Overview

Issues regarding fire codes and their implications on Solatube Daylighting Systems are becoming more frequent. Understanding fire codes and their impact are important so that we can effectively consider product solutions to meet the code requirements where possible.

When approaching these fire issues, it is important to understand that there is not one single fire issue to evaluate. In fact, there are three distinct areas of a building structure that have different code restrictions that we must consider: 1. the roof assembly, 2. the ceiling assembly, and 3. the plenum space.

This report addresses these three distinct zones separately, providing detail on what the code dictates, what the intent of the code is, when and where the code applies, as well as possible solutions when Solatube Daylighting Systems are involved.

Warranty information and technical support of all non-Solatube components will be provided by the product manufacturers. Any questions regarding non-Solatube components listed in this guide should be directed to the manufacturer.

For more information, please contact your Solatube account representative.
# Solatube Fire Solution Guide

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This section covers building code issues related to the use of Solatube products. All information and code sections in this guide have been obtained from the 2009 International Building Code (IBC), the IWUIC, and the Universal Mechanical Code. These code standards are the most recognized governing body for building construction.

The potential solutions referenced throughout this guide are available from 3rd party sources. These solutions have not been formally tested by Solatube International, Inc., but are known to have been integrated with Solatube Daylighting Systems. These solutions are provided as a reference of potential solutions when fire codes are present. It is recommended to consult with the building inspector, fire marshal, or the authority having jurisdiction when considering any of these options.

Disclaimer: at the time of this publication, the 3rd party products listed in this guide were commercially available. Please check with appropriate vendor for current availability and specifications. Contact information for these 3rd party vendors are provided at the end of this guide.

1a. The Roof Assembly - IBC

**Code Overview** Fire rated roofs shall maintain fire rating when Solatube Daylighting Systems are installed. Chapter 7 of the IBC deals with Fire-Resistance-Rated Construction. This chapter governs the materials and assemblies used for structural fire resistance and fire-resistance-rated construction.

Section 2610.2 of the 2009 IBC addresses roof mounting.

2610.2 Mounting

The light transmitting plastic shall be mounted above the plane of the roof on a curb constructed in accordance with the requirements for the type of construction classification, but at least 4 inches (102 mm) above the plane of the roof. Edges of light-transmitting plastic skylights or domes shall be protected by metal or other approved noncombustible material, or the light-transmitting plastic dome or skylight shall be shown to be able to resist ignition where exposed a the edge to a flame from a class B brand as described in ASTM E 108 or UL 790.

The metal or noncombustible edge is not required where non-classified roof coverings are permitted.

**Code Intent** Maintain the fire rating for the roof assembly even when a penetration is made. The fire and smoke must not be allowed to enter the interior of the building (plenum, attic, or interior space) through the penetration in the fire rated roof assembly.

**Where/When it Applies** This code applies to all fire class roof assemblies as specified in section 1505 Fire Classification of the IBC.

**Solatube International Approved Solutions** The Solatube Dome Edge Protection Band

1. The addition of the Solatube Dome Edge Protection Band will meet the current International Building Code (IBC) for rooftop applications. Adding the Dome Edge Protection Band will maintain the class rating of a roof as described in the paragraph above in section 2610 of the IBC.
2. Solatube International has tested a configuration of the Solatube 330 DS and 750 DS according to ASTM E108-07a, Standard Test Methods for Fire Tests of Roof Coverings. The test was conducted by an ANSI accredited third party laboratory with the intent of achieving a 1-hour fire rating at the roof level. The attached test report shows that the samples submitted passed the requirements of ASTM E108-07a for a period of 1 hour.

This fire test standard aims to measure relative fire characteristics of roof coverings under simulated fire scenarios which originate outside the building. In addition to the prescribed test method, Solatube International specified that the test be run for a total of 60 minutes in order to simulate a 1-hour fire rating to meet 1-hour fire rated roof requirements.

In order to meet the results achieved in this test, the open-ceiling and closed-ceiling product configuration must include:

1. Either Solatube 330 DS outer dome, 750 DS outer dome, or 750 DS dual dome (acrylic or polycarbonate dome)
2. Solatube 11” High Flashing
3. Solatube Dome Edge Protection Band

No other Solatube product configurations were submitted for testing and therefore are not covered by this test report. Please contact your Solatube International representative with any questions.

1b. The Roof Assembly–International Wildland-Urban Interface Code (IWUIC)

**Code Overview** The IWUIC shall apply to the construction, alteration, movement, repair, maintenance and use of any building, structure or premises that is determined to be within the wildland-urban interface areas. The IWUIC was designed to bridge the gap between the International Building Code and the International Fire Code in order to mitigate the hazards of wildfires through model code regulation, which safeguards the public health and safety in these communities.

