3M Science. Applied to Life.™

Personal Safety Solutions for Work with Silica, Welding and Grinding in Construction

Find the information you need for construction worker safety and health when exposed to silica, welding and grinding operations. Discover how 3M can help you protect the workers that make project success possible, from groundbreaking to ribbon cutting.

Every day, nearly one million workers globally suffer a workplace accident, and close to 6,300 people will die due to an occupational accident or disease—including many in the construction industry.[1] Through collaboration and science, we believe that together we can help change that.

Construction Safety. Backed by Science.

Head impact and eye injuries. Hearing and respiratory hazards. Falls from height and dropped objects. Construction workers face all of these and more day in and day out, so they rely on integrated safety and health solutions from 3M to help keep them protected and comfortable.

Our approach goes well beyond providing quality personal protective equipment. With knowledgeable industry experts committed to developing worker-inspired innovations, our team delivers new technology and in-depth training that can make a measurable impact on worker health and safety.

300+
Technical service/application engineers and regulatory specialists worldwide

70+
Countries with local standards professionals

3,100+
Active patents on safety technologies

100+
Training professionals & 15 training centers globally[2]

Table of Contents

Use the following pages to explore construction hazards related to silica, welding and grinding, best practices for these applications and suggested PPE for each of your employees. It's important to remember that PPE should be considered the last line of defense in construction safety and health, as engineering controls (physical workplace changes) and administrative work practice controls should be established first to protect workers. When the safety and health of employees who work with silica or welding hazards is a priority, everyone on your team stands to benefit.

Respirable Crystalline Silica in Construction

Silica is a common worksite material that presents unique health challenges for workers. For centuries, respiratory illnesses associated with masonry and stonework have killed thousands of workers.[3,4] Since the 1930s, the presence of worksite silica and its potential health risks have gained more widespread recognition around the globe.[5, 6]

Silica or silicon dioxide (SiO_2) is a naturally occurring mineral—one of the most common on Earth. Construction crews encounter crystalline silica in many common materials found on construction sites such as sand, soil, masonry, concrete, granite, rock and landscaping materials.[7] When construction workers disturb these elements, respirable crystalline silica dust can be released. Respirable crystalline silica (RCS) particles are too small to be seen by the human eye. They remain in the air for extended time periods after handling, cutting or sanding materials containing crystalline silica. RCS particles present an inhalation hazard, as they can damage a worker's lungs.[8,9]

Despite advances in workplace safety practices, construction workers still face numerous silica hazards. Building materials, construction techniques and personal protective equipment (PPE) standards are always evolving, so it's critical to understand how these changes impact a worker's exposure to silica on a construction site. US Federal OSHA estimates that about

2 million

construction workers are exposed to respirable crystalline silica in over

600,000

workplaces.[9]

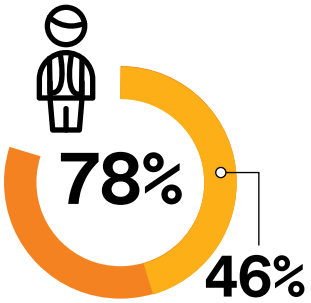
It's common in the construction industry to use materials with high proportions of crystalline silica. In a wide range of construction operations, workers encounter these materials. Silica exposure can increase the risk of developing silicosis and other nonmalignant respiratory diseases, lung cancer and kidney disease. Additional eye, head, fall and noise hazards often exist at construction sites where silica is present, compounding the safety and health challenge.

Construction applications that may lead to silica exposure include:[7]

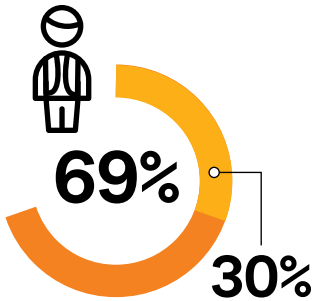
- Abrasive blasting
- Tuckpointing
- Block and brick cutting
- Drilling, grinding, cutting and chipping concrete
- Stationary saw masonry
- Rock crushing and drilling
- Polishing and sanding
- Concrete mixing
- Milling
- Demolition
- Handling and shoveling dry materials
- Tunneling operations

Crystalline Silica Content in Common Construction Materials[8]

Material	Approximate crystalline silica content
Sandstone	70-90%
Concrete, mortar	25-70%
Tile	30-45%
Granite	20-45%, typically 30%
Slate	20-40%
Brick	< 30%
Limestone	2%
Marble	2%



78% of tuckpointers and grinders are exposed to silica levels above US Federal OSHA Permissible Exposure Limit (PEL), and 46% are exposed to more than 250 µg/m³[7]



69% of abrasive blasting and demolition workers are exposed to levels above the PEL and more than 30% are exposed above 250 µg/m³[7]

In 2016, US Federal OSHA issued 29 CFR 1926.1153, a new silica regulation in construction. There are a variety of resources that help construction firms understand and comply with the standard. Compliance guides, FAQs, suggested engineering and work practice controls are available on US OSHA's silica website. Alternatively, you may visit the 3M OSHA Silica page for additional resources. Globally, the International Labor Organization (ILO) has guidance for National Programs for the Elimination of Silicosis. While the following information relates to US Federal OSHA, these guidelines would be helpful in meeting the Canadian requirements.

Another valuable source of information is US Federal OSHA's inspection procedures for compliance officers. This information helps construction safety and health program managers assess their silica program to ensure compliance to the 29 CFR 1926.1153 standard. Most silica-related citations occur due to a lack of proper exposure monitoring, improper application of Table 1, failure to create a written exposure control plan, insufficient silica hazard communication training for employees and failure to implement a respiratory protection program. The severe health effects associated with respirable silica exposure mean that most of these citations are categorized as serious.

If you're wondering how to get started, here are a few specific steps your team can take to help improve safety for workers who face silica exposure:

Implement Proper Exposure Assessments and Air Monitoring

Many violations have occurred because employers have inadequate or nonexistent exposure assessments at their construction sites. Table 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica in the US 29 CFR 1926.1153 standard is a common area of confusion for construction safety professionals. To simplify exposure assessment for 18 common construction tasks, employers have the option of implementing the silica dust control methods, and in some cases, the respiratory protection Table 1 prescribes. What's important to know is that employers who "fully and properly implement" Table 1 controls are not required to assess workers' exposure to silica. In any other case, an exposure assessment is required.

If an employer cannot implement Table 1, they must assess the silica levels a task generates by completing an exposure assessment. US Federal OSHA allows two ways to conduct the exposure assessment: Performance method or Scheduled air monitoring method. Performance methods use a variety of data sources to estimate the worst-case silica exposure. These data sources could include industry surveys of similar tasks, prior air monitoring studies, engineering calculations or air monitoring.

...employers who "fully and properly implement" Table 1 controls are not required to assess worker's exposure to silica for Table 1 tasks.

Alternatively, the assessment can be completed by scheduled air monitoring representative of each job class, location or shift that may have silica exposure. US Federal OSHA's permissible exposure limits are set at 50 µg/m^3 as an 8-hour TWA or action Level (AL) 25 µg/m^3 as an 8-hour TWA. Employers can discontinue scheduled monitoring if below the Action Level. They must repeat monitoring every six months if levels are between the AL and the PEL. For readings above the PEL, monitoring must occur every three months. Monitoring may be discontinued if two consecutive samples are below the AL or PEL. If data indicates that the PEL will be consistently exceeded, employers may wish to switch to the Performance option (per 29 CFR 1926.1153).

Reasons to implement accurate exposure assessments include:

- Planning job classifications, tasks and equipment to include in a written exposure control plan
- Identifying silica hazard training needs and opportunities
- Determining which workers must wear respiratory protection
- Planning medical evaluations, fit testing and training for respirator use
- Assessing which employees need medical surveillance program coverage

Ensure Table 1 Controls are "Fully and Properly" Implemented

Properly implementing Table 1 Controls, requires employers to use ALL of the controls listed in a specific task on the table including required respiratory protection. Employers must also ensure that the controls are not only present but also working properly until the task is complete. If an employer is using Table 1 in place of exposure assessment but does not have all of the required controls "fully and properly implemented," a US Federal OSHA inspector may be required to conduct air monitoring. If the inspector determines the exposure is greater than PEL, a citation may be issued.

To find more information about complying with Table 1, see The Center for Construction Research and Training's "Equipment Names and Best Practice Tips" guide, and US Federal OSHA's Controlling Silica Dust in Construction Fact Sheets for Table 1 Tasks.

Write an Exposure Control Plan

US Federal OSHA citations can occur when an employer doesn't have a site-specific written exposure control plan (WECP). This plan must identify the tasks that expose employees to respiratory silica. For each task, the plan outlines the engineering controls, work practices and respiratory protection in place to help protect workers. Additionally, the WECP details housekeeping measures and work area access restriction procedures that reduce an employee's exposure to silica. A designated competent person must implement the control plan, complete inspections regularly and have the authority to promptly correct safety violations. There is a requirement to annually review the control plan.

