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Article I. Introduction to the Concrete Masonry Guide

This guide is intended to be used as a reference, to simplify your access to the most current product information, primarily residing online at the www.basalite-cmu.com website. Some sections are included in a high-resolution color print format, to give you offline access to important design-related information and options.

If you wish to receive additional copies of this guide, please contact us directly at (707) 678-1901, or visit us online at www.basalite-cmu.com/request-binder.

Section 1.01 Navigating the Guide (Print vs Digital Content)

Most of the information in this guide can be accessed in digital format, online at: www.basalite-cmu.com

If you require additional printed resources, you may request them directly at (707) 678-1901. You may also reproduce any of the contents of this guide, without exception, for your use, as needed.

Section 1.02 Contact Your Product Expert

Masonry products are REGIONAL; thus, the Basalite Concrete Products sales and support team includes several regional contacts and product experts. While we do recommend contacting the product expert that is closest to your PROJECT LOCATION, (rather than your office location), you may indeed call on your most local representative as your primary contract.

For a current directory of Product Experts, please visit: www.basalite-cmu.com/our-team

The contact information for each of our regional production facilities is listed below, for your convenience:

NORTHERN CALIFORNIA
(CORPORATE HQ)
605 Industrial Way
Dixon, CA 95620-9779
Phone: 707-678-1901
Toll-Free: 800-776-6690
Fax: 707-678-6268

CENTRAL CALIFORNIA
1201 Golden State Blvd.
Selma, CA. 93662
Phone: 559-896-1649
Section 1.02 Contact Your Product Expert (Continued)

ALBERTA, CANADA
233183 Range Road 283
Rocky View Country, Alberta T1X0J9
Phone: 800-596-3844
Fax: 604-596-6914

BRITISH COLUMBIA, CANADA
8650 130th Street
Surrey, BC V3W 1G1
Phone: 604-596-3844
Toll-Free: 800-596-3844
Fax: 604-596-6914

COLORADO
4900 Race Street
Denver, CO 80216-2242
Phone: 303-292-2345
Toll-Free: 800-289-2562
Fax: 303-292-2380

IDAHO
1300 E. Franklin Road
Meridian, ID 83642-5902
Phone: 208-888-4050
Toll-Free: 800-473-4080
Fax: 208-888-4054

NEVADA
355 Greg Street
Sparks, NV 89431-6205
Phone: 775-358-1200
Toll-Free: 800-800-1511
Fax: 775-359-5997

OREGON & WASHINGTON
3299 International Place
Dupont, WA 98327-7707
Phone: 253-964-5000
Toll-Free: 800-964-3424
Fax: 253-964-5005

Section 1.03 Request a Product Presentation

Our product experts are available to provide you with guidance and product education, including in-office or online courses. A directory of AIA-Accredited CEU courses can be viewed online at www.basalite.com/AlACEU.

You may request a product presentation by either calling your local product expert, or by using the online presentation request form, located at www.basalite.com/PresentationRequest.

After requesting a product presentation, our team will work with yours to coordinate the event details, including: presentation date and time, presentation location, meal accommodations (if any), including head count/quantity of attendees and any dietary restrictions.

Non-AIA-Accredited product presentations can also be provided on a per-project or per-product basis. And presentations can be scheduled for audiences of just one person, up to more than one hundred. Just ask!
Section 1.05 Request Product Sample(s)

Material samples are important to every project, and we have hundreds of samples ready to be sent to you, as needed. Rather than stocking your office with all the physical product samples available, we have included, both in this binder and online, a color/texture directory, from which samples can be ordered on-demand, as-needed, and shipped directly to your office with either normal delivery (2-4 business days), or expedited/overnight delivery, at no cost to you.

Prior to selecting any product samples, it is important to determine the location of your project, (due to the regional nature of concrete masonry products). For instance, you should not select samples from Northern California, for a project located in Central California.

Additionally, is it important to determine if your project might include any specialty shapes, (such as Ship Lap/Sloped units), which might only be produced in certain locations. If there is any question about which location you should select samples, please feel free to call your local product expert, per Section 1.02, Contact Your Product Expert.

Upon submitting a Sample Request, please be prepared to share, (if available), a few project-specific items that will allow us to maintain a clear history of our sample communications, including:

- Project Name:
- Project Address, (if known):
- A Brief Project Description:
- Contact Name:
- Contact Phone:
- Contact email:
- And Shipping Address(es), to which the samples will be sent: (Samples can be sent to more than one location, if needed, on the same project).

(Note: The information requested above is for our internal records only, and will not be shared outside of our company). To place a Sample Request by phone, please call your local product expert, or to submit your Sample Request online, please visit www.basalite.com/SampleRequest.