Section 504.8 and 505.8 of the IWUIC address exterior glazing.

**504.8 Exterior glazing**
Exterior windows, window walls and glazed doors, windows within exterior doors, and skylights shall be tempered glass, multilayered glazed panels, glass block or have a fire protection rating of not less than 20 minutes.

**Code Intent** To establish guidelines for construction, building materials and surrounding areas for buildings, structures, or premises located in the wildland-urban interface area in order to suppress and control the potential of a catastrophic wild-fire, property damage, and the safeguard of public health and safety.

As it applies to Solatube Daylighting Systems, the intent is to suppress the risk of fire or burning embers from entering the interior of the structure through the exterior glazing of the Solatube Daylighting System.

**Where it Applies** The IWUIC applies to many areas but only affects Solatube Daylighting Systems at the roof level and only to those areas determined to be located in the wildland-urban interface areas. These IWUIC areas can be located on each official state website.

**Potential 3rd Party Solutions** Though there is no formal testing for Solatube Daylighting Systems installed in zones designated as wildland-urban interface areas, we have seen varying interpretation of the code. Interpretation and solutions for the code have varied from county and state.
We have seen local acceptance of the following solution located in wildland-urban interface areas. The San Diego County Fire Marshal has accepted the use of a 1/4" thick clear tempered glass disk installed at the dome level of the Solatube Daylighting System and adhered with high temperature silicone. This solution is used in conjunction with the Solatube Dome Edge Protection Band.

Glass disk dimensions:

160 DS 10.5 in. radius cut
290 DS 14.5 in. radius cut
330/750 DS 21.25 in. radius cut

The glass disk can be sourced at any local glass company. Please consult with a glass company for availability and specifications.

2. The Ceiling Assembly – Fire Rated Ceilings

**Code Overview** Fire rated ceiling assemblies shall maintain the fire rating when a penetration is made by the installation of a Solatube Daylighting System. Chapter 7 of the IBC deals with Fire-Resistance-Rated Construction. This chapter governs the materials and assemblies used for structural fire resistance and fire-resistance-rated construction.

Section 711 Horizontal Assemblies of the 2009 IBC lists an exception for 711.3 Fire Resistance Rating.

**711.3 Fire-resistance rating.** The fire-resistance rating of floor and roof assemblies shall not be less than that required by the building type of construction. Where the floor assembly separates mixed occupancies, the assembly shall have a fire-resistance rating of not less than that required by section 508.3.3 based on the occupancies being separated. Where the floor assembly separates a single occupancy into different fire areas, the assembly shall have a fire resistance rating of not less than that required by section 706.3.9. Floor assemblies separating dwelling units in the same building or sleeping units in occupancies in Group R-1, hotel occupancies, R-2 and I-1 shall be a minimum of 1-hour fire-resistance-rated-construction.

**Exception:** Dwelling unit and sleeping unit separations in buildings of type IIB, IIB, and VB construction shall have fire-resistance ratings of not less that ½ hour in buildings equipped throughout with an automatic sprinkler system in accordance with section 903.3.1.1. (Section 903.3.1.1. refers to sprinkler installations)

Section 712 Penetrations of the IBC provides code language for penetrations through fire-rated horizontal assemblies.

Chapter 26 of the 2009 IBC lists allowable plastic materials used in construction. In Chapter 26, Section 2606 Light-Transmitting Plastics offers information that refers directly to our product.

2606.7 Light-diffusing systems. Unless the building is equipped throughout with an automatic sprinkler system in accordance with section 903.3.1.1., light-diffusing systems shall not be installed in the following occupancies and locations:

1. Group A with an occupant load of 1,000 or more.
2. Theatres with stage and proscenium opening and an occupant load of 700 or more.
5. Exit stairways and exit passageways.
Terms & Definitions

Group A – Assembly Group A occupancy includes, among others, the use of a building or structure, or a portion thereof, for the gathering of persons for purposes such as civic, social or religious functions; recreation, food or drink consumption; or awaiting transportation or motion picture and television production studio and sound stages, approved production facilities and production locations.

Group I-2: This occupancy shall include buildings and structures used for medical, surgical, psychiatric, nursing or custodial care on a 24-hour basis for more than six persons who are classified as nonambulatory or bedridden. This group shall include, but not limited to, the following:
- Hospitals
- Nursing homes (both intermediate care facilities and skilled nursing facilities)
- Mental hospitals
- Detoxification facilities

Group I-3: This occupancy shall include buildings or portions of buildings, and structures that are inhabited by one or more persons who are under restraint. An I-3 facility is occupied by persons who are restrained. This group shall include, but not be limited to, the following:
- Prisons
- Jails
- Reformatories
- Detention centers
- Correctional centers
- Juvenile Halls

F Rating – An F-rating indicates the time in hours that a firestop system will prevent the passage of flames through an opening, remain in place, and not permit the projection of a water stream through the assembly.

