# AGENDA

**NFPA Technical Committee on Air Conditioning (AIC-AAA)**
**NFPA 90A/NFPA 90B First Draft Meeting (A2023)**

August 31 and September 1, 2021 (September 2, 2021, if necessary).
10:00 a.m. – 6:00 p.m. (ET)

Microsoft Teams Web Conference
To join the meeting, please contact Yiu Lee (ylee@nfpa.org)

1. **Call to order.** Chair Dwayne Sloan.
2. **Roll call of members and guests present.** See page 3.
3. **Chair report.** Dwayne Sloan.
4. **Staff liaison report.** Kevin Carr.
   a. Presentation on first draft meeting process. See page 7.
5. **Previous meeting minutes.** See page 42.
6. **90A Reorganization.**
   a. Discussion on possible reorganization of NFPA 90A from the Pre-First Draft meeting.
7. **Public Input (PI) review.**
   a. NFPA 90A PIs. See page 45.
   b. NFPA 90B PIs. See page 211.
8. **NFPA 90A staff identified issues.**
   a. Editorial items.
   b. Egress corridor discussion.
   c. Figure A.5.3 review.
   d. VRF discussion.
   e. Annex B discussion.
   f. Definitions and extracts.
   g. Reference publications.

**9. NFPA 90B staff identified issues**

a. Editorial items.

b. VRF discussion.

c. Definitions and extracts.

d. Reference publications.

**10. New business.**

a. Creation and review of task groups for Second Draft.

b. Other business by the technical committee.

**11. Future meetings.** To be determined.

**12. Adjournment.**

# Address List

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# NFPA 90A and NFPA 90B First Draft Meetings

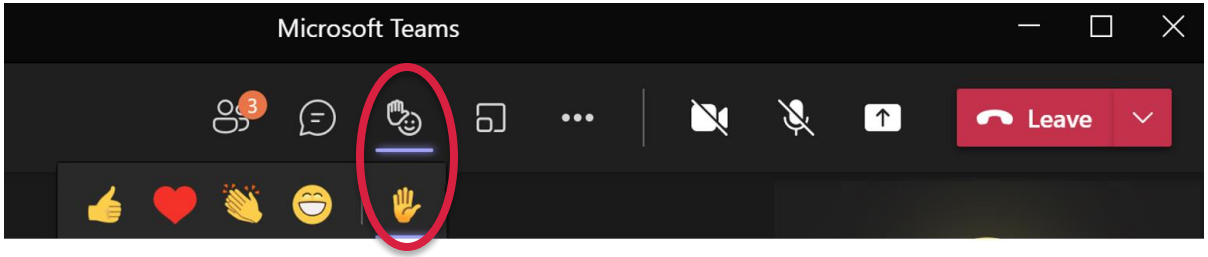
Microsoft Teams Remote Meeting/Teleconference

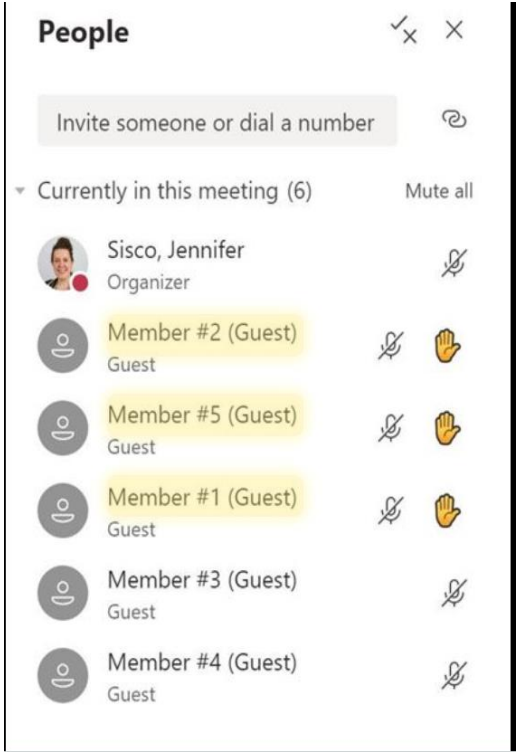
August 31, September 1 and September 2, 2021

IT'S A BIG WORLD. LET'S PROTECT IT TOGETHER.™

# NFPA Virtual Meeting

- Please use the “hand raise” function to speak



# NFPA First Draft Meeting

## Web Conference Tips

- Use “raise hand” function to be recognized
- State name before speaking
- Mute your microphone/phone when not speaking (*6 on phone) – staff can mute you but CAN’T unmute you
- Shut off video if you have a slow connection

# NFPA First Draft Meeting

## Members

- Please verify your contact information on roster at www.nfpa.org/90A or www.nfpa.org/90B and email any changes to ylee@nfpa.org
- Use of audio recorders or other means capable of reproducing verbatim transcriptions of this or any NFPA meeting is not permitted

# NFPA First Draft Meeting

## Guests

- Sign in and identify affiliations
- Participation
  - Requested 7 days prior to the meeting or;
  - At the discretion of the Chair
- Equal opportunity granted to opposing views

# NFPA First Draft Meeting

Members categorized in ANY interest category who have been retained to represent the interests of ANOTHER interest category (with respect to a specific issue or issues that are to be addressed by a TC/CC) shall declare those interests to the committee and refrain from voting on any Public Input, Comment, or other matter relating to those issues throughout the process.

# Annual 2023 Revision Cycle – Key Dates

- Public Input Stage (First Draft):
  - First Draft Meeting**: August 31-September 2, 2021**
  - Posting of First Draft for Balloting Date: **February 1, 2022**
  - Posting of First Draft for Public Comment: **March 22, 2022**
- Comment Stage (Second Draft):
  - Public Comment Closing Date: **May 31, 2022**
  - Second Draft Meeting Period: **July-August, 2022**
  - Posting of Second Draft for Balloting Date: **January 17, 2023**
  - Posting of Second Draft for NITMAM: **February 28, 2023**
- Tech Session Preparation:
  - NITMAM Closing Date: **March 28, 2023**
  - NFPA Technical Meeting: **June 2023**
- Standards Council Issuance:
  - Documents with CAMs: **August 2023**

# NFPA First Draft Meeting

## Voting During the First Draft Meeting:

- Either Principal or Alternate can vote, not both.
- All Principals are encouraged to have an Alternate.
- Voting (simple majority) during meeting is used to create proposed First Revisions.
- Voting (simple majority) during meeting is also used to establish Public Input resolution responses and to create Committee Inputs.

# NFPA First Draft Meeting

General Procedures:

- Follow Robert's Rules of Order
- Discussion requires a motion

# NFPA First Draft Meeting

Committee Member Actions:

- Member addresses the chair
- Receives recognition from the chair
- Member introduces the motion
- Another member seconds the motion

# NFPA First Draft Meeting

Committee Chair Actions:

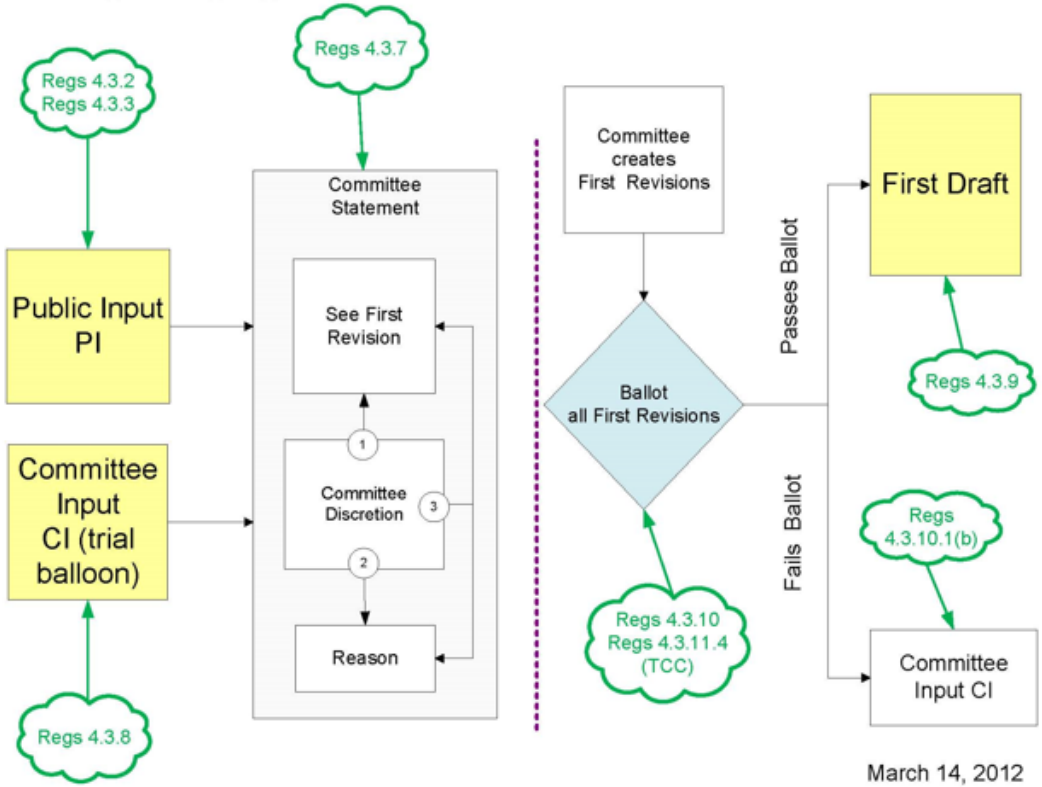
- Restates the motion
- Calls for discussion
- Ensures all issues have been heard
- Calls for a vote
- Announces the vote result

# NFPA First Draft Meeting

Motion to End Debate, Previous Question, or to “Call the Question”

- Not in order when another member has the floor
- Requires a second
- Not debatable and DOES NOT automatically stop debate
- 2/3 affirmative vote immediately closes debate, returns to the original motion
- Less than 2/3 allows debate to continue

# *Standards Development Process – Input Stage Regs §4.3*



# NFPA First Draft Meeting

Committee Actions and Motions:

- Resolve Public Input (PI)
- Create a First Revision (FR)
- Create a Committee Input (CI) – a placeholder used to solicit Public Comments and permit further work at Second Draft stage

# NFPA First Draft Meeting

Resolve a Public Input (PI):

- Committee develops a committee statement to respond to (i.e., resolve) a Public Input.
- Committee indicates in statement its reasons for not accepting the recommendation and/or points to a relevant First Revision.
- PI response does not get balloted.

# NFPA First Draft Meeting

Create a First Revision (FR):

- FR is created to change current text or add new text.
- Committee statement is developed to substantiate the change.
- Associated PIs get a committee response, often simply referring to the relevant FR.
- Each FR gets balloted.

# NFPA First Draft Meeting

Create a Committee Input (CI):

- Committee is not ready to incorporate a change into the First Draft but wants to receive Public Comment on a topic that can be revisited at Second Draft stage.
- Committee statement is developed to explain committee's intent.
- CI is not balloted.

# NFPA First Draft Meeting

## Committee Statements:

- All Public Input must receive a Committee Statement.
- A valid technical reason must be provided.
- Vague references to “intent” should not be used.
- Reasons for why the submitter’s substantiation is inadequate should be provided.
- A First Revision should be referenced if it addresses the intent of the submitter’s Public Input.

# NFPA First Draft Meeting

Formal Voting on First Revisions

- In-meeting votes establish a base committee position on the development of First Revisions (FRs).
- FRs are secured by electronic balloting (≥2/3 of completed ballots affirmative, and affirmative by ≥1/2 voting members).
- Only the results of the electronic ballot determine the official position of the committee on the First Draft.

# NFPA First Draft Meeting

## Ballots:

- Only First Revisions (FR) are balloted.
  - Public Inputs and Committee Statements are not balloted.
  - Reference materials are available.
    - First Draft, PI, CI, and CS
- Voting options:
  - Affirmative on all FRs
  - Affirmative on all FRs with exceptions specifically noted
- Ballot provides option to vote affirmative with comment.
- Vote to reject or abstain requires a reason.

# NFPA First Draft Meeting

Electronic Balloting:

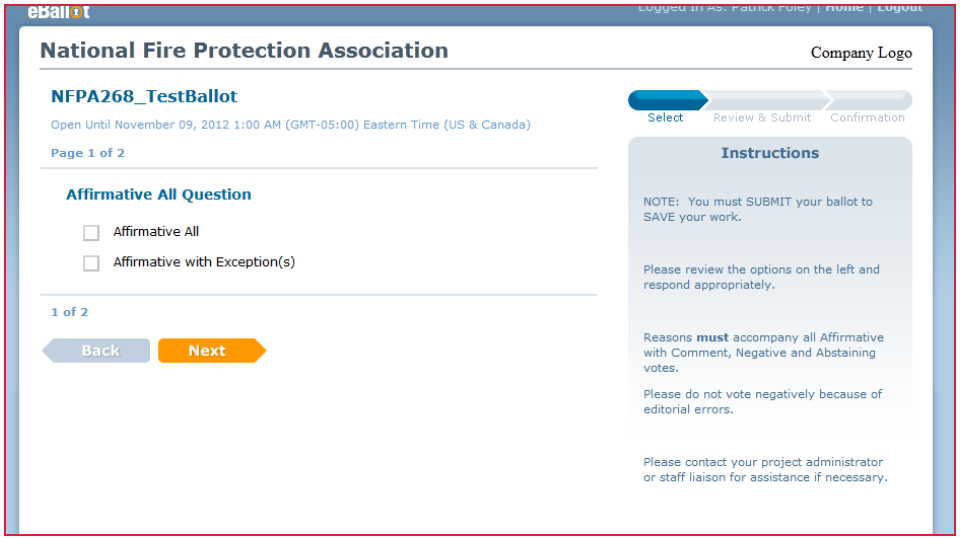
- Ballot system is web-based.
- Alternates are encouraged to complete ballots.
- Ballot session will time out after 90 minutes.
- Use “submit” to save your work – ballots can be revised until the balloting period is closed.

# NFPA First Draft Meeting

- Click link provided in ballot email.
- Sign in with NFPA.org username and password.

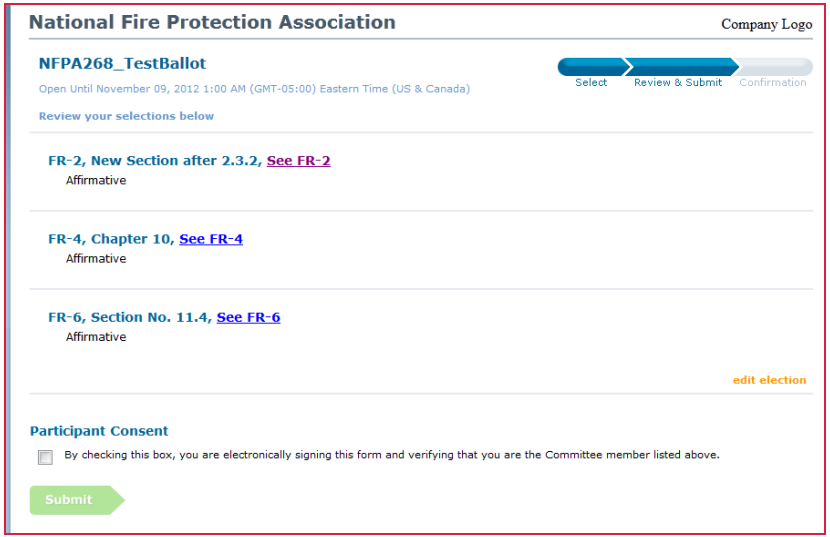
# NFPA First Draft Meeting

- Select either ‘Affirmative All’ or ‘Affirmative with Exception(s)’.



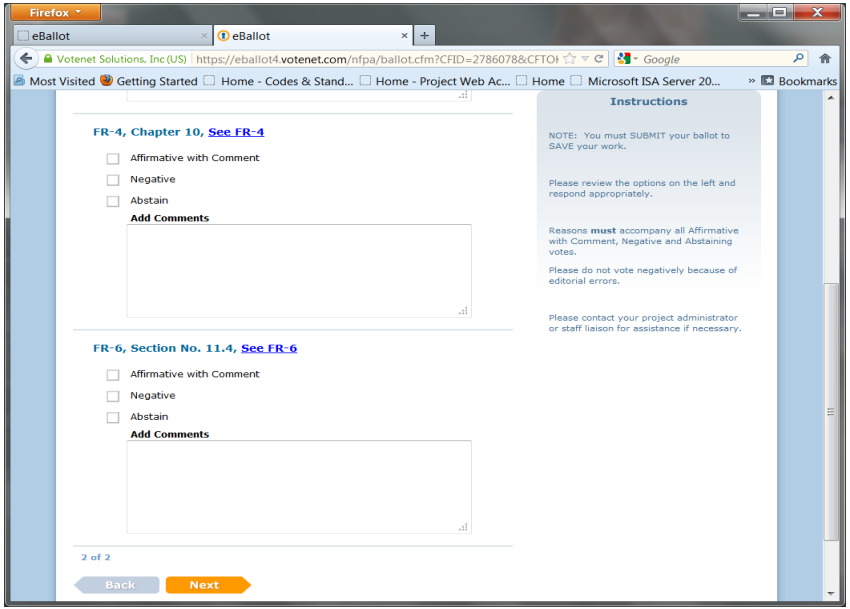
# NFPA First Draft Meeting

- Use “See FR- #” link to review all First Revisions.
- Use “edit election” to change individual votes or to modify vote after submitting ballot.



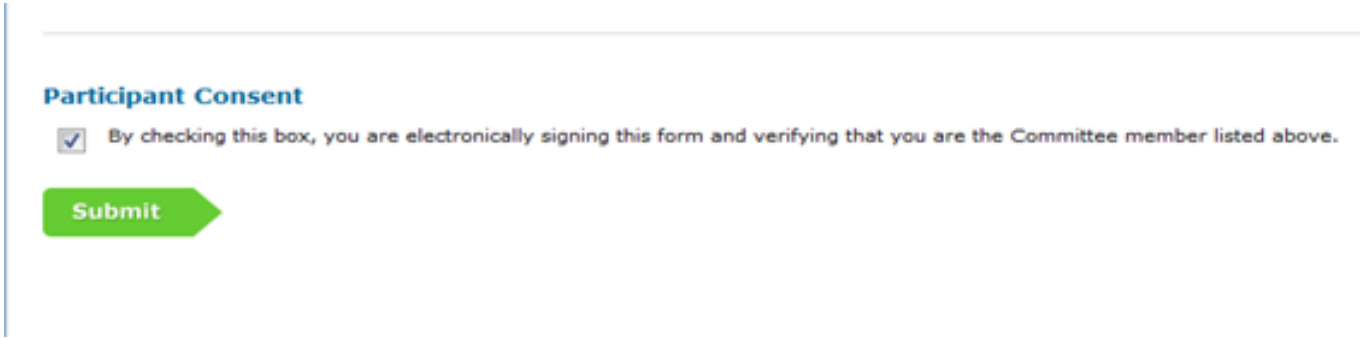
# NFPA First Draft Meeting

- Make selection: Affirmative with Comment, Negative, or Abstain
- No selection defaults to affirmative
- Must include comment (reason) on each vote other than Affirmative



# NFPA First Draft Meeting

- To complete ballot, click ‘Participant Consent and Submit’.
- Return to edit any votes by ballot due date.



# NFPA First Draft Meeting

Balloting:

- Initial ballot
- Circulation of negatives and comments – electronic balloting re-opened to permit members to change votes
- Any First Revision that fails ballot becomes a Committee Input (CI)

# Legal

Antitrust Matters:

- Must comply with state and federal antitrust laws
- Participants are to conduct themselves in strict accordance with these laws
- Read and understand NFPA's Antitrust Policy which can be accessed at nfpa.org/regs

# Legal

## Antitrust Matters (cont'd):

- Participants must avoid any conduct, conversation or agreement that would constitute an unreasonable restraint of trade
- Conversation topics that are off limits include:
  - Profit, margin, or cost data
  - Prices, rates, or fees
  - Selection, division or allocation of sales territories, markets or customers
  - Refusal to deal with a specific business entity

# Legal

## Antitrust Matters (cont'd):

- NFPA's standards development activities are based on openness, honesty, fairness and balance
- Participants must adhere to the *Regulations Governing the Development of NFPA Standards* and the *Guide for the Conduct of Participants in the NFPA Standards Development Process* which can accessed at nfpa.org/regs
- Follow guidance and direction from your employer or other organization you may represent

# Legal

## Antitrust Matters (cont'd):

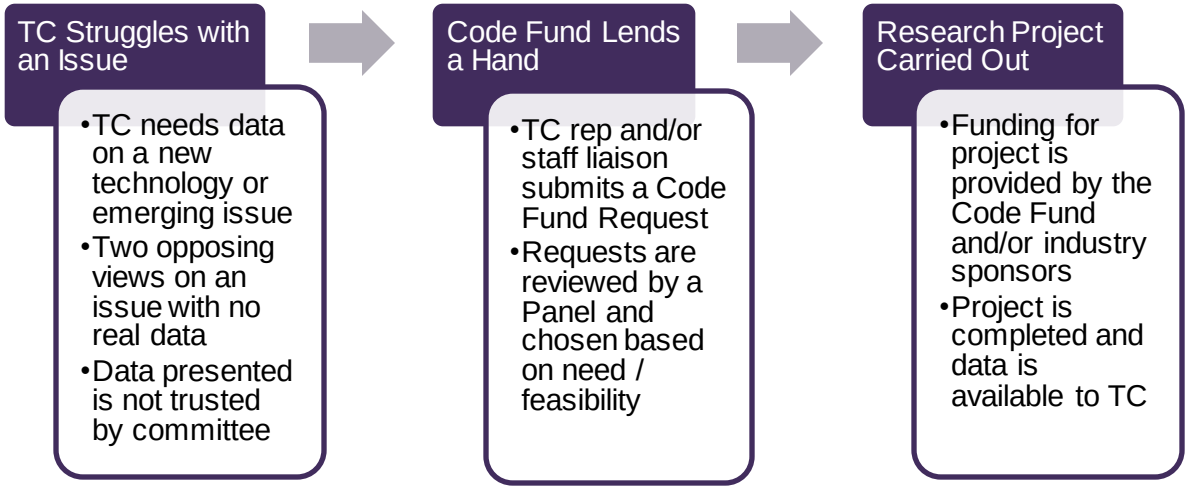
- Manner is which standards development activity is conducted can be important
- The *Guide of Conduct* requires standards development activity to be conducted with openness, honesty and in good faith
- Participants are not entitled to speak on behalf of NFPA
- Participants must take appropriate steps to ensure their statements whether written or oral and regardless of the setting, are portrayed as personal opinions, not the position of NFPA
- Be sure to ask questions if you have them

# Legal

## Patents:

- Disclosures of essential patent claims should be made by the patent holder
- Patent disclosures should be made early in the process
- Others may also notify NFPA if they believe that a proposed or existing NFPA standard includes an essential patent claim
- NFPA has adopted and follows ANSI's Patent Policy
- It is the obligation of each participant to read and understand NFPA's Patent Policy which can be accessed at nfpa.org/regs

# THE FIRE PROTECTION RESEARCH FOUNDATION




www.nfpa.org/research

# Document Information Pages

| About | Current and Previous Editions | Next Edition | Technical Committee |
|---|---|---|---|
| • Document scope<br>• Table of contents<br>• Articles<br>• Research and statistical reports<br>• Latest codes and standards news on NFPA Today blog feed<br>• Free access | • Issued TIAs, FIs, Errata<br>• Archived revision information such as meeting and ballot information, First Draft Reports (previously ROPs), Second Draft Reports (previously ROCs), and Standards Council and NITMAM information | • Revision cycle schedule<br>• Posting & closing dates<br>• Submit public input/comments via electronic submission system.<br>• Meeting and ballot information<br>• First Draft Report and Second Draft Report<br>• NITMAM information<br>• Standard Council Decisions<br>• Private TC info (*red asterisk)<br>  • Ballot circulations, informational ballots and other committee info | • Committee name and staff liaison<br>• Committee scope and responsibility<br>• Committee list with private information<br>• Committee documents (codes & standards) in PDF format<br>• Committees seeking members<br>• Online committee membership application |

# Questions?

NFPA 90A and NFPA 90B Document Information Pages:

- www.nfpa.org/90A
- www.nfpa.org/90B

# NFPA Technical Committee on Air Conditioning
# (AIC-AAA)
# NFPA 90A and 90B PRE-FIRST DRAFT
# MEETING MINUTES

Thursday, May 6, 2021
Microsoft Teams

1. **Call to Order.** The meeting was called to order by Chair Dwayne Sloan at 1:01 p.m. on May 6, 2021 via Microsoft Teams.

2. **Chair's Report.** The Chair welcomed everyone and outlined the meeting agenda. The Chair thanked the previous past chair, Ralph D. Gerdes, for his years of service.

3. **Staff Liaison Remarks.** NFPA Staff Liaison Kevin Carr welcomed everyone and provided an update and important dates pertaining to the A2023 revision cycle.

4. **Introduction of Committee Members.** NFPA Staff Liaison took a roll call of the members and guests present.

**TECHNICAL COMMITTEE MEMBERS PRESENT**

| NAME | COMPANY |
|---|---|
| Dwayne Sloan, Chair | UL LLC |
| Rendell K. Bourg, Principal | National Fire Protection Company, Inc./Automatic Fire Alarm Association, Inc. |
| Dennis Dawe, Principal | CBRE |
| Brian Deacy, Principal | Atkore International/National Electrical Manufacturers Association |
| Jonathan Flannery, Principal | AHA-ASHE |
| Ralph D. Gerdes, Principal | Ralph Gerdes Consultants, LLC |
| Jonathan Hartsell, Principal | Rodgers |
| Eli P. Howard III, Principal | Sheet Metal & Air Conditioning Contractors National Association |
| Kevin D. Kalakay, Principal | State of Michigan |
| Ralph A. Koerber, Principal | ATCO Rubber Products, Inc./Air Duct Council |
| Ajay V. Prasad, Principal | Jensen Hughes |
| Michael Schmeida, Principal | Gypsum Association |

| | |
|---|---|
| Jay Burris, Alternate (Andre) | Wheatland Tube (Div. of Zekelman Industries) |
| Timothy Earl, Alternate (Hirschler) | GBH International/North American Flame Retardant Alliance/Plenum Cable Association |
| Juan Carlos Hernandez, Alternate (Prasad) | Jensen Hughes |
| Kevin Carr, Staff Liaison | NFPA |

**GUESTS**

| NAME | COMPANY |
|---|---|
| Robert Glass | Goodman Manufacturing |
| Scott Lang | Honeywell |

**TECHNICAL COMMITTEE MEMBERS NOT PRESENT (WHOSE ALTERNATES DID NOT ATTEND)**

| NAME | COMPANY |
|---|---|
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| Alberto Cusimano, Principal | Dupont International SA |
| James T. Dollard, Jr., Principal | IBEW Local Union 98 |
| Anthony Hurst, Principal | Mason & Hangar |
| William E. Koffel, Principal | Koffel Associates, Inc. |
| John M. Wright, Principal | SMART 20 |
| Charles C. Cottrell, Voting Alternate | North American Insulation Manufacturers Association |
| Amando Lyndyll Hisole, Voting Alternate | CCRD Partners |
| William A. Webb, Voting Alternate | Webb Fire Protection Consulting, Inc |

5. **Presentation of NFPA Standards Development Process.** The NFPA Staff Liaison gave a PowerPoint presentation on the NFPA technical committee process.

6. **Approval of August 2019 Second Draft Development Meeting Minutes.** The technical committee unanimously approved these as written.

7. **Possible Reorganization of NFPA 90A.** The technical committee discussed a possible reorganization and reviewed a draft of a proposed arrangement. The committee will review this document and provide comments to the chair by June 1, 2021. The committee will discuss this possible reorganization at the First Draft meeting.

8. **Other Business.** None.

9. **Next Meeting.** A poll will be sent to the technical committee to determine the dates of the First Draft meeting in late summer/early fall 2021.

10. **Adjournment.** The meeting was adjourned at 1:56pm on Thursday, May 6, 2021.

## Public Input No. 4-NFPA 90A-2021 [ Section No. 2.3.2 ]

**2.3.2** ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM C411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation*, 2019.

ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester*, ~~2018~~ 2020 .

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, ~~2019b~~ 2021a .

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, ~~2018c e1~~ 2020 .

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*, ~~2019~~ 2019a .

ASTM E2231, *Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics*, ~~2018~~ 2019 .

ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C*, 2018.

ASTM E2965, *Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter*, 2017.

### Statement of Problem and Substantiation for Public Input

date updates

### Submitter Information Verification

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**Submittal Date:** Thu Apr 01 21:43:24 EDT 2021
**Committee:** AIC-AAA

## Public Input No. 25-NFPA 90A-2021 [ Section No. 2.3.6 ]

**2.3.6** UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 181, *Factory-Made Air Ducts and Air Connectors*, 2013, revised 2017.

UL 181A, *Closure Systems for Use with Rigid Air Ducts*, 2013, revised 2017.

UL 181B, *Closure Systems for Use with Flexible Air Ducts and Air Connectors*, 2013, revised 2017.

UL 263, *Fire Tests of Building Construction and Materials*, 2011, revised ~~2018~~ 2020 .

UL 555, *Fire Dampers*, 2006, revised ~~2016~~ 2020 .

UL 555C, *Ceiling Dampers*, 2014, revised ~~2017~~ 2020 .

UL 555S, *Smoke Dampers*, 2014, revised ~~2016~~ 2020 .

*UL 586, High-Efficiency, Particulate, Air Filter Units, 2009, revised 2017*

UL 723, *Test for Surface Burning Characteristics of Building Materials*, 2018.

UL 867, *Electrostatic Air Cleaners*, 2011, revised 2018.

UL 900, *Air Filter Units*, 2015.

UL 1598, *Luminaires*, ~~2018~~ 2021 .

UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics*, 2004, revised 2017.

UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics*, 2004, revised 2017.

UL 1995, *Heating and Cooling Equipment*, 2015, revised 2018 .

UL 2024, *Cable Routing Assemblies and Communications Raceways*, 2014, revised 2015.

UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces*, 2013.

UL 2518, *Air Dispersion Systems*, 2016.

UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics*, 2014, revised ~~2016~~ 2020 .

UL 60335-2-40, *Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers*, ~~2017~~ 2019 .

## Statement of Problem and Substantiation for Public Input

Update references to the UL standards.

High-efficiency particulate air-filter units are a throw-away type air filter intended for removal of very fine particulate matter (i.e., designed to remove not less than 99.97% of 0.3 micron diameter particles) from the air of industrial and laboratory exhaust and ventilating systems. These units consist of a filter medium of glass fiber or other equivalent inorganic material and a frame of metal or other inorganic material or of wood. Wood, if used, is evaluated for a flame-spread index of 25 or less, as determined by ANSI/UL 723, "Test for Surface Burning Characteristics of Building Materials." UL currently has 11 manufacturers that high efficiency particulate air filter units listed to UL 586.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 26-NFPA 90A-2021 [New Section after 4.2.2.5] | |

## Submitter Information Verification

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**Committee:** AIC-AAA

## Public Input No. 19-NFPA 90A-2021 [ Section No. 3.3.14 ]

**3.3.14** Damper.

**3.3.14.1*** Ceiling ~~Damper~~ Radiation Damper .

A listed device installed in a ceiling membrane of a fire resistance–rated floor-ceiling or roof-ceiling assembly to automatically limit the radiative heat transfer through an air inlet/outlet opening.

**3.3.14.2** Combination Fire ~~and~~ - Smoke Damper.

A listed device installed in ducts or air transfer openings of fire-resistance rated walls, barriers, partitions, or floors that meets both fire damper and smoke damper requirements.

**3.3.14. 3** Corridor Damper.

A listed device intended for use where air ducts penetrate or terminate at horizontal openings in the ceillings of fire-resistance-rated corridors, where the corridor ceiling is constructed as required for the corridor walls.

**3.3.14.4*** Fire Damper.

A listed device installed in an air distribution system and designed to close automatically upon detection of heat, to interrupt migratory airflow, and to restrict the passage of flame.

**3.3.14.4 5*** Smoke Damper.

A ~~device within~~ listed device within an air-distribution system to control the movement of smoke. [ ***5000,*** ~~2021~~]

## Statement of Problem and Substantiation for Public Input

The damper definitions are being revised to be align with the UL Marking Guide and to define the type of product and applications for each type of damper. It is further recommended that all damper definitions be assigned to this Technical Committee and that NFPA 1, NFPA 101, and NFPA 5000 extract the definitions for dampers from NFPA 90A.

It should be noted that the term "ceiling damper" be replaced with "ceiling radiation damper" and that "combination fire and smoke damper" be replaced with "combination fire-smoke damper" throughout the document.

## Submitter Information Verification

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**Committee:** AIC-AAA

# Public Input No. 35-NFPA 90A-2021 [ New Section after 3.3.20 ]

**3.3.21 Fusible Link.**

A device consisting of two strips of metal soldered together with a fusible alloy that is designed to melt at a specific temperature, designed to be the triggering device in fire dampers, ceiling radiation dampers, mecahnical automatic door release mechanisms, and other devices.

**3.3.22 Heat-Responsive Device.**

A mechanical or electrical device arranged to actuate the closing mechanism of a damper or other device by operation at a predetermined temperature.

## Statement of Problem and Substantiation for Public Input

The term fusible link is already used in NFPA 90A and language has been proposed to use "heat-responsive device".

