



**Solar UV Radiation Risk Assessment for  
Outdoor Workers: Operational Review**



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## Purpose

As part of a comprehensive Sun Safety Program, a *sun safety risk assessment* is an important element of the 'Plan' phase of the program. It builds on the elements of a *Sun Safety Policy*; descriptions of *Responsibility, Accountability and Authority* for all levels of employees; the *Role of the Health and Safety Committee* with respect to sun safety; and an understanding of the specific sun safety *legal requirements* of the jurisdiction in which the workplace is located.

In our *Solar UV Radiation Risk Assessment for Outdoor Workers – Technical Guide*, we recommend the following three (3) steps for undertaking a *sun safety risk assessment* which has a focus on assessing solar UV radiation exposures of outdoor workers:

1. *Operational review* – to gain an understanding of the operational environment and factors which increase the risk of adverse skin and eye conditions for outdoor workers within your workplace as a result of solar UV radiation exposure
2. *Job Safety Analysis* for specific positions identified as being at an elevated risk
3. *Daily assessment* (during season/months of elevated risk)

This *Operational Review* can be used as an: (1) initial/baseline assessment; (2) annual review; (3) assessment of the impacts on worker exposure when major change occurs within the workplace (e.g. work tasks); or (4) assessment of changes/improvements in safety practice (particularly for the risk factor categories of 'Operation' and 'Personal Protection').

Please note: this risk assessment is not designed to be a personal risk assessment for specific employees, but is a tool to assist workplaces make an assessment of the overall risk that their workers face from exposure to solar UV radiation.

## Form Design

The risk assessment form has the following design elements:

- It allows up to 3 positions/job titles to be assessed and compared.
- If a workplace wishes to make an assessment of an exposure situation which is representative for all workers, in this case they would complete the form for one position only.
- Three categories of risk factors are presented: Environment, Operation, and Personal Protection. For each category, a number of risk factors are listed. For each risk factor, there are a range of variables, with each variable having a point allocation.
- Risk factors/variables which contribute more to the overall risk have a higher point allocation than risk factors which contribute less. Therefore, the more points awarded, the higher the risk.

- The level of risk, i.e. risk rating for each category and overall, is provided on a scale of Low, Medium and High, based on the number of points received.

## Instructions for Use

1. Determine a position (or number of positions) /job category to be assessed and list their details.
2. For each position: (1) review the listed risk factors; (2) identify the risk factor variables which are most relevant; and (3) assign the nominated points. For each risk factor, assign points for one variable only (e.g. for 'Time of Year', points would be awarded for one of either 'all year', 'summer', 'fall or spring', or 'winter'). Note: for 'History of Sunburn at the Workplace', this reflects the workplace overall and not the specific position being assessed.
3. For the 'Personal Protection' category of risk factors, each risk factor includes a point allocation for the percentage of workers using the particular form of protection.
4. For each risk factor category (i.e. Environment, Operation, Personal Protection), tally-up the number of points received and determine the risk rating for each category based on the 'Risk Ratings' tables provided.
5. To determine the overall risk rating, tally-up the total number of points received and compare to the risk ratings in the 'Risk Ratings' table provided.

## Rationale/Background

The risk ratings and point's allocation included in this risk assessment are based on key factors which are known to contribute to the risk of skin cancer for outdoor workers from occupational exposure to solar UV radiation. The point's allocation was made on the basis of expert judgement, however, the variables listed were determined through a comprehensive review and assessment of the literature. The following rationale is provided for the risk factors and the variables chosen:

- **Time of Year:** this reflects UV Index (UVI) values for locations throughout Canada. The WHO<sup>1</sup> recommends that 'Protection is Required' for UVI above 3, and 'Extra Protection' is required when UVI is above 8. Based on measured UVI for locations throughout Canada,<sup>2</sup> time periods where the UVI was above 3 and above 8 were identified. The following variable categories were then determined as being broadly representative of UVI and exposure/seasonality: UVI of >8 = Summer (June – Aug), UVI 3 – 7 = Fall (Sept – Oct) or Spring (March – May), and UVI <3 = Winter (Nov – Feb).
- **Altitude:** UVI increases by approximately 4% for every 300 meters above sea level.<sup>3,4,5</sup> Variable categories were determined to account for this increase in UVI with altitude.

