Eye injury prevention

MISSION: ZERO

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Introduction

Eye injuries are 100 per cent preventable, yet they account for a number of workplace injuries in Saskatchewan.

The purpose of this guide is to outline an employer's duties in preventing eye injuries and to explain:

- the risk factors;
- when eye and face protection and other control measures are required;
- how to choose "suitable" and "approved" eye and face protection when required; and
- how to recognize and treat eye injuries.

The Occupational Health and Safety Regulations, 2020 (regulations) require an employer to supply approved eye and/or face protectors and ensure workers use them in workplaces where workers' eyes may become irritated or injured from flying particles, splashes, ultraviolet (UV) or infrared radiation (IR).

See Appendix 1 for a listing of regulations that are relevant to preventing eye injuries.

Risk factors

Who is at risk?

In Saskatchewan, welders account for the greatest proportion of eye injuries. Workers who perform tasks that generate flying particles (e.g. grinding, sanding, cutting, chiseling, hammering, sawing, smelting, etc.) are also at high risk of sustaining an eye injury.

The highest proportion of eye injuries occurs in the manufacturing and construction sectors. Across all sectors, high-risk activities include drilling, spraying or mixing.

Typically, males and employees under the age of 30 account for the majority of eye injury claims.

How do they occur?

Once engineering controls have been established, review those controls on a regular basis to ensure they are still in compliance with regulations and to identify if better solutions become available.

Administrative controls

Administrative controls, such as the following, also need to be considered:

- Removing a substance from the workplace (e.g. chemical) or substituting it with something less hazardous.
- Good preventive maintenance procedures on certain tools (e.g., chisels, hammers) to lessen the potential of metal fragments being dislodged.
- Keeping workers at a distance from an eye hazard, such as radiation.

[2] According to *The Saskatchewan Employment Act* (section 3-1(1)(z)), "reasonably practicable" means practicable unless the person on whom a duty is placed can show that there is a gross disproportion between the benefit of the duty and the cost, in time, trouble and money, of the measures to secure the duty.

Personal protective equipment — eye and face protection

Eye and face protection can be used:

- to supplement more effective controls, or
- when more effective controls are not reasonably practicable. For example, constructing an expensive enclosure on a dust-generating procedure may not be reasonably practicable if it is only done once a year during a shutdown.

Safe work procedures

All control measures must be integrated into well-developed and implemented safe work procedures and training. This is critical to preventing eye injuries.

Additional control measures for radiation hazards

The Radiation Health and Safety Regulations, 2005 (see excerpt in Appendix 2) set out the requirements with respect to radiation hazards, including requirements for a laser to have a label indicating its classification and the corresponding hazard. These regulations also set out the qualifications required to operate lasers. More information on lasers can be found at www.ccohs.ca/topics/hazards/workplace/lasers/.

Choosing suitable and adequate eye and face protection

1. Identify hazards

Survey the workplace to determine which eye hazards exist. Ask questions such as:

- Does the operation have the potential to generate dust, flying particles, molten metal, or chemical splashes?
- Is UV and/or IR radiation exposure a concern?
- Check labels, safety data sheets (SDS) and other information sources to determine if a substance or radiation source presents a hazard to the eyes. For example:
    - Can it have toxic, corrosive or irritative effects on the eyes?
    - Does it produce easily recognized acute effects or hard to recognize cumulative or chronic effects that develop over time?
    - Can it penetrate or be absorbed into the eyes?

2. Assess the risks

Assess the likelihood of workers coming into contact with the hazard and the nature and extent of the consequences, considering how the work is done. For example:

- Are any particles, gases, vapours or radiation hazards likely to reach workers' eyes?
- Is the risk restricted to the eyes or does the rest of the face and/or the respiratory passages also need protection?
- Can workers in the vicinity of radiation or another hazard be exposed to a harmful extent?

Where the assessment indicates a need for eye or face protection to supplement the use of other controls, or where used alone, the employer needs to select appropriate and adequate approved protection. Where eye protection is being relied upon it must be suitable and approved eye protection[3]. This is required by Sections 1-2(1) and 7-8 of the regulations.