For more details on creating a WECP, see US Federal OSHA's FAQ page for Occupational Exposure to Respirable Crystalline Silica, or visit The Center for Construction Research and Training's "Work Safe with Silica" resource page.

Provide Silica Training

A lack of proper training for construction workers can lead to a violation. Employers are required to teach workers about health effects of silica exposure, tasks that may lead to silica exposure, and the controls that help prevent overexposure. If workers are exposed to silica above the action level, training must be available to them in an understandable language. Every employee should know the specific site-specific WECP controls, competent person, housekeeping methods and medical surveillance programs that protect them from silica hazards.

If employees work with silica-containing products, they must also be trained according to the US Federal OSHA Hazard Communication Standard 29 CFR 1910.1200. Failure to do so may result in a citation for both the silica standard and hazard communication standard.

For help with implementing a silica safety training program, visit The Center for Construction Research and Training's "Work Safe with Silica" resource page.

Implement a Respiratory Protection Program

If workers are required to wear respirators, based on exposure assessment, Table 1 requirements or the WECP, employers must implement a respiratory protection program. According to US Federal OSHA 29 CFR 1910.134, a respiratory protection program must:[10]

- Be in writing
- Document proper exposure assessment
- Include how respirators are selected
- Describe requirements for respirator maintenance, use and care
- Provide training, fit testing and medical evaluations
- Be evaluated annually to ensure effectiveness
- Have an administrator

In Canada, please consult CSA Z94.4 or local jurisdiction regulations for respiratory protection program development.

Other Considerations

In addition to respiratory protection program violations, it's critical to be aware that failure to offer the necessary medical surveillance program and violations of housekeeping provisions have led to citations. Additionally, local jurisdictions sometimes have their own silica regulations for construction. Be sure to search for your jurisdiction's regulations and guidance before completing any work that involves silica exposure.

To see more details about the US Federal OSHA Respiratory Protection Standard, visit the 3M Center for Respiratory Protection. Here you will also find a wide range of resources to set up your respiratory protection program. 3M tools are based on years of construction safety experience and a deep knowledge of industry standards. When you need science-based respiratory program guidance and insights, 3M can help you achieve a safe and compliant workforce.

PPE Backed by Science

To help keep your team safe when working with silica, you need to know that your PPE comes from a company with decades of respiratory protection experience. Starting with a foundation in science, we work closely with construction companies to develop practical solutions that address real-world safety challenges. In addition to construction safety insights, we leverage our knowledge across industries to develop innovative health and safety solutions applicable for work with silica. This e-book can help construction companies discover the science based solutions that can help elevate health and safety for crews.

Before choosing PPE for a construction project, construction companies and subcontractors should read US Federal OSHA 29 CFR 1926.1153, the preamble to the regulation, the FAQs, silica enforcement guidelines and Fact Sheet on Construction for detailed information on silica hazards and other compliance information. Using this information, the site health and safety professional or safety competent person must review the worksite to determine what PPE is relevant to their needs. This person should identify all of the hazards that require attention and worker protection. As conditions, tasks and tools change, assessments should be repeated as necessary. In Canada, please consult CSA Z94.4 or local jurisdiction regulations. While the following information relates to US Federal OSHA, these guidelines would be helpful in meeting the Canadian requirements.

The following suggestions include examples of PPE for hazards that may be present while completing tasks found on Table 1*.

PPE Codes:

A – 3M™ Rugged Comfort Quick Latch Half Facepiece Reusable Respirator 6500 Series or 3M™ Aura™ Particulate Respirator 9205+

B – 3M™ Full Face Piece Respirator - 6000 Series

C – 3M™ Particulate Filter 2071, P95 or 3M™ Particulate Filter 2091, P100

D – 3M™ Particulate Filter 2091, P100

E – 3M™ E-A-R™ Flexible Fit Earplug or 3M™ PELTOR X-Series Ear Muffs

F – 3M™ Solus™ CCS Eyewear with Foam Gasket

G – 3M™ Solus™ 1000 Series Safety Glasses with Foam Gasket and Face Shield

H – 3M™ H-700 Hard Hat with Uvicator™ Sensor H-700 Vented UVicator PinLock

J – 3M™ DBI-SALA® ExoFit STRATA™ Construction Style Harness

Equipment/task (7 of the 18 US Federal OSHA categories are described below)	**Engineering and work practice control methods**	**Suggested respirator – specified engineering controls are in place per US 29 CFR 1926.1153(c)**		**Examples of Noise Levels for Common Construction Tools**	**Suggested additional PPE to consider**	**Additional information**
		≤ 4 hours	**> 4 hours**			
(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	A**, C	A, C	94-98 dB[1,2,3]	E, F, H, J	**Not required if work is done outdoors ≤ 4hrs
(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 a enclosed area	A**, C	A**, C	98-102 dB[1,2,4]	E, F, H	**Not required if work is done outdoors
(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. - When used outdoors	A, C	A, C	97-104dB[2,4]	E, F, H	This applies to outdoor work only. Indoor work is not covered in Table 1 – 29 CFR1926.1153 or this Table A

Suggested PPE Options

Equipment/task (7 of the 18 US Federal OSHA categories are described below)	Engineering and work practice control methods	Suggested respirator – specified engineering controls are in place per 29 CFR 1926.1153(c)		Examples of Noise Levels for Common Construction Tools	Suggested additional PPE to consider	Additional information
		≤ 4 hours	> 4 hours			
(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	A**, C	A, C	97-113 dB[1,2,3,4]	E, F, H, J	**Not required if work is done outdoors ≤ 4hrs
(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.	A, C, G	B***, D	87-99 dB[1,2,3]	E, H, J	***Must use quantitative fit test. Alternative TR-300 PAPR with M-300 headgear and safety glasses
(xii) Handheld grinders for uses other than mortar removal	• Use grinder equipped with commercially available shroud and dust collections 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 - When used indoors or in an enclosed area	US Federal OSHA does not require respirator use	A****, C	87-100 dB[1,3]	E, F, H, J	****Not required if work is done outdoors

For more information, consult 3M's "#210 – Task-Based PPE Suggestions for Silica in the Construction Industry"

1. ANSI/ASSE A10.46 – 2013 Hearing Loss Prevention for Construction and Demolition Workers
2. US Federal OSHA's Approach to Noise Exposure in Construction Feb 2003
3. Construction Industry Noise Exposures University of Washington Dept of Environmental and Occupational Health Sciences 2004
4. Per NIOSH, hearing protectors shall attenuate noise sufficiently to keep the worker's "real-world" exposure below 85 dBA as an 8-hour TWA. Workers exposed to any single impulse noise level that exceed 140 dBA those whose 8-hour TWA exposures exceed 100 dBA should wear double hearing protection (i.e., they should wear earplugs and earmuffs simultaneously).

*The US silica in construction standard, 29 CFR 1926.1153 Table 1 lists 18 equipment/tasks that may produce worker exposure to respirable crystalline silica ("silica"). When the specific engineering, administrative and respiratory controls for a given task are "fully and properly" implemented, US OSHA waives the exposure assessment requirements of 29 CFR 1926.1153 and 29 CFR 1910.134. US Federal OSHA does not specify the type of respirator to be used, only the minimum assigned protection factor (APF) the respirator must have per 29 CFR 1910.134(d)(3)(i)(A). Contractors may wish to consider these suggestions as a starting point during pre-project planning and are a minimum level of protection. Employers have the flexibility to provide a more protective PPE to those employees who request or require a more protective PPE based on the employer's evaluation of the worksite. In Canada, please consult CSA Z94.4 or local jurisdiction regulations.

Respiratory Protection

For applications up to 10 times the Occupational Exposure limit:

3M™ Aura™ Particulate Respirator 9205+, N95

This N95 particulate respirator's 3-panel design combines comfort and convenience with soft inner materials, adjustable chin tab and a sculpted, embossed top panel designed to allow more room for eyewear and help reduce eyewear fogging. The flatfold design offers convenient storage and portability; individually packaged to help protect respirator from contamination.

3M™ Particulate Respirator 8210, N95

The 3M™ Particulate Respirator 8210, N95 is a disposable particulate respirator that is designed to help provide respiratory protection against certain non-oil based particles. This respirator is designed for use for particles such as those from grinding, sanding, sweeping, sawing, bagging or other dusty operations. The respirator incorporates 3M's proprietary technology with advanced electrostatically charged microfiber filter media designed for ease of breathing.

