

FIRE SAFETY MATERIAL SUBMITTAL

Expanded Polystyrene (EPS) & Polyurethane (PU) Foam Insulation

Prepared for Fire Marshal / Authority Having Jurisdiction (AHJ) Review | Date: April 16, 2026 | Applicable Codes: IBC 2021 · IFC 2021 · NFPA 101 · IRC 2021

SCOPE OF SUBMITTAL This document provides fire safety data for two classes of foam plastic insulation — Expanded Polystyrene (EPS, per ASTM C578) and Spray/Rigid Polyurethane foam (PU/PIR, per ASTM C591 / C1029) — to support permit issuance and AHJ review. Data includes ASTM E84 surface burning characteristics, ignition barrier requirements, thermal barrier requirements, maximum exposed thicknesses, applicable building code sections, and R-value/density cross-reference tables. All values reflect tested or code-referenced performance at standard conditions (75°F, ASTM C518).

Key Code & Standard References

Code / Standard	Section / Ref.	Applicability
IBC 2021 — International Building Code	Section 2603	Foam plastic insulation in buildings
IFC 2021 — International Fire Code	Section 2603.4	Thermal / ignition barrier requirements
IRC 2021 — International Residential Code	Section R316	Foam plastic insulation residential
NFPA 101 — Life Safety Code	Section 10.2.3	Interior finish flame-spread classification
ASTM E84 — Surface Burning Characteristics	Tunnel test, 10 min	Flame Spread Index & Smoke Developed Index
ASTM E119	Fire resistance	Hour-rated assembly testing
ASTM C578	Types I–IX	EPS physical properties & density classification
ASTM C591 / C1029	Types I–VI / I–II	PU/PIR rigid foam & spray foam classification
NFPA 285	Wall assembly test	Multi-story exterior wall fire propagation
ICC-ES AC377	Appendix X	Attic/crawl space ignition barrier alternative

NFPA 101 / IBC Interior Finish Classification by Flame Spread Index

Class	Flame Spread Index (FSI)	Smoke Developed Index (SDI)	Typical Locations Permitted
Class A (I)	0–25	0–450	Exits, exit access, high-hazard occupancies
Class B (II)	26–75	0–450	Rooms / areas in most occupancies
Class C (III)	76–200	0–450	Rooms in low-hazard occupancies only
Prohibited	200	Any	Not permitted as interior finish

SECTION 1 — EXPANDED POLYSTYRENE (EPS) INSULATION STANDARD:

Standard: ASTM C578 | Types I, VIII, II, IX by density | Oxygen Index: 24% | Contains flame retardant additive

Table 1A — EPS Fire Properties by ASTM Type & Density (ASTM E84 / IBC 2603)

ASTM Type	Nominal Density (lb/ft ³)	Flame Spread Index (FSI)	Smoke Developed Index (SDI)	NFPA 101 Class	IBC Section 2603.4 Compliant	Oxygen Index (%)	Ignition Temp (°F)	Max Thickness w/o Thermal Barrier
Type I	0.9 – 1.14	< 25	< 450	Class A (I)	YES	24.0	~680°F	IBC 2603.4 (requires TB)
Type VIII	1.15 – 1.34	< 25	< 450	Class A (I)	YES	24.0	~680°F	IBC 2603.4 (requires TB)
Type II	1.35 – 1.79	< 25	< 450	Class A (I)	YES	24.0	~680°F	IBC 2603.4 (requires TB)
Type IX	1.80 – 2.20	< 25	< 450	Class A (I)	YES	24.0	~680°F	IBC 2603.4 (requires TB)

FSI and SDI values apply to flame-retardant grade EPS per ASTM C578. Non-FR EPS may exceed these values. TB = Thermal Barrier (minimum 15-min rated, IBC Section 2603.4).

