NC Department of Insurance
Office of State Fire Marshal, Engineering Division

RE:	Appeal of the March 21, 2023	)	
	Denial of the Use of Foam	)	
	Plastic Without a Thermal	)	NCDOI DECISION
	Barrier by the Orange County	)	
	Inspection Department	)	

In accordance with N.C.G.S. § 160D-1127, Kim Parton, RA, representing herself has appealed the Orange County Inspection Department decision regarding the use of Dupont de Nemours, Inc. FROTH-PAK polyurethane foam insulation without a thermal barrier at the intersection of concrete block exterior walls and metal roof decking for a new Fire Department/EMS building located at 350 College Park Road, Hillsborough, North Carolina.

N.C.G.S. § 160D-1127 allows appeals from any order, decision, or determination by a member of a local inspection department pertaining to the State Building Code or other State building laws to the Commissioner of Insurance or his designee within 10 days of the order, decision, or determination.

PARTIES

Appellant: Kim Parton, RA
719 E. Second Ave.
Gastonia, NC 28054

Appellee: Orange County
Inspections Department
131 W. Margaret Lane
Hillsborough, NC 27278

BACKGROUND

On March 10, 2023, the appellee notified the appellant by email that the foam plastic insulation exceeded NCBC Section 2603.7 limit of 50 or less for Smoke-Develop Index.

On March 21, 2023, the appellee emailed the appellant that the application rate noted in the email string was inconsistent with the application rate required by the UES Evaluation Report Number 499 that had been submitted by the appellant.

On March 22, 2023, the appellee emailed the appellant that the (2018 edition) North Carolina Building Code (NCBC) Section 1705.2(3) required a special inspection of the thermal barrier applied over the foam plastic.

On March 30, 2023, NC Department of Insurance (DOI) received the appellant's appeal request.

ISSUE RAISED IN APPEAL

Appellants' appeal reads, in pertinent part, as follows:

> "The local authority having jurisdiction has recently notified the general contractor that they are requiring a thermal barrier to be installed over the project's foam insulation. The foam insulation is installed at the top of the exterior CMU walls to fill any voids between the CMU and the metal deck to form a complete thermal barrier envelope (refer to the attached photo for one of the installed locations, for reference). Based on the attached information we want to appeal the AHJ's decision as we feel this information demonstrates that the project's foam plastic is in compliance with the building code and does not require the use of a thermal barrier."

FINDINGS

Based on information submitted by the appellant, the undersigned makes the following findings:

1. In the appeal request the appellant notes that the building where the polyurethane foam insulation is being used is a Fire Department/EMS station.

2. Photographs submitted by the appellant show that the polyurethane foam insulation is being used to seal the thermal gap between the top of exterior CMU walls and the bottom side of corrugate metal roof decking in truck bays.

3. NCBC Section 2603.7 "Foam plastic insulation used as interior finish or interior trim in plenums" reads as follows:

> "Foam plastic insulation used as interior wall or ceiling finish or as interior trim in plenums 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 or UL 723 and shall comply with one or more of Sections 2603.7.1, 2603.7.2 and 2607.3."

4. The NCBC does not define the term "plenum", but a definition is found in the 2018 NC Mechanical Code. 2018 NC Mechanical Code Chapter 2 defines "Plenum" as follows:

> "An enclosed portion of the building structure, other than occupiable space being conditioned, that is designed to allow air

movement, and thereby serve as part of an air distribution system."

5. NCBC Section 2603.4 "Thermal barrier" reads in part as follows:

> "Except as provided for in Sections 2603.4.1 and 2603.9, foam plastic shall be separated from the interior of a building by an approved thermal barrier of ½-inch (12.7 mm) gypsum wall board 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."

6. NCBC Section 2603.4.1 "Thermal barrier not required" reads as follows:

> "The thermal barrier specified in Section 2603.4 is not required under the conditions set forth in Sections 2603.4.1.1 through 2603.4.1.14."

7. NCBC Section 2603.4.1.1 "Masonry or concrete construction" reads as follows:

> "A thermal barrier is not required for foam plastic installed in a masonry or concrete wall, floor or roof system where the foam plastic insulation is covered on each face by not less than 1-inch (25 mm) thickness of masonry or concrete."