3M™ Particulate Respirator 8210V, N95

The lightweight, disposable N95 particulate dust respirator is designed to help provide worker respiratory protection. The respirator incorporates 3M's proprietary technology with advanced electrostatically charged microfiber filter media. The proprietary 3M™ Cool Flow™ Exhalation Valve helps release warm and moist exhaled breath from inside the respirator, offers easy exhalation and is suitable for physically demanding environments.

3M™ Cool Flow™ Valve Particulate Respirator 8511, N95

The respirator is designed for use for particles such as those from grinding, sanding, sweeping, sawing, bagging or other dusty operations. Fitted with a 3M™ Cool Flow™ Exhalation Valve, this respirator offers easy exhalation and is suitable for physically demanding environments. 3M™ Cool Flow™ Exhalation Valve helps direct exhaled air downward and allow for easy breathing.

3M™ Aura™ Particulate Respirator 9211+, N95

The lightweight, three panel designed disposable N95 particulate respirator helps provide convenient worker respiratory protection. 3M uses a variety of innovative technologies and features to help you meet your respiratory protection and comfort needs. 3M's proprietary filter media, 3M™ Advanced Electrostatic Media, filters dust and other particles, while allowing for easy breathing.

3M™ Half Facepiece Reusable Respirator 6000

3M™ 6000 Series reusable respirators are made from soft, lightweight materials, and the adjustable features help provide a secure, personalized fit. The placement of the 3M™ respirator filters helps improve visibility on the job and the respirator itself can be disassembled, cleaned and reused.

Pair with:

3M™ Particulate Filter 2071, P95

Advanced Electret Media (AEM) provides lightweight, easy breathing comfort. Bayonet compatibility allows use with many 3M™ half and full facepieces and certain 3M™ Scott™ full facepieces.

3M™ Particulate Filter 2091, P100

Advanced Electret Media (AEM) provides lightweight, easy breathing comfort. Bayonet compatibility allows use with many 3M™ half and full facepieces and certain 3M™ Scott™ full facepieces.

3M™ Particulate Filter 7093

Plastic filter encasement designed for high heat or wet applications. Innovative solid-top air-inlet design creates a channeled airflow that reduces premature loading. Its swept-back design provides enhanced field of view and greater comfort for welders in construction.

Respiratory Protection continued

For applications up to 10 times the Occupational Exposure limit:

[3M™ Rugged Comfort Quick Latch Half Facepiece Reusable Respirator 6500 Series]

This reusable respirator has a resilient silicone faceseal, offering extended facepiece life. The facepiece features our proprietary quick latch design, which offers an easy, one-hand touch drop-down mechanism for putting the facepiece on and taking it off while in a non-contaminated area. With 3M's Quick Latch drop-down mechanism and Cool Flow™ Valve, respirators are easy-on and easy-off for comfortable protection.

Pair with [3M™ Particulate Filter 2071, P95, 3M™ Particulate Filter 2091, P100 or 3M™ Particulate Filter 7093]

[3M™ Secure Click™ HF-800]

Designed with smart and intuitive features, the 3M™ Secure Click™ Half Facepiece Reusable Respirator HF-800 Series is simple, comfortable and reliable. It comes with an optional speaking diaphragm which is designed to help provide easier communication while you work. The quick, easy, one-touch negative pressure push button seal check provides improved confidence in respirator fit. The innovative Secure Click connection provides wearers confidence that filters and cartridges are installed properly. Also, the Secure Click cartridges are dual-flow to allow easier breathing. Two dual-flow cartridges on each respirator combine to create the world's first quad-flow cartridge system with four airflow paths providing greater breathability and comfort.

Pair with [3M™ Secure Click™ Particulate Filter P95 D3071, 3M™ Secure Click™ Particulate Filter P100 D3091, or 3M™ Secure Click™ Hard Case P100 Particulate Filter D9093]

For applications up to 50 times the Occupational Exposure limit when fit-tested using quantitative methods:

[3M™ Full Face Piece Respirator - 6000 Series]

Lightweight well-balanced design and silicone faceseal for comfort, durability and ease of cleaning. Equipped with our proprietary 3M™ Cool Flow™ Valve and a center adapter that directs exhaled breath and moisture downward. These features combine to make a comfortable, practical and economical solution.

Pair with [3M™ Particulate Filter 2071, P95, 3M™ Particulate Filter 2091, P100 or 3M™ Particulate Filter 7093]

For applications up to 25 times the Occupational Exposure limit:

[3M™ Versaflo™ Heavy Industry PAPR Kit TR-600-HIK]

This system features loose-fitting headgear that eliminates fit testing and can accommodate certain limited facial hair. Face shields help provide eye and face protection, and hard hats additionally help provide head protection. In addition, employees with prescription safety eyewear can keep their glasses on under loose-fitting head tops.

Replacement filter:

[3M™ Versaflo™ High Efficiency Filter TR-6710N]

Head, Eye and Face Protection:

3M™ Solus™ CCS Series Protective Eyewear with Foam Gasket

The 3M™ Solus™ CCS Series eyewear includes the Corded Control System (CCS) temples. The versatile design helps keep eyewear and earplugs attached, untangled and ready to use, so your team has the convenient, comfortable protection they need to focus on the jobs at hand. All models feature 3M™ Scotchgard™ Protector Anti-fog coating. A foam gasket is optional with small vents in the gasket help minimize fogging.

3M™ Solus™ 1000 Series

These safety glasses feature a sporty low profile and are available in several frame colors and lens tints with Scotchgard™ Anti-fog Protector Coating. Models with TPE gasket help provide additional protection against debris with a flexible seal that adapts to wearer's face contours. When used in combination with strap, the eyewear helps provide splash and dust protection. With 3M™ Scotchgard™ Protector Anti-Fog Coating resists fogging longer than traditional anti-fog coatings through up to 25 washings with water* and helps provide scratch resistance in tough work environments.

*Based on 3M internal testing per EN168 test method when compared with traditional anti-fog coatings.

3M™ Faceshield Holder for Hard Hat H24M

Designed to be compatible with 3M™ Hard Hats, the 3M™ Hard Hat Faceshield Holders help securely mount a faceshield to your hard hat. Compatible with a variety of 3M™ W-Series Faceshields that help protect against impact, splash and/ or radiant heat.

Pair with:

3M™ Clear Polycarbonate Faceshield WP96

For workers requiring face protection, the 3M™ W-Series Faceshields offer optical clarity and high-performance durability in unpredictable environments that involve exposure to impact hazards and flying debris.

3M™ H-700 Hard Hat with Uvicator™ Sensor

Designed to help protect a worker's head from impact, these adjustable hard hats feature a four-point ratchet or pinlock suspension system to deliver a comfortable, secure fit that helps reduce slippage. A UVicator™ sensor lets the wearer know when to replace hard hat due to UV exposure and integrated vents help release heat buildup and allow air circulation for enhanced comfort.

Hearing Protection:

3M™ E-A-R™ Push-Ins™ Earplug

The 3M™ E-A-R™ Push-Ins™ Earplugs are designed for hearing protection on noisy construction jobs. Fitting stems help for an easier insertion of the earplugs even when wearing gloves and help keep the earplug clean for workers with dirty hands. No roll-down required–all it takes is a push to insert the soft foam eartip into the ear canal. The EARform™ eartip has a smooth surface to help it slide easily into the ear canal. Noise reduction rating (NRR) 28db. CSA Class AL.

3M™ PELTOR™ X4 Earmuffs X4P3E/37278(AAD), Hard Hat Attached

The 3M™ PELTOR™ X Series Earmuffs are designed for comfort and excellent noise reduction during tough jobs where loud sounds are frequent. Available in Over-the-Head, Hard Hat Attached, and Behind-the-Head models, they are designed to adapt the requirements of the work. Featuring an adjustable cup that angles to help create a customized fit for the worker. Electrically insulated options available. NRR 25 dB and CSA Class A.

Fall Protection:

3M™ Protecta® Vest-Style Harness

Features a fixed back D-ring to minimize workday readjustment and offers a modern design that gives the harness a fresh, sleek look includes a tongue-buckle leg and quick-connect chest connections. Pair with appropriate anchorage and connecting device.

Body Protection:

3M™ Disposable Protective Coverall, 4520

Built for protection and designed for comfort, it features breathable Spunbound Meltblown Spunbound space (SMS) material and an anatomical fit for enhanced wear, coverage and comfort while working.

Welding and Grinding Operations in Construction

Welding generates an enormous amount of heat to melt metal and join workpieces together. As part of this melting process, some metal is vaporized, producing metal fume—microscopic particles of hot metal and gases that are small and buoyant enough to be released from the welding arc and rise in a cloud into the workplace air. This fume is potentially inhaled by the welder or others close to the source. Without effective controls in place, welders may have significant exposures potentially leading to significant short- and long-term health effects.[11]

Visible fume clouds are likely to contain metal particles, metal oxides and flux if it is used. Researchers are continually learning more about the science behind welding fumes, and the worksite hazards they present. Every construction project is different, and so are the welding fume hazards. Specific toxic effects depend on the metals being used, their concentration levels and total time of exposure.

