



**MODERN
MASONRY:
PRE-BLENDED
MORTAR
for the**

**CONSTRUCTION
INDUSTRY**

Presented by:
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Oldcastle APG - Coastal

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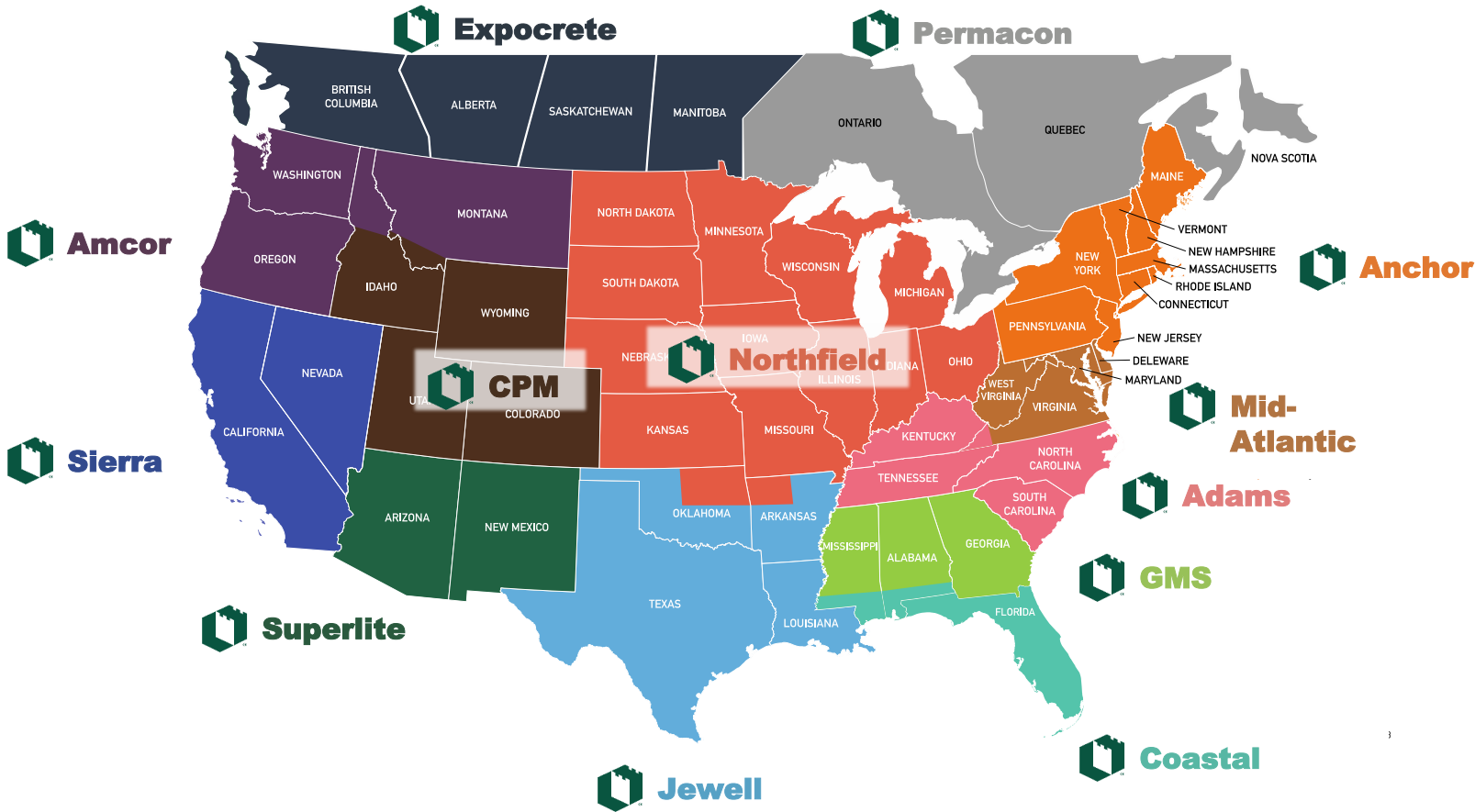


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Masonry Association of Florida

WHO WE ARE

The Masonry Association of Florida (MAF) is a not-for-profit trade association dedicated to expanding the market share of masonry construction in Florida. Masonry construction dominates the construction industry because of its adaptability to the Florida climate. One of the most durable building products available, masonry resists storms, termites and mold, while reducing energy costs, maintenance and noise. The MAF is a coalition of Florida masonry industry professionals who believe it's time to bring our industry together.