As an alternative, the Technical Committee could extract the definition of "fusible link" from NFPA 80. If the Technical Committee prefers the proposed definition, it is recommended that NFPA 80 extract this definition. NFPA 80 has a definition for heat-actuated device but not heat-responsive device.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 23-NFPA 90A-2021 [Section No. 5.4.5.2] | |

## Submitter Information Verification

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**Submittal Date:** Tue Jun 01 12:14:27 EDT 2021
**Committee:** AIC-AAA

# Public Input No. 10-NFPA 90A-2021 [ Chapter 4 ]

**Chapter 4** – ~~HVAC Systems~~

**4.1** – ~~General Requirements for Equipment.~~

**4.1.1** – ~~Access.~~

~~Equipment shall be arranged to afford access for inspection, maintenance, and repair.~~

**4.1.2** –

~~Equipment shall be selected and installed based on its application with respect to the manufacturer's installation instructions and listing, as applicable.~~

**4.1.3** – ~~Protection.~~

**4.1.3.1** –

~~Equipment shall be guarded for personnel protection.~~

**4.1.3.2** –

~~Equipment shall be guarded against the intake of foreign matter into the system.~~

**4.1.4** –

~~Electrical wiring and equipment shall be installed in accordance with *NFPA 70* .~~

**4.1.5** –

~~Air-handling equipment rooms shall meet the requirements of Section 5.1 .~~

**4.2** – ~~System Components.~~

**4.2.1** – ~~Outside Air Intakes.~~

**4.2.1.1** –

~~Outside air intakes shall be protected by screens of corrosion-resistant material not larger than 12.7 mm (0.5 in.) mesh.~~

**4.2.1.2** ~~*~~ –

~~Outside air intakes shall be located so as to minimize the introduction of fire or smoke into the building.~~

**4.2.1.2.1** –

~~Outside air intakes shall be equipped with an approved fire and/or smoke damper where not located to meet the requirements of 4.2.1.2 . *(See Section 6.3 for smoke damper operation to restrict the intake of smoke.)*~~

**4.2.2** – ~~Air Cleaners and Air Filters.~~

**4.2.2.1** –

~~Electrostatic air cleaners shall be listed in accordance with UL 867, *Electrostatic Air Cleaners* .~~

**4.2.2.1.1** –

~~Electrostatic air cleaners shall be installed in conformance with the conditions of the manufacturer's listing.~~

**4.2.2.2** ~~*~~ –

~~Air filters shall comply with UL 900, *Air Filter Units* .~~

**4.2.2.3** –

Liquid adhesive coatings used on air filters shall have a minimum flash point of 163°C (325°F) as determined by ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester* .

**4.2.2.4** –

Where air filters are flushed with liquid adhesives, the system shall be arranged so that the air cleaner cannot be flushed while the fan is in operation.

**4.2.2.5** –

Combustible adhesive coatings shall be stored in accordance with NFPA 30.

**4.2.3** – Fans.

**4.2.3.1** – Installation.

**4.2.3.1.1** –

Fans shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

**4.2.3.1.2** –

Fans shall be approved for the specific installation.

**4.2.3.2** – Access.

Fans shall be located, arranged, and installed to afford access for inspection and maintenance.

**4.2.3.3** – Exposed Inlets.

Exposed fan inlets shall be protected with metal screens to prevent the entry of paper, trash, and foreign materials.

**4.2.4** – Air- 5 Equipment, Systems and Rooms

**5.1** Air- Cooling and Heating Equipment.

**4 5 .2.4. 1** Installation.

**4 5 .2.4. 1.1**

Heating and cooling equipment shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

**4 5 .2.4. 1.2**

The equipment shall be approved for the specific installation. *(See 4.3.3.1.)*

4.2.4.2

***(This would be in new chapter 6)***

**5.2** Materials.

Materials used in the manufacturing of fan coil units, self-contained air-conditioning units, furnaces, heat pumps, humidifiers, and all similar equipment shall meet the requirements of 4.3.3.1 and 4.3.3.2 ***(new chapter 6)*** unless otherwise specified in 4 5 .2. 4 1 or 5 .2. 1 or 4. 2. 4.2.2.

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**5 .2.4.2. 1**

The requirements of 4.3.3.1 and 4.3.3.2 **(new chapter 6)** shall not apply to equipment tested and listed in accordance with UL 1995, *Heating and Cooling Equipment*, or UL 60335-2-40, *Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers*.

**4 5 .2.4. 2.2**

Unlisted solar energy air distribution system components shall be accompanied by supportive information demonstrating that the components have flame spread and smoke developed indexes that are not in excess of those of the air duct system permitted by this standard.

**4 5 .2.4. 3** Mechanical Cooling.

**4 5 .2.4. 3.1**

Mechanical refrigeration used with air duct systems shall be installed in accordance with recognized safety practices.

**4 5 .2.4. 3.2**

Installations conforming to ASHRAE 15 (packaged with ASHRAE 34), *Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants*, shall be considered to be in compliance with the requirement in 4.2.4.3.1.

**4 5 .2. 4.4** Furnaces.

**4 5 .2. 4.4. 1**

Oil-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 31.

**4 5 .2. 4.4. 2**

Gas-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 54.

**4 5 .2.4. 5** Duct Heaters.

**4 5 .2.4. 5.1**

Where electrical resistance or fuel-burning heaters are installed in air ducts, the air duct coverings and their installation shall comply with the provisions of 4.3.5.3 ***(check new section)*** .

**4 5 .2.4. 5.2**

The installation of electrical duct heaters shall comply with the provisions of Part VI, "Duct Heaters," of Article 424 of *NFPA 70*.

**4 5 .2.4. 6** Evaporative Coolers.

Combustible evaporation media shall not be used unless they meet the requirements of 4.2.2.2***(check section numbers)*** .

**4 5 .2.4. 7** Heat Recovery Equipment.

4.3.4 Materials for

Equipment not covered by other provisions of this standard and used for heat transfer or air movement shall be constructed so that all material in the air path meets the requirements of Section 4.2.

**4.3 *** – Air Distribution.

**4.3.1** – Air Ducts.

**4.3.1.1** –

Air ducts shall be constructed of iron, steel, aluminum, copper, concrete, masonry, or clay tile, except as otherwise permitted in 4.3.1.2 or 4.3.1.3 .

**4.3.1.2** –

Class 0 or Class 1 rigid or flexible air ducts tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , and installed in conformance with the conditions of listing shall be permitted to be used for ducts where air temperature in the ducts does not exceed 121°C (250°F) or where used as vertical ducts serving not more than two adjacent stories in height.

**4.3.1.3** – Gypsum Board Air Ducts.

**4.3.1.3.1** –

Gypsum board having a flame spread index not exceeding 25 without evidence of continued progressive combustion and a smoke developed index not exceeding 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , shall be permitted to be used for negative pressure exhaust and return ducts where the temperature of the conveyed air does not exceed 52°C (125°F) in normal service.

**4.3.1.3.2** –

The air temperature limits of 4.3.1.3.1 shall not apply where gypsum board material is used for emergency smoke exhaust air ducts.

**4.3.1.4** –

All air duct materials shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the air duct.

**4.3.1.5** –

The materials, thickness, construction, and installation of ducts shall provide structural strength and durability.

**4.3.1.5.1** –

Air ducts shall be considered to be in compliance with 4.3.1.5 where constructed and installed in accordance with the *ASHRAE Handbook — HVAC Systems and Equipment* and with one of the following as applicable:

(1) NAIMA *Fibrous Glass Duct Construction Standards*

(2) SMACNA *Fibrous Glass Duct Construction Standards*

(3) SMACNA *HVAC Duct Construction Standards — Metal and Flexible*

(4) ANSI/SMACNA 016, *HVAC Air Duct Leakage Test Manual*

**4.3.1.6** –

Where no standard exists for the construction of air ducts, the ducts shall be constructed to withstand both the maximum positive and the maximum negative pressures of the system at fan shutoff.

**4.3.1.7** –

A duct enclosure used for the multiple distribution or gathering of ducts or connectors shall be constructed of materials and methods specified in 4.3.1 .

**4.3.1.7.1** –

Electrical wires and cables and optical fiber cables within a duct enclosure shall comply with 4.3.4 .

**4.3.1.8** – Air Dispersion Systems.

Air dispersion systems shall meet the following criteria:

(1) They shall only be installed in entirely exposed locations.

(2) They shall always operate under positive pressure.

(3) They shall not penetrate fire resistance–rated construction.

(4) They shall not pass through fire resistance–rated construction.

(5) They shall be listed and labeled in accordance with UL 2518, *Air Dispersion Systems.*

**4.3.2** – Air Connectors.

**4.3.2.1** –

Air connectors shall be permitted to be used as limited-use, flexible air ducts that shall not be required to conform to the provisions for air ducts where they meet the requirements of 4.3.2.1.1 through 4.3.2.1.7 .

**4.3.2.1.1** –

Air connectors shall conform to the requirements for Class 0 or Class 1 air connectors when tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* .

**4.3.2.1.2** –

Class 0 or Class 1 air connectors shall not be used for ducts containing air at temperatures in excess of 121°C (250°F).

**4.3.2.1.3** –

Air connector runs shall not exceed 4.27 m (14 ft) in length.

**4.3.2.1.4** –

Air connectors shall not pass through any wall, partition, or enclosure of a vertical shaft that is required to have a fire resistance rating of 1 hour or more.

**4.3.2.1.5** –

Air connectors shall not pass through floors.

**4.3.2.1.6** –

An air connector shall not be interrupted by a short collar or any other fitting on one side and then connected to another air connector on the other side where penetrating a floor or a wall, partition, or enclosure of a vertical shaft that is required to have a fire-resistance rating of 1 hour.

**4.3.2.1.7** –

Multiple air connector runs shall not be spliced together to exceed the length limitation in 4.3.2.1.3 .

**4.3.2.2** –

Vibration isolation connectors in duct systems shall be made of materials having a maximum flame spread index of 25 and a maximum smoke developed index of 50.

**4.3.2.3** –

Wiring shall not be installed in air connectors.

**4.3.3** – Supplementary Materials for Air Distribution Systems.

**4.3.3.1** * –

Pipe and duct insulation and coverings, duct linings, vapor retarder facings, adhesives, fasteners, tapes, and supplementary materials added to air ducts, plenums, panels, and duct silencers used in duct systems, unless otherwise provided for in 4.3.3.1.1 or 4.3.3.1.2 , shall have, in the form in which they are used, a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* . Pipe and duct insulation and coverings, duct linings and their adhesives, and tapes shall use the specimen preparation and mounting procedures of ASTM E2231, *Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics* .

**4.3.3.1.1** –

The flame spread index and smoke developed index requirements of 4.3.3.1 shall not apply to air duct weatherproof coverings where they are located entirely outside a building, do not penetrate a wall or roof, and do not create an exposure hazard.

**4.3.3.1.2** –

Smoke detectors required by 6.4.4 shall not be required to meet flame spread index or smoke developed index requirements.

**4.3.3.2** –

Closure systems for use with rigid and flexible air ducts tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , shall have been tested, listed, and used in accordance with the conditions of their listings, in accordance with one of the following:

(1) UL 181A, *Closure Systems for Use with Rigid Air Ducts*

(2) UL 181B, *Closure Systems for Use with Flexible Air Ducts and Air Connectors*

**4.3.3.3** –

Coverings and linings for air ducts, pipes, plenums, and panels, including all pipe and duct insulation materials, shall not flame, glow, smolder, or smoke when tested in accordance with ASTM C411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation* , at the temperature to which they are exposed in service. In no case shall the test temperature be below 121°C (250°F).

**4.3.3.4** –

Air duct coverings shall not extend through walls or floors that are required to be fire stopped or required to have a fire resistance rating, unless such coverings meet the requirements of NFPA 80.

**4.3.3.5** * –

Air duct linings shall be interrupted at fire dampers to prevent interference with the operation of devices.

**4.3.3.6** –

Air duct coverings shall not be installed so as to conceal or prevent the use of any service opening.

**4.3.3.7** * –

Wall or ceiling finish in plenums shall comply with 4.3.11.6 .

***(check section numbers)*** .

**5.8** _ Materials for Operation and Control of the Air Distribution System.

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**5** :

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**8** :

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**1** * –

Wiring

shall not be installed

in air ducts

, except as permitted in 4.3.4.2 through 4.3.4.4 .

**4.3.4.2** –

Wiring shall be permitted to be installed in air ducts only if the wiring is directly associated with the air distribution system and does not exceed 1.22 m (4 ft).

**4.3.4.3** –

Wiring permitted by 4.3.4.2 shall be as short as practicable.

**4.3.4.4** * –

Electrical wires and cables and optical fiber cables shall consist of wires or cables listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering or metal sheathed cable without an overall nonmetallic covering.

**4.3.4.5** –

shall comply with the electrical section chapter (chapter xx).

4.3.12.

**5.8.2** _

Nonmetallic pneumatic tubing for control systems shall be permitted to have up to 457.2 mm (18 in.) of tubing that meets the requirements of 4.3.11.2.6.2

to connect to equipment.

**4.3.5** – Air Duct Access and Inspection.

**4.3.5.1** –

A service opening shall be provided in air ducts adjacent to each fire damper, smoke damper, combination fire/smoke damper, and any smoke detectors that need access for installation, cleaning, maintenance, inspection, and testing.

**4.3.5.1.1** –

The opening shall be large enough to permit maintenance and resetting of the device.

**4.3.5.2** –

Service openings shall be identified with letters having a minimum height of 12.7 mm ( **1**⁄**2** in.) to indicate the location of the fire protection device(s) within.

**4.3.5.3** –

Horizontal air ducts and plenums shall be provided with service openings to facilitate the removal of accumulations of dust and combustible materials.

**4.3.5.3.1** –

Service openings shall be located at approximately 6.1 m (20 ft) intervals along the air duct and at the base of each vertical riser, unless otherwise permitted in 4.3.5.3.2 through 4.3.5.3.4 .

**4.3.5.3.2** –

Removable air outlet or air inlet devices of adequate size shall be permitted in lieu of service openings.

**4.3.5.3.3** –

Service openings shall not be required in supply ducts where the supply air has previously passed through an air filter, an air cleaner, or a water spray.

**4.3.5.3.4** –

Service openings shall not be required where all the following conditions exist:

(1) The occupancy has no process that produces combustible material such as dust, lint, or greasy vapors. Such occupancies include banks, office buildings, churches, hotels, and health care facilities (but not kitchens, laundries, and manufacturing portions of such facilities).

(2) The air inlets are at least 2.13 m (7 ft) above the floor or are protected by corrosion-resistant metal screens of at least 14 mesh [1.8 mm (0.07 in.)] that are installed at the inlets so that they cannot draw papers, refuse, or other combustible solids into the return air duct.

(3) The minimum design velocity in the return duct for the particular occupancy is 5.08 m/sec (1000 ft/min).

**4.3.5.4** –

Inspection windows shall be permitted in air ducts, provided they are glazed with wired or fire protection–rated glass.

**4.3.5.5** –

Openings in walls or ceilings shall be provided so that service openings in air ducts are accessible for maintenance and inspection needs.

**4.3.5.6** –

Where a service opening is necessary in an air duct located above the ceiling of a floor-ceiling or a roof-ceiling assembly that has been tested and assigned a fire resistance rating in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials* , or UL 263, *Fire Tests of Building Construction and Materials* , access shall be provided in the ceiling.

**4.3.5.7** –

The service opening shall be designed and installed so that it does not reduce the fire resistance rating of the assembly.

**4.3.6** – Air Duct Integrity.

**4.3.6.1** –

Air ducts shall be located where they are not subject to damage or rupture, or they shall be protected to maintain their integrity.

**4.3.6.2** –

Where an air duct is located outdoors, the air duct, together with its covering or lining, shall be protected from harmful elements.

**4.3.6.3** –

Where electrical, fossil fuel, or solar energy collection heat sources are installed in air ducts, the installation shall avoid the creation of a fire hazard.

**4.3.6.3.1** –

For air ducts rated as Class 1 in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , air duct coverings and linings shall be interrupted at the immediate area of operation of such heat sources in 4.3.5.3 in order to meet the clearances specified as a condition of the equipment listing, unless otherwise permitted in 4.3.5.3.2 or 4.3.5.3.3 .

**4.3.6.3.2** –

Appliances listed for zero clearance from combustibles shall be permitted to be installed in accordance with the conditions of their listings.

**4.3.6.3.3** –

Insulation specifically suited for the maximum temperature that reasonably can be anticipated on the duct surface shall be permitted to be installed at the immediate area of operation of such appliances.

**4.3.7** – Air Outlets.

**4.3.7.1** – General.

Air supplied to any space shall not contain flammable vapors, flyings, or dust in quantities and concentrations that would introduce a hazardous condition.

**4.3.7.2** – Construction of Air Outlets.

Air outlets shall be constructed of noncombustible material or of a material that has a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials*.

**4.3.7.3** – Location of Air Outlets.

**4.3.7.3.1** –

Air outlets shall be located at least 76 mm (3 in.) above the floor, unless provisions have been made to prevent dirt and dust accumulations from entering the system.

**4.3.7.3.2** –

Where located less than 2.13 m (7 ft) above the floor, outlet openings shall be protected by a grille or screen having openings through which a 12.7 mm ( **1/2** in.) sphere cannot pass.

**4.3.8** – Air Inlets — Return or Exhaust or Return and Exhaust.

**4.3.8.1** – General.

Air shall not be recirculated from any space in which flammable vapors, flyings, or dust are present in quantities and concentrations that would introduce a hazardous condition into the return air system.

**4.3.8.2** – Construction of Air Inlets.

Air inlets shall be constructed of noncombustible material or a material that has a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials*.

**4.3.8.3** – Location of Air Inlets.

**4.3.8.3.1** –

Air inlets shall be located at least 76 mm (3 in.) above the floor, unless provisions have been made to prevent dirt and dust accumulations from entering the system.

**4.3.8.3.2** –

Where located less than 2.13 m (7 ft) above the floor, inlet openings shall be protected by a grille or screen having openings through which a 12.7 mm ( **1/2** in.) sphere cannot pass.

**4.3.9** – Fire Dampers.

**4.3.9.1** –

Approved fire dampers shall be provided as required in Chapter 5 .

**4.3.9.2** –

Approved fire dampers shall be installed in conformance with the conditions of their listings.

**4.3.10** – Smoke Dampers.

**4.3.10.1** –

Approved smoke dampers shall be provided as required in Chapter 5 .

**4.3.10.1.1** –

Approved smoke dampers shall be installed in conformance with the conditions of their listings.

**4.3.10.2** –

Smoke dampers shall be installed in systems with a capacity greater than 7080 L/sec (15,000 ft $^3$ /min) to isolate the air-handling equipment, including filters, from the remainder of the system on both the building supply side and the return side, in order to restrict the circulation of smoke, unless specifically exempted by 4.3.10.2.1 or 4.3.10.2.2 .

**4.3.10.2.1** –

Air-handling units located on the floor they serve and serving only that floor shall be exempt from the requirements of 4.3.10.2 .

**4.3.10.2.2** –

Air-handling units located on the roof and serving only the floor immediately below the roof shall be exempt from the requirements of 4.3.10.2 .

**4.3.11** – Plenums.

**4.3.11.1** – Storage.

**4.3.11.1.1** –

Plenums shall not be used for occupancy or storage.

**4.3.11.1.2** –

Accessible abandoned material shall be deemed to be in storage and shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.2** – Ceiling Cavity Plenum.

The space between the top of the finished ceiling and the underside of the floor or roof above shall be permitted to be used to supply air to the occupied area or to return or exhaust air from the occupied area, provided that the conditions in 4.3.11.2.1 through 4.3.11.2.7 are met.

**4.3.11.2.1** –

The integrity of the fire and smoke stopping for penetrations shall be maintained.

**4.3.11.2.2** –

Light diffusers, other than those made of metal or glass, used in air-handling luminaires shall be listed in accordance with UL 1598, *Luminaires* , and marked "Light Diffusers for Air-Handling Luminaires."

**4.3.11.2.3** –

The temperature of air delivered to these plenums shall not exceed 121°C (250°F).

**4.3.11.2.4** –

Materials used in the construction of a ceiling plenum shall be noncombustible or shall be limited combustible having a maximum smoke developed index of 50, except as permitted in 4.3.11.2.4.1 through 4.3.11.2.4.3 , and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.2.4.1** –

Materials used in the construction of a plenum space between the ceiling and roof (or floor) of other than the fire-resistive assemblies covered in 5.3.3 shall be permitted as specified in 4.3.11.2.4.2 and 4.3.11.2.4.3 .

**4.3.11.2.4.2** –

The ceiling material shall have a flame spread index of not more than 25 and a smoke developed index not greater than 50. All surfaces, including those that would be exposed by cutting through the material in any way, shall meet these requirements.

**4.3.11.2.4.3** –

The ceiling materials shall be supported by noncombustible material.

**4.3.11.2.5** –

Where the plenum is a part of a floor-ceiling or roof-ceiling assembly that has been tested or investigated and assigned a fire resistance rating of 1 hour or more, the assembly shall meet the requirements of 5.3.3 .

**4.3.11.2.6** –

Materials within a ceiling cavity plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* , or

(3) Comply with 4.3.11.2.6.1 through 4.3.11.2.6.11 , as applicable.

**4.3.11.2.6.1** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering, metal sheathed cable without an overall nonmetallic covering, or totally enclosed nonventilated metallic busway without an overall nonmetallic covering.

**4.3.11.2.6.2** –

Pneumatic tubing for control systems shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics* .

**4.3.11.2.6.3** –

Nonmetallic fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics* .

**4.3.11.2.6.4** –

Communications raceways shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, *Cable Routing Assemblies and Communications Raceways* .

**4.3.11.2.6.5** * –

Loudspeakers, recessed lighting fixtures, and other electrical equipment with combustible enclosures, including their assemblies and accessories, nonmetallic cable ties, wraps, nonmetallic cable supports, and other discrete products, shall be permitted in the ceiling cavity plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.*

**4.3.11.2.6.6** –

Plastic piping and tubing used in plumbing systems shall be permitted to be used within a ceiling cavity plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless permitted by 4.3.11.2.6.7 .

**4.3.11.2.6.7** –

Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics* , and installed in accordance with its listing, shall be permitted to be used within a ceiling cavity plenum.

**4.3.11.2.6.8** –

Supplementary materials for air distribution systems shall be permitted provided they comply with the provisions of 4.3.3 .

**4.3.11.2.6.9** –

Smoke detectors shall not be required to meet the provisions of Section 4.3 .

**4.3.11.2.6.10** –

Air ducts complying with 4.3.1.2 and air connectors complying with 4.3.2 shall be permitted.

**4.3.11.2.6.11** –

Materials that, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb), when tested in accordance with NFPA 259 and include either of the following:

(1) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( **1** / **8** in.) that has a flame spread index not greater than 50.

(2) Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .

**4.3.11.2.7** –

The accessible portion of abandoned materials exposed to airflow shall be removed.

**4.3.11.3** – Apparatus Casing Plenum.

**4.3.11.3.1** –

A fabricated plenum and apparatus casing shall be permitted to be used for supply, return, or exhaust air service.

**4.3.11.3.2** –

Fabricated plenum and apparatus casing shall be constructed of materials and by methods specified in 4.3.1 and in accordance with the following:

(1) The casing and plenum construction standards in SMACNA *HVAC Duct Construction Standards — Metal and Flexible*

(2) *ASHRAE Handbook — HVAC Systems and Equipment*

(3) Subsection 4.3.3 for all air duct coverings, duct lining, acoustical liner/cells, and miscellaneous materials

**4.3.11.3.3** –

Electrical wires and cables and optical fiber cables shall comply with 4.3.4 .

**4.3.11.4** – Air-Handling Unit Room Plenum.

**4.3.11.4.1** * –

Individual rooms containing an air-handling unit(s) shall gather air from various sources and combine the air within the room before returning it to the air-handling unit.

**4.3.11.4.2** –

Duct covering, duct lining, acoustical liner/cells, and miscellaneous materials shall comply with 4.3.3 .

**4.3.11.4.3** –

Air-handling unit room plenums shall not be used for storage or occupancy other than during equipment servicing.

**4.3.11.4.4** –

Accessible abandoned material shall be deemed to be in storage and shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.4.5** –

Materials used in the construction of an air-handling unit room plenum shall be noncombustible or shall be limited combustible having a maximum smoke developed index of 50 and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.4.6** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways, metal sheathed cable, or totally enclosed nonventilated busway.

**4.3.11.5** – Raised Floor Plenum.

**4.3.11.5.1** –

The space between the top of the finished floor and the underside of a raised floor shall be permitted to be used to supply air to the occupied area or return or exhaust air from or return and exhaust air from the occupied area, provided that the conditions in 4.3.11.5.2 through 4.3.11.5.6 are met.

**4.3.11.5.2** –

The integrity of the firestopping for penetrations shall be maintained.

**4.3.11.5.3** –

The temperature of air delivered to these plenums shall not exceed 121°C (250°F).

**4.3.11.5.4** –

Materials used in the construction of a raised floor plenum shall be noncombustible or limited-combustible materials, shall have a maximum peak smoke developed index of 50, and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.5.5** –

Materials within a raised floor plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* , or

(3) Comply with 4.3.11.5.5.1 through 4.3.11.5.5.12 , as applicable.

**4.3.11.5.5.1** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways, metal sheathed cable, or totally enclosed nonventilated busway.

**4.3.11.5.5.2** –

Pneumatic tubing for control systems shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics* .

**4.3.11.5.5.3** –

Nonmetallic fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics* .

**4.3.11.5.5.4** –

Communications raceways shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, *Cable Routing Assemblies and Communications Raceways* . Cables installed within these raceways shall be listed as plenum cable in accordance with the requirements in 4.3.11.5.5.1 .

**4.3.11.5.5.5** –

Raised floors, intermachine cables, electrical wires, listed plenum communications raceways, and optical-fiber cables in computer/data processing rooms where these rooms are designed and installed in accordance with NFPA 75 shall be permitted.

**4.3.11.5.5.6** –

Loudspeakers, recessed lighting fixtures, and other electrical equipment with combustible enclosures, including their assemblies and accessories, nonmetallic cable ties, wraps, nonmetallic cable supports, and other discrete products, shall be permitted in the raised floor plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.*

**4.3.11.5.5.7** –

Plastic piping and tubing used in plumbing systems shall be permitted to be used within a raised floor plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless otherwise permitted by 4.3.11.5.5.8 .

**4.3.11.5.5.8** –

Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics* , and installed in accordance with its listing, shall be permitted to be used within a raised floor plenum.

**4.3.11.5.5.9** –

Air ducts complying with 4.3.1.2 and air connectors complying with 4.3.2 shall be permitted.

**4.3.11.5.5.10** –

Materials, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb) when tested in accordance with NFPA 259 and include either of the following:

(1) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( **1** ⁄ **8** in.) that has a flame spread index not greater than 50.

(2) Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .

**4.3.11.5.5.11** –

Smoke detectors shall not be required to meet the requirements of 4.3.11.5.1 .

**4.3.11.5.5.12** –

Supplementary materials for air distribution systems shall be permitted provided they comply with 4.3.3 .

**4.3.11.5.6** –

The accessible portion of abandoned materials exposed to airflow shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.6** – Wall or Ceiling Finish in Plenums.

**4.3.11.6.1** –

Wall or ceiling finish in plenums, except as indicated in 4.3.11.6.2 , shall be noncombustible or shall exhibit a flame spread index of 25 or less and a smoke developed index of 50 or less, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2** –

Foam plastic insulation shall not be used as wall or ceiling finish in plenums unless the insulation meets any one of the criteria shown in 4.3.11.6.2.1 through 4.3.11.6.2.4 .

**4.3.11.6.2.1** –

The foam plastic insulation material shall exhibit a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use, and shall comply with the following criteria, when tested in accordance with NFPA 286 (where the testing shall be performed on the finished foam plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use):

(1) Flame does not spread to the ceiling during the 40 kW exposure.

(2) Flame does not spread to the outer extremities of the sample.

(3) Flashover, based on the criteria from NFPA 286, does not occur.

(4) The peak heat release rate does not exceed 800 kW.

(5) The total smoke release does not exceed 1000 m$^2$ (1196 yd$^2$ ).

**4.3.11.6.2.2** –

The foam plastic insulation material shall be covered by corrosion-resistant steel having a base metal thickness of not less than 0.4 mm (0.0160 in.) and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2.3** –

The foam plastic insulation material shall be separated from the plenum by an approved thermal barrier consisting of 12.7 mm (0.5 in.) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the temperature transmission fire test and the integrity fire test of NFPA 275 and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2.4** –

The foam plastic insulation material shall be separated from the plenum by not less than 25.4 mm (1.0 in.) of masonry or concrete and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.12** – Corridor Air Systems.

**4.3.12.1** – Egress Corridors.

~~**4.4.2.6** –~~

~~Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible* . [ ***101*** **:** 4.6.14.6]~~

***(check section number)*** to connect to equipment.

**5.9** _ Corridor Air Systems.

**5.9.1** _ Egress Corridors.

**5.9. 1.1 *** _

Egress corridors in health care, detention and correctional, and residential occupancies shall not be used as a portion of a supply, return, or exhaust air system serving adjoining areas unless otherwise permitted by 4.3.12.1.3.1 through 4.3.12.1.3.4 ***(check section numbers)*** .

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Air movement between rooms and egress corridors in hospitals, nursing facilities, and ambulatory care facilities shall be permitted where the transfer of air is required for clinical purposes by other standards.

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**1.3** _

An air transfer opening(s) shall not be permitted in walls or in doors separating egress corridors from adjoining areas.

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**1.3.1** _

An air transfer opening(s) shall be permitted in walls or doors from toilet rooms, bathrooms, shower rooms, sink closets, and similar auxiliary spaces opening directly onto the egress corridor.

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**1.3.2** _

Where door clearances do not exceed those specified for fire doors in NFPA 80 air transfer caused by pressure differentials shall be permitted.

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**1.3.3** _

Use of egress corridors shall be permitted as part of an engineered smoke-control system.

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**1.3.4** _

Air transfer opening(s) shall be permitted in walls or in doors separating egress corridors from adjoining areas in detention and correctional occupancies with corridor separations of open construction (e.g., grating doors or grating partitions).

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**2** _ Exits.

Exit passageways, stairs, ramps, and other exits shall not be used as a part of a supply, return, or exhaust air system serving other areas of the building.

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**5.9.3**

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***** _ Smoke Control.

Where a smoke-control or exhaust system is required, it shall conform to the requirements of the building code of the authority having jurisdiction.

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**5.**

~~4 Materials~~

**10 _ Air-Handling Equipment Rooms.**

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**5.**

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**10.1**

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Noncombustible Material.

**4.4.1.1** –

A material that complies with any of the following shall be considered a noncombustible material:

(1) A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat

(2) A material that is reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

(3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C*

[ ***101*** **:** 4.6.13.1]

**4.4.1.2** –

Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible* . [ ***101*** **:** 4.6.13.2]

**4.4.2** – Limited-Combustible Material.

A material shall be considered a limited-combustible material where one of the following is met:

(1) The conditions of 4.4.2.1 and 4.4.2.2 , and the conditions of either 4.4.2.3 or 4.4.2.4 , shall be met.

(2) The conditions of 4.4.2.5 shall be met.

[ ***101*** **:** 4.6.14]

**4.4.2.1** –

The material shall not comply with the requirements for noncombustible material in accordance with 4.4.1 . [ ***101*** **:** 4.6.14.1]

**4.4.2.2** –

The material, in the form in which it is used, shall exhibit a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259. [ ***101*** **:** 4.6.14.2]

**4.4.2.3** –

The material shall have the structural base of a noncombustible material with a surfacing not exceeding a thickness of **1**⁄**8** in. (3.2 mm) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* . [ ***101*** **:** 4.6.14.3]

~~**4.4.2.4** –~~

~~The material shall be composed of materials that, in the form and thickness used, neither exhibit a flame spread index greater than 25 nor evidence of continued progressive combustion when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , and shall be of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723. [ ***101*** : 4.6.14.4]~~

~~**4.4.2.5** –~~

~~Materials shall be considered limited-combustible materials where tested in accordance with ASTM E2965, *Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter* , at an incident heat flux of 75 kW/m 2 for a 20-minute exposure and both of the following conditions are met:~~

~~(1) The peak heat release rate shall not exceed 150 kW/m 2 for longer than 10 seconds.~~

~~(2) The total heat released shall not exceed 8 MJ/m 2 .~~

~~[ ***101*** : 4.6.14.5]~~

**General.**

Air-handling equipment rooms shall be classified into the following three categories:

(1) Those used as air plenums (usually return air)

(2) Those with air ducts that open directly into a shaft

(3) Other air-handling unit rooms

**5.10.2 Air-Handling Equipment Rooms Used as Plenum Space.**

Air-handling equipment rooms used as plenums for supply or return air shall comply with 4.3.11.4. ***(section number must be checked)***

**5.10.3 Air-Handling Equipment Rooms That Have Air Ducts That Open Directly into a Shaft.**

**5.10.3.1**

Air-handling equipment rooms, including the protection of openings, shall be separated from shafts by construction having a fire resistance rating not less than that required for the shaft by 5.3.4 ***(section number must be checked)*** .

**5.10.3.2**

Fire-resistant separation shall not be required for air-handling equipment rooms that are enclosed by construction having a fire resistance rating not less than that required for the shaft.

**5.10.4 Other Spaces Housing Air-Handling Units.**

Other spaces housing air-handling units shall meet the requirements of the building code of the authority having jurisdiction.

