
    - The respirator shall be inspected prior to use and cleaned after each use.
- The supplied breathing (compressed) air shall be tested periodically (Grade D air testing).

Other PPE:

- Employees may consider the use of other protective clothing (e.g. disposable protective coveralls).

Housekeeping:

- When possible, the work area should be wet cleaned; dry sweeping is not permitted.

Procedures for Restricting Access to Work Areas:

- Other employees working near the operation should maintain an adequate distance from the operation to avoid exposure to airborne silica. Restricted access may be necessary.
- Public access restrictions (traffic cones, drums, or tape) are to be utilized.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Materials and Testing (M&T) quality assurance testing of concrete materials (includes sifting/transferring of aggregate, operation of Gilson/Silent Sifter machinery, and drilling of concrete cores).

Engineering and Work Practice Controls:

- This activity falls under the General Industry (29 CFR 1910.1053) regulation.
- Aggregate sifting is only to be performed in a designated "shaker room," which will maintain properly shut doors.
- The employee will only be in the shaker room when necessary, i.e. during filling and emptying/weighing of aggregate. The shaker room will be vacated while the machines are in operation.
- The shaker room must be equipped with local exhaust ventilation (LEV) suitable for the size of the room. Outdoor exhaust is the preferred method, but properly implemented recycling systems equipped with a filter are acceptable.
- The LEV system must be used in accordance with the manufacturer's specification and must be rated to handle dust.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required for this activity.
- If employees decide to voluntarily wear a respirator, they must comply with the requirements of the voluntary respirator usage (NCDOT SPP 1910.134 Appendix D).

Other PPE:

- Employees should consider the use of other protective clothing (e.g. disposable protective coveralls, hearing protection).

Housekeeping:

- The shaker room and nearby areas should be cleaned regularly to prevent the buildup of dust.
- Cleaning should be performed with a HEPA vacuum, sweeping compound, or comparable system.
- Compressed air is not to be used to clean surfaces or clothing.

Procedures for Restricting Access to Work Areas:

- There should not be other employees working regularly in the vicinity of the shaking/sifting activities.
- Designated shaker rooms should have access limited to the pertinent employee(s) and are to have warning signs posted at all entrances.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Hand-mixing pre-packaged, bagged grout, quikrete or concrete (all cementitious, silica-containing material) for outdoor road and bridge maintenance and repair operations. ®

Engineering and Work Practice Controls:

- Table I in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction does not include this task.
- A reference to this type of task is noted in the OSHA 2017 publication, Small Entity Compliance Guide for the Respirable Crystalline Silica for Construction, which reads, "Employee exposures can reasonably be anticipated to remain below 25 micrograms per cubic meter of air (mg/m^3) as an 8-hour TWA (time weighted average) when performing certain tasks that involve only minimal exposure to respirable crystalline silica. Such tasks include: Mixing concrete for post holes; pouring concrete footers, slab foundations and foundation walls; and removing concrete formwork. When these tasks are performed in isolation from tasks that generate silica, the standard does not apply."
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review the material's Safety Data Sheet (SDS). Employees will be informed of the hazards associated with the material and controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and perform re-assessments when necessary.
- Water or vacuum systems for dust suppression are not an option during outdoor hand-mixing of bagged cementitious material, therefore alternative exposure control methods will be utilized to determine employee exposure.
- The use of ready-mixed products is the preferred method of using cementitious silica-containing products/materials, however the amount of material needed (2 yards is typically the minimum order requirement) and the accessibility of the work site (amount of space needed to maneuver a large concrete delivery truck) may be prohibitive to using ready-mixed materials.
- For grouting operation, only those employees *on* the grouting unit (performing the opening/emptying and mixing) are considered to be exposed. Other employees, including those applying the wet grout mixture, are to remain clear (>20 feet) from the emptying process and potential dust exposure.
- Employees engaged in the opening/emptying of material bags are not to perform that task for a duration greater than 4 hours.

Respiratory Protection:

- Unless an exposure determination has been completed, all employees engaged in the opening/emptying or mixing of bagged cementitious, silica-containing materials are **required to use respiratory protection at all times,** regardless of the duration of the operation.
- A respirator with an assigned protection factor (APF) of at least 10 will be utilized by employees engaged in this operation.
- A powered air-purifying respirator (PAPR) with disposable shroud (APF-25) may be used as well.

†: task is listed in Table I
®: task requires respiratory protection at all times

- The respirator shall be used in accordance with the manufacturer's instructions and the NCDOT Respiratory SPP 1910.134.
    - Only employees that have been medically cleared are permitted to use a respirator.
    - The respirator shall be inspected prior to use and cleaned after each use.
    - Individuals are not to share their respirator with other employees.