[3] "Approved" is defined as follows in Section 1-2(1) of the Regulations:
(a) approved by an agency acceptable to the director for use in accordance with any terms and conditions determined by the agency; or
(b) approved by a certificate of the director subject to any terms and conditions the director considers appropriate;

In Saskatchewan, safety eyewear is considered approved if the supplier indicates that it meets the most recent edition of the standard CSA (Canadian Standards Association) *Z94.3 Eye and Face Protectors.* Check regularly with the CSA for updates. Please note that the Director of Occupational Health and Safety may in certain circumstances conditionally "approve" eyewear that does not meet the most current CSA standard.

Highlights of the most recent (2020) edition of CSA *Z94.3:20*, include:

- Addition of lasers and arc flash hazards and provisions for protection.
- Revised optical requirements for plano eyewear with non-prescription reading segments.
- Revised specifications for headform used for impact and penetration tests.
- Updated Table 5 outlining provisions for types of lenses presumed to be compliant with this standard.
- Clarification of the points of impact for face shields and welding protectors.

3. Selecting eye and face protection based on the hazard

The following information indicates what is suitable and approved eye protection based on the type of hazard. See Figure 1 on pages 17-19 for illustrations of the various types of eye and face protective equipment.

Refer to Table 6 of CSA standard *Z94.3.1-16 Guideline for the selection, use, and care of eye and face protectors* for more information.

Under no circumstances are regular eyeglasses to be considered a substitute for approved eye protection. In environments where industrial eye protection is required, contact lenses should not be worn, except under special medical circumstances. If an individual's medical circumstances require that contact lenses be worn in such environments, eye protection must also be used.

Shade selection for welding helmets

Although personal preference should be taken into account, shade selections need to meet CSA *Z94.3:20.*

Table C.1
Recommended shade numbers for arc welding and allied processes

Operation	Current in amperes													
	0.5	2.5	10	20	40	80	125	175	225	275	350	450		
	1.0	5.0	15	30	60	100	150	200	250	300	400	500		
SMAW (covered electrodes)	7					8		10		11				
GMAW (MIG)	7					10		10		10				
GTAW (TIG)	8					8		10						
Air carbon arc cutting	10													
Plasma arc cutting				8						9		10		
Plasma arc welding	6			8			10					11		
	1.0	5.0	15	30	60	100	150	200	250	300	400	500		

Notes:

1) *For other welding processes (e.g., laser welding, electron beam welding), consult the manufacturer for eye protection recommendations.*
2) *For pulsed GMAW (MIG), use peak current for selecting the appropriate shade number.*
3) *For underwater welding, the minimum shade number shown might not apply.*
4) *See Table 1 for description of shade number.*

Maintenance of eye and face protective equipment

To help prevent injuries, employers need to ensure eye and face protective equipment is maintained and stored in a way that limits scratching and dirt build-up. Dirty or scratched protectors will inhibit the field of view, and this may result in workers not using them or removing them.

It is especially important that gold welding shades be frequently inspected, as they are prone to scratching. Small scratches on the surface of these shades allow for UV radiation to penetrate, exposing the worker to harmful radiation. Scratched gold shades must be replaced immediately.

Refer to the CSA standard *Z94.3.1-16 Guideline for the selection, use, and care of eye and face protectors* for more information.

Recognizing and treating eye injuries

Employers need to inform workers of the nature and degree of eye hazards and how to recognize symptoms. Some of this information can usually be found on the safety and data sheets (SDS).

Employers need to ensure written emergency response procedures are in place. Employers also need to ensure emergency supplies and equipment, as well as first aid personnel and supplies, are provided and readily available. Workers must be trained on what to do in the event of an eye injury and their role in responding to eye injuries of co-workers.

Immediate attention to an eye injury is crucial and can prevent serious and permanent damage.

Chemical splashes

Eyes exposed to chemical splashes must be immediately flushed at an eye wash station with large volumes of lukewarm water for at least 15-20 minutes. In Saskatchewan workplaces, employers are required to provide, at readily accessible locations, approved equipment to flush the eyes where they may be risk of eye injury from corrosive or other substances. Approved eye wash equipment means it meets the requirements set out by the American National Standards Institute (ANSI) Standard for Emergency Eyewash and Shower Equipment. See *Emergency Showers and Eyewashes in the Workplace* for more detailed information.