Section 1.05 Submit Recommendations for Update

Because our primary goal is to serve your needs in the manner that best suits you, we welcome any feedback or recommendations for how we might improve our available resources. We will consider all recommendations submitted. Please submit your recommendations online, by visiting www.basalite.com/Recommendations.
Article II. Concrete Block/CMU 101 – The Basics

Concrete Masonry Units (CMU), are available with far more options than most architects would imagine. Revisiting the fundamentals of concrete masonry is an excellent first step to designing a successful project, and the following sections outline some of the most important fundamentals to consider. You may also review this information online at www.basalite.com/CMU101.

Section 2.01 “Rocks in a Box” – Mix Design and Shape

Concrete Masonry is simply a modular form of concrete, consisting of a concrete mix design (the “rocks”), which is poured into a steel shape mold (the “box”), and then steam cured, palletized and made ready for shipping, once design strengths are achieved.

MIX DESIGN
The reason we call the concrete a “mix design” is because it is made up of specific ingredients in specific quantities, to meet a series of design and engineering criteria for both color and strength. The ingredients in a mix design typically include some, or all, of the following:

- Small Aggregates
- Medium Aggregates
- Sand
- Cement
- Water
- Iron Oxide Pigment(s)
- Other Additives (Eg. Integral Water Repellant)

SHAPE
There are literally hundreds of size and shape variations available. Just as the shape of a cake pan will define the shape of a cake, so to, does the shape of the CMU mold determine the shape of the CMU.

In expressing the size of a CMU, it is necessary to state the dimensions in the proper order – Width, Height and Length. A helpful tool for remembering this is the phrase “Wine Has Legs” (or W x H x L).

Mold options include variations in block width, (4”, 6”, 8”, 10”, 12”, 14” and 16” nominal), block height (4” and 8” nominal), and block length (8”, 16” and 24” nominal). Additionally, both the size of the voids (or “cores”), and the alignment of the core (centered or off-set), can be specifically varied. Solid units, without cores, are also available.

A typical unit includes several important elements, including Face Shells, Webs, and Cores. The “face shells” are the surfaces facing the inside and outside of the wall. The “web” or “webs” are the portions of the block connecting the two face shells. And the “cores”, are the open voids
between the face shells and the webs. Solid units, however, do not have cores, and thus, do not have face shells nor webs.

Example:

---

**DIMENSIONS**

There are three terms used in referring to dimensions: “Specified”, “Actual” and “Nominal”.

- **SPECIFIED DIMENSIONS** are those specified for the manufacture of masonry units or the construction of masonry. Calculations are based on specified dimension.

- **ACTUAL DIMENSIONS** are the measured dimension of the unit. UBC/IBC and ASTM Standards allow the actual dimensions a permissible variation from the specified dimension. Each individual product has its respective tolerances.

- **NOMINAL DIMENSIONS** are those used in stating unit size. They are equal to the specified dimension, plus the thickness of the mortar joint. The nominal dimensions compensate for a 3/8-inch joint for precision and split face, and a 1/2-inch joint for slump block. (For example: if the nominal dimension of the most common sized precision block is 8 x 8 x 16, the specified dimension of that same block is 7-5/8 x 3-5/8 x 15-5/8).

Example:
You may review a broad range of available shapes in Section 3.05 Block Shapes Guide. Note that we are continually responding to requests for new shapes and will continue to expand our available options, to meet the demand of our market. If there is a shape you are looking for that is not included in the Block Shapes Guide, please reach out to your local Product Expert, for additional information.

Section 2.02 Density vs Strength

It is important to understand the difference between the “Density” and “Strength” of a concrete masonry unit, as the two terms are often misunderstood and incorrectly assumed to be the same. In short, all three “Density” categories of CMU meet the minimum “Strength” requirements as defined by ASTM C90.

DENSITY

“Density” is another word for “weight”. A concrete “mix design” is measured in pounds per cubic foot, (“lbs/ft³” or “pcf”). In other words, “How much does one cubic foot of a given mix design weigh, when paced on a scale?” Most mix designs for CMU range between 85pcf and 140pcf+. Standards applicable to CMU include three classifications of weight: Lightweight (“LW”), Medium Weight (“MW”) and Normal Weight (“NW”). The term “Normal Weight” means “Heavy Weight”, because most aggregates in the U.S. are heavy. In Northern California, most local aggregates are light and medium, therefore, most CMU in Northern California is produced as Lightweight and Medium Weight, while Normal Weight is used less frequently.

Industry Classification of Density (weight) for Concrete Masonry (as determined by the weight of one cubic foot of the mix design used in a block):

- **Lightweight (LW) CMU**: Weighs less than 105lb/ft³ (1,680 kg/m³)
- **Medium Weight (MW) CMU**: Weighs 105lb/ft³ to less than 125lb/ft³ (1,680-2,000kg/m³)
- **Normal Weight (NW) CMU**: Weighs 125lb/ft³ (2,000kg/m³) or greater.