Other PPE:

- Employees may consider the use of other protective clothing (e.g. disposable protective coveralls).

Housekeeping:

- The work area around the hand-mixing operation should be wet cleaned when possible after the task has been completed.
- Compressed air is not to be utilized to clean employee clothing or surfaces.

Procedures for Restricting Access to Work Areas:

- Other employees working near the operation should maintain an adequate distance (>20 feet) and remain up-wind of visible airborne dust.
- Public access restrictions (traffic cones, drums or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Using a rotary or hammer drill to drill holes in asphalt or concrete (includes installation of sign posts and flexible delineators, drilling holes for anchor bolts required for mounting traffic signal cabinets, and drilling anchor bolt holes and during concrete form work construction during bridge maintenance operations). †

Engineering and Work Practice Controls:

- Table I (vii) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- The dust suppression system for the drill shall include a commercially available collection system which shall be operated and maintained in accordance with the manufacturer's instructions to minimize dust emissions.
- The dust collector must provide 25 cubic feet per minute of airflow or greater as recommended by the tool manufacturer and have a filter with 99% or greater efficiency and cyclonic pre-separator or filter-cleaning mechanism. The shroud or cowling must be intact and installed and the hose connecting the tool to the vacuum must be intake and without kinks or tight bends. The filters must be cleaned or changed in accordance with the manufacturer's instructions. Dust collection bags must be emptied to avoid overfilling.
- A HEPA-filtered vacuum must be used when cleaning holes. Compressed air can be used to clean holes when used in conjunction with a HEPA- filtered vacuum to capture the dust or a hole-cleaning kit designed for use with compressed air.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required when using the drill indoors or outdoors.

Housekeeping:

- When using the drill indoors or in an enclosed area, additional exhaust must be provided to minimize the accumulation of visible airborne dust.

Procedures for Restricting Access to Work Areas:

- If engineering and work practice controls have been properly implemented, others in the work area will not require restricted access.
- The work area may be restricted to other employees if other safety hazards are identified.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Using a rotary or hammer drill to drill holes in asphalt or concrete without the use of a dust suppression system. ®

Engineering and Work Practice Controls:

- This activity should only be performed when the Table 1 controls (dust suppression system) cannot be feasibly implemented fully.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- The use of applied water for dust suppression should be considered.
- A HEPA-filtered vacuum must be used when cleaning holes. Compressed air can be used to clean holes when used in conjunction with a HEPA- filtered vacuum to capture the dust or a hole-cleaning kit designed for use with compressed air.

Respiratory Protection:

- Respiratory protection (APF-10 or better) should be implemented for the duration of this activity by all employees in the vicinity.

Housekeeping:

- When using the drill indoors or in an enclosed area, additional exhaust must be provided to minimize the accumulation of visible airborne dust.

Procedures for Restricting Access to Work Areas:

- Activity access will be limited to those necessary to perform the task.
- The work area will be restricted to other employees if other safety hazards are identified.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Using a dowel drill to drill holes in asphalt or concrete (i.e. gang drilling). † ®

Engineering and Work Practice Controls:

- Table I (viii) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- Dowel drilling rigs are not permitted to be used indoors.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- The dust suppression system for the drill shall include a commercially available shroud and collection system which shall be operated and maintained in accordance with the manufacturer's instructions to minimize dust emissions.
- The dust collector must provide airflow equal or greater to that recommended by the tool manufacturer and have a filter with 99% or greater efficiency and cyclonic pre-separator or filter-cleaning mechanism. The shroud or cowling must be intact and installed and the hose connecting the tool to the vacuum must be intake and without kinks or tight bends. The filters must be cleaned or changed in accordance with the manufacturer's instructions. Dust collection bags must be emptied to avoid overfilling.
- A HEPA-filtered vacuum must be used when cleaning holes. Compressed air can be used to clean holes when used in conjunction with a HEPA-filtered vacuum to capture the dust or a hole-cleaning kit designed for use with compressed air.

Respiratory Protection:

- **Respiratory protection is required at all times for this activity.**
- A respirator with an assigned protection factor (APF) of at least 10 will be utilized by employees engaged in this operation.
- A powered air-purifying respirator (PAPR) with disposable shroud (APF-25) may be used as well.
- The respirator shall be used in accordance to the manufacturer's instructions and the NCDOT Respiratory SPP (1910.134).
    - Only employees that have been medically cleared are permitted to use a respirator.
    - The respirator shall be inspected prior to use and cleaned after each use.

†: task is listed in Table I
®: task requires respiratory protection at all times

Housekeeping:

- The work area around the drilling operation should be wet cleaned when possible after the task has been completed.
- Compressed air is not to be utilized to clean employee clothing or surfaces.

