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AnAmerican National Standard

Standard Guide for Specifying and Evaluating Performance of Single Family Attached and Detached Dwellings—Indoor Air Quality[1]

This standard is issued under the fixed designation E2267; 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.

INTRODUCTION

This standard guide is part of a set which together presents a complete performance standard guide for specifying and evaluating single family attached and detached dwellings. The complete set in the series, when finished, is to include the attributes given in Table 1.

The series provides a framework for specifying and evaluating qualities of building products and systems to meet user needs without limiting ways and means. The format for this standard guide includes performance statements that consist of four components, Objectives-Criteria-Evaluation-Commentary (O-C-E-C), which together provide a systematic performance based approach for the intended purpose. These performance statements are presented in Section 8 against a Hierarchy of Building Elements as tabulated in Table 2.

The purpose of these standard guides is to provide a standardized system for describing performance parameters of single-family attached or detached dwellings. This system standardizes the descriptions of performance of a single-family dwelling, attached or detached, that can be expressed as performance statements (O-C-E-C) for a particular attribute, agent, and user need.

These standard guides are intended for use by those who need to prescribe required levels of performance and those who need to rate a product which forms a single-family dwelling or part thereof. The standard guides include examples of performance statements that may be used for the specification and evaluation of design, materials, products, components, subsystems, and systems.

1. Scope

1.1 This guide contains suggested performance statements for single family residential buildings (attached and detached) that address indoor air quality performance including indoor air pollution and thermal comfort. These performance statements are not presented as proposed requirements, but are written in permissive language as suggestions that can be used in developing specifications to satisfy user needs.

1.2 This standard guide does not address other aspects of the indoor environment such as lighting and acoustics.

1.3 Performance statements addressing building ventilation and ventilation rates are also included in the standard, since it is premature to base performance only on indoor air pollution, that is, airborne contaminant concentrations. When health authorities have established contaminant concentration limits for residential environments, it may be possible to define indoor air quality performance in terms of contaminant concentrations rather than ventilation.

1.4 This standard guide is one in a series of guides containing performance statements for residential buildings that are intended for use in the procurement, specification and evaluation of one- and two-family dwellings. These companion standard guides include those noted in the Introduction above.

1.5 This standard guide also addresses a number of residential indoor air quality issues that can not be expressed as performance statements at this time. However, they are important enough to include in this guide to at least raise the

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TABLE 1 Attributes Addressed in the Series of Performance Standards for Single Family Attached and Detached Dwellings

A	Structural Safety and Serviceability
B	Fire Safety
C	Accident Safety
D	Health and Hygiene
E	Indoor Air Quality
F	Light
G	Acoustics
H	Durability
I	Accessibility
J	Security
K	Economics
L	Functionality
M	Aesthetics
N	Adaptability
O	Maintainability
P	Sustainability

awareness of those involved in the process of procurement, specification and evaluation. These issues are addressed in 8.3.

1.6 This standard guide does not include site planning objectives. However, certain issues addressing the relationship of building to site have been covered, and it is important that these few objectives not be construed as a comprehensive site specification.

1.7 *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 requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

D5116 Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products

E241 Guide for Limiting Water-Induced Damage to Buildings

E631 Terminology of Building Constructions

E779 Test Method for Determining Air Leakage Rate by Fan Pressurization

E1465 Practice for Radon Control Options for the Design and Construction of New Low-Rise Residential Buildings

E1554 Test Methods for Determining Air Leakage of Air Distribution Systems by Fan Pressurization

E1998 Guide for Assessing Depressurization-Induced Backdrafting and Spillage from Vented Combustion Appliances

E2151 Terminology of Guides for Specifying and Evaluating Performance of Single Family Attached and Detached Dwellings

E2156 Guide for Evaluating Economic Performance of Alternative Designs, Systems, and Materials in Compliance with Performance Standard Guides for Single-Family

TABLE 2 Hierarchy of Building Elements Included in the Series of Performance Standards for Single Family Attached and Detached Dwellings