Longer flushing times (60 minutes) may be required with severe alkali or acid burns. Seek medical attention as soon as possible. A portable eye wash bottle should be used to continuously flush the worker's eyes while on the way to a hospital or other medical facility. These bottles can also be distributed throughout the workplace to use on the way to an eyewash station.

Flying particles

If a particle is small and loose, it may be removed by gently flushing the eye with large volumes of water as described on the previous page. In some rare cases, a particle may be flushed out by tears. If the object cannot be removed through flushing, or is embedded in the eye, make sure that nothing touches the eye. Cover the eye appropriately and take the worker to a hospital.

Radiation

Welder's flash is the most common eye injury resulting from exposure to radiation produced during welding operations. It can also result when workers' eyes are exposed to direct sunlight, (or reflection off of water or snow) or radiation from certain types of lamps (e.g. tanning lamps, photographer's flood lamps). The onset of symptoms is usually seen within six to eight hours after exposure and may include light sensitivity, a grainy feeling over the eyes, watering, blurred vision and pain. Medical treatment should be sought at the hospital and includes the use of anesthetic drops and eye dressings.

Exposure to IR radiation from high heat sources (e.g., molten metal) may cause severe, irreversible burns to the eye. In the event of this type of injury, apply ice and take the worker directly to the hospital. Exposure to UV and IR radiation can, over the long term, result in cataract formation.

Lasers that emit visible or near infrared light can damage the retina. If the wavelength of the laser's beam is in the far infrared or ultraviolet regions of the spectrum, the damage affects the cornea and lens.

Respiratory protective devices and eye protection

Certain tasks or substances that are hazardous to the eyes can also be hazardous to the respiratory tract or skin. For example, some of these tasks may also result in workers inhaling gases, vapours, mists, fumes or other particles that can cause injury to the lungs.

Refer to the SDS first. It will give specific information about the chemical and the proper respiratory protective devices. Most often the SDS will refer to the CSA standard.

See CSA standard Z94.3:20 to determine if the respiratory protective device you need also meets the standard for approved eye protection. Section 11 of the standard discusses respiratory facepieces.

Protecting workers in the vicinity

When assessing the hazard and risk to workers, it is important to assess the risk of exposure to workers in adjacent areas as well. If there is a reasonable likelihood of exposure to chemicals, particles, UV and IR radiation or lasers, the employer must also ensure the protection of these workers.

Other considerations

Workers exposed to harmful radiation should consult their physician and receive regular eye examinations.

Appendix 1. *The Occupational Health and Safety Regulations, 2020* for Eye Protection

Please note: regulations set out the minimum requirements that must be met. It is recommended to always adopt the most recent edition of the standards.

General responsibilities

Use of equipment required
7-1(1) If it is not reasonably practicable to protect the health and safety of workers by design of the plant and work processes, suitable work practices or administrative controls, an employer or contractor shall ensure that every worker wears or uses suitable and adequate personal protective equipment.

(2) If personal protective equipment will not effectively protect a worker, an employer or contractor shall, if reasonably practicable, provide alternative work arrangements for that worker.

General responsibilities
7-2(1) If an employer or contractor is required by these regulations or any other regulations made pursuant to the Act to provide personal protective equipment, the employer or contractor shall:

(a) supply approved personal protective equipment to the workers at no cost to the workers;

(b) ensure that the personal protective equipment is used by the workers;

(c) ensure that the personal protective equipment is at the worksite before work begins;

(d) ensure that the personal protective equipment is stored in a clean, secure location that is readily accessible to workers;

(e) ensure that each worker is aware of the location of the personal protective equipment and trained in its use;

(f) inform the workers of the reasons why the personal protective equipment is required to be used and of the limitations of its protection; and

(g) ensure that personal protective equipment provided to a worker:

  (i) is suitable and adequate and a proper fit for that worker;

  (ii) is maintained and kept in a sanitary condition; and

  (iii) is removed from use or service when damaged.