THE MAF OFFERS

- Professional Education (Architects, Engineers, Contractors & Building Inspectors)
- Masonry Apprentice Training
- Technical Assistance through our Engineering Help Desk & Technical Library
- For more: www.floridamasonry.com

Florida Concrete Masonry Education Council



Masonry Education and Advocacy

The Florida Concrete Masonry Education Council was created as a non-profit corporation under Rick Scott. Operating as a direct-support organization of the Dept. of Economic Opportunity.

Its directives include:

- Plan, implement and conduct programs of education in the field of concrete masonry
- Develop and improve access to education for individuals seeking employment in the field of concrete masonry
- Develop and implement outreach programs to ensure diversity among individuals trained in the programs
- Coordinate educational programs with national programs and programs of other states
- Inform and educate the public about the sustainability and economic benefits of concrete masonry products
- Develop, implement and monitor a system for the collection of self-imposed voluntary assessment on each concrete masonry unit produced and sold by the concrete manufacturers in the state

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Modern Masonry: Pre-Blended Mortar for the Construction Industry



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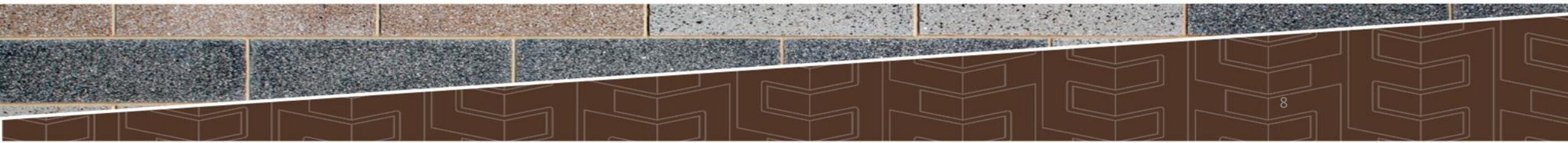
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Quick Agenda

1. What is Mortar?
2. Sand Bulking
3. Mortar Designations and Strengths
4. Pre-Blended versus Field Batching





What is
mortar?

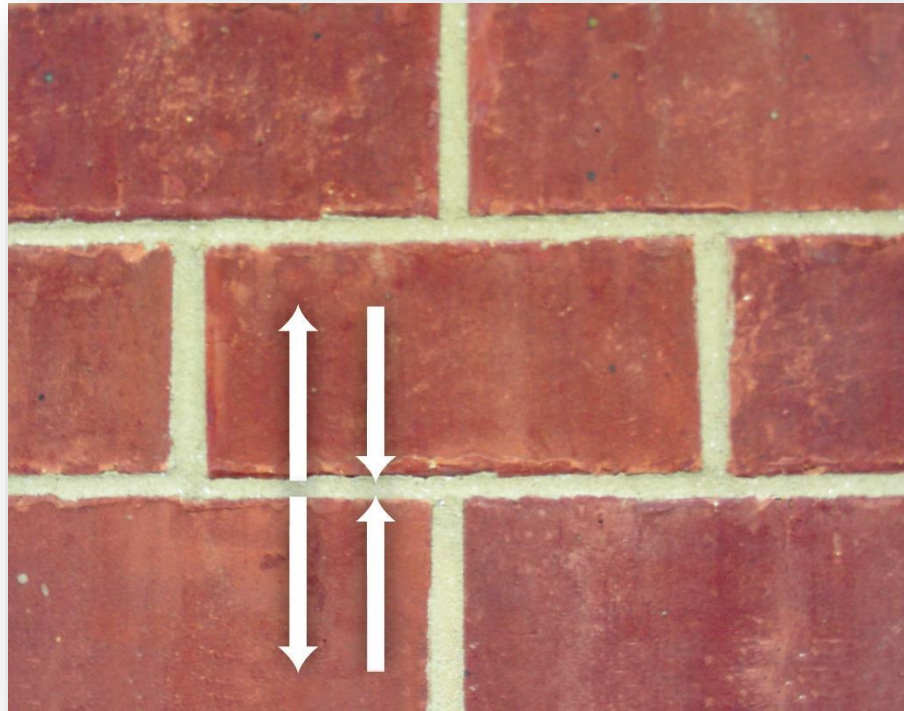
WHAT IS MORTAR?