Table 1B — EPS R-Values, Thickness & Code Requirements by Type

Thickness (inches)	Type I 0.9 pcf R-value	Type VIII 1.15 pcf R-value	Type II 1.35 pcf R-value	Type IX 1.80 pcf R-value	Thermal Barrier Required	Ignition Barrier Required	IBC 2603.4 Notes
1"	3.85	3.92	4.17	4.35	YES (all)	Attic/crawl	2603.4.1.2
1-1/2"	5.78	5.88	6.26	6.53	YES (all)	Attic/crawl	2603.4.1.2
2"	7.70	7.84	8.34	8.70	YES (all)	Attic/crawl	2603.4.1.2
2-1/2"	9.63	9.80	10.43	10.88	YES (all)	Attic/crawl	2603.4.1.2
3"	11.55	11.76	12.51	13.05	YES (all)	Attic/crawl	2603.4.1.2
3-1/2"	13.48	13.72	14.60	15.23	YES (all)	Attic/crawl	2603.4.1.2
4"	15.40	15.68	16.68	17.40	YES (all)	Attic/crawl	2603.4.1.2
4-1/2"	17.33	17.64	18.77	19.58	YES (all)	Attic/crawl	2603.4.1.2
5"	19.25	19.60	20.85	21.75	YES (all)	Attic/crawl	2603.4.1.2
5-1/2"	21.18	21.56	22.94	23.93	YES (all)	Attic/crawl	2603.4.1.2
6"	23.10	23.52	25.02	26.10	YES (all)	Attic/crawl	2603.4.1.2
7"	26.95	27.44	29.19	30.45	YES (all)	Attic/crawl	2603.4.1.2
8"	30.80	31.36	33.36	34.80	YES (all)	Attic/crawl	2603.4.1.2

Table 1B — EPS R-Values, Thickness & Code Requirements by Type

Installation Location	Thermal Barrier Required	Ignition Barrier Required	Max Exposed Thickness	Code Reference
Walls / Ceilings (interior) 1-1/2"	YES — min. 1/2" gypsum board or equiv	N/A	None — must be covered	IBC 2603.4
Attic (above insulation)	NO (exempt if IBC 2603.4.1.2)	YES (unless AC377 Alt.)	Varies by listing	IBC 2603.4.1.2
Crawl space (floor/walls)	NO (exempt if IBC 2603.4.1.3)	YES (unless AC377 Alt.)	Varies by listing	IBC 2603.4.1.3
Below-grade / foundation	NO (typically exempt)	NO	Unlimited below grade	IBC 2603.4.1.4
Roof assembly (above deck)	NO (above deck, protected by roofing)	NO	Per roofing system listing	IBC 2603.4.1.6

Thermal Barrier = minimum 15-minute fire-rated separation per IBC 2603.4. Acceptable products: 1/2" Type X gypsum wallboard, 23/32" wood structural panel, or products listed per IBC 2603.4. Ignition Barrier alternatives per ICC-ES AC377 Appendix X may substitute for ignition barriers in attic/crawl spaces when foam is listed and labeled for such use.

SECTION 2 — POLYURETHANE (PU/PUR/PIR) FOAM INSULATION

Standards: ASTM C591 (rigid PU/PIR) · ASTM C1029 (spray PU, Type I open-cell / Type II closed-cell) | Contains flame retardant | Must be protected from UV

Table 2A — PU Foam Fire Properties by Type & Density (ASTM E84 / IBC 2603)

Type / Product	Density (lb/ft ³)	Cell Structure	Flame Spread Index (FSI)	Smoke Developed Index (SDI)	NFPA 101 Class	IBC 2603.4 Compliant	Oxygen Index (%)	Max Thickness ASTM E84 (tested)
Open-cell SPF (ASTM C1029 Type I)	0.4–0.6	Open	< 75	< 450	Class B (II)	YES (w/ barrier)	~25	4"
Closed-cell SPF (ASTM C1029 Type II)	1.5–2.0	Closed	< 25	< 450	Class A (I)	YES (w/ barrier)	~27	4"
Rigid PU/PIR (ASTM C591 Type I)	1.8	Closed	< 25	< 450	Class A (I)	YES (w/ barrier)	~26	4"
Rigid PU/PIR (ASTM C591 Type II)	2.5	Closed	< 25	< 450	Class A (I)	YES (w/ barrier)	~26	4"
Rigid PU/PIR (ASTM C591 Type III)	3.0	Closed	< 25	< 450	Class A (I)	YES (w/ barrier)	~26	4"
High-density PU (ASTM C591 Type VI)	6.0	Closed	< 25	< 450	Class A (I)	YES (w/ barrier)	~26	4"

Open-cell SPF Class B (FSI 25–75) requires Class B or better interior finish rating. Closed-cell and rigid PU/PIR achieve Class A. ASTM E84 tested at max 4" thickness per ASTM guidelines; thicker installations require NFPA 285 assembly testing. FSI/SDI values are for FR-grade foam — verify specific product listing.