Procedures for Restricting Access to Work Areas:

- Access should be limited to those employees engaged in the activity.
- Public access restrictions (traffic cones, drums or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Manually clearing bridge shoulders with shovels and blowers.

Engineering and Work Practice Controls:

- Periodic bridge maintenance includes the clearing of dirt and debris buildup on the bridge shoulders. Material is manually removed with brooms and shovels and then cleared away with a blower (typically a backpack blower). Each bridge takes ~15 minutes to clear. For safety and convenience reasons a sweeper machine nor wet methods are practical options to perform this activity.
- Employees manually clearing the shoulders must remain appropriately distanced from the employee blowing the shoulders clean (>35 feet).
- Each employee can operate the blower for a maximum of 3 bridges and then must switch roles with another employee.
- Be mindful of wind direction and, if possible, keep employees upwind of the blowing operation.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required.
- **Respiratory protection is required when the blower is operated by a specific employee for 4 or more hours or on 4 or more bridges.**
- A respirator with an assigned protection factor (APF) of at least 10 will be utilized by employees engaged in this operation.

Housekeeping:

- Keep equipment and employees properly distanced from the blowing operation.
- Removed dirt and debris should be deposited a safe distance from the roadways before or after the bridge, not strewn over the side.

Procedures for Restricting Access to Work Areas:

- If engineering and work practice controls have been properly implemented, others in the work area will not require restricted access.
- The work area may be restricted to other employees if other safety hazards are identified.
- Public access restrictions (traffic cones, drums or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Using handheld grinders for scoring, grinding and shaping concrete (e.g. bridge substructure repair). †

Engineering and Work Practice Controls:

- Table I (xii) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this plan.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- A dust suppression system for the grinder may include either (1) a commercially developed integrated water delivery system that continuously feeds water to the blade or (2) a commercially available dust collection system. For use of either system, operate and maintain the grinder in accordance with the manufacturer's instructions to minimize dust emissions.
- If using an integrated water delivery system, the system can be a free- flowing water system designed for blade cooling as well as manufacturers' systems designed for dust suppression alone. This option applies only when grinders are used outdoors.
- When the use of water is not feasible for the operation/task, a grinder equipped with a commercially available dust collection system will be utilized. The dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism. The shroud or cowling must be intact and installed and the hose connecting the tool to the vacuum must be intact and without kinks or tight bends. The filters must be cleaned or changed in accordance with the manufacturer's instructions. Dust collection bags must be emptied to avoid overfilling.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required when using the grinder outdoors. No respiratory protection is required when the grinder is used indoors or in an enclosed area if the work-shift is less than 4 hours.
- **Respiratory protection is required when the grinder is used indoors or in an enclosed area when the work-shift exceeds 4 hours.**
- A respirator with an assigned protection factor (APF) of at least 10 will be utilized by employees engaged in this operation.
- A powered air-purifying respirator (PAPR) with disposable shroud (APF-25) may be used as well.
- The respirator shall be used in accordance with the manufacturer's instructions and the NCDOT Respiratory SPP (1910.134).
    - Only employees that have been medically cleared are permitted to use a respirator.
    - The respirator shall be inspected prior to use and cleaned after each use.

†: task is listed in Table I
®: task requires respiratory protection at all times

Housekeeping:

- When working indoors or in an enclosed area, slurry generated during the use of water suppression systems will be cleaned up using a wet vacuum and the slurry transferred into a closed container for disposal.
- Dry sweeping of dust covered areas is not permitted; wet the area before cleaning to eliminate air-borne dust.

Procedures for Restricting Access to Work Areas:

- If engineering and work practice controls have been properly implemented, others in the work area will not require restricted access.
- The work area may be restricted to other employees if other safety hazards are identified.
- Public access restrictions (traffic cones, drums or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Spray application of aggregate-pitch mixture for spot patching (e.g.
Durapatching).

Engineering Controls:

- The exposure assessment for this activity showed that there is no exposure at or above the action level of 25 µg/m3, and therefore no engineering controls are required.

Work Practice Controls:

- Aggregate must be washed prior to use to limit amount of dust.
- Employees must remain behind the application hose during use so that no stone or pitch is blown into their breathing zone.
- This activity must be performed outdoors.
- If a large visible plume of dust results from the task, the competent person may want to reevaluate the task and consider rewashing the aggregate or performing the task on a windier day.
- Employees should limit handling or shoveling aggregate whenever possible (e.g. shoveling aggregate into hopper from dump truck).

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required for this activity.

Housekeeping:

- Dry sweeping of dust covered areas is not permitted.
- Avoid opening vehicle doors or windows to prevent interior dust accumulation.

