



ON THE COVER

When a town had to rebuild two schools from the ground up, masonry provided both aesthetics and peace of mind.

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Echelon is the new consolidated brand for the masonry products and services of Oldcastle Architectural.



FEATURES

- 03Letter from the Editor
- 04 Reader Feedback
- 06 Masonry Protects Life, Property

Masonry can stop a fire from spreading long enough to give firefighters time to gain control, won't create toxic smoke, and often requires less post-fire remediation.

10 **Product Spotlight** InsulTech Fire Properties

> InsulTech has fire-resistant properties that make it well-suited for schools, hospitals and other institutions

14 Masonry Solves Fire Stations' Code Challenge

> Concrete walls meet residential and storage space requirements in fire houses, while providing design flexibility that makes for good neighbors.

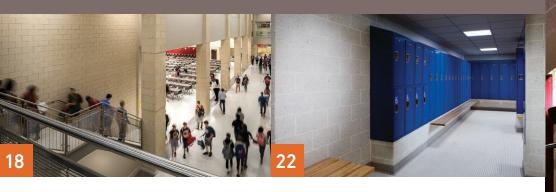
18 **Design Perspective**

Konrad Judd, Chief Design Officer for Huckabee, Fort Worth, Texas

The West Independent School District's Middle and High Schools celebrate Rebirth, look to future, after devastating loss.

22 Fireproof Testing: Load-Bearing Materials

> Combustible materials are often tested at 78% of the total load, which is up to 22% less than the load they'll need to bear in the event of a real fire.



Letter from the Editor

In recent years, there has been a rise in fire events from wildland areas to inner cities—including the devastating high-rise building fire in London. To design and build a structure that will withstand the test of time and resist fires, it takes commitment, education and knowledge of building materials' fire properties.

This includes safeguarding life and property by constructing buildings using masonry and other resilient materials. Resilient products and systems will afford occupants shelter and evacuation time alike, are less prone to total loss, and offer quicker remediation following a fire.

In this issue, we look at concrete masonry as a resilient building material able to protect life and property. We'll look, in particular, at examples of the use of concrete masonry in fire stations, and as the primary structural and facing material in a Texas school rebuilt after a tragic fertilizer plant explosion.

As always, we welcome your feedback on this issue and ideas for future *Modern Masonry* issues.

SUBMIT IDEA



In 100 words or less, why is masonry the best building material to meet the challenges of modern design?

66

Sustainability is the norm for building design today. Masonry works well with green design strategies by offering longevity, durability and low maintenance, optional regional sourcing for natural stone products, and potential recycled content and/or reuse of reclaimed materials for engineered products. In regard to aesthetics, masonry provides probably the largest palette of options to design with of all building materials. There are almost unlimited possibilities for color, texture, sheen, scale, light/shadow play, and patterning or geometry. Masonry is an incredibly versatile building material and can be used for design concepts ranging from hi-tech to handcrafted and anywhere in between.

- JONATHAN KHARFEN, Principal, Verner Johnson, Inc.

READER

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FIGHTING FIRE DAMAGE AND LOSS WITH MASONRY







From increasing escape time and reducing flame spread to speeding recovery, masonry is critical to fire safety

Fire is one of the most devastating threats a building faces. It is one with many potential causes, such as human error or electrical malfunctions, or weather events such as hurricanes, tornadoes and lightning storms. Because fire can move quickly through a structure, it can cause severe damage before even a well-timed response occurs.

To protect a building and its occupants, designers employ a wide variety of safeguards, ranging from fire suppression systems and placement of exits to the use of fireproof or resilient building materials such as steel, masonry, gypsum and concrete. As a code-recognized non-combustible material, concrete is an excellent material choice. From structural block to designer colors and textures of veneer, concrete is also one of the most aesthetically versatile resilient materials for both the structure and facing surfaces of a building.