Metals that may create welding fumes include:[12]

- Manganese
- Chromium (including hexavalent chromium Cr VI)
- Iron
- Aluminum
- Cadmium
- Nickel
- Copper
- Lead
- Zinc
- and others

Inhaling metal fume has the potential to lead to adverse health effects, so it's important to effectively control worker exposure. On construction sites without effective engineering controls, work practice controls or respiratory protection in place, workers may face significant exposure to hazardous welding fumes. An example of this potential health impact is the possibility for workers to develop flu-like symptoms for 24-48 hours following certain welding activities. Known as metal fume fever, this ailment leads to eye, nose and throat irritation, dizziness and nausea.[12] If workers have overexposure to welding fumes over long time periods, it may lead to lung damage and other serious health outcomes.[13]

Potential immediate health effects of certain* welding fumes:

- Eye, nose and throat irritation
- Dizziness
- Nausea

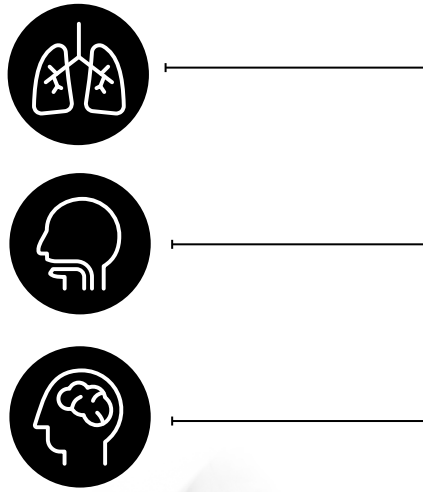
- Headaches
- Metal fume fever. Notably, it is more likely to occur after time away from the job (weekends, holidays, etc.)[14]

*Metals such as Cadmium Oxides, Copper, Iron Oxides, Manganese, Molybdenum, Nickel, Zinc and others[15]

Potential long-term health effects of certain welding fumes:

- Chronic lung diseases and lung cancer[16]
- Fumes such as cadmium and lead may cause kidney damage. Fumes such as manganese may lead to central nervous system damage.[15]

It's important to remember that welding fumes affect not just the welder, but may affect bystanders as well. Welding operations may impact welder helpers, employees completing fire watches or any other adjacent workers. As health and safety should be the top priority for all of these stakeholders, each should be considered in the welding exposure assessment plan.



An Evolving Body of Knowledge

Research into the effects of welding continues to change, so it's essential to consistently reevaluate your respiratory protection choices. The American Conference of Governmental Industrial Hygienists (ACGIH) recently updated its occupational exposure limits for certain metals found in welding fumes. While welding fumes as a whole are still under study, the research could have a significant impact in the construction industry. Two common metals found in construction welding fumes are manganese and hexavalent chromium. ACGIH has lowered the Threshold Limit Values (TLVs) of these metals significantly. See the "What are Manganese, Hexavalent Chromium, and Beryllium?" infographic for more information.

Hexavalent Chromium Hazards

Found naturally in the earth's crust, chromium is an element that poses a significant health hazard in welding. While it has many forms, its hexavalent form presents the greatest health risk to workers. Stainless steel welding can lead to hexavalent chromium fumes, which can become airborne during welding activities. Workers may also encounter this metal in certain paints, pigments, dyes and plastics. In the US, the OSHA PEL for construction for hexavalent chromium is 5 µg/m^3 8-hour time weighted average.[17] In Canada, occupational exposure limits for hexavalent chrome vary by local jurisdiction. In comparison, the ACGIH TLV is 0.2 µg/m^3 8-hour time weighted average. Workers should take precautions to account for hexavalent chromium when welding, spray painting, sanding, grinding or abrasive blasting.

Manganese Hazards

Manganese, a naturally occurring metal, is often used with steel to improve hardness and durability. Workers typically interact with manganese when using welding rods or filler metals. This type of metal can lead to harmful health effects during welding. When it's heated, it reacts with oxygen in the air and creates manganese oxide fumes—a dangerous compound that poses a real hazard to workers if too much is inhaled. Cutting, welding, grinding and polishing metal containing manganese can all lead to potential manganese exposures. Over long periods of time, overexposure to this metal can lead to serious health concerns. In 2013, the ACGIH (TLV- 8 hr TWA) for manganese changed. The previous TLV-TWA® of 0.2 mg/m^3 was decreased to 0.1 mg/m^3 for the inhalable fraction and 0.02 mg/m^3 for the respirable fraction. This is significantly lower than the US Federal OSHA PEL of 5 mg/m^3 for total dust.

Mn US OSHA Permissible exposure limit (PEL):
5.0 mg/m^3 of air

Mn Respirable ACGIH threshold limit value (TLV):
0.02 mg/m^3 of air

This is a graphical illustration constructed by 3M for the estimated annual dose of the manganese respirable fraction. The illustration is based on certain important assumptions. Learn more at: 3M.com/respmanganese

Eye Hazards

Electric arc welding can lead to unique hazards for workers' eyes, faces and respiratory systems. Some welding and cutting work create ultraviolet/infrared (UV/IR) radiation and intense visible light, which may lead to permanent eye damage. What's more, welding spatter and grinding particles can cause physical eye damage.

Burns on the retina or cornea are some of the most common eye injuries associated with welding work. Additionally, arc-eye can occur when a worker's eyes are exposed to UV radiation. These injuries typically occur when a worker is not wearing proper eye protection, or their welding helmet is in the up position as they accidentally strike an arc. Years of overexposure to these hazards may lead to retinal degeneration, cataracts and skin cancer. These optical radiation injuries are preventable when the proper protection is worn and used accordingly. As the intensity of light exposure varies with welding application, it is critical to choose welding PPE that provides the appropriate level of protection. Consult your local regulations or guidelines for assistance selecting the correct shade and eye protection, such as US Federal OSHA 29 CFR 1926.102 Eye and Face Protection, ANSI/ISEA Z87.1 and ANSI Z49.1.[18] The ANSI/ISEA Z87.1-2020 selection guide offers additional guidance on selecting proper eye protection during welding and grinding operations.[19] In Canada, consult CSA Z94.3 Eye and Face Protectors.

Physical eye damage, also known as foreign body eye injuries, can happen when dust, grinding swarf or weld spatter get into a welder's eyes. Penetrating foreign body injuries occur when metal particles travelling at a high rate of speed penetrate the outer layer of the eye. This type of injury may occur in the white membrane of the eye called the sclera, or in the dome-shaped tissue at front of the eye called the cornea. If a penetrating eye injury is not treated promptly, infections may occur which could lead to blindness.[20]

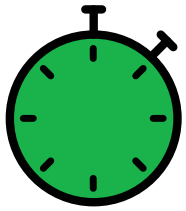
Noise Hazards

Welders have the highest prevalence of noise-induced hearing impairment among construction trades.[7] Pulsed and high-current welding processes, in addition to other sources, can lead to excessive noise exposure during welding operations. Activities such as carbon arc welding and gouging, TIG (pulsed), grinding and sanding may all lead to hazardous noise levels on a construction site.[21] Hearing and communication issues may arise when workers use hearing protection that is not appropriate for the exposures either below or above required levels. PPE that doesn't reduce hazardous noise to permissible levels can lead to hearing damage, while protective equipment that shuts out too much sound can impact a worker's ability to hear surrounding alarms and conversations.

Minutes of carelessness per day significantly reduces the effect of hearing protection.

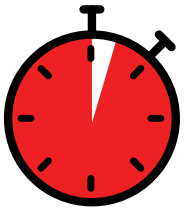
If you're in a harmfully loud workplace—at or above 85 decibels—then not wearing your hearing protection just 10% of the time significantly reduces your effective protection.[22] Noise-induced hearing loss is caused by the damage and eventual death of the sensory cells in your ears, called *hair cells*. Unlike some other cells, human ear hair cells never grow back.