Table 2B — PU Foam R-Values by Density & Thickness with Fire Code Requirements

Thickness (inches)	Open-cell 0.5 lb/ft ³ R-val	Closed-cell 2.0 lb/ft ³ R-val	Closed-cell 3.0 lb/ft ³ R-val	H-Density 6.0 lb/ft ³ R-val	Thermal Barrier Required	Min TB Product	Vapor Retarder Class	IBC Code Ref.
1"	3.7	6.2	6.2	5.8	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
1-1/2"	5.5	9.3	9.3	8.7	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
2"	7.4	12.4	12.4	11.6	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
2-1/2"	9.2	15.5	15.5	14.5	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
3"	11.1	18.6	18.6	17.4	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
3-1/2"	12.9	21.7	21.7	20.3	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
4"	14.8	24.8	24.8	23.2	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
4-1/2"	16.6	27.9	27.9	26.1	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
5"	18.5	31.0	31.0	29.0	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
5-1/2"	20.4	34.1	34.1	31.9	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
6"	22.2	37.2	37.2	34.8	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
7"	25.9	43.4	44.1	40.6	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4
8"	29.6	49.6	50.4	46.4	YES	1/2" Type X GWB or equiv.	Class II	IBC 2603.4

R-values: open-cell @ 3.70/in, closed-cell 2.0 lb @ 6.20/in, 3.0 lb @ 6.30/in, 6.0 lb @ 5.80/in per ASTM C518 @ 75°F aged values (FTC 16 CFR Part 460). Vapor retarder class per ASHRAE 90.1 / IRC R702.7 at rated thickness.

SECTION 3 — BARRIER REQUIREMENTS, INSTALLATION COMPLIANCE & COMPARATIVE SUMMARY

Table 3A — PU Foam Barrier Requirements by Installation Location (IBC 2603.4 / IRC R316)

Location	Thermal Barrier Required?	Min Thermal Barrier	Ignition Barrier Required	NFPA 285 Required	Max Exposed Thickness	Code Ref.
Interior walls / ceilings	YES	1/2" Type X GWB or 15-min equiv.	N/A	NO (residential)	None — must cover	IBC 2603.4
Attic (open-cell SPF)	YES	1/2" GWB	YES	NO	Per product listing	IBC 2603.4.1.2
Attic (closed-cell SPF)	NO (w/ ICC-ES AC377)	—	YES (or AC377 Alt.)	NO	9.5" (AC377 Appx X)	ICC-ES AC377 Appx X
Crawl space	NO (exempt)	—	YES (or AC377 Alt.)	NO	Per listing	IBC 2603.4.1.3
Exterior continuous insulation	NO (above grade, with cladding)	—	NO	YES (multi-story)	Per assembly	IBC 2603.5 / NFPA 285
Below-grade / foundation	NO	—	NO	NO	Unlimited below grade	IBC 2603.4.1.4
Roof — above deck (SPF roofing)	NO	—	NO	NO (single story)	Per roofing listing	IBC 2603.4.1.6 / FM 4450
Cold storage / industrial	YES	Per listing / AHJ	N/A	Per occupancy	Per engineer design	IBC 2603.4 / NFPA 13

Table 3B — EPS vs. PU Foam Fire Property Comparison Property

Property	Test Method	EPS (all types)	PU Open-cell 0.5 lb/ft ³	PU Closed-cell 2.0 lb/ft ³	PU Closed-cell 3.0 lb/ft ³	PU High-density 6.0 lb/ft ³
Flame Spread Index	ASTM E84	< 25 (Class A)	< 75 (Class B)	< 25 (Class A)	< 25 (Class A)	< 25 (Class A)
Smoke Developed Index	ASTM E84	< 450	< 450	< 450	< 450	< 450
NFPA 101 Class	NFPA 101	Class A (I)	Class B (II)	Class A (I)	Class A (I)	Class A (I)
Oxygen Index (%)	ASTM D2863	24.0	~25	~27	~27	~27
Ignition temp (°F)	—	~680	~600	~700	~720	~750
Thermal barrier req.	IBC 2603.4	YES (all)	YES (all)	YES (all)	YES (all)	YES (all)
Max ASTM E84 thickness	ASTM E84	Unlimited (w/TB)	4"	4" (or NFPA 285)	4"	4"
NFPA 285 for exterior	IBC 2603.5	YES (>1 story)	YES (>1 story)	YES (>1 story)	YES (>1 story)	YES (>1 story)
R-value per inch	ASTM C518	3.85–4.35	3.6–3.8	6.0–6.5	6.0–6.5	5.5–6.0
Vapor retarder	ASTM E96	No (permeable)	No	Class II @ 2"	Class I @ 2"	Class I @ 1"
Structural strength	ASTM D1621	5–33 psi	0.1–0.3 psi	20–35 psi	35–50 psi	100–150 psi
Water absorption	ASTM C272/D2842	<4% vol	10%	< 1%	< 0.8%	< 0.5%
CFC / HCFC content	—	None	None (water-blown)	None (HFC)	None (HFC)	None
UV resistance	—	Degrades (cover)	Degrades (cover)	Degrades (cover)	Degrades (cover)	Degrades (cover)

