



FIRE PROTECTION TRAINING

Procedures Handbook 4300

TOPIC: BLEVE

TIME FRAME: :30

LEVEL OF INSTRUCTION: Level I

BEHAVIORAL OBJECTIVE:

Condition: A written quiz

Behavior: The student will be able to describe what a BLEVE is, how it occurs and what control actions may be necessary

Standard: With a minimum 80% accuracy

MATERIALS NEEDED:

- Flip charts
- White board
- Pens
- Appropriate visual aids
- Audio visual equipment

REFERENCES:

- BLEVE, John E. Bowen "American Fire Journal" 1980
- IFSTA, Hazardous Materials For First Responders
- IFSTA, Essentials of Fire Fighting, 5th Edition

PREPARATION:

The term BLEVE has become a standard part of firefighter terminology. It is commonly thought of as an explosion accompanied by a fireball. This mental image is a misconception. A BLEVE need not be accompanied by fire at all and in fact every time a kernel of popcorn pops in the microwave a small BLEVE has occurred.



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BLEVE

PRESENTATION

APPLICATION

I. BLEVE

A. The acronym for:

B boiling

L liquid

E expanding

V vapor

E explosion

B. BLEVE Defined: Rupture of a liquid-holding container when the liquid boils and the resulting vapor pressure exceeds the container's ability to hold it.

C. Conditions Required for a BLEVE

1. A liquid must be present

a. Vapors or gas alone **can not** BLEVE

b. Liquid need not be flammable

(1) Water can BLEVE but there will be no fire

2. The liquid must be in a tightly closed container

a. Examples: an aerosol can or a railroad tank car

What does BLEVE stand for?

What conditions must be present for a BLEVE potential to exist?



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PRESENTATION	APPLICATION
<ul style="list-style-type: none">b. Vented container can BLEVE if vent is damaged or inadequate for pressure within container3. The temperature of the confined liquid must be above its boiling point at atmospheric pressure<ul style="list-style-type: none">a. The higher the pressure at the surface of the liquid, the higher the temperature required to produce boilingb. When a container of liquid is tightly closed and then heated, the vapor pressure increases. The increased vapor pressure is accompanied by an elevated boiling pointc. A fire is the most common occurrence that will bring the temperature above the normal boiling pointd. Heat is not always essential. Some liquids have extremely low boiling points at atmospheric pressure. These liquids are already considerably above their boiling point, even at normal atmospheric pressure4. There must be structural failure of the container. Failure may be due to:<ul style="list-style-type: none">a. Direct flame impingement<ul style="list-style-type: none">(1) Most common cause of failure(2) Container failure almost always occurs in the metal around the vapor space. Metal in contact with the liquid is quite difficult to heat to the danger point because liquids are usually excellent conductors and	<p>Information sheet #1</p>



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<p style="text-align: center;">absorbers of heat whereas vapors are not</p> <ul style="list-style-type: none">b. Metal fatiguec. Inadequate or damage relief valved. Mechanical damage<ul style="list-style-type: none">(1) Collision(2) Corrosion <p>D. BLEVE Warning Signs</p> <ul style="list-style-type: none">1. Pinging sound from metal shell2. Discoloration of container (normally cherry red)3. Flaking of small metal pieces4. Bubble or bulge on container5. Steam from tank surface6. Shrill sound from pressure relief valve<ul style="list-style-type: none">a. Especially if increasing with passage of time7. Tear in tank surface <p>II. CONTROLLING A BLEVE</p> <p>A. Guidelines</p> <ul style="list-style-type: none">1. Isolate and deny entry for at least 3000 feet2. If personnel or property are not threatened a "no attack" posture is warranted3. If property only is at stake a very cautious approach should be taken	



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<ul style="list-style-type: none">4. If fire has impinged on the vapor space of the container for more than ten minutes, a "no attack" posture is warranted5. In the event an attack is necessary<ul style="list-style-type: none">a. Use unstaffed master streams<ul style="list-style-type: none">(1) Water application at point of flame impingement first(2) Over entire vapor space second priority(3) Never extinguish flames that come from a pressure-relief device. This may allow flammable vapors to build in the area and reignite violentlyb. Minimum of 500 GPM at each point of flame contact<ul style="list-style-type: none">(1) Ensure a sufficient water source for several hoursc. Remove firefighters as soon as possible after setting up unstaffed monitors	



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SUMMARY:

Boiling Liquid Expanding Vapor Explosions are unpredictable and can be particularly devastating. They may occur with or without an ensuing fire depending upon whether flammable liquids are involved. In order to have a BLEVE, the following conditions must exist.

1. A liquid must be present.
2. The liquid must be in a tightly closed container.
3. The temperature of the confined liquid must be above its boiling point at atmospheric pressure.
4. There must be structural failure of the container.

EVALUATION:

A written quiz.

ASSIGNMENT:

To be determined by instructor(s).