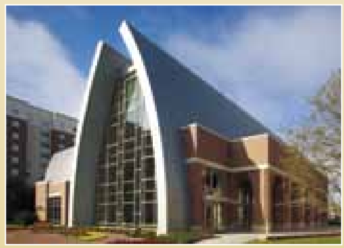
BRICK IN ARCHITECTURE

From the Brick Industry Association

The 2011 Brick In Architecture Award Winners





BEST IN CLASS WINNERS

IN THIS ISSUE – DECEMBER 2011

Since 1989, the Brick In Architecture Awards have been one of the most prestigious national architectural award programs featuring clay brick. Architecture firms from around North America enter their best projects to be judged by a jury of their peers.

This year, architects from around the United States independently reviewed and scored each of the entries. Based on the technical and creative use of brick in meeting the aesthetic and functional design challenges, the Brick Industry Association is pleased to showcase the following projects which were chosen as the Best in Class in their respective categories.

Montana State Fund Building and Parking Garage
Helena, Montana

Brick Brings Color to Big Sky Country

When the Montana State Fund needed to consolidate the operations from three existing leased buildings to a single facility, they worked closely with the City of Helena to identify a site that would keep the facility located downtown.

Early in the process, the architects established a series of guiding design principles for the new Montana State Fund Building and Parking Garage. First and foremost, the team sought to deliver a high-quality building that expresses strength and stability while reflecting its Montana surroundings. They also wanted a facility that could accommodate future growth. Lastly, they needed to design a contemporary building that was suitable to the scale and proportion of downtown Helena.

The use of clay brick and color played a key role in the building's design, and the architects used color in a way that breaks up the expanses of wall into smaller interlocking volumes. By using two different shades of the same type of brick, the design team achieved the desired layered complexity, while maintaining a consistent bond pattern throughout.

A dry-pressed brick provided the appropriate color and texture as outlined in the design goals, and it also helped the project achieve the regional material credit for LEED® certification. Given the durability of brick, it also helped provide the image of the permanence and stability required by Montana State Fund.

In the end, the Montana State Fund Building achieved LEED Gold certification. The building stands as a leading example of sustainability for the State of Montana as well as the many business partners of the Montana State Fund.

A dry-pressed brick provided the appropriate color and texture that helped achieve the design goals as well as the regional material component of LEED certification.

Architect:
Mosaic Architecture, P.C.
Associate Architect:
CTA Architects & Engineers
Builder:
Dick Anderson Construction
Manufacturer:
I-XL Industries Ltd.
Mason Contractor:
Gruber Masonry
Photographers:
J K Lawrence Photography, Inc.
Mosaic Architecture, P.C.

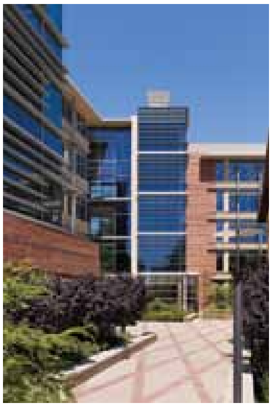
Credits appear as submitted in entry form

Terasaki Life Science Building at UCLA Los Angeles, California

UCLA Makes a Seismic Shift While Maintaining Traditional Brick Heritage

As part of UCLA's massive renovation and replacement building program, the University has pledged to upgrade the seismic safety of its facilities. This was especially important for the 176,000-square-foot Terasaki Life Sciences Building, which plays a prominent role by presenting a public face to the surrounding community. The building is comprised of two seismically separate, five-story wings that each house an efficient pattern of flexible, modular, and open laboratory, support, and office space.

UCLA's campus has a rich tradition of brick architecture in the Northern Italian Romanesque style. To match this aesthetic, seven colors of brick were used in bands, bond patterns, and relief in the traditional UCLA brick blend of rose tan, red, dark red, purple, and peach. Extensive brick patterning, reveals, and detailing accentuate functional and aesthetic details. For example, shadow lines and special brick courses accent window placement



patterns, enhancing Terasaki's relationship to the older brick buildings nearby.

Adjacent to historic Mira Hershey Hall, Terasaki pays tribute to the older building's site, materials palette, and scale. The building's use of a concrete frame as a shear wall eliminates 10 feet in height, opens the perimeter to light, creates new views, and provides inherent vibration control. Brick animates the façades with texture and pattern, creating shadows that contribute to the overall composition.

In response to a rigorous seismic engineering study that mapped force potential on the building's structure, the architects created a carefully calibrated layout of brick anchors placed behind the veneer. The anchor system controls differential movement between skin and structure, permitting varied movement across the façade in response to specific forces.

The project is currently in the process of obtaining LEED Silver certification. The architects used locally manufactured materials whenever possible, and all the brick used in the project was locally produced.

Brick animates the façades with texture and pattern, creating shadows that form an overall composition.

Architect:
Bohlin Cywinski Jackson
Associate Architect:
Stenfors Associates Architects
Landscape Architect:
Katherine Spitz Associates, Inc.
Builder:
PCL Construction Services, Inc.
Mason Contractor:
Masonry Concepts, Inc.
Photographer:
David Lena Photography

Credits appear as submitted in entry form

Methodist Le Bonheur Women's and Children's Pavilion Germantown, Tennessee

New Health Care Facility Turns a Brownfield into LEED Gold

Guided by sustainable principles and the need for a dedicated women's center, the Women's and Children's Pavilion expands the current facilities at Methodist Germantown and sets the standard for all future facilities within the Methodist Healthcare System. Designed to achieve a LEED Gold rating, it is the largest LEED-certified facility in the Mid-South Region and the first LEED Gold health care facility in the region.

In addition to the LEED requirements, the facility adhered to Germantown's strict aesthetic guidelines and sought to blend in with the existing architecture of the campus. Therefore, scale, material, and building forms were all taken into account during the design process. Clay brick quickly became the exterior cladding material of choice in order to produce a cohesive design aesthetic and to relate to pedestrians with its small-scale units. The pavilion features articulated and carefully proportioned brick façades, residential-scaled windows, and metal standing seam hip roofs with eaves—all elements incorporated with the surrounding residential aesthetic in mind.

Clay brick was the exterior cladding material of choice because of its cohesive design aesthetic and ability to relate to pedestrians with its small-scale units.

As noted, LEED Gold certification played a dominant design role, and the brick exterior was a contributing design element by helping add points for energy efficiency. In addition, a manufacturer less than 500 miles away supplied the brick—a sustainable move that contributed to an innovation credit of exemplary performance for regional materials. Finally, the architects took advantage of a Brownfield site in an urban setting and recycled 90 percent of the construction waste.

Architect:
TRO Jung|Brannen
Builder:
Flintco
Distributor:
Acme Brick Company
Mason Contractor:
EMB Quality Masonry
Photographer:
Gary Kessel

Credits appear as submitted in entry form

Sykes Chapel at University of Tampa
Tampa, Florida

Careful Attention to Details Transforms Brick Chapel into Space of Inspiration

With a student body representing more than 100 countries, the University of Tampa conceived the new Sykes Chapel as a unifying space where diverse students can come to develop a sense of purpose and self-awareness. The new chapel will become a place for reflection where students can go to reflect and learn to make decisions based on principles, values, and a better understanding of the world.

To give form to the University's vision, the architects demonstrated the highest attention to detail and to the discerning use of quality materials. They designed the chapel to elicit spiritual, sensory, and emotional responses from the building's users. Simple curved forms create the space, like two cupped hands sheltering the space within, allowing sunlight to pass between them.