Procedures for Restricting Access to Work Areas:

- The work area will be restricted to other employees not directly involved in the task by the supervisor or crew lead.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Using handheld grinders for mortar removal (i.e. tuckpointing). † ®

Engineering and Work Practice Controls:

- Table I (xi) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- The dust suppression system for the grinder must include a commercially available dust collection system that is operated and maintained in accordance with the manufacturer' s instructions to minimize dust emissions.
- The dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism. The shroud or cowling must be intact and installed and the hose connecting the tool to the vacuum must be intact and without kinks or tight bends. The filters must be cleaned or changed in accordance with the manufacturer's instructions. Dust collection bags must be emptied to avoid overfilling.
- If a visible plume of dust results from the task, all activity must be stopped by the competent person and the engineering controls must be re- evaluated.

Respiratory Protection:

- **Respiratory protection is required at all times for this activity.**
- A respirator with an assigned protection factor (APF) of at least 10 will be utilized by employees engaged in this operation if the activity duration is less than 4 hours per shift.
- A powered air-purifying respirator (PAPR) with disposable shroud (APF-25) must be used if the activity duration exceeds 4 hours per shift.
- The respirator shall be used in accordance with the manufacturer's instructions and the NCDOT Respiratory SPP 1910.134.
    - Only employees that have been medically cleared are permitted to use a respirator.
    - The respirator shall be inspected prior to use and cleaned after each use.

Housekeeping:

- Dry sweeping of dust covered areas is not permitted; wet the area before cleaning to eliminate air-borne dust.

Procedures for Restricting Access to Work Areas:

- The work area will be restricted to other employees not directly involved in the task by the supervisor or crew lead.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Sawing/cutting concrete or asphalt slabs, pavement, sidewalks or curb using a **handheld power saw** during road and bridge maintenance operations or maintenance of signal loops (wet methods). †

Engineering and Work Practice Controls:

- Table I (ii) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- A dust suppression system for the saw will consist of a commercially developed integrated water delivery system that continuously feeds water to the blade that will be operated and maintained in accordance with the manufacturer's instructions to minimize dust emissions.
- When using the integrated water system, ensure the water spray nozzle is working properly to apply water at the point of dust generation, the spray nozzle is not clogged or damaged and all hoses and connections are intact.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required when using the saw outdoors for less than 4 hours per shift.
- **Respiratory protection is required at all times when using the saw indoors or in an enclosed area, or when used indoors for 4 or more hours per shift.**
- A respirator with an assigned protection factor (APF) of at least 10 will be utilized by employees engaged in this operation.
- A powered air-purifying respirator (PAPR) with disposable shroud (APF-25) may be used as well.
- The respirator shall be used in accordance with the manufacturer's instructions and the NCDOT Respiratory SPP 1910.134.
    - Only employees that have been medically cleared are permitted to use a respirator.
    - The respirator shall be inspected prior to use and cleaned after each use.
    - Individuals are not to share their respirator with other employees.

Housekeeping:

- When working indoors or in an enclosed area, slurry generated during the use of water suppression systems will be cleaned up using a wet vacuum and the slurry transferred into a closed container for disposal.
- Dry sweeping of dust covered areas is not permitted; wet the area before cleaning to eliminate air-borne dust.

Procedures for Restricting Access to Work Areas:

- If engineering and work practice controls have been properly implemented, others in the work area will not require restricted access.
- The work area may be restricted to other employees if other safety hazards are identified.
- Public access restrictions (traffic cones, drums or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Sawing/cutting concrete, brick, or asphalt using a **handheld power saw** where neither water integration nor vacuum system is feasible. ®

Engineering and Work Practice Controls:

- Table I in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction does not include this task.
- **Dry sawing without a dust collection system or water suppression is a last resort activity and must not exceed 15 minutes.**
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- All employees not integral to the activity are to stay a suitable distance away and upwind from the activity to prevent exposure.

Respiratory Protection:

- **Respiratory protection is required at all times during this activity.**
- A respirator with an assigned protection factor (APF) of at least 10 will be utilized by employees engaged in this operation.
- A powered air-purifying respirator (PAPR) with disposable shroud (APF-25) is recommended.
- The respirator shall be used in accordance with the manufacturer's instructions and the NCDOT Respiratory Protection SPP 1910.134.
    - Only employees that have been medically cleared are permitted to use a respirator.
    - The respirator shall be inspected prior to use and cleaned after each use.
    - Tight fitting respirators are not to be shared among employees.

Housekeeping:

- Dry sweeping of dust covered areas is not permitted; wet the area before cleaning to eliminate air-borne dust or use a sweeping compound.