0. Whole Building System
   - 0.1 All Building Subsystems
   - 0.2 Groups of Building Subsystems
1. Spaces
   - 1.1 Entries
   - 1.2 Living Spaces
   - 1.3 Dining Spaces
   - 1.4 Kitchens
   - 1.5 Sleeping Spaces
   - 1.6 Bathrooms
   - 1.7 Water Closets
   - 1.8 Outdoor Living Spaces
   - 1.9 Storage Spaces
   - 1.10 Other
2. Structure
   - 2.1 Foundation
   - 2.2 Superstructure
3. Exterior Enclosure
   - 3.1 Grade Enclosure
     - 3.1.1 Floor on Grade
     - 3.1.2 Floor over Air Space
     - 3.1.3 Other
   - 3.2 Vertical and Sloped Enclosure
     - 3.2.1 Walls
     - 3.2.2 Windows
     - 3.2.3 Doors
     - 3.2.4 Other (e.g., railings, louvers, screens, etc.)
   - 3.3 Roofs
     - 3.3.1 Roof Coverings
     - 3.3.2 Skylights
     - 3.3.3 Other Roof Openings
   - 3.4 Joint Sealants
4. Interior Space Division
   - 4.1 Vertical Space Dividers
     - 4.1.1 Partitions
     - 4.1.2 Doors
     - 4.1.3 Other
   - 4.2 Horizontal Space Dividers
     - 4.2.1 Floors
     - 4.2.2 Ceilings
     - 4.2.3 Floor/Ceiling Openings
     - 4.2.4 Other
   - 4.3 Stairs and Ramps
5. Plumbing
   - 5.1 Plumbing Fixtures
   - 5.2 Domestic Water Distribution
   - 5.3 Sanitary Waste
   - 5.4 Rain Water Drainage
6. HVAC
   - 6.1 Heating
     - 6.1.1 Heating Generation
     - 6.1.2 Heating Distribution
     - 6.1.3 Heating Terminal and Package Units
     - 6.1.4 Heating Controls and Instrumentation
   - 6.2 Cooling
     - 6.2.1 Cooling Generation
     - 6.2.2 Cooling Distribution
     - 6.2.3 Cooling Terminal and Package Units
     - 6.2.4 Cooling Controls and Instrumentation
   - 6.3 Ventilation
     - 6.3.1 Ventilation Distribution
     - 6.3.2 Ventilation Terminal and Package Units
     - 6.3.4 Ventilation Controls and Instrumentation
7. Fire Protection Subsystems
   - 7.1 Suppression Systems
   - 7.2 Detection Systems
   - 7.3 Notification Systems
   - 7.4 Fire Protection Specialties
8. Electrical Network
   - 8.1 Electrical Service and Distribution
   - 8.2 Lighting and Branch Wiring

[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.

TABLE 2 *(continued)*

9. Communication and Security Networks
9.1 Telephone
9.2 Intercom
9.3 Television
9.4 Security
9.5 Other
10. Fuel Networks
10.1 Gas
10.2 Oil
10.3 Other
11. Fittings, Furnishings and Equipment

Attached and Detached Dwellings

2.2 *ASHRAE Standards:*[3]

ASHRAE Fundamentals Handbook 2001

ASHRAE Standard 52.2 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

ASHRAE Standard 55 Thermal Environmental Conditions for Human Occupancy

ASHRAE Standard 62 Ventilation for Acceptable Indoor Air Quality

ASHRAE Standard 111 Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems

ASHRAE Standard 129 Measuring Air Change Effectiveness

ASHRAE Standard 136 A Method of Determining Air Change Rates in Detached Dwellings

2.3 *Other Standards:*

ICC International Fuel Gas Code[4]

ISO 7730 Moderate Thermal Environments, Determination of the PMV and PPD Indices and Specification of the Conditions for Thermal Comfort[5]

NFPA 54 National Fuel Gas Code[6]

NFPA 5000 Building Construction and Safety Code[6]

2.4 *Other References:*

Building for Environmental and Economic Sustainability (BEES) 3.0, [7]

EPA, 1992, Indoor Radon and Radon Decay Product Measurement Device Protocols, EPA 402-R-92-004[8]

International Residential Code, 2003 [4]

Moisture Control in Buildings, ASTM Manual Series, MNL 18, 1994[2]

MOIST: A PC Program for Predicting Heat and Moisture Transfer in Building Envelopes. Version 3.0. NIST SP 917[7]

ORNL/CON-295 Builder's Foundation Handbook, 1991[9]

3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard guide refer to Terminologies E631, D1356, and E2151.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *commentary, n*—the fourth part of a performance statement, consisting of an informative narrative explaining aspects of the performance statement.

