

Change to Safety Zone Calculation Field Test for Incident Management Teams

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.

The proposed new guideline is:

SSD = Safe Separation Distance (feet)

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 area should be 19 acres.

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

Field personnel are requested to manually determine Safe Separation Distance (SSD) using the above formulas and table in a field setting.

Incident management teams (IMT) are requested to utilize the Safe Separation Distance Evaluator (SSDE), a new online tool for mapping SSD based on vegetation height, terrain slope, wind speed, and burning condition. The SSDE allows users to draw a potential safety zone (SZ) polygon and estimate SSD and the extent to which that SZ polygon may be suitable, given the local landscape, weather, and fire conditions. SSDE is a tool that can provide valuable safety information to wildland fire personnel who are charged with the critical responsibility of protecting the public and landscapes from increasingly intense and frequent fires in a changing climate. However, as it is based on data that possess inherent uncertainty, it is essential that all SZ polygons evaluated using SSDE are validated on the ground prior to use.

Safe Separation Distance Evaluator: <https://firesafetygis.users.earthengine.app/view/ssde>

IMT Considerations

- Obtain a 30-minute briefing from Dan Jimenez, Research Engineer, Rocky Mountain Research Station, on the wildland firefighter safety zone guidelines and the Safe Separation Distance Evaluator (SSDE) if the information is new to the team.
- Consider resource ordering Dan Jimenez as a Technical Specialist (THSP), Daniel.Jimenez@usda.gov, 406-239-4164, to assist the IMT through the process and for validation purposes.
- The IMT utilizes the Safe Separation Distance Evaluator (SSDE) online tool for mapping Safe Separation Distance (SSD).
- Provide constructive feedback using the QR Code below or by contacting Dan Jimenez.
- Additional resources and information is available at <https://www.nwcg.gov/committees/incident-and-position-standards-committee> under the “Useful Resources” tab.

Feedback for Change to Safety
Zone Calculation Field Test for
Incident Management Teams

