Fire Protection for Troffer Light Fixture Installation in T-Grid Ceiling Systems

- Why code-compliant fire-resistive enclosure protection for Troffer and LED lay-in lighting is critical in rated suspended T-grid ceiling assemblies.

THE CENTRAL DESIGN QUESTION

When a 2 x 2 or 2 x 4 light fixture is a part of a tested fire-resistive ceiling membrane, what protects the opening and preserves the building code required fire rating?



Figure 1. Acoustic T-grid suspended ceiling system + FRPS integration: 2 x 4 troffer fixture protected by the FRPS FN-R-T patent-pending composite enclosure (5 in. high x 47.75 in. long x 23.75 in. wide). Project-specific listing, assembly design, fixture compatibility and AHJ requirements govern.

EXECUTIVE ABSTRACT

A Recurring Ceiling Detail Can Become a Life-Safety Weak Point

Suspended acoustical T-grid ceilings are widely used because they provide fast access to building services, flexible fixture layouts, acoustic control and an efficient finished ceiling plane. In a fire-resistance-rated floor/ceiling or roof/ceiling assembly, however, the ceiling system also performs a life-safety function: it is part of the tested construction that limits heat transfer and helps protect structural and concealed spaces for the required period.

A troffer or lay-in LED panel can interrupt four to eight square feet of ceiling membrane. The resulting condition must not be treated as an ordinary lighting detail when the ceiling membrane is part of a rated horizontal assembly. The applicable tested design, luminaire listing, protective enclosure and installation instructions must show how the rating is preserved.

UL RESEARCH FINDING

UL Solutions reports that omitting required supplemental protection over a troffer can cause significant heat transmission into the ceiling plenum and can potentially reduce a two-hour rated assembly to one hour or even less.

Key Findings

- Fire resistance is assigned to the complete tested assembly, not automatically to individual ceiling panels, grids or luminaires.
- An electrical luminaire listing does not by itself establish suitability in a fire-resistance-rated floor/ceiling or roof/ceiling assembly.
- Where a tested design requires supplemental protection, the protection is commonly provided by boxing, tenting, a fire-resistive luminaire, or a listed/evaluated enclosure.
- Large-format lay-in luminaires create substantial membrane interruptions: approximately 4 sq ft for 2 x 2 fixtures and 8 sq ft for 2 x 4 fixtures.
- Protection must be coordinated during design and submittal review; after ceiling close-in, deficiencies can be difficult to see and expensive to correct.
- FRPS patent-pending composite enclosures are intended to provide a repeatable, lightweight, five-sided protection method for qualifying troffer and LED lay-in applications, subject to the applicable listing and project conditions.

Audience and Scope

This white paper is intended for architects, electrical and MEP engineers, fire-protection professionals, specification writers, ceiling and electrical contractors, manufacturers, plan reviewers, inspectors, authorities having jurisdiction, owners and facility teams. It addresses rated suspended acoustical ceiling applications; it does not suggest that every ordinary non-rated T-grid ceiling requires a fire-resistive luminaire enclosure.

The Ceiling is a Tested Assembly, Not a Product Label.

Historical industry guidance supplied with this white paper makes the central principle clear. The Armstrong technical material explains that the fire-resistance rating applies to the entire roof/ceiling or floor/ceiling assembly rather than to individual components. It identifies the ceiling system, lighting, HVAC outlets, plenum, structural system, subfloor and finished floor as interacting parts of the construction.

The companion Columbia Lighting bulletin, under the heading “Fire Rated Troffers: Debunking the Myth,” similarly explains that a troffer is not simply made “fire rated” by an electrical label. Instead, the applicable fire-rated ceiling system establishes which fixtures are permitted and whether protection such as an enclosure or tent of fire-resistant material is required above the fixture.

Why the Distinction Matters:

- A ceiling tile can have a flame-spread classification without being, by itself, a one-hour or two-hour floor/ceiling assembly.
- A suspension system can be qualified for rated designs without making every installed luminaire acceptable.
- A luminaire can be electrically listed while still needing supplemental fire-resistive protection in a rated ceiling.
- The correct compliance question is whether the complete installed condition matches a tested/listed or otherwise approved rated assembly.