Note that CMU “Weight” does NOT equal CMU “Strength”.

STRENGTH

“Strength,” as related to masonry systems, is expressed in two distinct ways: Compressive Strength of the CMU, and the Specified Compressive Strength of the Masonry System (masonry units + mortar + grout).

The Compressive Strength of CMU is measured in “pounds per square inch”, (“lbs/in²” or “psi”). Among the combined strengths of the aggregates, sand and cement, the more important influence on overall compressive strength is the quantity of cement used in the mix, and the time allowed for the block to cure. Generally, the higher the cement content, the higher the strength, and, the longer the CMU cures, the stronger it gets, until it reaches its maximum designed strength (usually about 28 days).
Industry Classification of the compressive strength of CMU, (as determined by the psi calculated from the net area of the individual unit), must meet at least the minimum average net compressive strength, per ASTM C90, (which, as of the 2014 edition, is 2,000 net psi).

CMU that meets the ASTM C-90 minimum of 2,000psi is considered “Standard Strength”. CMU is also available in High Strength (“HS”) and Ultra High Strength (“UHS”), and the higher strengths are typically achieved by simply adding more cement to a standard strength mix design.

The Specified Compressive Strength of the Masonry System, (known as $f'_m$), is the value used in the design of the masonry wall, (the combined assembly, including the CMU, Grout, Mortar, and Steel). The California Building Code Sections 2105.1 and 2015A.1 refer to the TMS 602 for compliance with the specified $f'_m$ value. Testing methods used include the Unit Strength Method, and Prism Testing. More information on these testing methods is available in TMS 602, which can be viewed online at www.basalite.com/TMS602.

Note that only one testing method, (either Unit Strength Method, or Prism Testing), may be used for strengths up to 2,000 net psi, and only Prism Testing may be used for testing strengths greater than 2,000 net psi.

Industry Classification of Strength for Concrete Masonry Systems, (as determined by the compressive strength of the wall assembly, [CMU + (TYPE M OR S Mortar) + Grout], include:

- **Standard Strength**: $f'_m$ 2,000 net psi (min) met with 2,000 net psi CMU
- **High Strength**: $f'_m$ 2,250 net psi (min) met with 2,660 net psi CMU
- **Ultra High Strength**: $f'_m$ 2,500 net psi (min) met with 3,250 net psi CMU
- **Super Ultra High Strength**: $f'_m$ 3,000 psi (min) met with 4,500 net psi CMU

See Section 6.02 for additional information regarding ASTM C-90 and TMS 602.

<table>
<thead>
<tr>
<th>Net Area Compressive Strength of Concrete Masonry (psi), psi</th>
<th>Net Area Compressive Strength of ASTM C90 Concrete Masonry Units, psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1700</td>
<td>N/A</td>
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<tr>
<td>2750</td>
<td>3900</td>
</tr>
<tr>
<td>3000</td>
<td>4500</td>
</tr>
</tbody>
</table>

TMS 602-13 Compressive Strengths for Concrete Masonry (Unit Strength Table from TMS 602-13)
Section 2.03 Color, Texture and Pattern

Concrete masonry is available in a greater variety of options than you might imagine. A recommended order of selecting the attributes of CMU is:

1. Begin by selecting the “Color” (See Section 3.01 Mix Design/Color Options)
2. Select a “Texture” (See Section 3.02 Texture Options)
3. Select a “Pattern”, if any is desired (See Section 3.03 Pattern Options)

Note that while most colors are available in most shapes and patterns, specialty units might only be available in certain combinations. Contact your local Product Expert for more information.

Section 2.04 Thermal Design – Insulation vs Thermal Mass

A surprisingly positive benefit of CMU is its contribution to energy savings, when properly used in an overall energy strategy. A good way to think about this section is to consider every building as a combination of “Shelter” and “Comfort”.

In the western U.S., we have become perhaps too comfortable with relying on insulation and mechanical systems as our primary method of achieving comfort inside our buildings. With the rising cost of energy, coupled with the advancement of holistic energy modeling software, we have come to know that Thermal Mass is perhaps the most powerful component to a successful energy management strategy.

INSULATION

“Insulation” is a familiar material and is measured in R-value. While most of us know what an R-11 or R-19 Insulation solution means, we might not fully understand what insulation does, and why or when it should be used. Essentially, Insulation “lags” the time it takes for an outside climate to enter a building through the building envelope. Unfortunately, because insulation does not “damp” or lower the impact of the outside climate, we are left to “condition” the interior climate, most commonly with a mechanical heating and cooling system.