To preserve the campus' architectural heritage, the architects employed brickwork on the lower portions of the building façade. They expressed sensitivity to human scale and divine proportions in the detailing of the arches and other building elements that resulted in an inspirational and contemporary classic design while maintaining a timeless aesthetic. They also intentionally reduced the scale of the exterior chapel's perimeter by designing an inviting brick arcade and human-scaled canopies.

When it came to selecting building materials, clay brick was chosen for its long-term durability. The life of the building is anticipated to be well over 100 years, and the brick is expected to endure as well. In addition to providing a stunning visual connection to the campus, the materials were also selected for their ability to perform well in Florida's bright sunlight and severe weather.

Included in the brickwork are several subtle details providing depth to the work, including recessed brick on the West elevation, a Flemish bond detail with projected headers on the South elevation, and the use of a special shape employed as framework enhancing the truncated arch built with structural brick in true old-world craftsmanship and skill. Ultimately, the architect's uncompromised attention to detail created design subtleties and complexity that will inspire students for generations.

The life of the building is anticipated to be well over 100 years, and the brick is expected to endure as well.

Architect:
tvsdesign
Builder:
Peter Brown Construction Inc.
Manufacturer:
Hanson Brick
Distributor:
Oldcastle Coastal COLOROC
Mason Contractor:
Red Brookshire of Florida
Photographer:
Mike Butler, Inc.

Credits appear as submitted in entry form

Village of Wheeling, IL, Fire Station 24
Wheeling, Illinois

Brick Creates New Fire Station on Budget and in Style

Surrounded by commercial and residential properties, the Village of Wheeling's Fire Station 24 encompasses a sizable 16,000-square-foot facility. The architects designed the facility to not only be a full-service fire station supporting the busy village of Wheeling, but to also provide living quarters for up to 12 firefighters who serve there.

The City of Wheeling wanted its firefighters focused on fighting fires and serving the community, so the City put a priority on designing a building that would require little maintenance, would protect the firefighters from noise, and could withstand the harsh weather. Careful attention was also paid to the building's exterior cladding to ensure that there was a seamless appearance with the surrounding architecture.

From the beginning, the client set a goal of designing a Prairie-style facility. Under this direction, the architects specified brick extensively for the facility due to the fact that brick's inherent qualities of warmth, solidity, and beauty dovetail well into the Prairie style. Brick's sustainable attributes and cost-effective qualities allowed the project to meet all of the fire department's functional needs while remaining in budget.

The weather posed one of the design team's biggest challenges. To remain on schedule, the masonry work had to be completed during the winter months 30 miles outside of Chicago. By enclosing the scaffolding and using portable heaters, the builders were able to complete the exterior masonry on schedule.

The architects' decision to use brick was essential to the project's ultimate success. The community quickly embraced their new brick firehouse and approved of its beauty and durability. Upon completion, the citizens of Wheeling felt assured that the new firehouse would serve its citizens for decades to come.

Brick's sustainable attributes and cost-effective qualities allowed the project to meet all of the fire department's functional needs while remaining in budget.

Architect:
Williams Design Build
Manufacturer:
Glen-Gery Corporation
Distributor:
Illinois Brick Company
Mason Contractor:
Masonry Company Inc.
Photographers:
Steinkamp Photography
Williams Architects

Credits appear as submitted in entry form

PNC Triangle Park
Pittsburgh, Pennsylvania

Clay Brick Pavers Transform a Small City Park into a Natural Urban Oasis

As the first new high-rise building in downtown Pittsburgh in 20 years, PNC Financial Services Group erected a Gold LEED-certified building that has become the signature green building for a company that has the most LEED-certified properties of any company in the world. Situated at its prominent front corner is the PNC Triangle Park.

This small triangular park is just over 10,000 square feet and provides a passive setting that not only serves as a public amenity but also as an extension of the company's corporate campus. From the pedestrian's perspective, the spine of the park and welcoming seating area under a custom shade structure lead the eye to the building's entrance.

The public park exploits a forced perspective to make the park look larger when viewing it from the building entry. Linear patterns with increased spacing pull the pedestrian's eye into the park, and the long, narrow boardwalk clay pavers amplify this linear concept.

By using a pattern of three colors where at least three pavers in the same color are laid in a row, an elegant, elongated pattern is achieved. The colors of the pavers enhance the metal, concrete, and building materials. In short, the pavers tie the campus' ornate palette together.

The use of the clay brick in the center of the triangular park adds texture and rich color that will never fade. In addition, the quality of the material reflects the elegance of the building and makes the visitor feel like they've escaped from the busy city sidewalks.

To strengthen the park's sustainability, the architects employed a permeable brick pavement to reduce the amount of storm water run-off from more impervious hardscape surfaces. They were sourced from local origins, and their durability will ensure that the park endures for generations to come.

Linear patterns with increased spacing pull the pedestrian's eye into the park, and the long, narrow boardwalk clay pavers amplify this linear concept.

Landscape Architect:
LaQuatra Bonci Associates
Builder:
PJ Dick Incorporated
Manufacturer:
Whitacre-Greer
Mason Contractor:
Cost Construction
Photographers:
Haritan Photography
LaQuatra Bonci Associates

Credits appear as submitted in entry form

The Veridian
Silver Spring, Maryland

A Brick Homage to Art Deco Style Proves Popular in Urban Setting

Situated in an emerging neighborhood and adjacent to a historic plant, the Veridian derives its form and choice of materials from the area's Art Deco/Art Moderne heritage and the formerly industrial district.

The apartment complex's primary elevation takes the form of a curve, echoing a nearby industrial plant's rounded front, and is recessed at regular intervals to provide balconies. The curve also has the added benefit of creating a large public plaza whose space energizes the streetscape and the building's ground level retail. The abundant use of orange-tone clay brick is one of the building's signature elements.

The architects chose a sophisticated palette of materials for the large apartment building, including a custom orange brick blend and a polychrome brick in 12-inch sizes. Given its large mass, the design team used a longer-than-standard brick to reinforce the horizontal lines. This larger, 12-inch brick also proved helpful in reaching the project's cost goals without having to resort to other materials.

Few people realize the multiplicity of colors, textures, and sizes that are available in clay brick. For

projects on a tight budget, brick's variety of colors and sizes gives the walls a pleasing visual depth while maintaining costs. By using brick on both the building's exterior as well as on the large plaza's main hardscape, the design teams successfully anchored the building to the site.

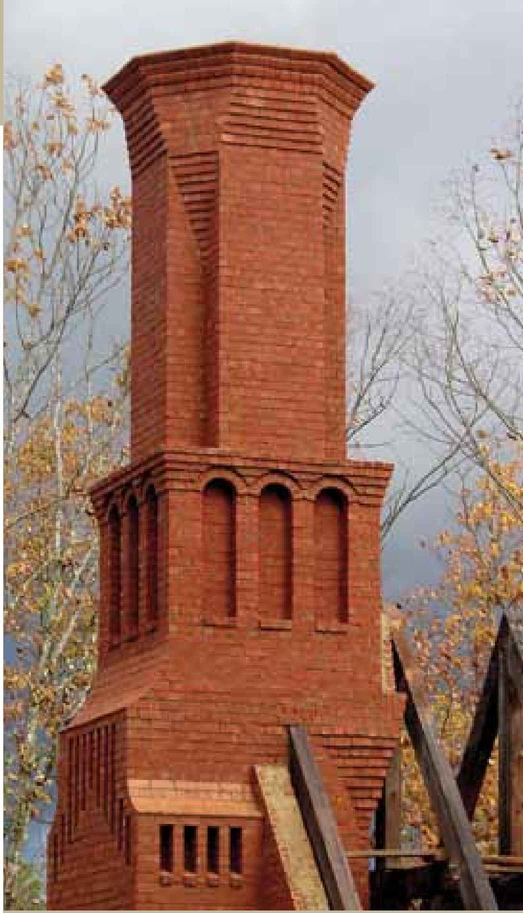
Brick—when paired with metal accents—lends itself to today's fashionable urban industrial aesthetic and is a popular style for young professionals seeking apartment living in an urban environment.