(2) If an employer or contractor requires a worker to clean and maintain personal protective equipment, the employer shall ensure that the worker has adequate time during normal working hours without loss of pay or other benefits for this purpose.

(3) If reasonably practicable, an employer or contractor shall make appropriate adjustments to the work procedures and the rate of work to eliminate or reduce the danger or discomfort to the worker that may arise from the worker's use of personal protective equipment.

(4) A worker who is provided with personal protective equipment by an employer or contractor shall:

(a) use the personal protective equipment; and

(b) take reasonable steps to prevent damage to the personal protective equipment.

(5) If personal protective equipment provided to a worker becomes defective or otherwise fails to provide the protection it was intended for, the worker shall:

(a) return the personal protective equipment to the employer or contractor; and

(b) inform the employer or contractor of the defect or other reason why the personal protective equipment does not provide the protection that it was intended to provide.

(6) An employer or contractor shall immediately repair or replace any personal protective equipment returned to the employer or contractor pursuant to clause (5)(a).

Eye and face protectors

7-8(1) If there is a risk of irritation or injury to the face or eyes of a worker from flying objects or particles, splashing liquids, molten metal or ultraviolet, visible or infrared radiation, an employer or contractor shall provide industrial eye or face protectors and require the worker to use them.

(2) If an industrial eye or face protector is required by these regulations to be provided or used, the industrial eye or face protector must be approved.

(3) An employer or contractor shall take all reasonable steps to ensure that a worker does not perform electric arc welding if another worker may be exposed to radiation from the arc, unless the other worker is using a suitable industrial eye protector or is protected from the radiation by a suitable screen.

(4) A worker shall not perform electric arc welding if another worker may be exposed to radiation from the arc, unless the other worker is using a suitable industrial eye protector or is protected from the radiation by a suitable screen.

Eye flushing equipment

21-12 If there may be a risk to the eyes of a worker from corrosive or other harmful substances, an employer or contractor shall provide, at readily accessible locations, approved equipment to flush the eyes of the worker with lukewarm water or another appropriate liquid.

Appendix 2. *The Radiation Health and Safety Regulations, 2005,* for protection from ultraviolet and laser radiation

PART III
Non-ionizing radiation
DIVISION 1
Ultraviolet radiation

Exposure limits to ultraviolet radiation — general

20(1) In any place of employment where an occupational worker may be exposed to ultraviolet radiation from ultraviolet radiation equipment or industrial processes, the owner of the equipment or process must ensure that exposure from the equipment or industrial processes is limited to levels listed under "Ultraviolet Radiation" of the *Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices (2003),* published by the American Conference of Governmental Industrial Hygienists (ACGIH).

(2) If the spectral composition of the radiation is not known, the owner of the equipment must ensure that the total radiant exposure of an occupational worker's unprotected eyes or skin in any period of eight hours does not exceed 30 joules per square metre.

(3) For the purposes of subsection (2), an exposure for eight hours to a maximum continuous irradiance of one milliwatt per square metre is deemed to be equal to a total radiant exposure of 30 joules per square metre.

(4) In any place where a member of the public may be exposed to ultraviolet radiation from ultraviolet radiation equipment, the owner of the equipment must ensure that the total radiant exposure of a member of the public does not exceed the exposure limits for occupational workers established by this section.

(5) Subsection (4) does not apply with respect to persons who:

(a) voluntarily undergo exposure to ultraviolet radiation in a commercial tanning salon; or

(b) receive exposure to ultraviolet radiation in the course of diagnosis or treatment carried out by or under the direction of a duly qualified medical practitioner.

Exposure limits to ultraviolet radiation – photosensitivity

21(1) If the conditions at a place of employment may lead to chemically-induced photosensitivity in an occupational worker, the owner of ultraviolet radiation equipment must ensure that the exposure to ultraviolet radiation of the occupational worker's eyes or skin, in any period of eight hours, does not exceed the values that are recommended by the chief occupational medical officer.

(2) Values recommended by the chief occupational medical officer for the purposes of subsection (1) must not exceed the values mentioned in section 20.