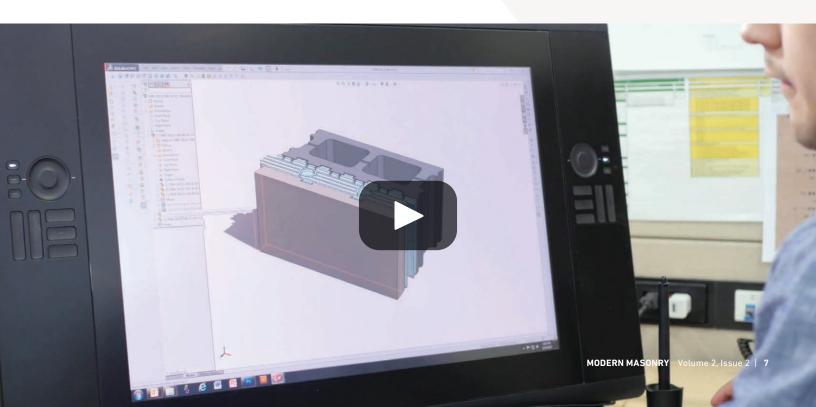
Used for exterior walls or a roof, concrete keeps fire from jumping from building to building in close quarters.

Additionally, masonry architectural blocks and veneers can provide non-combustible assurance in combination with numerous aesthetic options for designers.



Many of Oldcastle Architectural's Echelon brand concrete masonry assemblies can provide fire ratings up to four hours.

One convenient, cost-saving option for veneer wall surfaces is to use Insulated Concrete Masonry Unit (ICMU) systems, which incorporate pre-assembled Structural Masonry Unit (SMU), a molded expanded polystyrene (EPS) insulation insert and thin veneer face. Because most insulation is flammable, the International Building Code (IBC) mandates that these materials be protected by fire-resistance-rated materials or assemblies in wall and roof assemblies, to prevent the plastic insulation from contributing to the spread of fire in a building. **Learn more about ICMU wall systems in the video below.**







FIRESTOPPING FOR **CONCRETE MASONRY WALLS**

Concrete masonry is widely specified for fire walls and fire barriers because it is noncombustible. durable and economical.

SEE NCMA RECOMMENDATIONS

Within a building, concrete containment walls buy firefighters time to control the spread while civilians exit. Since it doesn't burn, concrete also will not contribute to the buildup of smoke and toxic gases, the inhalation of which is the primary cause of death by fire ("The Consequences of Fire," NFPA, www. nfpa.org/press-room/reporters-guide-to-fire-and-nfpa/ consequences-of-fire).

It's important to note, slower burning wood products, those that have been charred, have been promoted for use as a sustainable alternative for tall buildings. However, the National Fire Protection Association states.

"Previous research has shown that timber elements contribute to the fuel load in buildings and can increase the initial fire growth rate. This has the potential to overwhelm fire protection systems, which may result in more severe conditions for occupants, fire fighters, property and neighboring property."

In fact, charring can increase fire intensity and burn rate while adding to the smoke created by the fire.

After a fire, concrete masonry walls often need only cleaning and repair. In fact, only one percent of concrete buildings are demolished due to fire.

The greatest damage concrete masonry walls sustain in a fire is often that resulting from lost support (when other materials give way around the masonry), and not from direct contact with the fire.

Concrete masonry is a reliable component in protecting a building, its assets and occupants from fire. With so many attractive sizes, styles, colors and systems available for structural and non-structural use, it can also be the most seamless fire protection system in a building.

BD+C CEU COURSES COVER TOP ISSUES IN MASONRY

Oldcastle features several BD+C University courses to keep you up-to-date on the latest issues in modern masonry. Earn CEU credits when your schedule allows and find informative articles and videos. Topics include evolving energy codes for walls, moisture management, designing with stone veneers and more. More information about CEU courses is available online.

EARN CREDITS







PRODUCT SPOTLIGHT

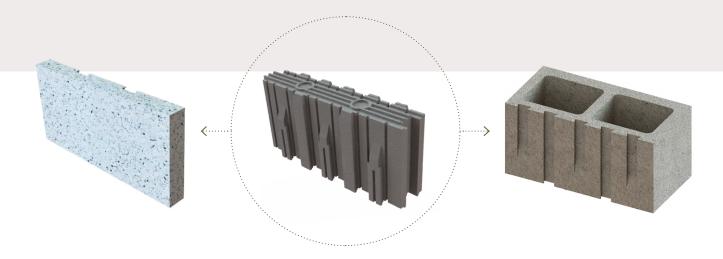
InsulTech Fire Properties

Echelon's InsulTech System™ combines install convenience with fire code adherence.



