WOODFORD COUNTY BOARD OF EDUCATION
AGENDA ITEM

ITEM #: 14F **DATE:** December 13, 2021

TOPIC/TITLE: New WCHS - Waiver petition for KDE requirement for sloped roof framing

PRESENTER: Jeff Martello

ORIGIN:

- ☐ TOPIC PRESENTED FOR INFORMATION ONLY (No board action required.)
- ☒ ACTION REQUESTED AT THIS MEETING
- ☐ ITEM IS ON THE CONSENT AGENDA FOR APPROVAL
- ☐ ACTION REQUESTED AT FUTURE MEETING: (DATE)
- ☐ BOARD REVIEW REQUIRED BY
  - ☒ STATE OR FEDERAL LAW OR REGULATION
  - ☐ BOARD OF EDUCATION POLICY
  - ☐ OTHER:

PREVIOUS REVIEW, DISCUSSION OR ACTION:

- ☒ NO PREVIOUS BOARD REVIEW, DISCUSSION OR ACTION
- ☐ PREVIOUS REVIEW OR ACTION
  - ☐ DATE:
  - ☐ ACTION:

BACKGROUND INFORMATION:

Board's formal petition for a waiver for the KDE requirement for sloped roof framing. This project will use lightweight insulating concrete to provide a sloped roof surface instead of sloping joists for the majority of the roof areas.

SUMMARY OF MAJOR ELEMENTS:

New WCHS - Waiver petition for KDE requirement for sloped roof framing

IMPACT ON RESOURCES: NA.

TIMETABLE FOR FURTHER REVIEW OR ACTION: NA

SUPERINTENDENT'S RECOMMENDATION: ☑ **Recommended** ☐ **Not Recommended**

Danny Adkins Jr.

rosstarrant architects

architecture · civil engineering · landscape architecture · interior design

December 2, 2021

Mr. Greg Dunbar
Manager, District Facilities Branch
Division of District Support
Kentucky Department of Education
300 Sower Boulevard
Frankfort, Kentucky 40601

Re: New Woodford County High School—Phase 1
Woodford County Public Schools
Versailles, Kentucky
RTA 1916
BG 19-353

Dear Mr. Dunbar:

I am writing on behalf of Woodford County Public Schools to request a variance to the KDE regulation requiring sloped roof structure, on the majority of the roof area on the above-mentioned project. As a firm, our typical approach has been to use a sloping lightweight insulating concrete system placed on the metal roof deck on metal roof joists which are level due to a consistent bearing height for both exterior and interior load bearing CMU walls. The ¼" per foot slope is achieved by placing a slurry of lightweight in the deck flutes prior to the placement of expanded polystyrene board (EPS) insulation which increases in thickness by 1" every 4 feet to create a stepped substrate on which the lightweight insulating concrete is placed with a minimum thickness of 2" to 3" before it goes back to the 2" thickness as it passes over each rising top surface of the board insulation. In this way the expanded polystyrene board insulation is captured in the lightweight concrete creating a monolithic insulating and sloping structure on which a variety of roof membranes may be placed.

The following reasons for this system approach are offered for your consideration;

Structure

While we definitely agree that roof slope should not be generated by using tapered perlite or tapered polyisocyanurate insulation boards, we believe the lightweight insulating concrete by its very nature and method of installation becomes part of the roof structure.

The lightweight concrete is cast in place on the roof deck. It does not require any type of additional adhesive or mechanical fastening which is required for board insulation. The lightweight concrete has a minimum compressive strength of 200 psi which is 28,800 psf (144 sq in X 200 psi), or almost 10 times the 3,000 psf typically used as a foundation bearing pressure. This strength is what allows the lightweight concrete to hold the mechanical fasteners to install an SBS Modified Bituminous Asphalt roof membrane over the lightweight concrete for example. No board insulation is able to hold a mechanical fastener for fastening the roof membrane. In fact all boards must themselves be mechanically fastened to the roof deck before a roof membrane may be fully adhered to the board insulation by hot asphalt or cold adhesive.
Another reason we believe the lightweight becomes a part of the structure is its ability to remain in place when it is time to replace the existing roof membrane. We have done a number of re-roof projects where the old roof membrane was removed from the lightweight and the lightweight was patched prior to placing the new roof membrane. Even when roof leaks from the failing old roof

allowed water to reach the lightweight and travel on down into the building we have been able to remove the old roof, allow the lightweight concrete to dry out once exposed to the sun and wind, and reach the required strength based on fastener pull out testing, to allow the new roof to be installed. We would never allow the installation of a new roof over wet polyisocyanurate or perlite insulation boards. Once those types of boards get wet they deteriorate and will not dry out to be allowed to remain in place.