A surprising fact is that little or no insulation is required for CMU walls in most climate zones. In California, one of the toughest jurisdictions for energy compliance, the Title 24 Energy Code requires zero additional insulation, per Section 120.7(b)4, Mandatory Insulation Requirement for Heavy Mass Walls.

THERMAL MASS

“Thermal Mass” is the ability of a material to absorb and store heat energy. High thermal mass materials, like concrete, or water, require a lot of heat energy to change their internal temperature, while low mass materials, like timber and steel, change their temperature quickly when exposed to heat. The general effect of thermal mass is to regulate a more stable interior temperature. The building codes generally define an 8-inch CMU wall as a “Heavy Mass Wall”.
CMU has a direct impact on stabilizing interior temperatures due to a combination of both high thermal damping and even higher thermal lag. (Insulation provides a low degree of thermal lag, and has no ability to contribute to thermal damping).

Ideally, the right balance of both Insulation and Thermal Mass is designed for the specific climate zone of each project. Due to the relative lack of common knowledge related to thermal mass in the Western U.S., CMU offers perhaps the largest opportunity for improving the energy efficiency of structures, both old and new, in nearly every climate zone. In extreme climates, insulation may be used to reduce the thermal conductivity of walls.

Also, the modular nature of CMU allows it to be used easily in the renovation of existing structures, by allowing assembly of the masonry walls in just the right amount, location and configuration.

Below is a graph of the basic principles of temperature, comfort, insulation and thermal mass.

Thermal mass can assist in damping the outside climate into the comfort zone, thus achieving internal comfort with less reliance on other means of conditioning, such as mechanical heating and cooling systems.

Section 2.05 Moisture Control

Controlling moisture in any concrete structure requires thoughtful design, quality materials, and competent assembly. Fortunately, concrete masonry is a very mature building material and one that has benefited from a continuing level of improvement and innovation over the past many
decades, and masonry technology today offers a very favorable building solution for controlling and minimizing the effects of moisture.

“Moisture”, in any form, includes anything higher than zero percent humidity. Rather than only thinking about “driving rain” conditions, it is important to understand that moisture is a constant element in the environment, and a complete or holistic strategy for moisture management will ensure a successful masonry project, long into the future.

There are five essential components to a “best practices” moisture control strategy:

1. **Integral Water Repellant (IWR), and Post Applied Water Repellant**;
2. **Properly-Tooled Mortar Joints**, (“thumb print hard” and “full face shell deep”);
3. **Properly Caulked Openings and Penetrations**;
4. **Adequate Use and Location of Control Joints**, (26ft on center max, ½ at corners.);
5. **Proper Detailing and Cap Flashing at Top-of-Wall and Parapet Conditions**.

![Standard CMU Control Joint](image1.png) ![CMU Joint with Neoprene Insert](image2.png)

Several resources are available for properly understanding the essential components of a moisture control strategy, and can be viewed online at [www.basalite.com/MoistureControl](http://www.basalite.com/MoistureControl).

You may also contact your local Product Expert to review your Moisture Control Strategy at any time in the design of your project.

**Section 2.06 CMU + Mortar + Steel Reinforcing + Grout**

Masonry buildings require an entire system of components, including:

- **Concrete Masonry Units (CMU)**, which serve as a “stay-in-place-form” and offer a high degree of compressive strength to the wall assembly;
- **Cementitious Mortar**, which binds the CMU together and serves as roughly 7% of the finished wall surface area;
- **Steel Reinforcing**, which provides a high tensile strength to the wall assembly;
- **Cementitious Grout**, which serves to bind the tensile strength of the steel reinforcement to the compressive strength of the CMU.
All the components involved in a concrete masonry wall are thoroughly covered in the 2015 Design of Reinforced Masonry Structures (DORMS) publication, an abbreviated version of which is included in this binder, (See Section 6.02).

Section 2.07 End of Wall, Opening, Corners and Caps

End of wall conditions, door and window openings, corners and cap conditions occur on most projects, and conventional details are available. Most common is to end a wall or opening with “closed-end” (“A-Shaped”) units, rather than open-end “H-shaped” block. Corners can be detailed in a few different ways, and caps are simply solid CMU in 2”, 4”, or 8” high units. (See Section 5.03 BIM-M, CMU Standard Wall Assemblies and Detail Library) and access additional CMU details online at www.basalite.com/CMUDetails.

Article III. CMU Design Options

Section 3.01 Mix Design/Color Options

“Mix Design” and “Color” are directly related, and cannot be separated. The mix design is the combination of ingredients, (aggregates, sand, water, cement, etc.), and the color is the visual result of the combination of visible aggregates, visible cement, and (if included), the visual color of the iron oxide pigment.