But brick is more than the style of the day. Brick provides a bridge between the past, present, and future. Unlike other materials, brick's enduring timelessness lends itself to a sense of authenticity and permanence.

For projects on a tight budget, brick's variety of colors and sizes give the walls a pleasing visual depth while maintaining costs.

Architect:
WDG
Manufacturers:
The Belden Brick Company
Taylor Clay Products Company
Distributor:
Potomac Valley Brick & Supply Company
Mason Contractor:
United Masonry
Photographer:
Maxwell MacKenzie

Credits appear as submitted in entry form



Pierce/Lee House
Cedartown, Georgia

170,000 Brick, 100 Structural Arches, Walls Three Brick Deep Make One Exceptional Home

The beauty of the Pierce/Lee house lies in its materials. Constructed almost entirely of structural clay brick masonry, the house demonstrates both the versatility of brick and the honesty of materials like few other buildings conceived and constructed in recent history.

The 3,500-square-foot house sits gracefully atop a small mountain in Georgia. The two-story house's exterior walls are three brick thick (12 inches) with interior walls two brick thick (8 inches). In addition, more than 100 structural arches span the openings of all windows, doors, and vaults throughout the home. By the end of construction, nearly 170,000 engineered modular brick were used.

The defining aspect of this design is that it is not replica-based or created from standard plans. While some may immediately assume that such custom craftsmanship would be cost prohibitive, both the human and material resources required for brick construction are a fraction of the cost for the less durable materials typically found in a conventional stick-built house.

Seen from the designer's perspective, the rule of thumb applicable in their area is that one cubic foot of structural masonry costs approximately $25.00 to build. For a 12-inch thick masonry wall, this cost can be measured in square feet—8-inch walls would be

$^2/_3$ of this. This approach to building makes obsolete the processes of framing, insulating, painting, and in many cases, trim. Therefore, the man hours and costs to manage the labor, logistics, and financing of these various elements are no longer required.

Finally, the projected lifespan of the house, which can be quantified in centuries rather than decades, has important sustainability and energy efficiency implications. The thermal mass of the brick structure and the partial sub-grade orientation of the terrace level account for significant heating and cooling advantages.

The end result is an honest structure, one that is made richer with age and can gracefully wear the passage of time. From aesthetics to functionality, nothing does what brick does so well.

The projected lifespan of the house is quantified in centuries rather than decades and has important sustainability and energy efficiency implications.

Designer:
Clay Chapman
Builder:
Period Architecture
Manufacturer:
General Shale Brick, Inc.
Distributor:
North Georgia Brick Company, Inc.
Mason Contractor:
Period Architecture
Photographers:
Period Architecture
Mountain Photographics

Credits appear as submitted in entry form

GOLD WINNERS

COMMERCIAL

Citi Field
Location: Flushing, New York
Architect: Populous
Manufacturer: General Shale Brick, Inc.
Distributor: Abbey Hart Brick Co.
Mason Contractor: International Concrete Products

EDUCATIONAL

George Washington Carver Academy
Location: Waterloo, Iowa
Architect: INVISION Architecture
Landscape Architect: Craig Ritland Landscape Architect
Builder: Larson Construction
Mason Contractor: Carl Schuler Masonry

Southern Polytechnic State University's Architectural Studio Addition (Building I)
Location: Marietta, Georgia
Architect: Cooper Carry
Associate Architect: Paul Cheeks Architects
Builder: DPR Construction, Inc.
Manufacturer: Endicott Clay Products Company
Distributor: Alley-Cassetty Brick
Mason Contractor: O.L. Jollay, Inc.

STEPS Building, Lehigh University
Location: Bethlehem, Pennsylvania
Architect: Bohlin Cywinski Jackson
Landscape Architect: Lager Raabe Skafte Landscape Architects, Inc.
Builder: Alvin H. Butz, Inc.
Manufacturer: The Belden Brick Company
Mason Contractor: Caretti, Inc.

University of Notre Dame, Eck Hall of Law
Location: Notre Dame, Indiana
Architect: The S/L/A/M Collaborative
Manufacturer: The Belden Brick Company
Mason Contractor: Ziolkowski Construction, Inc.

HEALTH CARE FACILITIES

United Cerebral Palsy Diagnostic and Treatment Center
Location: Central Islip, New York
Architect: Perkins Eastman Architects
Manufacturer: Endicott Clay Products Company
Mason Contractor: Giaquinto Masonry, Inc.

HOUSES OF WORSHIP

Korean Central Presbyterian Church
Location: Centreville, Virginia
Architect: The Hughes Group
Manufacturer: The Belden Brick Company
Distributor: Potomac Valley Brick & Supply Co.
Mason Contractor: Calvert Masonry

MUNICIPAL/GOVERNMENT/CIVIC

City of Tolleson Fire Station + Administration
Location: Tolleson, Arizona
Architect: LEA-Architects, LLC
Landscape Architect: Colwell:Shelor
Associate Architect: LEA-Architects, LLC
Builder: Adolfson & Peterson Construction
Mason Contractor: Huff & Sons Construction

PAVING & LANDSCAPE ARCHITECTURE

Portland Mall Revitalization
Location: Portland, Oregon
Architect: ZGF Architects LLP
Builder: Stacy and Witbeck / Kiewit Construction Group, Inc. (joint venture)
Mason Contractor: Schonert & Associates, Inc. / Raimore Construction LLC

RESIDENTIAL – MULTI-FAMILY

Mill District City Apartments
Location: Minneapolis, Minnesota
Architect: BKV Group
Builder: Frana Companies Inc.
Mason Contractor: Northland Concrete & Masonry, LLC

RESIDENTIAL – SINGLE FAMILY

Hudson Valley Georgian
Location: Dobbs Ferry, New York
Architect: Hilton-VanderHorn, Architects
Landscape Architect: Rutherford Associates, P.C.
Builder: Significant Homes LLC
Manufacturer: Redland Brick Inc.
Mason Contractor: V & Y Construction, LLC

SILVER WINNERS

COMMERCIAL

Harley-Davidson Museum
Location: Milwaukee, Wisconsin
Architect: Pentagram Architects/Biber Architects
Landscape Architect: Oslund + Associates Landscape Architects
Associate Architect: HGA
Builder: MA Mortenson
Manufacturer: Elgin Butler Company
Mason Contractor: Kinateder Masonry

EDUCATIONAL

Butler College Dormitories, Princeton University
Location: Princeton, New Jersey
Architect: PEI COBB FREED & PARTNERS Architects LLP
Landscape Architect: Michael Van Valkenburgh Associates Inc.
Builder: Turner Construction Company
Distributor: Belden Tri-State Building Materials
Mason Contractor: D. M. Sabia & CO