InsulTech System Fire Properties

Echelon's InsulTech System meets the International Building Code (IBC) mandate for insulation, because it is held between the two concrete block shells by dove tail slots and internal stainless-steel metal anchors molded into the EPS inserts.





NATIONAL FIRE PROTECTION ASSOCIATION

The leading information and knowledge resource on fire, electrical and related hazards.

LEARN MORE ABOUT NFPA

This creates a tight-fitting single unit. Additionally, InsulTech meets the IBC exception criteria for National Fire Protection Association (NFPA) 285 testing, which

excludes: "Wall assemblies where the foam plastic insulation is covered on each face by a minimum 1 in. (25 mm) thickness of masonry or concrete and meeting one of the following: a) there is no air space between the insulation and the concrete or masonry (as occurs with foamed-in-place insulation); or the insulation has a flame spread index of 25 or less as determined by ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials, or UL 723, Standard for Test for Surface Burning Characteristics of Building Materials, (refs. 3, 4) and the air space between the insulation and the concrete or masonry does not exceed 1 in. (25 mm)." InsulTech also has <u>Fire Integrity™</u> for fire safety. ■

ASTM E119 TEST METHOD TIME-TEMPERATURE CURVE FOR ASTM STANDARD E119 2400 1200 2000 Temperature (Deg. F) 1000 1600 800 1200 600 800 400 400 200 0 Time (Hours) **WATCH A TEST**