The most important thing to remember about selecting a color, is that the specific ingredients required to achieve that color have both a specific weight, when placed on a scale, and a specific ratio of ingredients. If a color is to be modified, most likely the weight and most certainly the ratio of ingredients must also be modified.

Whatever the resulting weight of a given mix design might be, that weight should be referred to in all instances. (For example, if a mix design is selected that happens to weigh 100 lbs/ft³, then that mix design, which the industry considers to be “Lightweight”, should be referred to as “Lightweight” in all related STRUCTURAL NOTES, GENERAL NOTES, and SPECIFICATIONS). Too often, a color will be selected that is one weight classification, and then the additional references to that color/weight, get incorrectly referenced in the construction documents. See Section 2.02 Density vs Strength for more information on this important topic.

BASE COLORS
CMU can be selected by color, but it is important to realize that whatever color is selected, so too has the mix design been selected. The most basic color of block, commonly called “grey block”, is a natural grey, concrete mix design, with no other colored aggregates or iron oxide color added.
In addition to grey block, colored aggregates and various colors of iron oxide can be added to the mix. The second most common color of block is “tan block”, which results from adding iron oxide to the basic grey block mix design.

**STANDARD COLORS**
Most of the colors available for CMU are “standard”. And among the standard color options, there are hundreds of possible combinations of aggregate colors and iron oxide pigment colors available.

**PREMIUM COLORS**
Some of the more specialized color options include those containing either a “white cement” (rather than the normal grey “block cement”), and/or those including a specialty aggregate, (such as dolomite), and/or those using a rarer color of iron oxide pigment (blues and lavenders, for instance, can be more expensive than most other iron oxide pigments).

Section 3.02 Texture Options – Precision, Split Face, Shot Blast and Ground Face

CMU is available in several textures or “face” options, including:

**Precision Face**
“Precision Face” units are smooth-faced, straight-edged CMU, and are typically referred to as the most common or basic face type. The texture is an “as-molded” finish, produced by vibration during manufacturing, which brings the finest of aggregates to the surface, creating a thin veil of opacity on the surface of the block.

**Split Face**
The second, most common texture or face type of CMU is “Split Face”, which has a natural stone-like texture produced by manufacturing two or more units together, then mechanically splitting them apart after curing, creating a randomly fractured finish. Because the larger aggregates are split open during this process, aggregate selection can alter the final appearance.

Split face units can be manufactured with flutes or scores to provide strong vertical lines in the finished wall. The split face units are slightly wider than a precision face unit, to ensure that even the thinnest portions of the fractured face still meet the minimum thickness requirements for compliance with industry standards, as defined by ASTM C90.

**Shot Blast**
Yet another basic face type option is “Shot Blast”, which, as the name suggests, is the result of dropping steel shot beads on a precision face unit, which causes the opaque veil on the surface of the precision unit to be blasted away, leaving an exposed aggregate finish. Shot Blast units can be considered “pre-weathered”, as they possess a rough, exposed-aggregate look, right from the beginning of their life cycle.
Ground Face
One of the more sophisticated finishes is “Ground Face”, which results from evenly grinding through the opaque veil of a precision face unit, as the name suggests. Ground face units expose nearly all the ingredients of the mix design, including the aggregates, cement color and iron oxide pigments, if any. Ground face CMU looks a bit like a terrazzo finish, and when sealed, offer an attractive finish option for both exterior and interior use.

"Pattern Options" with CMU are available in a range of depths, widths and types. Pattern options can be either cast into the block at time of production, or, in the case of some scored unit options, literally wheel cut into the units, once fully cured at the plant. Three of the pattern categories, ranging from subtle to greatly exaggerated, include:

Combed Face
“Combed Face” units are literally combed with a toothy metal blade, which achieves a similar look as if you pulled a rake through sand. The striated effect is achieved by means of small vertical grooves molded into the face of the block. The striations are most often random, to achieve a naturally rough look, but are sometimes available in uniform striation patterns.

The Combed Face finish can be specified for conventional, scored and fluted units. Some designers have chosen to treat the striations a bit like a “scratch coat” (using stucco terminology), over which a one-coat cementitious finish may be applied. Note that the striations are only available in a vertical, not horizontal, direction, and can either be left exposed, or can be covered with a cementitious plaster finish, in the field.

Scored
“Scored” units are available in a range of options, the most standard of which is intended to simulate a vertical mortar joint(s) on the face of the block, to appear as though there are several smaller sized units being used, while still allowing construction using full-sized units. For example, an 8 x 8 x 16 unit with a single score up the middle of the face, looks like two 8” long units, rather than one 16” long unit, whereas an 8 x 8 x 16 unit with three scores, looks like four 4” long units are used. Scored units may also be available in 1, 2, 3, 5, 7 and 11 scores per unit.
Scores are available as “STANDARD”, “TAPERED”, and “DEEP SCORE”. Standard scores are typically 3/8” wide and 3/8” deep (emulating a typical mortared head joint). Tapered scores are 3/4” wide, tapering to 3/8” wide, and are 5/8” deep. Deep Scores, (also called “1-inch scores”) are 1” wide and 1” deep. Deep Score units must be manufactured in a wider block width, to allow for the deep score to be achieved, while maintaining the minimum required face shell thickness.

