

having length or width greater than 250 ft (76.2 m) along either axis.

11.12.2.2.3.2 Pathways. Pathways shall be established as follows:

- (1) Pathways shall be over areas capable of supporting the live load of fire fighters accessing the roof.
- (2) Centerline axis pathways shall be provided in both axes of the roof.
- (3) Centerline axis pathways shall run where the roof structure is capable of supporting the live load of fire fighters accessing the roof.
- (4) Pathways shall be in a straight line not less than 4 ft (1219 mm) clear to skylights, ventilation hatches, and roof standpipes.
- (5) Pathways shall provide not less than 4 ft (1219 mm) clear around roof access hatches with at least one not less than 4 ft (1219 mm) clear pathway to the parapet or roof edge.

11.12.2.2.3.3 Smoke Ventilation. Ability for fire department smoke ventilation shall be provided in accordance with this section.

11.12.2.2.3.3.1 Maximum Array. Arrays of photovoltaic modules shall be no greater than 150 ft (45.7 m) × 150 ft (45.7 m) in distance in either axis.

11.12.2.2.3.3.2 Ventilation Options. Ventilation options between array sections shall be one of the following:

- (1) A pathway 8 ft (2438 mm) or greater in width
- (2) A pathway 4 ft (1219 mm) or greater in width and bordering on existing roof skylights or ventilation hatches
- (3) A pathway 4 ft (1219 mm) or greater in width and bordering 4 ft (1219 mm) × 8 ft (2438 mm) venting cutouts options every 20 ft (6096 mm) on alternating sides of the pathway

11.12.2.2.4 Location of Direct Current (DC) Conductors.

11.12.2.2.4.1 Exterior-mounted dc conduits, wiring systems, and raceways for photovoltaic circuits shall be located as close as possible to the ridge, hip, or valley and from the hip or valley as directly as possible to an outside wall to reduce trip hazards and maximize ventilation opportunities.

11.12.2.2.4.2 Conduit runs between subarrays and to dc combiner boxes shall be designed to take the shortest path from the array to the dc combiner box.

11.12.2.2.4.3 DC combiner boxes shall be located so that conduit runs are minimized in the pathways between arrays.

11.12.2.2.4.4 DC wiring shall be run in metallic conduit or raceways where located within enclosed spaces in a building.

11.12.2.2.4.4.1 Where dc wiring is run perpendicular or parallel to load-bearing members, a minimum 10 in. (254 mm) space below roof decking or sheathing shall be maintained.

11.12.3 Ground-Mounted Photovoltaic System Installations. Ground-mounted photovoltaic systems shall be installed in accordance with 11.12.3.1 through 11.12.3.3.

11.12.3.1* Clearances. A clear area of 10 ft (3048 mm) around ground-mounted photovoltaic installations shall be provided.

11.12.3.2* Noncombustible Base. A gravel base or other noncombustible base acceptable to the AHJ shall be installed and maintained under and around the installation.

11.12.3.3* Security Barriers. Fencing, skirting, or other suitable security barriers shall be installed when required by the AHJ.

Chapter 12 Features of Fire Protection

12.1 General. This chapter shall apply to new, existing, permanent, or temporary buildings.

12.2* Construction.

12.2.1* Where required by this *Code*, a type of building construction shall comply with NFPA 220, *Standard on Types of Building Construction*.

12.2.2 Fire safety construction features for new and existing occupancies shall comply with this *Code* and the referenced edition of NFPA 101.

12.3 Fire-Resistive Materials and Construction.

12.3.1 The design and construction of fire walls and fire barrier walls that are required to separate buildings or subdivide a building to prevent the spread of fire shall comply with Section 12.3 and NFPA 221, *Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls*.

12.3.2* Quality Assurance for Penetrations and Joints. In new buildings three stories or greater in height, a quality assurance program for the installation of devices and systems installed to protect penetration and joints shall be prepared and monitored by the RDP responsible for design. Inspections of firestop systems and fire-resistive joint systems shall be in accordance with 12.3.2.1 and 12.3.2.2.

12.3.2.1 Inspection of firestop systems of the types tested in accordance with ASTM E 814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops*, or /UL 1479, *Standard for Fire Tests of Through-Penetration Firestops*, shall be conducted in accordance with ASTM E 2174, *Standard Practice for On-Site Inspection of Installed Fire Stops*. [5000:40.9.1]

12.3.2.2 Inspection of fire-resistive joint systems of the types tested in accordance with ASTM E 1966, *Standard Test Method for Fire-Resistive Joint Systems*, or UL 2079, *Standard for Tests for Fire Resistance of Buildings Joint Systems*, shall be conducted in accordance with ASTM E 2393, *Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers*. [5000:40.9.2]

12.3.3* Maintenance of Fire-Resistive Construction.

12.3.3.1 Required fire-resistive construction, including fire barriers, fire walls, exterior walls due to location on property, fire-resistive requirements based on type of construction, draft-stop partitions, and roof coverings, shall be maintained and shall be properly repaired, restored, or replaced where damaged, altered, breached, penetrated, removed, or improperly installed.

12.3.3.2 Where required, fire-rated gypsum wallboard walls or ceilings that are damaged to the extent that through openings exist, the damaged gypsum wallboard shall be replaced or returned to the required level of fire resistance using a listed repair system or using materials and methods equivalent to the original construction.