A mixture of cementitious materials, aggregates, water, with or without admixtures, that is used to construct unit masonry assemblages



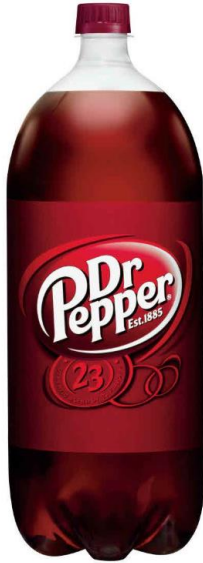
WHAT IS THE ROLE OF MORTAR?

Does mortar keep units together or keep units apart?



WHAT GOES INTO MORTAR?

1. Cement



es

- Water Repellents
- Accelerators/Retarders
- Bond Strength
- Durability
- Shrinkage





Sand!



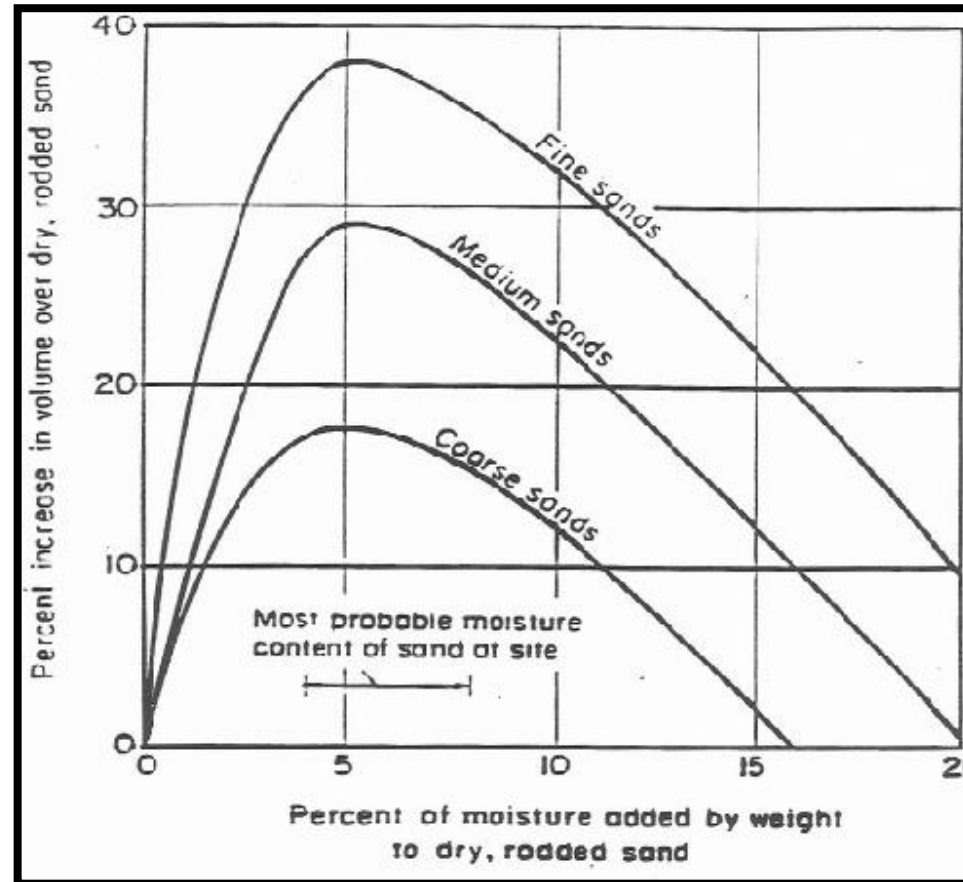
How does sand affect the quality or consistency of mortar?



Sand Bulking!



