

Ultraviolet radiation



Exposure to ultraviolet (UV) radiation is a concern in many workplaces. UV radiation exposure can cause serious health problems, including cancer, immune system suppression, eye damage and premature skin aging.

What is UV radiation?

UV radiation is part of the light spectrum, just beyond what the human eye can see. It has a shorter wavelength than visible light, which means it carries more energy. Energy with shorter wavelengths is more likely to damage the human body.

Most UV radiation exposure comes from the sun. Workers may also be exposed to artificial UV radiation from welding equipment, germicidal lamps, sunlamps, bactericidal lamps and high-energy lasers.

There are three types of UV radiation:

Long-wave (UVA)

- Reaches Earth's surface in large amounts
- Causes long-term skin damage and aging
- Passes through glass
- Increases the risk of skin cancer

Medium-wave (UVB)

- Partly blocked by the atmosphere
- Damages the skin and increases cancer risk
- Causes sunburn

Short-wave (UVC)

- Blocked by the atmosphere
- Workers exposed through artificial sources
- Can cause burns and skin cancer

The amount of UV radiation that reaches Earth depends on:

- Time of day
- Sun angle
- Cloud cover
- Reflective surfaces like snow, water, sand and concrete

When the sun is low in the sky, its rays hit the earth at an angle. They must travel farther to reach the ground, so less UV radiation reaches the surface. When the sun is overhead, the rays travel a shorter distance, so more UV radiation gets through.

UV radiation levels are usually highest between 11 a.m. and 3 p.m. during summer.

UV index

The UV index measures the intensity of UV radiation. It ranges from 0 to 11+. As the number increases, stronger protection is needed.

0–2 (low)

- Minimal protection required
- Wear sunglasses on bright days
- If outside more than one hour, cover up and use sunscreen
- Snow reflection can nearly double UV radiation strength

3–5 (moderate)

- Take precautions
- Wear a hat, sunglasses and sunscreen if outside 30 minutes or more
- Look for shade near midday

6–7 (high)

- Protection required
- UV radiation damages skin and causes sunburn
- Reduce sun exposure between 11 a.m. and 3 p.m.
- Seek shade and wear full protection

8–10 (very high)

- Extra precautions required
- Unprotected skin burns quickly
- Avoid the sun between 11 a.m. and 3 p.m.
- Seek shade and wear full protection

11+ (extreme)

- Full precautions required
- Unprotected skin can burn within minutes
- Avoid the sun between 11 a.m. and 4 p.m.
- Bright surfaces increase exposure

Health effects of UV radiation exposure

Exposure to UV radiation can damage the skin, eyes and immune system. Damage can happen quickly or build up over time.

Sunburn

Sunburn is a common injury caused by UV radiation exposure. Most sunburns result from sunlight, but artificial sources can cause the same reaction.

Mild sunburn causes redness and sensitivity. Severe sunburn can cause blisters and peeling.

Symptoms often appear several hours after exposure. Most sunburns heal if further exposure is avoided. Blisters can become infected and may require antibiotics. Pain can be treated with medication and soothing lotions.

Workers with fair skin burn more easily. However, all skin tones can burn and require protection.

Tanning is also skin damage. A tan occurs when the body produces more pigment after UV radiation exposure. Tanning increases the risk of skin cancer.

Skin cancer

Skin cancer is the most common type of cancer. There is strong evidence linking UV radiation exposure to skin cancer.

There are three main types of skin cancer:

Basal cell carcinoma

- Most common
- Usually appears on sun-exposed areas like the face, neck, ears, hands and forearms
- Rarely spreads
- Often looks like a sore or growth that does not heal

Squamous cell carcinoma

- Second most common
- Appears as a scaly patch or sore that heals and reopens
- Rarely spreads
- Often develops on sun-exposed areas

Melanoma

- Less common but more dangerous
- Can spread to other organs
- Can be fatal
- Often dark with irregular borders, but appearance varies

Use the ABCDE of melanoma to check moles:

- **A**symmetry
- **B**order irregularity
- **C**olour variation
- **D**iameter greater than 6 mm
- **E**volving changes in shape, size or colour

Skin cancer risk is higher for those who:

- Have fair skin or fair hair
- Burn easily
- Have more than 50 moles
- Have a family history of skin cancer

Skin cancer is less common in darker skin, but is more likely to be fatal. It often appears on areas with less sun exposure, including:

- Under the fingernails
- Palms
- Soles of the feet

Certain chemicals increase the risk for skin cancer. Workers exposed to these chemicals and UV radiation should take extra precautions:

- Arsenic
- Tar
- Coal
- Paraffin

Some medications also increase sun sensitivity:

- Antibiotics
- Antihistamines
- Anti-inflammatories
- Oral contraceptives

Workers should check medication side effects or speak with a doctor.

Eye damage

UV eye injuries can occur from welding light or sunlight reflecting off snow or other reflective surfaces.

Short exposure can cause:

- photokeratitis (corneal irritation)
- conjunctivitis (irritation of the eyelid membrane)

These conditions cause pain and discomfort but usually do not result in permanent vision loss.

Long-term exposure has been linked to cataracts.

Protecting workers from UV exposure

There are no specific regulations in Canada covering solar UV exposure for workers. Employers are required under general health and safety law to take every reasonable precaution to protect workers. Protection should follow the hierarchy of controls.

Engineering controls

- Install temporary or permanent UV shields
- Use materials that block UV
- Use UV-blocking plastics when visibility is required
- Do not rely on glass to block UV
- Fully enclose UV sources when possible

Note: Shade does not fully block UV. UV can pass through clouds and reflect off surfaces. Up to 90% of UV can reflect off surfaces including water, sand, snow or concrete.

Administrative controls

For outdoor work:

- Schedule work when UV levels are lower
- Reduce work in direct sun between 11 a.m. and 3 p.m.
- Provide shaded rest areas

For artificial sources:

- Limit exposure time
- Shut off equipment when not in use
- Post warning signs
- Restrict access to active welding areas

Employers must provide training on UV radiation hazards and protection. Employers should include UV radiation safety in orientation and provide seasonal refreshers.

Personal protective equipment (PPE)

PPE should be used when other controls cannot fully eliminate exposure. Joint health and safety committees should be involved in selecting protective measures.

Clothing

- Tightly woven fabrics block more UV radiation
- UV protection factor (UPF) rates clothing protection:
 - UPF 15 = minimum
 - UPF 40+ = ideal
- Cover as much skin as possible without increasing heat stress

Eye and face protection

- Safety glasses must block both long-wave and medium-wave UV (UVA and UVB)
- Dark lenses do not guarantee protection
- Workers who wear prescription glasses should wear UV-protective goggles
- Face shields are required for artificial UV sources such as welding

Sunscreen

Employers should cover the cost of sunscreen. Use one of the approved sunscreens from the [Canadian Dermatology Association](#). Sunscreen should not be used as a reason to spend more time in the sun.

- Use broad-spectrum, water-resistant SPF sunscreen and lip balm with SPF 30 or higher
- Apply 15–30 minutes before exposure
- Reapply every two hours, or more often when sweating
- Use two finger lengths' worth of sunscreen for your face
- Apply to all exposed skin, including ears, neck, nose and scalp

Take action

Workers can take action to improve UV radiation protection:

- Put UV radiation protection on the joint health and safety committee agenda
- Demand employer-provided sunscreen and shade
- Push for safer scheduling when UV radiation levels are high
- Raise the issue in bargaining
- Organize education sessions
- Develop a workplace UV radiation policy recognizing UV radiation as a hazard
- Plan collective action if employers fail to address concerns

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