ASSEMBLY PRINCIPLE

A product can be safe and code-compliant for its own function and still be unsuitable for a particular fire-resistance-rated assembly unless that application has been evaluated.

The Membrane Interruption Created by Troffers and LED Panels

A conventional 2 x 2 lay-in panel occupies roughly four square feet of the ceiling plane. A 2 x 4 troffer occupies roughly eight square feet. In a rated ceiling membrane, these are not trivial openings. They replace a significant area of the protective plane with a thin metal or composite luminaire housing, driver components and electrical access points.

The concern is not limited to visible flame passage. Heat can be conducted through the fixture and transmitted into the concealed plenum, exposing structural members and above-ceiling services earlier than the tested assembly intended.

What UL Solutions Aays About Recessed Luminaires

UL Solutions identifies three ways recessed luminaires can be used in fire-resistive ceilings:

- First, a tested UL fire-resistance design can incorporate a troffer with prescribed field-installed tenting or boxing that continues the protective ceiling membrane.
- Second, the luminaire itself can be specifically certified for use in the applicable fire-resistance-rated assembly.
- Third, a separately certified enclosure or cover can be installed over an otherwise unprotected recessed luminaire.

The Thermal Consequence of Omitting Protection

UL Solutions states that recent research testing confirmed historical test experience: when required supplemental protection over troffer luminaires was omitted, substantial heat transmission occurred through the luminaire housing and into the ceiling plenum. UL reports that this condition can potentially reduce the performance of a two-hour rated assembly to one hour or even less.

DESIGN IMPLICATION

A metal fixture can remain physically in place and still transmit enough heat to undermine the thermal performance of the rated ceiling assembly.

A Simple Compliance Decision Path

1. Identify	Is the suspended ceiling part of a required fire-resistance-rated horizontal assembly?
2. Verify	What exact tested/listed assembly design governs, and what does it permit at luminaires?
3. Protect	Use the tested fixture configuration, certified fire-resistive luminaire, or approved enclosure/cover required for that design.
4. Inspect	Confirm fixture size, spacing, support, enclosure position, penetrations and above-ceiling coordination before concealment.

Code Coordination: Preserve the Required Fire Resistance

IBC Chapter 7 establishes the governing principle for recessed fixtures in rated horizontal assemblies: the installation must not reduce the required fire resistance. Current 2024 IBC development language further clarifies luminaire membrane penetrations by identifying listed and labeled luminaires for rated assemblies and luminaires installed in accordance with tested assembly construction specifications as compliance paths.

Because model-code adoption and local amendments vary, project teams should verify the edition adopted by the jurisdiction and the exact language enforced by the AHJ.

Why Coordination Failures Occur in Real Projects

The risk often develops at the boundary between disciplines. The architect specifies a rated suspended ceiling. The electrical engineer specifies the lighting. The electrical contractor installs the fixture. The ceiling contractor installs the grid and panels. The firestop contractor may not consider a lay-in luminaire part of its scope. The finished ceiling can look complete from below while the required supplemental protection above the fixture is absent.

Common Coordination Gaps

- Reflected ceiling plans identify the fixture but not the fire-resistance design or protective enclosure requirement.
- Fixture substitutions change housing dimensions, driver locations or clearances after the rated assembly was selected.
- Submittal review confirms wattage, optics and electrical listing but does not verify rated-assembly compatibility.
- Field crews assume the T-grid or ceiling panel fire classification automatically protects the opening.
- Inspection occurs after the ceiling is substantially complete, when above-fixture conditions are difficult to verify.
- Field-built covers are improvised without confirming dimensions, material, seams, clearance, fixture area or spacing limitations in the tested design.

THE SPECIFICATION QUESTION

Who owns the fire-resistance continuity at the lighting opening? If the drawings and specifications do not answer that question, the project has a coordination gap.