Fluted
“Fluted” units are among the most expressive options in CMU. The term “flute”, refers to the deep void, cast into the face of the unit, which results in a series of projections, or “ribs”. The size, depth and quantity of the flutes are available in several options, and the face texture can be either Precision or Split Face. The flutes and ribs are always in a vertical orientation and horizontal flutes and ribs are not currently an option.

Fluted units typically have an equal number of flutes and ribs, (for example, a unit with four ribs, requires three flutes in the middle of the unit, and two “half” flutes at each end, thus 3 + ½ + ½ = 4 flutes). Fluted units are available with 4, 6 and 8 vertical flutes/ribs.

Much like Deep Score units, Fluted units must be manufactured in a wider block width, to allow for the deep flute to be achieved, while maintaining the minimum required face shell thickness.
The following Color/Texture Guide includes many of our most popular CMU Colors and Textures. It is not meant to be entirely inclusive of all our available options as we will continue to develop new mix designs and textures in response to demand from the AEC community for continued innovation in CMU. Please review the most current Color/Texture Guide online at www.basalite.com/CMUColorTextureGuide.

Also, if you either do not see a color or texture you are seeking, or have ideas for new colors or textures, please contact your local Product Expert directly.
Section 3.05 Block Shapes Guide

The following Block Shapes Guide includes many of our most popular CMU shapes. It is not meant to be entirely inclusive of all our available shapes as we will continue to develop new shapes in response to demand from the AEC community for continued innovation in CMU. Please review the most current Block Shapes Guide online at www.basalite.com/CMUBlockShapes.

Also, if you either do not see a shape you are seeking, or have ideas for new shapes, please contact your local Product Expert directly.
Several specialty CMU shapes are available, including “Slump Block”, “ShipLap”, “Hi-RH”, and “SpecFinish”, among others. Additional specialty options may be added in the future, which are typically created in response to a growing demand by designers and engineers for more innovative shapes and features in CMU.

**SLUMP BLOCK**

“Slump Block” masonry units have slightly curved faces and are designed to resemble handmade adobe units. They are commonly used as a more structurally sound alternative to traditional adobe. The term “Slump Block” comes from the fact that unlike standard CMU, (which is produced using a “no-slump” mix design which holds its shape when removed from the manufacturing mold), Slump Block is manufactured using a concrete mix that settles, or slumps, within desired limits, when removed from its manufacturing mold.

Slump unit widths can vary as much as 1-inch (25mm). For this reason, the structural design should assume the actual width of the unit is 1-inch (25mm) less than the nominal dimension.

**SHIPLAP**

“ShipLap” concrete masonry units are a more recent innovation produced in response to an architect’s request for a CMU that resembles traditional ship lap wood siding. The solution is quickly becoming a popular option for custom and multi-family residential, as well as commercial, projects, due to its integrity as a reinforced concrete solution, with inherent attributes that are far more durable than traditional wood siding, including a 4-hour fire rating (8-inch solid grouted wall), integral color, moisture resistance, and long-term resistance to the elements, without the need for repetitive maintenance, repainting, or upkeep.

ShipLap units are available in straight, or “stretcher” units, as well as corner and half units. They are assembled similarly to non-shiplap CMU units, and have a pronounced horizontal shadow line, characteristic of shiplap wood siding or cottage shingles.

![Slump Block](image1)

![Ship Lap Unit](image2)
“Hi-RH” – “Integrally Insulated”, (or “Pre-Insulated”) CMU

Hi-RH CMU is a specialty shape developed in response to a need for integral insulation, inside of the masonry unit, rather than outside of the masonry unit. The specialty unit is manufactured, under license, as SpecThermal© by a national group of manufacturers called The Concrete Products Group, or “CPG”, of which Basalite is a member. Hi-RH units are currently available as a 12-inch wide option, with roughly the equivalent structural properties of a typical 8-inch wide CMU, while allowing additional thickness for the insulation insert, and outer face shell.

NOTE: It is important to review Section 2.04 Thermal Design – Insulation vs Thermal Mass, whenever selecting an insulated, or non-insulated masonry solution.