8. NCBC Section 2603.4.1.2 "Cooler and freezer walls" reads as follows:

> "Foam plastic installed in a maximum thickness of 10 inches (254 mm) in cooler and freezer walls shall:
>
> 1. Have a *flame spread index* of 25 or less and a *smoke-developed index* of not more than 450, where tested in a minimum 4-inch (102 mm) thickness.
>
> 2. Have flash ignition and self-ignition temperatures of not less than 600°F and 800°F (316°C and 427°C), respectively.
>
> 3. Have a covering of not less than 0.032-inch (0.8 mm) aluminum or corrosion-resistant steel having a base metal thickness not less than 0.0160 inch (0.4 mm) at any point.
>
> 4. Be protected by an *automatic sprinkler system* in accordance with Section 903.3.1.1. Where the cooler or freezer is within

a building, both the cooler or freezer and that part of the building in which it is located shall be sprinklered."

9. NCBC Section 2603.4.1.3 "Walk-in coolers" reads as follows:

> "In nonsprinklered buildings, foam plastic having a thickness that does not exceed 4 inches (102 mm) and a maximum *flame spread index* of 75 is permitted in walk-in coolers or freezer units where the aggregate floor area does not exceed 400 square feet (37 m^2) and the foam plastic is covered by a metal facing not less than 0.032-inch-thick (0.81 mm) aluminum or corrosion-resistant steel having a minimum base metal thickness of 0.016 inch (0.41 mm). A thickness of up to 10 inches (254 mm) is permitted where protected by a thermal barrier."

10. NCBC Section 2603.4.1.4 "Exterior walls-one-story buildings" reads as follows:

> "For one-*story* buildings, foam plastic having a *flame spread index* of 25 or less, and a *smoke-developed index* of not more than 450, shall be permitted without thermal barriers in or on *exterior walls* in a thickness not more than 4 inches (102 mm) where the foam plastic is covered by a thickness of not less than 0.032-inch-thick (0.81 mm) aluminum or corrosion-resistant steel having a base metal thickness of 0.0160 inch (0.41 mm) and the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1."

11. NCBC Section 2603.4.1.5 "Roofing" reads as follows:

> "A thermal barrier is not required for foam plastic insulation that is a part of a Class A, B or C roof-covering assembly that is installed in accordance with the code and the manufacturer's instructions and is either constructed as described in Item 1 or tested as described in Item 2.
>
> 1. The roof assembly is separated from the interior of the building by *wood structural panel* sheathing not less than 0.47 inch (11.9 mm) in thickness bonded with exterior glue, with edges supported by blocking, tongue-and-groove joints,

other approved type of edge support or an equivalent material.

2. The assembly with the foam plastic insulation satisfactorily passes NFPA 276 or UL 1256."

12. NCBC Section 2603.4.1.6 "Attics and crawl spaces" reads as follows:

> **"**Within an *attic* or crawl space where entry is made only for service of utilities, foam plastic insulation shall be protected against ignition by $1^1/_2$-inch-thick (38 mm) mineral fiber insulation; $^1/_4$-inch-thick (6.4 mm) *wood structural panel*, *particleboard* or *hardboard*; $^3/_8$-inch (9.5 mm) *gypsum wallboard*, corrosion-resistant steel having a base metal thickness of 0.016 inch (0.4 mm); $1^1/_2$-inch-thick (38 mm) self-supported spray-applied cellulose insulation in *attic* spaces only or other approved material installed in such a manner that the foam plastic insulation is not exposed. The protective covering shall be consistent with the requirements for the type of construction."

13. NCBC Section 2603.4.1.7 "Doors not required to have a fire protection rating" reads as follows:

> **"**Where pivoted or side-hinged doors are permitted without a *fire protection rating*, foam plastic insulation, having a *flame spread index* of 75 or less and a *smoke-developed index* of not more than 450, shall be permitted as a core material where the door facing is of aluminum not less than 0.032 inch (0.8 mm) in thickness or steel having a base metal thickness of not less than 0.016 inch (0.4 mm) at any point."

14. NCBC Section 2603.4.1.8 "Exterior doors in buildings of Group R-2 or R-3" reads as follows:

> "In occupancies classified as Group R-2 or R-3, foam-filled exterior entrance doors to individual *dwelling units* that do not require a *fire-resistance rating* shall be faced with aluminum, steel, fiberglass, wood or other approved materials."

15. NCBC Section 2603.4.1.9 "Garage doors" reads as follows:

> "Where garage doors are permitted without a *fire-resistance rating* and foam plastic is used as a core material, the door facing

shall be metal having a minimum thickness of 0.032-inch (0.8 mm) aluminum or 0.010-inch (0.25 mm) steel or the facing shall be minimum 0.125-inch-thick (3.2 mm) wood. Garage doors having facings other than those described in this section shall be tested in accordance with, and meet the acceptance criteria of, DASMA 107.