- Surfaces: surfaces are known to reflect different amounts of UV radiation. Based on reflectance measurements,<sup>6</sup> surfaces have been grouped based on percentage of UV radiation they reflect.
- Worktime in sun: peak UV intensity occurs around midday throughout the year,<sup>7</sup> with consensus reached for Canada that the peak UV time is between 11am and 3pm, particularly between April and September.<sup>8</sup> As such, the variables listed take account of hourly variations in UV intensity through the workday.
- Shade: the provision of shade can be an effective way to reduce worker exposure to solar UV radiation,<sup>9</sup> with sun-sheltered meal breaks being particularly effective.<sup>10</sup>
- History of sunburn: a personal history of sunburn is a significant risk factor for developing skin cancer,<sup>11</sup> therefore preventing sunburn is important within a workplace.
- Ability to reschedule: due to variations in solar UV intensity throughout the day,<sup>7</sup> being able to reschedule work to times of lower intensity is an important administrative control measure.<sup>9</sup>
- Photosensitizing chemical exposure: some chemicals can enhance sensitivity of the skin to UV radiation. These include certain drugs, plant materials, dyes, wood preservatives, and coal tars.<sup>9</sup> Refer to safety data sheets for further details regarding specific substances.
- Person protection: the use of a range of personal protection to protect the skin and eyes is effective in reducing worker exposure to solar UV radiation.<sup>9</sup>

## References/Sources

1. World Health Organization. (n.d.). *UV index*. Retrieved from [http://www.who.int/uv/intersunprogramme/activities/uv\\_index/en/index1.html](http://www.who.int/uv/intersunprogramme/activities/uv_index/en/index1.html)
2. Environment Canada. (2016, June 21). *UV index directory, WOUCD*. Retrieved from <http://es-ee.tor.ec.gc.ca/cgi-bin/uvindexannual>
3. Australian Government Australian Radiation Protection and Nuclear Safety Agency. (2010, April). *Management Plan for Sun Protection: Supplementary Information*. Retrieved from [http://www.arpana.gov.au/pubs/rps/rps12\\_Supplementary\\_Information\\_Sun\\_Protection.pdf](http://www.arpana.gov.au/pubs/rps/rps12_Supplementary_Information_Sun_Protection.pdf)
4. Diffey, B. L. (1992). Stratospheric ozone depletion and the risk of non-melanoma skin cancer in a British population. *Physics in Medicine and Biology*, 37, 2267-2279.
5. Blumthaler, M., Webb, A.R, Seckmeyer, G., Bais, A.F., Huber, M., & Mayer, B. (1994). Simultaneous spectroradiometry: A study of solar UV irradiance at two altitudes. *Geophysical Research Letters*, 21, 2805-2808.
6. Sliney, D. H. (1986). Physical factors in cataractogenesis: ambient ultraviolet radiation and temperature. *Investigative Ophthalmology and Visual Science*, 27, 781-790.
7. Godar, D. E. (2005). UV doses worldwide. *Photochemistry and Photobiology*, 81, 736-749.

8. National Steering Committee for Consensus Content for Sun Safety Messages. (2015, June). *Briefing on the 2014-15 National Consensus Process on Recommended Content for Core Sun Safety Messages in Canada*. Toronto: Author.
9. Vecchia, P., Hietanen, M., Struck, B.E., van Deventer, E., & Niu, S. (Eds.) (2007). *Protecting Workers from Ultraviolet Radiation*. Germany: International Commission on Non-Ionizing Radiation Protection, International Labour Organization & World Health Organization. Retrieved from [http://www.who.int/uv/publications/protect\\_workers/en/](http://www.who.int/uv/publications/protect_workers/en/)
10. Parisi, A. & Kimlin, M. (1999). Effects of simple measures to reduce the occupational solar UV exposure of outdoor workers. *Journal of Occupational Health and Safety – Australia and New Zealand*, 15(3), 267-272.
11. Armstrong, B., & Kricker, A. (2001). The epidemiology of UV induced skin cancer. *Journal of Photochemistry and Photobiology B: Biology*, 63, 8-18.