Cuisinart Center for Culinary Excellence
Location: Providence, Rhode Island
Architect: Tsoi/Kobus & Associates
Landscape Architect: Stephen Stimson Associates
Builder: Agostini Construction Company
Manufacturer: Endicott Clay Products Company
Distributor: Spaulding Brick Company, Inc.
Mason Contractor: Costa Brothers Masonry

George Dean Johnson, Jr. College of Business Administration and Economics
Location: Spartanburg, South Carolina
Architect: McMillan Pazdan Smith Architecture
Landscape Architect: LandArt Design Group
Associate Architect: David M. Schwarz Architects
Builder: The Linbeck Group
Manufacturer: Boral Bricks, Inc.
Mason Contractor: Cherokee Masonry

Sherman and Gloria H. Cohen Career Center
Location: Williamsburg, Virginia
Architect: Cunningham | Quill Architects
Landscape Architect: Lila Fendrick Landscape Architecture
Builder: Whiting-Turner Contracting Company
Manufacturer: Old Virginia Brick Company
Distributor: Riverside Brick & Supply Co., Inc.
Mason Contractor: Chesapeake Masonry Corporation

University of Texas at Arlington - ERB Building
Location: Arlington, Texas
Architect: ZGF Architects LLP
Associate Architect: PageSoutherlandPage
Manufacturer: Acme Brick Company
Mason Contractor: Clayton Masonry

HEALTH CARE FACILITIES

Great Lakes Cancer Institute at Clarkston - McLaren Health Care
Location: Clarkston, Michigan
Architect: RTKL Associates Inc.
Landscape Architect: Professional Engineering Associates (PEA)
Builder: Cunningham-Limp, Inc.
Manufacturer: Glen-Gery Corporation
Mason Contractor: Pomponio Construction, Inc.

HOUSES OF WORSHIP

Community of the Holy Spirit Convent
Location: New York, New York
Architect: BKSK Architects
Landscape Architect: Denis Gray Horticulture
Builder: ICS Builders
Manufacturer: Jenkins Brick Company
Mason Contractor: MarinaRan Consulting, LLC

MUNICIPAL/GOVERNMENT/CIVIC

King's Fork Public Safety
Location: Suffolk, Virginia
Architect: RRMM Architects
Manufacturers: Taylor Clay Products Company & Carolina Ceramics Brick Co.
Distributor: Batchelder & Collins, Inc.
Mason Contractor: J.D. Hammond, Inc.

PAVING & LANDSCAPE ARCHITECTURE

The Plaza at Kenan Hall/Flagler College
Location: St. Augustine, Florida
Landscape Architect: Hauber Fowler & Associates, LLC
Builder: A.D. Davis Construction
Manufacturer: Pine Hall Brick Company, Inc.
Distributor: Oldcastle Coastal - Jacksonville
Mason Contractor: Paverscape Inc.

RESIDENTIAL – MULTI-FAMILY

Roscoe C Brown Apartments
Location: Bronx, New York
Architect: Meltzer Mandl Architects
Builder: Mega Contracting
Manufacturer: Glen-Gery Corporation
Mason Contractor: Flagge Contracting

RESIDENTIAL – SINGLE FAMILY

French Manor Home
Location: Winnetka, Illinois
Architect: Melichar Architects
Builder: Tiedmann Enterprises
Manufacturer: Redland Brick Inc.
Distributor: Illinois Brick Company
Mason Contractor: Fontana Masonry

BRONZE WINNERS

COMMERCIAL

BB&T Ballpark
Location: Winston-Salem, North Carolina
Architect: CJMW Architecture
Landscape Architect: Stimmel Associates, PA
Associate Architect: 360 Architecture
Builder: Samet Corporation
Manufacturer: Pine Hall Brick Company, Inc.
Mason Contractor: Proffit Brick & Stone Work Inc.

Raleigh Convention Center
Location: Raleigh, North Carolina
Architects: O'Brien Atkins Associates, PA and Clearscapes, & PA in association with TVS Design
Mason Contractor: Brodie Contractors, Inc.

EDUCATIONAL

Barton College Studio Theater
Location: Wilson, North Carolina
Architect: Pearce Brinkley Cease + Lee
Manufacturer: Taylor Clay Products Company
Distributor: Custom Brick Company, Inc.
Mason Contractor: M. C. Masonry

CSM Wellness Center
Location: Leonardtown, Maryland
Architect: Grimm + Parker Architects
Manufacturer: Redland Brick Inc.
Distributor: Potomac Valley Brick & Supply Company
Mason Contractor: Guy & Guy Masonry

Hopkins School, Thompson Hall
Location: New Haven, Connecticut
Architect: The S/L/A/M Collaborative
Manufacturers: General Shale Brick, Inc. & Redland Brick Inc.
Mason Contractor: Sebastian J. Damiata Masonry

MIT Ashdown House Graduate Student Housing
Location: Cambridge, Massachusetts
Architect: William Rawn Associates, Architects, Inc.
Landscape Architect: Richard Burck Associates, Inc.
Builder: Bovis Lend Lease
Manufacturer: Glen-Gery Corporation
Distributor: Spaulding Brick Company, Inc.
Mason Contractor: NER Construction Management, Inc.

Post Road School
Location: White Plains, New York
Architect: KG&D Architects & Engineers, PC
Manufacturer: The Belden Brick Company
Mason Contractor: MPCC Corporation

School of Education
Location: Williamsburg, Virginia
Architect: Sasaki Associates, Inc.
Landscape Architect: Sasaki Associates, Inc.
Associate Architect: Boynton-Rothschild-Rowland Architects PC
Builder: Barton Marlow Company
Manufacturer: The Belden Brick Company
Distributor: Batchelder & Collins, Inc.
Mason Contractor: Coastal Masonry

University of Michigan Stadium Expansion and Renovation
Location: Ann Arbor, Michigan
Architect: HNTB
Builder: Barton Malow Company
Manufacturer: The Belden Brick Company
Distributor: The Belden Brick Sales Company
Mason Contractors: Leidal and Hart Mason Contractors, Boettcher Masonry, & Baker Construction

Washington University Early Childhood Learning Center
Location: St. Louis, Missouri
Architect: Ross Barney Architects
Landscape Architect: Oslund Associates
Builder: United Construction Enterprise Co.
Distributor: Acme Brick Company
Mason Contractor: John J. Smith Masonry Company

HEALTH CARE FACILITIES

The Wilmer Eye Institute - Johns Hopkins Hospital
Location: Baltimore, Maryland
Architect: Ayers Saint Gross
Landscape Architect: Oasis Design Group
Associate Architect: Wilmot Sanz
Builder: Whiting Turner Contracting Company
Manufacturer: Glen-Gery Corporation
Distributor: L & L Supply Corporation
Mason Contractor: Manganaro

HOUSES OF WORSHIP

St. Patrick Catholic Church
Location: Iowa City, Iowa
Architect: Neumann Monson Architect
Landscape Architect: MMS Consultants
Associate Architect: BVH Architects
Builder: McComas Lacina Construction
Mason Contractor: Yoder Masonry

MUNICIPAL/GOVERNMENT/CIVIC

Alta Mesa Pump Station
Location: Dallas, Texas
Architect: CamargoCopeland Architects, LLP
Manufacturer: Acme Brick Company
Mason Contractor: Masonry and Stucco Services, Inc.