The Sand Bulking Curve



Moisture Content of Masonry Sand Typically Ranges Between 4-12%



Selecting
and
Specifying
Mortar



Designation: C270 – 14a

Standard Specification for Mortar for Unit Masonry¹

This standard is issued under the fixed designation C270; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.



Mortar selection has two basic parts...

<u>Plastic Mortar</u>	<u>Hardened Mortars</u>
<ul style="list-style-type: none">• Workability• Flow• Water Retentivity – “Board Life”• Cohesion• Stiffening Characteristics – “Tooling Times”	<ul style="list-style-type: none">• Bond – “Intimacy” – “Extent” – “Durability”• Freeze – Thaw Durability• Compressive Strength

Other Factors: I.R.A. of Unit, Seismic Zone, Climate



What are the ASTM C270 mortar designations and how were they determined?

M A S O N W O R K





ASTM C 270 SELECTION GUIDE FOR MORTAR

TABLE X1.1 Guide for the Selection of Masonry Mortars^A

Location	Building Segment	Mortar Type	
		Recommended	Alternative
Exterior, above grade	load-bearing wall	N	S or M
	non-load bearing wall	O ^B	N or S
	parapet wall	N	S
Exterior, at or below grade	foundation wall, retaining wall, manholes, sewers, pavements, walks, and patios	S ^C	M or N ^C
Interior	load-bearing wall	N	S or M
	non-bearing partitions	O	N
Interior or Exterior	tuck pointing	see Appendix X3	see Appendix X3

^AThis table does not provide for many specialized mortar uses, such as chimney, reinforced masonry, and acid-resistant mortars.

^BType O mortar is recommended for use where the masonry is unlikely to be frozen when saturated, or unlikely to be subjected to high winds or other significant lateral loads. Type N or S mortar should be used in other cases.

^CMasonry exposed to weather in a nominally horizontal surface is extremely vulnerable to weathering. Mortar for such masonry should be selected with due caution.



ASTM C 270 PROPORTION SPECIFICATION:

TABLE 2 Proportion Specification Requirements

NOTE 1—Two air-entraining materials shall not be combined in mortar.

Mortar	Type	Proportions by Volume (Cementitious Materials)							Aggregate Ratio (Measured in Damp, Loose Con- ditions)	
		Cement ^A	Mortar Cement			Masonry Cement				Hydrated Lime or Lime Putty
			M	S	N	M	S	N		
Cement-Lime	M	1	¼	
	S	1	...	...	...	...	...	...	over ¼ to ½
	N	1	...	...	...	...	...	...	over ½ to 1¼
	O	1	...	...	...	...	...	...	over 1¼ to 2½
Mortar Cement	M	1	1	Not less than 2¼ and not more than 3 times the sum of the separate vol- umes of cementi- tious materials
	M	...	1	...	...	...	...	...	...
	S	½	...	...	1	...	...	...	...
	S	...	...	1	...	...	...	...	...
	N	...	...	...	1	...	...	...	...
	O	...	...	...	1	...	...	...	...
Masonry Cement	M	1	1	...	
	M	...	...	...	...	1	...	...	...
	S	½	...	...	...	...	...	1	...
	S	...	...	...	...	...	1	...	...
	N	...	...	...	...	...	...	1	...
	O	...	...	...	...	...	...	1	...

Is ASTM C270 Table 2 prepared mortar really proportioned by strict volume controls?





ASTM C 270 PROPERTY SPECIFICATION:

TABLE 1 Property Specification Requirements^A

Mortar	Type	Average Compressive Strength at 28 days, min, psi (MPa)	Water Retention, min, %	Air Content, max, % ^B	Aggregate Ratio (Measured in Damp, Loose Conditions)
Cement-Lime	M	2500 (17.2)	75	12	Not less than 2 ¼ and not more than 3 ½ times the sum of the separate volumes of cementitious materials
	S	1800 (12.4)	75	12	
	N	750 (5.2)	75	14 ^C	
	O	350 (2.4)	75	14 ^C	
Mortar Cement	M	2500 (17.2)	75	12	
	S	1800 (12.4)	75	12	
	N	750 (5.2)	75	14 ^C	
	O	350 (2.4)	75	14 ^C	
Masonry Cement	M	2500 (17.2)	75	18	
	S	1800 (12.4)	75	18	
	N	750 (5.2)	75	20 ^D	
	O	350 (2.4)	75	20 ^D	

^ALaboratory prepared mortar only (see **Note 5**).