## Additional Proposed Changes

| File Name | Description | Approved |
|---|---|---|
| New_draft_chapter_5_reorg_2021.docx | Chapter 5 new clean showing changes in red from existing text for electrical chapter | |

## Statement of Problem and Substantiation for Public Input

This is the second of the draft reorganized chapters. The only change compared to the proposal is the deletion of the old sections dealing with wiring in ducts and referencing the new proposed electrical chapter.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 8-NFPA 90A-2021 [New Section after 4.4] | |

## Submitter Information Verification

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**Submittal Date:** Thu May 20 18:44:17 EDT 2021
**Committee:** AIC-AAA

# Public Input No. 11-NFPA 90A-2021 [ Chapter 4 ]

**Chapter 4** – ~~HVAC Systems~~

**4.1** – ~~General Requirements for Equipment.~~

**4.1.1** – ~~Access.~~

~~Equipment shall be arranged to afford access for inspection, maintenance, and repair.~~

**4.1.2** –

~~Equipment shall be selected and installed based on its application with respect to the manufacturer's installation instructions and listing, as applicable.~~

**4.1.3** – ~~Protection.~~

**4.1.3.1** –

~~Equipment shall be guarded for personnel protection.~~

**4.1.3.2** –

~~Equipment shall be guarded against the intake of foreign matter into the system.~~

**4.1.4** –

~~Electrical wiring and equipment shall be installed in accordance with *NFPA 70* .~~

**4.1.5** –

~~Air-handling equipment rooms shall meet the requirements of Section 5.1 .~~

**4.2** – ~~System Components.~~

**4.2.1** – ~~Outside Air Intakes.~~

**4.2.1.1** –

~~Outside air intakes shall be protected by screens of corrosion-resistant material not larger than 12.7 mm (0.5 in.) mesh.~~

**4.2.1.2** ~~*~~ –

~~Outside air intakes shall be located so as to minimize the introduction of fire or smoke into the building.~~

**4.2.1.2.1** –

~~Outside air intakes shall be equipped with an approved fire and/or smoke damper where not located to meet the requirements of 4.2.1.2 . *(See Section 6.3 for smoke damper operation to restrict the intake of smoke.)*~~

**4.2.2** – ~~Air Cleaners and Air Filters.~~

**4.2.2.1** –

~~Electrostatic air cleaners shall be listed in accordance with UL 867, *Electrostatic Air Cleaners* .~~

**4.2.2.1.1** –

~~Electrostatic air cleaners shall be installed in conformance with the conditions of the manufacturer's listing.~~

**4.2.2.2** ~~*~~ –

~~Air filters shall comply with UL 900, *Air Filter Units* .~~

**4.2.2.3** –

Liquid adhesive coatings used on air filters shall have a minimum flash point of 163°C (325°F) as determined by ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester* .

**4.2.2.4** –

Where air filters are flushed with liquid adhesives, the system shall be arranged so that the air cleaner cannot be flushed while the fan is in operation.

**4.2.2.5** –

Combustible adhesive coatings shall be stored in accordance with NFPA 30.

**4.2.3** – Fans.

**4.2.3.1** – Installation.

**4.2.3.1.1** –

Fans shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

**4.2.3.1.2** –

Fans shall be approved for the specific installation.

**4.2.3.2** – Access.

Fans shall be located, arranged, and installed to afford access for inspection and maintenance.

**4.2.3.3** – Exposed Inlets.

Exposed fan inlets shall be protected with metal screens to prevent the entry of paper, trash, and foreign materials.

**4.2.4** – Air-Cooling and Heating Equipment.

**4.2.4.1** – Installation.

**4.2.4.1.1** –

Heating and cooling equipment shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

**4.2.4.1.2** –

The equipment shall be approved for the specific installation. *(See 4.3.3.1 .)*

**4.2.4.2** – Materials.

Materials used in the manufacturing of fan coil units, self-contained air-conditioning units, furnaces, heat pumps, humidifiers, and all similar equipment shall meet the requirements of 4.3.3.1 and 4.3.3.2 unless otherwise specified in 4.2.4.2.1 or 4.2.4.2.2 .

**4.2.4.2.1** –

The requirements of 4.3.3.1 and 4.3.3.2 shall not apply to equipment tested and listed in accordance with UL 1995, *Heating and Cooling Equipment* , or UL 60335-2-40, *Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers* .

**4.2.4.2.2** –

Unlisted solar energy air distribution system components shall be accompanied by supportive information demonstrating that the components have flame spread and smoke developed indexes that are not in excess of those of the air duct system permitted by this standard.

**4.2.4.3** – Mechanical Cooling.

**4.2.4.3.1** –

Mechanical refrigeration used with air duct systems shall be installed in accordance with recognized safety practices.

**4.2.4.3.2** –

Installations conforming to ASHRAE 15 (packaged with ASHRAE 34), *Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants* , shall be considered to be in compliance with the requirement in 4.2.4.3.1 .

**4.2.4.4** – Furnaces.

**4.2.4.4.1** –

Oil-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 31.

**4.2.4.4.2** –

Gas-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 54.

**4.2.4.5** – Duct Heaters.

**4.2.4.5.1** –

Where electrical resistance or fuel-burning heaters are installed in air ducts, the air duct coverings and their installation shall comply with the provisions of 4.3.5.3 .

**4.2.4.5.2** –

The installation of electrical duct heaters shall comply with the provisions of Part VI, "Duct Heaters," of Article 424 of *NFPA 70* .

**4.2.4.6** – Evaporative Coolers.

Combustible evaporation media shall not be used unless they meet the requirements of 4.2.2.2 .

**4.2.4.7** – Heat Recovery Equipment.

Equipment not covered by other provisions of this standard and used for heat transfer or air movement shall be constructed so that all material in the air path meets the requirements of Section 4.2 .

**4.3 6** Air Ducts

**6** * _ Air Distribution.

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**6** .

3.

**1** _ Air Ducts.

**4.**

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**6** .**1.1** _

Air ducts shall be constructed of iron, steel, aluminum, copper, concrete, masonry, or clay tile, except as otherwise permitted in

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3.

1.2 or

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1.3 .

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**1.2** _

Class 0 or Class 1 rigid or flexible air ducts tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , and installed in conformance with the conditions of listing shall be permitted to be used for ducts where air temperature in the ducts does not exceed 121°C (250°F) or where used as vertical ducts serving not more than two adjacent stories in height.

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**6** .

3.

**1.3** _ Gypsum Board Air Ducts.

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**6** .

3.

**1.3.1** _

Gypsum board having a flame spread index not exceeding 25 without evidence of continued progressive combustion and a smoke developed index not exceeding 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , shall be permitted to be used for negative pressure exhaust and return ducts where the temperature of the conveyed air does not exceed 52°C (125°F) in normal service.

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**6** .

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**1.3.2** _

The air temperature limits of

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~~3.~~

1.3.1 shall not apply where gypsum board material is used for emergency smoke exhaust air ducts.

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**6 .**

~~3.~~

**1.4** _

All air duct materials shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the air duct.

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**6 .**

~~3.~~

**1.5** _

The materials, thickness, construction, and installation of ducts shall provide structural strength and durability.

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**6 .**

~~3.~~

**1.5.1** _

Air ducts shall be considered to be in compliance with 4.3.1.5 where constructed and installed in accordance with the *ASHRAE Handbook — HVAC Systems and Equipment* and with one of the following as applicable:

(1) NAIMA *Fibrous Glass Duct Construction Standards*

(2) SMACNA *Fibrous Glass Duct Construction Standards*

(3) SMACNA *HVAC Duct Construction Standards — Metal and Flexible*

(4) ANSI/SMACNA 016, *HVAC Air Duct Leakage Test Manual*

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**6 .**

~~3.~~

**1.6** _

Where no standard exists for the construction of air ducts, the ducts shall be constructed to withstand both the maximum positive and the maximum negative pressures of the system at fan shutoff.

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**6 .**

~~3.~~

**1.7** _

A duct enclosure used for the multiple distribution or gathering of ducts or connectors shall be constructed of materials and methods specified in

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~~3.~~

1 .

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**6 .**

~~3.~~

**1.7.1** _

Electrical wires and cables and optical fiber cables within a duct enclosure shall comply with

~~4.3.4~~ .

~~4.3.~~

the electrical section chapter .

**6. 1.8** _ Air Dispersion Systems.

Air dispersion systems shall meet the following criteria:

(1) They shall only be installed in entirely exposed locations.

(2) They shall always operate under positive pressure.

(3) They shall not penetrate fire resistance–rated construction.

(4) They shall not pass through fire resistance–rated construction.

(5) They shall be listed and labeled in accordance with UL 2518, *Air Dispersion Systems.*

~~**4.3.2** – Air Connectors.~~

~~**4.3.2.1** –~~

~~Air connectors shall be permitted to be used as limited-use, flexible air ducts that shall not be required to conform to the provisions for air ducts where they meet the requirements of 4.3.2.1.1 through 4.3.2.1.7 .~~

~~**4.3.2.1.1** –~~

~~Air connectors shall conform to the requirements for Class 0 or Class 1 air connectors when tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* .~~

~~**4.3.2.1.2** –~~

~~Class 0 or Class 1 air connectors shall not be used for ducts containing air at temperatures in excess of 121°C (250°F).~~

~~**4.3.2.1.3** –~~

~~Air connector runs shall not exceed 4.27 m (14 ft) in length.~~

~~**4.3.2.1.4** –~~

~~Air connectors shall not pass through any wall, partition, or enclosure of a vertical shaft that is required to have a fire resistance rating of 1 hour or more.~~

~~**4.3.2.1.5** –~~

~~Air connectors shall not pass through floors.~~

4.3.2.1.

**6**

–

An air connector shall not be interrupted by a short collar or any other fitting on one side and then connected to another air connector on the other side where penetrating a floor or a wall, partition, or enclosure of a vertical shaft that is required to have a fire-resistance rating of 1 hour

**:**

4.3.

**2**

.1.7

–

Multiple air connector runs shall not be spliced together to exceed the length limitation in 4.3.2.1.3 .

**4.3.2.2** –

Vibration isolation connectors in duct systems shall be made of materials having a maximum flame spread index of 25 and a maximum smoke developed index of 50.

**4.3.2.3** –

Wiring shall not be installed in air connectors.

~~4.3.3~~ –

**Supplementary Materials for Air Distribution Systems.**

4

**6.**

~~3~~

**2.**

~~3.~~

**1*** –

Pipe and duct insulation and coverings, duct linings, vapor retarder facings, adhesives, fasteners, tapes, and supplementary materials added to air ducts, plenums, panels, and duct silencers used in duct systems, unless otherwise provided for in

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6.

~~3~~

2.

~~3.~~

1.

~~1 or 4.3.3.~~

1 or 6.2. 1.2, shall have, in the form in which they are used, a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or with UL 723, *Test for Surface Burning Characteristics of Building Materials*. Pipe and duct insulation and coverings, duct linings and their adhesives, and tapes shall use the specimen preparation and mounting procedures of ASTM E2231, *Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics*.

4

**6.**

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**2.**

~~3.~~

**1.1** –

The flame spread index and smoke developed index requirements of

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~~3~~

2.

~~3.~~

1 shall not apply to air duct weatherproof coverings where they are located entirely outside a building, do not penetrate a wall or roof, and do not create an exposure hazard.

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**6.**

~~3~~

**2.**

~~3.~~

**1.2** _

Smoke detectors required by 6.4.4 shall not be required to meet flame spread index or smoke developed index requirements.

4

**6.**

~~3~~

**2.**

~~3.~~

**2** _

Closure systems for use with rigid and flexible air ducts tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , shall have been tested, listed, and used in accordance with the conditions of their listings, in accordance with one of the following:

(1) UL 181A, *Closure Systems for Use with Rigid Air Ducts*

(2) UL 181B, *Closure Systems for Use with Flexible Air Ducts and Air Connectors*

4

**6.**

~~3~~

**2.3**

~~.3~~

_

Coverings and linings for air ducts, pipes, plenums, and panels, including all pipe and duct insulation materials, shall not flame, glow, smolder, or smoke when tested in accordance with ASTM C411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation* , at the temperature to which they are exposed in service. In no case shall the test temperature be below 121°C (250°F).

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**6.**

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**2.**

~~3.~~

**4** _

Air duct coverings shall not extend through walls or floors that are required to be fire stopped or required to have a fire resistance rating, unless such coverings meet the requirements of NFPA 80.

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**6.**

~~3~~

**2.**

~~3.~~

**5** * –

Air duct linings shall be interrupted at fire dampers to prevent interference with the operation of devices.

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**6** .

3

**2** .

3.

**6** –

Air duct coverings shall not be installed so as to conceal or prevent the use of any service opening.

**4.3.3.7** * –

Wall or ceiling finish in plenums shall comply with 4.3.11.

**6** .

4.

**3**

.4

–

Materials for Operation and Control of the

**Air**

Distribution System.

**4.3.4.1** * –

Wiring shall not be installed in air ducts, except as permitted in 4.3.4.2 through 4.3.4.4 .

**4.3.4.2** –

Wiring shall be permitted to be installed in air ducts only if the wiring is directly associated with the air distribution system and does not exceed 1.22 m (4 ft).

**4.3.4.3** –

Wiring permitted by 4.3.4.2 shall be as short as practicable.

**4.3.4.4** * –

Electrical wires and cables and optical fiber cables shall consist of wires or cables listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering or metal sheathed cable without an overall nonmetallic covering.

**4.3.4.5** –

Nonmetallic pneumatic tubing for control systems shall be permitted to have up to 457.2 mm (18 in.) of tubing that meets the requirements of 4.3.11.2.6.2 to connect to equipment.

~~4.3.5~~ ~~Air~~

**Duct Access and Inspection.**

4

**6** **.3.**

~~5.~~

**1** _

A service opening shall be provided in air ducts adjacent to each fire damper, smoke damper, combination fire/smoke damper, and any smoke detectors that need access for installation, cleaning, maintenance, inspection, and testing.

4

**6** **.3.**

~~5.~~

**1.1** _

The opening shall be large enough to permit maintenance and resetting of the device.

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**6** **.3.**

~~5.~~

**2** _

Service openings shall be identified with letters having a minimum height of 12.7 mm ( **1** ⁄ **2** in.) to indicate the location of the fire protection device(s) within.

4

**6** **.3.**

~~5.~~

**3** _

Horizontal air ducts and plenums shall be provided with service openings to facilitate the removal of accumulations of dust and combustible materials.

4

**6** **.3.**

~~5.~~

**3.1** _

Service openings shall be located at approximately 6.1 m (20 ft) intervals along the air duct and at the base of each vertical riser, unless otherwise permitted in

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6 .3.

~~5.~~

3.

~~2 through 4~~

2 through 6 .3.

~~5.~~

3 .4 .

4

**6 .3.**

~~5.~~

**3.2** _

Removable air outlet or air inlet devices of adequate size shall be permitted in lieu of service openings.

4

**6 .3.**

~~5.~~

**3.3** _

Service openings shall not be required in supply ducts where the supply air has previously passed through an air filter, an air cleaner, or a water spray.

4

**6 .3.**

~~5.~~

**3.4** _

Service openings shall not be required where all the following conditions exist:

(1) The occupancy has no process that produces combustible material such as dust, lint, or greasy vapors. Such occupancies include banks, office buildings, churches, hotels, and health care facilities (but not kitchens, laundries, and manufacturing portions of such facilities).

(2) The air inlets are at least 2.13 m (7 ft) above the floor or are protected by corrosion-resistant metal screens of at least 14 mesh [1.8 mm (0.07 in.)] that are installed at the inlets so that they cannot draw papers, refuse, or other combustible solids into the return air duct.

(3) The minimum design velocity in the return duct for the particular occupancy is 5.08 m/sec (1000 ft/min).

4

**6 .3.**

~~5.~~

**4** _

Inspection windows shall be permitted in air ducts, provided they are glazed with wired or fire protection–rated glass.

4

**6 .3.5**

~~.5~~

_

Openings in walls or ceilings shall be provided so that service openings in air ducts are accessible for maintenance and inspection needs.

4

**6 .3.**

~~5.~~

**6** _

Where a service opening is necessary in an air duct located above the ceiling of a floor-ceiling or a roof-ceiling assembly that has been tested and assigned a fire resistance rating in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials* , or UL 263, *Fire Tests of Building Construction and Materials* , access shall be provided in the ceiling.

4

**6** **.3.**

5.

**7** _

The service opening shall be designed and installed so that it does not reduce the fire resistance rating of the assembly.

**6.** **4**

.3.6

_ Air Duct Integrity.

**6.** **4.**

3.6.

**1** _

Air ducts shall be located where they are not subject to damage or rupture, or they shall be protected to maintain their integrity.

**6.** **4.**

3.6.

**2** _

Where an air duct is located outdoors, the air duct, together with its covering or lining, shall be protected from harmful elements.

**6.** **4.3**

.6.3

_

Where electrical, fossil fuel, or solar energy collection heat sources are installed in air ducts, the installation shall avoid the creation of a fire hazard.

**6.** **4.3.**

6.3.

**1** _

For air ducts rated as Class 1 in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , air duct coverings and linings shall be interrupted at the immediate area of operation of such heat sources in 4.3.5.3 in order to meet the clearances specified as a condition of the equipment listing, unless otherwise permitted in 4.3.5.3.2 or 4.3.5.3.

3

3 ***(check section numbers)*** .

**6.** **4.3.**

6.3.

**2** _

Appliances listed for zero clearance from combustibles shall be permitted to be installed in accordance with the conditions of their listings.

**6. 4.3.**

~~6.~~

**3**

~~.3~~

_

Insulation specifically suited for the maximum temperature that reasonably can be anticipated on the duct surface shall be permitted to be installed at the immediate area of operation of such appliances.

~~4~~

**6 .**

~~3.7 Air Outlets~~

**5 _ Building Construction .**

~~4~~

**6 .**

~~3~~

**5 .**

~~7.~~

~~**4.3.7.3.2** –~~

~~Where located less than 2.13 m (7 ft) above the floor, outlet openings shall be protected by a grille or screen having openings through which a~~

**1** _

~~General.~~

~~Air supplied to any space shall not contain flammable vapors, flyings, or dust in quantities and concentrations that would introduce a hazardous condition.~~

~~**4.3.7.2** – Construction of Air Outlets.~~

~~Air outlets shall be constructed of noncombustible material or of a material that has a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials.*~~

~~**4.3.7.3** – Location of Air Outlets.~~

~~**4.3.7.3.1** –~~

~~Air outlets shall be located at least 76 mm (3 in.) above the floor, unless provisions have been made to prevent dirt and dust accumulations from entering the system.~~

**Air Duct Clearance.**

**6.5.1.1** _

The clearance from metal air ducts used for heating to assemblies constructed of combustible materials, including plaster on wood lath, shall be not less than 12.7 mm ( **1** / **2** in.)

~~sphere cannot pass.~~

~~**4.3.8** – Air Inlets — Return or Exhaust or Return and Exhaust.~~

~~**4.3.8.1** – General.~~

~~Air shall not be recirculated from any space in which flammable vapors~~

~~,~~

~~flyings,~~

or

~~dust are present in quantities and concentrations that would introduce a hazardous condition into the return air system.~~

~~**4.3.8.2** – Construction of Air Inlets.~~

~~Air inlets shall be constructed of noncombustible material or a material that has a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials.*~~

~~**4.3.8.3** – Location of Air Inlets.~~

~~**4.3.8.3.1** –~~

~~Air inlets shall be located at least 76 mm (3 in.) above the floor, unless provisions have been made to prevent dirt and dust accumulations from entering the system.~~

~~**4.3.8.3.2** –~~

~~Where located less than 2.13 m (7 ft) above the floor, inlet openings shall be protected by a grille or screen having openings through which a 12.7 mm ( **1** / **2** in.) sphere cannot pass.~~

~~**4.3.9** – Fire Dampers.~~

~~**4.3.9.1** –~~

~~Approved fire dampers shall be provided as required in Chapter 5 .~~

~~**4.3.9.2** –~~

~~Approved fire dampers shall be installed in conformance with the conditions of their listings.~~

~~**4.3.10** – Smoke Dampers.~~

~~**4.3.10.1** –~~

~~Approved smoke dampers shall be provided as required in Chapter 5 .~~

~~**4.3.10.1.1** –~~

~~Approved smoke dampers shall be installed in conformance with the conditions of their listings.~~

~~**4.3.10.2** –~~

~~Smoke dampers shall be installed in systems with a capacity greater than 7080 L/sec (15,000 ft $^3$ /min) to isolate the air-handling equipment, including filters, from the remainder of the system on both the building supply side and the return side, in order to restrict the circulation of smoke, unless specifically exempted by 4.3.10.2.1 or 4.3.10.2.2 .~~

**4.3.10.2.1** –

Air-handling units located on the floor they serve and serving only that floor shall be exempt from the requirements of 4.3.10.2 .

**4.3.10.2.2** –

Air-handling units located on the roof and serving only the floor immediately below the roof shall be exempt from the requirements of 4.3.10.2 .

**4.3.11** – Plenums.

**4.3.11.1** – Storage.

**4.3.11.1.1** –

Plenums shall not be used for occupancy or storage.

**4.3.11.1.2** –

Accessible abandoned material shall be deemed to be in storage and shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.2** – Ceiling Cavity Plenum.

The space between the top of the finished ceiling and the underside of the floor or roof above shall be permitted to be used to supply air to the occupied area or to return or exhaust air from the occupied area, provided that the conditions in 4.3.11.2.1 through 4.3.11.2.7 are met.

**4.3.11.2.1** –

The integrity of the fire and smoke stopping for penetrations shall be maintained.

**4.3.11.2.2** –

Light diffusers, other than those made of metal or glass, used in air-handling luminaires shall be listed in accordance with UL 1598, *Luminaires* , and marked "Light Diffusers for Air-Handling Luminaires."

**4.3.11.2.3** –

The temperature of air delivered to these plenums shall not exceed 121°C (250°F).

**4.3.11.2.4** –

Materials used in the construction of a ceiling plenum shall be noncombustible or shall be limited combustible having a maximum smoke developed index of 50, except as permitted in 4.3.11.2.4.1 through 4.3.11.2.4.3 , and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.2.4.1** –

Materials used in the construction of a plenum space between the ceiling and roof (or floor) of other than the fire-resistive assemblies covered in 5.3.3 shall be permitted as specified in 4.3.11.2.4.2 and 4.3.11.2.4.3 .

**4.3.11.2.4.2** –

The ceiling material shall have a flame spread index of not more than 25 and a smoke developed index not greater than 50. All surfaces, including those that would be exposed by cutting through the material in any way, shall meet these requirements.

**4.3.11.2.4.3** –

The ceiling materials shall be supported by noncombustible material.

~~**4.3.11.2.5** –~~

~~Where the plenum is a part of a~~

the combustible material shall be protected with minimum 6.35 mm ( **1** / **4** in.) thick approved insulating material.

**6.5.1.2** _

The integrity of the firestopping and smokestopping shall be maintained.

**6.5.1.3** _

The clearances provided in 6.5.1.1 shall not apply to systems used solely for ventilation, air cooling, or air conditioning without heating.

**6.5.2** _ **Structural Members.**

The installation of air ducts, including the hangers, shall not reduce the fire resistance rating of structural members.

**6.5.3** _ **Ceiling Assemblies.**

Where the installation of the hangers for the components of an air duct system penetrates an existing ceiling of a fire-resistive floor-ceiling or roof-ceiling assembly

~~that has been tested or investigated and assigned a fire resistance rating of 1 hour or more, the assembly shall meet the requirements of 5.3.3 .~~

~~**4.3.11.2.6** –~~

~~Materials within a ceiling cavity plenum exposed to the airflow shall:~~

(1) ~~Be noncombustible, or~~

(2) ~~Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* , or~~

(3) ~~Comply with 4.3.11.2.6.1 through 4.3.11.2.6.11 , as applicable.~~

~~**4.3.11.2.6.1** * –~~

~~Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering, metal sheathed cable without an overall nonmetallic covering, or totally enclosed nonventilated metallic busway without an overall nonmetallic covering.~~

~~**4.3.11.2.6.2** –~~

~~Pneumatic tubing for control systems shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics* .~~

~~**4.3.11.2.6.3** –~~

~~Nonmetallic fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics* .~~

**4.3.11.2.6.4** –

Communications raceways shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, *Cable Routing Assemblies and Communications Raceways* .

**4.3.11.2.6.5** * –

Loudspeakers, recessed lighting fixtures, and other electrical equipment with combustible enclosures, including their assemblies and accessories, nonmetallic cable ties, wraps, nonmetallic cable supports, and other discrete products, shall be permitted in the ceiling cavity plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.*

**4.3.11.2.6.6** –

Plastic piping and tubing used in plumbing systems shall be permitted to be used within a ceiling cavity plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless permitted by 4.3.11.2.6.7 .

**4.3.11.2.6.7** –

Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics* , and installed in accordance with its listing, shall be permitted to be used within a ceiling cavity plenum.

**4.3.11.2.6.8** –

Supplementary materials for air distribution systems shall be permitted provided they comply with the provisions of 4.3.3 .

**4.3.11.2.6.9** –

Smoke detectors shall not be required to meet the provisions of Section 4.3 .

**4.3.11.2.6.10** –

Air ducts complying with 4.3.1.2 and air connectors complying with 4.3.2 shall be permitted.

**4.3.11.2.6.11** –

Materials that, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb), when tested in accordance with NFPA 259 and include either of the following:

(1) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( 1 ⁄ 8 in.) that has a flame spread index not greater than 50.

(2) Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .

**4.3.11.2.7** –

The accessible portion of abandoned materials exposed to airflow shall be removed.

**4.3.11.3** – Apparatus Casing Plenum.

**4.3.11.3.1** –

A fabricated plenum and apparatus casing shall be permitted to be used for supply, return, or exhaust air service.

**4.3.11.3.2** –

Fabricated plenum and apparatus casing shall be constructed of materials and by methods specified in 4.3.1 and in accordance with the following:

(1) The casing and plenum construction standards in SMACNA *HVAC Duct Construction Standards — Metal and Flexible*

(2) *ASHRAE Handbook — HVAC Systems and Equipment*

(3) Subsection 4.3.3 for all air duct coverings, duct lining, acoustical liner/cells, and miscellaneous materials

**4.3.11.3.3** –

Electrical wires and cables and optical fiber cables shall comply with 4.3.4 .

**4.3.11.4** – Air-Handling Unit Room Plenum.

**4.3.11.4.1** * –

Individual rooms containing an air-handling unit(s) shall gather air from various sources and combine the air within the room before returning it to the air-handling unit.

**4.3.11.4.2** –

Duct covering, duct lining, acoustical liner/cells, and miscellaneous materials shall comply with 4.3.3 .

**4.3.11.4.3** –

Air-handling unit room plenums shall not be used for storage or occupancy other than during equipment servicing.

**4.3.11.4.4** –

Accessible abandoned material shall be deemed to be in storage and shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.4.5** –

Materials used in the construction of an air-handling unit room plenum shall be noncombustible or shall be limited combustible having a maximum smoke developed index of 50 and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.4.6** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways, metal sheathed cable, or totally enclosed nonventilated busway.

**4.3.11.5** – Raised Floor Plenum.

**4.3.11.5.1** –

The space between the top of the finished floor and the underside of a raised floor shall be permitted to be used to supply air to the occupied area or return or exhaust air from or return and exhaust air from the occupied area, provided that the conditions in 4.3.11.5.2 through 4.3.11.5.6 are met.

**4.3.11.5.2** –

The integrity of the firestopping for penetrations shall be maintained.

**4.3.11.5.3** –

The temperature of air delivered to these plenums shall not exceed 121°C (250°F).

**4.3.11.5.4** –

Materials used in the construction of a raised floor plenum shall be noncombustible or limited-combustible materials, shall have a maximum peak smoke developed index of 50, and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.5.5** –

Materials within a raised floor plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* , or

(3) Comply with 4.3.11.5.5.1 through 4.3.11.5.5.12 , as applicable.

**4.3.11.5.5.1** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways, metal sheathed cable, or totally enclosed nonventilated busway.

**4.3.11.5.5.2** –

Pneumatic tubing for control systems shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics* .

**4.3.11.5.5.3** –

Nonmetallic fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics* .

**4.3.11.5.5.4** –

Communications raceways shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, *Cable Routing Assemblies and Communications Raceways* . Cables installed within these raceways shall be listed as plenum cable in accordance with the requirements in 4.3.11.5.5.1 .

**4.3.11.5.5.5** –

Raised floors, intermachine cables, electrical wires, listed plenum communications raceways, and optical-fiber cables in computer/data processing rooms where these rooms are designed and installed in accordance with NFPA 75 shall be permitted.

**4.3.11.5.5.6** –

Loudspeakers, recessed lighting fixtures, and other electrical equipment with combustible enclosures, including their assemblies and accessories, nonmetallic cable ties, wraps, nonmetallic cable supports, and other discrete products, shall be permitted in the raised floor plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.*

**4.3.11.5.5.7** –

Plastic piping and tubing used in plumbing systems shall be permitted to be used within a raised floor plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless otherwise permitted by 4.3.11.5.5.8 .

**4.3.11.5.5.8** –

Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics* , and installed in accordance with its listing, shall be permitted to be used within a raised floor plenum.

**4.3.11.5.5.9** –

Air ducts complying with 4.3.1.2 and air connectors complying with 4.3.2 shall be permitted.

**4.3.11.5.5.10** –

Materials, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb) when tested in accordance with NFPA 259 and include either of the following:

(1) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( **1** / **8** in.) that has a flame spread index not greater than 50.

(2) Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .

**4.3.11.5.5.11** –

Smoke detectors shall not be required to meet the requirements of 4.3.11.5.1 .

**4.3.11.5.5.12** –

Supplementary materials for air distribution systems shall be permitted provided they comply with 4.3.3 .

**4.3.11.5.6** –

The accessible portion of abandoned materials exposed to airflow shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.6** – Wall or Ceiling Finish in Plenums.

**4.3.11.6.1** –

Wall or ceiling finish in plenums, except as indicated in 4.3.11.6.2 , shall be noncombustible or shall exhibit a flame spread index of 25 or less and a smoke developed index of 50 or less, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2** –

Foam plastic insulation shall not be used as wall or ceiling finish in plenums unless the insulation meets any one of the criteria shown in 4.3.11.6.2.1 through 4.3.11.6.2.4 .

**4.3.11.6.2.1** –

The foam plastic insulation material shall exhibit a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use, and shall comply with the following criteria, when tested in accordance with NFPA 286 (where the testing shall be performed on the finished foam plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use):

(1) Flame does not spread to the ceiling during the 40 kW exposure.

(2) Flame does not spread to the outer extremities of the sample.

(3) Flashover, based on the criteria from NFPA 286, does not occur.

(4) The peak heat release rate does not exceed 800 kW.

(5) The total smoke release does not exceed 1000 m $^{2}$ (1196 yd $^{2}$ ).

**4.3.11.6.2.2** –

The foam plastic insulation material shall be covered by corrosion-resistant steel having a base metal thickness of not less than 0.4 mm (0.0160 in.) and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2.3** –

The foam plastic insulation material shall be separated from the plenum by an approved thermal barrier consisting of 12.7 mm (0.5 in.) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the temperature transmission fire test and the integrity fire test of NFPA 275 and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2.4** –

The foam plastic insulation material shall be separated from the plenum by not less than 25.4 mm (1.0 in.) of masonry or concrete and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.12** – Corridor Air Systems.

**4.3.12.1** – Egress Corridors.

**4.3.12.1.1** * –

Egress corridors in health care, detention and correctional, and residential occupancies shall not be used as a portion of a supply, return, or exhaust air system serving adjoining areas unless otherwise permitted by 4.3.12.1.3.1 through 4.3.12.1.3.4 .

**4.3.12.1.2** –

Air movement between rooms and egress corridors in hospitals, nursing facilities, and ambulatory care facilities shall be permitted where the transfer of air is required for clinical purposes by other standards.

**4.3.12.1.3** –

An air transfer opening(s) shall not be permitted in walls or in doors separating egress corridors from adjoining areas.

**4.3.12.1.3.1** –

An air transfer opening(s) shall be permitted in walls or doors from toilet rooms, bathrooms, shower rooms, sink closets, and similar auxiliary spaces opening directly onto the egress corridor.

**4.3.12.1.3.2** –

Where door clearances do not exceed those specified for fire doors in NFPA 80 air transfer caused by pressure differentials shall be permitted.

**4.3.12.1.3.3** –

Use of egress corridors shall be permitted as part of an engineered smoke-control system.

**4.3.12.1.3.4** –

Air transfer opening(s) shall be permitted in walls or in doors separating egress corridors from adjoining areas in detention and correctional occupancies with corridor separations of open construction (e.g., grating doors or grating partitions).

**4.3.12.2** – Exits.

Exit passageways, stairs, ramps, and other exits shall not be used as a part of a supply, return, or exhaust air system serving other areas of the building.

**4.3.13** * – Smoke Control.

Where a smoke-control or exhaust system is required, it shall conform to the requirements of the building code of the authority having jurisdiction.

**4.4** – Materials.

**4.4.1** * – Noncombustible Material.

**4.4.1.1** –

A material that complies with any of the following shall be considered a noncombustible material:

(1) A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat

(2) A material that is reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

(3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C*

[ ***101*** : 4.6.13.1]

**4.4.1.2** –

Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible* . [ ***101*** **:** 4.6.13.2]

**4.4.2** – Limited-Combustible Material.

A material shall be considered a limited-combustible material where one of the following is met:

(1) The conditions of 4.4.2.1 and 4.4.2.2 , and the conditions of either 4.4.2.3 or 4.4.2.4 , shall be met.

(2) The conditions of 4.4.2.5 shall be met.