(3) If an owner of ultraviolet radiation equipment knows or ought to know that an occupational worker shows inherited photosensitivity to ultraviolet radiation or is under treatment with a photosensitizing drug, the owner must ensure that:

(a) the worker's exposure to ultraviolet radiation is limited in accordance with the advice of a duly qualified medical practitioner; or

(b) the worker is issued with any eye and skin protection that is specified by:

(i) a duly qualified medical practitioner; or

(ii) an officer.

Protection where exposure limits cannot be complied with

22 If the exposure limits set out in section 20 and subsection 21(1) cannot be complied with, an owner of ultraviolet radiation equipment must issue to each occupational worker whose exposure to ultraviolet radiation may exceed those limits:

(a) any eye and skin protection that is specified by:

(i) a duly qualified medical practitioner; or

(ii) an officer; and

(b) if required by an officer, a personal monitoring device to evaluate the exposure of the worker to ultraviolet radiation.

DIVISION 2
Laser Radiation

Laser classification

25 The owner of a laser or laser device must ensure that the laser or laser device is installed, operated, labelled and maintained in accordance with American National Standards Institute *(ANSI) Z136.1-2000, Safe Use of Lasers;* and

(a) if the laser or laser device is a medical laser in a health care facility, the laser or laser device is installed, operated, and maintained in accordance with American National Standards Institute *(ANSI) Z136.3-2004, Safe Use of Lasers in Health Care Facilities;* or

(b) if the laser or laser device is part of an optical fiber communication system utilizing laser diode and LED sources, the laser or laser device is installed, operated, and maintained in accordance with American National Standards Institute *(ANSI) Z136.2-1997, Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources.*

Duty to inform

26 An owner of a laser or a laser device must:

(a) fully inform all occupational workers who may be exposed to radiation from a laser or laser device of class 2, 3a, 3b or 4 as to the hazards of this radiation under the conditions of use; and

(b) without limiting the generality of clause (a), draw the attention of the occupational workers to the viewing restrictions that are indicated on the laser classification label.

Exposure to class 3 or 4 lasers

27 The owner of a class 3 or class 4 laser or laser device must ensure that no part of the body of any person is deliberately exposed to the direct beam of the laser except under the direction of:

(a) a duly qualified medical practitioner;

(b) a dentist who is licensed pursuant to *The Dental Disciplines Act;*

(c) a chiropractor who is registered pursuant to *The Chiropractic Act, 1994;*

(d) a physical therapist who is registered pursuant to *The Physical Therapists Act, 1998;*

(e) a certified athletic therapist who is registered with the Saskatchewan Athletic Therapists Association; or

(f) in the case of a non-medical laser procedure, a person who:

(i) has been formally trained to carry out the procedure for which the laser or laser device is to be used; and

(ii) can demonstrate to the satisfaction of an officer his or her knowledge of the equipment, the biological effects associated with its use, and the necessary safety procedures.

Qualifications of operators

28 The owner of a class 3b or class 4 laser or laser device must ensure that each operator of the laser or laser device:

(a) is:

(i) a duly qualified medical practitioner;

(ii) a dentist who is licensed pursuant to *The Dental Disciplines Act;*

(iii) a veterinarian who is registered pursuant to *The Veterinarians Act, 1987;*

(iv) a physical therapist who is registered pursuant to *The Physical Therapists Act, 1998;*

(v) a chiropractor who is registered pursuant to *The Chiropractic Act, 1994;* or

(vi) a certified athletic therapist who is registered with the Saskatchewan Athletic Therapists Association;

(b) works under the direct supervision of a person described in clause (a); or

(c) is, in the case of a non-medical laser, a person who:

(i) has been formally trained to carry out the procedures for which that laser or laser device is to be used; and

(ii) can demonstrate to the satisfaction of an officer his or her knowledge of the equipment, the biological effects associated with its use and the necessary safety procedures.

Figure 1. Examples of eye and face protectors

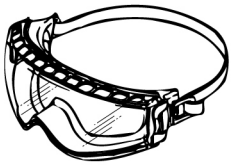
(See Clauses 5.2–5.8.)