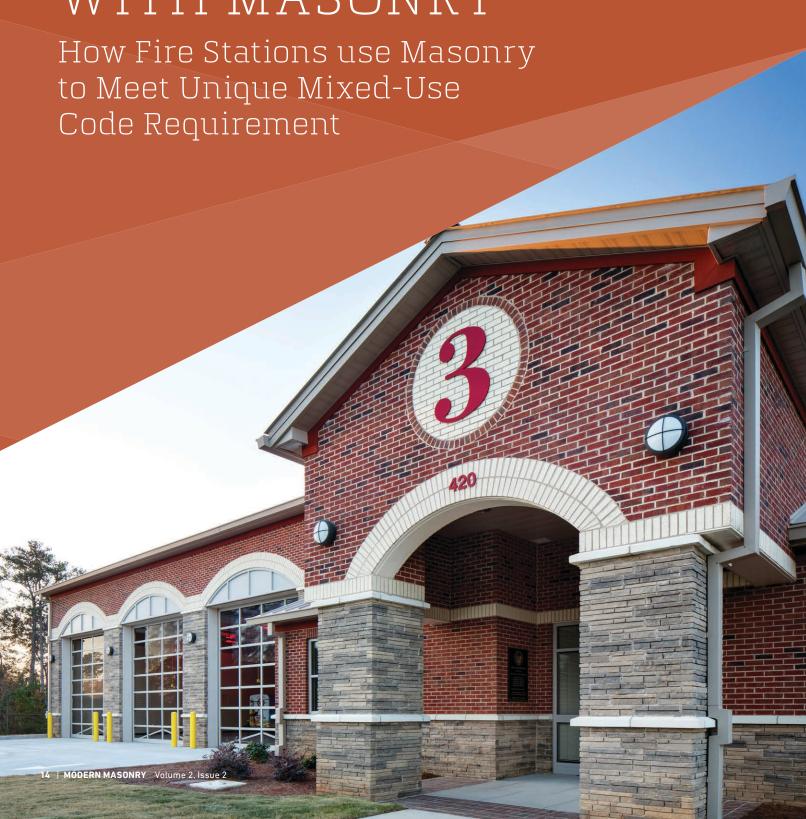


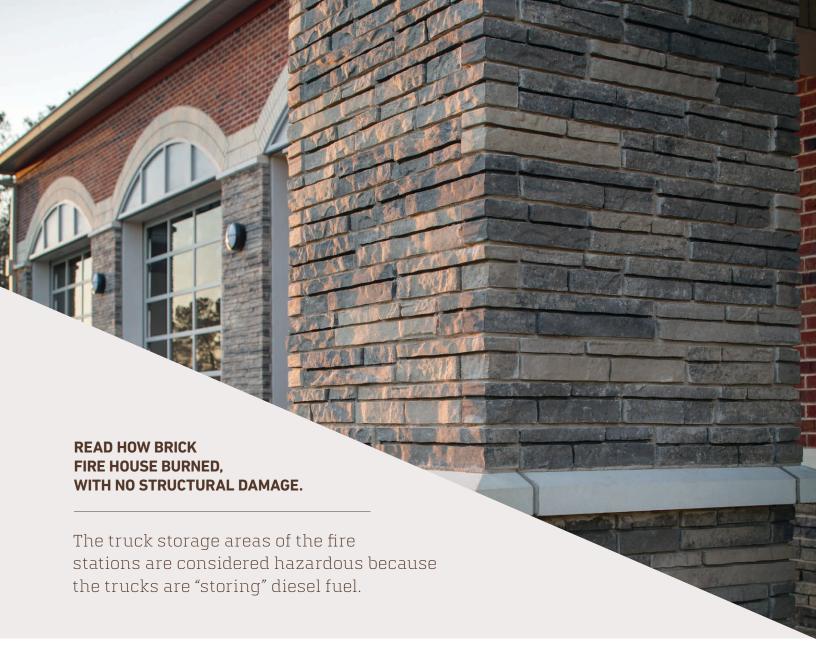
FIRE RESISTANCE RATING OF BRICK MASONRY

E119 procedures, The Brick Industry Association stream test conducted immediately after the wall has standing when other parts of the building have been

READ TECHNICAL NOTES







Bill Howell, architect and president of The Howell Group, Inc. in Marietta, Georgia, has designed 29 fire stations in the State of Georgia in the past 25 to 30 years. Fire stations pose a unique opportunity for architects because towns need to add fire services as residential development expands, to keep response time and insurance premiums both low. However, Howell points out they also pose a unique problem in that they house people alongside highly combustible fuel in large trucks.

"I can't think of any other situation in which to meet code you are dealing with this type of mixed-use occupancy."

BILL HOWEL

"The International Building Code has specific separation requirements for the apparatus bay, or storage areas, and for the residential area. To meet code, you have to separate the two types of occupancies with a fire-rated wall assembly such as concrete block and/or sprinklers."



Howell explains the truck storage areas of the fire stations are considered hazardous because the trucks are "storing" diesel fuel. In these cases, the building code requires the use of a material with a two-hour fire rating between the storage and residential areas (if the building doesn't have fire sprinklers). Howell achieves this with an 8-inch* heavy duty concrete block wall.

8"

Because many fire stations are in the residential areas they serve, Howell is always mindful of aesthetics. This is a lesson he learned long ago on one of his first projects. The homeowners' association (HOA) was concerned property values would decrease if an unsightly, industrial-looking fire house rose across the street. Howell's team looked at the prominent architectural features of the subdivision and designed the fire station to blend in. When the HOA saw the design, it dropped a lawsuit it had filed to block construction.

*Regional ratings vary, so not all 8" units are 2-hour rated. Contact an Oldcastle representative to verify the rating for your region.

"Since then, we've always taken the same approach, particularly when working in a subdivision area," says Howell. "It makes the fire station a good neighbor."

A recent project located in a small town in Georgia wasn't in a subdivision, but was near the old downtown historic area. For this design, Howell tried to relate to the historic area by using conventional modular brick from Oldcastle, as well as Echelon's Waterford Stone® Artisan Masonry Veneers around the base of the fire station and on the entrance columns.

The Waterford Stone has a handchiseled texture reminiscent of natural stone, integrated color, and is modular (full-depth) so there's less cutting and waste. The veneer is also mold resistant and repels water.

"We often use a cast stone on fire stations because the current trend for homes is toward a dual stone and brick exterior. It's a nice, attractive look. The client benefits from this as well because it is lowmaintenance, durable and cost-effective."

BILL HOWEL

All fire stations he designs also have clearlydefined public entrances. "The station needs to be approachable, and people don't feel comfortable walking up to a fire station if they're not sure where they should go. There's always that concern that they'll be walking in front of the truck bay when there's a call." In this case, the Waterford-wrapped columns accentuate the main doorway to the right of the bays.

Since 2016, Echelon's products have been used on 32 fire stations across the United States. Regardless of the location or design, the one feature they all share is that they house diesel trucks (and fuel) just feet apart from human habitats. Oldcastle Architectural's Echelon brand offers products that affordably meet the code requirements for these unusual spaces while also providing minimal maintenance for a long lifespan.