3.2.1.1 *Discussion*—A commentary may include one or more of the following: an explanation of how the objective relates to user needs in fields such as physiology, psychology, and culture or tradition; an explanation of how the criteria are established including guides for setting different levels of performance to meet various user needs; a discussion of the reliability of the evaluation method; and example solutions that may be deemed by the specifier to comply with the performance statement.

3.2.2 *criteria, n*—the second part of a performance statement, consisting of quantitative statements defining the level or range of performance necessary to meet an objective or, where such a level or range cannot be established, the units of measurement of the performance.

3.2.3 *evaluation, n*—the third part of a performance statement, consisting of the method(s) of assessing conformance of the element being addressed to the criteria.

3.2.3.1 *Discussion*—The evaluation states standards, inspection methods, review procedures, historical documentation, test methods, in-use performance, engineering analyses, models, or other means that may be used in assessing whether or not a criterion has been satisfied.

3.2.4 *indoor air pollution, n*—the level of air pollution in an enclosed environment.

3.2.4.1 *Discussion*—Based on the definition of air pollution in D1356, indoor air pollution relates to the concentrations of unwanted material in the air.

3.2.5 *indoor air quality, n*—the composition and characteristics of the air in an enclosed space that affect the occupants of that space.

3.2.5.1 *Discussion*—The indoor air quality of a space is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity, and air speed.

3.2.6 *specifier, n*—the individual or organization using the standard guides to create specifications and ultimately accept dwelling designs, materials, products, components, subsystems, or buildings to be provided by providers.

3.2.7 *thermal comfort, n*—the condition of mind that expresses satisfaction with the thermal environment; it requires subjective evaluation.

3.2.8 *user need, n*—a statement of the activities and behavior to be carried out in relation to the dwelling by its residents,

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

[4] Available from International Code Council (ICC), 5203 Leesburg Pike, Suite 600, Falls Church, VA 22041.

[5] Available from International Organization for Standardization (ISO), 1 rue de Varembé, Case postale 56, CH-1211, Geneva 20, Switzerland.

[6] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269-9101.

[7] Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 3460, Gaithersburg, MD 20899-3460.

[8] Available from United States Environmental Protection Association (EPA), Ariel Rios Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460.

[9] Available from Oak Ridge National Laboratory (ORNL), P.O. Box 2008, Oak Ridge, TN 37831.

or other users, defined in terms of motor, kinetic, physiological, psychological, emotional and other parameters of human behavior.

3.2.9 *ventilation, n*—the process of supplying outdoor air or removing indoor air by natural or mechanical means to or from any space.

4. Significance and Use

4.1 *General Purpose and Intent:*

4.1.1 This standard guide is to provide a standardized system for describing performance parameters of single-family attached and detached dwellings. The use of consensus performance standards for housing, can significantly contribute to the removal of barriers to the acceptance of traditional and innovative housing products and systems in the global marketplace. This standard guide in conjunction with the balance of the set of standard guides can also serve to improve communications between producers and consumers leading to enhanced quality and performance of housing.

4.1.2 This standard guide, in conjunction with the balance of the set of standard guides, will be useful to managers of housing procurement projects, homebuilders, designers, product manufacturers, and evaluation services.

4.2 *Indoor Air Quality Issues:*

4.2.1 The environment within a building impacts the health of the building occupants and their satisfaction with the space. While this standard only addresses indoor air quality, this aspect of the indoor environment is an important component of a performance approach to residential buildings.

4.2.2 The performance statements contained in this standard guide are relevant to the procurement of a range of built elements related to the indoor environment, including but not limited to the whole building, the exterior enclosure, HVAC subsystems, local exhaust subsystems, other ventilation subsystems and their components, filtration and air cleaning subsystems, and building materials and furnishings.