The term “Hi-RH” refers to the fact that the unit achieves a “high R-Value”, and is manufactured as a “double-open-end”, or “H” block shape. The concrete portion of the unit is manufactured as a traditional CMU, however the web of the unit differs slightly from traditional CMU, in order to allow room for a two-piece rigid insulation insert. The units ship from the factory with the insulation already inserted. Note that end-of-wall, and corner conditions, require a combination of Hi-RH and non-Hi-RH (traditional) CMU. There are several excellent design and construction guides and resources available online at www.basalite.com/hirh.

SPECBRIK©

“SpecBrik©” is another specialty shape, produced in alliance with The Concrete Products Group, and is a cost-effective alternative to traditional clay brick construction. SpecBrik is typically 20-30% less expensive than comparable clay brick systems, and delivers the traditional look of brick, while delivering the structural benefits of a fully reinforced concrete wall system.

It is important to note that the shape of a SpecBrik© unit is identical to a conventional 8x4x16 CMU, however, the mix design has been specifically developed to emulate fired clay brick, and is available nationwide in a range of 12 colors. SpecBrik© allows for an increased speed of construction over traditional clay brick systems, is mold and fire resistant, and requires minimal maintenance over the life of the project. Additional information on SpecBrik© is available online at www.basalite.com/SpecBrik.

Additionally, if the unit size of traditional brick is part of your design intent, but you wish to have the look of something other than fired clay brick, you can simply specify a conventional 8x4x16, and select from any of the available colors in the Basalite Color/Texture Guide. See Section 3.04 Color/Texture Guide, or go online to www.basalite.com/CMUColorGuide.

Hi-RH Pre-Insulated Unit  SpecBrik© Unit
**SPECFINISH® (Coated Masonry)**

“SpecFinish” Coated Masonry is another specialty product, produced in alliance with The Concrete Products Group, and is a cost-effective solution for settings where a smooth, durable and easily cleaned wall surface is required.

SpecFinish® is great for rooms with strict sanitary requirements, such as pharmaceutical clean rooms, food processing plants, food preparation areas, research/biosafety labs, veterinary facilities, vivariums and hospitals. It is also a great solution for high-traffic public facilities, including stadiums, arenas, schools, dormitories, lavatories, gyms and indoor swimming facilities, among others.

SpecFinish® walls are made using Spec-Surface™ block, which is made with a pre-conditioner and special mix design to produce a tight and smooth finish texture, reducing the amount of block filler coats required to achieve a smooth, finish-ready surface.

SpecFinish® combines special smooth textured Spec-Surface™ block with high performance coatings from Tnemec. The result is a coated wall system that is economical, water and chemical resistant, durable, and easily cleaned.

**Article IV. Specifications**

Specifications for any building material can vary in format and content depending on which standard is being used on a project. A variety of resources are available to help with creating a proper masonry specification, (typically under CSI Division 04 22 00 for concrete masonry).

If you already have a draft specification, you may contact your local Product Expert for a review of the most common issues and updates.

**Section 4.01 An Overview of the CMU Specification**

It is easy to get lost in the details of a specification and lose sight of the fundamentals that most relate to your design intent. The following is a good outline of information that originally appeared in the CMACN 2017 Awards Issue of “CMU Profiles in Architecture”, and was written by Kurt Siggard of the Concrete Masonry Association of California & Nevada, and John Chrysler of The Masonry Institute of America. (Note: Some additions have been made).

**SPECIFYING CONCRETE MASONRY UNITS (CMUs):**

Only specify that the CMUs meet all the requirements of ASTM C90, along with color and texture. Leave the weight and method of verifying compliance with the design strength ($f'_m$) (Unit Strength of Prism method) to the S-1 (Structural) Sheet.
When Unit Strength method is used to verify $f'_m$, suggest that the structural engineer use a “standard” composite masonry strength (i.e. 2,000psi, 2,250psi, 2,500psi, 2,750psi or 3,000psi) listed in the Unit Strength Table.

Make sure that your specification does not require a “Grade” or “Type”. These designations have not been found in the ASTM or Building Code for many cycles. Producers will not be able to certify that CMUs meet the requirements of a specification requiring “Grade” or “Type”.

**SPECIFYING MASONRY MORTAR:**
Only specify that the masonry mortar meets the requirements of ASTM C270 and any color that may be required. Leave the mortar Type (M or S) to the S-1 (Structural) Sheet.

Do not specify a mortar strength. Mortar meeting the requirements of ASTM C270 may be either proportioned as shown in the C270 Proportion Table, or meet the physical properties required for the Type specified (i.e. compressive strength). Mortar should never be specified to meet both the proportion and property requirements.

Do not specify field testing in an effort to verify compressive strength of mortar used in the field. Field testing may be used to establish consistency in mortar used in the field. When field mortar testing is required, mortar must be sampled and tested prior to start of construction in accordance with ASTM C780 to establish a baseline for comparison of field-tested mortar. There are no ASTM requirements that field sampled mortar meet the strength requirements.