SECTION 4 — INSTALLATION REQUIREMENTS, WARNINGS & FIRE MARSHAL CHECKLIST

Critical Fire Safety Warnings — Required for AHJ Review

<p>THERMAL BARRIER MANDATORY All foam plastic insulation (EPS and PU) used on interior surfaces MUST be separated from occupied space by an approved thermal barrier per IBC Section 2603.4. Minimum: 1/2" Type X gypsum wallboard or equivalent 15-minute fire-rated assembly. Failure to install thermal barrier voids code compliance.</p>	<p>ASTM E84 THICKNESS LIMITATION ASTM E84 tunnel test is valid only for the thickness tested. PU spray foam tested at 4" maximum. Installations exceeding tested thickness require full-scale NFPA 285 wall assembly testing or an approved engineering alternative per IBC 2603.10.</p>
<p>NFPA 285 EXTERIOR WALL ASSEMBLIES For buildings over one story, exterior wall assemblies containing foam plastic insulation must pass NFPA 285 fire propagation test OR use a listed assembly. This applies to both EPS and PU foam in continuous insulation (ci) applications per IBC Section 2603.5.</p>	<p>UV EXPOSURE PROHIBITION Both EPS and PU foam insulation degrade under prolonged UV (sunlight) exposure. All foam must be covered promptly after installation. Exposed foam during construction is a temporary condition only. Permanent exterior use requires UV-protective cladding per manufacturer requirements.</p>
<p>COMBUSTIBILITY WARNING Both EPS and PU foam are combustible materials. Despite flame retardant additives, both materials will burn under prolonged fire exposure. EPS melts before burning. PU foam produces dense smoke. Never use either material as a finished interior surface without an approved thermal barrier. Keep away from ignition sources during installation.</p>	

Fire Marshal / AHJ Review Checklist

	Item for Verification	EPS	PU Open-cell	PU Closed-cell	Code Reference
1	ASTM E84 test report provided for specific product/thickness	Req'd	Req'd	Req'd	IBC 2603.3
2	Flame Spread Index ≤ 25 (Class A) or ≤ 75 (Class B) confirmed	< 25	< 75	< 25	IBC 2603.3 / NFPA 101
3	Smoke Developed Index ≤ 450 confirmed	< 450	< 450	< 450	IBC 2603.3
4	Thermal barrier (15-min min.) installed on all interior faces	Req'd	Req'd	Req'd	IBC 2603.4
5	Thermal barrier product listed / approved by AHJ	Verify	Verify	Verify	IBC 2603.4
6	Ignition barrier in attic/crawl space (or AC377 alt. listed)	Req'd	Req'd	Req'd	IBC 2603.4.1.2/3
7	NFPA 285 assembly test for exterior wall (if > 1 story)	Req'd	Req'd	Req'd	IBC 2603.5
8	Max installation thickness ≤ ASTM E84 tested thickness (or NFPA 285)	Verify	≤ 4"	≤ 4" or NFPA 285	ASTM E84 / IBC 2603
9	Foam covered / not permanently exposed to UV	Req'd	Req'd	Req'd	Mfr. req.
10	Product label / ICC-ES listing number provided	Req'd	Req'd	Req'd	IBC 1703
11	Vapor retarder compliance verified (if climate zone requires)	N/A	N/A	Verify	ASHRAE 90.1 / IRC
12	Jobsite fire watch during foam application (spray foam)	N/A	Req'd	Req'd	NFPA 241

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