



Designation: **F3195--16 F3195 – 21**

## Standard Guide for Estimating the Volume of Oil Consumed in an In-Situ Burn<sup>1</sup>

This standard is issued under the fixed designation F3195; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This guide relates to the use of in-situ burning of oil spills. The focus of the guide is in-situ burning of spills on water, but the techniques described in the guide are generally applicable to in-situ burning of land spills as well.

1.2 The purpose of this guide is to provide information that will enable spill responders to estimate the volume of oil consumed in an in-situ burn.

1.3 This guide is one of several related to in-situ burning. Other standards cover specifications for fire-containment booms and the environmental and operational considerations for burning.

1.4 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4.1 *Exception*—Table 1, Table 2 and Fig. 2 provide inch-pound units for information only.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

**F818 Terminology Relating to Spill Response Booms and Barriers**

**F1788 Guide for In-Situ Burning of Oil Spills on Water: Environmental and Operational Considerations**

### 3. Terminology

3.1 *burn efficiency*—the percentage of the oil removed from the water by burning.

**F1788**

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee F20 on Hazardous Substances and Oil Spill Response and is the direct responsibility of Subcommittee F20.15 on In-Situ Burning.

Current edition approved June 1, 2016; Nov. 1, 2021. Published July 2016; January 2022. Originally approved 2016. Last previous edition approved in 2016 as F3195–16. DOI: 10.1520/F3195-16.10.1520/F3195-21

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.2 *gap ratio*—sweep width divided by boom length.

**F818**

3.3 *residue*—the material, excluding airborne emissions, remaining after the oil stops burning.

**F1788**

3.4 *sweep width* —width intercepted by a boom in collection mode, the projected distance between the ends of a boom deployed in a “U,” “V,” or “J” configuration. (Also known as *swath*.)

**F818**

#### 4. Significance and Use

4.1 This guide describes a methodology for estimating the effectiveness of an in-situ burn. It is intended to aid decision-makers and spill-responders in contingency planning, spill response, and training.

4.2 This guide is not intended as a detailed operational manual for the ignition and burning of oil slicks. The guide does not cover the feasibility of an in-situ burn, or the evaluation of airborne emissions from a burn.

4.3 It is generally accepted that a precise determination of the burn effectiveness will not be possible. However, the methodology presented in this guide can be used to provide a consistent and reasonable estimate.

4.4 Burn effectiveness can be reported as total volume burned or burn ~~efficiency, or both efficiency~~ (that is, volume burned of that available.)available), or both.

#### 5. Evaluation Approach

5.1 For most oils and under most conditions, oil slicks burn at a rate of between 2 and 4 mm/min. By accurately observing the total area of an in-situ burn and the total duration of the burn it is possible to estimate the volume of oil consumed in the burn.

5.2 If it is necessary to estimate the burn effectiveness, defined as the percentage of oil burned of that available for burning, one must also estimate either: the volume of oil spilled or available for burning; or, the volume of residue remaining after the burn.

5.3 In most cases an estimate of the spill volume or of the residue volume will be much less accurate than that of the volume of oil consumed in the burn. If all three components can be estimated independently, the calculation procedure can be refined and the overall accuracy increased.

5.4 Potential errors are described in Section 8.

#### 6. Estimating Volume of Oil Burned

6.1 Estimating the volume of oil burned comprises three variables: burn rate of the oil, burn duration, and burn area. Note that the area actively engaged in burning must be estimated, not simply the total slick area.

6.2 The volume of oil burned is calculated as:

$$\text{Volume burned(m}^3\text{)} = \text{burn rate(mm/min)} \times \text{duration(minutes)} \times \text{burn area (m}^2\text{)} \times 0.001 \text{ m/mm} \quad (1)$$

6.3 **Table 1** lists the burning rate for various oils. The specified burn rates represent the accepted median values for given oil types; the ranges reflect potential variability.

6.4 Discontinuities in slicks can occur due to the presence of ice or debris within the burning area. For discontinuous slicks, burn durations should be recorded for discrete portions of the slick.

6.5 For slicks of emulsions, heat from the fire may cause emulsion to break, and may lead to variations in burning rate. In this instance, estimates of the burn area should make note of the variations in slick area that is burning with time.

6.6 There are a number of methods that can be used to aid in estimating the slick area, including: the use of photographs, video,