Procedures for Restricting Access to Work Areas:

- Work access should be restricted to those employees directly involved in the task.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Sawing/cutting concrete, brick, or asphalt using a **handheld power saw with** vacuum system and blade diameter <8 inches. †

Engineering and Work Practice Controls:

- Table I (iii) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- In some Division Bridge Maintenance operations use of water is not feasible (e.g. patching bridge decks) due to the type of materials utilized for filling the sawed-out area. In those cases, a saw equipped with a commercially available dust collection system will be utilized. The dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with a 99% or greater efficiency. The shroud or cowling must be intact and installed. The hose connecting the saw to the vacuum must be intact and without kinks or tight bends. The filter(s) on the vacuum must be cleaned or changed to prevent clogging and the collection bags regularly emptied to avoid clogging or over-filling.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- A dust suppression system for the saw will consist of a commercially available dust collection system operated in accordance with the manufacturer's instructions to minimize dust emissions.
- *The operation is not to exceed four hours.*

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required for equipment operators or others who assist during the operation.

Housekeeping:

- Dry sweeping of dust covered areas is not permitted; wet the area before cleaning to eliminate air-borne dust.
- Minimize or prevent dust buildup on tools and equipment.

Procedures for Restricting Access to Work Areas:

- Work access should be restricted to those employees directly involved in the task.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Sawing/cutting concrete, brick, or asphalt using a **handheld power saw** with integrated vacuum system and blade diameter >8 inches.

Engineering and Work Practice Controls:

- Table I in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction does not include this task.
- Although OSHA's Table I does not list dust vacuum collection systems for handheld saws with a blade diameter larger than 8 inches, commercially developed systems are available. In those cases, a saw equipped with a commercially available dust collection system will be utilized. The dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with a 99% or greater efficiency. The shroud or cowling must be intact and installed. The hose connecting the saw to the vacuum must be intact and without kinks or tight bends. The filter(s) on the vacuum must be cleaned or changed to prevent clogging and the collection bags regularly emptied to avoid clogging or over-filling.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- A dust suppression system for the saw will consist of a commercially available dust collection system operated in accordance with the manufacturer's instructions to minimize dust emissions. Specific questions may need to be answered by the manufacturer's customer service department.
- Homemade or makeshift vacuum systems are not to be utilized.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required for equipment operators or others who assist during the operation **if the operation duration is less than 1 hour.**
- **Respiratory protection is required if the duration exceeds 1 hour for this activity.**
    - A respirator with an assigned protection factor (APF) of at least 10 will be utilized by employees.
    - A powered air-purifying respirator (PAPR) with disposable shroud (APF-25) may be used as well.
    - If used, the respirator shall be used in accordance with the manufacturer's instructions and the NCDOT Respiratory SPP 1910.134.
        - Only employees that have been medically cleared are permitted to use a respirator.
        - The respirator shall be inspected prior to use and cleaned after each use.

†: task is listed in Table I
®: task requires respiratory protection at all times

Housekeeping:

- Dry sweeping of dust covered areas is not permitted; wet the area before cleaning to eliminate air-borne dust or use a sweeping compound.
- Minimize or prevent dust buildup on tools and equipment.

Procedures for Restricting Access to Work Areas:

- Work access should be restricted to those employees directly involved in the task.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Using heavy equipment and utility vehicles (dozers, track hoes, backhoes, sweepers) for **grading and excavating during road and bridge maintenance and construction operations.** This includes the operation of a motor grader for blading gravel roads. †

Engineering and Work Practice Controls :

- Table I (xviii) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- If the only employee engaged in the task, the equipment operator must be in an enclosed, filtered cab that is maintained as free as practicable from settled dust, has door seals and closing mechanisms that work properly, has gaskets and seals that are in good conditions and work properly, is under positive pressure maintained through continuous delivery of filtered air, has intake air that is filtered through a pre-filter that is at least 95% efficient (e.g. MERV-16 or better), and has heating and cooling capabilities.
- If the equipment cab is not enclosed, or when employees outside the equipment cab are engaged in the operation, apply water and/or dust suppressants as necessary to minimize dust emissions (e.g. use of water truck and spray hose).

Housekeeping:

- Equipment cabs must be maintained as free as possible from air-borne dust; wet cleaning methods should be utilized (e.g. wet-sponge/cloth, water hose, etc.).
- The use of a HEPA vacuum system is also an acceptable method for interior cleaning of the equipment cab.
- Dry sweeping the cab is not permitted.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required for equipment operators or others who assist during the operation.

