



Standard Test Method for Evaluating the Mobility Capabilities of Emergency Response Robots Using Towing Tasks: Grasped Sleds¹

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1. Scope

1.1 Purpose:

1.1.1 The purpose of this test method, as a part of a suite of mobility test methods, is to quantitatively evaluate a teleoperated ground robot's towing capability with the task of grasping loads and traversing a specified route on a flat and paved surface.

1.1.2 Robots shall possess a certain set of mobility capabilities, including towing, to suit critical operations such as emergency responses. This capability would be required to perform such emergency response-related tasks as delivering critical supplies, moving victims to safe locations, or transporting suspected packages away from humans.

1.1.3 Emergency response ground robots shall be able to handle many types of obstacles and terrains. The required mobility capabilities include traversing gaps, hurdles, stairs, slopes, various types of floor surfaces or terrains, and confined passageways. Yet additional mobility requirements include sustained speeds and towing capabilities. Standard test methods are required to evaluate whether candidate robots meet these requirements.

1.1.4 ASTM Task Group E54.08.01 specifies a mobility test suite, which consists of a set of test methods for evaluating these mobility capability requirements. This towing-by-grasping test method is a part of the mobility test suite. The apparatuses associated with the test methods challenge specific robot capabilities in repeatable ways to facilitate comparison of different robot models as well as particular configurations of similar robot models.

1.1.5 The test methods quantify elemental mobility capabilities necessary for ground robot emergency response applications. As such, the test suite should be used collectively to represent a ground robot's overall mobility performance.

NOTE 1—Additional test methods within the suite are anticipated to be developed to address additional or advanced robotic mobility capability requirements, including newly identified requirements and even for new application domains.

¹ This test method is under the jurisdiction of ASTM Committee E54 on Homeland Security Applications and is the direct responsibility of Subcommittee E54.08 on Operational Equipment.

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1.2 *Performing Location*—This test method shall be performed in a testing laboratory or the field where the specified apparatus and environmental conditions are implemented.

1.3 *Units*—The values stated in SI units are to be regarded as the standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

1.4 *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:²

E2521 Terminology for Urban Search and Rescue Robotic Operations

E2592 Practice for Evaluating Cache Packaged Weight and Volume of Robots for Urban Search and Rescue

2.2 Other Standards:

National Response Framework U.S. Department of Homeland Security³

3. Terminology

3.1 Terminology E2521 lists additional definitions relevant to this test method.

3.2 Definitions:

3.2.1 *abstain, v*—the operator's action of notifying the administrator to withdraw from the test, causing the result not to be reported and the test form to be marked as abstained.

3.2.1.1 *Discussion*—The operator is the only person who can convey the decision to abstain the test. The abstention may be made when the robot configuration is not designed nor equipped to perform the test. The testing sponsor should make a consistent policy about the time period during which the

² 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 Available from Federal Emergency Management Agency (FEMA), P.O. Box 10055, Hyattsville, MD 20782-8055, <http://www.fema.gov>.