[ ***101*** **:** 4.6.14]

**4.4.2.1** –

The material shall not comply with the requirements for noncombustible material in accordance with 4.4.1 .[ ***101*** **:** 4.6.14.1]

**4.4.2.2** –

The material, in the form in which it is used, shall exhibit a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259. [ ***101*** **:** 4.6.14.2]

**4.4.2.3** –

The material shall have the structural base of a noncombustible material with a surfacing not exceeding a thickness of $^{1}/_{8}$ in. (3.2 mm) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* . [ ***101*** **:** 4.6.14.3]

**4.4.2.4** –

The material shall be composed of materials that, in the form and thickness used, neither exhibit a flame spread index greater than 25 nor evidence of continued progressive combustion when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , and shall be of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723. [ ***101*** **:** 4.6.14.4]

**4.4.2.5** –

Materials shall be considered limited-combustible materials where tested in accordance with ASTM E2965, *Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter* , at an incident heat flux of 75 kW/m$^{2}$ for a 20-minute exposure and both of the following conditions are met:

(1) The peak heat release rate shall not exceed 150 kW/m$^{2}$ for longer than 10 seconds.

(2) The total heat released shall not exceed 8 MJ/m$^{2}$ .

[ ***101*** **:** 4.6.14.5]

**4.4.2.6** –

Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible* . [ ***101*** **:** 4.6.14.6]

and necessitates removal of a portion of that ceiling, the replacement material shall be identical to that which was removed or shall be approved as equivalent to that which was removed.

**6.5.4** _

As an alternative to repairing the existing ceiling, a new ceiling shall be permitted to be installed below the air duct system, provided the fire resistance rating of the floor-ceiling or roof-ceiling design is not reduced.

**6.6** _ **Shafts.**

**6.6.1** _

Air ducts that pass through the floors of buildings that require the protection of vertical openings shall be enclosed with partitions or walls constructed of materials as permitted by the building code of the authority having jurisdiction, as indicated in 5.3.4.2 or 5.3.4.3, unless otherwise permitted by 5.3.4.3.1 ***(check secton numbers)*** .

**6.6.2** _

The shaft enclosure shall have a minimum fire resistance rating (based on possible fire exposure from either side of the partition or wall) of 1 hour where such air ducts are located in a building less than four stories in height.

**6.6.3** _

The shaft enclosure shall have a minimum fire resistance rating (based on possible fire exposure from either side of the partition or wall) of 2 hours where such air ducts are located in a building four stories or more in height.

**6.6.3.1** _

Where an air duct penetrates only one floor or one floor and an air-handling equipment penthouse floor, and the air duct contains a fire damper located where the duct penetrates the floor, an air duct enclosure shall not be required.

**6.6.4** _

A fire-resistive enclosure used as an air duct shall conform with 4.3.1 and with 5.3.4.2 through 5.3.4.3.1. ***(check section numbers)***

**6.6.4.1** _

Gypsum board systems shall be constructed in accordance with GA-600, _ *Fire Resistance Design Manual* .

**6.6.5** _

Shafts that constitute air ducts or that enclose air ducts used for the movement of environmental air shall not enclose the following:

(1) _ Exhaust ducts used for the removal of smoke- and grease-laden vapors from cooking equipment

(2) _ Ducts used for the removal of flammable vapors

(3) _ Ducts used for moving, conveying, or transporting stock, vapor, or dust

(4) _ Ducts used for the removal of nonflammable corrosive fumes and vapors

(5) Refuse and linen chutes

(6) Piping, except for noncombustible piping conveying water or other nonhazardous or nontoxic materials

(7) Combustible storage

## Additional Proposed Changes

| File Name | Description | Approved |
|---|---|---|
| New_draft_chapter_6_reorg_2021.docx | Chapter 6 after reorg - no changes from existing text | |

## Statement of Problem and Substantiation for Public Input

Next chapter in the proposed reorg - no changes

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 8-NFPA 90A-2021 [New Section after 4.4] | |

## Submitter Information Verification

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**Committee:** AIC-AAA

## Public Input No. 12-NFPA 90A-2021 [ Chapter 4 ]

~~Air~~

**Chapter 4** – ~~HVAC Systems~~

**4.1** – ~~General Requirements for Equipment.~~

**4.1.1** – ~~Access.~~

~~Equipment shall be arranged to afford access for inspection, maintenance, and repair.~~

**4.1.2** –

~~Equipment shall be selected and installed based on its application with respect to the manufacturer's installation instructions and listing, as applicable.~~

**4.1.3** – ~~Protection.~~

**4.1.3.1** –

~~Equipment shall be guarded for personnel protection.~~

**4.1.3.2** –

~~Equipment shall be guarded against the intake of foreign matter into the system.~~

**4.1.4** –

~~Electrical wiring and equipment shall be installed in accordance with *NFPA 70* .~~

**4.1.5** –

~~Air-handling equipment rooms shall meet the requirements of Section 5.1 .~~

**4.2** – ~~System Components.~~

**4.2.1** – ~~Outside Air Intakes.~~

**4.2.1.1** –

~~Outside air intakes shall be protected by screens of corrosion-resistant material not larger than 12.7 mm (0.5 in.) mesh.~~

**4.2.1.2** ~~*~~ –

~~Outside air intakes shall be located so as to minimize the introduction of fire or smoke into the building.~~

**4.2.1.2.1** –

~~Outside air intakes shall be equipped with an approved fire and/or smoke damper where not located to meet the requirements of 4.2.1.2 . *(See Section 6.3 for smoke damper operation to restrict the intake of smoke.)*~~

**4.2.2** – ~~Air Cleaners and Air Filters.~~

**4.2.2.1** –

~~Electrostatic air cleaners shall be listed in accordance with UL 867, *Electrostatic Air Cleaners* .~~

**4.2.2.1.1** –

~~Electrostatic air cleaners shall be installed in conformance with the conditions of the manufacturer's listing.~~

**4.2.2.2** ~~*~~ –

~~Air filters shall comply with UL 900, *Air Filter Units* .~~

**4.2.2.3** –

Liquid adhesive coatings used on air filters shall have a minimum flash point of 163°C (325°F) as determined by ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester* .

**4.2.2.4** –

Where air filters are flushed with liquid adhesives, the system shall be arranged so that the air cleaner cannot be flushed while the fan is in operation.

**4.2.2.5** –

Combustible adhesive coatings shall be stored in accordance with NFPA 30.

**4.2.3** – Fans.

**4.2.3.1** – Installation.

**4.2.3.1.1** –

Fans shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

**4.2.3.1.2** –

Fans shall be approved for the specific installation.

**4.2.3.2** – Access.

Fans shall be located, arranged, and installed to afford access for inspection and maintenance.

**4.2.3.3** – Exposed Inlets.

Exposed fan inlets shall be protected with metal screens to prevent the entry of paper, trash, and foreign materials.

**4.2.4** – Air-Cooling and Heating Equipment.

**4.2.4.1** – Installation.

**4.2.4.1.1** –

Heating and cooling equipment shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

**4.2.4.1.2** –

The equipment shall be approved for the specific installation. *(See 4.3.3.1 .)*

**4.2.4.2** – Materials.

Materials used in the manufacturing of fan coil units, self-contained air-conditioning units, furnaces, heat pumps, humidifiers, and all similar equipment shall meet the requirements of 4.3.3.1 and 4.3.3.2 unless otherwise specified in 4.2.4.2.1 or 4.2.4.2.2 .

**4.2.4.2.1** –

The requirements of 4.3.3.1 and 4.3.3.2 shall not apply to equipment tested and listed in accordance with UL 1995, *Heating and Cooling Equipment* , or UL 60335-2-40, *Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers* .

**4.2.4.2.2** –

Unlisted solar energy air distribution system components shall be accompanied by supportive information demonstrating that the components have flame spread and smoke developed indexes that are not in excess of those of the air duct system permitted by this standard.

**4.2.4.3** – Mechanical Cooling.

**4.2.4.3.1** –

Mechanical refrigeration used with air duct systems shall be installed in accordance with recognized safety practices.

**4.2.4.3.2** –

Installations conforming to ASHRAE 15 (packaged with ASHRAE 34), *Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants*, shall be considered to be in compliance with the requirement in 4.2.4.3.1.

**4.2.4.4** – Furnaces.

**4.2.4.4.1** –

Oil-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 31.

**4.2.4.4.2** –

Gas-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 54.

**4.2.4.5** – Duct Heaters.

**4.2.4.5.1** –

Where electrical resistance or fuel-burning heaters are installed in air ducts, the air duct coverings and their installation shall comply with the provisions of 4.3.5.3.

**4.2.4.5.2** –

The installation of electrical duct heaters shall comply with the provisions of Part VI, "Duct Heaters," of Article 424 of *NFPA 70*.

**4.2.4.6** – Evaporative Coolers.

Combustible evaporation media shall not be used unless they meet the requirements of 4.2.2.2.

**4.2.4.7** – Heat Recovery Equipment.

Equipment not covered by other provisions of this standard and used for heat transfer or air movement shall be constructed so that all material in the air path meets the requirements of Section 4.2.

**4.3** * – Air Distribution.

**4.3.1** – Air Ducts.

**4.3.1.1** –

Air ducts shall be constructed of iron, steel, aluminum, copper, concrete, masonry, or clay tile, except as otherwise permitted in 4.3.1.2 or 4.3.1.3.

**4.3.1.2** –

Class 0 or Class 1 rigid or flexible air ducts tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors*, and installed in conformance with the conditions of listing shall be permitted to be used for ducts where air temperature in the ducts does not exceed 121°C (250°F) or where used as vertical ducts serving not more than two adjacent stories in height.

**4.3.1.3** – Gypsum Board Air Ducts.

**4.3.1.3.1** –

Gypsum board having a flame spread index not exceeding 25 without evidence of continued progressive combustion and a smoke developed index not exceeding 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Test for Surface Burning Characteristics of Building Materials*, shall be permitted to be used for negative pressure exhaust and return ducts where the temperature of the conveyed air does not exceed 52°C (125°F) in normal service.

**4.3.1.3.2** –

The air temperature limits of 4.3.1.3.1 shall not apply where gypsum board material is used for emergency smoke exhaust air ducts.

**4.3.1.4** –

All air duct materials shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the air duct.

**4.3.1.5** –

The materials, thickness, construction, and installation of ducts shall provide structural strength and durability.

**4.3.1.5.1** –

Air ducts shall be considered to be in compliance with 4.3.1.5 where constructed and installed in accordance with the *ASHRAE Handbook — HVAC Systems and Equipment* and with one of the following as applicable:

(1) NAIMA *Fibrous Glass Duct Construction Standards*

(2) SMACNA *Fibrous Glass Duct Construction Standards*

(3) SMACNA *HVAC Duct Construction Standards — Metal and Flexible*

(4) ANSI/SMACNA 016, *HVAC Air Duct Leakage Test Manual*

**4.3.1.6** –

Where no standard exists for the construction of air ducts, the ducts shall be constructed to withstand both the maximum positive and the maximum negative pressures of the system at fan shutoff.

**4.3.1.7** –

A duct enclosure used for the multiple distribution or gathering of ducts or connectors shall be constructed of materials and methods specified in 4.3.1 .

**4.3.1.7.1** –

Electrical wires and cables and optical fiber cables within a duct enclosure shall comply with 4.3.4 .

**4.3.1.8** – Air Dispersion Systems.

Air dispersion systems shall meet the following criteria:

(1) They shall only be installed in entirely exposed locations.

(2) They shall always operate under positive pressure.

(3) They shall not penetrate fire resistance–rated construction.

(4) They shall not pass through fire resistance–rated construction.

(5) They shall be listed and labeled in accordance with UL 2518, *Air Dispersion Systems.*

**4.3.2** – Air Connectors.

**4.3.2.1** –

## 7 _ Air Connectors , Air Outlets, and Air Inlets

**7.1** _ Air Connectors.

**7.1.1** _

Air connectors shall be permitted to be used as limited-use, flexible air ducts that shall not be required to conform to the provisions for air ducts where they meet the requirements of 4.3.2.1.1 through 4.3.2.1.7 . ***(check section numbers)***

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Air connectors shall conform to the requirements for Class 0 or Class 1 air connectors when tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* .

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Class 0 or Class 1 air connectors shall not be used for ducts containing air at temperatures in excess of 121°C (250°F).

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Air connector runs shall not exceed 4.27 m (14 ft) in length.

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Air connectors shall not pass through any wall, partition, or enclosure of a vertical shaft that is required to have a fire resistance rating of 1 hour or more.

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Air connectors shall not pass through floors.

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An air connector shall not be interrupted by a short collar or any other fitting on one side and then connected to another air connector on the other side where penetrating a floor or a wall, partition, or enclosure of a vertical shaft that is required to have a fire-resistance rating of 1 hour.

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Multiple air connector runs shall not be spliced together to exceed the length limitation in 4.3.2.1.3 .

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**7.1** **.2**

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Vibration isolation connectors in duct systems shall be made of materials having a maximum flame spread index of 25 and a maximum smoke developed index of 50.

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Wiring shall not be installed in air connectors.

**4.3.3** _ Supplementary Materials for Air Distribution Systems.

**4.3.3.1** * _

Pipe and duct insulation and coverings, duct linings, vapor retarder facings, adhesives, fasteners, tapes, and supplementary materials added to air ducts, plenums, panels, and duct silencers used in duct systems, unless otherwise provided for in 4.3.3.1.1 or 4.3.3.1.2 , shall have, in the form in which they are used, a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* . Pipe and duct insulation and coverings, duct linings and their adhesives, and tapes shall use the specimen preparation and mounting procedures of ASTM E2231, *Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics* .

**4.3.3.1.1** –

The flame spread index and smoke developed index requirements of 4.3.3.1 shall not apply to air duct weatherproof coverings where they are located entirely outside a building, do not penetrate a wall or roof, and do not create an exposure hazard.

**4.3.3.1.2** –

Smoke detectors required by 6.4.4 shall not be required to meet flame spread index or smoke developed index requirements.

**4.3.3.2** –

Closure systems for use with rigid and flexible air ducts tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , shall have been tested, listed, and used in accordance with the conditions of their listings, in accordance with one of the following:

(1) UL 181A, *Closure Systems for Use with Rigid Air Ducts*

(2) UL 181B, *Closure Systems for Use with Flexible Air Ducts and Air Connectors*

**4.3.3.3** –

Coverings and linings for air ducts, pipes, plenums, and panels, including all pipe and duct insulation materials, shall not flame, glow, smolder, or smoke when tested in accordance with ASTM C411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation* , at the temperature to which they are exposed in service. In no case shall the test temperature be below 121°C (250°F).

**4.3.3.4** –

Air duct coverings shall not extend through walls or floors that are required to be fire stopped or required to have a fire resistance rating, unless such coverings meet the requirements of NFPA 80.

**4.3.3.5** * –

Air duct linings shall be interrupted at fire dampers to prevent interference with the operation of devices.

**4.3.3.6** –

Air duct coverings shall not be installed so as to conceal or prevent the use of any service opening.

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* – 4.3.7.1 –

Wall or ceiling finish in plenums shall comply with 4

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**4.3.4** – Materials for Operation and Control of the Air Distribution System.

**4.3.4.1** * –

Wiring shall not be installed in air ducts, except as permitted in 4.3.4.2 through 4.3.4.4 .

**4.3.4.2** –

Wiring shall be permitted to be installed in air ducts only if the wiring is directly associated with the air distribution system and does not exceed 1.22 m (4 ft).

**4.3.4.3** –

Wiring permitted by 4.3.4.2 shall be as short as practicable.

**4.3.4.4** * –

Electrical wires and cables and optical fiber cables shall consist of wires or cables listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering or metal sheathed cable without an overall nonmetallic covering.

**4.3.4.5** –

Nonmetallic pneumatic tubing for control systems shall be permitted to have up to 457.2 mm (18 in.) of tubing that meets the requirements of 4.3.11.2.6.2 to connect to equipment.

**4.3.5** – Air Duct Access and Inspection.

**4.3.5.1** –

A service opening shall be provided in air ducts adjacent to each fire damper, smoke damper, combination fire/smoke damper, and any smoke detectors that need access for installation, cleaning, maintenance, inspection, and testing.

**4.3.5.1.1** –

The opening shall be large enough to permit maintenance and resetting of the device.

**4.3.5.2** –

Service openings shall be identified with letters having a minimum height of 12.7 mm ( 1 ⁄ 2 in.) to indicate the location of the fire protection device(s) within.

**4.3.5.3** –

Horizontal air ducts and plenums shall be provided with service openings to facilitate the removal of accumulations of dust and combustible materials.

**4.3.5.3.1** –

Service openings shall be located at approximately 6.1 m (20 ft) intervals along the air duct and at the base of each vertical riser, unless otherwise permitted in 4.3.5.3.2 through 4.3.5.3.4 .

**4.3.5.3.2** –

Removable air outlet or air inlet devices of adequate size shall be permitted in lieu of service openings.

**4.3.5.3.3** –

Service openings shall not be required in supply ducts where the supply air has previously passed through an air filter, an air cleaner, or a water spray.

**4.3.5.3.4** –

Service openings shall not be required where all the following conditions exist:

(1) The occupancy has no process that produces combustible material such as dust, lint, or greasy vapors. Such occupancies include banks, office buildings, churches, hotels, and health care facilities (but not kitchens, laundries, and manufacturing portions of such facilities).

(2) The air inlets are at least 2.13 m (7 ft) above the floor or are protected by corrosion-resistant metal screens of at least 14 mesh [1.8 mm (0.07 in.)] that are installed at the inlets so that they cannot draw papers, refuse, or other combustible solids into the return air duct.

(3) The minimum design velocity in the return duct for the particular occupancy is 5.08 m/sec (1000 ft/min).

**4.3.5.4** –

Inspection windows shall be permitted in air ducts, provided they are glazed with wired or fire protection–rated glass.

**4.3.5.5** –

Openings in walls or ceilings shall be provided so that service openings in air ducts are accessible for maintenance and inspection needs.

**4.3.5.6** –

Where a service opening is necessary in an air duct located above the ceiling of a floor-ceiling or a roof-ceiling assembly that has been tested and assigned a fire resistance rating in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials* , or UL 263, *Fire Tests of Building Construction and Materials* , access shall be provided in the ceiling.

**4.3.5.7** –

The service opening shall be designed and installed so that it does not reduce the fire resistance rating of the assembly.

**4.3.6** – Air Duct Integrity.

**4.3.6.1** –

Air ducts shall be located where they are not subject to damage or rupture, or they shall be protected to maintain their integrity.

**4.3.6.2** –

Where an air duct is located outdoors, the air duct, together with its covering or lining, shall be protected from harmful elements.

**4.3.6.3** –

Where electrical, fossil fuel, or solar energy collection heat sources are installed in air ducts, the installation shall avoid the creation of a fire hazard.

**4.3.6.3.1** –

For air ducts rated as Class 1 in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , air duct coverings and linings shall be interrupted at the immediate area of operation of such heat sources in 4.3.5.3 in order to meet the clearances specified as a condition of the equipment listing, unless otherwise permitted in 4.3.5.3.2 or 4.3.5.3.3 .

**4.3.6.3.2** –

Appliances listed for zero clearance from combustibles shall be permitted to be installed in accordance with the conditions of their listings.

**4.3.6.3.3** –

Insulation specifically suited for the maximum temperature that reasonably can be anticipated on the duct surface shall be permitted to be installed at the immediate area of operation of such appliances.

**4.3.7** – Air Outlets.

**2** Air Outlets

**7.2.1 General.**

Air supplied to any space shall not contain flammable vapors, flyings, or dust in quantities and concentrations that would introduce a hazardous condition.

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**7.2 .2** Construction of Air Outlets.

Air outlets shall be constructed of noncombustible material or of a material that has a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials.*

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**3** Location of Air Outlets.

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**3.1**

Air outlets shall be located at least 76 mm (3 in.) above the floor, unless provisions have been made to prevent dirt and dust accumulations from entering the system.

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**3.2**

Where located less than 2.13 m (7 ft) above the floor, outlet openings shall be protected by a grille or screen having openings through which a 12.7 mm ( **1** ⁄ **2** in.) sphere cannot pass.

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Air Inlets — Return or Exhaust or Return and Exhaust.

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**1** _ General.

Air shall not be recirculated from any space in which flammable vapors, flyings, or dust are present in quantities and concentrations that would introduce a hazardous condition into the return air system.

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**2** _ Construction of Air Inlets.

Air inlets shall be constructed of noncombustible material or a material that has a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials.*

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**3** _ Location of Air Inlets.

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**3.1** _

Air inlets shall be located at least 76 mm (3 in.) above the floor, unless provisions have been made to prevent dirt and dust accumulations from entering the system.

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**3.2** _

Where located less than 2.13 m (7 ft) above the floor, inlet openings shall be protected by a grille or screen having openings through which a 12.7 mm ( **1** ⁄ **2** in.) sphere cannot pass.

~~**4.3.9** – Fire Dampers.~~

~~**4.3.9.1** –~~

~~Approved fire dampers shall be provided as required in Chapter 5 .~~

~~**4.3.9.2** –~~

~~Approved fire dampers shall be installed in conformance with the conditions of their listings.~~

~~**4.3.10** – Smoke Dampers.~~

~~**4.3.10.1** –~~

~~Approved smoke dampers shall be provided as required in Chapter 5 .~~

~~**4.3.10.1.1** –~~

~~Approved smoke dampers shall be installed in conformance with the conditions of their listings.~~

~~**4.3.10.2** –~~

Smoke dampers shall be installed in systems with a capacity greater than 7080 L/sec (15,000 ft $^3$ /min) to isolate the air-handling equipment, including filters, from the remainder of the system on both the building supply side and the return side, in order to restrict the circulation of smoke, unless specifically exempted by 4.3.10.2.1 or 4.3.10.2.2 .

**4.3.10.2.1** –

Air-handling units located on the floor they serve and serving only that floor shall be exempt from the requirements of 4.3.10.2 .

**4.3.10.2.2** –

Air-handling units located on the roof and serving only the floor immediately below the roof shall be exempt from the requirements of 4.3.10.2 .

**4.3.11** – Plenums.

**4.3.11.1** – Storage.

**4.3.11.1.1** –

Plenums shall not be used for occupancy or storage.

**4.3.11.1.2** –

Accessible abandoned material shall be deemed to be in storage and shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.2** – Ceiling Cavity Plenum.

The space between the top of the finished ceiling and the underside of the floor or roof above shall be permitted to be used to supply air to the occupied area or to return or exhaust air from the occupied area, provided that the conditions in 4.3.11.2.1 through 4.3.11.2.7 are met.

**4.3.11.2.1** –

The integrity of the fire and smoke stopping for penetrations shall be maintained.

**4.3.11.2.2** –

Light diffusers, other than those made of metal or glass, used in air-handling luminaires shall be listed in accordance with UL 1598, *Luminaires* , and marked "Light Diffusers for Air-Handling Luminaires."

**4.3.11.2.3** –

The temperature of air delivered to these plenums shall not exceed 121°C (250°F).

**4.3.11.2.4** –

Materials used in the construction of a ceiling plenum shall be noncombustible or shall be limited combustible having a maximum smoke developed index of 50, except as permitted in 4.3.11.2.4.1 through 4.3.11.2.4.3 , and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.2.4.1** –

Materials used in the construction of a plenum space between the ceiling and roof (or floor) of other than the fire-resistive assemblies covered in 5.3.3 shall be permitted as specified in 4.3.11.2.4.2 and 4.3.11.2.4.3 .

**4.3.11.2.4.2** –

The ceiling material shall have a flame spread index of not more than 25 and a smoke developed index not greater than 50. All surfaces, including those that would be exposed by cutting through the material in any way, shall meet these requirements.

**4.3.11.2.4.3** –

The ceiling materials shall be supported by noncombustible material.

**4.3.11.2.5** –

Where the plenum is a part of a floor-ceiling or roof-ceiling assembly that has been tested or investigated and assigned a fire resistance rating of 1 hour or more, the assembly shall meet the requirements of 5.3.3 .

**4.3.11.2.6** –

Materials within a ceiling cavity plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* , or

(3) Comply with 4.3.11.2.6.1 through 4.3.11.2.6.11 , as applicable.

**4.3.11.2.6.1** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering, metal sheathed cable without an overall nonmetallic covering, or totally enclosed nonventilated metallic busway without an overall nonmetallic covering.

**4.3.11.2.6.2** –

Pneumatic tubing for control systems shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics* .

**4.3.11.2.6.3** –

Nonmetallic fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics* .

**4.3.11.2.6.4** –

Communications raceways shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, *Cable Routing Assemblies and Communications Raceways* .

**4.3.11.2.6.5** * –

Loudspeakers, recessed lighting fixtures, and other electrical equipment with combustible enclosures, including their assemblies and accessories, nonmetallic cable ties, wraps, nonmetallic cable supports, and other discrete products, shall be permitted in the ceiling cavity plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.*

**4.3.11.2.6.6** –

Plastic piping and tubing used in plumbing systems shall be permitted to be used within a ceiling cavity plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless permitted by 4.3.11.2.6.7 .

**4.3.11.2.6.7** –

Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics* , and installed in accordance with its listing, shall be permitted to be used within a ceiling cavity plenum.

**4.3.11.2.6.8** –

Supplementary materials for air distribution systems shall be permitted provided they comply with the provisions of 4.3.3 .

**4.3.11.2.6.9** –

Smoke detectors shall not be required to meet the provisions of Section 4.3 .

**4.3.11.2.6.10** –

Air ducts complying with 4.3.1.2 and air connectors complying with 4.3.2 shall be permitted.

**4.3.11.2.6.11** –

Materials that, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb), when tested in accordance with NFPA 259 and include either of the following:

(1) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( 1 ⁄ 8 in.) that has a flame spread index not greater than 50.

(2) Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .

**4.3.11.2.7** –

The accessible portion of abandoned materials exposed to airflow shall be removed.

**4.3.11.3** – Apparatus Casing Plenum.

**4.3.11.3.1** –

A fabricated plenum and apparatus casing shall be permitted to be used for supply, return, or exhaust air service.

**4.3.11.3.2** –

Fabricated plenum and apparatus casing shall be constructed of materials and by methods specified in 4.3.1 and in accordance with the following:

(1) The casing and plenum construction standards in SMACNA *HVAC Duct Construction Standards — Metal and Flexible*

(2) *ASHRAE Handbook — HVAC Systems and Equipment*

(3) Subsection 4.3.3 for all air duct coverings, duct lining, acoustical liner/cells, and miscellaneous materials

**4.3.11.3.3** –

Electrical wires and cables and optical fiber cables shall comply with 4.3.4 .

**4.3.11.4** – Air-Handling Unit Room Plenum.

**4.3.11.4.1** * –

Individual rooms containing an air-handling unit(s) shall gather air from various sources and combine the air within the room before returning it to the air-handling unit.

**4.3.11.4.2** –

Duct covering, duct lining, acoustical liner/cells, and miscellaneous materials shall comply with 4.3.3 .

**4.3.11.4.3** –

Air-handling unit room plenums shall not be used for storage or occupancy other than during equipment servicing.

**4.3.11.4.4** –

Accessible abandoned material shall be deemed to be in storage and shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.4.5** –

Materials used in the construction of an air-handling unit room plenum shall be noncombustible or shall be limited combustible having a maximum smoke developed index of 50 and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.4.6** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways, metal sheathed cable, or totally enclosed nonventilated busway.

**4.3.11.5** – Raised Floor Plenum.

**4.3.11.5.1** –

The space between the top of the finished floor and the underside of a raised floor shall be permitted to be used to supply air to the occupied area or return or exhaust air from or return and exhaust air from the occupied area, provided that the conditions in 4.3.11.5.2 through 4.3.11.5.6 are met.

**4.3.11.5.2** –

The integrity of the firestopping for penetrations shall be maintained.

**4.3.11.5.3** –

The temperature of air delivered to these plenums shall not exceed 121°C (250°F).

**4.3.11.5.4** –

Materials used in the construction of a raised floor plenum shall be noncombustible or limited-combustible materials, shall have a maximum peak smoke developed index of 50, and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.5.5** –

Materials within a raised floor plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* , or

(3) Comply with 4.3.11.5.5.1 through 4.3.11.5.5.12 , as applicable.

**4.3.11.5.5.1** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways, metal sheathed cable, or totally enclosed nonventilated busway.

**4.3.11.5.5.2** –

Pneumatic tubing for control systems shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics* .

**4.3.11.5.5.3** –

Nonmetallic fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics* .

**4.3.11.5.5.4** –

Communications raceways shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, *Cable Routing Assemblies and Communications Raceways* . Cables installed within these raceways shall be listed as plenum cable in accordance with the requirements in 4.3.11.5.5.1 .

**4.3.11.5.5.5** –

Raised floors, intermachine cables, electrical wires, listed plenum communications raceways, and optical-fiber cables in computer/data processing rooms where these rooms are designed and installed in accordance with NFPA 75 shall be permitted.

**4.3.11.5.5.6** –

Loudspeakers, recessed lighting fixtures, and other electrical equipment with combustible enclosures, including their assemblies and accessories, nonmetallic cable ties, wraps, nonmetallic cable supports, and other discrete products, shall be permitted in the raised floor plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.*

**4.3.11.5.5.7** –

Plastic piping and tubing used in plumbing systems shall be permitted to be used within a raised floor plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless otherwise permitted by 4.3.11.5.5.8 .

**4.3.11.5.5.8** –

Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics* , and installed in accordance with its listing, shall be permitted to be used within a raised floor plenum.

**4.3.11.5.5.9** –

Air ducts complying with 4.3.1.2 and air connectors complying with 4.3.2 shall be permitted.

**4.3.11.5.5.10** –

Materials, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb) when tested in accordance with NFPA 259 and include either of the following:

(1) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( 1 ⁄ 8 in.) that has a flame spread index not greater than 50.

(2) Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .

**4.3.11.5.5.11** –

Smoke detectors shall not be required to meet the requirements of 4.3.11.5.1 .

**4.3.11.5.5.12** –

Supplementary materials for air distribution systems shall be permitted provided they comply with 4.3.3 .

**4.3.11.5.6** –

The accessible portion of abandoned materials exposed to airflow shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.6** – Wall or Ceiling Finish in Plenums.

**4.3.11.6.1** –

Wall or ceiling finish in plenums, except as indicated in 4.3.11.6.2 , shall be noncombustible or shall exhibit a flame spread index of 25 or less and a smoke developed index of 50 or less, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2** –

Foam plastic insulation shall not be used as wall or ceiling finish in plenums unless the insulation meets any one of the criteria shown in 4.3.11.6.2.1 through 4.3.11.6.2.4 .

**4.3.11.6.2.1** –

The foam plastic insulation material shall exhibit a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use, and shall comply with the following criteria, when tested in accordance with NFPA 286 (where the testing shall be performed on the finished foam plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use):

(1) Flame does not spread to the ceiling during the 40 kW exposure.

(2) Flame does not spread to the outer extremities of the sample.

(3) Flashover, based on the criteria from NFPA 286, does not occur.

(4) The peak heat release rate does not exceed 800 kW.

(5) The total smoke release does not exceed 1000 $m^2$ (1196 $yd^2$ ).

**4.3.11.6.2.2** –

The foam plastic insulation material shall be covered by corrosion-resistant steel having a base metal thickness of not less than 0.4 mm (0.0160 in.) and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2.3** –

The foam plastic insulation material shall be separated from the plenum by an approved thermal barrier consisting of 12.7 mm (0.5 in.) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the temperature transmission fire test and the integrity fire test of NFPA 275 and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2.4** –

The foam plastic insulation material shall be separated from the plenum by not less than 25.4 mm (1.0 in.) of masonry or concrete and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.12** – Corridor Air Systems.

**4.3.12.1** – Egress Corridors.

**4.3.12.1.1** * –

Egress corridors in health care, detention and correctional, and residential occupancies shall not be used as a portion of a supply, return, or exhaust air system serving adjoining areas unless otherwise permitted by 4.3.12.1.3.1 through 4.3.12.1.3.4 .

**4.3.12.1.2** –

Air movement between rooms and egress corridors in hospitals, nursing facilities, and ambulatory care facilities shall be permitted where the transfer of air is required for clinical purposes by other standards.

**4.3.12.1.3** –

An air transfer opening(s) shall not be permitted in walls or in doors separating egress corridors from adjoining areas.

**4.3.12.1.3.1** –

An air transfer opening(s) shall be permitted in walls or doors from toilet rooms, bathrooms, shower rooms, sink closets, and similar auxiliary spaces opening directly onto the egress corridor.

**4.3.12.1.3.2** –

Where door clearances do not exceed those specified for fire doors in NFPA 80 air transfer caused by pressure differentials shall be permitted.

**4.3.12.1.3.3** –

Use of egress corridors shall be permitted as part of an engineered smoke-control system.

**4.3.12.1.3.4** –

Air transfer opening(s) shall be permitted in walls or in doors separating egress corridors from adjoining areas in detention and correctional occupancies with corridor separations of open construction (e.g., grating doors or grating partitions).

**4.3.12.2** – Exits.

Exit passageways, stairs, ramps, and other exits shall not be used as a part of a supply, return, or exhaust air system serving other areas of the building.

**4.3.13** * – Smoke Control.

Where a smoke-control or exhaust system is required, it shall conform to the requirements of the building code of the authority having jurisdiction.