PAVING & LANDSCAPE ARCHITECTURE

Pack Square Park
Location: Asheville, North Carolina
Landscape Architect: LaQuatra Bonci Associates
Associate Architect: ColeJenest and Stone
Builder: ValleyCrest Landscape Development
Manufacturer: Pine Hall Brick Company, Inc.
Mason Contractor: ValleyCrest Landscape Development

RESIDENTIAL – MULTI-FAMILY

The Lyric at Carleton Place
Location: St. Paul, Minnesota
Architect: BKV Group
Builder: Jaeger Construction, LLC
Manufacturer: The Belden Brick Company
Mason Contractor: Hollenback & Nelson

RESIDENTIAL – SINGLE FAMILY

Lewisburg Residence
Location: Lewisburg, Pennsylvania
Architect: Archer & Buchanan Architecture, Ltd.
Landscape Architect: Landstudies Inc.
Builder: CWD Distinctive Homes, LLC
Manufacturer: Glen-Gery Corporation
Mason Contractor: Preston Boop

All credit information appears as it was provided in the entry by the architect or BIA member company.

A special thank you to this year's judges:

Eugenia Brieva – QPK Design
Bobby Eichholz – Rialto Studio, Inc.
Walter Jennings – Maurice Jennings Architect
Paul Matheny – Matheny Goldmon Architects, AIA

web

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Review the following learning objectives to focus your study while reading the article below. To receive credit, follow the instructions found at the end of the article which direct you to complete the AIA questionnaire found at www.gobrick.com/ArchitectCredit.

Learning Objectives

After reading this article you should be able to:

1. Understand how brick manufacturing affects performance.
2. Better comprehend what influences brick durability and appearance.
3. Specify and distinguish between different kinds of brick.
4. Identify the primary details necessary to produce durable brickwork.

The beauty and inherent durability of brick and brickwork can be attributed to the raw materials and processes that are used to manufacture each unit, and to the detailing and construction integrating them into the structure. Each of these aspects is important and plays a critical role in the performance of the brickwork. Specifying that the brick comply with the proper standard and designation within that standard ensures the former. Proper detailing and construction along with minimal maintenance ensures the latter. Both are required.

Improper selection and specification of brick can affect the long-term durability of the brickwork in which they are installed, even though they may be detailed and installed correctly. Likewise, even though the brick provided are specified properly, if the brickwork in which they are installed is not detailed or constructed properly, the longevity of the brickwork can be compromised. Both proper specification of the brick and proper detailing and construction of the brickwork are required to ensure the durability and beauty of brick.

MANUFACTURING

To properly specify brick, it is important to understand the manufacturing process used to create them. A better comprehension of this process gives one more perspective on brick's appearance and inherent durability.

Materials. Brick are made from clay or shale, sometimes with additives included, and are often coated with sand or mineral oxides. In brick manufacturing, little is wasted; virtually each pound of clay or shale mined ends up in a brick. Clay and shale are sedimentary mineral deposits. As a result, the chemical composition of the raw materials in a pit or quarry changes with the depth of the deposit and its horizontal location. Manufacturers may blend raw materials from several pits in order to attain the best consistency and to maximize the productive life of each pit. In spite of all this care, however, some natural variation is unavoidable, and this is reflected in differences in color each time a brick is manufactured.

Chemical composition influences color along with the particle size of the material. Iron compounds yield red and orange hues. Manganese, often an additive, results in brown hues. Kaolin produces white/gray hues. Fire clay provides a buff or yellow hue. Oxides can be used to produce other colors. The saturation or intensity of the color is influenced by the firing temperatures and the level of oxygen in the kiln. Because color is inherent in the raw materials, there is no fading of the color over time.

Forming. There are two primary methods used by manufacturers in the United States to form brick: molding and extruding. Molded brick often have folds and imperfections on their surfaces and are characterized by soft, rounded edges and corners. The molds are filled with the prepared raw materials and "struck" to remove the excess clay or shale off the top. The prepared clay or shale is kept from sticking to the surfaces of the molds by treating the molds with either sand or water. Sand-struck brick have a coating of sand on the surfaces that make contact with the mold. Some of this sand may come off during subsequent handling and cleaning. Water-struck brick have a slightly smooth, velvety texture. Molded brick are shown in Figure 1.

Figure 1. Molded brick

Approximately 90% of domestic brick production is extruded. In this process the prepared raw materials are forced through a die (like toothpaste from a tube) forming a continuous, rectangular "column." The dimensions coming out of the extruder, or die, typically establish the width and length of the brick. The brick height is set when the column is cut into brick-sized pieces by wires or knives. Since the green brick (just-formed brick) shrink when they are fired, they are made five to ten percent larger than the finished product.

As the extruded clay column exits the die, a variety of textures may be created, ranging from a smooth die-skin finish that receives no treatment to extremely rough surfaces. If a wire is used to remove the die-skin surface, as shown in Figure 2, a velour (wire-cut) texture results. This removed layer of clay may be placed back on the column in a random manner to add more texture or recycled back into the manufacturing process. Other surface treatment options include brushing, scratching, rolling, or tearing the surface of the brick. The process of cutting the column into brick-sized pieces with wires or knives may include placing paper under the wire or blade to create rounded edges. The brick may be tumbled prior to firing to soften the edges and corners or rumbled after firing to create chips along the edges. Both of these treatments create cuts and gouges in the brick that result in a used appearance.

Figure 2. Velour brick

Clay and shale mixtures have many characteristics which affect their ability to be formed into brick which affects their final appearance. Plasticity is the ability of a clay-water mass with proper water content to be shaped and to hold that shape indefinitely after the forming forces are removed.

In the extrusion process, the clay and shale mixtures should have a high plasticity. Extruded brick must not deform when they are stacked directly on kiln cars after they are formed and cut. Brick can be stacked up to 14 high on the kiln car. Extruded brick near the bottom of the stack must withstand the compressive and shear loads imposed on them from the green brick above without deforming. Adequately mixing and maintaining water content in the range of 10 to 15 percent helps achieve the desired plasticity. De-airing the clay or shale mixture in a vacuum immediately prior to extrusion removes air holes and bubbles, giving the clay increased density, resulting in greater strength.

Workability refers to the ease with which a moist clay mass conforms to the mold. The clay or shale mixture placed in molds to form molded brick must easily flow into all parts of the mold. Plasticity is not as important for molded brick since the molds are emptied onto a pallet where the brick are allowed to adequately dry before stacking for the kiln. Workability is more important and is typically achieved by increasing water content to 20 to 30 percent. This results in more shrinkage and results in the wider range of dimensions typically associated with molded brick.

Coatings. Many brick have coatings applied to the stretcher face and one or both ends during the manufacturing process. There are many types of coatings: sand, engobes, and glazes, and these can add both color and texture. Coatings may match or contrast the body color and may have full or partial coverage of the faces and ends of the brick. Typically, other than the sand in the mold box, the only coating applied to molded brick is a glaze, though this is rare. The application of a coating to extruded brick is shown in Figure 3.

Figure 3. Application of coating to extruded brick

Brick without coatings are said to be "through-body" brick. That is, the surface color is the same as the color of the materials inside of the brick.