5. Aspects of Indoor Air Quality Performance

5.1 The quality of the air within a dwelling has multiple characteristics, including those described in this section.

5.2 *Indoor Air Pollution:*

5.2.1 Indoor concentrations of contaminants are important parameters of indoor air quality. However, few concentration guidelines have been issued to date that apply to nonindustrial environments, including residential buildings. Example guidelines are cited in Appendix B of ASHRAE Standard 62-2001, but these lists are not comprehensive in terms of the pollutants covered and are provided only for informational purposes.

5.2.2 Odors are another aspect of indoor air quality. Some odors can be readily associated with specific airborne contaminants, while many can not or are complex mixtures of contaminants. Because individuals vary greatly in their perceptions of and reactions to odors, the consideration of odor is necessarily a subjective issue.

5.2.3 Indoor moisture is important due to the association between high interior moisture levels and the potential for microbial growth. Liquid water from plumbing leaks or rain penetration can also be associated with microbial growth. Such growth indoors can lead to the generation of bioaerosols, which can seriously degrade indoor air quality. In addition, low levels of indoor humidity can lead to discomfort and health concerns based on drying of mucous membranes. Therefore, moisture issues are covered in this guide.

5.3 *Thermal Comfort:*

5.3.1 The thermal environment within a space is another important aspect of indoor air quality. The thermal conditions in a space, and the reaction of building occupants to these conditions, are determined by a combination of physical and personal factors. The physical factors include the air temperature, relative humidity, air speed, and radiant temperatures of indoor surfaces. The personal factors include clothing levels, physical activity and personal preference.

5.4 *Energy Use:*

5.4.1 Energy use is an important consideration in the provision of adequate indoor air quality. Some approaches to ventilating for indoor air quality can lead to a net increase in outdoor air entry, leading to increased energy consumption. In addition, approaches that employ fans for ventilation are associated with the energy used to power those fans. Compliance with the performance statements in this standard guide can be achieved with alternative designs and elements proposed by providers that very in the costs of components. These alternatives will also very in their energy use, and consequently in energy costs to be incurred over the design life of the dwellings. The evaluation of energy costs will be an important consideration for specifiers in making the selections among alternative proposals by providers.

5.4.2 Some performance specifications have included some form of energy budget, but that is not the approach taken in this standard guide. Economics is addressed in a separate standard guide of this suite: Standard Guide for Evaluating Economic Performance of Alternative Designs, Systems, and Materials in Compliance With Performance Standard Guides for Single-Family Attached and Detached Dwellings. An appendix to this latter document will include an example of the use of life-cycle costing to evaluate alternative solutions with varying energy costs. Providers should provide all the necessary information on the energy use entailed by their proposals. Specifiers shall provide information on the methods to be used for estimating the costs of various energy sources, as well as predicting the ambient thermal conditions affecting the dwelling.

6. Site Considerations Affecting Indoor Air Quality

6.1 *Outdoor Sources:*

6.1.1 Indoor air quality can be impacted by contaminant sources outside a building in addition to those indoors. Outdoor air pollution sources can be characterized as regional, local or immediate. Examples of regional sources include a high density of heavy industry and other industrial pollution sources, farming and other agricultural activities, and natural sources of dust or pollen. Local sources would include a specific agricultural or industrial source (such as a factory) located near the building, or proximity to a road with heavy traffic. An immediate source might be an exhaust vent from an

adjacent building, idling motor vehicles at a nearby loading dock, landscaping activities, or a trash dumpster in an adjoining alley.

6.1.2 Information on regional, local or immediate contaminant sources of sufficient detail is important to the design of the building so as to provide a specified level of indoor air quality. Outdoor or other contaminant sources should be determined in conjunction with the site design, so that methods for controlling contaminant sources may be established.

6.2 *Climate:*

6.2.1 The climate in which a building is located can impact indoor air quality. The relevant climatic variables are air temperature, insolation, relative humidity, wind speed and direction, and precipitation.

