



San Diego Fire-Rescue Department Training & Education Division **TRAINING DRILL**

Training and Education Division

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Subject: Fire Dynamics - Reading Smoke

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New Training Drills,
Feedback, and
Suggestions send to the
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Background:

- In 2014, the San Diego Fire-Rescue Department's Training and Education Division implemented the Fire Dynamics Program. Fire Dynamics is the study of how chemistry, fire science, material science and the mechanical engineering disciplines of fluid mechanics and heat transfer interact to influence fire behavior. There are many different aspects of Fire Dynamics that teach us skills and fundamentals that are applicable to fire behavior. As firefighters it is imperative that we take these skills and apply them to an incident. Our personal size-up at a structure fire will give us a better understanding of the current fire behavior and the impact of the fire in relation to the fuel that is burning. One of the tools that a firefighter can use when determining fire behavior in a structure fire is the art of reading smoke.

Discussion Points:

- Firefighter Size-up
 - When conducting a size-up and/or performing a 360:
 - What are we looking for with the structure and fire behavior?
 - How can reading smoke help you understand the location of the fire?
 - How does the color of the smoke indicate what type of fuel is burning?
 - What is the difference between modern fuels versus legacy fuels?
 - Firefighter size-up will enhance firefighter safety.
- Why is it important to read smoke?
 - Smoke helps us find the location of the fire. How?
 - Reminder that smoke is fuel.
 - It can help us predict future fire behavior.
 - Protects firefighters from a hostile fire event (Flashover, backdraft)
 - Prioritize tactics and strategy
 - Reading smoke can help predict collapse potential. How?
- What are the four characteristics of smoke? **Volume, Velocity, Density, Color**
 - **Volume:** The quantity of smoke.
 - The volume of smoke gives us a general impression of the fire.
 - Volume indicates the fuel load and fire flow required to stop the progress.



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- **Velocity:** The speed at which the smoke comes from the building.
 - Smoke velocity is an indicator of pressure that has built up within the building.
 - Compare smoke venting from like size openings as it is leaving the structure such as similar windows and doors.
 - Typically, the faster the smoke is moving and taller the smoke column is, the closer you are to the main body of fire.
- **Density:** The thickness of smoke.
 - *The most important attribute.*
 - Density tells you how much fuel is present. Typically, the thicker the smoke the more likely a hostile fire event will occur and the more dangerous/explosive the event will be.
- **Color:** Can indicate how long the fuel has been burning and/or the distance the smoke has traveled to the outside.
 - What does white smoke indicate during a structure fire?
 - What does brown smoke indicate during a structure fire?
 - What does thick, black smoke indicate during a structure fire?
 - What color may indicate a backdraft?

Action Items/Drills:

- Watch the following presentation:
Fireground Size-Ups and How to Read Smoke
<https://www.youtube.com/watch?v=fHUjG5Zt1tM>
- Review the assigned videos and discuss the fire behavior, smoke characteristics, and how it affected the incident.

For additional information follow the links below:

- Principles of Fire, Drill Manual, Chapter 7
<http://sdfd.targetssafety.com/drillmanual/Chapter7/pdf/chapter7.pdf>
- Fire Ground Survival, Drill Manual, Chapter 30
<http://sdfd.targetssafety.com/drillmanual/Chapter30/pdf/Chapter30.pdf>
- SDFD - Fire Dynamics Module 1
<https://s3.amazonaws.com/tsresources.targetssolutions.com/225857/player.html>
- SDFD - Fire Dynamics Module 2
http://clients.targetssafety.com/16009/Fire_Dynamics_Module/player.html
- SDFD - Fire Dynamics Module 3
<https://s3.amazonaws.com/tsresources.targetssolutions.com/250176/player.html>
- UL Firefighter Safety Institute
<https://ulfirefightersafety.org>