**4.4** – Materials.

**4.4.1** * – Noncombustible Material.

**4.4.1.1** –

A material that complies with any of the following shall be considered a noncombustible material:

(1) A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat

(2) A material that is reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

(3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C*

[ ***101*** : 4.6.13.1]

**4.4.1.2** –

Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible* . [ ***101*** : 4.6.13.2]

**4.4.2** – Limited-Combustible Material.

A material shall be considered a limited-combustible material where one of the following is met:

(1) The conditions of 4.4.2.1 and 4.4.2.2 , and the conditions of either 4.4.2.3 or 4.4.2.4 , shall be met.

(2) The conditions of 4.4.2.5 shall be met.

[ ***101*** **:** 4.6.14]

**4.4.2.1** –

The material shall not comply with the requirements for noncombustible material in accordance with 4.4.1 . [ ***101*** **:** 4.6.14.1]

**4.4.2.2** –

The material, in the form in which it is used, shall exhibit a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259. [ ***101*** **:** 4.6.14.2]

**4.4.2.3** –

The material shall have the structural base of a noncombustible material with a surfacing not exceeding a thickness of **1⁄8** in. (3.2 mm) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* . [ ***101*** **:** 4.6.14.3]

**4.4.2.4** –

The material shall be composed of materials that, in the form and thickness used, neither exhibit a flame spread index greater than 25 nor evidence of continued progressive combustion when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , and shall be of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723. [ ***101*** **:** 4.6.14.4]

**4.4.2.5** –

Materials shall be considered limited-combustible materials where tested in accordance with ASTM E2965, *Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter* , at an incident heat flux of 75 kW/m$^2$ for a 20-minute exposure and both of the following conditions are met:

(1) The peak heat release rate shall not exceed 150 kW/m$^2$ for longer than 10 seconds.

(2) The total heat released shall not exceed 8 MJ/m$^2$ .

[ ***101*** **:** 4.6.14.5]

**4.4.2.6** –

Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible* . [ ***101*** **:** 4.6.14.6]

## Additional Proposed Changes

| File Name | Description | Approved |
|---|---|---|
| New_draft_chapter_7_reorg_2021.docx | Chapter 7 after reorg - no changes from existing text | |

## Statement of Problem and Substantiation for Public Input

next chapter in the draft reorg - no changes

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 8-NFPA 90A-2021 [New Section after 4.4] | |

## Submitter Information Verification

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## Public Input No. 13-NFPA 90A-2021 [ Chapter 4 ]

~~**4.3.11.1.1** –~~

~~Plenums~~

**Chapter 4** – ~~HVAC Systems~~

**4.1** – ~~General Requirements for Equipment.~~

**4.1.1** – ~~Access.~~

~~Equipment shall be arranged to afford access for inspection, maintenance, and repair.~~

**4.1.2** –

~~Equipment shall be selected and installed based on its application with respect to the manufacturer's installation instructions and listing, as applicable.~~

**4.1.3** – ~~Protection.~~

**4.1.3.1** –

~~Equipment shall be guarded for personnel protection.~~

**4.1.3.2** –

~~Equipment shall be guarded against the intake of foreign matter into the system.~~

**4.1.4** –

~~Electrical wiring and equipment shall be installed in accordance with *NFPA 70* .~~

**4.1.5** –

~~Air-handling equipment rooms shall meet the requirements of Section 5.1 .~~

**4.2** – ~~System Components.~~

**4.2.1** – ~~Outside Air Intakes.~~

**4.2.1.1** –

~~Outside air intakes shall be protected by screens of corrosion-resistant material not larger than 12.7 mm (0.5 in.) mesh.~~

**4.2.1.2** ~~*~~ –

~~Outside air intakes shall be located so as to minimize the introduction of fire or smoke into the building.~~

**4.2.1.2.1** –

~~Outside air intakes shall be equipped with an approved fire and/or smoke damper where not located to meet the requirements of 4.2.1.2 . *(See Section 6.3 for smoke damper operation to restrict the intake of smoke.)*~~

**4.2.2** – ~~Air Cleaners and Air Filters.~~

**4.2.2.1** –

~~Electrostatic air cleaners shall be listed in accordance with UL 867, *Electrostatic Air Cleaners* .~~

**4.2.2.1.1** –

~~Electrostatic air cleaners shall be installed in conformance with the conditions of the manufacturer's listing.~~

**4.2.2.2** * –

Air filters shall comply with UL 900, *Air Filter Units* .

**4.2.2.3** –

Liquid adhesive coatings used on air filters shall have a minimum flash point of 163°C (325°F) as determined by ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester* .

**4.2.2.4** –

Where air filters are flushed with liquid adhesives, the system shall be arranged so that the air cleaner cannot be flushed while the fan is in operation.

**4.2.2.5** –

Combustible adhesive coatings shall be stored in accordance with NFPA 30.

**4.2.3** – Fans.

**4.2.3.1** – Installation.

**4.2.3.1.1** –

Fans shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

**4.2.3.1.2** –

Fans shall be approved for the specific installation.

**4.2.3.2** – Access.

Fans shall be located, arranged, and installed to afford access for inspection and maintenance.

**4.2.3.3** – Exposed Inlets.

Exposed fan inlets shall be protected with metal screens to prevent the entry of paper, trash, and foreign materials.

**4.2.4** – Air-Cooling and Heating Equipment.

**4.2.4.1** – Installation.

**4.2.4.1.1** –

Heating and cooling equipment shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

**4.2.4.1.2** –

The equipment shall be approved for the specific installation. *(See 4.3.3.1 .)*

**4.2.4.2** – Materials.

Materials used in the manufacturing of fan coil units, self-contained air-conditioning units, furnaces, heat pumps, humidifiers, and all similar equipment shall meet the requirements of 4.3.3.1 and 4.3.3.2 unless otherwise specified in 4.2.4.2.1 or 4.2.4.2.2 .

**4.2.4.2.1** –

The requirements of 4.3.3.1 and 4.3.3.2 shall not apply to equipment tested and listed in accordance with UL 1995, *Heating and Cooling Equipment* , or UL 60335-2-40, *Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers* .

**4.2.4.2.2** –

Unlisted solar energy air distribution system components shall be accompanied by supportive information demonstrating that the components have flame spread and smoke developed indexes that are not in excess of those of the air duct system permitted by this standard.

**4.2.4.3** – Mechanical Cooling.

**4.2.4.3.1** –

Mechanical refrigeration used with air duct systems shall be installed in accordance with recognized safety practices.

**4.2.4.3.2** –

Installations conforming to ASHRAE 15 (packaged with ASHRAE 34), *Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants*, shall be considered to be in compliance with the requirement in 4.2.4.3.1.

**4.2.4.4** – Furnaces.

**4.2.4.4.1** –

Oil-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 31.

**4.2.4.4.2** –

Gas-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 54.

**4.2.4.5** – Duct Heaters.

**4.2.4.5.1** –

Where electrical resistance or fuel-burning heaters are installed in air ducts, the air duct coverings and their installation shall comply with the provisions of 4.3.5.3.

**4.2.4.5.2** –

The installation of electrical duct heaters shall comply with the provisions of Part VI, "Duct Heaters," of Article 424 of *NFPA 70*.

**4.2.4.6** – Evaporative Coolers.

Combustible evaporation media shall not be used unless they meet the requirements of 4.2.2.2.

**4.2.4.7** – Heat Recovery Equipment.

Equipment not covered by other provisions of this standard and used for heat transfer or air movement shall be constructed so that all material in the air path meets the requirements of Section 4.2.

**4.3** * – Air Distribution.

**4.3.1** – Air Ducts.

**4.3.1.1** –

Air ducts shall be constructed of iron, steel, aluminum, copper, concrete, masonry, or clay tile, except as otherwise permitted in 4.3.1.2 or 4.3.1.3.

**4.3.1.2** –

Class 0 or Class 1 rigid or flexible air ducts tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors*, and installed in conformance with the conditions of listing shall be permitted to be used for ducts where air temperature in the ducts does not exceed 121°C (250°F) or where used as vertical ducts serving not more than two adjacent stories in height.

**4.3.1.3** – Gypsum Board Air Ducts.

**4.3.1.3.1** –

Gypsum board having a flame spread index not exceeding 25 without evidence of continued progressive combustion and a smoke developed index not exceeding 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Test for Surface Burning Characteristics of Building Materials*, shall be permitted to be used for negative pressure exhaust and return ducts where the temperature of the conveyed air does not exceed 52°C (125°F) in normal service.

**4.3.1.3.2** –

The air temperature limits of 4.3.1.3.1 shall not apply where gypsum board material is used for emergency smoke exhaust air ducts.

**4.3.1.4** –

All air duct materials shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the air duct.

**4.3.1.5** –

The materials, thickness, construction, and installation of ducts shall provide structural strength and durability.

**4.3.1.5.1** –

Air ducts shall be considered to be in compliance with 4.3.1.5 where constructed and installed in accordance with the *ASHRAE Handbook — HVAC Systems and Equipment* and with one of the following as applicable:

(1) NAIMA *Fibrous Glass Duct Construction Standards*

(2) SMACNA *Fibrous Glass Duct Construction Standards*

(3) SMACNA *HVAC Duct Construction Standards — Metal and Flexible*

(4) ANSI/SMACNA 016, *HVAC Air Duct Leakage Test Manual*

**4.3.1.6** –

Where no standard exists for the construction of air ducts, the ducts shall be constructed to withstand both the maximum positive and the maximum negative pressures of the system at fan shutoff.

**4.3.1.7** –

A duct enclosure used for the multiple distribution or gathering of ducts or connectors shall be constructed of materials and methods specified in 4.3.1 .

**4.3.1.7.1** –

Electrical wires and cables and optical fiber cables within a duct enclosure shall comply with 4.3.4 .

**4.3.1.8** – Air Dispersion Systems.

Air dispersion systems shall meet the following criteria:

(1) They shall only be installed in entirely exposed locations.

(2) They shall always operate under positive pressure.

(3) They shall not penetrate fire resistance–rated construction.

(4) They shall not pass through fire resistance–rated construction.

(5) They shall be listed and labeled in accordance with UL 2518, *Air Dispersion Systems.*

**4.3.2** – Air Connectors.

**4.3.2.1** –

Air connectors shall be permitted to be used as limited-use, flexible air ducts that shall not be required to conform to the provisions for air ducts where they meet the requirements of 4.3.2.1.1 through 4.3.2.1.7 .

**4.3.2.1.1** –

Air connectors shall conform to the requirements for Class 0 or Class 1 air connectors when tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* .

**4.3.2.1.2** –

Class 0 or Class 1 air connectors shall not be used for ducts containing air at temperatures in excess of 121°C (250°F).

**4.3.2.1.3** –

Air connector runs shall not exceed 4.27 m (14 ft) in length.

**4.3.2.1.4** –

Air connectors shall not pass through any wall, partition, or enclosure of a vertical shaft that is required to have a fire resistance rating of 1 hour or more.

**4.3.2.1.5** –

Air connectors shall not pass through floors.

**4.3.2.1.6** –

An air connector shall not be interrupted by a short collar or any other fitting on one side and then connected to another air connector on the other side where penetrating a floor or a wall, partition, or enclosure of a vertical shaft that is required to have a fire-resistance rating of 1 hour.

**4.3.2.1.7** –

Multiple air connector runs shall not be spliced together to exceed the length limitation in 4.3.2.1.3 .

**4.3.2.2** –

Vibration isolation connectors in duct systems shall be made of materials having a maximum flame spread index of 25 and a maximum smoke developed index of 50.

**4.3.2.3** –

Wiring shall not be installed in air connectors.

**4.3.3** – Supplementary Materials for Air Distribution Systems.

**4.3.3.1** * –

Pipe and duct insulation and coverings, duct linings, vapor retarder facings, adhesives, fasteners, tapes, and supplementary materials added to air ducts, plenums, panels, and duct silencers used in duct systems, unless otherwise provided for in 4.3.3.1.1 or 4.3.3.1.2 , shall have, in the form in which they are used, a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* . Pipe and duct insulation and coverings, duct linings and their adhesives, and tapes shall use the specimen preparation and mounting procedures of ASTM E2231, *Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics* .

**4.3.3.1.1** –

The flame spread index and smoke developed index requirements of 4.3.3.1 shall not apply to air duct weatherproof coverings where they are located entirely outside a building, do not penetrate a wall or roof, and do not create an exposure hazard.

**4.3.3.1.2** –

Smoke detectors required by 6.4.4 shall not be required to meet flame spread index or smoke developed index requirements.

**4.3.3.2** –

Closure systems for use with rigid and flexible air ducts tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , shall have been tested, listed, and used in accordance with the conditions of their listings, in accordance with one of the following:

(1) UL 181A, *Closure Systems for Use with Rigid Air Ducts*

(2) UL 181B, *Closure Systems for Use with Flexible Air Ducts and Air Connectors*

**4.3.3.3** –

Coverings and linings for air ducts, pipes, plenums, and panels, including all pipe and duct insulation materials, shall not flame, glow, smolder, or smoke when tested in accordance with ASTM C411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation* , at the temperature to which they are exposed in service. In no case shall the test temperature be below 121°C (250°F).

**4.3.3.4** –

Air duct coverings shall not extend through walls or floors that are required to be fire stopped or required to have a fire resistance rating, unless such coverings meet the requirements of NFPA 80.

**4.3.3.5** * –

Air duct linings shall be interrupted at fire dampers to prevent interference with the operation of devices.

**4.3.3.6** –

Air duct coverings shall not be installed so as to conceal or prevent the use of any service opening.

**4.3.3.7** * –

Wall or ceiling finish in plenums shall comply with 4.3.11.6 .

**4.3.4** – Materials for Operation and Control of the Air Distribution System.

**4.3.4.1** * –

Wiring shall not be installed in air ducts, except as permitted in 4.3.4.2 through 4.3.4.4 .

**4.3.4.2** –

Wiring shall be permitted to be installed in air ducts only if the wiring is directly associated with the air distribution system and does not exceed 1.22 m (4 ft).

**4.3.4.3** –

Wiring permitted by 4.3.4.2 shall be as short as practicable.

**4.3.4.4** * –

Electrical wires and cables and optical fiber cables shall consist of wires or cables listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering or metal sheathed cable without an overall nonmetallic covering.

**4.3.4.5** –

Nonmetallic pneumatic tubing for control systems shall be permitted to have up to 457.2 mm (18 in.) of tubing that meets the requirements of 4.3.11.2.6.2 to connect to equipment.

**4.3.5** – Air Duct Access and Inspection.

**4.3.5.1** –

A service opening shall be provided in air ducts adjacent to each fire damper, smoke damper, combination fire/smoke damper, and any smoke detectors that need access for installation, cleaning, maintenance, inspection, and testing.

**4.3.5.1.1** –

The opening shall be large enough to permit maintenance and resetting of the device.

**4.3.5.2** –

Service openings shall be identified with letters having a minimum height of 12.7 mm ( **1**⁄**2** in.) to indicate the location of the fire protection device(s) within.

**4.3.5.3** –

Horizontal air ducts and plenums shall be provided with service openings to facilitate the removal of accumulations of dust and combustible materials.

**4.3.5.3.1** –

Service openings shall be located at approximately 6.1 m (20 ft) intervals along the air duct and at the base of each vertical riser, unless otherwise permitted in 4.3.5.3.2 through 4.3.5.3.4 .

**4.3.5.3.2** –

Removable air outlet or air inlet devices of adequate size shall be permitted in lieu of service openings.

**4.3.5.3.3** –

Service openings shall not be required in supply ducts where the supply air has previously passed through an air filter, an air cleaner, or a water spray.

**4.3.5.3.4** –

Service openings shall not be required where all the following conditions exist:

(1) The occupancy has no process that produces combustible material such as dust, lint, or greasy vapors. Such occupancies include banks, office buildings, churches, hotels, and health care facilities (but not kitchens, laundries, and manufacturing portions of such facilities).

(2) The air inlets are at least 2.13 m (7 ft) above the floor or are protected by corrosion-resistant metal screens of at least 14 mesh [1.8 mm (0.07 in.)] that are installed at the inlets so that they cannot draw papers, refuse, or other combustible solids into the return air duct.

(3) The minimum design velocity in the return duct for the particular occupancy is 5.08 m/sec (1000 ft/min).

**4.3.5.4** –

Inspection windows shall be permitted in air ducts, provided they are glazed with wired or fire protection–rated glass.

**4.3.5.5** –

Openings in walls or ceilings shall be provided so that service openings in air ducts are accessible for maintenance and inspection needs.

**4.3.5.6** –

Where a service opening is necessary in an air duct located above the ceiling of a floor-ceiling or a roof-ceiling assembly that has been tested and assigned a fire resistance rating in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials* , or UL 263, *Fire Tests of Building Construction and Materials* , access shall be provided in the ceiling.

**4.3.5.7** –

The service opening shall be designed and installed so that it does not reduce the fire resistance rating of the assembly.

**4.3.6** – Air Duct Integrity.

**4.3.6.1** –

Air ducts shall be located where they are not subject to damage or rupture, or they shall be protected to maintain their integrity.

**4.3.6.2** –

Where an air duct is located outdoors, the air duct, together with its covering or lining, shall be protected from harmful elements.

**4.3.6.3** –

Where electrical, fossil fuel, or solar energy collection heat sources are installed in air ducts, the installation shall avoid the creation of a fire hazard.

**4.3.6.3.1** –

For air ducts rated as Class 1 in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , air duct coverings and linings shall be interrupted at the immediate area of operation of such heat sources in 4.3.5.3 in order to meet the clearances specified as a condition of the equipment listing, unless otherwise permitted in 4.3.5.3.2 or 4.3.5.3.3 .

**4.3.6.3.2** –

Appliances listed for zero clearance from combustibles shall be permitted to be installed in accordance with the conditions of their listings.

**4.3.6.3.3** –

Insulation specifically suited for the maximum temperature that reasonably can be anticipated on the duct surface shall be permitted to be installed at the immediate area of operation of such appliances.

**4.3.7** – Air Outlets.

**4.3.7.1** – General.

Air supplied to any space shall not contain flammable vapors, flyings, or dust in quantities and concentrations that would introduce a hazardous condition.

**4.3.7.2** – Construction of Air Outlets.

Air outlets shall be constructed of noncombustible material or of a material that has a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials.*

**4.3.7.3** – Location of Air Outlets.

**4.3.7.3.1** –

Air outlets shall be located at least 76 mm (3 in.) above the floor, unless provisions have been made to prevent dirt and dust accumulations from entering the system.

**4.3.7.3.2** –

Where located less than 2.13 m (7 ft) above the floor, outlet openings shall be protected by a grille or screen having openings through which a 12.7 mm ( **1** / **2** in.) sphere cannot pass.

**4.3.8** – Air Inlets — Return or Exhaust or Return and Exhaust.

**4.3.8.1** – General.

Air shall not be recirculated from any space in which flammable vapors, flyings, or dust are present in quantities and concentrations that would introduce a hazardous condition into the return air system.

~~**4.3.8.2** – Construction of Air Inlets.~~

~~Air inlets shall be constructed of noncombustible material or a material that has a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials.*~~

~~**4.3.8.3** – Location of Air Inlets.~~

~~**4.3.8.3.1** –~~

~~Air inlets shall be located at least 76 mm (3 in.) above the floor, unless provisions have been made to prevent dirt and dust accumulations from entering the system.~~

~~**4.3.8.3.2** –~~

~~Where located less than 2.13 m (7 ft) above the floor, inlet openings shall be protected by a grille or screen having openings through which a 12.7 mm ( **1** / **2** in.) sphere cannot pass.~~

~~**4.3.9** – Fire Dampers.~~

~~**4.3.9.1** –~~

~~Approved fire dampers shall be provided as required in Chapter 5 .~~

~~**4.3.9.2** –~~

~~Approved fire dampers shall be installed in conformance with the conditions of their listings.~~

~~**4.3.10** – Smoke Dampers.~~

~~**4.3.10.1** –~~

~~Approved smoke dampers shall be provided as required in Chapter 5 .~~

~~**4.3.10.1.1** –~~

~~Approved smoke dampers shall be installed in conformance with the conditions of their listings.~~

~~**4.3.10.2** –~~

~~Smoke dampers shall be installed in systems with a capacity greater than 7080 L/sec (15,000 ft $^3$ /min) to isolate the air-handling equipment, including filters, from the remainder of the system on both the building supply side and the return side, in order to restrict the circulation of smoke, unless specifically exempted by 4.3.10.2.1 or 4.3.10.2.2 .~~

~~**4.3.10.2.1** –~~

~~Air-handling units located on the floor they serve and serving only that floor shall be exempt from the requirements of 4.3.10.2 .~~

~~**4.3.10.2.2** –~~

~~Air-handling units located on the roof and serving only the floor immediately below the roof shall be exempt from the requirements of 4.3.10.2 .~~

~~**4.3.11** – Plenums.~~

~~**4.3.11.1** – Storage.~~

**8** _ Plenums

**8** _ Plenums.

**8.1** _ Storage.

**8.1.1** _

Plenums shall not be used for occupancy or storage.

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**8** .

~~3.11.~~

**1.2** _

Accessible abandoned material shall be deemed to be in storage and shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

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**8** .

~~3.11.~~

**2** _ Ceiling Cavity Plenum.

~~4.3.11.~~

The space between the top of the finished ceiling and the underside of the floor or roof above shall be permitted to be used to supply air to the occupied area or to return or exhaust air from the occupied area, provided that the conditions in 4.3.11.2.1 through 4.3.11.2.7 are met.

~~***(check section numbers)***~~

~~**8. 2.1**~~ –

~~The integrity of the fire and smoke stopping for penetrations shall be maintained.~~

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~~**8**~~ .

~~3.11.~~

~~**2.2**~~ –

~~Light diffusers, other than those made of metal or glass, used in air-handling luminaires shall be listed in accordance with UL 1598, *Luminaires* , and marked "Light Diffusers for Air-Handling Luminaires."~~

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~~**8**~~ .

~~3.11.~~

~~**2.3**~~ –

~~The temperature of air delivered to these plenums shall not exceed 121°C (250°F).~~

4

~~**8**~~ .

~~3.11.~~

~~**2.4**~~ –

~~Materials used in the construction of a ceiling plenum shall be noncombustible or shall be limited combustible having a maximum smoke developed index of 50, except as permitted in 4.3.11.2.4.1 through 4.3.11.2.4.3 ***(check section numbers)*** , and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.~~

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**8.**

3.11.

**2.4.1** –

Materials used in the construction of a plenum space between the ceiling and roof (or floor) of other than the fire-resistive assemblies covered in 5.3.3 shall be permitted as specified in 4.3.11.2.4.2 and 4.3.11.2.4.3 .

4.3.11.

**(check all section numbers)**

**8. 2.4.2** –

The ceiling material shall have a flame spread index of not more than 25 and a smoke developed index not greater than 50. All surfaces, including those that would be exposed by cutting through the material in any way, shall meet these requirements.

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**8.**

3.11.

**2.4.3** –

The ceiling materials shall be supported by noncombustible material.

4

**8.**

3.11.

**2.5** –

Where the plenum is a part of a floor-ceiling or roof-ceiling assembly that has been tested or investigated and assigned a fire resistance rating of 1 hour or more, the assembly shall meet the requirements of 5.3.3 . ***check section numbers)***

4

**8.**

3.11.

**2.6** –

Materials within a ceiling cavity plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Be limited combustible in accordance with section 4.4.2 ***(check section number)***

(3) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* , or

(4) Comply with

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(1) 8.

3.11.

(1) 2.6.1 through

4

(1) 8 .

3.11.

(1) 2.6.

114.3.11

(1) 10 , as applicable.

(1) ***(check section numbers - note that new 8.2.6.11 has been deleted to refer to limited combustible)***

**8 .2.6.1 *** –

Electrical wires and cables and optical fiber cables shall be listed as

having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering, metal sheathed cable without an overall nonmetallic covering, or totally enclosed nonventilated metallic busway without an overall nonmetallic covering.

4.3.11.

described in the electrical chapter.

**8. 2.6.2** –

Pneumatic tubing for control systems shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics* .

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**8 .**

3.11.

**2.6.3** –

Nonmetallic fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics* .

4

**8 .**

3.11.

**2.6.4** –

Communications raceways shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, *Cable Routing Assemblies and Communications Raceways* .

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**8 .**

3.11.

**2.6.5** * –

Loudspeakers, recessed lighting fixtures, and other electrical equipment with combustible enclosures, including their assemblies and accessories, nonmetallic cable ties, wraps, nonmetallic cable supports, and other discrete products, shall be permitted in the ceiling cavity plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces*.

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**8** .

3.11.

**2.6.6** –

Plastic piping and tubing used in plumbing systems shall be permitted to be used within a ceiling cavity plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless permitted by

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8 .

3.11.

2.6.7 .

4

**8** .

3.11.

**2.6.7** –

Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics* , and installed in accordance with its listing, shall be permitted to be used within a ceiling cavity plenum.

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**8** .

3.11.

**2.6.8** –

Supplementary materials for air distribution systems shall be permitted provided they comply with the provisions of 4.3.3 . ***(check section number)***

4

**8** .

3.11.

**2.6.9** –

Smoke detectors shall not be required to meet the provisions of Section 4.3 . ***(check section number)***

4

**8** .

3.11.4.3.11.

**2.6.10** –

Air ducts complying with 4.3.1.2 and air connectors complying with 4.3.2 shall be permitted.

**4.3.11.2.6.11** –

Materials that, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb), when tested in accordance with NFPA 259 and include either of the following:

(1) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( **1** ⁄ **8** in.) that has a flame spread index not greater than 50.

(2) Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .

***(check section numbers)***

**8. 2.7** _

The accessible portion of abandoned materials exposed to airflow shall be removed.

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**8 .3**

.11.3

_ Apparatus Casing Plenum.

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**8 .3.**

11.3.

**1** _

A fabricated plenum and apparatus casing shall be permitted to be used for supply, return, or exhaust air service.

4

**8 .3.**

11.3.

**2** _

Fabricated plenum and apparatus casing shall be constructed of materials and by methods specified in 4.3.1 and in accordance with the following: ***(check section number)***

(1) The casing and plenum construction standards in SMACNA *HVAC Duct Construction Standards — Metal and Flexible*

(2) *ASHRAE Handbook — HVAC Systems and Equipment*

(3) Subsection 4.3.3 for all air duct coverings, duct lining, acoustical liner/cells, and miscellaneous materials

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**8 .3.**

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**3**

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Electrical wires and cables and optical fiber cables shall comply with

4.3.4 .

4.3.11.

the electrical section chapter.

**8. 4** _ Air-Handling Unit Room Plenum.

4

**8 .**

3.11.

**4.1 *** _

Individual rooms containing an air-handling unit(s) shall gather air from various sources and combine the air within the room before returning it to the air-handling unit.

4

**8.**

~~3.11.~~

**4.2** _

Duct covering, duct lining, acoustical liner/cells, and miscellaneous materials shall comply with 4.3.3 .

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**8.**

~~3.11.~~

**4.3** _

Air-handling unit room plenums shall not be used for storage or occupancy other than during equipment servicing.

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**8.**

~~3.11.~~

**4.4** _

Accessible abandoned material shall be deemed to be in storage and shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

4

**8.**

~~3.11.~~

**4.5** _

Materials used in the construction of an air-handling unit room plenum shall be noncombustible or shall be limited combustible having a maximum smoke developed index of 50 and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

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**8.**

~~3.11.~~

**4.6** * _

Electrical wires and cables and optical fiber cables shall

~~be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways, metal sheathed cable, or totally enclosed nonventilated busway.~~

~~4.3.11.~~

comply with the electrical section chapter.

**8. 5** _ Raised Floor Plenum.

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**8.**

~~3.11.~~

**5.1** _

The space between the top of the finished floor and the underside of a raised floor shall be permitted to be used to supply air to the occupied area or return or exhaust air from or return and exhaust air from the occupied area, provided that the conditions in

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5.

2 through

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8 .

3

5 .

11.5.6 are

1.6 are met.

4.3.11.

_ ***(check section numbers)***

**8. 5.2** _

The integrity of the firestopping for penetrations shall be maintained.

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**8 .**

3.11.

**5.3** _

The temperature of air delivered to these plenums shall not exceed 121°C (250°F).

4

**8 .**

3.11.

**5.4** _

Materials used in the construction of a raised floor plenum shall be noncombustible or limited-combustible materials, shall have a maximum peak smoke developed index of 50, and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

4

**8 .**

3.11.

**5.5** _

Materials within a raised floor plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Be limited combustible in accordance with section 4.4.2 ***(check section number)***

(3) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* , or

(4) Comply with

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(1) 8 .

~~3.11.~~

(1) 5.5.1 .1 through

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(1) 8 .

~~3.11.~~

(1) 5.5.

~~124.3.11.~~

(1) 1.11 , as applicable.

(1) ~~*(check section numbers - note that one section is being deleted and sent to reference limited combustible)*~~

**~~8. 5.5.1~~ ~~*~~** _

~~Electrical wires and cables and optical fiber cables shall~~

~~be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways, metal sheathed cable, or totally enclosed nonventilated busway.~~

~~4.3.11.~~

~~comply with the electrical section chapter.~~

**~~8. 5.5.2~~** _

~~Pneumatic tubing for control systems shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics* .~~

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**~~8~~** .

~~3.11.~~

**~~5.5.3~~** _

~~Nonmetallic fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics* .~~

4

**8.**

3.11.

**5.5.4** –

Communications raceways shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, *Cable Routing Assemblies and Communications Raceways* . Cables installed within these raceways shall be listed as plenum cable in accordance with the requirements in 4.3.11.5.5.1 .

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**8.**

3.11.

**5.5.5** –

Raised floors, intermachine cables, electrical wires, listed plenum communications raceways, and optical-fiber cables in computer/data processing rooms where these rooms are designed and installed in accordance with NFPA 75 shall be permitted.

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**8.**

3.11.

**5.5.6** –

Loudspeakers, recessed lighting fixtures, and other electrical equipment with combustible enclosures, including their assemblies and accessories, nonmetallic cable ties, wraps, nonmetallic cable supports, and other discrete products, shall be permitted in the raised floor plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.*

4

**8.**

3.11.

**5.5.7** –

Plastic piping and tubing used in plumbing systems shall be permitted to be used within a raised floor plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless otherwise permitted by

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3.11.

5.5.8 .

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**8.**

3.11.

**5.5.8** –

Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics* , and installed in accordance with its listing, shall be permitted to be used within a raised floor plenum.

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**8** .

3.11. 4.3.11.5.5.11

**5.5.9** –

Air ducts complying with 4.3.1.2 and air connectors complying with 4.3.2 shall be permitted.

**4.3.11.5.5.10** –

Materials, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb) when tested in accordance with NFPA 259 and include either of the following:

(1) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( **1** / **8** in.) that has a flame spread index not greater than 50.

(2) Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .

***(check section numbers)***

**8.5.5.10** _

Smoke detectors shall not be required to meet the requirements of 4.3.11.5.

~~4~~

1 ***(check section number)*** .

~~4~~

**8** .

~~3.11.~~

**5.5.**

~~12~~

**11** _

Supplementary materials for air distribution systems shall be permitted provided they comply with 4.3.3 . ***(check section number)***

~~4~~

**8** .

~~3.11.~~

**5.6** _

The accessible portion of abandoned materials exposed to airflow shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

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**8** .

~~3.11.~~

**6** _ Wall or Ceiling Finish in Plenums.

~~4~~

**8** .

~~3.11.~~

**6.1** _

Wall or ceiling finish in plenums, except as indicated in 4.3.11.6.2 , shall be noncombustible or shall exhibit a flame spread index of 25 or less and a smoke developed index of 50 or less, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

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**8** .

~~3.11.~~

**6.2** _

Foam plastic insulation shall not be used as wall or ceiling finish in plenums unless the insulation meets any one of the criteria shown in

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8 .

~~3.11.~~

6 .2.1 through

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8 .

3.11.

6 .2.4 .

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**8 .**

3.11.

**6.2.1** _

The foam plastic insulation material shall exhibit a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use, and shall comply with the following criteria, when tested in accordance with NFPA 286 (where the testing shall be performed on the finished foam plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use):

(1) Flame does not spread to the ceiling during the 40 kW exposure.

(2) Flame does not spread to the outer extremities of the sample.

(3) Flashover, based on the criteria from NFPA 286, does not occur.

(4) The peak heat release rate does not exceed 800 kW.

(5) The total smoke release does not exceed 1000 m 2 = (1196 yd 2 = ).

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**8 .**

3.11.

**6.2.2** _

The foam plastic insulation material shall be covered by corrosion-resistant steel having a base metal thickness of not less than 0.4 mm (0.0160 in.) and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

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**8 .**

3.11.

**6.2.3** _

The foam plastic insulation material shall be separated from the plenum by an approved thermal barrier consisting of 12.7 mm (0.5 in.) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the temperature transmission fire test and the integrity fire test of NFPA 275 and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

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**8 .**

3.11.

**6.2.4** _

The foam plastic insulation material shall be separated from the plenum by not less than 25.4 mm (1.0 in.) of masonry or concrete and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.12** – Corridor Air Systems.

**4.3.12.1** – Egress Corridors.

**4.3.12.1.1** * –

Egress corridors in health care, detention and correctional, and residential occupancies shall not be used as a portion of a supply, return, or exhaust air system serving adjoining areas unless otherwise permitted by 4.3.12.1.3.1 through 4.3.12.1.3.4 .

**4.3.12.1.2** –

Air movement between rooms and egress corridors in hospitals, nursing facilities, and ambulatory care facilities shall be permitted where the transfer of air is required for clinical purposes by other standards.

**4.3.12.1.3** –

An air transfer opening(s) shall not be permitted in walls or in doors separating egress corridors from adjoining areas.

**4.3.12.1.3.1** –

An air transfer opening(s) shall be permitted in walls or doors from toilet rooms, bathrooms, shower rooms, sink closets, and similar auxiliary spaces opening directly onto the egress corridor.