Firing. Most brick are fired in either a tunnel or beehive kiln. Both are named for their shape. Tunnel kilns are typically around 400 feet or more long and, as their name implies, form a tunnel through which the brick move as they are fired. Such kilns typically operate around the clock, seven days a week. Brick stacked on kiln cars move through temperature zones inside the tunnel kiln. In the preheat zone of the tunnel, the temperature gradually increases as the brick-laden kiln cars progress through the kiln. Once they reach the soaking zone of the tunnel, the temperature is held steady for a certain period of time. The last portion of the kiln is the cooling zone where the temperature is slowly decreased. Usually the waste heat from cooling the brick is used to heat green brick in the dryers. Each zone in a kiln is important to the durability of the brick. Too little time in the soak zone and the clay does not meet maturity. Too little time in the cooling zone and the brick may break apart. Modern brick plants have computer controls that determine each step.

Figure 4. Brick exiting tunnel kiln

Figure 5. Brick being stacked in beehive kiln

Beehive kilns are circular in cross-section with a dome roof. The brick are loaded inside the beehive kiln manually when the kiln is cold. Once loaded, the openings are sealed and the entire stack of brick are heated and cooled over several days. Once cooled, the kiln is emptied manually. Brick exiting from a tunnel kiln are shown in Figure 4; brick being stacked in a beehive kiln are shown in Figure 5.

Two features of firing affect the color of the fired brick: temperature and amount of oxygen in the kiln. As a brick is subject to higher temperatures its color tends to darken. The absence of oxygen in the kiln (flashing) changes the chemical reaction of the iron oxides and results in darker surface colors; the red turns to black, as hematite turns to magnetite. Removing oxygen throughout the cycle produces blues and blacks. Adding oxygen back into the kiln during specific points of the cooling phase can change browns to yellows at higher temperatures and can produce brilliant reds at slightly lower temperatures. Removing oxygen near the middle of the cooling phase can produce pinks and grays.

The composition of a green, unfired brick changes as it is fired to give it the strength and durability associated with brick. Clay, unlike metal, softens slowly and melts or vitrifies gradually when subjected to rising temperatures. This physical change, referred to as vitrification, allows clay to become a hard, denser mass and occurs in the soak zone of the kiln. The melting of clay takes place in three stages: 1) incipient fusion, when clay particles become sufficiently soft to stick together in a mass when cooled; 2) vitrification, when extensive fluxing occurs and the mass becomes tight, solid, and nonabsorbent; and 3) viscous fusion, when the clay mass breaks down and becomes molten, leading to a deformed shape. The key to the firing process for brick is to control the temperature and the amount of time brick are exposed to a given temperature in the kiln so that incipient fusion and partial vitrification occur but viscous fusion is avoided. Doing so produces a structure in the brick which is a mixture of several types of glass mingled together with small new crystals that were formed during heating and with residual clay crystals that have not melted. Partially vitrified clay is what gives brick its compressive strength. The term clinker brick refers to a brick that has undergone some viscous fusion and has a warped final shape that is sometimes considered a desirable architectural feature.

In the cooling zone of the kiln, heat is slowly removed from the brick so that the cooler temperature on the outside of the brick does not outpace the warmer temperature on the inside of the brick. Air circulation causes convective heat transfer between the draft of the kiln and the exposed surfaces of the brick. Within the brick, heat is removed by conduction as it moves from the inside to the outside of the brick. The cooling zone allows conduction to occur at a controlled rate such that the brick is not over stressed and the particles maintain contact with each other.

Each of the processes in brickmaking results in brick that is aesthetically pleasing yet innately durable. The brick manufacturer controls each of these stages to create a unique product while still adhering to material standard requirements.

ASTM STANDARD SPECIFICATIONS FOR BRICK

Standards ensure that a product is sufficient for the market. The ASTM standards for brick used on buildings and other above-grade applications include:

- C62 Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
- C126 Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
- C216 Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)
- C652 Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale)
- C1088 Standard Specification for Thin Veneer Brick Units Made from Clay or Shale
- C1405 Standard Specification for Glazed Brick (Single-Fired, Solid Brick Units)

Each of these standards has multiple designations for both durability and for appearance. While the nomenclature may change from standard to standard, there is some consistency in the designations.

Durability. Table 1 indicates the durability designation associated with each standard. Durability is established by a series of tests which reveal physical properties.

ASTM Standard	Durability Designation	More Severe Exposure		Less Severe Exposure
C62 Building Brick	Grade	SW	MW	NW
C126 Glazed Brick	Established by C216, C652, or C1088			
C216 Facing Brick	Grade	SW	–	MW
C652 Hollow Brick	Grade	SW	–	MW
C1088 Thin Veneer Brick	Grade	Exterior	–	Interior
C1405 Glazed Brick, Single-fired	Class	Exterior	–	Interior

Table 1. Brick Durability Designations

The letters SW, MW, and NW indicate the following exposure conditions:

SW indicates **severe weathering**. SW is the default value. Brick used in exterior applications in all but the most southern parts of Florida, Texas, Arizona, and California should be specified as "Grade SW."

MW indicates **moderate weathering**.

NW indicates negligible or **no weathering**.

There are three physical properties used to establish the durability designation of a brick: minimum compressive strength, maximum boiling water absorption, and maximum saturation coefficient. Table 2 indicates the values required for a brick to attain each durability designation. Both individual and average values are included because the sample is representative of all colors and sizes.

A brick's compressive strength is determined by subjecting five dry half-brick samples to a compression load distributed across the bedding surface of the brick (the load is applied in the direction of the height of the brick). The load on each brick is increased until the maximum load supported by the brick is achieved. Typically the brick fails with

ASTM Standard	Durability Designation	Minimum Compressive Strength, Gross Area psi		Maximum Five-Hour Boiling Absorption, percent		Maximum Saturation Coefficient	
		Average of 5 brick	Individ.	Average of 5 brick	Individ.	Average of 5 brick	Individ.
C62 Building Brick	Grade SW	3000	2500	17.0	20.0	0.78	0.80
	Grade MW	2500	2200	22.0	25.0	0.88	0.90
	Grade NW	1500	1250	No Limit	No Limit	No Limit	No Limit
C216 Facing Brick	Grade SW	3000	2500	17.0	20.0	0.78	0.80
	Grade MW	2500	2200	22.0	25.0	0.88	0.90
C652 Hollow Brick	Grade SW	3000	2500	17.0	20.0	0.78	0.80
	Grade MW	2500	2200	22.0	25.0	0.88	0.90
C1088 Thin Veneer Brick	Grade Ext.	--	--	17.0	20.0	0.78	0.80
	Grade Int.	--	--	22.0	25.0	0.88	0.90
C1405 Glazed Brick, Single-fired	Class Ext.	6000	5600	--	--	0.78	0.80
	Class Int.	3000	2500	--	--	--	--

Table 2. Physical Properties of Brick Designations

the formation of vertical cracks. The compressive strength is the peak load divided by the area over which the load is applied. Except for thin brick, all brick must meet a minimum compressive strength requirement. While compressive strength is a measure used in structural applications, it is used here to determine that a brick has met some minimum level of partial vitrification. This property also is used in combination with absorption and saturation coefficient to assess durability. Specifying a very high compressive strength for a brick does not guarantee that it is durable; a combination of requirements determines this. In fact, limiting brick to a compression strength that is higher than required by the ASTM standards for brick eliminates a lot of very durable brick from consideration.