^BSee **Note 6**.

^CWhen structural reinforcement is incorporated in cement-lime or mortar cement mortar, the maximum air content shall be 12 %.

^DWhen structural reinforcement is incorporated in masonry cement mortar, the maximum air content shall be 18 %.



Mortar
Strength



Does the compressive strength of a mortar cube represent the strength of the mortar in the wall?



NO!

The mortar in the wall will be MUCH stronger than the tested strength of the cube due to water absorption and its aspect ratio (L x H).



ASTM C 780 Testing: Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry

1. Scope*

1.1 This test method covers procedures for the sampling and testing of mortars for composition and for their plastic and hardened properties, either before or during their actual use in construction.

NOTE 1—Guide [C1586](#) provides guidance on evaluating mortar and clarifies the purpose of both this test method and Specification [C270](#).

NOTE 2—The testing agency performing this test method should be evaluated in accordance with Practice [C1093](#).

1.2 *Preconstruction Evaluation*—This test method permits comparisons of mortars made from different materials under simulated field conditions. It is also used to establish baseline values for comparative evaluation of field mortars.

1.3 *Construction Evaluation*—Use of this method in the field provides a means for quality assurance of field-mixed mortar. It includes methods for verifying the mortar mix proportions, comparing test results for field mortars to preconstruction testing, and determining batch-to-batch uniformity of the mortar.

1.4 The test results obtained under this test method are not required to meet the minimum compressive values in accordance with the property specifications in Specification [C270](#).

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific hazards statements, see Section [8](#).

2. Referenced Documents

2.1 *ASTM Standards:*²

[C39/C39M](#) Test Method for Compressive Strength of Cylindrical Concrete Specimens

[C109/C109M](#) Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

MORTAR COMPRESSIVE STRENGTH REPORT

Report Number: 95141006.0061
Service Date: 04/02/15
Report Date: 05/04/15 Revision 1 - 28 day results

Terracon

2501 East Loop 820 North
Fort Worth, TX 76118
817-268-8600 Reg No: F-3272

Client

Oldcastle West APG, Inc.
Attn: Garen Graves
400 Jewell Dr.
Waco, TX 76712

Project

Mortar/Grout Product Testing
Plant Samples
Various Locations
Fort Worth, TX

95141006

Services: Mix, mold and test for compressive strength in accordance with ASTM C270, mortar mix submitted to this facility.

Product: Gray Portland Lime, Type N

REPORT OF TESTS

Date Mixed: 4-2-15
Flow: 108
Water Retention: 91.7
Water Used (%): 16.7

Air Content: 12.0+
Method of Mixing: Machine
Specimen Size: 2" X 2" X 2" Cubes

CYLINDER MARK		AREA (SQ. IN.)	AGE (DAYS)	DATE TESTED	TOTAL LOAD (LBS)	COMPRESSIVE STRENGTH (PSI)
SET	NO.					
1	1	4.0	7	4-9-15	1980	500
1	2	4.0	7	4-9-15	2140	540
1	3	4.0	7	4-9-15	2120	530
			AVERAGE			520
1	4	4.0	28	4-30-15	3550	890
1	5	4.0	28	4-30-15	3730	930
1	6	4.0	28	4-30-15	3570	890
			AVERAGE			900
1	10		42	5-14-15		
1	11		42	5-14-15		
1	12		42	5-14-15		
			AVERAGE			

Services:

Terracon Rep.: Taylor, Frankie

Reported To:

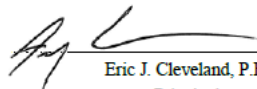
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Reviewed By:


Eric J. Cleveland, P.E.
Principal

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

Type

Water

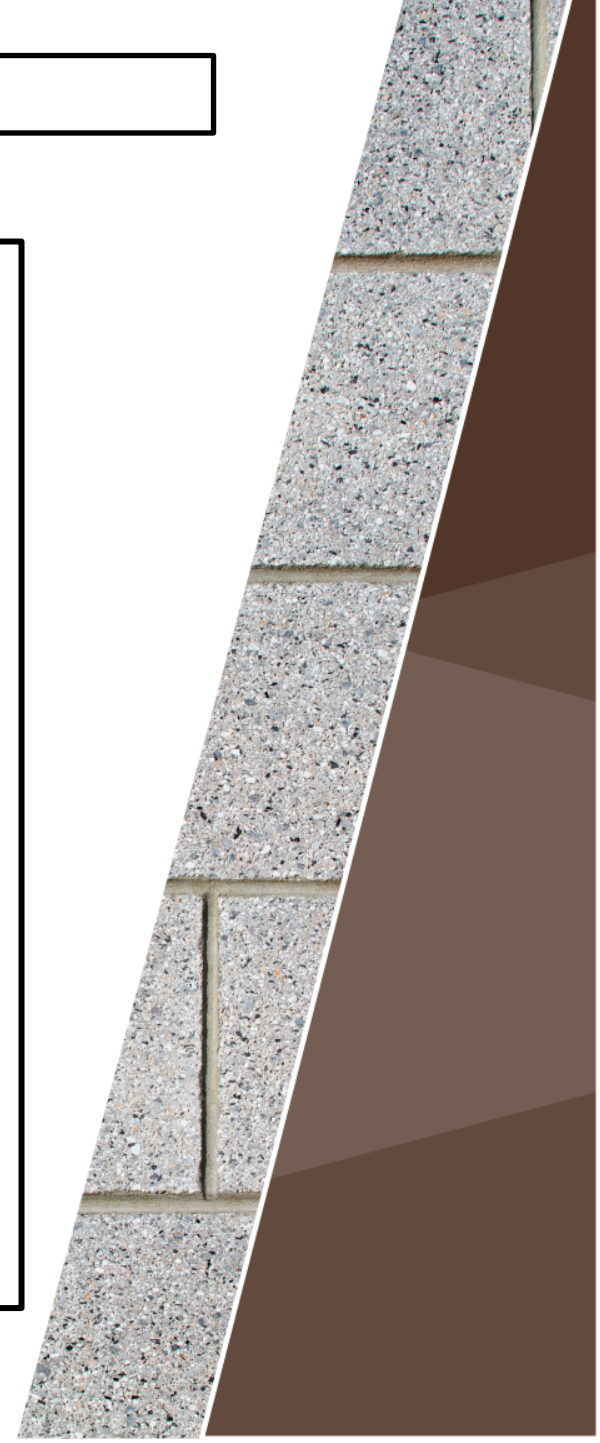
Air

Strength

Steps to selecting masonry mortar.

Through a preconstruction evaluation:

1. Selecting and analyze masonry units for the project.
2. Specify an ASTM C270 “Property Spec” mortar to match units.
3. Request laboratory certified test results!
4. Specify CONSISTENT mortar materials, pigments and mixing procedures.
5. Construct a sample panel. **WASH IT. LET IT CURE 7 DAYS.**
6. Perform ASTM C780 (field test) BEFORE construction. Use same materials in panel for construction!
7. Always request a COMPLETE submittal package.



Side Note:

ASTM C1714 Standard Specification for Preblended Dry Mortar Mix for Unit Masonry



Designation: C1714/C1714M – 10

Standard Specification for Preblended Dry Mortar Mix for Unit Masonry¹

This standard is issued under the fixed designation C1714/C1714M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification covers masonry mortars whose materials and design requirements are governed by Specification C270 but are preblended dry in a factory instead of produced from individual raw materials delivered to the job-site.

1.2 The field-sampling, testing, directly comparable test results, packaging, and the traceability of ingredients of preblended dry mortar mix differ from job site mixed mortars and this standard specifically addresses these issues. The tight control of ingredient ratios possible with preblended dry mortar is also covered.

1.3 The text of this specification refers to notes and footnotes, which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered the requirements of the standard.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* **Warning**—Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.