Code Intent

Fire, smoke, and toxic gases must not be allowed to spread into other areas of the building through a fire rated ceiling assembly. When penetrations are made in a fire rated ceiling assembly a fire stop system must be installed and also must meet testing in accordance with ASTM E 814 or UL 1479 and have an F-rating of not less than the required fire-resistance rating of the ceiling assembly penetrated. The addition of an approved fire stop system will then maintain the required rating by blocking the fire, smoke, and toxic gases from spreading.

Where/When it Applies

This code applies to all construction, residential and commercial building types, requiring a fire rated ceiling assembly. It is required by the building code that every penetration or membrane penetration, joint or open gap in a fire-rated ceiling assembly is adequately protected by sealing or firestopping such that the building component is restored to its original fire-rated condition in order to maintain compartmentalization.

Potential 3rd Party Solutions

A possible solution is the addition of an approved penetration firestop system that has been installed, evaluated, and tested in accordance with the ASTM E814 and ASTM E119.

1. Fire sprinklers offer some exceptions to the fire stop system. Sprinkler systems are extremely important and are a key component of the "Life Safety System." However, it is important to remember that sprinkler systems suppress rather than contain fire. Sprinklers are useless against smoke and deadly gases. Considering this, it is still necessary to have a fire (smoke) stop in place.

2. Fire rated glass is also a potential solution but is limited to spaces that have sprinklers. Fire rated glass effectively stops the spread of fire and smoke, but usually only gives a 20-30 minute rating. This limits the use of fire rated glass in spaces that have sprinklers. This does not address spaces that do not have a sprinkler system in place. Also, the addition of fire rated glass adds weight to suspended ceilings and additional means of support would be necessary.
Solatube Fire Solution Guide
Fire Code Review & Potential Solutions

3. One more possible solution is listed in the Automated Sprinkler System Handbook. It refers to paragraph 5-13.1.1 of the NFPA 13. This section talks about fire sprinklers and concealed spaces. The formal interpretation states “the Committee’s intent is to permit limited combustibles if the exposed surfaces have been demonstrated not to propagate fire in the form in which they are installed in the space.” Though this section of the code does not specify a size which would give the ability to install in said spaces, the penetration at said point would not stop the propagation of fire or smoke. This also limits the use of Solatube Daylighting Systems to spaces that have fire sprinklers installed.

4. Intumescent Materials provide the necessary fire blocking and have been tested to provide as much as a four-hour rating depending on the type of product and application used. The intumescent material is designed to expand at high temperatures and will stop the spread of flame, smoke, and toxic gasses. However, it is limited to the size of material/opening and would not meet the requirements of a Solatube product’s 21” diameter opening.

5. An approved ceiling fire damper is another solution and would provide the necessary firestop. The only drawback with this solution is a section of up to five inches of non-reflective material inside the tubing would affect light output. A custom damper would need to be made and tested in accordance with required testing standards previously mentioned.
3. The Plenum Space

**Code Overview**
A fire rated plenum shall maintain the fire rating when a Solatube Daylighting System has made a through penetration in this space. Chapter 7 of the 2009 IBC deals with Fire-Resistance-Rated Construction. This chapter governs the materials and assemblies used for structural fire resistance and fire-resistance-rated construction. Chapter 6 of the Uniform Mechanical Code specifically refers to this section of the code for through penetrations.

**602.2 Combustibles Within Ducts or Plenums (Uniform Mechanical Code)** Materials exposed within ducts or plenums shall be noncombustible or shall have a flame spread index not greater than twenty-five (25) and a smoke developed index not greater than fifty (50), when tested as a composite product in accordance with one of the following test methods: NFPA 225, Method of Test of Surface Burning Characteristics of Building Materials, ASTM E84, Surface Burning Characteristics of Building Materials, or UL 723, test for Surface Burning Characteristics of Building Materials, except as indicated below.

**Code Intent** The intent of this code is to stop the spread of smoke and fire in fire rated plenum by only allowing noncombustible material to be installed in the plenum.

**Where/When it Applies** This applies in all construction with fire rated plenums that do not allow combustible material to be installed in them.

**Potential 3rd Party Solutions**
1. The use of a fire wrap that is installed and tested in accordance with ASTM E84 is an acceptable solution for use of a Solatube Daylighting System in a rated plenum space. Fire blanket solutions have been utilized and approved in several applications. A method of attachment for fire blankets is necessary. Appropriate attachment would need to be discussed with the authority having jurisdiction on each individual application.
FyreWrap® Elite® 1.5 Duct Insulation – Air Distribution System (ADS Ducts)

Introduction
Unifrax's FyreWrap® Elite® 1.5 Duct Insulation is a single-layer flexible duct wrap enclosure for 1- and 2-hour fire-rated air distribution systems (ADS ducts). Typical duct types include smoke control, stairwell and vestibule pressurization, ventilation, supply/return ducts, commercial dryer exhaust, as well as refuse and linen chutes. This slim, compact design is an alternate to code prescribed fire-rated shafts and results in significant weight, space and labor savings when compared to traditional shafts.