12.3.3.3 Where readily accessible, required fire-resistance-rated assemblies in high-rise buildings shall be visually inspected for integrity at least once every 5 years.

12.3.3.3.1 The person responsible for conducting the visual inspection shall demonstrate appropriate technical knowledge and experience in fire-resistance-rated design and construction acceptable to the AHJ.

A.11.5.1.5 Examples of portable devices not covered by NFPA 31 are blowtorches, melting pots, and weed burners. [31: A.1.1.5]

A.11.5.1.10.1 See Chapter 11 of NFPA 31 for additional requirements for oil-burning stoves, kerosene-burning room heaters, and kerosene-burning portable heaters. See Chapter 12 of NFPA 31 for additional requirements for used oil-burning appliances. See Chapter 13 of NFPA 31 for additional requirements for combination oil-and-gas-burning appliances. [31: A.4.5.1]

A.11.5.1.10.3 Where heavy oils are used, provisions should be made to maintain the oil within the recommended temperature range indicated in Table A.11.5.1.10.3 so that proper atomization is maintained. [31: A.4.5.3]

Table A.11.5.1.10.3 Recommended Temperature Range for Proper Atomization of Heavy Oils

Fuel No.	Viscosity in SSU at 100°F	Low Temperature Limit (°F)	High Temperature Limit (°F)
4	45	35*	50
	50	35*	65
	60	45*	85
	75	62	105
	100	80	125
5	150	100	145
	200	112	160
	300	130	180
	400	140	190
	500	150	200
6	1,000	170	225
	2,000	190	245
	3,000	205	260
	4,000	212	270
	5,000	218	275
	10,000	240	290

* At these temperatures, proper operation of the appliance might not be attained because of unsatisfactory atomization of the fuel. For this reason, the fuel oil should be kept at the high end of the recommended temperature range.

[31: Table A.4.5.3]

A.11.5.1.10.3(4) ANSI/UL 296A, *Standard for Waste Oil-Burning Air Heating Appliances*, specifies that a burner provided with preheating means for the fuel oil can be provided with an oil temperature interlock device to prevent delivery of the fuel oil to the firing portion of the burner until the fuel oil has reached a predetermined minimum temperature. On a burner that is not equipped with oil-preheating equipment, an oil temperature interlock device should not be provided on the burner and should be bypassed during any firing tests of the burner. [31: A.4.5.3(4)]

A.11.7.2.1 It is not the intent of this section to prohibit the installation or use of portable generators within outside structures such as lean-tos or sheds intended solely to provide weather protection for the generator.

A.11.8 NFPA 92, *Standard for Smoke Control Systems*, provides guidance in implementing systems using pressure differentials to accomplish one or more of the following:

- (1) Maintain a tenable environment in the means of egress during the time required for evacuation
- (2) Control and reduce the migration of smoke from the fire area
- (3) Provide conditions outside the fire zone that assist emergency response personnel to conduct search and rescue operations and to locate and control the fire
- (4) Contribute to the protection of life and reduction of property loss

A.11.10 Two-way radio communication enhancement systems provide for greater flexibility and safety for emergency responders during in-building operations.

A.11.12.2.1 Marking is needed to provide emergency responders with appropriate warning and guidance with respect to working around and isolating the solar electric system. This can facilitate identifying energized electrical lines that connect the solar modules to the inverter, which should not be cut when venting for smoke removal during fire-fighting operations.

A.11.12.2.1.3 Markings are intended to alert emergency responders to avoid inadvertent cutting through the conduits, raceways, or cable assemblies during fire-fighting operations.

A.11.12.2.1.3.2 Materials used for marking should be in compliance with ANSI/UL 969, *Marking and Labeling System Standard*.

A.11.12.2.1.6 Inverters are devices used to convert dc electricity from the solar system to ac electricity for use in the building's electrical system or the grid.

A.11.12.3.1 The zoning regulations of the jurisdiction setback requirements between buildings or property lines, and accessory structures may apply.

A.11.12.3.2 Though dirt with minor growth is not considered noncombustible, the AHJ might approve dirt bases as long as any growth is maintained under and around the installation to reduce the risk of ignition from the electrical system. This could be a serious consideration for large ground-mounted photovoltaic systems. Not only should the base be considered under the systems, but also around the systems to the point that the risk of fire from growth or other ignition sources will be reduced.

A.11.12.3.3 Security barriers are intended to protect individuals and animals from contact with energized conductors or other components.

A.12.2 Table A.12.2 provides a cross reference from the NFPA construction types to the model building codes.

A.12.2.1 Building construction types are defined in NFPA 220, *Standard on Types of Building Construction*. The following material is extracted verbatim from NFPA 220 and is included here as a convenience for users of this *Code*. Any requests for Formal Interpretations (FIs) or Tentative Interim Amendments (TIAs) on the following material should be directed to the Technical Committee on Building Construction. See Table A.12.2.1 for fire resistance ratings for each building construction type.

Type I and Type II Construction. Type I (442 or 332) and Type II (222, 111, or 000) construction shall be those types in which the fire walls, structural elements, walls, arches, floors, and roofs are of approved noncombustible or limited-combustible materials. [220:4.3.1]