Designation: F 1460 – 93 (Reapproved 1999)

Standard Practice for Calibrating Oil Spill Dispersant Application Equipment Boom and Nozzle Systems[1]

This standard is issued under the fixed designation F 1460; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers uniform procedures for determining and reporting the dosage rate of oil spill dispersant application equipment.

1.2 This practice is applicable to spray systems employing booms and nozzles and is not fully applicable to other systems such as fire monitors, sonic distributors, or fan-spray guns.

1.3 This practice is applicable to systems for use on ships or boats and helicopters or airplanes.

1.4 This practice is one of four related to dispersant application systems. One is on design, one on calibration, one on deposition, and one on the use of the systems. Familiarity with all four standards is recommended. The other three standards are listed in Section 2.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

F 1413 Guide for Oil Spill Dispersant Application Equipment: Boom and Nozzle Systems[2]

3. Significance and Use

3.1 This practice will enable calibration of oil spill dispersant application equipment and ensure a desired dosage and uniformity across the swath width.

3.2 The data provided by the methods described herein will permit the preparation of a chart relating delivery rate with application vehicle speed, flow meter reading or pump setting so that in actual application, the desired dosage will be achieved.

3.3 This practice will ensure that a dispersant application system is functional, capable of delivering a specified dosage, and that major components are operational.

4. Apparatus and Materials

4.1 *Pails*— of capacity 7 to 20 L (2 to 5 U.S. gal) to catch the spray from the nozzles.

4.2 *Graduated Cylinder*— of capacity 7 to 20 L or a scale having capacity of at least 20 kg (45 lbs) to determine the amount of fluid in each pail. Commercial equipment with an accuracy of at least 1 % is adequate.

4.3 *Stopwatch.*

4.4 *Test Fluid*—Water can be used as a test fluid if the viscosity of the dispersant to be used is not dissimilar to the viscosity of water. A surrogate fluid should be used if the viscosity difference is greater than approximately 100 times that of water. This can occur with more viscous dispersants or at low temperatures. The surrogate fluid could be water with the appropriate amount of thickener.

4.5 A continuing supply of water or test fluid, enough to run the system during the test period, must be available. Tank truck quantities may be required.

4.6 *Auxiliary Power Units*, where required.

4.7 Temperature of test fluid.

5. Calibration Procedure

5.1 *Synopsis*—The calibration procedure is done in four steps. The first step is equipment inspection. Any defects are corrected before further calibration. The second step is the calibration of the flow meter. The third step is calibration of the unit by catching water spray from each nozzle. The fourth step is the preparation of a calibration curve.

5.2 *Equipment Setup*— Place the application equipment at a suitable outdoor location and close to a supply of water or test fluid. Set up the equipment in accordance with the manufacturer's instructions and inspect visually. Start the unit. All nozzles should visually be producing approximately the same amount of spray. Inoperative nozzles or other elements such as pressure gages or flow meters, are repaired or replaced before proceeding. The operation of pressure gages should be verified before proceeding.

5.3 *Dispersant Flow Meter Calibration*:

5.3.1 Calibrate the flow meter using a surrogate fluid. This surrogate fluid could be water or a surrogate fluid, if necessary. The withdrawal of test fluid from a calibrated vessel is timed to establish the flow rate. The calibration is done at a minimum of three flow rates and these should be chosen to represent typical

[1] This practice is under the jurisdiction of ASTM Committee F-20 on Hazardous Substances and Oil Spill Response and is the direct responsibility of Subcommittee F20.13 on Treatment.

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[2] *Annual Book of ASTM Standards*, Vol 11.04.

minimum, average, and maximum dispersant flow rates.

5.3.2 Fill the calibrated vessel with test fluid and connect the dispersant input line to it. Set the desired flow rate and start the unit. After a steady flow rate is established, begin the measurement. The measurement period should be sufficiently long to allow for accurate measurements. Operate the spray system with all sub-systems and nozzles to ensure that the pressure drop across the flow meter is the same as during normal operations.

5.3.3 Run the test at least three times for each of the flow rates and the numbers averaged for each flow rate. Data are used to produce a calibration chart for the flow rate.

5.4 *Nozzle Calibration*:

5.4.1 Calibrate the apparatus using water or a surrogate test fluid, if necessary, which is collected to establish flow rates. Start the unit, and when pressure and flow are constant, catch the output from each nozzle under test using pails manipulated by test personnel at the same time. A timekeeper should give start and stop signals and maintain records of the time elapsed during collection of the fluid. Each run should last 30 to 60 s or long enough to fill one-half to two-thirds of the collection pail. All nozzles must be tested. Any number of nozzles can be tested at a time, but during any test all nozzles must be running.

5.4.2 Determine the amount of fluid in each pail by weighing it and converting to volume, or by using a calibrated cylinder. Each pail should be numbered and preweighed (if weight is the system used for volume determination) before the run begins. Determine the amount of fluid sprayed from each nozzle immediately after collection. Compare the amount of fluid produced by each nozzle to the calculated amount determined by taking the total flow divided by the number of nozzles. Total flow is the sum of the fluid collected from all the nozzles. The output of each nozzle should be within 10 % of the calculated average or designed amount. If not, the nozzles should be repaired or replaced and the calibration procedure repeated. Separate calibrations must be done for each variation of pressure, number of operating nozzles, or type of nozzles.

5.5 *Calibration of Dispersant Addition (Eductor or Pump) Systems*—Boat and ship systems sometimes apply dispersant mixed with water. Addition systems are of two types, eductors and pumps. Both pumps and eductors are calibrated by measuring the volume of dispersant surrogate added to the water stream. The systems are calibrated in the configuration they are normally used. Calibrations are performed for each water pressure and water flow rate that would be used in actual practice.

5.5.1 Eductor systems are cleaned and repaired (if necessary) prior to calibration. Eductors require frequent maintenance, cleaning, and calibration. Eductors are calibrated by placing the suction tube into a calibrated cylinder and timing the withdrawal of material. Either the relative change per unit time of the water of the dispersant to be used is recorded over at least three flow settings to produce a calibration chart.

5.5.2 Dispersant addition pumps are calibrated by measuring the flow input or output with a calibrated cylinder or by weight. Tests are run at three pump settings representing a minimum, a maximum, and one or more typical operating-flow-rate setting.

5.6 *Calibration Frequency*—Systems should be calibrated at least once a year. Systems should be cleaned and recalibrated after each use and after making system configuration changes.

5.7 *Report of Calibration Procedure*—Perform the calibration of the application system at three or more different equipment settings to produce an overall dispersant delivery chart and a flow meter correction chart.

6. Data Reporting

6.1 Data shall be accurate to two significant figures. Tables or graphs are prepared showing dispersant delivery rate in L/min (or U.S. gal/min) with pump settings and flow meter data.

7. Keywords

7.1 boom and nozzles; dispersant application; dispersant spray equipment; dispersants; oil spill chemicals; oil spill dispersants; oil spill treating agents