Water absorption by brick is a natural phenomenon. Boiling water absorption and saturation coefficient both are related to absorption. The amount of water a brick absorbs is related to the quantity of pores and the conditions of saturation. Pores in brick can range in size from a few tenths of one micron to several hundred microns. One inch is equal to about 25,400 microns. The measure of the amount of saturation is simply the percentage of weight gain of a dry brick on immersion in water for a defined period. These periods for saturation have been standardized as 24 hours in room temperature or "cold" water (CWA) and five hours in boiling water (BWA). The 24-hour CWA test saturates most of the "small" pores in the brick while the five-hour boiling test brings the brick to near 100 percent saturation. Small pores in the micron size range are called capillaries and exert a force or suction on water. A brick with small capillary pores will absorb water and wick up mortar more rapidly than a brick with larger pores. The ratio of cold to boiled water absorption (CWA/BWA) is referred to as the saturation coefficient. Since CWA represents absorption by "small" pores and BWA represents "total" absorption by both small and large pores, then the saturation coefficient is a number that reflects the fraction of small pores in the brick.

It is important to realize that the durability of some brick are established by means other than the absorption properties. Alternates and alternatives in ASTM standards qualify brick that are known to perform well in service. A brick qualifying for a designation by an alternate or alternative does not signify that it is of a lower quality. Saturation coefficient is not necessarily a good predictor of durability for brick with low absorption. Thus if such a brick meeting ASTM C216 has a CWA of no more than 8.0 percent, then it qualifies as a Grade SW brick. Likewise, if a brick qualifying for ASTM C216 can pass a 50-cycle freezing and thawing test, then it is designated as a Grade SW brick. In both cases, the brick also must meet the minimum compressive strength requirements established for Grade SW.

Appearance. Appearance attributes addressed in the standard include size variation, distortion (warpage of the exposed surface), out of square, chippage, and imperfections visible from a prescribed distance. Table 3 indicates the classification and nomenclature used in each standard. For the Type classification, the first two letters relate to the standard: FB for facing brick, HB for hollow brick, and TB for thin veneer brick. The letter suffixes S, X, A, and B indicate the following control of appearance features:

S indicates brick for general use, the **standard** requirement for the industry. The S designation is the default when no Type is stipulated for the project.

X indicates a tighter control of appearance-related attributes: more stringent dimensional tolerances, fewer chips, smaller cracks. This is often referred to as **extreme** or **extra** stringent requirements.

A indicates a brick with a wider range of appearance requirements, usually including a desired non-uniformity in size and texture. These requirements cannot be more stringent than those for the S classification. The A implies an **aesthetic** or **architectural** component, a component that can only be established with a sample.

B indicates a **building** brick, where appearance attributes are not required.

ASTM Standard	Appearance Classification Name	More Stringent Requirements			Less Stringent Requirements
C62 Building Brick	None	None			
C126 Glazed Brick	Grade	SS	-		S
C216 Facing Brick	Type	FBX	FBS		FBA
C652 Hollow Brick	Type	HBX	HBS	HBA	HBB
C1088 Thin Veneer Brick	Type	TBX	TBS		TBA
C1405 Glazed Brick, Single-fired	Grade	SS	-		S

Table 3. Brick Appearance Classifications

For the Grade designation in C1405, the letters S and SS indicate the following control of appearance features:

S indicates **select** and is the default requirement for general use.

SS indicates **select sized or ground edge** and has more stringent requirements for dimensional variation than S.

Examples of Brick and Appearance Designations. Type _BS brick are used for general masonry construction. Most bond patterns and mortar joint treatments can be used. Figure 6 shows an extruded brick with a wide color range that meets Type FBS.

Type _BX are used where the tighter dimensional tolerances are needed. This includes brickwork laid in stack bond, in soldier courses, or in intricate bond patterns, with raked joints and where sections of masonry have small dimensions. Figure 7 is an extruded brick, Type FBX, with a die skin laid with a raked joint.

Type _BA brick exhibit a unique appearance. They are most often used in residential construction, and are appropriate for commercial and institutional applications, especially when a colonial look is desired. Figure 8 shows a sand-struck, hand-molded Type FBA brick that is flashed.

Because tolerances for _BX brick are the most stringent, it is easy to assume that a Type _BX brick is "better" than a Type _BS brick or, certainly than a Type _BA brick. Type FBX

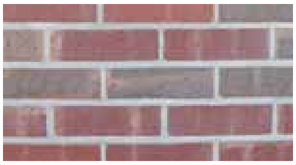

Figure 6. Extruded brick, Type FBS, with a velour texture

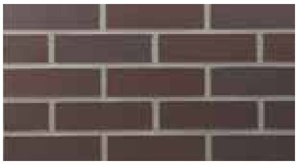

Figure 7. Extruded brick, Type FBX, with a die skin

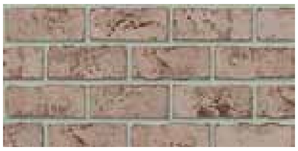

Figure 8. Sand-struck, hand-molded Type FBA brick

brick typically have a "machined" look. If you were designing a facility adjacent to Independence Hall, would a brick that looked machined, a Type FBX brick, be architecturally and historically appropriate? Likely not, because the appearance of a Type FBX brick does not match the brick used to construct Independence Hall. What does match is a Type FBA brick. One "Type" is not better than another; one Type is more suitable for certain architectural styles than another. Designing a stack bond or Art Deco façade? Use Type FBX. Building next to Monticello? Use Type FBA. For most other architectural styles, Type FBS is usually the right choice.

SPECIFYING BRICK

Brick used in an exterior application should be specified as Grade SW or Class Exterior.

Appearance items to specify, in addition to the designation, include the color, color range, and texture. This is best done by identifying a particular brick by name from a manufacturer or by reference to a sample. Dimensions of the brick should also be specified. The dimensions to be specified are not nominal dimensions, which include the addition of a mortar joint, but the size that is desired. The sequence for brick dimensions is width by height by length. Never use size names (modular, econo, closure) to specify size since the names vary from manufacturer to manufacturer.

The ASTM standards require that the stretcher face and one end have the specified color and texture. This is important to remember with brick that have coatings or textures. If other surfaces are to be exposed when the brick is in place, those surfaces must be identified and the finish specified. Of course, any shape other than that of a rectangular prism must be specified and likely must be specially manufactured as a shape.

ASTM standards define a solid masonry unit as one with up to 25 percent void area in the surface with voids (cores or deep frogs). The brick manufacturer has the option to include cores or frogs in the bed surface of the brick. If a brick without cores or frogs is needed, this should also be specified as an uncored, unfrogged unit.

DETAILING AND INSTALLATION

While by no means exhaustive, the list below identifies the primary considerations for detailing and constructing durable, beautiful brickwork. These considerations are presented from the prospective of the architect. While each has been generally categorized as affecting either the durability or beauty of the brickwork, all will affect both to some extent. For more specific recommendations on a given consideration, the Brick Industry Association (BIA) *Technical Notes* cited should be consulted.