Testing of approved, pre-blended mortar is no longer required on essential services projects (including K-12 and Community Colleges). CBC 2105A.3 Exception 2.

**SPECIFYING MASONRY GROUT**
Specify that the masonry grout must meet the requirements of ASTM C476. Leave the strength requirements to the S-1 (Structural) Sheet. Insist that the mix design submitted indicate compliance with ASTM C476.

Masonry grout should have a slump between 8 and 11 inches and should contain no water reducers or plasticizers (approved grout-aid should only be specified when required by some agencies for high-lift grouting).

Total weight of cementitious materials in the mix should not exceed 610 pounds, and Portland Cement may be replaced with up to 40% fly ash or a combination of 70% fly ash and ground granulated blast-furnace slag (see www.cmacn.org for details).

Masonry grout mixes developed by ready-mix suppliers are not required to have a 1/3 increase in strength when statistical test data is not available.

Masonry grout should not contain integral water repellants.
MORTAR JOINTS
Specify that mortar joints should be tooled to form a waterproof joint and a tight bond with the CMUs. A concave tooled joint is most commonly used.

Specify that mortar joints should be “face shell deep” and should be tooled when “thumb print hard”.

Any mortar joints that are cracked or not bonded with the face shells of the CMUs should be removed and joints repointed prior to grout placement.

CONSTRUCTION TOLERANCES
Construction tolerances should be specified to meet the requirements of TMS 602 Article 3.3 F. Note that construction tolerances are intentionally compatible with material manufacturing tolerances.

QUALITY CONTROL AND TESTING PROGRAM
A quality control and testing program should be specified to meet the requirements of TMS 602 Article 1.6.

Inspection and testing frequency should be outlined on the S-1 (Structural) Sheet. Incorporate Tables 3 and 4 from TMS 602 Article 1.6. We suggest creating a table similar to Tables 3 and 4 and indicate project specific tests and inspections and their frequency.

MOVEMENT AND CONTROL JOINTS
Movement and control joints should be specified and located on the project documents by the design team. Movement and control joint locations should never be left to the discretion of the contractor.

Section 4.02 Online Specifications Builder
An online specification builder is available at www.basalite.com/CMUSpecBuilder. Simply check the boxes related to your design intent, and then generate a text file that can be copied and pasted into your standard specifications format. For assistance on which items to include or not, you may contact your local Product Expert.

Section 4.03 Editable Specification
A complete CMU specification is also available online that can be downloaded and edited in a word or pdf version, at www.basalite.com/CMUSpecification. A copy is also available in Section 6.02 Directory of Related Publications.
Article V. Digital Design Tools

An exciting movement is underway regarding the advancement of technology-enabled design tools for concrete masonry.

Section 5.01 CMUColors.com

A growing online directory of CMU options is available at www.cmucolors.com.

The first step is to consider the location of your project, and select the library in which your project is located. Next, peruse the color/texture library by selecting a face type.

Next you may navigate the thumbnails located on the left of the site, and can view a medium-sized image on the right of the site, once a thumbnail is selected. You will notice a series of meta-tags or keywords under the medium-sized image, which pertain to that specific mix design, including color number/name, density, and price category. By clicking on the medium-sized image, a larger, high resolution image will appear, that can be downloaded and used for your design research and presentations.

Product samples can be requested from the www.cmucolors.com site and can be sent directly to your office, without cost. If you have any special requests, please contact your local Product Expert for assistance.

Section 5.02 Masonry IQ – REVIT Plug-In

One of the strongest tools available for concrete masonry design is Masonry IQ™, which is available as a REVIT Plug-In and is available for download at the Autodesk® App Store. A 30-day free trial is available as well as several tutorial videos and resources located at www.3diqinc.com.
Section 5.03 BIM-M, CMU Standard Wall Assemblies and Detail Library
Article VI. Additional Resources

Section 6.01 Directory of Related Associations

- American Institute of Architects: https://www.aia.org/
- ASTM International: www.astm.org
- California Association of Building Energy Consultants: https://cabec.org/
- Concrete Products Group: www.concreteproductsgroup.com
- Concrete Masonry Association of California and Nevada: www.cmacn.org
- Construction Specifications Institute: www.csiresources.org/home
- Interlocking Concrete Pavement Institute: www.icpi.org
- International Masonry Institute: http://imiweb.org/
- Masonry Systems: www.masonrysystems.com
- National Concrete Masonry Association: www.ncma-br.org/basaliteconcreteproducts
- Northwest Concrete Masonry Association: www.nwacma.org
- Rocky Mountain Masonry Institute: www.rmmi.org
- The Masonry Society: www.masonrysociety.org
- Why Masonry?: http://whymasonry.org
Section 6.02 Directory of Related Publications