6.2.2 Air temperature, insolation, relative humidity, and wind speed and direction impact thermal comfort through the shading, insulation and thermal storage capabilities of the building enclosure elements, through the thermal storage capability of the building interior elements, and through the placement of operable windows.

6.2.3 Outdoor air temperature and wind speed and direction also impact building infiltration rates, which determine the rate of dilution of pollutants generated indoors and the rates at which outdoor pollutants enter a building. These weather conditions are particularly relevant to natural ventilation strategies in buildings.

6.2.4 Outdoor temperature and humidity levels impact moisture migration into and through the building envelope and the potential for condensation in the envelope and within the building. Excessive condensation and accumulation can lead to microbial growth and deterioration of indoor air quality.

6.2.5 Wind speed and direction relate to the transport of contaminants from outdoor sources to the building and moisture penetration into and possibly through the building envelope. Prevailing winds and the location of outdoor pollutant sources is a consideration when locating operable windows and ventilation system inlets, as are local site conditions that impact airflow in the vicinity of the building (for example, trees, bushes, berms, other buildings, etc.). Wind-driven moisture should also be considered in designing the building envelope.

6.2.6 Air temperature, solar insolation and relative humidity can impact the emission rates of some organic materials due to temperature and humidity effects.

6.2.7 The level of precipitation at a site, in combination with wind conditions, is another climatic consideration. Exterior envelope design, rain runoff control and ventilation of unconditioned spaces such as crawl spaces are important factors to consider, particularly in climates with heavy precipitation, as they will impact water penetration and therefore the potential for indoor microbial growth.

6.2.8 Information on local climatic conditions of sufficient detail is important to the design of the building so as to provide a specified level of indoor air quality. Climatic conditions should be determined in conjunction with the site design, so that methods for controlling these contaminant sources may be established.

6.3 *Soil Conditions:*

6.3.1 The level of moisture in soil can impact indoor moisture levels and needs to be considered in foundation and floor design and construction.

6.3.2 The soil can also be a source of contaminants such as radon, bioaerosols, pesticides or other organic compounds associated with past site conditions and events. These factors need to be considered when selecting a site, preparing it for construction and designing the foundation system.

6.3.3 Information on the soil conditions at the local site of sufficient detail is important to the design of the building so as to provide a specified level of indoor air quality. Soil conditions should be determined in conjunction with the site design, so that methods for controlling contaminant sources may be established.

7. Evaluation Methods

7.1 *Contaminant Measurement*—While the guide does not contain many criteria based on indoor contaminant concentrations, the evaluation of concentration requires the use of appropriate measurement methods. Currently, there is not a comprehensive set of standard test methods for measuring the indoor concentrations of relevant contaminants at levels appropriate to non-industrial environments. When measuring indoor contaminant concentrations, the measurement method must be selected based on accuracy, minimum detection limits, expected indoor concentrations, noise associated with the measurement equipment, and cost.

7.2 *Ventilation and Airflow Measurement*—The guide contains criteria related to building ventilation and airflow rates. Standard test methods exist for such quantities. They are cited in the specific performance statements, and some of them are discussed in Appendix X2.

7.3 *Inspection*—Several of the criteria are associated with evaluations based on inspections of building design and of the constructed building. These are not standardized procedures, but are based on the specific item being examined and the relevant criteria.

7.4 *Life Cycle Costing*—Alternative proposals, each of which may comply with all the performance specifications based on the performance statements in this guide, are likely to have differing first costs as well as differing energy and other operating costs. A life cycle cost analysis of each of the alternatives may be performed in order to be able to complete the evaluation and select from among the alternative proposals. Such an analysis should be based on an agreed upon methodology that accounts for the energy and other costs needed to operate the proposed solutions. Life cycle cost analysis that includes energy use can be found in Guide E2156. In addition to these economic analyses, specifiers may also employ life cycle assessment methodologies that consider environmental impacts including resource consumption, pollution emitted and other issues such as those employed within the BEES methodology.

8. Performance Statements

8.1 Illustrative examples of performance statements for building materials, products, components, assemblies, and subsystems are given in Appendix X1 in O-C-E-C format.