Recommended Drawing and Specification Coordination

- Identify every rated floor/ceiling and roof/ceiling assembly on plans and reflected ceiling plans.
- List the applicable design number and hourly rating.
- Coordinate the selected troffer or LED panel dimensions with the protective method.
- Require enclosure/listing data in the lighting submittal package.
- Coordinate sprinklers, speakers, sensors, diffusers, seismic bracing, suspension wires, drivers and junction-box access.
- Require pre-concealment verification where the protective enclosure will no longer be readily visible.

FRPS Patent-Pending Composite Enclosure Technology

FRPS has developed patent-pending composite troffer and LED lay-in panel enclosures intended for rated suspended T-grid ceiling applications. FRPS technical documents describe a lightweight, factory-manufactured five-sided enclosure that ships flat and folds on site using factory forming lines and peel-and-stick tabs. The enclosure installs over the fixture housing within the same T-grid cavity.

Documented FRPS Product Characteristics

- Standard product formats include 24 x 24 and 24 x 48 in. troffer/LED enclosures, with 3-1/4 in. and 5 in. height options; related FRPS documents also identify a 12 x 48 in. option.
- A typical 24 x 48 in. composite enclosure is represented in FRPS product literature as weighing less than 2 lb.
- Five-sided flat-fold construction is designed to reduce shipping volume and simplify handling above suspended ceilings.
- Factory-applied peel-and-stick forming tabs allow assembly without routine drilling or added field-applied sealants unless the applicable listing or instructions require otherwise.
- Material attributes represented in FRPS literature include inorganic, non-corrosive, chemically stable, odorless, moisture resistant, fungus/mold/mildew resistant and antimicrobial-preventive characteristics.
- FRPS literature identifies 1-hour and 2-hour applications subject to the approved listing, fixture configuration and project conditions.

Advanced Testing Referenced in FRPS Technical Literature

Fire Resistance	ASTM E119 / UL 263; CAN/ULC-S101 referenced in FRPS installation literature
Surface Burning	ASTM E84 Class A
Acoustic Absorption	ASTM C423
Air Leakage / Enhanced Testing	ASTM E283
Fungal Resistance	ASTM G21
Thermal Transmission	ASTM C518

FRPS documents also reference Chicago Plenum, California Proposition 65 and RoHS-related attributes. These claims should be published and specified only to the extent confirmed by the current product-specific test reports, certifications and manufacturer documentation.

Field Benefits of a Purpose-Built Enclosure

REPEATABILITY

A factory-produced enclosure can reduce the dimensional variability inherent in field-fabricated tenting and makes the intended protective condition easier to recognize and inspect.

INSTALLATION EFFICIENCY

Flat shipping, low weight, factory fold lines and adhesive forming tabs are intended to simplify installation in crowded above-ceiling conditions where heavy or rigid protective assemblies can be difficult to maneuver.

COORDINATION

Defined enclosure footprints and heights allow the architect, electrical engineer and ceiling contractor to coordinate fixture drivers, suspension wires, seismic bracing, sprinkler piping and other above-ceiling systems before installation.

INSPECTION AND DOCUMENTATION

A distinct manufactured enclosure creates a visible, repeatable product condition that can be documented in submittals, field photographs and pre-concealment inspection records.

LIFECYCLE SERVICEABILITY

FRPS installation guidance requires the enclosure to be returned to its proper position after ceiling access or fixture service, reinforcing the need to treat the enclosure as an integral part of the rated condition throughout the building lifecycle.

IMPORTANT LIMITATION

No enclosure should be represented as universally acceptable in every rated ceiling. Final suitability depends on the exact listed assembly, hourly rating, luminaire type and dimensions, enclosure configuration, spacing, penetrations, installation instructions and AHJ approval.

High-Consequence Occupancies

The coordination issue deserves particular attention where rated assemblies protect sleeping occupants, vulnerable populations, defend-in-place strategies, mission-critical infrastructure or repetitive construction. Multifamily housing, senior living, healthcare, student housing, hospitality, schools, data centers and modular/prefabricated projects can multiply the consequences of a repeated ceiling detail.