**4.3.12.1.3.2** –

Where door clearances do not exceed those specified for fire doors in NFPA 80 air transfer caused by pressure differentials shall be permitted.

**4.3.12.1.3.3** –

Use of egress corridors shall be permitted as part of an engineered smoke-control system.

**4.3.12.1.3.4** –

Air transfer opening(s) shall be permitted in walls or in doors separating egress corridors from adjoining areas in detention and correctional occupancies with corridor separations of open construction (e.g., grating doors or grating partitions).

**4.3.12.2** – Exits.

Exit passageways, stairs, ramps, and other exits shall not be used as a part of a supply, return, or exhaust air system serving other areas of the building.

**4.3.13** * – Smoke Control.

Where a smoke-control or exhaust system is required, it shall conform to the requirements of the building code of the authority having jurisdiction.

**4.4** – Materials.

**4.4.1** * – Noncombustible Material.

**4.4.1.1** –

A material that complies with any of the following shall be considered a noncombustible material:

(1) A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat

(2) A material that is reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

(3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C*

[ ***101*** : 4.6.13.1]

**4.4.1.2** –

Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible* . [ ***101*** : 4.6.13.2]

**4.4.2** – Limited-Combustible Material.

A material shall be considered a limited-combustible material where one of the following is met:

(1) The conditions of 4.4.2.1 and 4.4.2.2 , and the conditions of either 4.4.2.3 or 4.4.2.4 , shall be met.

(2) The conditions of 4.4.2.5 shall be met.

[ ***101*** : 4.6.14]

**4.4.2.1** –

The material shall not comply with the requirements for noncombustible material in accordance with 4.4.1 . [ ***101*** : 4.6.14.1]

**4.4.2.2** –

The material, in the form in which it is used, shall exhibit a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259. [ ***101*** : 4.6.14.2]

**4.4.2.3** –

The material shall have the structural base of a noncombustible material with a surfacing not exceeding a thickness of **1**⁄**8** in. (3.2 mm) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* . [ ***101*** : 4.6.14.3]

**4.4.2.4** –

The material shall be composed of materials that, in the form and thickness used, neither exhibit a flame spread index greater than 25 nor evidence of continued progressive combustion when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , and shall be of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723. [ ***101*** : 4.6.14.4]

~~**4.4.2.5** –~~

~~Materials shall be considered limited-combustible materials where tested in accordance with ASTM E2965, *Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter* , at an incident heat flux of 75 kW/m $^{2}$ for a 20-minute exposure and both of the following conditions are met:~~

~~(1) The peak heat release rate shall not exceed 150 kW/m $^{2}$ for longer than 10 seconds.~~

~~(2) The total heat released shall not exceed 8 MJ/m $^{2}$ .~~

~~[ ***101*** : 4.6.14.5]~~

~~**4.4.2.6** –~~

~~Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible* . [ ***101*** : 4.6.14.6]~~

## Additional Proposed Changes

| File Name | Description | Approved |
|---|---|---|
| New_draft_chapter_8_reorg_2021.docx | Chapter 8 after reorg - several changes dealing with electrical - shown in red | |

## Statement of Problem and Substantiation for Public Input

Reorg - new chapter 8. Changes are: deleting the incomplete requirements for limited combustible materials and deleting all the requirements for wiring and sending to the new chapter.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 8-NFPA 90A-2021 [New Section after 4.4] | |

## Submitter Information Verification

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# Public Input No. 9-NFPA 90A-2021 [ Chapter 4 ]

**Chapter 4** ~~HVAC Systems~~ General Requirements

**4.1** General Requirements for Equipment.

**4.1.1** Access.

Equipment shall be arranged to afford access for inspection, maintenance, and repair.

**4.1.2**

Equipment shall be selected and installed based on its application with respect to the manufacturer's installation instructions and listing, as applicable.

**4.1.3** Protection.

**4.1.3.1**

Equipment shall be guarded for personnel protection.

**4.1.3.2**

Equipment shall be guarded against the intake of foreign matter into the system.

**4.1.4**

Electrical wiring and equipment shall be installed in accordance with *NFPA 70*.

**4.1.5**

Air-handling equipment rooms shall meet the requirements of Section 5.1.

**4.2** System Components.

**4.2.1** Outside Air Intakes.

**4.2.1.1**

Outside air intakes shall be protected by screens of corrosion-resistant material not larger than 12.7 mm (0.5 in.) mesh.

**4.2.1.2***

Outside air intakes shall be located so as to minimize the introduction of fire or smoke into the building.

**4.2.1.2.1**

Outside air intakes shall be equipped with an approved fire and/or smoke damper where not located to meet the requirements of 4.2.1.2. *(See Section 6.3 for smoke damper operation to restrict the intake of smoke.)*

**4.2.2** Air Cleaners and Air Filters.

**4.2.2.1**

Electrostatic air cleaners shall be listed in accordance with UL 867, *Electrostatic Air Cleaners*.

**4.2.2.1.1**

Electrostatic air cleaners shall be installed in conformance with the conditions of the manufacturer's listing.

**4.2.2.2***

Air filters shall comply with UL 900, *Air Filter Units*.

**4.2.2.3**

Liquid adhesive coatings used on air filters shall have a minimum flash point of 163°C (325°F) as determined by ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester*.

**4.2.2.4**

Where air filters are flushed with liquid adhesives, the system shall be arranged so that the air cleaner cannot be flushed while the fan is in operation.

**4.2.2.5**

Combustible adhesive coatings shall be stored in accordance with NFPA 30.

**4.2.3** Fans.

**4.2.3.1** Installation.

**4.2.3.1.1**

Fans shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

**4.2.3.1.2**

Fans shall be approved for the specific installation.

**4.2.3.2** Access.

Fans shall be located, arranged, and installed to afford access for inspection and maintenance.

**4.2.3.3** Exposed Inlets.

Exposed fan inlets shall be protected with metal screens to prevent the entry of paper, trash, and foreign materials.

4. 2.4 ~~Air-Cooling and Heating Equipment.~~

**4.2.4.1** ~~– Installation.~~

**4.2.4.1.1** ~~–~~

~~Heating and cooling equipment shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.~~

**4.2.4.1.2** ~~–~~

~~The equipment shall be approved for the specific installation. (See 4.~~

3

~~.3.1.)~~

**4.2.4.2** ~~–~~ Materials ~~.~~

~~Materials used in~~

~~the manufacturing of fan coil units, self-contained air-conditioning units, furnaces, heat pumps, humidifiers, and all similar equipment shall meet the requirements of~~

**4.3.**

~~3.~~

**1**

~~and 4.3.3.2 unless otherwise specified in 4.2.4.2.1 or 4.2.4.2.2 .~~

**4.2.4.2.1** ~~–~~

~~The requirements of 4.3.3.1 and 4.3.3.2 shall not apply to equipment tested and listed in accordance with UL 1995, *Heating and Cooling Equipment* , or UL 60335-2-40, *Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers* .~~

**4.2.4.2.2** –

Unlisted solar energy air distribution system components shall be accompanied by supportive information demonstrating that the components have flame spread and smoke developed indexes that are not in excess of those of the air duct system permitted by this standard.

**4.2.4.3** – Mechanical Cooling.

**4.2.4.3.1** –

Mechanical refrigeration used with air duct systems shall be installed in accordance with recognized safety practices.

**4.2.4.3.2** –

Installations conforming to ASHRAE 15 (packaged with ASHRAE 34), *Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants* , shall be considered to be in compliance with the requirement in 4.2.4.3.1 .

**4.2.4.4** – Furnaces.

**4.2.4.4.1** –

Oil-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 31.

**4.2.4.4.2** –

Gas-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 54.

**4.2.4.5** – Duct Heaters.

**4.2.4.5.1** –

Where electrical resistance or fuel-burning heaters are installed in air ducts, the air duct coverings and their installation shall comply with the provisions of 4.3.5.3 .

**4.2.4.5.2** –

The installation of electrical duct heaters shall comply with the provisions of Part VI, "Duct Heaters," of Article 424 of *NFPA 70* .

**4.2.4.6** – Evaporative Coolers.

Combustible evaporation media shall not be used unless they meet the requirements of 4.2.2.2 .

**4.2.4.7** – Heat Recovery Equipment.

Equipment not covered by other provisions of this standard and used for heat transfer or air movement shall be constructed so that all material in the air path meets the requirements of Section 4.2 .

**4.3 *** Air Distribution.

**4.3.1** – Air Ducts.

**4.3.1.1** –

Air ducts shall be constructed of iron, steel, aluminum, copper, concrete, masonry, or clay tile, except as otherwise permitted in 4.3.1.2 or 4.3.1.3 .

**4.3.1.2** –

Class 0 or Class 1 rigid or flexible air ducts tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , and installed in conformance with the conditions of listing shall be permitted to be used for ducts where air temperature in the ducts does not exceed 121°C (250°F) or where used as vertical ducts serving not more than two adjacent stories in height.

**4.3.1.3** – Gypsum Board Air Ducts.

**4.3.1.3.1** –

Gypsum board having a flame spread index not exceeding 25 without evidence of continued progressive combustion and a smoke developed index not exceeding 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , shall be permitted to be used for negative pressure exhaust and return ducts where the temperature of the conveyed air does not exceed 52°C (125°F) in normal service.

**4.3.1.3.2** –

The air temperature limits of 4.3.1.3.1 shall not apply where gypsum board material is used for emergency smoke exhaust air ducts.

**4.3.1.4** –

All air duct materials shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the air duct.

**4.3.1.5** –

The materials, thickness, construction, and installation of ducts shall provide structural strength and durability.

**4.3.1.5.1** –

Air ducts shall be considered to be in compliance with 4.3.1.5 where constructed and installed in accordance with the *ASHRAE Handbook — HVAC Systems and Equipment* and with one of the following as applicable:

(1) NAIMA *Fibrous Glass Duct Construction Standards*

(2) SMACNA *Fibrous Glass Duct Construction Standards*

(3) SMACNA *HVAC Duct Construction Standards — Metal and Flexible*

(4) ANSI/SMACNA 016, *HVAC Air Duct Leakage Test Manual*

**4.3.1.6** –

Where no standard exists for the construction of air ducts, the ducts shall be constructed to withstand both the maximum positive and the maximum negative pressures of the system at fan shutoff.

**4.3.1.7** –

A duct enclosure used for the multiple distribution or gathering of ducts or connectors shall be constructed of materials and methods specified in 4.3.1 .

**4.3.1.7.1** –

Electrical wires and cables and optical fiber cables within a duct enclosure shall comply with 4.3.4 .

**4.3.1.8** – Air Dispersion Systems.

Air dispersion systems shall meet the following criteria:

(1) They shall only be installed in entirely exposed locations.

(2) They shall always operate under positive pressure.

(3) They shall not penetrate fire resistance–rated construction.

(4) They shall not pass through fire resistance–rated construction.

(5) They shall be listed and labeled in accordance with UL 2518, *Air Dispersion Systems.*

**4.3.2** – Air Connectors.

**4.3.2.1** –

Air connectors shall be permitted to be used as limited-use, flexible air ducts that shall not be required to conform to the provisions for air ducts where they meet the requirements of 4.3.2.1.1 through 4.3.2.1.7 .

**4.3.2.1.1** –

Air connectors shall conform to the requirements for Class 0 or Class 1 air connectors when tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* .

**4.3.2.1.2** –

Class 0 or Class 1 air connectors shall not be used for ducts containing air at temperatures in excess of 121°C (250°F).

**4.3.2.1.3** –

Air connector runs shall not exceed 4.27 m (14 ft) in length.

**4.3.2.1.4** –

Air connectors shall not pass through any wall, partition, or enclosure of a vertical shaft that is required to have a fire resistance rating of 1 hour or more.

**4.3.2.1.5** –

Air connectors shall not pass through floors.

**4.3.2.1.6** –

An air connector shall not be interrupted by a short collar or any other fitting on one side and then connected to another air connector on the other side where penetrating a floor or a wall, partition, or enclosure of a vertical shaft that is required to have a fire-resistance rating of 1 hour.

**4.3.2.1.7** –

Multiple air connector runs shall not be spliced together to exceed the length limitation in 4.3.2.1.3 .

**4.3.2.2** –

Vibration isolation connectors in duct systems shall be made of materials having a maximum flame spread index of 25 and a maximum smoke developed index of 50.

**4.3.2.3** –

Wiring shall not be installed in air connectors.

**4.3.3** – Supplementary Materials for Air Distribution Systems.

**4.3.3.1** * –

Pipe and duct insulation and coverings, duct linings, vapor retarder facings, adhesives, fasteners, tapes, and supplementary materials added to air ducts, plenums, panels, and duct silencers used in duct systems, unless otherwise provided for in 4.3.3.1.1 or 4.3.3.1.2 , shall have, in the form in which they are used, a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* . Pipe and duct insulation and coverings, duct linings and their adhesives, and tapes shall use the specimen preparation and mounting procedures of ASTM E2231, *Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics* .

**4.3.3.1.1** –

The flame spread index and smoke developed index requirements of 4.3.3.1 shall not apply to air duct weatherproof coverings where they are located entirely outside a building, do not penetrate a wall or roof, and do not create an exposure hazard.

**4.3.3.1.2** –

Smoke detectors required by 6.4.4 shall not be required to meet flame spread index or smoke developed index requirements.

**4.3.3.2** –

Closure systems for use with rigid and flexible air ducts tested in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , shall have been tested, listed, and used in accordance with the conditions of their listings, in accordance with one of the following:

(1) UL 181A, *Closure Systems for Use with Rigid Air Ducts*

(2) UL 181B, *Closure Systems for Use with Flexible Air Ducts and Air Connectors*

**4.3.3.3** –

Coverings and linings for air ducts, pipes, plenums, and panels, including all pipe and duct insulation materials, shall not flame, glow, smolder, or smoke when tested in accordance with ASTM C411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation* , at the temperature to which they are exposed in service. In no case shall the test temperature be below 121°C (250°F).

**4.3.3.4** –

Air duct coverings shall not extend through walls or floors that are required to be fire stopped or required to have a fire resistance rating, unless such coverings meet the requirements of NFPA 80.

**4.3.3.5** * –

Air duct linings shall be interrupted at fire dampers to prevent interference with the operation of devices.

**4.3.3.6** –

Air duct coverings shall not be installed so as to conceal or prevent the use of any service opening.

**4.3.3.7** * –

Wall or ceiling finish in plenums shall comply with 4.3.11.6 .

**4.3.4** – Materials for Operation and Control of the Air Distribution System.

**4.3.4.1** * –

Wiring shall not be installed in air ducts, except as permitted in 4.3.4.2 through 4.3.4.4 .

**4.3.4.2** –

Wiring shall be permitted to be installed in air ducts only if the wiring is directly associated with the air distribution system and does not exceed 1.22 m (4 ft).

**4.3.4.3** –

Wiring permitted by 4.3.4.2 shall be as short as practicable.

**4.3.4.4** * –

Electrical wires and cables and optical fiber cables shall consist of wires or cables listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering or metal sheathed cable without an overall nonmetallic covering.

**4.3.4.5** –

Nonmetallic pneumatic tubing for control systems shall be permitted to have up to 457.2 mm (18 in.) of tubing that meets the requirements of 4.3.11.2.6.2 to connect to equipment.

**4.3.5** – Air Duct Access and Inspection.

**4.3.5.1** –

A service opening shall be provided in air ducts adjacent to each fire damper, smoke damper, combination fire/smoke damper, and any smoke detectors that need access for installation, cleaning, maintenance, inspection, and testing.

**4.3.5.1.1** –

The opening shall be large enough to permit maintenance and resetting of the device.

**4.3.5.2** –

Service openings shall be identified with letters having a minimum height of 12.7 mm ( **1**⁄**2** in.) to indicate the location of the fire protection device(s) within.

**4.3.5.3** –

Horizontal air ducts and plenums shall be provided with service openings to facilitate the removal of accumulations of dust and combustible materials.

**4.3.5.3.1** –

Service openings shall be located at approximately 6.1 m (20 ft) intervals along the air duct and at the base of each vertical riser, unless otherwise permitted in 4.3.5.3.2 through 4.3.5.3.4 .

**4.3.5.3.2** –

Removable air outlet or air inlet devices of adequate size shall be permitted in lieu of service openings.

**4.3.5.3.3** –

Service openings shall not be required in supply ducts where the supply air has previously passed through an air filter, an air cleaner, or a water spray.

**4.3.5.3.4** –

Service openings shall not be required where all the following conditions exist:

(1) The occupancy has no process that produces combustible material such as dust, lint, or greasy vapors. Such occupancies include banks, office buildings, churches, hotels, and health care facilities (but not kitchens, laundries, and manufacturing portions of such facilities).

(2) The air inlets are at least 2.13 m (7 ft) above the floor or are protected by corrosion-resistant metal screens of at least 14 mesh [1.8 mm (0.07 in.)] that are installed at the inlets so that they cannot draw papers, refuse, or other combustible solids into the return air duct.

(3) The minimum design velocity in the return duct for the particular occupancy is 5.08 m/sec (1000 ft/min).

**4.3.5.4** –

Inspection windows shall be permitted in air ducts, provided they are glazed with wired or fire protection–rated glass.

**4.3.5.5** –

Openings in walls or ceilings shall be provided so that service openings in air ducts are accessible for maintenance and inspection needs.

**4.3.5.6** –

Where a service opening is necessary in an air duct located above the ceiling of a floor-ceiling or a roof-ceiling assembly that has been tested and assigned a fire resistance rating in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials* , or UL 263, *Fire Tests of Building Construction and Materials* , access shall be provided in the ceiling.

**4.3.5.7** –

The service opening shall be designed and installed so that it does not reduce the fire resistance rating of the assembly.

**4.3.6** – Air Duct Integrity.

**4.3.6.1** –

Air ducts shall be located where they are not subject to damage or rupture, or they shall be protected to maintain their integrity.

**4.3.6.2** –

Where an air duct is located outdoors, the air duct, together with its covering or lining, shall be protected from harmful elements.

**4.3.6.3** –

Where electrical, fossil fuel, or solar energy collection heat sources are installed in air ducts, the installation shall avoid the creation of a fire hazard.

**4.3.6.3.1** –

For air ducts rated as Class 1 in accordance with UL 181, *Factory-Made Air Ducts and Air Connectors* , air duct coverings and linings shall be interrupted at the immediate area of operation of such heat sources in 4.3.5.3 in order to meet the clearances specified as a condition of the equipment listing, unless otherwise permitted in 4.3.5.3.2 or 4.3.5.3.3 .

**4.3.6.3.2** –

Appliances listed for zero clearance from combustibles shall be permitted to be installed in accordance with the conditions of their listings.

**4.3.6.3.3** –

Insulation specifically suited for the maximum temperature that reasonably can be anticipated on the duct surface shall be permitted to be installed at the immediate area of operation of such appliances.

**4.3.7** – Air Outlets.

**4.3.7.1** – General.

Air supplied to any space shall not contain flammable vapors, flyings, or dust in quantities and concentrations that would introduce a hazardous condition.

**4.3.7.2** – Construction of Air Outlets.

Air outlets shall be constructed of noncombustible material or of a material that has a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials.*

**4.3.7.3** – Location of Air Outlets.

**4.3.7.3.1** –

Air outlets shall be located at least 76 mm (3 in.) above the floor, unless provisions have been made to prevent dirt and dust accumulations from entering the system.

**4.3.7.3.2** –

Where located less than 2.13 m (7 ft) above the floor, outlet openings shall be protected by a grille or screen having openings through which a 12.7 mm ( **1** / **2** in.) sphere cannot pass.

**4.3.8** – Air Inlets — Return or Exhaust or Return and Exhaust.

**4.3.8.1** – General.

Air shall not be recirculated from any space in which flammable vapors, flyings, or dust are present in quantities and concentrations that would introduce a hazardous condition into the return air system.

**4.3.8.2** – Construction of Air Inlets.

Air inlets shall be constructed of noncombustible material or a material that has a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials.*

**4.3.8.3** – Location of Air Inlets.

**4.3.8.3.1** –

Air inlets shall be located at least 76 mm (3 in.) above the floor, unless provisions have been made to prevent dirt and dust accumulations from entering the system.

**4.3.8.3.2** –

Where located less than 2.13 m (7 ft) above the floor, inlet openings shall be protected by a grille or screen having openings through which a 12.7 mm ( $^{1}/_{2}$ in.) sphere cannot pass.

**4.3.9** – Fire Dampers.

**4.3.9.1** –

Approved fire dampers shall be provided as required in Chapter 5 .

**4.3.9.2** –

Approved fire dampers shall be installed in conformance with the conditions of their listings.

**4.3.10** – Smoke Dampers.

**4.3.10.1** –

Approved smoke dampers shall be provided as required in Chapter 5 .

**4.3.10.1.1** –

Approved smoke dampers shall be installed in conformance with the conditions of their listings.

**4.3.10.2** –

Smoke dampers shall be installed in systems with a capacity greater than 7080 L/sec (15,000 $ft^3$ /min) to isolate the air-handling equipment, including filters, from the remainder of the system on both the building supply side and the return side, in order to restrict the circulation of smoke, unless specifically exempted by 4.3.10.2.1 or 4.3.10.2.2 .

**4.3.10.2.1** –

Air-handling units located on the floor they serve and serving only that floor shall be exempt from the requirements of 4.3.10.2 .

**4.3.10.2.2** –

Air-handling units located on the roof and serving only the floor immediately below the roof shall be exempt from the requirements of 4.3.10.2 .

**4.3.11** – Plenums.

**4.3.11.1** – Storage.

**4.3.11.1.1** –

Plenums shall not be used for occupancy or storage.

**4.3.11.1.2** –

Accessible abandoned material shall be deemed to be in storage and shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.2** – Ceiling Cavity Plenum.

The space between the top of the finished ceiling and the underside of the floor or roof above shall be permitted to be used to supply air to the occupied area or to return or exhaust air from the occupied area, provided that the conditions in 4.3.11.2.1 through 4.3.11.2.7 are met.

**4.3.11.2.1** –

The integrity of the fire and smoke stopping for penetrations shall be maintained.

**4.3.11.2.2** –

Light diffusers, other than those made of metal or glass, used in air-handling luminaires shall be listed in accordance with UL 1598, *Luminaires* , and marked "Light Diffusers for Air-Handling Luminaires."

**4.3.11.2.3** –

The temperature of air delivered to these plenums shall not exceed 121°C (250°F).

**4.3.11.2.4** –

Materials used in the construction of a ceiling plenum shall be noncombustible or shall be limited combustible having a maximum smoke developed index of 50, except as permitted in 4.3.11.2.4.1 through 4.3.11.2.4.3 , and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.2.4.1** –

Materials used in the construction of a plenum space between the ceiling and roof (or floor) of other than the fire-resistive assemblies covered in 5.3.3 shall be permitted as specified in 4.3.11.2.4.2 and 4.3.11.2.4.3 .

**4.3.11.2.4.2** –

The ceiling material shall have a flame spread index of not more than 25 and a smoke developed index not greater than 50. All surfaces, including those that would be exposed by cutting through the material in any way, shall meet these requirements.

**4.3.11.2.4.3** –

The ceiling materials shall be supported by noncombustible material.

**4.3.11.2.5** –

Where the plenum is a part of a floor-ceiling or roof-ceiling assembly that has been tested or investigated and assigned a fire resistance rating of 1 hour or more, the assembly shall meet the requirements of 5.3.3 .

**4.3.11.2.6** –

Materials within a ceiling cavity plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* , or

(3) Comply with 4.3.11.2.6.1 through 4.3.11.2.6.11 , as applicable.

**4.3.11.2.6.1** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering, metal sheathed cable without an overall nonmetallic covering, or totally enclosed nonventilated metallic busway without an overall nonmetallic covering.

**4.3.11.2.6.2** –

Pneumatic tubing for control systems shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics* .

**4.3.11.2.6.3** –

Nonmetallic fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics* .

**4.3.11.2.6.4** –

Communications raceways shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, *Cable Routing Assemblies and Communications Raceways* .

**4.3.11.2.6.5** * –

Loudspeakers, recessed lighting fixtures, and other electrical equipment with combustible enclosures, including their assemblies and accessories, nonmetallic cable ties, wraps, nonmetallic cable supports, and other discrete products, shall be permitted in the ceiling cavity plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.*

**4.3.11.2.6.6** –

Plastic piping and tubing used in plumbing systems shall be permitted to be used within a ceiling cavity plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless permitted by 4.3.11.2.6.7 .

**4.3.11.2.6.7** –

Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics* , and installed in accordance with its listing, shall be permitted to be used within a ceiling cavity plenum.

**4.3.11.2.6.8** –

Supplementary materials for air distribution systems shall be permitted provided they comply with the provisions of 4.3.3 .

**4.3.11.2.6.9** –

Smoke detectors shall not be required to meet the provisions of Section 4.3 .

**4.3.11.2.6.10** –

Air ducts complying with 4.3.1.2 and air connectors complying with 4.3.2 shall be permitted.

**4.3.11.2.6.11** –

Materials that, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb), when tested in accordance with NFPA 259 and include either of the following:

(1) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( 1 ⁄ 8 in.) that has a flame spread index not greater than 50.

(2) Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .

**4.3.11.2.7** –

The accessible portion of abandoned materials exposed to airflow shall be removed.

**4.3.11.3** – Apparatus Casing Plenum.

**4.3.11.3.1** –

A fabricated plenum and apparatus casing shall be permitted to be used for supply, return, or exhaust air service.

**4.3.11.3.2** –

Fabricated plenum and apparatus casing shall be constructed of materials and by methods specified in 4.3.1 and in accordance with the following:

(1) The casing and plenum construction standards in SMACNA *HVAC Duct Construction Standards — Metal and Flexible*

(2) *ASHRAE Handbook — HVAC Systems and Equipment*

(3) Subsection 4.3.3 for all air duct coverings, duct lining, acoustical liner/cells, and miscellaneous materials

**4.3.11.3.3** –

Electrical wires and cables and optical fiber cables shall comply with 4.3.4 .

**4.3.11.4** – Air-Handling Unit Room Plenum.

**4.3.11.4.1** * –

Individual rooms containing an air-handling unit(s) shall gather air from various sources and combine the air within the room before returning it to the air-handling unit.

**4.3.11.4.2** –

Duct covering, duct lining, acoustical liner/cells, and miscellaneous materials shall comply with 4.3.3 .

**4.3.11.4.3** –

Air-handling unit room plenums shall not be used for storage or occupancy other than during equipment servicing.

**4.3.11.4.4** –

Accessible abandoned material shall be deemed to be in storage and shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.4.5** –

Materials used in the construction of an air-handling unit room plenum shall be noncombustible or shall be limited combustible having a maximum smoke developed index of 50 and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.4.6** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways, metal sheathed cable, or totally enclosed nonventilated busway.

**4.3.11.5** – Raised Floor Plenum.

**4.3.11.5.1** –

The space between the top of the finished floor and the underside of a raised floor shall be permitted to be used to supply air to the occupied area or return or exhaust air from or return and exhaust air from the occupied area, provided that the conditions in 4.3.11.5.2 through 4.3.11.5.6 are met.

**4.3.11.5.2** –

The integrity of the firestopping for penetrations shall be maintained.

**4.3.11.5.3** –

The temperature of air delivered to these plenums shall not exceed 121°C (250°F).

**4.3.11.5.4** –

Materials used in the construction of a raised floor plenum shall be noncombustible or limited-combustible materials, shall have a maximum peak smoke developed index of 50, and shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

**4.3.11.5.5** –

Materials within a raised floor plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Materials* , or

(3) Comply with 4.3.11.5.5.1 through 4.3.11.5.5.12 , as applicable.

**4.3.11.5.5.1** * –

Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways, metal sheathed cable, or totally enclosed nonventilated busway.

**4.3.11.5.5.2** –

Pneumatic tubing for control systems shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1820, *Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics* .

**4.3.11.5.5.3** –

Nonmetallic fire sprinkler piping shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 1887, *Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics* .

**4.3.11.5.5.4** –

Communications raceways shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, *Cable Routing Assemblies and Communications Raceways* . Cables installed within these raceways shall be listed as plenum cable in accordance with the requirements in 4.3.11.5.5.1 .

**4.3.11.5.5.5** –

Raised floors, intermachine cables, electrical wires, listed plenum communications raceways, and optical-fiber cables in computer/data processing rooms where these rooms are designed and installed in accordance with NFPA 75 shall be permitted.

**4.3.11.5.5.6** –

Loudspeakers, recessed lighting fixtures, and other electrical equipment with combustible enclosures, including their assemblies and accessories, nonmetallic cable ties, wraps, nonmetallic cable supports, and other discrete products, shall be permitted in the raised floor plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.*

**4.3.11.5.5.7** –

Plastic piping and tubing used in plumbing systems shall be permitted to be used within a raised floor plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless otherwise permitted by 4.3.11.5.5.8 .

**4.3.11.5.5.8** –

Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics* , and installed in accordance with its listing, shall be permitted to be used within a raised floor plenum.

**4.3.11.5.5.9** –

Air ducts complying with 4.3.1.2 and air connectors complying with 4.3.2 shall be permitted.

**4.3.11.5.5.10** –

Materials, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb) when tested in accordance with NFPA 259 and include either of the following:

(1) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( 1/8 in.) that has a flame spread index not greater than 50.

(2) Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .

**4.3.11.5.5.11** –

Smoke detectors shall not be required to meet the requirements of 4.3.11.5.1 .

**4.3.11.5.5.12** –

Supplementary materials for air distribution systems shall be permitted provided they comply with 4.3.3 .

**4.3.11.5.6** –

The accessible portion of abandoned materials exposed to airflow shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

**4.3.11.6** – Wall or Ceiling Finish in Plenums.

**4.3.11.6.1** –

Wall or ceiling finish in plenums, except as indicated in 4.3.11.6.2 , shall be noncombustible or shall exhibit a flame spread index of 25 or less and a smoke developed index of 50 or less, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2** –

Foam plastic insulation shall not be used as wall or ceiling finish in plenums unless the insulation meets any one of the criteria shown in 4.3.11.6.2.1 through 4.3.11.6.2.4 .

**4.3.11.6.2.1** –

The foam plastic insulation material shall exhibit a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use, and shall comply with the following criteria, when tested in accordance with NFPA 286 (where the testing shall be performed on the finished foam plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use):

(1) Flame does not spread to the ceiling during the 40 kW exposure.

(2) Flame does not spread to the outer extremities of the sample.

(3) Flashover, based on the criteria from NFPA 286, does not occur.

(4) The peak heat release rate does not exceed 800 kW.

(5) The total smoke release does not exceed 1000 $m^2$ (1196 $yd^2$ ).

**4.3.11.6.2.2** –

The foam plastic insulation material shall be covered by corrosion-resistant steel having a base metal thickness of not less than 0.4 mm (0.0160 in.) and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2.3** –

The foam plastic insulation material shall be separated from the plenum by an approved thermal barrier consisting of 12.7 mm (0.5 in.) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the temperature transmission fire test and the integrity fire test of NFPA 275 and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.11.6.2.4** –

The foam plastic insulation material shall be separated from the plenum by not less than 25.4 mm (1.0 in.) of masonry or concrete and shall exhibit a flame spread index of 75 or less and a smoke developed index of 450 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* , at the maximum thickness intended for use.

**4.3.12** – Corridor Air Systems.

**4.3.12.1** – Egress Corridors.

**4.3.12.1.1** * –

Egress corridors in health care, detention and correctional, and residential occupancies shall not be used as a portion of a supply, return, or exhaust air system serving adjoining areas unless otherwise permitted by 4.3.12.1.3.1 through 4.3.12.1.3.4 .

**4.3.12.1.2** –

Air movement between rooms and egress corridors in hospitals, nursing facilities, and ambulatory care facilities shall be permitted where the transfer of air is required for clinical purposes by other standards.

**4.3.12.1.3** –

An air transfer opening(s) shall not be permitted in walls or in doors separating egress corridors from adjoining areas.

**4.3.12.1.3.1** –

An air transfer opening(s) shall be permitted in walls or doors from toilet rooms, bathrooms, shower rooms, sink closets, and similar auxiliary spaces opening directly onto the egress corridor.

**4.3.12.1.3.2** –

Where door clearances do not exceed those specified for fire doors in NFPA 80 air transfer caused by pressure differentials shall be permitted.

**4.3.12.1.3.3** –

Use of egress corridors shall be permitted as part of an engineered smoke-control system.

**4.3.12.1.3.4** –

Air transfer opening(s) shall be permitted in walls or in doors separating egress corridors from adjoining areas in detention and correctional occupancies with corridor separations of open construction (e.g., grating doors or grating partitions).

~~**4.3.12.2** – Exits.~~

~~Exit passageways, stairs, ramps, and other exits shall not be used as a part of a supply, return, or exhaust air system serving other areas of the building.~~

~~**4.3.13** * – Smoke Control.~~

~~Where a smoke-control or exhaust system is required, it shall conform to the requirements of the building code of the authority having jurisdiction.~~

~~**4.4** – Materials.~~

~~**4.4.1** * – Noncombustible Material.~~

~~4.4~~ Noncombustible Material.

**4.3 .1.1**

A material that complies with any of the following shall be considered a noncombustible material:

(1) A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat

(2) A material that is reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

(3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C*

[***101*:**4.6.13.1]

**4.4 3 .1.2**

Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible*. [***101*:**4.6.13.2]

**4.4 3 .2** Limited-Combustible Material.

A material shall be considered a limited-combustible material where one of the following is met:

(1) The conditions of 4.4.2.1 and 4.4.2.2, and the conditions of either 4.4.2.3 or 4.4.2.4, shall be met.