8.2 *Hierarchy of Building Elements:*

8.2.1 The example performance statements given in Appendix X1 are presented against the Hierarchy of Building Elements tabulated in Table 2. The order of presentation begins with "0. Whole Building System" followed in order by each of the subsystems. Within each subsystem, the example performance statements follow in order down to the lowest levels of the hierarchy as needed.

8.2.2 To some extent the Hierarchy of Building Elements reflects the structure of the housing industry, and therefore, the organization of the provider teams. For example, a homebuilder or developer is likely to be the systems integrator responsible for "0. Whole Building System." The provider teams may include separate subcontractors for "5. Plumbing," "6. HVAC," "8. Electrical Network" and the like, and separate suppliers for components such as "3.2.2 Windows," "3.2.3 Doors," "3.4 Joint Sealants," and so forth.

8.2.3 The Evaluation part of the performance statements includes the identification of the types of information (for example, drawings, samples, test reports, and so forth) that might be developed to allow comparison with the Criteria. The responsibility for making available this information is dependent upon the contractual relationship that exists between provider, specifier and user. For performance statements at higher levels of the Hierarchy of Building Elements such as "0. Whole Building System," the technical information documenting compliance must be provided by the systems integrator. The systems integrator, for example, may assemble portions of this information from members of the provider's team, such as subcontractors or suppliers. In some cases, the systems integrator may develop a performance specification for one or more products, components, or assemblies at lower levels of the Hierarchy of Buildings Elements in order to obtain this information.

8.2.4 For performance statements at lower levels of the Hierarchy of Building Elements, the information documenting compliance may be provided directly by a subcontractor or supplier member of the provider's team.

8.3 *Other Performance Issues:*

8.3.1 There are a number of residential indoor air quality issues that are important, but that may not yet be appropriate for performance statements due to the current lack of recognized performance criteria or evaluation methods. This section identifies some of those issues.

8.3.2 *Odors:*

8.3.2.1 When occupying a building, the occupants should not experience objectionable odors generated within the building that are not created by the user. The occupants themselves may be responsible for odors due to their activities. Examples of such activities include some hobbies and cooking, while odorous sources might include some furnishings and pets.

8.3.2.2 Standardized methodologies for predicting odor levels that might occur due to materials and furnishings do not currently exist Therefore the ability to address these odors is limited within the context of this standard. Some work has been done that allows one to relate the emissions from some materials in chambers to expected odor levels, but the capability does not yet exist to perform such predictions on a whole building basis for the wide variety of sources that might be present.

8.3.2.3 Consideration of odors could focus on the unoccupied building, which would avoid the influences of occupant activities and furnishings. However, the methodological problems for predicting and evaluating odor levels would remain.

8.3.3 *Pollutant Sources in Garages:*

8.3.3.1 Indoor air quality can be impacted by contaminant sources in attached parking garages. Although the homeowner has control over the existence of noxious or odorous substances in a garage, the airtightness of the boundary between the garage and the occupied space can help to reduce the likelihood of such pollutant transport. In addition, they might want to consider the airtightness of air handling equipment and ductwork that is located in the garage, given the potentialimpact of duct leakage on pollutant transport between the garage and the living space.

9. Keywords

9.1 building performance; indoor air pollution; indoor air quality; residential; ventilation

APPENDIXES

(Nonmandatory Information)

X1. EXAMPLES OF INDOOR AIR QUALITY PERFORMANCE STATEMENTS

X1.1 Whole Building System

X1.1.1 Whole Building Ventilation. See Table X1.1.

X1.1.2 Ventilation Air Distribution. See Table X1.2.

X1.1.3 Occupant Control of Whole Building Ventilation. See Table X1.3.

X1.1.4 Thermal Comfort. See Table X1.4.

X1.1.5 Indoor Radon Concentrations. See Table X1.5.

X1.1.6 Design with Respect to Outdoor Sources. See Table X1.6.

X1.1.7 Indoor Pollutant Sources. See Table X1.7.

X1.2 Spaces

X1.2.1 Whole Building Kitchen, Bath and Toilet Exhaust. See Table X1.8.