Exception: Garage doors using foam plastic insulation complying with Section 2603.3 in detached and attached garages associated with one- and two-family dwellings need not be provided with a thermal barrier."

16. NCBC Section 2603.4.1.10 "Siding backer board" reads as follows:

"Foam plastic insulation of not more than 2,000 British thermal units per square feet (Btu/sq. ft.) (22.7 mJ/m^2) as determined by NFPA 259 shall be permitted as a siding backer board with a maximum thickness of $^1/_2$ inch (12.7 mm), provided that it is separated from the interior of the building by not less than 2 inches (51 mm) of mineral fiber insulation or equivalent or where applied as insulation with re-siding over existing wall construction."

17. NCBC Section 2603.4.1.11 "Interior trim" reads as follows:

"Foam plastic used as interior *trim* in accordance with Section 2604 shall be permitted without a thermal barrier."

18. NCBC Section 2603.4.1.12 "Interior signs" reads as follows:

"Foam plastic used for interior signs in *covered mall buildings* in accordance with Section 402.6.4 shall be permitted without a thermal barrier. Foam plastic signs that are not affixed to interior building surfaces shall comply with Chapter 8 of the *International Fire Code*."

19. NCBC Section 2603.4.1.13 "Type V construction" reads as follows:

"Foam plastic spray applied to a sill plate, joist header and rim joist in Type V construction is subject to all of the following:

1. The maximum thickness of the foam plastic shall be $3^1/_4$ inches (82.6 mm).

2. The density of the foam plastic shall be in the range of 1.5 to 2.0 pcf (24 to 32 kg/m^3).

3. The foam plastic shall have a *flame spread index* of 25 or less and an accompanying *smoke-developed index* of 450 or less when tested in accordance with ASTM E84 or UL 723."

20. NCBC Section 2603.4.1.14 "Floors" reads as follows:

"The thermal barrier specified in Section 2603.4 is not required to be installed on the walking surface of a structural floor system that contains foam plastic insulation where the foam plastic is covered by a minimum nominal $^1/_2$-inch-thick (12.7 mm) *wood structural panel* or approved equivalent. The thermal barrier specified in Section 2603.4 is required on the underside of the structural floor system that contains foam plastic insulation where the underside of the structural floor system is exposed to the interior of the building.

Exception: Foam plastic used as part of an *interior floor finish*."

21. NCBC Section 2603.9 "Special approval" reads as follows:

"Foam plastic shall not be required to comply with the requirements of Section 2603.4 or those of Section 2603.6 where specifically approved based on large-scale tests such as, but not limited to, NFPA 286 (with the acceptance criteria of Section 803.1.2.1), FM 4880, UL 1040 or UL 1715. Such testing shall be related to the actual end-use configuration and be performed on the finished manufactured foam plastic assembly in the maximum thickness intended for use. Foam plastics that are used as *interior finish* on the basis of special tests shall conform to the *flame spread* and smoke-developed requirements of Chapter 8. Assemblies tested shall include seams, joints and other typical details used in the installation of the assembly and shall be tested in the manner intended for use."

22. ICC Evaluation report ESR-3228 for FROTH-PAK™ polyurethane foam insulation Section 5.0 "Conditions of Use" reads in part as follows:

"The FROTH-PAK™ polyurethane foam insulation described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

> 5.2 The insulation must be separated from the interior of the building by an approved thermal barrier as described in Section 4.3, except as described in Sections 4.4, 4.5, 4.6 and 4.7."

Section 4.7 "Attics and Crawl Spaces" does not apply to this appeal.

23. ICC Evaluation report ESR-3228 for FROTH-PAK™ polyurethane foam insulation Section 4.3.1 "Application with a Prescriptive Thermal Barrier:" reads in part as follows:

> "The insulation must be separated from the interior of the building by an approved thermal barrier of ½-inch-thick (12.7 mm) gypsum wallboard or an equivalent thermal barrier complying with IBC Section 2603.4 or IRC Section R316.4, as applicable, except where installation is as described in Sections 4.3.2, 4.4, 4.5 and 4.6."

24. ICC Evaluation report ESR-3228 for FROTH-PAK™ polyurethane foam insulation Section 4.3.2 "Application without a Prescriptive Thermal Barrier:" reads in part as follows:

> "The code-prescribed thermal barrier may be omitted when installation is in accordance with this section. The FROTH-PAK™ polyurethane foam insulation and DC 315 coating (ESR 3702) may be used in lieu of the code-prescribed thermal barrier. The foam plastic insulation thickness must not exceed 3½ inches (89 mm) in walls and ceilings, and must be covered with 14 dry mils (0.36 mm) [20 wet mils (0.51 mm)] of DC315 coating applied at a minimum rate of 1.28 gallon (4.48 L) per 100 square feet ($9.3m^2$)."