(2) The conditions of 4.4.2.5 shall be met.

[***101*:**4.6.14]

**4.4 3 .2.1**

The material shall not comply with the requirements for noncombustible material in accordance with 4.4.1. [***101*:**4.6.14.1]

**4.4 3 .2.2**

The material, in the form in which it is used, shall exhibit a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259. [***101*:**4.6.14.2]

**4.4 3 .2.3**

The material shall have the structural base of a noncombustible material with a surfacing not exceeding a thickness of ⅛ in. (3.2 mm) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Test for Surface Burning Characteristics of Building Materials*. [***101*:**4.6.14.3]

**4.4 3 .2.4**

The material shall be composed of materials that, in the form and thickness used, neither exhibit a flame spread index greater than 25 nor evidence of continued progressive combustion when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Test for Surface Burning Characteristics of Building Materials*, and shall be of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723. [***101*:**4.6.14.4]

**4.4 3 .2.5**

Materials shall be considered limited-combustible materials where tested in accordance with ASTM E2965, *Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter*, at an incident heat flux of 75 kW/$m^2$ for a 20-minute exposure and both of the following conditions are met:

(1) The peak heat release rate shall not exceed 150 kW/$m^2$ for longer than 10 seconds.

(2) The total heat released shall not exceed 8 MJ/$m^2$.

[***101*:**4.6.14.5]

**4.4 3 .2.6**

Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible*. [***101*:**4.6.14.6]

## Additional Proposed Changes

| File Name | Description | Approved |
|---|---|---|
| New_draft_chapter_4_reorg_2021.docx | Chapter 4 after reorg - no changes from existing text. | |

## Statement of Problem and Substantiation for Public Input

This PI takes the first chapter of the proposed reorganization discussed at the preliminary meeting and makes it into a new chapter 4. No changes are being recommended.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 8-NFPA 90A-2021 [New Section after 4.4] | |

## Submitter Information Verification

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**Submittal Date:** Thu May 20 18:37:19 EDT 2021
**Committee:** AIC-AAA

## Public Input No. 1-NFPA 90A-2020 [ Section No. 4.2.2.2 ]

**4.2.2.2***

Air filters shall comply with UL 900, *Air Filter Units* - *or UL 586,* Standard for Safety for High-Efficiency, Particulate, Air Filter Units

### Statement of Problem and Substantiation for Public Input

HVAC systems also use HEPA filters. HEPA filters are covered by UL 586 while lower efficiency filters are covered by UL 900.

### Submitter Information Verification

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**Submittal Date:** Mon Nov 30 14:59:07 EST 2020
**Committee:** AIC-AAA

## Public Input No. 26-NFPA 90A-2021 [ New Section after 4.2.2.5 ]

**4.2.2.6** High-efficiency particulate air filters shall be listed in accordance with UL 586, *High-Efficiency, Particulate, Air Filter Units* .

**4.2.2.6.1** High-efficiency particulate air filters shall be installed in conformance with the conditions of the manufacturer's listing.

## Statement of Problem and Substantiation for Public Input

: High-efficiency particulate air-filter units are a throw-away type air filter intended for removal of very fine particulate matter (i.e., designed to remove not less than 99.97% of 0.3 micron diameter particles) from the air of industrial and laboratory exhaust and ventilating systems. These units consist of a filter medium of glass fiber or other equivalent inorganic material and a frame of metal or other inorganic material or of wood. Wood, if used, is evaluated for a flame-spread index of 25 or less, as determined by ANSI/UL 723, "Test for Surface Burning Characteristics of Building Materials." UL currently has 11 manufacturers that high efficiency particulate air filter units listed to UL 586.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 25-NFPA 90A-2021 [Section No. 2.3.6] | |

## Submitter Information Verification

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**Submittal Date:** Mon May 31 13:09:01 EDT 2021
**Committee:** AIC-AAA

## Public Input No. 27-NFPA 90A-2021 [ New Section after 4.2.4.6 ]

**4.2.2.6** Ultraviolet (UV-C) germicidal lamp systems used within ducts or plenums shall be listed in accordance with UL 60335-2-40, *Household And Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers* .

**4.2.2.6.1** Ultraviolet (UV-C) germicidal lamp systems shall be installed in conformance with the conditions of the manufacturer's listing.

## Statement of Problem and Substantiation for Public Input

The use of ultraviolet (UV) light solutions for sanitization and germicidal purposes have increased due to pandemic concerns. This proposed code change provides requirements for UV light air sterilization or purification systems that can be applied to a building's mechanical system to minimize transmission of diseases and viruses from airborne particles during a pandemic. UV exposure poses serious safety risks to skin and eyes. Annex 101.DVJ of UL 60335-2-40 was specifically developed to provide to address the evaluation of these devices located within a duct or plenum in order to provide minimum safety requirements intended to minimize risks. The installation and operating instructions are considered an integral system component. UL currently has 5 manufacturers that have germicidal lamp systems listed to UL 60335-2-40.

We have proposed two new section 4.2.2.6 section s in two PIs. Renumbering will be needed if they are both accepted.

## Submitter Information Verification

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**Committee:** AIC-AAA

## Public Input No. 3-NFPA 90A-2021 [ Section No. 4.3.1.3.1 ]

**4.3.1.3.1**

Gypsum board having a flame spread index not exceeding 25 without evidence of continued progressive combustion and a smoke developed index not exceeding 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Test for Surface Burning Characteristics of Building Materials*, shall be permitted to be used for negative pressure exhaust and return ducts where ~~the temperature~~ the temperature of the conveyed air does not exceed a continuous 52°C (125°F) in normal service.

## Statement of Problem and Substantiation for Public Input

Gypsum boards can be exposed to intermittent temperatures at or above 125F, not continual. This just clarifies this in the code.

## Submitter Information Verification

**Submitter Full Name:** Michael Schmeida
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**Submittal Date:** Thu Mar 25 12:05:53 EDT 2021
**Committee:** AIC-AAA

## Public Input No. 2-NFPA 90A-2020 [ Section No. 4.3.4 ]

**4.3.4** Materials for Operation and Control of the Air Distribution System.

**4.3.4.1***

Wiring shall not be installed in air ducts, except as permitted in 4.3.4.2 through 4.3.4.4 5 .

**4.3.4.2**

Wiring shall be permitted to be installed in air ducts only if the wiring is directly associated with the air distribution system and does not exceed 1.22 m (4 ft).

**4.3.4.3**

Wiring permitted by 4.3.4.2 shall be as short as practicable.

**4.3.4.4***

Electrical wires and cables and optical fiber cables shall consist of wires or cables listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering or metal sheathed cable without an overall nonmetallic covering.

**4.3.4.**

~~5~~

**5** Wiring shall not be installed through any openings protected by a fire damper, smoke damper, or combination fire-smoke damper.

**4.3.4.6**

Nonmetallic pneumatic tubing for control systems shall be permitted to have up to 457.2 mm (18 in.) of tubing that meets the requirements of 4.3.11.2.6.2 to connect to equipment.

## Statement of Problem and Substantiation for Public Input

Installing wiring through an opening protected by a fire damper, smoke damper, or combination fire-smoke damper could impact the proper operation of the damper.

Public Input 24 proposes a new Section 6.2 to address. The Technical Committee may accept either or both.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 24-NFPA 90A-2021 [New Section after 6.1] | |

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| **Committee:** | AIC-AAA |

## Public Input No. 15-NFPA 90A-2021 [ Section No. 4.3.11.2.6 [Excluding any Sub-Sections] ]

Materials within a ceiling cavity plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Be limited combustible in accordance with 4.4.2, or

(3) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or with UL 723, *Test for Surface Burning Characteristics of Building Materials*, or

(4) Comply with 4.3.11.2.6.1 through 4.3.11.2.6.~~11~~ 10 , as applicable.

## Statement of Problem and Substantiation for Public Input

The requirements in 4.4.2 for limited combustible materials have been updated but the requirements in 4.3.11.2.6.11 have not. Section 4.3.11.2.6.11 corresponds to the requirements for limited combustible material before the update. It is unnecessary to repeat the same information twice instead of sending to the section that contains the information, which will prevent the discontinuity.

This PI (and an associated one will be submitted to delete section 4.3.11.2.6.11) makes it clear that materials in ceiling cavity plenums are allowed to be noncombustible, limited combustible or 25/50. The same applies to raised floor plenums and 2 PIs will be submitted for those sections as well.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 16-NFPA 90A-2021 [Section No. 4.3.11.2.6.11] | |
| Public Input No. 17-NFPA 90A-2021 [Section No. 4.3.11.5.5 [Excluding any Sub-Sections]] | |
| Public Input No. 18-NFPA 90A-2021 [Section No. 4.3.11.5.5.10] | |
| Public Input No. 16-NFPA 90A-2021 [Section No. 4.3.11.2.6.11] | |
| Public Input No. 17-NFPA 90A-2021 [Section No. 4.3.11.5.5 [Excluding any Sub-Sections]] | |
| Public Input No. 18-NFPA 90A-2021 [Section No. 4.3.11.5.5.10] | |

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**Committee:** AIC-AAA

## Public Input No. 16-NFPA 90A-2021 [ Section No. 4.3.11.2.6.11 ]

~~**4.3.11.2.6.11** –~~

~~Materials that, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb), when tested in accordance with NFPA 259 and include either of the following:~~

(1) ~~Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( 1/8 in.) that has a flame spread index not greater than 50.~~

(2) ~~Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .~~

## Statement of Problem and Substantiation for Public Input

This section contains old requirements for limited combustible materials captured in section 4.4.2. The requirements in 4.4.2 for limited combustible materials have been updated but the requirements in 4.3.11.2.6.11 have not. Section 4.3.11.2.6.11 corresponds to the requirements for limited combustible material before the update. It is unnecessary to repeat the same information twice instead of sending to the section that contains the information, which will prevent the discontinuity.

This PI (and an associated one submitted to revise the charging paragraph) makes it clear that materials in ceiling cavity plenums are allowed to be noncombustible, limited combustible or 25/50. The same applies to raised floor plenums and 2 PIs will be submitted for those sections as well.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 15-NFPA 90A-2021 [Section No. 4.3.11.2.6 [Excluding any Sub-Sections]] | |
| Public Input No. 17-NFPA 90A-2021 [Section No. 4.3.11.5.5 [Excluding any Sub-Sections]] | |
| Public Input No. 18-NFPA 90A-2021 [Section No. 4.3.11.5.5.10] | |
| Public Input No. 15-NFPA 90A-2021 [Section No. 4.3.11.2.6 [Excluding any Sub-Sections]] | |
| Public Input No. 17-NFPA 90A-2021 [Section No. 4.3.11.5.5 [Excluding any Sub-Sections]] | |
| Public Input No. 18-NFPA 90A-2021 [Section No. 4.3.11.5.5.10] | |

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| **Submittal Date:** | Fri May 21 12:46:21 EDT 2021 |
| **Committee:** | AIC-AAA |

## Public Input No. 17-NFPA 90A-2021 [ Section No. 4.3.11.5.5 [Excluding any Sub-Sections] ]

Materials within a raised floor plenum exposed to the airflow shall:

(1) Be noncombustible, or

(2) Be limited combustible, in accordance with 4.4.2, or

(3) Exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or with UL 723, *Test for Surface Burning Characteristics of Building Materials*, or

(4) Comply with 4.3.11.5.5.1 through 4.3.11.5.5.~~12~~ 11 , as applicable.

## Statement of Problem and Substantiation for Public Input

The requirements in 4.4.2 for limited combustible materials have been updated but the requirements in 4.3.11.5.5.10 have not. Section 4.3.11.5.5.10 corresponds to the requirements for limited combustible material before the update. It is unnecessary to repeat the same information twice instead of sending to the section that contains the information, which will prevent the discontinuity.

This PI (and an associated one submitted to delete section 4.3.11.5.5.10) makes it clear that materials in ceiling cavity plenums are allowed to be noncombustible, limited combustible or 25/50. The same applies to ceiling cavity plenums and 2 PIs were submitted for those sections as well.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 15-NFPA 90A-2021 [Section No. 4.3.11.2.6 [Excluding any Sub-Sections]] | |
| Public Input No. 16-NFPA 90A-2021 [Section No. 4.3.11.2.6.11] | |
| Public Input No. 18-NFPA 90A-2021 [Section No. 4.3.11.5.5.10] | |
| Public Input No. 15-NFPA 90A-2021 [Section No. 4.3.11.2.6 [Excluding any Sub-Sections]] | |
| Public Input No. 16-NFPA 90A-2021 [Section No. 4.3.11.2.6.11] | |
| Public Input No. 18-NFPA 90A-2021 [Section No. 4.3.11.5.5.10] | |

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## Public Input No. 18-NFPA 90A-2021 [ Section No. 4.3.11.5.5.10 ]

~~**4.3.11.5.5.10** –~~

~~Materials, in the form in which they are used, shall have a potential heat value not exceeding 8141 kJ/kg (3500 Btu/lb) when tested in accordance with NFPA 259 and include either of the following:~~

(1) ~~Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 3.2 mm ( 1 ⁄ 8 in.) that has a flame spread index not greater than 50.~~

(2) ~~Materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or UL 723, *Test for Surface Burning Characteristics of Building Materials* .~~

## Statement of Problem and Substantiation for Public Input

The requirements in 4.4.2 for limited combustible materials have been updated but the requirements in this section have not. This section corresponds to the requirements for limited combustible material before the update. It is unnecessary to repeat the same information twice instead of sending to the section that contains the information, which will prevent the discontinuity.

This PI (and an associated one submitted to revise the charging paragraph) makes it clear that materials in ceiling cavity plenums are allowed to be noncombustible, limited combustible or 25/50. The same applies to ceiling cavity plenums and 2 PIs were submitted for those sections as well.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 15-NFPA 90A-2021 [Section No. 4.3.11.2.6 [Excluding any Sub-Sections]] | |
| Public Input No. 16-NFPA 90A-2021 [Section No. 4.3.11.2.6.11] | |
| Public Input No. 17-NFPA 90A-2021 [Section No. 4.3.11.5.5 [Excluding any Sub-Sections]] | |
| Public Input No. 15-NFPA 90A-2021 [Section No. 4.3.11.2.6 [Excluding any Sub-Sections]] | |
| Public Input No. 16-NFPA 90A-2021 [Section No. 4.3.11.2.6.11] | |
| Public Input No. 17-NFPA 90A-2021 [Section No. 4.3.11.5.5 [Excluding any Sub-Sections]] | |

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## Public Input No. 8-NFPA 90A-2021 [ New Section after 4.4 ]

**Chapter 5 - Electrical and Optical Fiber Wiring and Equipment in Plenums and Ducts**

5.1 General.

The provisions of this section shall apply to the installation and uses of electrical wiring and equipment in ducts used for dust, loose stock, or vapor removal; ducts specifically fabricated for environmental air; and other spaces used for environmental air (plenums).

5.2 Ducts for Dust, Loose Stock, or Vapor Removal.

5.2.1 No wiring system of any type shall be installed in ducts used to transport dust, loose stock, or flammable vapors.

5.2.2 No wiring system of any type shall be installed in any duct, or shaft containing only such ducts, used for vapor removal or for ventilation of commercial-type cooking equipment.

5.3 Ducts Specifically Fabricated for Environmental Air.

5.3.1 Applicability. This section shall apply to electrical and optical fiber wires and cables and equipment in air ducts (section 4.3.4) and in apparatus casing plenums (4.3.11.3).

5.3.2 Equipment, devices, and the wiring methods specified in this section shall be permitted within such ducts only if necessary for the direct action upon, or sensing of, the contained air.

5.3.3 Where equipment or devices are installed and illumination is necessary to facilitate maintenance and repair, enclosed gasketed-type luminaires shall be permitted.

5.3.4 The only wiring methods permitted in ducts specifically fabricated for environmental air shall be the following:

(1) Type MI cable without an overall nonmetallic covering,

(2) Type MC cable employing a smooth or corrugated impervious metal sheath without an overall nonmetallic covering,

(3) Wiring in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, or rigid metal conduit without an overall nonmetallic covering,

(4) Wiring methods and cabling systems, approved for use in other spaces used for environmental air (plenums) in accordance with 5.5, shall be permitted to be installed in ducts specifically fabricated for environmental air-handling purposes if: (a) the wiring methods or cabling systems are necessary to connect to equipment or devices associated with the direct action upon or sensing of the contained air, and (b) the total length of such wiring methods or cabling systems shall not exceed 1.2 m (4 ft).

5.4 Other Spaces Used for Environmental Air (Plenums).

5.4.1 Applicability.

5.4.1.1 This section shall apply to spaces not specifically fabricated for environmental air-handling purposes but used for air-handling purposes as a plenum.

5.4.1.2 This section shall apply to electrical and optical fiber wires and cables and equipment in ceiling cavity plenums, raised floor plenums and apparatus casing plenums.

5.4.1.3 This section shall not apply to habitable rooms or areas of buildings, the prime purpose of which is not air handling.

5.4.1.4 This section shall not apply to the joist or stud spaces of dwelling units where the wiring passes

through such spaces perpendicular to the long dimension of such spaces.

5.4.2 Wiring methods. The wiring methods for other spaces used for environmental air (plenums) shall be limited to those shown below:

(1) Totally enclosed, nonventilated, insulated busway having no provisions for plug-in connections,

(2) Type MI cable without an overall nonmetallic covering,

(3) Type MC cable without an overall nonmetallic covering,

(4) Listed prefabricated cable assemblies of metallic manufactured wiring systems without a nonmetallic sheath,

(5) Wires and cables installed in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit without an overall nonmetallic covering, flexible metal conduit, or, where accessible, surface metal raceway or metal wireway with metal covers, or

(6) Type AC cable, or other electrical or optical fiber cable approved for use within an air-handling space in accordance with 5.5.

5.4.3 Cable supports.

5.4.3.1 Any of the wiring methods in 5.4.2 shall be permitted to be supported by being fully enclosed in metal cable tray systems or in solid side and bottom metal cable tray systems with solid metal covers.

5.4.3.2 Wires and cables approved for use within an air-handling space in accordance with 5.5 shall additionally be permitted to be supported by any one of the following:

(1) Communications raceways approved , for use within an air-handling space, in accordance with 5.6.

(2) Cable routing assemblies , approved for use within an air-handling space, in accordance with 5.6.

(3) Open metal cable tray systems.

5.4.4 Cable accessories. Nonmetallic cable ties and other nonmetallic cable accessories shall be permitted to be used to secure and support cables , in other spaces used for environmental air (plenums) if listed as having low smoke and heat release properties in accordance with 5.7 .

5.4.5 Equipment. Electrical equipment with a metal enclosure, or electrical equipment with a nonmetallic enclosure (other than integral fan systems specifically identified for use within an air-handling space) shall be permitted for use in other spaces used for environmental air (plenums) if listed in accordance with 5.7.

5.5 Electrical or optical fiber wire and cable systems approved for use in other spaces used for environmental air (plenums) shall be noncombustible, limited combustible (in accordance with 4.4.2) or shall be listed as complying with either one of the following:

(1) Electrical wires and cables and optical fiber cables shall be listed as e xhibiting a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or with UL 723, *Test for Surface Burning Characteristics of Building Material* , or

(2) Electrical wires and cables and optical fiber cables shall be listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) when tested in accordance with NFPA 262, Standard Method of Test for

Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

5.6 Listing of communications raceways or cable routing assemblies. Communications raceways or cable routing assemblies shall be approved for use in other spaces used for environmental air (plenums) when listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, Cable Routing Assemblies and Communications Raceways.

5.7 Listing of plenum equipment. Nonmetallic cable ties and accessories and electrical equipment with a nonmetallic enclosure shall be approved for use in other spaces used for environmental air (plenums) when listed to UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces* as exhibiting a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less.

## Statement of Problem and Substantiation for Public Input

The intent of this PI is to create a brand new stand-alone chapter for electrical and optical fiber wires and cables (and the associated products) instead of it being contained in more than one place.

One of the key uses of NFPA 90A is the NEC. NFPA Standards Council determined, way back in 1980, that NFPA 90A has jurisdiction over ducts and plenums. However, the sections on ducts and plenums in NFPA 90A contain information about all materials in the ducts and plenums and also contain terminology that is different from that in the NEC (NFPA 90A talks about plenums and the NEC about "Other spaces used for environmental air"; NFPA 90A does not distinguish between "Ducts for Dust, Loose Stock, or Vapor Removal" and "Ducts Specifically Fabricated for Environmental Air" as the NEC does).
In fact, NFPA 90A does not distinguish between the different types of ducts in terms of what the requirements are and that is important.

In the NEC (and in practical application) no wiring is allowed in "Ducts for Dust, Loose Stock, or Vapor Removal" and NFPA 90A needs to be clarified on that. The NEC states in 300.22 (A) as follows:
"300.22(A) Ducts for Dust, Loose Stock, or Vapor Removal. No wiring systems of any type shall be installed in ducts used to transport dust, loose stock, or flammable vapors. No wiring system of any type shall be installed in any duct, or shaft containing only such ducts, used for vapor removal or for ventilation of commercial-type cooking equipment."

In the NEC the requirements for "Ducts Specifically Fabricated for Environmental Air" are probably similar to those in NFPA 90A for "air ducts" (section 4.3.4). The NEC states:
"300.22(B) Ducts Specifically Fabricated for Environmental Air. Equipment, devices, and the wiring methods specified in this section shall be permitted within such ducts only if necessary for the direct action upon, or sensing of, the contained air. Where equipment or devices are installed and illumination is necessary to facilitate maintenance and repair, enclosed gasketed-type luminaires shall be permitted. Only wiring methods consisting of Type MI cable without an overall nonmetallic covering, Type MC cable employing a smooth or corrugated impervious metal sheath without an overall nonmetallic covering, electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, or rigid metal conduit without an overall nonmetallic covering shall be installed in ducts specifically fabricated to transport environmental air. Flexible metal conduit shall be permitted, in lengths not to exceed 1.2 m (4 ft), to connect physically adjustable equipment and devices permitted to be in these fabricated ducts. The connectors used with flexible metal conduit shall effectively close any openings in the connection." Then it has an exception: "Wiring methods and cabling systems, listed for use in other spaces used for environmental air (plenums), shall be permitted to be installed in ducts specifically fabricated for environmental air-handling purposes under the following conditions: (1) The wiring methods or cabling systems shall be permitted only if necessary to connect to equipment or devices associated with the direct action upon or sensing of the contained air, and (2) The total length of such wiring methods or cabling systems shall not exceed 1.2 m (4 ft)."
NFPA 90A has the same exception in the section on air ducts, as it states:
"4.3.4.1 * Wiring shall not be installed in air ducts, except as permitted in 4.3.4.2 through 4.3.4.4.

4.3.4.2 Wiring shall be permitted to be installed in air ducts only if the wiring is directly associated with the air distribution system and does not exceed 1.22 m (4 ft).
4.3.4.3 Wiring permitted by 4.3.4.2 shall be as short as practicable.
4.3.4.4 * Electrical wires and cables and optical fiber cables shall consist of wires or cables listed as having a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262 or shall be installed in metal raceways without an overall nonmetallic covering or metal sheathed cable without an overall nonmetallic covering."
Clearly, NFPA 90A also allows (just like the NEC does) any wiring that is completely enclosed in metal, and that is being clarified in this proposed chapter.

NFPA 90A contains four types of plenums: ceiling cavity plenums, raised floor plenums, apparatus casing plenums and air handling unit room plenums, as well as the air ducts. With regard to wires and cables, the requirements in ceiling cavity plenums are identical to those in raised floor plenums (sections 4.3.11.2.6.1 and 4.3.11.5.5.1. They are actually also the same for air handling unit room plenums (4.3.11.4.6). On the other hand those for apparatus casing plenums are the same as those for air ducts (section 4.3.11.3.3 sends you to section 4.3.4).

This means that there are basically three sets of requirements: (1) no exposed wires and cables in the ducts on which NFPA 90A is silent and which correspond to NEC 300.22(A), (2) only up to 4 feet of exposed plenum cables (NFPA 262-based requirements) in apparatus casing plenums and in air ducts (which correspond to NEC 300.22 (B) and (3) exposed plenum cables (NFPA 262-based requirements) in the other plenums (which correspond to NEC 300.22 (C).

The NEC information on wires and cables (and associated equipment can be found in section 300.22 and in any one of the articles dealing with plenum wiring, namely articles 725, 760, 770 and 800).

The present NFPA 90A describes the requirements for "limited combustible" materials in section 4.4.2 but does not use the same requirements for materials in either ceiling cavity plenums (4.3.11.2.6.1) or raised floor plenums (4.3.11.5.5.10).
NFPA 90A describes two other types of plenums beyond ceiling cavity plenums and raised floor plenums: apparatus casing plenums (section 4.3.11.3, which are probably equivalent to "Ducts Specifically Fabricated for Environmental Air" in the NEC), and air handling room plenums (section 4.3.11.4), which seem similar to ceiling cavity plenums and raised floor plenums with regard to wires and cables but do not seem to be allowed to contain other combustibles (or are silent on them).

NFPA 90A allows anything (which includes wires and cables) to be noncombustible, limited combustible or to comply with ASTM E84/UL 723 with a 25/50. That is being retained here in one section, instead of being repeated.The present NFPA 90A describes the requirements for "limited combustible" materials in section 4.4.2 but does not use the same requirements for materials in either ceiling cavity plenums (4.3.11.2.6.1) or raised floor plenums (4.3.11.5.5.10), which use an outdated set of information on limited combustible. That is being revised to create consistency, and everything is in new section 5.5.

Communications raceways are described in NFPA 90A in 4.3.11.2.6.4 and in 4.3.11.5.5.4, with the same requirements as in the NEC. Cable routing assemblies, which are parallel to raceways are not described in NFPA 90A but they are used in plenums and are needed to support wires and cables. They must comply with the same requirements and are both contained in the new section 5.6.

Electrical equipment with combustible enclosures is described in NFPA 90A in 4.3.11.2.6.5 and in 4.3.11.5.5.6. Cable ties and other associated needed products are not described but the NEC clarifies that they need to meet the same UL 2043 test. This is all now in new section 5.7.

If the approach recommended in this PI is accepted, all the information regarding electrical wires and cables would be removed from the existing chapter 4 and would just reference this chapter.

If the reorganization of chapters 4 and 5 is accepted, this chapter should follow the chapter on plenums and come before the chapter on dampers. That means that, after the reorganization, that would make this new chapter a chapter 9.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 9-NFPA 90A-2021 [Chapter 4] | |
| Public Input No. 10-NFPA 90A-2021 [Chapter 4] | |
| Public Input No. 11-NFPA 90A-2021 [Chapter 4] | |
| Public Input No. 12-NFPA 90A-2021 [Chapter 4] | |
| Public Input No. 13-NFPA 90A-2021 [Chapter 4] | |
| Public Input No. 14-NFPA 90A-2021 [Chapter 5] | |

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**Committee:** AIC-AAA

# Public Input No. 14-NFPA 90A-2021 [ Chapter 5 ]

**Chapter 5** – ~~Integration of a Ventilation and Air-Conditioning System(s) with Building Construction~~

~~**5.1** – Air-Handling Equipment Rooms.~~

~~**5** **9** _ Fire dampers~~

## 9.1 _ Fire Dampers.

### 9 .1.1 _

~~General.~~

~~Air-handling equipment rooms shall be classified into the following three categories:~~

(1) ~~Those used as air plenums (usually return air)~~

(2) ~~Those with air ducts that open directly into a shaft~~

(3) ~~Other air-handling unit rooms~~

~~5~~

Approved fire dampers shall be provided as required in this Chapter.

### 9 .1.2 _

~~Air-Handling Equipment Rooms Used as Plenum Space.~~

~~Air-handling equipment rooms used as plenums for supply or return air shall comply with 4.3.11.4 .~~

~~**5.1.3** – Air-Handling Equipment Rooms That Have Air Ducts That Open Directly into a Shaft.~~

~~**5.1.3.1** –~~

~~Air-handling equipment rooms, including the protection of openings, shall be separated from shafts by construction having a fire resistance rating not less than that required for the shaft by~~

Approved fire dampers shall be installed in conformance with the conditions of their listings.

### 9.1.3 _

Fire dampers shall be installed at each direct or ducted opening into and out of enclosures required by 5.3.4.1 , unless otherwise permitted by 5.3.4 .

~~5~~

6 .1 or 5 .3.

~~2 –~~

~~Fire-resistant separation shall not be required for air-handling equipment rooms that are enclosed by construction having a fire resistance rating not less than that required for the shaft.~~

~~5.1.~~

4

~~– Other Spaces Housing Air-Handling Units.~~

~~Other spaces housing air-handling units shall meet the requirements of the building code of the authority having jurisdiction.~~

**~~5.2~~** ~~– Building Construction.~~

**~~5.2.1~~** ~~– Air Duct Clearance.~~

**~~5.2.1.1~~** ~~–~~

~~The clearance from metal air ducts used for heating to assemblies constructed of combustible materials, including plaster on wood lath, shall be not less than 12.7 mm ( 1⁄2 in.), or the combustible material shall be protected with minimum 6.35 mm ( 1⁄4 in.) thick approved insulating material.~~

**~~5.2.1.2~~** ~~–~~

~~The integrity of the firestopping and smokestopping shall be maintained.~~

**~~5.2.1.3~~** ~~–~~

~~The clearances provided in 5.2.1.1 shall not apply to systems used solely for ventilation, air cooling, or air conditioning without heating.~~

**~~5.2.2~~** ~~– Structural Members.~~

~~The installation of air ducts, including the hangers, shall not reduce the fire resistance rating of structural members.~~

**~~5.2.3~~** ~~– Ceiling Assemblies.~~

~~Where the installation of the hangers for the components of an air duct system penetrates an existing ceiling of a fire-resistive floor-ceiling or roof-ceiling assembly and necessitates removal of a portion of that ceiling, the replacement material shall be identical to that which was removed or shall be approved as equivalent to that which was removed.~~

**~~5.2.4~~** ~~–~~

~~As an alternative to repairing the existing ceiling, a new ceiling shall be permitted to be installed below the air duct system, provided the fire resistance rating of the floor-ceiling or roof-ceiling design is not reduced.~~

**~~5.3~~** ~~*~~ ~~– Penetrations — Protection of Openings.~~

**~~5.3.1~~** ~~–~~

.6.2 . ***(check section numbers)***

**9.1.3.1** _

A fire damper shall not be required where an air duct system serving only one story is used only for exhaust of air to the outside and is contained within its own dedicated shaft.

**9.1.3.2** _

A fire damper shall not be required where the following conditions exist:

(1) Branch ducts connect to enclosed exhaust risers meeting the requirements of 5.3.4.1 or 5.3.4.4 .

(2) The airflow moves upward.

(3) Steel subducts at least 560 mm (22 in.) in length are carried up inside the riser from each inlet.

(4) The riser is appropriately sized to accommodate the flow restriction created by the subduct.

**9.2 _ Fire-Rated Walls and Partitions.**

~~5~~

**9.**

~~3~~

**2.1**

~~.1~~

***** _

Approved fire dampers shall be provided where air ducts penetrate or terminate at openings in walls or partitions required to have a fire resistance rating of 2 hours or more.

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**9.**

~~3~~

**2.1.1**

~~.1~~

***** _

Fire dampers shall not be required where other openings through the wall are not required to be protected.

~~5~~

**9.**

~~3~~

**2.**

~~1.~~

**2** _

Approved fire dampers shall be provided in all air transfer openings in partitions that are required to have a fire resistance rating and in which other openings are required to be protected.

~~5~~

**9.3**

~~.2~~

_ **Floors Required to Have a Fire Resistance Rating.**

~~5~~

**9.3.**

~~2.~~

**1** _

~~5.3.3~~

Where air ducts extend through only one floor and serve only two adjacent stories, the air ducts shall be enclosed *(see 5.3.4.1 )* , or fire dampers shall be installed at each point where the floor is penetrated.

~~***(check section number)***~~

~~**9.4 * – Floor-Ceiling or Roof-Ceiling Assemblies Having a Fire Resistance Rating.**~~

~~5~~

~~**9.**~~

~~3~~

**4.**

3.

**1** –

Where air ducts and openings for air ducts are used in a floor-ceiling or roof-ceiling assembly that is required to have a fire resistance rating, all the materials and the construction of the assembly, including the air duct materials and the size and protection of the openings, shall conform with the design of the fire-resistive assembly, as tested in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials* , or UL 263, *Fire Tests of Building Construction and Materials* .

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**9.**

3

**4.**

3.

**2** –

Where dampers are required, they shall be located in accordance with 5.4.4 . ***(check section number)***

**9.5**

.3.4 Shafts

**– Smoke Dampers .**

**9.5.**

3.4.

**1** –

Air ducts that pass through the floors of buildings that require the protection of vertical openings shall be enclosed with partitions or walls constructed of materials as permitted by the building code of the authority having jurisdiction, as indicated in 5.3.4.2 or 5.3.4.3 , unless otherwise permitted by 5.3.4.3.1 .

**5.3.4.2** –

The shaft enclosure shall have a minimum fire resistance rating (based on possible fire exposure from either side of the partition or wall) of 1 hour where such air ducts are located in a building less than four stories in height.

**5.3.4.3** –

The shaft enclosure shall have a minimum fire resistance rating (based on possible fire exposure from either side of the partition or wall) of 2 hours where such air ducts are located in a building four stories or more in height.

**5.3.4.3.1** –

Where an air duct penetrates only one floor or one floor and an air-handling equipment penthouse floor, and the air duct contains a fire damper located where the duct penetrates the floor, an air duct enclosure shall not be required.