Procedures for Restricting Access to Work Areas:

- The use of heavy equipment will inherently require restricted access to other employees.
- Public access restrictions (cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Using heavy equipment and utility vehicles (e.g. hoe-ram, rock- ripper) for the fracturing or abrading of rock and soil, demolishing concrete masonry structures, or loading, dumping, and removing demolition debris during road and bridge maintenance and construction operations. †

Engineering and Work Practice Controls:

- Table I (xvii) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessment s when necessary.
- Equipment operators must be in an enclosed, filtered cab that is maintained as free as practicable from settled dust, has door seals and closing mechanisms that work properly, has gaskets and seals that are in good conditions and work properly, is under positive pressure maintained through continuous delivery of filtered air, has intake air that is filtered through a pre-filter that is at least 95% efficient (e.g. MERV-16 or better), and has heating and cooling capabilities.
- When employees outside the equipment cab are engaged in the operation, apply water and/or dust suppressants as necessary to minimize dust emissions (e.g. use of water truck and spray hose).

Housekeeping:

- Equipment cabs must be maintained as free as possible from airborne dust; wet cleaning methods should be utilized (e.g. water hose)
- Dry sweeping the cab is not permitted.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required for equipment operators or others who assist during the operation.

Procedures for Restricting Access to Work Areas:

- If engineering and work practice controls have been properly implemented, others in the work area will not require restricted access.
- The work area may be restricted to other employees if other safety hazards are identified.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Inspection of contract operations which generate silica dust as outlined in OSHA' s 1926.1153, Respirable Crystalline Silica Standard for Construction.

Engineering and Work Practice Controls:

- Table I in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction does not include this task.
- The NCDOT technician will conduct a tailgate safety meeting prior to the beginning of the operation in order to identify silica exposure hazards associated with the contractor's operation.
- Visible dust is an indication of a failed or non-existent dust suppression system. The technician should maintain adequate distance from airborne dust to avoid inhalation and notify the contractor's competent person of the requirement for dust suppression during operations that generate airborne silica dust.
- If the contractor is unable to comply with the requirements of OSHA's Table I, the technician shall consider the use of a respirator based upon the tasks and tools and respiratory requirements listed in Table I.
- The technician should be trained as a NCDOT competent person for respirable crystalline silica.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required.

Housekeeping:

- Vehicles must be maintained as free from silica dust as possible; vacuum or wet cleaning methods (e.g. wet sponge/cloth) should be utilized.
- Dry sweeping of vehicle cabs is not permitted.
- The NCDOT technician should communicate any housekeeping issues or concerns to the contractor.

Procedures for Restricting Access to Work Areas:

- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.
- The NCDOT technician should communicate any access issues or concerns to the contractor.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Using jackhammers and/or handheld powered chipping tools for road, bridge and traffic services maintenance, repair, and installation operations (including bridge repair and maintenance: decks, barrier rails, parapet, beams, approach slabs and piers, median barrier rails, roadway repairs and maintenance: sidewalks, curb and gutter, minor drainage structures or manholes, islands, median and shoulder drainage ditches, and traffic services: traffic sign installation) with an integrated water suppression or dust collection system.†

Engineering and Work Practice Controls:

- Table I (x) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- A dust suppression system for the jackhammer or handheld powered chipping tool may include either (1) a commercially developed integrated water delivery system that continuously feeds water to the blade or (2) a commercially available shroud and dust collection system. For use of either system, operate and maintain the tool in accordance with the manufacturer's instructions to minimize dust emissions.
- If using an integrated water system, ensure the water spray nozzle is working properly to apply water at the point of dust generation, the spray nozzle is not clogged or damaged, and all hoses and connections are intact.
- If using a shroud and dust collection system, the collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with a 99% or greater efficiency. The shroud or cowling must be intact and installed, the hose connecting the jackhammer or tool to the vacuum must be intact and without kinks or tight bends, and the filter(s) on the vacuum must be cleaned or changed to prevent clogging and the collection bags regularly emptied to avoid clogging or over-filling.
- Makeshift or homemade dust suppression systems are not to be utilized.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required when using jackhammers or chipping tools outdoors unless the operation/task exceeds a 4-hour shift.
- **Respiratory protection is required if the jackhammer or chipping tools are used indoors or in an enclosed area for any duration or used outdoors for over 4 hours per shift.**
    - When required, a respirator with an assigned protection factor (APF-10) will be utilized by the employee.
    - A powered air-purifying respirator (PAPR) with disposable shroud (APF-25) may be used as well.
    - The respirator shall be used in accordance to the manufacturer's instructions and the NCDOT Respiratory SPP 1910.134.

†: task is listed in Table I
®: task requires respiratory protection at all times

- Only employees that have been medically cleared are permitted to use a respirator.
- The respirator shall be inspected prior to use and cleaned after each use.

