

Change to Safety Zone Calculation Field Test for Fireline Personnel

The Rocky Mountain Research Station staff and NWCG Incident and Position Standards (IPSC), Risk Management (RMC), and Fire Environment (FENC) committees are soliciting feedback on the proposed new guideline for safe separation distance between the firefighter and the flames and associated safety zone size.

You’ve been taught your entire career safety zones need to be at least four times the flame height—easy math. But we’ve always known we needed a bigger safety zone if downwind or upslope of the fire. The current safety zone calculation is based on radiant heat only and does not account for convective heat from wind and/or terrain influences. Think about the safety zones you’ve seen throughout your career. Are many of them on flat ground and sheltered from the wind?

The fireground is rarely that simple. To better serve firefighters, the proposed new guideline accounts for slope, wind speed, burning conditions, and both convection and radiation from flames. Heat transfer by convection is a major—sometimes dominant—force, particularly in the presence of steep slopes and high winds. If you've ever stood in a safety zone upslope or down wind of the fire as it hit the edge of the safety zone, you've likely felt what this is like. The bottom line is when your safety zone is upslope or downwind of the fire, you need a bigger safety zone than you were trained to think. We call this Safe Separation Distance (SSD), the distance from the center of the safety zone to the nearest fuels.

SSD = Safe Separation Distance (feet)

The proposed new guideline is:

VH = Vegetation Height (feet)

$$SSD = 8 \times VH \times \Delta$$

Δ = Wind/Slope/Burning Condition factor (use table below to determine Δ based on predicted winds and fire behavior indices, i.e., Energy Release Component/Burning Index)

Δ VALUES				
Wind Speed (mph)	Burning Conditions	Slope		
		Flat <15%	Moderate 15-35%	Steep >35%
Light 0 – 10	Low	1	1	2
	Moderate	1	1	2
	Extreme	1	2	3
Moderate 10 – 20	Low	1.5	3	4
	Moderate	2	4	6
	Extreme	2.5	5	6
High >20	Low	3	4	6
	Moderate	3	5	7
	Extreme	4	5	10

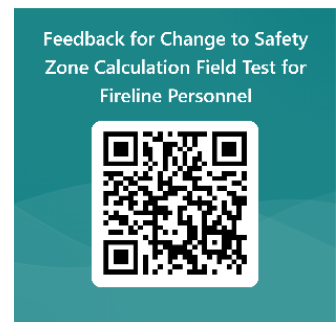
Formula to convert SSD into acres:

Area of circle (in feet²) = 3.14 * SSD² Hint: SSD² = SSD * SSD

Acres = area (calculated above)/43,560

Example: The wind speed is 12 mph, burning conditions are moderate, and the slope is 16%. Fuels are 16 feet in height. SSD = 8 x 16 x 4 = 512 feet. Area = 3.14 * 512² = 823,132/43,560 = 18.89. The safety zone size should be 19 acres.

The SSD is a guideline. Building a safety zone to the size calculated is determined by the user/team.



Additional resources and information is available at <https://www.nwcg.gov/committees/incident-and-position-standards-committee> under the “Useful Resources” tab.