



Designation: F2542 – 05

Standard Test Methods for Physical Assault on Ventilation Grilles for Detention and Correctional Facilities¹

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1. Scope

1.1 These test methods cover requirements for simulated service tests and testing equipment for determining the performance characteristics of ventilation grilles used in secure areas, including detention and correctional facilities. The testing equipment provides for the setup and testing of specimen grilles and mounting systems. It is recognized that, in order to meet the intent of these test methods, ventilation grilles must be compatible with the level of performance required by Test Methods F2322.

1.2 It is the intent of these test methods to ensure that security ventilation grilles meet minimum performance levels to control the passage of unauthorized materials into secure areas, to confine inmates, to resist vandalism, and to delay or frustrate escape, or both. It is also the responsibility of the user of these test methods to insure that the grille selected is appropriate, based on relevant regulatory, health, and safety concerns and requirements. Such concerns include, but are not limited to, injury and suicide avoidance. These test methods do not quantify such concerns.

1.3 Take care to provide access to return and exhaust ducts for cleaning as required by NFPA 90A. If access cannot be provided through an interstitial space behind walls or ceiling, the use of filter grilles needs to be considered as an option. When filter grilles are provided, filters shall have a minimum UL-900 class 2 rating, and a filter replacement program needs to be in place at the facility.

1.4 Airflow performance shall be catalogued in accordance with ASHRAE 70-91. Manufacturer's catalog data must include grade level achieved.

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

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the*

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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

F2322 Test Methods for Physical Assault on Vertical Fixed Barriers for Detention and Correctional Facilities

2.2 NFPA Standard:³

NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems

2.3 UL Standard:⁴

UL-900 Standard for Air Filter Units

2.4 ASHRAE Standard:⁵

ASHRAE 70-91 Method of Testing for Rating the Performance of Air Outlets and Inlets

3. Terminology

3.1 Definitions:

3.1.1 *bars*—method of reinforcement or prevention of egress installed in the sleeve. Bars may be of a material, size, shape, and spacing as selected by the manufacturer to provide the desired test results and meet applicable federal, state, and local jail and prison standards.

3.1.2 *diffuser*—ceiling-mounted device designed to provide deflection of air flow.

3.1.3 *filter grille*—grille incorporating a replaceable filter in the grille sleeve or body.

3.1.4 *forcible egress*—opening created in the specimen which allows a 5 in. × 8 in. × 8 in. (127 mm × 203 mm × 203 mm) rigid rectangular box to be passed through with force not exceeding 10 lbf (44.5 N).

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 National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269-9101.

⁴ Available from Underwriters Laboratories (UL), Corporate Progress, 333 Pfingsten Rd., Northbrook, IL 60062.

⁵ Available from American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), 1791 Tullie Circle, NE, Atlanta, GA 30329.

3.1.5 *grille, security grille, or ventilation grille*—device installed to allow passage of air while protecting ventilation openings.

3.1.6 *grille face*—portion of grille exposed to the occupied space.

3.1.7 *manufacturer*—party responsible for the construction, fabrication, or supply of the test specimens used to conduct the tests.

3.1.8 *mounting method*—method of retaining a device in a wall or ceiling. Typical methods may include angles welded to the sleeve, a sleeve formed to capture the wall or ceiling, or imbed masonry anchors, or both.

3.1.9 *openings*—passageways in the grille face, allowing flow of air through a device.

3.1.10 *sleeve*—portion of the grille that attaches to the face that can be used to connect ductwork, and provide a means to affix the grille into the wall, ceiling, or structure.

3.1.11 *suicide avoidance*—punched plate with through penetrations not exceeding 3/16 in. diameter, or another acceptable technology, such as multiple passageways, as deemed acceptable by the approving authority.

3.1.12 *test completion*—conduct one test sequence for each grille.

3.1.13 *testing laboratory*—accredited independent third party testing laboratory.