Housekeeping:

- When working indoors or in an enclosed area, slurry generated during the use of water suppression systems will be cleaned up using a wet vacuum and the slurry transferred into a closed container for disposal.
- When working outdoors, collection of generated slurry options should be explored.
- Dry sweeping of dust covered areas is not permitted; wet the area before cleaning to eliminate airborne dust or use a sweeping compound.

Procedures for Restricting Access to Work Areas:

- If engineering and work practice controls have been properly implemented, others in the work area will not require restricted access.
- The work area may be restricted to other employees if other safety hazards are identified.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Using a **small drivable milling machine** (less than half-lane) with integrated water suppression system for milling asphalt pavement during road and bridge maintenance operations, and for the removal of pavement marking paint or thermoplastic during traffic services operations. This includes the use of a skid steer with millingattachment. †

Engineering and Work Practice Controls:

- Table I (xiv) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- The machine must be operated and maintained in accordance with the manufacturer's instructions to minimize dust emissions.
- The machine must be equipped with supplemental water sprays designed to suppress dust. Water should be combined with a surfactant (cleaning agents/soaps/detergents).
- An adequate supply of water for dust suppression must be used, the spray nozzles must be working properly and produce a pattern that applies water at the point of dust generation, the spray nozzles must not be clogged or damaged, and all hoses and connections must be intact.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required when using the machine.

Housekeeping:

- When using the machine indoors or in enclosed areas, additional exhaust must be provided to prevent the accumulation of visible airborne dust.

Procedures for Restricting Access to Work Areas:

- If engineering and work practice controls have been properly implemented, others in the work area will not require restricted access.
- The work area may be restricted to other employees if other safety hazards are identified.
- Public access restrictions (traffic cones, drums or tape) may be utilizedif needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Grinding to remove pavement marking paint or thermo-plastic from asphalt or concrete roadways using a **walk-behind milling machine** during traffic services operations with either an integrated water suppression or dust collection system. †

Engineering and Work Practice Control:

- Table I (xiii) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessments when necessary.
- A dust suppression system for the machine may include either (1) a commercially developed integrated water delivery system that continuously feeds water to the cutting surface or (2) a commercially available shroud and dust collection system. For use of either system, operate and maintain the saw in accordance with the manufacturer's instructions to minimize dust emissions.
- If using an integrated water system ensure an adequate supply of water for dust suppression is used, the spray nozzles are working properly and produce a pattern that applies water at the point of dust generation, spray nozzles are not clogged or damaged, and all hoses and connections are intact.
- When the use of water is not feasible for the operation/task, a machine equipped with a commercially available dust collection system will be utilized. The dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow and have a filter with a 99% or greater efficiency and a filter-cleaning mechanism. The hose connecting the machine to the vacuum must be intact and without kinks or tight bends. The filter(s) on the vacuum must be cleaned or changed to prevent clogging and the collection bags regularly emptied to avoid clogging or over-filling.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required when using the machine outdoors or indoors for less than 4 hours per shift.
- **Respiratory protection is required if the milling machine is used indoors or in an enclosed area for over 4 hours per shift.**
  - When required, a respirator with an assigned protection factor (APF-10) will be utilized by the employee.
  - A powered air-purifying respirator (PAPR) with disposable shroud (APF-25) may be used as well.
  - The respirator shall be used in accordance with the manufacturer's instructions and the NCDOT Respiratory SPP 1910.134.

†: task is listed in Table I
®: task requires respiratory protection at all times

- Only employees that have been medically cleared are permitted to use a respirator.
- The respirator shall be inspected prior to use and cleaned after each use.

Housekeeping:

- When working indoors or in an enclosed area, loose dust must be cleaned with a HEPA-filtered vacuum in between passes of the machine to prevent the loose dust from being re-suspended. Additional ventilation must be provided as needed to minimize the accumulation of visible airborne dust.

Procedures for Restricting Access to Work Areas:

- If engineering and work practice controls have been properly implemented, others in the work area will not require restricted access.
- The work area may be restricted to other employees if other safety hazards are identified.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

Description of Task: Sawing/cutting concrete or asphalt slabs, pavement, sidewalks, or curbs using a **walk behind saw** with integrated water suppression system during road and bridge maintenance operations. †

Engineering and Work Practice Controls:

- Table I (iv) in OSHA's 1926.1153, Respirable Crystalline Silica Standard for Construction, will be incorporated and implemented into this Plan.
- The NCDOT supervisor or crew leader will conduct a tailgate safety meeting prior to the beginning of the operation/task to review identified silica hazards and instruct employees on the controls to be utilized to eliminate or reduce the risk of exposure. A competent person will be designated to monitor the operation and/or tools/equipment and perform re-assessment s when necessary.
- A dust suppression system for the saw must include a commercially developed integrated water delivery system that continuously feeds water to the blade. The saw will be operated and maintained in accordance with the manufacturer's instructions to minimize dust emissions.
- Ensure the water spray nozzle is working properly to apply water at the point of dust generation, the spray nozzle is not clogged or damaged and all hoses and connections are intact.