2. Referenced Documents

- 2.1 *ASTM Standards*:²
C144 Specification for Aggregate for Masonry Mortar

¹ This specification is under the jurisdiction of ASTM Committee C12 on Mortars and Grouts for Unit Masonry and is the direct responsibility of Subcommittee C12.03 on Specifications for Mortars.

Current edition approved June 15, 2010. Published June 2010. Originally approved in 2009. Last previous edition approved in 2009 as C1714/C1714M – 09. DOI: 10.1520/C1714_C1714M-10.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- C260 Specification for Air-Entraining Admixtures for Concrete
C270 Specification for Mortar for Unit Masonry
C305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
C780 Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C979 Specification for Pigments for Integrally Colored Concrete
C1180 Terminology of Mortar and Grout for Unit Masonry
C1384 Specification for Admixtures for Masonry Mortars
C1437 Test Method for Flow of Hydraulic Cement Mortar
C1586 Guide for Quality Assurance of Mortars

3. Terminology

3.1 For definition of terms used in this specification, refer to Terminology C1180.

3.2 *Definitions of Terms Specific to This Standard:*

3.3 *preblended dry mortar mix, n*—a mix of dry aggregate; portland cement and hydrated lime, blended hydraulic cement, masonry cement, hydraulic cement, or mortar cement; and may contain additives used to enhance one or more properties such as setting time, workability, water retention, bond and durability or color pigment; and are thoroughly blended together at the factory without the addition of water.

3.4 *additive, n*—a dry mortar material other than the Specification C270 prescribed materials of aggregate and cementitious materials that is added to a dry mortar mix at the batch plant to modify one or more properties of the conventional masonry mortar.

4. Classification

4.1 The classifications of mortars in this specification are as described in Specification C270. Mortar type selected shall be a Type M, S, N, or O meeting the requirements of either the Property Specification or the Proportion Specifications.

5. Specifying Mortar

5.1 Specify type of mortar desired.

*A Summary of Changes section appears at the end of this standard.

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Still meets ASTM C270
Still requires the same testing



Masonry mortar is a poorly understood building material, yet it is critical to a wall's structural integrity and aesthetic value.

Specifications are often misunderstood and quality assurance tests are frequently applied incorrectly.

REMEMBER: What YOU specify is what YOU get.



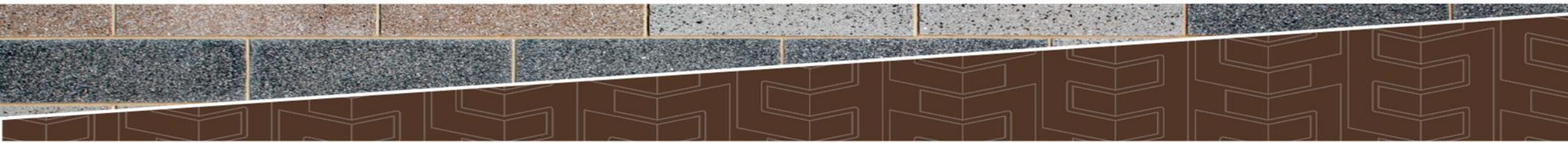
Polling Questions

Type S Mortar is recommended for CMU construction and Type N Mortar for Brickwork.

- A. True
- B. False

Is it possible to fail the ASTM 780 test for field mortar?

- A. Yes
- B. No



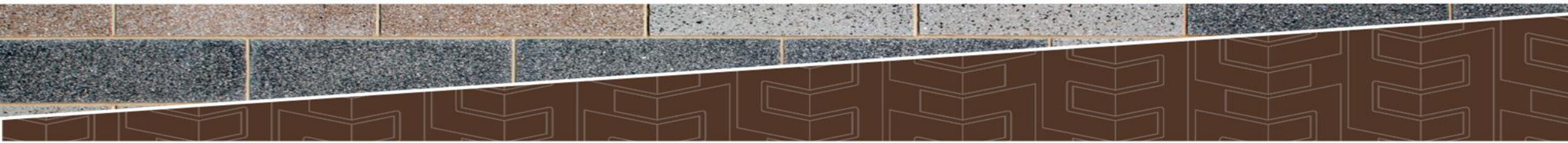
Polling Questions

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- A. True
- B. False

Is it possible to fail the ASTM 780 test for field mortar?