WATERFORD STONE **MASONRY VENEERS**

feature the modern benefits of manufactured masonry, including a diverse array of sizes and colors that provide unparalleled design flexibility.



QUIK-BRIK

offers efficient. one-step installation, the rich look of brick masonry and a variety of colors and shades. It is concrete masonry so does require minimal structural reinforcement.



WANT TO LEARN MORE? SIGN UP FOR A LUNCH & LEARN

High-end architectural concrete masonry units can be made in a number of different finishes including glazed, ground face, filled and polished, shot blasted, acoustical sound absorbing and limestone based. In addition, because of its modular nature, different concrete masonry units can be combined within the same wall to achieve variations in texture, pattern and colors. Learn the

basics of designing with architectural masonry blocks in Designing with Innovative Architectural Blocks for Buildings.

SIGN UP FOR LUNCH & LEARN







West School District "Rising Up" with Masonry After Nearby Explosion Destroys Schools

Konrad Judd, chief design officer with Huckabee, an architecture/engineering firm in Fort Worth, Texas, is an internationally-recognized thought-leader in educational design. With more than 20 years designing educational environments, he believes design should be holistic, human-centric and evidence-based in its execution. As if to underscore his beliefs, in 2016, the completion of one of his projects—a new high school/middle school—helped an entire town "Rise Up" following a devastating loss.

On April 17, 2013, a fertilizer plant explosion leveled the town of West, Texas. Five-hundred homes were destroyed and 15 people were killed. The result of a fire in the plant, the force of the explosion was equivalent to a magnitude 2.1 earthquake. West Mayor Tommy Muska was quoted in a CNN story, "It was like a nuclear bomb went off." In fact, people reported seeing mushroom clouds. Amidst all the loss, families soon learned the intermediate school, middle school and high school were no longer safe to use and needed to be rebuilt. With funding from FEMA and a fundraising campaign, the West Independent School District initiated "Rise Up," a major rebuilding initiative.

"Our structural engineers determined the elementary school could be repaired, but the intermediate, middle and high schools were too badly damaged and unsafe," explains Judd. "At the time, the school district decided to turn the loss into an opportunity to push forward and design for the future and seize the moment."

The middle and high schools were merged into one complex, a move that would prove more economical as well as efficient. The middle school gymnasium doubles as a shelter that can withstand up to an EF5 tornado. "The shelter can accommodate every individual in the school to protect against tornadoes, but also against unpredictable traumatic events such as the plant explosion," says Judd.





When designing the new West Independent School District (ISD) High School/Middle School, Judd says his team first looked at the profile of the town of West. A small town of roughly 2,800 people outside Waco, it is referred to as the "Czech Heritage Capital of Texas" because of its strong Czechoslovakian roots. Most of the town's buildings and shops are quaint and rich with history.

In contrast, the school district wanted the school to communicate the future, what they hoped to achieve and how they want to educate students in years to come.

"We looked to blend traditional and modern aesthetics to convey all that they are and all they want to be," Judd says.

The former school buildings were constructed of load-bearing concrete masonry and structural steel, while the new design communicates the historic nature of the town through a combination of red brick and Echelon's Jewell Stone 4x12x24 Cordova Buff High Polished, as well as 8", 4" and 12" Cordova Buff High Polished. Glass and metal are used in contrast to portray the futuristic quality of the new building.

"We chose Cordova stone because of the density of the product as well as the polished finish. It provides a more refined look. It also gave us lots of choices because there were many sizes. Using different dimensions of the stone throughout allowed us to add detail to the architecture."

KONRAD JUDD

The Cordova materials are also used on the interior, in the two-story main corridor and dining area. This was also a design choice that considered both aesthetics and maintenance.





Fire Resistance Ratings Can be Misleading

Not all means for complying with required fire resistance ratings are created equal, and many designers have been relying on ratings for load bearing combustible systems that in effect only allow for a portion of the total load of the assembly. In the event of a fire, this can result in failure sooner than anticipated when using these assemblies.

International Building Code 2015 provides several paths to compliance, including prescriptive design, use of accepted calculation methods, and actual physical testing per ASTM E119 or UL263 (Ref. IBC 703.3).