Architect / MEP / Contractor Action Checklist

Design	Identify the rated horizontal assembly and required hourly rating before lighting selection.
Specify	Reference the exact tested/listed assembly and require the protective luminaire method shown by that design.
Select	Confirm the troffer or LED panel model, dimensions, driver location and thermal/service clearances.
Submittal	Require luminaire data, FRPS enclosure data, listing/certification information and coordination drawings together.
Coordinate	Resolve grid, hanger wires, seismic bracing, sprinklers, sensors, diffusers, access and junction-box needs.
Install	Follow the current FRPS instructions and applicable tested assembly; do not cut, drill or modify protection unless specifically permitted.
Inspect	Verify the enclosure before concealment and document representative locations.
Closeout	Retain product data, installation instructions, assembly references and inspection documentation in the project record.

CONCLUSION

Protect the Assembly, Not Just the Fixture

The suspended ceiling system can be part of a building's tested fire-resistance strategy. When a troffer or LED lay-in panel interrupts that ceiling membrane, the project team must evaluate the installed condition as part of the complete rated assembly—not simply as a lighting product.

Historical ceiling and lighting industry guidance has long recognized the need for protective tenting or boxing in qualifying rated designs. Current UL Solutions research reinforces why: required supplemental protection limits heat transmission through the luminaire into the ceiling plenum, and its omission can dramatically reduce assembly performance.

FRPS patent-pending composite enclosures are intended to provide a modern, repeatable and installation-friendly approach for qualifying applications. Their value is not merely the material itself; it is the ability to engineer a recurring ceiling condition, coordinate it across disciplines, install it consistently, and verify it before concealment.

FRPS LIFE-SAFETY POSITION

Do not allow a lighting fixture to become the weakest point in a tested fire-resistance-rated ceiling assembly.

Professional References

- **UL Solutions** — "The Influence of Recessed Luminaires in Fire Resistive Assemblies." Describes troffer tenting/boxing, certified luminaires, certified enclosures and research showing significant heat transmission when required supplemental protection is omitted.
- **International Code Council** — 2024 IBC Chapter 7 / Section 714 membrane-penetration provisions and 2024 code-development material addressing luminaire penetrations in horizontal assemblies.
- **Armstrong World Industries** — Historical technical guidance supplied by FRPS: fire-resistance ratings apply to the complete ceiling/floor/roof assembly, including ceiling system, lighting, HVAC outlets and structural components.
- **Columbia Lighting / Hubbell Lighting** — Historical "Standards Compliance" bulletin supplied by FRPS. "Fire Rated Troffers: Debunking the Myth" explains that rated ceiling system designs govern troffer use and can require an enclosure or tent of fire-resistant material over the fixture.
- **FRPS Product Catalog** — Composite T-Grid Lighting Enclosures, FN-R-T 24-24 and FN-R-T 24-48 product information; dimensions, material properties and referenced test standards.
- **FRPS Troffer / LED Lay-In Panel Enclosure Specification and Installation Instructions** — Product description, standard sizes, installation method, testing/compliance summary and field verification requirements.

Technical and Editorial Notice

This white paper is educational and marketing-oriented and is not project-specific engineering or code advice. Adopted code editions and local amendments vary. Product ratings, assembly design numbers, fixture compatibility, spacing limitations, enclosure dimensions, penetration allowances and performance claims must be verified against the current FRPS product documentation, applicable third-party certification/listing, project specifications and Authority Having Jurisdiction requirements before publication, specification or construction.

About Fire Rated Product Specialties

Fire Rated Product Specialties Corp. provides engineered passive fire-protection solutions intended to help preserve fire-resistance-rated assemblies where recessed fixtures, lighting, valves, fans and other building-service components interrupt rated construction. FRPS supports architects, engineers, contractors, inspectors and building owners with application-specific products, specifications, installation resources and code-coordination information.