Minutes matter: Use hearing protection 100% of time to achieve effective protection

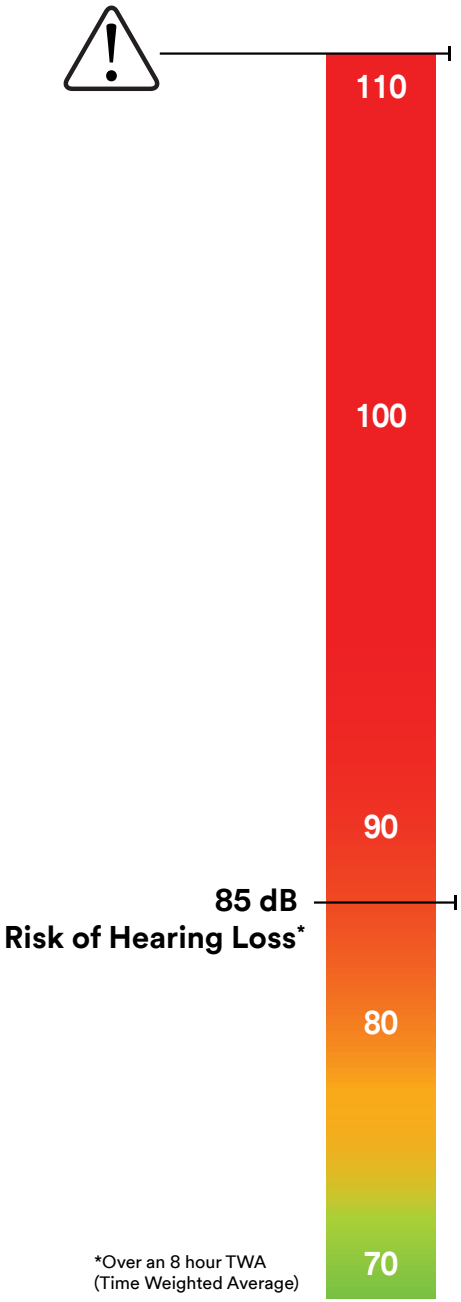


100% usage
Gives the expected protection

99% usage
Reduces protection



90% usage
Significantly reduces protection



Chain saw	110
Air arc gouging	110
Grader, scraper	107
Jackhammer	102
Bulldozer	100
Flame cutting	100
Plasma cutting	98
Concrete saw, electric grinder	98
Nail gun	97
Grinding	95
Flame gouging	95
MIG (GMAW)	95
Forklift	93
Belt sander	90
Backhoe	85
MMA (SMAW)	85
Framing saw	82
TIG	75

For more information visit the 3M Center for Hearing Conservation: www.3m.com/chc.

How to Reduce Welding Fumes

Welding can lead to an airborne mixture of gases and fumes (particles).[11, 12] Using a hierarchy of controls is the best approach to address these hazards and risks. The highest priority items on the hierarchy are the most effective in reducing fumes and worker exposure. They also place the least burden of responsibility on the welder. Remember that every welding fume control has specific limitations.

Priority		Controls[12]	Control Limitations
1	**Modify or Substitute a Welding Process**	Look for other processes that generate less fumes or reduce exposure to airborne contaminants.	It may not be possible to substitute a process or metal. An example would be when the end product requires stainless steel (chromium).
2	**Engineering Controls**	Modify enclosures around the welder, provide general ventilation of the work area (includes forced air and natural ventilation from drafts or outdoor work) or use local exhaust controls.	Ventilation can be difficult to achieve due to conflicting needs. For instance, providing enough local exhaust ventilation to remove the fumes while not disturbing shielding gases.
3	**Work Practices**	Ensure that the welder keeps their head out of the plume. For example, keeping the welder's head down wind of the plume.	Space restrictions may not allow a welder to move their head away from the plume.
4	**Personal Respiratory Protection**	When steps one through three don't reduce exposure enough, it is recommended to use respiratory protection.	Companies must establish a respiratory protection program in accordance with 29 CFR 1910.134 in the US that includes selection of respirators and their filters, training and maintenance. In Canada, ensure that the respiratory protection program meets CSA standards Z94.4 requirements and/or requirements of the applicable jurisdiction, as appropriate.

Take Action to Protect Worker Safety

If the results of workplace exposure assessments identify the presence of a respiratory hazard, construction companies must create a written respiratory protection program that aligns with the requirements of 29 CFR 1910.134. US Federal OSHA requirements and occupational exposure levels change over time, so construction companies need to continually review and update their respiratory protection program. The 3M Center for Respiratory Protection has a wide variety of helpful resources, including information for conducting assessments and selecting the necessary products to help protect against worksite respiratory hazards.

In Canada, ensure that the respiratory protection program meets CSA standards Z94.4 requirements and/or requirements of the applicable jurisdiction, as appropriate.

Each day in the US, about

2,000

workers

receive medical treatment due to eye injuries sustained at work.[25]

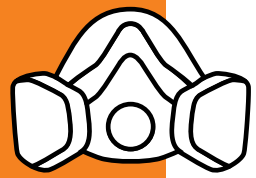
More than

90% **of serious eye injuries**

at work can be prevented by **using appropriate protective eyewear.**[26]

In the US in 2020,

inadequate respiratory protection



was the third most frequently cited workplace violation across all industries.[27]

Welding Protection

Welding helmets with filter lenses are designed to protect a worker's face and eyes from heat, spatter and radiation. When the helmet has an auto-darkening filter (ADF), even if the power is off the UV/IR bandpass filter is always in place and will provide protection from hazardous light radiation. This protection is maintained throughout the entire welding process. The American Welding Society reports several advantages of using ADFs, such as reducing the need to lift the welding helmet to see the work piece or arc zone, before, during and after striking the arc, resulting in less chances for eye injuries from arc rays or flying objects. Safety glasses must be worn under the helmet. Other advantages may include the potential for reduced ergonomic injuries since the need to nod the head to lower or raise the helmet is eliminated.[23] **Learn more** of the benefits of a 3M Welding powered air purifying respirator (PAPR) system.

Selecting PPE

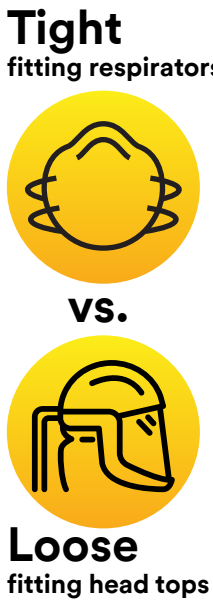
While arc/UV radiation and burn potential from welding might seem obvious, protecting workers' lungs and other vital organs is another critical consideration. Starting from an exposure assessment, analyze the varying hazards that will require PPE solutions and consider the protective equipment's specific fit-testing and inspection requirements. Integrated protection solutions have the potential to provide protection for multiple hazards in the same application. For example, a welding helmet may feature ADFs, hard hat protection, integrated grinding shields and mountable earmuffs. Be aware that some solutions also integrate a PAPR or supplied air respiratory (SAR) system. See the following guides for more information on selecting and maintaining welding respiratory protection.

Advantages of a well-designed welding helmet protective equipment include:

- A welding helmet with filter can protect a worker's face and eyes from heat, spatter and radiation
- Integrated respiratory protection to help protect against welding fumes
- Auto-darkening welding filters allow welders to keep their welding helmets in place much more often than passive welding filters, resulting in:
  - Reduced likelihood of accidental exposure to harmful UV/IR radiation by striking an arc or exposure to arcs of nearby welders
  - A lower potential for foreign body eye injuries from grinding swarf or weld spatter

Facial Hair Considerations

Many employees wonder if they can grow or keep facial hair when they're required to wear a respirator for their jobs. The answer to this question largely depends on the type of respirator the worker is using. Tight-fitting respirators require workers to be clean-shaven. Loose-fitting head tops may be an option for workers who have facial hair. These types of respirators can provide a more versatile PPE solution at construction sites, as employees won't necessarily need to shave their facial hair in order to wear the equipment. Check the manufacturer's instruction to determine the amount of hair allowed for loose fitting head tops. See the "Can Welders Grow Facial Hair" infographic for more information.



Eye Protection

Proper selection of eye and face protection for welding and grinding operations is crucial to help avoid eye injuries. Protection from optical radiation requires using welding filters. As the shade of the filter increases, the amount of protection from UV/IR light increases. Consult your local jurisdiction for guidance on selection of the proper shade. In the US, this includes 29 CFR 1926.102 Eye and Face Protection regulation, eyewear standard ANSI/ISEA Z87.1-2020 Selection Guide and American Welding Society fact sheet.[19,23,24] In Canada, consult CSA Z94.3. Welders have a choice between fixed shade filters and auto-darkening filters which cover multiple shades.

Grinding operations may result in flying particles, sparks, dust or fragments. The ANSI/ISEA Z87.1-2020 selection guide suggests the following types of eye and face protection for grinding and cutting operations:

- Spectacles with side protection
- Goggles with direct or indirect ventilation
- Faceshield worn over spectacles or goggles
- Welding helmet worn over spectacles or goggles
- Loose-fitting respirator worn over spectacles or goggles
- Full-facepiece respirator

When optical radiation (UV or IR light) is a concern, welding filters with the proper shade must also be worn.

Always wear ANSI Z87.1 approved safety spectacles or goggles as primary eye protection. Welding helmets are considered secondary eye protection.