3.1.14 *transfer grille*—device with two exposed faces serving adjacent spaces, providing a means for air movement from one space to the other, due to room pressure differences.

3.1.15 *vandalism*—opening created in the specimen which allows a 2 in. (51 mm) rigid cube to be passed through with force not exceeding 10 lbf (44.5 N).

4. Significance and Use

4.1 A major concern for administration officials is security of barriers used in detention/correctional facilities. These test methods are designed to identify the security levels for ventilation grilles mounted within these barriers.

4.2 The purpose of these tests is to approximate levels of abuse to which grilles will potentially be subjected in the field, and to provide assurance of protection to the public, facility administrative personnel, and inmates.

5. Sampling

5.1 Specimens shall be constructed in accordance with 6.1 and shall be representative of grilles made by the manufacturer.

5.2 One specimen for of size 16 × 16 in. (406 × 406 mm) to be offered for each grade.

6. Specimen Preparation

6.1 Construction:

6.1.1 Grilles must be available in 4 in. (101 mm) increments. Manufacturers shall be permitted to offer intermediate sizes also, at their discretion.

6.1.2 Openings in face shall not exceed 3/16 in. (4.76 mm) diameter. Multiple passageways with 3/16 in. (4.76 mm) maximum openings are also acceptable.

6.1.3 Air flow performance shall be cataloged in accordance with ASHRAE Standard 70-91 and need to include filter pressure loss if the grille is so equipped.

6.1.4 Where bars are required for purpose of testing, they must be located no more than 5 in. (127 mm) maximum behind face.

6.2 *Test Fixture*—Fixture shall be fabricated of structural steel, shall be large enough to accommodate the specimen and allow for mounting of the specimen in a method common to detention and corrections installations.

7. Procedures

VANDALISM PRYING TEST

7.1 *Scope*—Simulate attack with common hand tools.

7.2 *Significance and Use*—Crowbar, screwdriver, and pliers are used to remove face or create an opening.

7.3 *Apparatus:*

7.3.1 A10 in. (254 mm) screwdriver,

7.3.2 A24 in. (610 m) crowbar, and

7.3.3 A8 in. (203 m) pliers.

7.3.4 *Procedure:*

7.3.4.1 Test must be conducted prior to the Vandalism Impact Test.

7.3.4.2 Specimen must remain in fixture for use in the Vandalism Impact Test.

7.3.4.3 Attack grille with tools for time required in Table 1.

7.3.4.4 Specimen is exposed to the Prying Test at each successive grade level. The specimen is deemed to have failed if a 2 in. (51 mm) cube can be passed through any opening in the face with a force not exceeding 10 lbf (44.5 N). The specimen will be classed at the highest Vandalism Prying Test grade level achieved prior to failure.

7.3.4.5 Transfer grilles must have both faces of a single specimen tested for the appropriate grade. If the grille is symmetrical in all aspects of construction and mounting method, then testing on one face is permitted for Grade Levels 3 and 4.

VANDALISM IMPACT TEST

7.4 *Scope*—This test is designed to evaluate the ability of a specimen to resist an attack that uses common hand tools.

7.5 *Significance and Use*—This test method is designed to simulate a field situation where a 10 lb (4.54 kg) sledgehammer is used to attack the grille face. Specimen must resist attack without allowing passage of a 2 in. (51 mm) cube through the grille face with a force not exceeding 10 lbf (44.5 N).

7.6 *Apparatus:*

7.6.1 *Impact Test Apparatus*—Steel impact ram shall be equipped to be incorporated into a hinged or pivoted swinging pendulum equipped with a blunt impactor (Fig. 1). The system shall be capable of delivering 200 lbf (271.2 J) of energy.

TABLE 1 Security Level

	Grade 1	Grade 2	Grade 3	Grade 4
Vandalism Prying Test	45 min	30 min	20 min	10 min
Vandalism Impact Test	200 blows	150 blows	100 blows	50 blows
Egress Test	400 additional blows	200 additional blows	Not required	Not required