For a load-bearing assembly, ASTM E119 requires: "Throughout the fire endurance and hose stream tests, apply a superimposed load to the specimen to simulate a maximum load condition. This load shall be the maximum load condition allowed under nationally recognized structural design criteria unless limited design criteria are specified and a corresponding reduced load is applied." (Section 15.1 of ASTM E119)

"For a fire test of a load bearing wall, then, the maximum allowed design load for that assembly should be applied," explains Jason Thompson, VP Engineering, National Concrete Masonry Association (NCMA).

A discrepancy arises, though, if one follows the prescriptive compliance path in the IBC (Section 721). Footnotes within this section allow the use of GA 600, the Gypsum Association's Fire Resistance Design Manual, to essentially serve as an extension of the prescriptive compliance method for fire resistance rating.

"The disconnect that can happen between architect, engineer, and building code official or inspector is connecting the dots between the fire rating for a given assembly and the permitted design load for that assembly to achieve that specified fire rating. Some construction materials quickly lose strength when subjected to fire; concrete masonry does not."

JASON THOMPSON



VIEW REPORT

The Gypsum Association's Fire Resistance Design Manual makes note of this itself (page 7), citing:

"Where a load-bearing fire rated wood stud wall assembly contained in this Manual is specifically designed for structural capacity, the design value in compression parallel to the grain adjusted for slenderness ratio (Fc') used in such analysis shall be taken as 78 percent of the maximum Fc' value determined in accordance with normal design practice but shall not exceed 78 percent of the Fc' value for such member having a slenderness ratio (le/d) of 33."

Thompson concludes, "Essentially, if a designer has a fire-rated wood/gypsum assembly, it may have been tested at only a fraction of their design strength—potentially leaving a gap between what they are tested to withstand and what they are being designed to withstand."

BALANCED DESIGN FOR FIRE PROTECTION

According to the United States Fire Administration (USFA), multi-family residential building fires accounted for an annual estimated 108.000 reported fires between 2012 and 2014 (29 percent of all residential building fires nationally). These fires resulted in an annual average of 410 deaths, 4,125 injuries, and 1.3 billion dollars in property loss (according to a special report, "Multi-family Residential Building Fires, 2012–2014"). The National Concrete Masonry Association (NCMA) advocates balanced design for fire protection in multi-family housing. This is comprised of a detection system, containment system and an automatic suppression system. Concrete plays a significant role in compartmentation of fire as it can stop the spread of fire from one room to another and from unit-to-unit in multi-family housing.

LEARN MORE ON BALANCED DESIGN

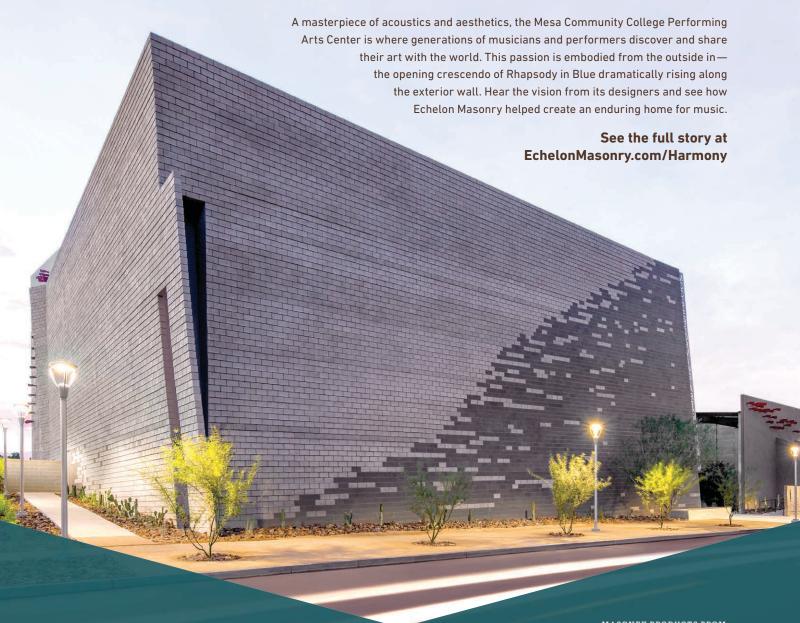
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