



ADDENDA

**ANSI/ASHRAE Addendum a to
ANSI/ASHRAE Standard 145.1-2015**

Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Loose Granular Media

Approved by ASHRAE and the American National Standards Institute on February 28, 2023.

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Cognizant TC: 2.3, Gaseous Air Contaminants and Gas-Contaminant Removal Equipment

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FOREWORD

Addendum a harmonizes definitions with Standard 145.2 (as amended by RP-1838) and ASHRAE Handbook—Applications, Chapter 47.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~striking through~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum a to Standard 145.1-2015

3.2 Definitions. Some terms are defined here for the purposes of this standard. When definitions are not provided, refer either to *ASHRAE Terminology of Heating, Ventilation, Air Conditioning and Refrigeration*¹ or to ASTM D-2652-05A, *Standard Terminology Relating to Activated Carbon*.² Otherwise, common usage shall apply.

adsorbent: ~~any solid material having the ability to retain gaseous or vapor contaminants on its surface by physical or chemical processes having the ability to concentrate significant quantities of other substances on its surface.~~

adsorption, chemical (chemisorption): binding of a ~~gas or vapor contaminant~~ to the surface of a solid by forces with energy levels approximately those of a chemical bond. Binding occurs to both inner and outer pore surfaces. This process is usually followed by a chemical reaction that removes the compound ~~contaminant~~ from the airstream but may add other gasses to it. Chemisorption is an irreversible process.

adsorption, physical: ~~attraction of a contaminant to the outer surface and inner pore surface of adsorbent media by physical forces (Van der Waals forces).~~ process in which the molecules of a gas or vapor adhere by physical forces (Van der Waals forces) to the surface, both the outer surface and the inner pore surfaces, of a solid substance. Physical adsorption is a reversible process.

airflow rate: volume of air ~~passing~~ flowing through the test sample per unit time.

breakthrough: ~~first appearance in the effluent of a challenge contaminant under specified conditions.~~ see penetration.

breakthrough (penetration) curve: plot of challenge compound ~~contaminant~~ penetration versus time for a particular challenge concentration and airflow.

catalyst: any substance of which a small amount relative to the reactants ~~proportion~~ notably affects the rate of a chemical reaction without itself being consumed or undergoing a chemical change. Most catalysts accelerate reactions, but a few ~~retard them~~ (negative catalysts or inhibitors) retard them. (**Informative Note:** catalysts may become poisoned, fouled, or deactivated during use.)

challenge gas: ~~chemical compound~~ gas or vapor that is being used as the ~~challenge~~ challenge ~~contaminant of interest~~ for any given test. (**Informative Note:** For examples, see Tables 1, 2, and 3.)

challenge (air) stream: test contaminant(s) of interest diluted with clean air to the concentration(s) and air-flow conditions of the test ~~prior to filtration.~~ (**Informative Note:** This is the gas stream that contacts the media bed at a defined face velocity to produce a desired residence time.)

chemisorption: see *adsorption, chemical*.

concentration: quantity of one substance dispersed in a defined amount of another.

density, apparent (density, bulk): mass under specified conditions of a unit volume of a solid physical adsorbent or chemisorbent ~~adsorbent~~, including its pore volume and inter-particle voids.

density, packing: (a) weight of adsorbent per unit volume determined using ASTM D-28543 as specified in Section 5.4.3 of this standard; (b) mass of a substance per unit volume described as the ratio between the actual density and what is theoretically possible if voids did not exist.

desorption: process by which adsorbed sorbate ~~adsorbent~~ molecules leave the surface of a physical ~~the~~ adsorbent and reenter the air-fluid ~~air~~ stream. (**Informative Note:** Desorption is the ~~Opposite~~ Opposite of *adsorption*.)

end point: the point at which the test is stopped due to (a) specified elapsed time or (b) reaching the maximum specified concentration of a challenge gas in the air downstream of the media bed. ~~occurrence of the maximum permissible concentration of the challenge gas in the air downstream of a media bed or, alternatively, the time when a predetermined contaminant penetration is reached.~~

mean particle diameter: weighted average particle size, in millimetres (inches), of a granular adsorbent. It is computed by multiplying the percent retained in a size fraction by the respective mean sieve openings, summing these values, and dividing by 100.

media: ~~a~~ granular or pelletized physical adsorbents or chemisorbents used in gaseous contaminant removal equipment.

penetration: ratio of challenge gas ~~contaminant~~ concentration downstream of the media bed to the upstream ~~(challenge)~~ concentration, sometimes expressed as a percentage.

Informative Notes:

1. Related to removal efficiency by the following removal expression:

$$\text{Efficiency} = (1 - \text{Penetration})$$

2. The term “breakthrough” is often used to denote the first measurable penetration of challenge gas through a media bed.

pressure drop: difference in absolute (static) pressure between two points in an airflow system.

Note: it is caused by frictional resistance to airflow in a duct, filter, or other system component such as a media bed or air-cleaning device.

removal efficiency: ~~that~~ fraction or percentage of a challenge gas molecules that are ~~is~~ removed from the challenge air stream at a given time by physical and/or chemical means.

removal efficiency curve: a plot of contaminant removal efficiency (or mass of challenge compound removed) against time for a particular challenge concentration and airflow.

residence time: theoretical time that an increment of air (or gas or vapor molecule or contaminant) is within the confines of a media bed, ignoring the fraction of internal volume that is occupied by the media. ~~This standard neglects the fact that the media occupies at least 40% of the volume of the bed (empty bed contact time).~~ **(Informative Note:** The media may occupy more than 40% of the volume of the bed.)

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