PPE Backed by Science

Before you determine the specific PPE your crew needs for its welding or grinding operations, consider what goes into that equipment's performance. It's important to source PPE from a trusted company who uses science as a starting point for every product. 3M has spent 45 years developing PPE for a variety of construction site needs, including welding and grinding applications. By applying knowledge and insights from construction worksites, 3M develops welding and grinding PPE that can help improve safety outcomes. Explore the proven, science-based PPE solutions that construction crews across the globe use for worksite safety.

For welding For grinding

3M™ Speedglas™ 100 Welding Helmet

The Speedglas 100 Black Helmet with Auto-Darkening Filter 100V is good for Stick, MIG and most TIG welding processes. User selectable dark shades 8 through 12 and viewing area of 1.7 × 3.7 in. It has three user-selectable sensitivity levels for reliable arc detection and has excellent optical quality. For additional head protection use with 3M™ Speedglas™ 100 Hard Hat Adapter and 3M™ Cap Style H-700 Series Hard Hats. Pair with appropriate respiratory protection if needed. For up to 10 times the occupational exposure limit, consider a half face piece or filtering face piece respirator.

3M™ Speedglas™ FA III SAR V-100 Valve and Speedglas™ Welding Helmet 9100 MP

The 3M™ Speedglas™ 9100 MP Welding Helmet includes respiratory protection, a hard hat, optional hearing protection and flip-up weld shield. It can help protect the face from sparks and spatter, and the eyes from intense light during MIG, TIG and stick welding. ADF sold separately. The 9100 MP welding helmet offers an APF of 25. This supplied air respirator system features a belt mounted V-100 air cooling valve which lowers headgear temperature by up to 50°F(28°C). Optional hearing protection kit, 3M™ PELTOR™ Earmuff Assembly M-985.

3M™ Scott™ Weld-O-Vista Facepiece

When connected to an appropriate respiratory system, offers welders full facepiece respiratory protection against welding fumes, gases, vapors and other airborne particulates. The Weld-O-Vista utilizes a clear lens and flip up welding filter holder that accommodates a standard 2" X 4 1/4" welding filter. The Weld-O-Vista facepiece is compatible with 3M Scott's NIOSH approved Self-Contained Breathing Apparatus (SCBA), Supplied Air Respirators (SAR) and negative pressure Air-Purifying Respirators (APR).

3M™ Adflo™ Powered Air Purifying Respirator HE System with 3M™ Speedglas™ Welding Helmet 9100 MP

The 3M™ Adflo™ Powered Air Purifying Respirator (PAPR) and 3M™ Speedglas™ Welding Helmet 9100 MP with auto-darkening filter (ADF) offers the welder compact, lightweight respiratory protection and quality filter optics all-in-one. Head, eye, face, respiratory and optional hearing protection—we have the ability to integrate five types of welder protection into one easy-to-use system. ADF sold separately. The 9100 MP welding helmet has an APF of 25. The 3M Adflo PAPR features a lithium-ion battery, high efficiency particulate filter, spark arrester and wide leather belt. Audible and visual alarms signal low airflow and low battery charge. Optional hearing protection kit, 3M™ PELTOR™ Earmuff Assembly M-985.

3M™ Adflo™ PAPR and Versaflo™ M-Series Helmet Kit Speedglas™ Welding Shield

When used correctly, the 3M™ Adflo™ PAPR and Versaflo™ M-409SG Helmet Kit with Speedglas™ Weld Shield offers 1000 APF respiratory protection. The M-409SG includes a hard hat with visor and a flip-up weld shield, which can help protect the face from sparks and spatter. The auto-darkening filter (ADF) is essential PPE for skilled pros who need precision optics. Side windows in the welding helmet give each welder a wider viewing field to see more of their work area.

Respiratory Protection

For respiratory protection while welding in combination with a welding shield or while grinding with appropriate face protection:

3M™ Particulate Respirator 8214

The lightweight, disposable N95 particulate respirator is designed to help provide respiratory protection for certain non-oil particles in applications such as welding, soldering and other operations in which metal fumes may be present. The specially designed cake resistant filter media provides longer respirator life. The respirator incorporates 3M's proprietary technology with advanced electrostatically charged microfiber filter media, designed for ease of breathing. 3M™ Cool Flow™ Exhalation Valve helps release warm and moist exhaled breath from inside the respirator, and is suitable for physically demanding environments. Respirator offers foam face seal and adjustable straps.

3M™ Rugged Comfort Quick Latch Half Facepiece Reusable Respirator 6500 QL Series

This reusable respirator has a resilient silicone face seal. The facepiece features our proprietary quick latch design, which offers an easy, one-hand touch drop-down mechanism for putting the facepiece on and taking it off while in a non-contaminated area.

Pair with 3M™ Particulate Filter 2097/07184 or 3M™ Particulate Filter 7093

3M™ Half Facepiece Reusable Respirator 7500

This respirator uses an advanced silicone material that provides a softer feel on the face. A unique adjustment design helps reduce pressure points on the face for even more comfort. The exhalation valve cover directs exhaled breath and moisture downward while helping protect the valve area from debris while also making for easy cleaning.

Pair with 3M™ Particulate Filter 2097/07184 or 3M™ Particulate Filter 7093

3M™ Secure Click™ HF-800

Designed with smart and intuitive features, the 3M™ Secure Click™ Half Facepiece Reusable Respirator HF-800 Series is simple, comfortable and reliable. It comes with an optional speaking diaphragm which is designed to help provide easier communication while you work. The quick, easy, one-touch negative pressure push button seal check provides improved confidence in respirator fit. The innovative Secure Click connection provides wearers confidence that filters and cartridges are installed properly. Also, the Secure Click cartridges are dual-flow to allow easier breathing. Two dual-flow cartridges on each respirator combine to create the world's first quad-flow cartridge system with four airflow paths providing greater breathability and comfort.

Pair with 3M™ Secure Click™ Particulate Filter P100/D3097

Grinding Protection

For respiratory protection while grinding:

3M™ Full Face Piece Respirator - 6000 Series

Lightweight well-balanced design and silicone face seal for comfort, durability and ease of cleaning. The 3M™ Cool Flow™ Valve helps make breathing easier. These features combine to make a comfortable, practical and economical solution.

Pair with 3M™ Particulate Filter 2097/07184 or 3M™ Particulate Filter 7093

3M™ Versaflo™ Heavy Industry PAPR Kit TR-600-HIK

This system features loose-fitting headgear that eliminates fit testing and can accommodate certain limited facial hair. Face shields help provide eye and face protection, and hard hats additionally help provide head protection. In addition, employees with prescription safety eyewear can keep their glasses on under loose-fitting head tops.

Pair with:

3M™ Versaflo™ High Efficiency Filter TR-6710N

Designed to be used with our TR-600 and TR-800 Series Powered Air Purifying Respirators (PAPRs), these filters help provide respiratory protection from a broad range of airborne including certain particulates. Filters help protect against particles such as dust.

3M™ Adflo™ Powered Air Purifying Respiratory Systems for Welding and Grinding

Welding and Grinding

9100 MP

27-0099-35SW

Grinding Only

M-Series Helmet

M-307

Grinding Only

M-Series Helmet

M-407

Welding and Grinding

M-Series Helmet

M-407SG/409SG

SG-30W, SG-40W, SG-50W

SG-50W

35-5401-01

Nuisance Odor Pad must be used with HE filter, pre-filter and spark arrestor. Do not use alone. Do not use with the OV/AG cartridge.

Auto Darkening Filter is required for welding helmets, consider 3M™ Speedglas™ Welding Filter 9100V, 9100X, 9100XX or 9100XXi.

Mandatory Components

1 **HE Filter:** 15-0299-99X02, 15-0299-99X06, 15-0299-99X36

2 **Prefilter:** 15-0099-99X06, 15-0099-99X12

3 **Spark Arrestor:** 15-0009-99X02

Optional

OV Nuisance Odor Filters:

35-0699-99X01 Nuisance Odor Pad (OV) Assembly

35-0799-99X01 Nuisance Odor Pad (OV)

3M Supplied Air Respiratory Systems for Welding and Grinding

Welding or Grinding

9100 MP

27-0099-35SW

BT-20S, BT-20L, BT-30, BT-40, SG-30W, SG-40W + V-199 Adaptor

Grinding Only

Grinding Only

Welding or Grinding

M-Series Helmet

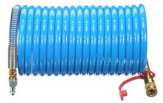
M-307/407 M-407SG/409SG

BT-20S, BT-20L, BT-30, BT-40, + V-199 Adaptor

Note: remember to consult rules on connecting air lines

3M™ High Pressure Supplied Air Hoses and Valves

W-9435-25/50/100



W-2929-25/50/100

V-100/200/300

3M™ Portable Compressed Air Filter and Regulator Panels

256-02-00

3M™ Low Pressure Supplied Air Hoses and Valves

W-3020-25/50/100

V-400 Valve

Auto Darkening Filter is required for welding helmets, consider 3M™ Speedglas™ Welding Filter 9100V, 9100X, 9100XX or 9100XXi.