Examples of Class 1 — Spectacles

Class 1A
Spectacles with side protection

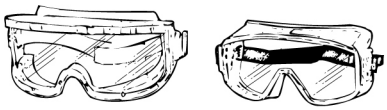
Class 1B
Spectacles with side and non-ionizing radiation protection

Examples of Class 2 — Goggles

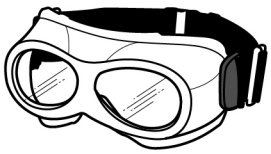


Class 2A
Direct ventilated goggles

Class 2B
Indirect ventilated goggles

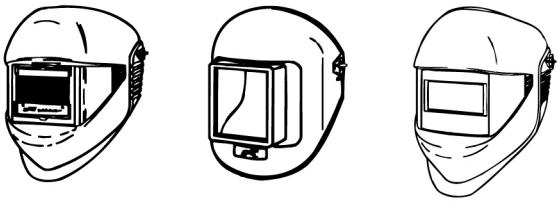


Class 2C
Direct/non-ventilated goggles with non-ionizing radiation protection

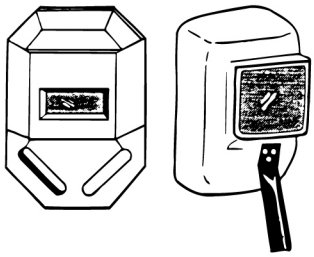


Class 2D and 2E Laser-protective goggles

Examples of Classes 3 and 4 — Welding helmets and hand shields



Class 3
Welding helmets



Class 4
Welding hand shields

(Continued)

Examples of Class 5 — Hoods

Class 5A	Hood with impact-resistant window
Class 5B	Hood for dust, splash, and abrasive materials protection
Class 5C	Hood with non-ionizing radiation protection
Class 5D	Hood for high-heat applications
Class 5E	Hood for electric arc protection

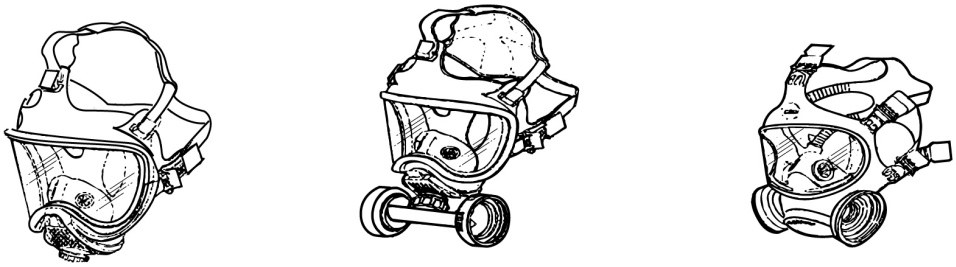
Examples of Class 6 — Face shields

Class 6A	Face shield for impact and splash protection
Class 6B	Face shield for non-ionizing radiation protection
Class 6C	Face shield for high-heat application
Class 6D	Face shield for electric arc protection

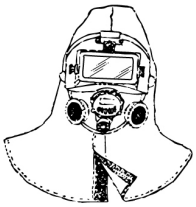
(Continued)

Figure 1 (Concluded)

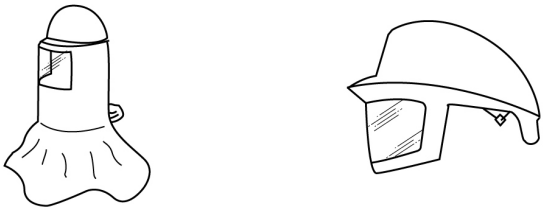
Examples of Class 7 — Respirator facepieces



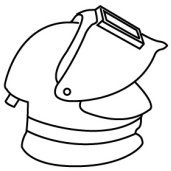
Class 7A
Respirator facepiece for impact and splash protection



Class 7B
Respirator facepiece for non-ionizing radiation protection



Class 7C
Respirator facepiece with loose-fitting hood or helmet



Class 7D
Respirator facepiece with loose-fitting hood or helmet for non-ionizing radiation protection

Note: *Total coverage includes lens, eyewire rim, and lateral protection lip to the outside edge of the frame.*

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