Durability

1. Detail top of brickwork to be covered or sloped. Where brickwork in a wall is not vertical, either other materials such as metal or precast concrete should cover the brick or the brick should be sloped no less than 15 degrees from horizontal. This protects the brick below and allows for fast drainage of water. This condition is typically found at copings and window sills but can also be found in reveals and setbacks. And don't forget flashing—see #6. Refer to BIA *Technical Notes* 7, 36, and 36A.
2. Specify to fill all mortar joints with mortar. All mortar joints that are designed to receive mortar should be filled. This avoids the formation of air pockets which can harbor water and result in leaks in brickwork. For head (vertical) joints, the ends of the brick should be completely buttered with mortar before shoving in place. Refer to BIA *Technical Note* 7B.
3. Specify appropriate mortar. Generally this means requiring a Type N mortar. Refer to BIA *Technical Notes* 8 and 8B.
4. Specify a clean air space. While no air space is completely void of mortar droppings, to the greatest extent possible, they should be prevented from falling into the air space or cavity. Refer to BIA *Technical Note* 7B.
5. Specify appropriate masonry accessories. Where required, specify the proper size of lintels, shelf angles, veneer anchors, and reinforcement. Keep in mind the minimum spacing and clearances for these items. Refer to BIA *Technical Notes* 17A, 31B, and 44B.
6. Detail through-wall flashing and weeps. Flashing and weeps channel water out of the cavity and away from the brickwork. Flashing and weeps should be provided at wall bases, window sills, heads of openings, shelf angles, projections, recessed bay windows, chimneys, under coping, tops of walls, and roofs. Refer to BIA *Technical Notes* 7, 7A, and 7B.
7. Detail expansion joints. Incorporate vertical and horizontal expansion joints into the brickwork at the appropriate spacing and locations. Place at or near corners, offsets, setbacks, wall intersections, changes in wall height, and where the backing or support changes. Place below shelf angles. Refer to BIA *Technical Note* 18A.
8. Specify tooled mortar joints. When "thumbprint" hard, mortar joints should tooled or struck with a jointer to consolidate the mortar. Concave, "V," and grapevine joints are best to resist water penetration. Refer to BIA *Technical Note* 7B.
9. When necessary, specify hot or cold weather construction practices. When temperatures are below 40°F or above 100°F, preparation, construction, and protection requirements for brickwork may have to be altered. Refer to BIA *Technical Note* 1.
10. Specify that no impermeable coatings be applied to brickwork. In most cases, BIA advises against the use of coatings on brick. If coatings are applied, they should be vapor permeable to allow moisture out of the brickwork. Refer to BIA *Technical Notes* 6 and 6A.

Beauty

11. Use the brick module to design and layout buildings. Design and construct the building plans, elevations, and masonry openings using the brick module which is usually 8 in. (200 mm). Refer to BIA *Technical Note* 10.
12. Specify to store materials off the ground during construction. Brick and mortar materials stored directly on the ground can wick up salts and other contaminants. Refer to BIA *Technical Notes* 7B and 23A.
13. Specify to cover materials during construction. Brick, mortar, and sand should be covered during construction to prevent water absorption. Discolored mortar joints or brick often occur when not covered. Refer to BIA *Technical Notes* 7B and 23A.
14. Specify to cover top of brickwork during construction. The tops of unfinished brickwork should be covered during construction to prevent water entry and resulting efflorescence. Refer to BIA *Technical Notes* 7B and 23A.
15. Specify blending of brick as they are laid. The mason should blend the brick by using brick from different cubes of brick as they are placed in the wall. This minimizes a splotchy appearance in the finished brickwork. Refer to BIA *Technical Note* 7B.
16. Specify proper cleaning of brickwork. Only the brick manufacturer's recommended cleaning procedure should be specified. Do not specify unbuffered muriatic acid. Specify that the brickwork be thoroughly saturated before and thoroughly rinsed after application of any cleaner. Refer to BIA *Technical Note* 20.

Both Durability and Beauty

17. Construct and approve mock-up panel. A mock-up panel allows all parties to view a full-scale example of the brickwork prior to its construction. Through this, all of the above considerations can be agreed upon before construction proceeds. Refer to BIA *Technical Note* 9B.

Summary

Brickwork is renowned for its beauty as well as its durability. Achieving these results requires proper specifying of the brick in addition to proper detailing and construction. Both are required. Doing so ensures the durability and beauty of brickwork for generations to come.

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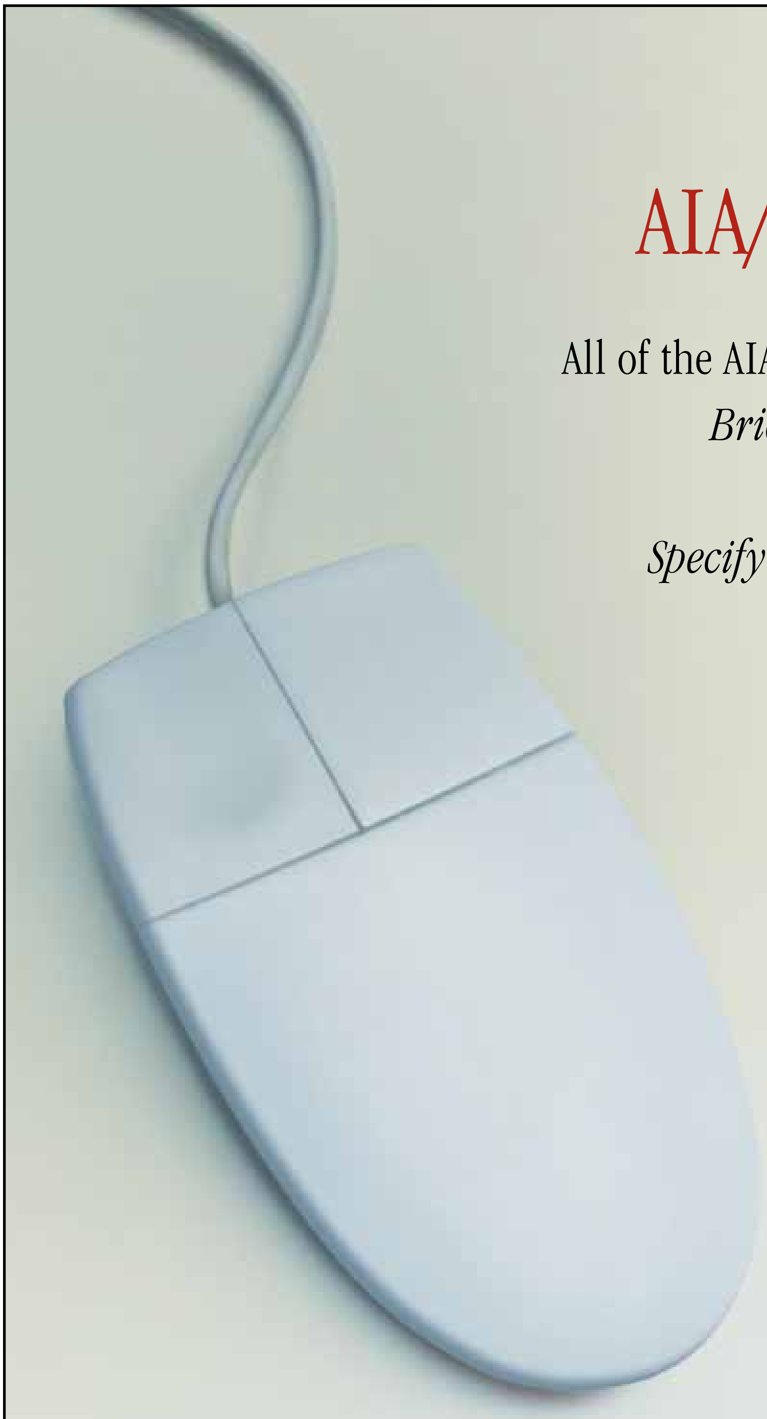

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