### Solar UV Radiation Risk Assessment for Outdoor Workers: Operational Review

Date: \_\_\_\_\_ Assessor: \_\_\_\_\_ Baseline Assessment / Annual Review/ Other

Workplace Name & Address: \_\_\_\_\_

Positions assessed: 1: \_\_\_\_\_  
 2: \_\_\_\_\_  
 3: \_\_\_\_\_

Risk Factors		Points	Position 1	Position 2	Position 3	Example
<b>ENVIRONMENT:</b>						
<b>Time of Year</b> work activities are undertaken	All year	40				40
	Summer (June – Aug)	30				
	Fall (Sept – Oct) or Spring (March – May)	20				
	Winter (Nov – Feb)	10				
<b>Altitude</b> at which work is undertaken	Greater than 1800 meters	8				0
	1200 to 1800 meters	6				
	600 to 1200 meters	4				
	Less than 600 meters	2				
	Sea level	0				
<b>Surfaces</b> Around which work activities are carried out	Snow	8				2
	Sea surf, painted surfaces (white gloss), beach sand (dry)	6				
	Concrete, asphalt, open ocean/water	4				
	Soil, grass	2				
	Other non-reflective surfaces	0				
Environment Sub-Total (Max = 56 points)						42
Environment Risk Rating (Circle relevant)			L / M / H	L / M / H	L / M / H	L / M / <b>(H)</b>
<b>OPERATION:</b>						
<b>Worktime in Sun</b>	1. All day (includes 2, 3 or 4 below)	15				15
	2. 11am to 3pm only	10				
	3. 8am to 11am or 3pm to 5pm only	7				
	4. Before 8am or after 5pm only	5				
<b>Shade availability</b>	During work	None	10			10
		Partial	5			
		Full	0			
	During rest breaks/lunch	None	5			3
		Partial	3			
		Full	0			
<b>History of Sunburn at the workplace</b>	Regular occurrence	10				5
	Irregular occurrence	5				
	None previously reported	0				
<b>Ability to Re-schedule work to non-peak UV time</b>	No	10				10
	Yes	1				
<b>Photosensitizing chemical exposure</b>	Regular occurrence	10				0
	Irregular occurrence	1				
	None / not identified by MSDS	0				
Operation sub-total (Max = 55 points)						43
Operation Risk rating (Circle relevant)			L / M / H	L / M / H	L / M / H	L / M / <b>(H)</b>

PERSONAL PROTECTION:*													
Usual/Regular/Daily use of:		Point allocation for % of workers using this form of protection					Position 1	Position 2	Position 3	Example (See Note)			
		None	<25%	26-50%	51-75%	76-100%						100%	
<b>Headwear</b>	Hat/hard hat with wide brim & neck flap	N/A	1	1	0	0	0				1	11	
	<i>and/or</i>		+					+	+	+	+		
	Hat with wide brim or Hard Hat with brim		2	2	2	1	0				2		
	<i>and/or</i>		+					+	+	+	+		
	Hard hat, cap, visor		3	3	5	5	7				3		
	<i>and/or</i>		+					+	+	+	+		
	No headwear worn		5	5	8	10	12				5		
<b>Shirts</b>	Long-sleeved	N/A	2	2	2	1	0					12	
	<i>and/or</i>		+					+	+	+	+		
	Short-sleeved		3	3	5	5	7						
	<i>and/or</i>		+					+	+	+	+		
No shirt worn	5	5	8	10	12					12			
<b>Pants</b>	Long	N/A	2	2	2	1	0				2	5	
	<i>and/or</i>		+					+	+	+	+		
	Short		3	3	5	5	7				3		
	<i>and/or</i>		+					+	+	+	+		
No Leg covering	5	5	8	10	12								
<b>UV rated clothing</b>		5	4	3	2	1	0					5	
<b>UV protective eyewear</b>		5	4	3	2	1	0					1	
<b>Sunscreen use</b>		10	8	6	4	2	0					6	
Personal Protection Sub-Total (Max = 56 points)												40	
Person Protection Risk Rating (Circle relevant)							L / M / H	L / M / H	L / M / H	L / M / H	L / M / H	(H)	
<b>TOTAL FOR ALL RISK FACTORS</b>												125	
<b>OVERALL RISK RATING</b>							L / M / H	L / M / H	L / M / H	L / M / H	L / M / H	(H)	

\*Notes: 1. The example illustrates the following use of personal protection: headwear = roughly ¼ of workers wearing each type of headwear, including roughly ¼ not wearing any headwear; shirts = no shirt use; pants = roughly 60% use of long pants + 40% use of shorts; no use of UV rated clothing; roughly 80% workers using UV protective eyewear (e.g. sunglasses); roughly 40% use of sunscreen.

2. For Headwear, Shirts, and Pants, the options chosen should add-up to 100% of use.

**Risk Ratings (based on points obtained):**

<b>Environment</b>		+	<b>Operational Considerations</b>		+	<b>Personal Protection</b>		=	<b>OVERALL RISK</b>	
Low (L)	<18		Low (L)	<18		Low (L)	<12		Low (L)	<48
Medium (M)	19-37		Medium (M)	19-36		Medium (M)	13-24		Medium (M)	49-97
High (H)	>38		High (H)	>37		High (H)	>25		High (H)	>98

**Note:** The level of risk for particular positions/work tasks can be modified by implementing alternative operational procedures and/or alternative personal protection.

**Comments:**



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