**5.3.4.4** –

A fire-resistive enclosure used as an air duct shall conform with 4.3.1 and with 5.3.4.2 through 5.3.4.3.1 .

**5.3.4.4.1** –

Gypsum board systems shall be constructed in accordance with GA-600, *Fire Resistance Design Manual* .

**5.3.4.5** –

Shafts that constitute air ducts or that enclose air ducts used for the movement of environmental air shall not enclose the following:

(1) Exhaust ducts used for the removal of smoke- and grease-laden vapors from cooking equipment

(2) Ducts used for the removal of flammable vapors

(3) Ducts used for moving, conveying, or transporting stock, vapor, or dust

(4) Ducts used for the removal of nonflammable corrosive fumes and vapors

(5) Refuse and linen chutes

(6) Piping, except for noncombustible piping conveying water or other nonhazardous or nontoxic materials

(7) Combustible storage

**5.3.4.6** –

Fire dampers shall be installed at each direct or ducted opening into and out of enclosures required by 5.3.4.1 , unless otherwise permitted by 5.3.4.6.1 or 5.3.4.6.2 .

**5.3.4.6.1** –

A fire damper shall not be required where an air duct system serving only one story is used only for exhaust of air to the outside and is contained within its own dedicated shaft.

**5.3.4.6.2** –

A fire damper shall not be required where the following conditions exist:

(1) Branch ducts connect to enclosed exhaust risers meeting the requirements of 5.3.4.1 or 5.3.4.4 .

(2) The airflow moves upward.

(3) Steel subducts at least 560 mm (22 in.) in length are carried up inside the riser from each inlet.

(4) The riser is appropriately sized to accommodate the flow restriction created by the subduct.

**5.3.5** – Smoke Barriers.

**5.3.5.1** –

Smoke dampers shall be installed at or adjacent to the point where air ducts pass through required smoke barriers, but in no case shall a smoke damper be installed more than 0.6 m (2 ft) from the barrier or after the first air duct inlet or outlet, whichever is closer to the smoke barrier, unless otherwise permitted by 5.3.5.1.1 through 5.3.5.1.5 .

**5.3.5.1.1** –

Smoke dampers shall not be required on air systems other than where necessary for the proper functioning of that system where the system is designed specifically to accomplish the following:

(1) Function as an engineered smoke-control system, including the provision of continuous air movement with the air-handling system

(2) Provide air to other areas of the building during a fire emergency

(3) Provide pressure differentials during a fire emergency

**5.3.5.1.2** –

Smoke dampers shall not be required to be located within a prescribed distance of a smoke barrier where isolation smoke dampers complying with 4.3.9.2 are used in air-handling equipment.

**5.3.5.1.3** –

Smoke dampers shall not be required where the air inlet or outlet openings in ducts are limited to a single smoke compartment.

**5.3.5.1.4** –

Smoke dampers shall not be required in ducts where the air continues to move and the air-handling system installed is arranged to prevent recirculation of exhaust or return air under fire emergency conditions.

**5.3.5.1.5** * –

Smoke dampers shall not be required in occupancies where exempted by NFPA *101* or *NFPA 5000* .

**5.3.5.2** –

Where penetration of a smoke barrier is required to be provided with a fire damper, a combination fire and smoke damper equipped and arranged to be both smoke responsive and heat responsive shall be permitted.

~~5.4~~ –

Approved smoke dampers shall be provided as required in this Chapter .

**9.5.1.1** _

Approved smoke dampers shall be installed in conformance with the conditions of their listings.

**9.5.1.2** _

Smoke dampers shall be installed in systems with a capacity greater than 7080 L/sec (15,000 $ft^3$/min) to isolate the air-handling equipment, including filters, from the remainder of the system on both the building supply side and the return side, in order to restrict the circulation of smoke, unless specifically exempted by 4.3.10.2.1 or 4.3.10.2.2. ***(check section number)***

**9.5.2.1** _

Air-handling units located on the floor they serve and serving only that floor shall be exempt from the requirements of 4.3.10.2. ***(check section number)***

**9.5.2.2** _

Air-handling units located on the roof and serving only the floor immediately below the roof shall be exempt from the requirements of 4.3.10.2. ***(check section number)***

**9.6 Fire Dampers, Smoke Dampers, and Ceiling Dampers.**

**~~5~~ 9 .4 6 .1** Fire Dampers.

**~~5~~ 9 .4 6 .1.1**

Fire dampers used for the protection of openings in walls, partitions, or floors with fire resistance ratings of less than 3 hours shall have a 1½-hour fire protection rating in accordance with UL 555, *Fire Dampers*.

**~~5~~ 9 .4 6 .2**

Fire dampers used for the protection of openings in walls, partitions, or floors having a fire resistance rating of 3 hours or more shall have a 3-hour fire protection rating in accordance with UL 555, *Fire Dampers*.

**~~5~~ 9 .4 6 .3*** Smoke Dampers.

Smoke dampers used for the protection of openings in smoke barriers or in engineered smoke-control systems shall be classified in accordance with UL 555S, *Smoke Dampers*.

**~~5~~ 9 .4 6 .3.1**

Smoke damper leakage ratings shall meet, as a minimum, Class II, and elevated temperature ratings shall be not less than 121°C (250°F).

**~~5~~ 9 .4 6 .4** Ceiling Dampers.

**~~5~~ 9 .4 6 .4.1***

Ceiling dampers or other methods of protecting openings in rated floor-ceiling or roof-ceiling assemblies shall comply with the construction details of the tested floor-ceiling or roof-ceiling assembly or with listed ceiling air diffusers or listed ceiling dampers.

**~~5~~ 9 .4 6 .4.2**

Ceiling dampers shall be tested in accordance with UL 555C, *Ceiling Dampers*.

**~~5~~ 9 .4 6 .5** Damper Closure.

**~~5~~ 9 .4 6 .5.1**

All fire dampers and ceiling dampers shall close automatically.

**~~5~~ 9 .4 ~~6~~ .5.1.1**

All fire dampers and ceiling dampers shall remain closed upon the operation of a listed fusible link or other approved heat-actuated device located where it will be readily affected by an abnormal rise of temperature.

**~~5~~ 9 .4 ~~6~~ .5.2** Fusible Links.

**~~5~~ 9 .4 ~~6~~ .5.2.1**

Fusible links shall have a temperature rating approximately 28°C (50°F) above the maximum temperature that normally is encountered when the system is in operation or shut down.

**~~5~~ 9 .4 ~~6~~ .5.2.2**

Fusible links shall have a temperature rating not less than 71°C (160°F).

**~~5~~ 9 .4 ~~6~~ .5.2.2.1***

Where combination fire and smoke dampers are located within air ducts that are part of an engineered smoke-control system, fusible links or other approved heat-responsive devices shall have a temperature rating approximately 28°C (50°F) above the maximum smoke-control system designed operating temperature.

**~~5~~ 9 .4 ~~6~~ .5.2.2.2**

The combination fire and smoke dampers shall not exceed the UL 555S, *Smoke Dampers*, degradation test temperature rating of the combination fire and smoke damper.

**~~5~~ 9 .4 ~~6~~ .5.2.2.3**

The combination fire and smoke dampers shall not exceed a maximum temperature rating of 177°C (350°F).

**~~5~~ 9 .4 ~~6~~ .5.3**

A provision for remote opening of combination fire and smoke dampers, where necessary for smoke removal, shall be permitted.

**~~5~~ 9 .4 ~~6~~ .5.3.1**

Combination fire and smoke dampers permitted in 5.4.5.3 shall have provisions that allow them to reclose automatically upon reaching the damper's maximum degradation test temperature in accordance with UL 555S, *Smoke Dampers*.

**~~5~~ 9 .4 ~~6~~ .5.4***

Dampers shall close against the maximum calculated airflow of that portion of the air duct system in which they are installed.

**~~5~~ 9 .4 ~~6~~ .5.4.1**

Fire dampers shall be tested for closure in accordance with UL 555, *Fire Dampers*.

**~~5~~ 9 .4 ~~6~~ .5.4.2**

Smoke dampers shall be tested for closure in accordance with UL 555S, *Smoke Dampers*.

**~~5~~ 9 .4 ~~6~~ .5.4.3**

Fire dampers, smoke dampers, and combination fire/smoke dampers shall not be required in ducts used for kitchen or clothes dryer exhaust systems.

**~~5~~ 9 .4 ~~6~~ .6** Damper Location Information.

**~~5~~ 9 .4 ~~6~~ .6.1**

The locations and mounting arrangement of all fire dampers, smoke dampers, ceiling dampers, and fire protection means of a similar nature required by this standard shall be shown on the drawings of the air duct systems.

**~~5~~ 9 .4 6 .6.2**

Dampers required to close in airflow shall have the calculated airflow at their location shown on the drawings of the air duct system.

**~~5~~ 9 .4 6 .7** Installation.

**~~5~~ 9 .4 6 .7.1***

Fire dampers, including their sleeves; smoke dampers; and ceiling dampers shall be installed in accordance with the conditions of their listings and the manufacturer's installation instructions and the requirements of NFPA 80.

**~~5~~ 9 .4 6 .7.2**

Smoke dampers shall be installed in accordance with the conditions of their listings, the manufacturer's installation instructions, and the requirements of NFPA 105.

**~~5~~ 9 .4 6 .8** Maintenance.

**~~5~~ 9 .4 6 .8.1**

Fire dampers and ceiling dampers shall be maintained in accordance with NFPA 80.

**~~5~~ 9 .4 6 .8.2**

Smoke dampers shall be maintained in accordance with NFPA 105.

**9.7 Smoke Barriers.**

**9.7.1**

Smoke dampers shall be installed at or adjacent to the point where air ducts pass through required smoke barriers, but in no case shall a smoke damper be installed more than 0.6 m (2 ft) from the barrier or after the first air duct inlet or outlet, whichever is closer to the smoke barrier, unless otherwise permitted by 5.3.5.1.1 through 5.3.5.1.5. ***(check section number)***

**9.7.1.1**

Smoke dampers shall not be required on air systems other than where necessary for the proper functioning of that system where the system is designed specifically to accomplish the following:

(1) Function as an engineered smoke-control system, including the provision of continuous air movement with the air-handling system

(2) Provide air to other areas of the building during a fire emergency

(3) Provide pressure differentials during a fire emergency

**9.7.1.2**

Smoke dampers shall not be required to be located within a prescribed distance of a smoke barrier where isolation smoke dampers complying with 4.3.9.2 are used in air-handling equipment. ***(check section number)***

**9.7.1.3**

Smoke dampers shall not be required where the air inlet or outlet openings in ducts are limited to a single smoke compartment.

**9.7.1.4**

Smoke dampers shall not be required in ducts where the air continues to move and the air-handling system installed is arranged to prevent recirculation of exhaust or return air under fire emergency conditions.

**9.7.1.5 ***

Smoke dampers shall not be required in occupancies where exempted by NFPA *101* or *NFPA 5000* .

**9.7.2**

Where penetration of a smoke barrier is required to be provided with a fire damper, a combination fire and smoke damper equipped and arranged to be both smoke responsive and heat responsive shall be permitted.

## Additional Proposed Changes

| File Name | Description | Approved |
|---|---|---|
| New_draft_chapter_9_reorg_2021.docx | Chapter 9 after reorg - no changes from existing text | |

## Statement of Problem and Substantiation for Public Input

Last of the 5 reorg chapters - no changes

## Related Public Inputs for This Document

| Related Input | Relationship |
| --- | --- |
| Public Input No. 8-NFPA 90A-2021 [New Section after 4.4] | |

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**Committee:** AIC-AAA

## Public Input No. 20-NFPA 90A-2021 [ Section No. 5.3.4.6.2 ]

**5.3.4.6.2**

A fire damper shall not be required where the following conditions exist:

(1) Branch ducts connect to enclosed exhaust risers meeting the requirements of 5.3.4.1 or 5.3.4.4.

(2) ~~The airflow moves upward~~ A fan with back-up power to supply continuous exhaust airflow .

(3) Steel subducts at least 560 mm (22 in.) in length are carried up inside the riser from each inlet.

(4) The riser is appropriately sized to accommodate the flow restriction created by the subduct.

## Statement of Problem and Substantiation for Public Input

Removing the fire damper requirement without making sure there is a fan supplying continuous exhaust could allow for an unprotected opening in a shaft where the upward flow of air can be recirculated through the building. This may allow for unintended fire spread upward through a shaft.

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**Committee:** AIC-AAA

## Public Input No. 21-NFPA 90A-2021 [ New Section after 5.4.4 ]

**5.4.5 Combination Fire-Smoke Dampers.**

**5.4.5.1** Combination fire-smoke dampers used for the protection of openings in walls, partitions, or floors with fire-resistance ratings of less than 3 hours shall have a 11/2-hour fire protection rating in accordance with UL 555, *Fire Dampers* .

**5.4.5.2** Combination fire-smoke dampers use for the protection of openings in walls, partitions, or floors with fire-resistance ratings of 3 hours or more shall ahve a 3-hour fire protection rating in accordance with UL 555, *Fire Dampers* .

**5.4.5.3** Combination fire-smoke dampers used for the protection of openings in smoke barriers or in engineered smoke control systems shall be classifed in accordance with UL 555S, Smoke *Dampers* .

**5.4.5.4** Combination fire-smoke damper leakage ratings shall meet, as a minimum, Class II, and elevated temperature ratings shall be not less than 121 ºC (250 ºF).

Also, add "Combination Fire-Smoke Damper" to the title of Section 5.4.

## Statement of Problem and Substantiation for Public Input

The language is copied from Section 5.4.1 - 5.4.3.1, which apply to fire dampers and smoke dampers. The proposed language adds clarity by providing a section specific to combination fire-smoke dampers.

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## Public Input No. 22-NFPA 90A-2021 [ New Section after 5.4.4 ]

**5.4.6 Corridor Dampers.**

**5.4.6.1** Corridor dampers shall copmly with the requirements of both UL 555 and UL 555S.

**5.4.6.2** Corridor dampers shall demonstrate acceptable closure performance when subjected to 0.76 m/s (150 ft/min) velocity across the face of the damper using the UL 555 fire exposure test.

**5.4.6.3** Corridor dampers shall have a 1-hour fire protection rating. Corridor damper leakage ratings shall meet, as a minimum, Class II, and elevator temperature ratings shall be not less than 121 ºC (250 ºF).

## Statement of Problem and Substantiation for Public Input

The proposed language is being added to Section 5.4 to address corridor dampers. The language is similar to what is commonly found in mechanical codes, such as the International Mechanical Code.

## Submitter Information Verification

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**Committee:** AIC-AAA

## Public Input No. 23-NFPA 90A-2021 [ Section No. 5.4.5.2 ]

**5.4.5.2** Fusible Links and Heat-Responsive Devices .

**5.4.5.2.1**

Fusible links ~~shall~~ or other approved heat-responsive devices shall have a temperature rating approximately 28°C (50°F) above the maximum temperature that normally is encountered when the system is in operation or shut down.

**5.4.5.2.2**

Fusible links or other approved heat-responsive devices shall have a temperature rating not less than 71°C (160°F).

**5.4.5.2.2.1***

Where combination fire and smoke dampers are located within air ducts that are part of an engineered smoke-control system, fusible links or other approved heat-responsive devices shall have a temperature rating approximately 28°C (50°F) above the maximum smoke-control system designed operating temperature.

**5.4.5.2.2.2**

The combination fire and smoke dampers shall not exceed the UL 555S, *Smoke Dampers*, degradation test temperature rating of the combination fire and smoke damper.

**5.4.5.2.2.3**

The combination fire and smoke dampers shall not exceed a maximum temperature rating of 177°C (350°F).

## Statement of Problem and Substantiation for Public Input

The proposed language provides an alternative to fusible links for applications that use such heat-responsive devices. A related Public Input adds a definition for heat-responsive devices.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 35-NFPA 90A-2021 [New Section after 3.3.20] | |

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## Public Input No. 24-NFPA 90A-2021 [ New Section after 6.1 ]

**6.2 Mechanical, Electrical, and Plumbing Controls.**

**6.2.1** Mechanical, electrical, and plumbing controls shall nto be installed in air duct systems, unless the controls are directly associated with the air distribution system and the controls comply with 4.3.4.2 through 4.3.4.4.

**6.2.2** Mechanical, electrical, and plumbing controls shall not be intsllled through fire dampers, smoek dampters, combination fire-smoke dampers, corridor dampers, or ceiling radiation dampers unless otherwise permitted by the manufacturer's installation instructions and the manufacturer's listing.

## Statement of Problem and Substantiation for Public Input

The proposed language is intended to prevent controls from being run through damper openings, which could impact the operation of the damper.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 2-NFPA 90A-2020 [Section No. 4.3.4] | |

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**Committee:** AIC-AAA

## Public Input No. 7-NFPA 90A-2021 [ Section No. 6.4.2.1 ]

**6.4.2.1**

Smoke detectors listed for use in air distribution systems shall be located as follows:

(1) Downstream of the air filters and ahead of any branch connections in air supply systems ~~having a capacity greater than 944 L/sec (2000 ft $^3$ /min)~~ .

(2) At each story prior to the connection to a common return and prior to any recirculation or fresh air inlet connection in air return systems ~~having a capacity greater than 7080 L/sec (15,000 ft $^3$ /min) and serving more than one story~~ .

(3) Smoke detector shall be in direct communication with furnace fan to disengage power upon alarm activation.

## Additional Proposed Changes

| File Name | Description | Approved |
|---|---|---|
| .1618866961582 | | |

## Statement of Problem and Substantiation for Public Input

What is needed is a HVAC monitoring system that is positioned to fill the void in residential building fire protection being the failure to shut off the central ventilation system blower (HVAC) in the case of a fire. In the event of a residential house fire when the HVAC unit is activated, the furnace fan during air conditioning ramps up to compensate for the heat from fire which further feeds the fire with oxygen and spreads toxic gases and smoke throughout the house. Residential buildings/occupants need the same protection as in commercial building codes and standards. A simple inexpensive new technology exists that can solve this oversight. Any fan blowing during a fire is life threatening.

## Submitter Information Verification

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## Public Input No. 36-NFPA 90A-2021 [ Section No. 7.2 ]

**7.2*** Fire Dampers, Smoke Dampers, Combination Fire-Smoke Dampers, Corridor Dampers, and Ceiling Radiation Dampers.

All fire dampers, smoke dampers, ~~and ceiling~~ combination fire-smoke dampers, corridor dampers, and ceiling radiation dampers shall be operated prior to the occupancy of a building to determine that they function in accordance with the requirements of this standard.

**7.2.1** Access.

Dampers equipped with fusible links, internal operators, or both shall be provided with an access door that is not less than ~~12 in. (305 mm) square~~ 305 mm (12 in.) square or provided with a removable duct section.

**7.2.2**

Access shall not be obstructed.

**7.2.3** Testing.

**7.2.3.1**

All fire dampers, smoke dampers, combination fire-smoke dampers, corridor dampers, and ceiling ~~dampers~~ radiation dampers shall be tested to determine their proper functioning in accordance with the requirements of this standard prior to the occupancy of the building.

**7.2.3.2**

The operational test shall verify that there is full and unobstructed access to the ~~fire~~ damper and all listed components. [**80:**19.3.1.5] [ **80** : **19.3.2.4** ] [ **105** : 7.4.1.4]

## Statement of Problem and Substantiation for Public Input

Combination fire-smoke dampers and corridor dampers are being added to the section to make it more comprehensive. Whereas the standard placed metric units first, the change to 7.2.1 should be editorial. Paragraph 7.2.3.2 has been editorial revised to address various types of dampers and the appropriate paragraphs from NFPA 80 and NFPA 105 have been cited as the source of the generic requirement.

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## Public Input No. 31-NFPA 90A-2021 [ Section No. A.3.3.3 ]

**A.3.3.3** Air Connector.

Some such devices are listed in UL ~~*Heating, Cooling, Ventilating and Cooking Equipment Directory*~~ - Online Search Tool Product iQ; www.UL.com/ PiQ under the category "Connectors (ALNR)." Because these devices do not meet all the requirements for air ducts, they have limitations on their use, length, and location. *(For limitations on the use of air connectors, see 4.3.2.1.)*

## Statement of Problem and Substantiation for Public Input

The Building Materials Directory is no longer published and products are now incorporated into UL's Product IQ online database.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 28-NFPA 90A-2021 [Section No. A.3.3.17] | |
| Public Input No. 29-NFPA 90A-2021 [Section No. A.3.3.19] | |
| Public Input No. 30-NFPA 90A-2021 [Section No. A.3.3.28] | |
| Public Input No. 32-NFPA 90A-2021 [Section No. A.3.3.14.3] | |
| Public Input No. 33-NFPA 90A-2021 [Section No. A.3.3.14.4] | |
| Public Input No. 34-NFPA 90A-2021 [Section No. C.1.2.6] | |

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## Public Input No. 32-NFPA 90A-2021 [ Section No. A.3.3.14.3 ]

**A.3.3.14.3** Fire Damper.

Some such devices are listed in UL ~~*Heating, Cooling, Ventilating and Cooking Equipment Directory*~~ - Online Search Tool Product iQ; www.UL.com/PiQ under the category of "Fire Dampers for Fire Barrier and Smoke Applications (EMME)." Fire dampers are classified for use in either static systems or for dynamic systems, where the dampers are rated for closure under airflow.

## Statement of Problem and Substantiation for Public Input

The Heating, Cooling, Ventilating and Cooking Equipment Directory is no longer published and products are now incorporated into UL's Product IQ online database.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 28-NFPA 90A-2021 [Section No. A.3.3.17] | |
| Public Input No. 29-NFPA 90A-2021 [Section No. A.3.3.19] | |
| Public Input No. 30-NFPA 90A-2021 [Section No. A.3.3.28] | |
| Public Input No. 31-NFPA 90A-2021 [Section No. A.3.3.3] | |
| Public Input No. 33-NFPA 90A-2021 [Section No. A.3.3.14.4] | |
| Public Input No. 34-NFPA 90A-2021 [Section No. C.1.2.6] | |

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## Public Input No. 33-NFPA 90A-2021 [ Section No. A.3.3.14.4 ]

**A.3.3.14.4** Smoke Damper.

Smoke dampers are subjected to various pressure differentials, are exposed to elevated temperatures, and can be required to open or close against mechanically induced airflow. Some such devices are listed in UL ~~*Heating, Cooling, Ventilating and Cooking Equipment Directory*~~ Online Search Tool Product iQ; www.UL.com/PiQ , under the category "Dampers for Fire Barrier and Smoke Applications (EMME)."

## Statement of Problem and Substantiation for Public Input

The Heating, Cooling, Ventilating and Cooking Equipment Directory is no longer published and products are now incorporated into UL's Product IQ online database.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 28-NFPA 90A-2021 [Section No. A.3.3.17] | |
| Public Input No. 29-NFPA 90A-2021 [Section No. A.3.3.19] | |
| Public Input No. 30-NFPA 90A-2021 [Section No. A.3.3.28] | |
| Public Input No. 31-NFPA 90A-2021 [Section No. A.3.3.3] | |
| Public Input No. 32-NFPA 90A-2021 [Section No. A.3.3.14.3] | |
| Public Input No. 34-NFPA 90A-2021 [Section No. C.1.2.6] | |

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## Public Input No. 28-NFPA 90A-2021 [ Section No. A.3.3.17 ]

**A.3.3.17** Fire Resistance Rating.

Some such assemblies are listed in UL ~~*Fire Resistance Directory*~~ - Online Search Tool Product iQ; www.UL.com/PiQ under the categories “Floors,” “Roofs,” and “Walls and Partitions.”

## Statement of Problem and Substantiation for Public Input

The Fire Resistive Directory is no longer published and products are now incorporated into UL’s Product IQ online database.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 29-NFPA 90A-2021 [Section No. A.3.3.19] | |
| Public Input No. 30-NFPA 90A-2021 [Section No. A.3.3.28] | |
| Public Input No. 31-NFPA 90A-2021 [Section No. A.3.3.3] | |
| Public Input No. 32-NFPA 90A-2021 [Section No. A.3.3.14.3] | |
| Public Input No. 33-NFPA 90A-2021 [Section No. A.3.3.14.4] | |
| Public Input No. 34-NFPA 90A-2021 [Section No. C.1.2.6] | |

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## Public Input No. 29-NFPA 90A-2021 [ Section No. A.3.3.19 ]

**A.3.3.19** Flame Spread Index.

Flame spread indexes for some materials are listed in UL ~~*Building Materials Directory* .~~ Online Search Tool Product iQ; www.UL.com/PiQ . Classifications have been developed using flame spread index values.

## Statement of Problem and Substantiation for Public Input

The Building Materials Directory is no longer published and products are now incorporated into UL's Product IQ online database.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 28-NFPA 90A-2021 [Section No. A.3.3.17] | |
| Public Input No. 30-NFPA 90A-2021 [Section No. A.3.3.28] | |
| Public Input No. 31-NFPA 90A-2021 [Section No. A.3.3.3] | |
| Public Input No. 32-NFPA 90A-2021 [Section No. A.3.3.14.3] | |
| Public Input No. 33-NFPA 90A-2021 [Section No. A.3.3.14.4] | |
| Public Input No. 34-NFPA 90A-2021 [Section No. C.1.2.6] | |

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## Public Input No. 30-NFPA 90A-2021 [ Section No. A.3.3.28 ]

**A.3.3.28** Smoke Developed Index.

Smoke developed indexes for some materials are listed in UL ~~*Building Materials Directory* .~~ Online Search Tool Product iQ; www.UL.com/PiQ . Classifications have been developed using smoke developed index values.

## Statement of Problem and Substantiation for Public Input

The Building Materials Directory is no longer published and products are now incorporated into UL's Product IQ online database.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 28-NFPA 90A-2021 [Section No. A.3.3.17] | |
| Public Input No. 29-NFPA 90A-2021 [Section No. A.3.3.19] | |
| Public Input No. 31-NFPA 90A-2021 [Section No. A.3.3.3] | |
| Public Input No. 32-NFPA 90A-2021 [Section No. A.3.3.14.3] | |
| Public Input No. 33-NFPA 90A-2021 [Section No. A.3.3.14.4] | |
| Public Input No. 34-NFPA 90A-2021 [Section No. C.1.2.6] | |

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## Public Input No. 37-NFPA 90A-2021 [ Section No. A.5.4.7.1 ]

**A.5.4.7.1**

Fire dampers are of no fire protection value unless they remain in place in the protected opening in the event that the ductwork collapses during a fire. To accomplish this, ductwork should not be continuous through a partition opening but instead should connect on each side of the partition to a damper installed in a sleeve or frame secured by perimeter-mounting angles ~~on both sides of the opening~~ or be installed per the listing of the device. For specific details regarding sleeve thickness, perimeter angle dimensions, size and frequency of fasteners, clearance for expansion, duct-sleeve connections, and fire damper access doors, the damper manufacturer's installation instructions ~~and~~ , the damper manufacturer's listing, and SMACNA *Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems* should be referenced.

## Statement of Problem and Substantiation for Public Input

The suggestion that perimeter-mounting angles should be on both sides of the openings is no longer needed as many damper manufacturers have approvals using single-sided mounting angles.

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## Public Input No. 38-NFPA 90A-2021 [ Section No. A.6.3 ]

**A.6.3**

The dampers should close ~~as quickly as practicable,~~ subject to requirements of the system fan and air duct characteristics. The designer should evaluate whether the smoke dampers normally should be open or closed and should consider the fail-safe position of the dampers during an event such as a power failure.

## Statement of Problem and Substantiation for Public Input

Although it is in the Annex, "as quickly as practicable" is subjective language.

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## Public Input No. 5-NFPA 90A-2021 [ Section No. C.1.2.3 ]

**C.1.2.3** ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, ~~2019b~~ 2021a .

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*, ~~2019~~ 2019a .

ASTM E2231, *Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics*, ~~2018~~ 2019 .

ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C*, 2018.

## Statement of Problem and Substantiation for Public Input

date updates

## Submitter Information Verification

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## Public Input No. 34-NFPA 90A-2021 [ Section No. C.1.2.6 ]

**C.1.2.6** UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 555, *Fire Dampers*, 2006, revised ~~2016~~ 2020 .

UL 555S, *Smoke Dampers*, 2014, revised ~~2016~~ 2020 .

UL 1565, *Positioning Devices*, 2013, revised 2017.

UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces*, 2013, revised 2018 .

UL 2424, *Outline of Investigation for Cable Marked 'Limited Combustible,'* 2006.

UL 62275, *Cable Management Systems — Cable Ties for Electrical Installations*, 2016.

~~*Building Materials Directory* , 2018.~~

~~*Fire Resistance Directory* , 2018.~~

~~*Heating, Cooling, Ventilating and Cooking Equipment Directory* , 2018.~~

UL Online Search Tool Product iQ; www.UL.com/PiQ

## Statement of Problem and Substantiation for Public Input

The Building Materials Directory, Fire Resistive Directory and the Heating, Cooling, Ventilating and Cooking Equipment Directories are no longer published and products are now incorporated into UL's Product IQ online database. Up dated references to reflect the latest publications.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 28-NFPA 90A-2021 [Section No. A.3.3.17] | |
| Public Input No. 29-NFPA 90A-2021 [Section No. A.3.3.19] | |
| Public Input No. 30-NFPA 90A-2021 [Section No. A.3.3.28] | |
| Public Input No. 31-NFPA 90A-2021 [Section No. A.3.3.3] | |
| Public Input No. 32-NFPA 90A-2021 [Section No. A.3.3.14.3] | |
| Public Input No. 33-NFPA 90A-2021 [Section No. A.3.3.14.4] | |

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**Committee:** AIC-AAA

# Public Input No. 4-NFPA 90B-2021 [ Section No. 2.3.2 ]

**2.3.2** ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM C411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation*, 2019.

ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester*, ~~2018~~ 2020 .

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, ~~2019b~~ 2021a .

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*, ~~2019~~ 2019a .

ASTM E2231, *Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics*, ~~2018~~ 2019 .

ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*, 2018.

ASTM E2688, *Standard Practice for Specimen Preparation and Mounting of Tapes to Assess Surface Burning Characteristics*, 2018.

ASTM E2690, *Standard Practice for Specimen Preparation and Mounting of Caulks and Sealants to Assess Surface Burning Characteristics*, 2017b.

## Statement of Problem and Substantiation for Public Input

date updates

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**Committee:** AIC-AAA

## Public Input No. 7-NFPA 90B-2021 [ Section No. 2.3.4 ]

**2.3.4** UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 94, *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*, 2013, revised ~~2018~~ 2021 .

UL 181, *Factory-Made Air Ducts and Air Connectors*, 2013, revised 2017.

UL 181A, *Closure Systems for Use with Rigid Air Ducts*, 2013, revised 2017.

UL 181B, *Closure Systems for Use with Flexible Air Ducts and Air Connectors*, 2013, revised 2017.

UL 723, *Test for Surface Burning Characteristics of Building Materials*, 2018.

UL 900, *Air Filter Units*, 2015.

UL 1381, *Outline of Investigation for Aerosol Duct Sealant*, 2013.

UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces*, 2013.

UL 2518, *Air Dispersion Systems*, 2016.

## Statement of Problem and Substantiation for Public Input

Update references to current publication dates.

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**Committee:** AIC-AAA

## Public Input No. 3-NFPA 90B-2021 [ Section No. 5.2.1.4 ]

**5.2.1.4**

Gypsum board shall not be used in an air duct where the air temperature will be in constant excess of 52°C (125°F).

## Statement of Problem and Substantiation for Public Input

Gypsum board may be exposed intermittently to temperatures of 125F, not constant. This clarifies that for the code.

## Submitter Information Verification

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**Committee:** AIC-AAA

## Public Input No. 1-NFPA 90B-2020 [ Section No. 7.1.3.1 ]

**7.1.3.1**

Air filters shall comply with UL 900 ~~,~~ or UL 586

## Statement of Problem and Substantiation for Public Input

HEPA filters are covered by UL 586 not UL 900. HVAC systems sometimes use HEPA filters in addition to lower efficiency filters covered by UL 900.

## Submitter Information Verification

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## Public Input No. 8-NFPA 90B-2021 [ Section No. A.5.3.2 ]

**A.5.3.2**

Additional information can be found in the category “Fabrics” in the UL ~~*Building Materials Directory*~~ . Online Search Tool Product iQ; www.UL.com/ PiQ .

## Statement of Problem and Substantiation for Public Input

The Building Materials Directory is no longer published and products are now incorporated into UL’s Product IQ online database.

## Related Public Inputs for This Document

| Related Input | Relationship |
|---|---|
| Public Input No. 9-NFPA 90B-2021 [Section No. B.1.2.3] | |

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## Public Input No. 5-NFPA 90B-2021 [ Section No. B.1.2.1 ]

**B.1.2.1** ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, ~~2019b~~ 2021a .

ASTM E2231, *Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics*, ~~2018~~ 2019 .

## Statement of Problem and Substantiation for Public Input

date updates

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## Public Input No. 9-NFPA 90B-2021 [ Section No. B.1.2.3 ]

**B.1.2.3** UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 181, *Factory-Made Air Ducts and Air Connectors*, 2013, revised 2017.

UL 1381, *Outline of Investigation for Aerosol Duct Sealant*, 2013.~~*Building Materials Directory* , 2018.~~

UL Online Search Tool Product iQ; www.UL.com/PiQ

## Statement of Problem and Substantiation for Public Input

The UL Building Materials Directory is no longer published and products are now incorporated into UL's Product IQ online database.

## Related Public Inputs for This Document

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|---|---|
| Public Input No. 8-NFPA 90B-2021 [Section No. A.5.3.2] | |

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