FyreWrap Elite 1.5 Duct Insulation Air Distribution System (ADS) offers the following features:
• 1- and 2-hour fire-rated enclosure
• Alternate to fire-rated shaft
• Zero clearance to combustibles at all locations on blanket wrap
• Saves weight, space, labor
• Thin, lightweight single-layer system
• High-temperature, biosoluble insulation
• Durable foil scrim covering
• GREENGUARD listed for Microbial Resistance

Typical Product Parameters

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Product Components
Core Material: FyreWrap Elite 1.5 Duct Insulation incorporates Insulflex® Thermal Insulation as its core material. Insulflex is a high-temperature insulation made from calcium, magnesia, silica chemistry designed to enhance biosolubility. It provides excellent insulation in a noncombustible blanket form.

Encapsulating Material: The core insulation is completely encapsulated in an aluminum foil, fiberglass-reinforced scrim covering. This scrim provides additional handling strength as well as protection from tearing and moisture absorption.

2. When fire-resistance-rated construction applies and the building code requires an hourly rating for penetrations into horizontal assemblies, a drywall/gypsum board chase can be utilized. Most building requirements are for double layered 5/8" type X gypsum board but vary based on the hourly rating. Please consult with your local building official, building inspector, fire marshal, or the authority having jurisdiction for proper material and assembly when considering this option.

**SHEETROCK® Brand FIRECODE® Core Gypsum Panels**

*Offer superior fire resistance for fire-rated applications.*

SHEETROCK FIRECODE Core gypsum panels are the original, most widely used Type X gypsum panels on the market. The panels score and snap easily for quick installation, allowing painting, decorating, and the installation of metal or wood almost immediately. They are composed of fire-resistant gypsum core encased in 100-percent recycled natural-finish face paper and 100-percent recycled liner paper on the back side. The face paper is folded around the long edges to reinforce and protect the core, and the ends are square-cut and finished smooth. The long edges of the panels are tapered, allowing joints to be reinforced and concealed with a USG Interior Finish System.

The panels are available in 5/8"-inch thickness and are UL-Classified (Type X) for application in fire-rated construction.
ProRoc® Type X Gypsum Board

ProRoc® Type X Gypsum Board is an interior gypsum board consisting of a solid set, fire resistant Type X gypsum core enclosed in ivory-colored face paper and a strong liner back paper. ProRoc® Type X board features a specially formulated core providing fire resistance ratings when used in tested assemblies. Long edges are slightly tapered, allowing joints to be reinforced and concealed with joint tape and joint compound. ProRoc® Type X Gypsum Board is available in a variety of lengths and widths. Fire ratings up to four hours.

- Consistently high quality.
- Uniformly flat, attractive appearance; no shadowing.
- High edge hardness.
- No wavy edges, warps, bows or deformities.
- Uniform high-strength cores eliminate crumbling, cracking.
- Edge tapers consistent to form perfect joints.
- Excellent thermal barrier and sound attenuation qualities.

Product Data:
ASTM C 1396 (Type X)
Thickness: 5/8" (15.9 mm)
Lengths: 8' (2440mm), 9' (2740mm), 10' (3050mm), 12' (3660mm)
Widths: 4' (1220 mm) standard; 54" (1370 mm)
Edges: Tapered
Paper: 100% recycled Ivory colored face paper and strong liner back paper
Weight: 2.3 lbs/ft2 (11.2 kg/m2)
Packaging: Two pieces per bundle; face-to-face and end-taped.

For complete product description, please see Product Data and Submittal Sheet.
Potential 3rd Party Solutions

Contact Information

3M Fire Wrap
Fire Barrier Wrap 15A
mmm.com

CertainTeed Drywall
ProRoc Type X Gypsum Board
www.certainteed.com

Ruskin
FDR25 Round Fire Damper
www.ruskin.com

Tempered Glass Disk
Consult with local glass shop

Unifrax FyreWrap
FyreWrap Elite 1.5 Duct Insulation—Air Distribution System
ww.unifrax.com

USG Sheetrock
Sheetrock Brand Firecode Core Gypsum Panels
www.usg.com

Resources / References
International Code Council (ICC)
The ICC Governs the Following Codes:
International Building Code (IBC)
Uniform Mechanical Code (UMC)
International Wildland-Urban Interface Code (IWUIC)
www.iccsafe.org