Additionally, since the lightweight concrete has a strength of 200 psi (28,800 psf) and is poured into the metal deck flutes, it is able to bridge joints between metal decks that run in opposing directions, creating a monolithic substrate for the roof membrane to be attached to. Other systems require a roof expansion joint or vertical stem wall to isolate the deck movement so it is not telegraphed through the board insulation to the roof membrane, stretching and tearing the roofing material.

An additional benefit to generating slope with lightweight concrete is the installation of level joists is much easier to install, as you have a uniform bearing elevation and joist seat. Our experience has been less confusion and cost associated with a level joist and deck for the steel fabricator and erectors as well as the masonry contractor installing the bond beams for bearing.

Flexibility

When the roof framing is sloped to the interior, terminating at a low bearing point on a bearing wall or steel beam, usually at a corridor wall, that is where the low point in the deck will be. This is where the roof drain should be located, but the drain must be moved to one side or the other of the low point to avoid the CMU wall or steel beam below. This often leads to ponding on the roof because the roof drain is not located at the true low point. When lightweight concrete is used to generate the roof slope you have the flexibility to locate the drains where they will not conflict with walls, beams or joists below. You also have the flexibility to create specific drain areas over the entire roof areas of the building by locating the drains where best and sloping to that location.

Another issue with sloped metal deck is coordinating the roof curbs for roof top units arriving on the job at the correct slope, to counter the roof slope, and provide a level curb top for placement of the HVAC unit. While this sounds minor the flexibility of a simple 24" tall level curb placed directly on the metal deck with the lightweight poured around it with an integral cricket to send water around the curb and to the drain is a nice feature. You can turn the unit 90 degrees if required and all you need to do is adjust the steel supports between joists. The curb will still work.

R-Value

The thermal envelope of the building is very important, with the insulation value of the roof the most important surface. While a high R-value can be reached with either system lightweight or polyisocyanurate, the installation of polyisocyanurate boards will always have hundreds of feet of edges that will always have some gaps even when boards are staggered in layers, and will have hundreds of metal mechanical fasteners down to the roof deck that create a thermal bridge. In a lightweight insulating concrete system the EPS insulation with its gaps is encapsulated, and the lightweight concrete creates a monolithic mass filling the flutes of the decks, eliminating all but the perimeter gaps (and even those are poured against the walls of the parapet for an exact fit) which eliminates almost all air infiltration and thermal breaks.

We also like the feature of the sloped lightweight having a lower R-value at the drain as compared to the rest of the roof surface, because it is the thinnest section. This serves to allow the roof drain area to warm up sooner than the surrounding areas in freezing temperatures allowing snow and ice as it melts to enter the roof drains. With an even thickness of board insulation the drains may not be the first area to melt.

Life Cycle Cost

While the initial cost of the lightweight concrete is comparable to polyisocyanurate with a wood fiber board, the real costs are shown in the life of the roof. When the roof membrane on the polyisocyanurate is replaced much of the insulation is replaced at that time. With the lightweight concrete system only the roof membrane is removed and replaced. The lightweight concrete typically remains in place. We believe this system is often the most appropriate system in meeting 702 KAR 4:170, Part 3.d, providing low maintenance, maximum life-cycle service, and a unit cost within the budget established for the project.

Taking all of these factors into account we believe, that level framing and deck with the lightweight insulating concrete system completing the sloped roof structure, offers a real value to the school districts we serve. Considering all the factors of structure, flexibility, R-value, initial cost, long term cost, and overall durability of the system, we would request Woodford County Public Schools be allowed to implement this system on the new high school.

If we can help answer any questions regarding the system you or your staff may have please contact our office to discuss further.

Sincerely,

Michael Hughes, AIA, LEED AP
Project Manager

/mh

c: Danny Adkins, WCPS Superintendent
Jeff Martello, WCPS Chief Operating Officer & Director of Finance
Sarah Lamere, AIA, LEED AP BD+C, WELL AP
File 1916
LT211202-KDE-Sloped Structure Waiver Request-1916