Head, Eye and Face Protection:

Grinding operations may result in flying particles, sparks, dust, or fragments. The ANSI/ISEA Z87.1-2020 selection guide suggests the following types of eye and face protection for grinding and cutting operations: spectacles with side protection, goggles with direct or indirect ventilation, faceshield worn over spectacles or goggles, welding helmet worn over spectacles or goggles, loose-fitting respirator worn over spectacles or goggles, and full-facepiece respirators. In welding operations, ANSI Z87.1 requires the use of safety glasses in combination with all welding helmets which have a welding shield that can be flipped up. When optical radiation (UV or IR light) is a concern, welding filters with the proper shade must also be worn.

3M™ Solus™ CCS Series Protective Eyewear with Foam Gasket

The 3M™ Solus™ CCS Series eyewear includes the Corded Control System (CCS) temples. The versatile design helps keep eyewear and earplugs attached, untangled and ready to use, so your team has the convenient, comfortable protection they need to focus on the jobs at hand. All models feature 3M™ Scotchgard™ Protector Anti-fog coating. A foam gasket is optional with small vents in the gasket help minimize fogging.

3M™ Solus™ 1000 Series

These safety glasses feature a sporty low profile and are available in several frame colors and lens tints with Scotchgard™ Anti-fog Protector Coating. Models with TPE gasket help provide additional protection against debris with a flexible seal that adapts to wearer's face contours. When used in combination with strap, the eyewear helps provide splash and dust protection. With 3M™ Scotchgard™ Protector Anti-Fog Coating resists fogging longer than traditional anti-fog coatings through up to 25 washings with water* and helps provide scratch resistance in tough work environments.

3M™ GoggleGear™ 6000 Series Safety Goggles

With models featuring 3M™ Scotchgard™ Anti-Fog Coating, the 3M™ GoggleGear™ 6000 Series is a large profile goggle design that provides better fog and abrasion resistance when compared to traditional anti-fog coatings. All models are designed with indirect venting to help reduce fogging. Both adjustable nylon fiber cloth straps and neoprene straps are available to suit your comfort and style.

3M™ GoggleGear™ 500 Series Safety Goggles

Fogged lenses can be frustrating and dangerous, which is why 3M™ GoggleGear™ 500 Series Safety Goggles feature 3M™ Scotchgard™ Protector Anti-Fog Coating. This helps workers see clearly thanks to a formula that bonds the coating to the lens. Additionally, these low-profile goggles are D3 (droplet and splash) and D4 (dust) rated.

3M™ Faceshield Holder for Hard Hat H24M

Designed to be compatible with 3M™ Hard Hats, the 3M™ Hard Hat Faceshield Holders help securely mount a faceshield to your hard hat. Compatible with a variety of 3M™ W-Series Faceshields that help protect against impact, splash and/ or radiant heat. Consider pairing with the 3M™ Dual Coated Clear Polycarbonate Faceshield WCP96, 3M™ Clear Polycarbonate Faceshield WP96 standard polycarbonate or 3M™ Polycarbonate Faceshield Window W96IR5, 82706-10000, Shade 5.0. For workers requiring face protection, the 3M™ W-Series Faceshields offer optical clarity and high-performance durability in unpredictable environments that involve exposure to impact hazards and flying debris. It is recommended that protective eyewear be worn under faceshields at all times.

*Based on 3M internal testing per EN168 test method when compared with traditional anti-fog coatings.

Head Protection

3M™ H-700 Hard Hat with Uvicator™ Sensor

Designed to help protect a worker's head from impact, these adjustable hard hats feature a four-point ratchet or pinlock suspension system to deliver a comfortable, secure fit that helps reduce slippage. A UVicator™ sensor lets the wearer know when to replace hard hat due to UV exposure and integrated vents help release heat buildup and allow air circulation for enhanced comfort.

3M™ SecureFit™ X5000 Series Safety Helmets

Safety helmets are designed to help protect workers from small falling objects with the security of a chinstrap. This climbing-style helmet delivers all-day comfort without sacrificing security. Its suspension system incorporates exclusive patented Pressure Diffusion Technology to deliver comfort without compromise.

See the 3M Selection Guide for more options.

Hearing Protection

3M™ E-A-R™ Push-Ins™ Earplug

The 3M™ E-A-R™ Push-Ins™ Earplugs are designed for hearing protection on noisy construction jobs. Fitting stems help for an easier insertion of the earplugs even when wearing gloves and help keep the earplug clean for workers with dirty hands. No roll-down required–all it takes is a push to insert the soft foam eartip into the ear canal. The EARform™ eartip has a smooth surface to help it slide easily into the ear canal. Noise reduction rating (NRR) 28db. CSA Class AL.

3M™ PELTOR™ Welding Earmuff H505B, Behind-the-Head

The 3M™ Peltor™ Welding Helmet Earmuff H505B features a low-profile design that fits comfortably under most welding helmets, as well as a semi-soft cup surface that minimizes scratch sound transmission. The H505B earmuff helps reduce exposure to the moderate noise levels associated with welding, cutting or grinding. With a two-point suspension for balanced pressure distribution, this advanced earmuff delivers the comfortable protection that professionals need in a wide range of welding environments.

3M™ PELTOR™ Earmuff Assembly M-985

The M-985 Earmuff Assembly allows 3M™ Versaflo™ M-300 Series users to use headgear-mounted earmuffs. Includes one pair of Peltor™ H31 Earmuffs and hardware for mounting on the M-300 Series products.

3M™ PELTOR™ X4 Earmuffs X4P3E/37278(AAD), Hard Hat Attached

The 3M™ PELTOR™ X Series Earmuffs are designed for comfort and excellent noise reduction during tough jobs where loud sounds are frequent. Available in Over-the-Head, Hard Hat Attached, and Behind-the-Head models, they are designed to adapt the requirements of the work. Featuring an adjustable cup that angles

to help create a customized fit for the worker. Electrically insulated options available.

Fall Protection

3M™ Protecta® PRO™ Vest-Style Positioning Harness for Hot Work

With designs that incorporates improved fit, updated colors and durable yet lightweight construction, PRO™ harnesses provide greater comfort and added safety. Protecta® has many of the same features as higher priced equipment, such as ergonomic design, Heat-resistant and flame retardant Kevlar Fiber Webbing, impact indicators, serial numbers, steel hardware and options for specialized needs and budgets. Pair with appropriate connecting device and anchor.

Nano-Lok™ Edge Twin-Leg Quick Connect Self Retracting Lifeline

It features a combination of innovative lifeline material, energy absorption and harness connection to reduce the impact forces on the worker, and the shear forces on the lifeline, in a fall arrest event over a leading edge.

3M™ Protecta® Shock Absorbing Lanyard for Hot Work Use

For welding or metal cutting applications, these lanyards feature heat-resistant Kevlar® fiber webbing, a shock pack and 3,600 lb. (16 kN) gated hooks.

Rollgliss™ R550 Rescue and Descent Device

The Rollgliss™ R550 offers the choice of controlled descent rescue, evacuation or the versatility of assisted rescue with lifting capabilities. During assisted rescue scenarios, a fallen worker can be attached to the R550 device, raised to a point that allows their fall arrest device to be disconnected, then lowered to the ground safely.

Parts Pouch, Canvas Black

Innovative self-closure system traps objects inside, making it nearly impossible for objects to fall out once placed in the bag. It makes it easy to retrieve objects while you work at heights since no opening or closing is necessary. Compatible with most tool belts.

Body Protection:

3M™ Protective Coverall 4530

The 3M™ Disposable Protective Collared Coveralls 4530 are the coveralls that professionals look to for enhanced safety, functionality and long-lasting comfort. Built with secondary flame spread-resistant properties, our full-body suit features a comfortable design and enhanced construction for peace-of-mind on the job. Made from extremely lightweight and breathable material and is designed to offer protection against hazardous dusts and limited liquid splashes. The fabric complies with ISO 14116:2008 for limited flamespread index 1 (must be worn over an index 2 or 3 garment and must not be worn next to skin).