Respiratory Protection:

- When engineering and work practice controls are properly implemented, respiratory protection is not required when using the saw outdoors.
- **Respiratory protection is required at all times when using the saw indoors or in an enclosed area.**
    - A respirator with an assigned protection factor (APF-10) will be utilized by the employee.
    - A powered air-purifying respirator (PAPR) with disposable shroud (APF-25) may be used as well.
    - The respirator shall be used in accordance with the manufacturer's instructions and the NCDOT Respiratory SPP 1910.134.
        - Only employees that have been medically cleared are permitted to use a respirator
        - The respirator shall be inspected prior to use and cleaned after each use

Housekeeping:

- When working indoors or in an enclosed area, slurry generated during the use of water suppression systems will be cleaned up using a wet vacuum and the slurry transferred into a closed container for disposal.
- Dry sweeping of dust covered areas is not permitted; wet the area before cleaning to eliminate airborne dust.

†: task is listed in Table I
®: task requires respiratory protection at all times

Procedures for Restricting Access to Work Areas:

- If engineering and work practice controls have been properly implemented, others in the work area will not require restricted access.
- The work area may be restricted to other employees if other safety hazards are identified.
- Public access restrictions (traffic cones, drums, or tape) may be utilized if needed.

†: task is listed in Table I
®: task requires respiratory protection at all times

TABLE 1:

SPECIFIED EXPOSURE CONTROL METHODS WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(i) Stationary masonry saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
(ii) Handheld power saws (any blade diameter)	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. – When used outdoors. – When used indoors or in an enclosed area.	None APF-10	APF-10 APF-10
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)	*For tasks performed outdoors only:* Use saw equipped with commercially available dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency.	None	None

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(iv) Walk-behind saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. − When used outdoors. − When used indoors or in an enclosed area.	None APF-10	None APF-10
(v) Drivable saws	*For tasks performed outdoors only:* Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
(vi) Rig-mounted core saws or drills	Use tool equipped with integrated water delivery system that supplies water to cutting surface. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills)	Use drill equipped with commercially available shroud or cowling with dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. Use a HEPA-filtered vacuum when cleaning holes.	None	None
(viii) Dowel drilling rigs for concrete	*For tasks performed outdoors only:* Use shroud around drill bit with a dust collection system. Dust collector must have a filter with 99% or greater efficiency and a filter-cleaning mechanism. Use a HEPA-filtered vacuum when cleaning holes.	APF-10	APF-10
ix) Vehicle-mounted drilling rigs for rock and concrete	Use dust collection system with close capture hood or shroud around drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector. -**OR-** Operate from within an enclosed cab and use water for dust suppression on drill bit.	None	None

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(x) Jackhammers and handheld powered chipping tools	Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact. − When used outdoors. − When used indoors or in an enclosed area. **-OR-** Use tool equipped with commercially available shroud and dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. − When used outdoors. − When used indoors or in an enclosed area.	None APF-10 None APF 10	APF-10 APF 10 APF-10 APF-10

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(xi) Handheld grinders for mortar removal (i.e., tuck-pointing)	Use grinder equipped with commercially available shroud and dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.	APF-10	APF-25
(xii) Handheld grinders for uses other than mortar removal	*For tasks performed outdoors only:* Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. **-OR-**	None	None

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(xii) Handheld grinders for uses other than mortar removal (Continued)	Use grinder equipped with commercially available shroud and dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.		
	− When used outdoors.	None	None
	− When used indoors or in an enclosed area.	None	APF-10

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(xiii) Walk-behind milling machines and floor grinders	Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. **-OR-** Use machine equipped with dust collection system recommended by the manufacturer. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.	None None	None None
(xiv) Small drivable milling machines (less than half-lane)	Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant. Operate and maintain machine to minimize dust emissions.	None	None

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(xv) Large drivable milling machines (half-lane and larger)	*For cuts of any depth on asphalt only:* Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. Operate and maintain machine to minimize dust emissions.	None	None
	For cuts of four inches in depth or less on any substrate: Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. Operate and maintain machine to minimize dust emissions.	None	None
	-OR- Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant. Operate and maintain machine to minimize dust emissions.	None	None

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(xvi) Crushing machines	Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points). Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions. Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station.	None	None
(xvii) Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials	Operate equipment from within an enclosed cab. When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.	None None	None None
(xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: demolishing, abrading, or fracturing silica-containing materials	Apply water and/or dust suppressants as necessary to minimize dust emissions. **-OR-** When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None None	None None