25. ICC Evaluation report ESR-3228 for FROTH-PAK™ polyurethane foam insulation Section 4.4 "Joint Sealant on Metallic Air Ducts:" reads as follows:

> "The insulation, installed at a maximum thickness of 2 inches (51 mm) and width of 6 inches (152 mm), may be used to seal the joints of non-factory-made (non-listed) air ducts, in accordance with Section M1601.4.1 of the IRC. See Figure 1."

26. ICC Evaluation report ESR-3228 for FROTH-PAK™ polyurethane foam insulation Section 4.5 "Application as Air Barrier Material:" reads as follows:

> "FROTH-PAK™ may be used in any type of construction as an air barrier material for wall/floor and roof/wall intersection in exterior building envelope when installed at a maximum thickness of 2 inches (51 mm) and a width of 6 inches (152 mm) (the length is unlimited). See Figures 2 and 3.

> In wall/floor intersections, the foam plastic may be applied over a fire-resistant joint without affecting the fire-resistance rating provided the foam plastic installation is limited to 2 inches by 2 inches (51 mm by 51 mm) and unlimited length."

27. ICC Evaluation report ESR-3228 for FROTH-PAK™ polyurethane foam insulation Section 4.6 "Use on Sill Plates, Band Joists and Headers:" reads as follows:

> "The FROTH-PAK™ polyurethane foam insulation with a maximum thickness of 2 inches (51 mm) may be applied to sill plates, band joists and headers without a thermal barrier or ignition barrier in Type V construction in accordance with OBC Section 2603.4.1.13 and IRC Section R316.5.11."

CONCLUSIONS

Based on the foregoing findings of fact, the undersigned makes the following conclusions:

1. 2018 NCBC Section 2603.7 only applies to finishes and trim within a plenum. The foam plastic insulation involved with this appeal is not within a plenum as defined by the 2018 NC Mechanical Code; so, Section 2603.7 does not apply to this appeal.

2. 2018 NCBC Section 2603.4 requires foam plastic insulation to be separated from the interior of a building with a thermal barrier.

3. NCBC Sections 2603.4.1 "Thermal barrier not required" allows the deletion of a thermal barrier under specific conditions described in Section 2603.4.1.1 through 2603.4.1.14. None of the conditions described in 2603.4.1.1 thorough 2603.4.1.14 apply to this appeal.

4. ESR-3228 Section 4.3.2 "Application without a Prescriptive Thermal Barrier" indicates that a coating named DC 315 complying with ESR 3702 may be used in lieu of the prescriptive thermal barrier listed in the codes. While Section 4.3.2 lists DC 315 as a product that may be used in lieu of a prescriptive thermal barrier, it does not indicate that FROTH-PAK™ polyurethane foam insulation can be installed without a thermal barrier.

5. ESR-3228 Section 4.5 "Application as Air Barrier Material" allows the use of FROTH-PAK™ polyurethane foam insulation at the intersection of a wall/roof when specific conditions are met but does not indicate that FROTH-PAK™ polyurethane foam insulation can be installed without a thermal barrier.

6. ESR-3228 Section 4.6 "Use on Sill Plates, Band Joists and Headers" allows the use of FROTH-PAK™ polyurethane foam insulation at sill plates, band joists and headers without a thermal barrier for Type V construction only. The appellant indicated that the building is Type II construction; so, Section 4.6 does not apply to this appeal.

APPEAL DECISION

Based on the above findings and conclusions:

The appellee's decision to require a thermal barrier to separate the FROTH-PAK™ polyurethane foam insulation from the interior of the building is UPHELD.

This 11th day of April 2023.

Carl Martin, RA
Deputy Commissioner
Division Chief of Engineering
North Carolina Department of Insurance

FURTHER APPEAL RIGHTS

The appellant and appellee have the right to appeal this decision to the NC Building Code Council. Please refer to N.C.G.S § 160D-1114 and the NC Administrative Code and Policies Section 202.9.2 for further appeal rights. In accordance with N.C.G.S § 143-141 you have 30 days in which to appeal this decision to the NC Building Code Council.

Cc:
Michael Rettie, Chief Building Official, Orange County
Nathan Childs, Special Deputy Attorney General – NCBCC
Erin Gibbs, Assistant General Counsel, NCDOI