References

1. World Statistic. International Labour Organization, “World Statistic”. [Online]. Available: https://www.ilo.org/moscow/areas-of-work/occupational-safety-and-health/WCMS_249278/lang--en/index.htm. [Accessed 19 October, 2021].
2. 3M US, “Worker Health & Safety”. [Online]. Available: https://www.3m.com/3M/en_US/worker-health-safety-us/safety-resources-training-news/science-of-safety/. [Accessed 19 October, 2021].
3. G. Agricola, De natura fossilium, 1556.
4. B. Ramazzini, De Morbis Artificum Diatriba, 1713.
5. G. Markowitz and D. Rosner, “Workers, Industry, and the Control of Information: Silicosis and the Industrial Hygiene Foundation”, Journal of Public Health Policy, vol. 16, no. 1, pp. 29-58, 1995.
6. International Labour Organization, “Occupational health: Silicosis”, [Online]. Available: https://www.ilo.org/safework/areasofwork/occupational-health/WCMS_108566/lang--en/index.htm. [Accessed 12 October, 2021].
7. CPWR, “The Construction Chart Book (6th edition)”, February 2018. Chart 50f [Online]. Available: https://www.cpwr.com/wp-content/uploads/publications/The_6th_Edition_Construction_eChart_Book.pdf. [Accessed 16 September 2021].
8. Health and Safety Executive (HSE), “INDG463 –Control of exposure to silica dust – A guide for employees”, 2014. [Online]. Available: https://www.hse.gov.uk/pubns/indg463.pdf. [Accessed 19 October, 2021]
9. US Occupational Safety and Health Administration (OSHA), “OSHA’s Respirable Crystalline Silica Standard for Construction”, [Online]. Available: https://www.osha.gov/sites/default/files/publications/OSHA3681.pdf. [Accessed 9 August 2021].
10. ASSP, “OSHA Silica Enforcement: Behind the Statistics”, 27 June 2017. [Online]. Available: https://www.assp.org/news-and-articles/2018/06/27/osha-silica-enforcement-behind-the-statistics. [Accessed 15 September, 2021].
11. Centers for Disease Control and Prevention, “Welding Fumes”, [Online]. Available: https://www.cdc.gov/niosh/pel88/welding.html
12. Occupational Safety and Health Administration (OSHA), “Controlling Hazardous Fume and Gases during Welding”, March 2013. [Online]. Available: https://www.osha.gov/sites/default/files/publications/OSHA_FS-3647_Welding.pdf [Accessed 19 October, 2021].
13. International Agency for Research on Cancer Volume 118: welding, indium tin oxide, molybdenum trioxide. IARC Working Group, Lyon, France 21–28 March, 2017.
14. “Prevalence and association of welding related systemic and respiratory symptoms in welders,” Occupational & Environmental Medicine, El- Zein M., Malo J-L., Infante-Rivard C., Gautrin D., 2003;60:655-661. https://oem.bmj.com/content/oemed/60/9/655.full.pdf
15. Canadian Centre for Occupational Health & Safety https://www.ccohs.ca/oshanswers/safety_haz/welding/fumes.html Table 1: Source and health effect of welding fumes
16. Occupational Safety and Health Administration (OSHA), “Controlling Hazardous Fumes and Gases during Welding,” OSHA Fact Sheet, U.S. Department of Labor, DSG FS-3647, March, 2013.
17. Occupational Safety and Health Administration (OSHA), “Safety and Health Regulations for Construction: Toxic and Hazardous Substances: Chromium (VI)”, [Online]. Available: https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.1126. [Accessed 6 October 2021].
18. American Welding Society, “Safety in Welding, Cutting, and Allied Processes”, July 2021. [Online]. Available: https://www.aws.org/library/doclib/AWS-Z49-2021.pdf. [Accessed 19 October, 2021].
19. International Safety Equipment Association, “Eye and Face Protection Selection Tool”, 2020. [Online]. Available: https://safetyequipment.org/wp-content/uploads/2020/04/Eye-and-Face-Selection-Guide-tool.pdf. [Accessed 19 October, 2021].
20. Chicago Medicine, “Eye Trauma”. [Online]. Available: https://chicago.medicine.uic.edu/departments/academic-departments/ophthalmology-visual-sciences/our-department/media-center/eye-facts/trauma-to-the-eye-test/. [Accessed 14 October, 2021].
21. Health and Safety Executive, “Health risks from welding”. [Online]. Available: https://www.hse.gov.uk/welding/health-risks-welding.htm. [Accessed 14 October, 2021].
22. National Institute on Deafness and Other Communication Disorders, “Noise-Induced Hearing Loss”. [Online]. Available: https://www.nidcd.nih.gov/health/noise-induced-hearing-loss. [Accessed 17 November, 2021].
23. Occupational Safety and Health Administration (OSHA), “Standard number 1926.102 – Eye and face protection”. [Online]. Available: https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.102. [Accessed 14 October, 2021].
24. American Welding Society, “Eye and Face Protection for Welding and Cutting Operations”, October 2019. [Online]. Available: https://www.aws.org/library/doclib/fs31-201404.pdf. [Accessed 14 October, 2021].
25. National Eye Institute (NEI), “Preventing Work-Related Eye Injuries”, [Online]. Available: https://www.nei.nih.gov/sites/default/files/2019-05/HVMPreventingInjuries_Tagged.pdf. [Accessed 5 October 2021].
26. Prevent Blindness, “Eye Safety at Work”, 2021. [Online]. Available: https://advocacy.preventblindness.org/preventing-eye-injuries/#1585701834003-65402908-aa1a. [Accessed 22 September, 2021].
27. Occupational Safety and Health Administration (OSHA), “Top 10 Most Frequently Cited Standards”, 2020. [Online]. Available: https://www.osha.gov/top10citedstandards. [Accessed 22 September, 2021].

Always consult the User Instructions for any personal protective equipment you are using and follow local laws and regulations.

Hearing and PELTOR

⚠ WARNING

These hearing protectors help reduce exposure to hazardous noise and other loud sounds. Misuse or failure to wear hearing protectors at all times that you are exposed to noise may result in hearing loss or injury. For correct use, consult supervisor and User Instructions, or call 3M PSD Technical Service in the USA at 1-800-665-2942. In Canada, call 1-800-267-4414. 3M PSD products are for occupational use only.

⚠ WARNING

U.S. EPA specifies the NRR as the measure of hearing protector noise reduction. However, 3M makes no warranties as to the suitability of the NRR for this purpose. 3M strongly recommends personal fit testing of hearing protectors. Research suggests that users may receive less noise reduction than indicated by the attenuation label value(s) on the packaging due to variation in fit, fitting skill, and motivation of the user. Refer to applicable regulations or guidance on how to adjust attenuation label values. It is recommended that the NRR be reduced by 50% to better estimate typical protection.

Eye Protection

⚠ WARNING

These eye or face protection products help provide limited eye and face protection. Misuse or failure to follow warning and instruction may result in serious potential injury, including blindness or death. For proper use, selection and applications against flying particles, optical radiation and/or splash see supervisor, read User Instructions and warning on the package or call 3M PSD Technical Service in the USA at 1-800-243-4630. In Canada, call 1-800-267-4414. 3M PSD products are for occupational use only.

Head Protection

⚠ WARNING

3M Head and Face Products provide limited protection only. Misuse or failure to follow warnings and User Instructions may result in serious personal injury or death. For proper use, see supervisor, User Instructions, or call 3M Personal Safety Division Technical Assistance at 800-243-4630.

Fall Protection

⚠ WARNING

Compliant fall protection and emergency rescue systems help prevent serious injuries associated with fall events. Users must read and understand the User Instructions provided with the product, and must be properly trained by their employers in the safe use of these systems before using them, per OSHA 1910.140 and 1926.503 or applicable local standards. Misuse or failure to follow warnings and instructions may result in serious personal injury or death. For proper use, see supervisor, User Instructions, or call 800-328-6146 (Opt. 1).

Respiratory Protection

⚠ WARNING

These respirators help to protect against certain airborne contaminants. Before use, the wearer must read and understand the User Instructions provided as part of the product packaging. A written respiratory protection program must be implemented meeting all the requirements of OSHA 1910.134 including training, fit testing and medical evaluation. In Canada, CSA standards Z94.4 requirements must be met and/or requirements of applicable jurisdiction, as appropriate. Improper use may result in sickness or death. For correct use, see supervisor and User Instructions, or call 3M PSD Technical Service in USA at 1-800-243-4630 and in Canada at 1-800-267-4414.

Welding Safety

⚠ WARNING

This product is designed to help protect the wearer's eyes and face from harmful radiation including visible light, ultra-violet radiation (UV), infra-red radiation (IR), sparks and spatter resulting from welding processes. These products must be used only by qualied persons who are properly trained in their use and maintenance. Misuse may result in permanent eye injury and vision loss. Always wear ANSI Z87.1 compliant safety spectacles in addition to any welding helmet. For correct use, see supervisor and User Instructions, or call 3M PSD Technical Service in U.S.A at 1-800-243-4630 and in Canada at 1-800-267-4414.

Coveralls

Final determination as to the suitability of these products for a particular situation is the employer's responsibility. This information is subject to revision at any time. Always read and follow all User Instructions supplied with your 3M™ Protective Coveralls in order to ensure correct operation. If you have any questions, contact 3M Technical Service.

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