- A. Yes
- B. No





Field Mix
Vs.
Pre-
Blended



Two ways to make mortar.





Field mixed mortar...



Heavy Lifting

Twisting and Turning



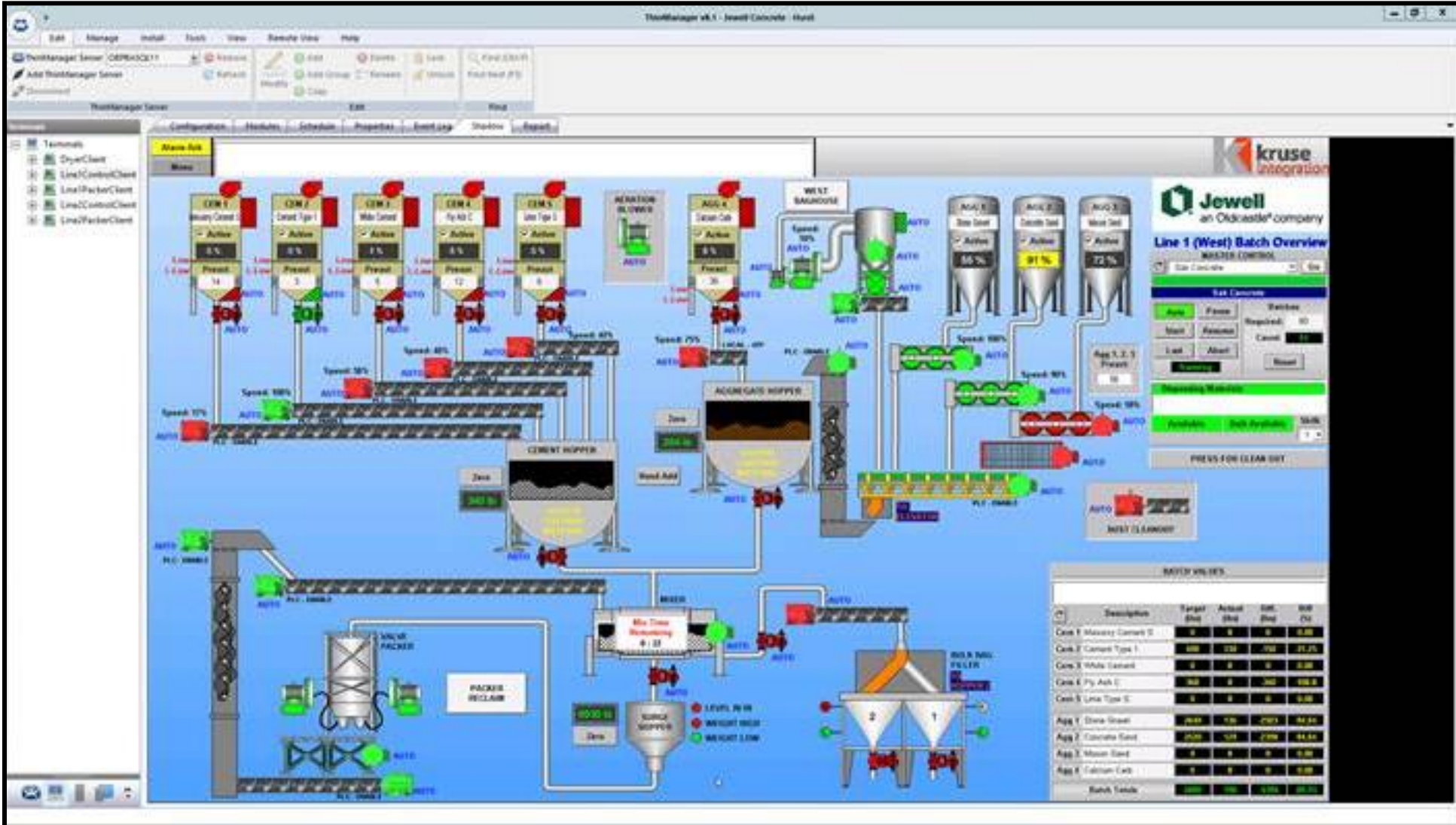
Not to mention the inexact “science” of making quality mortar by guessing volume.





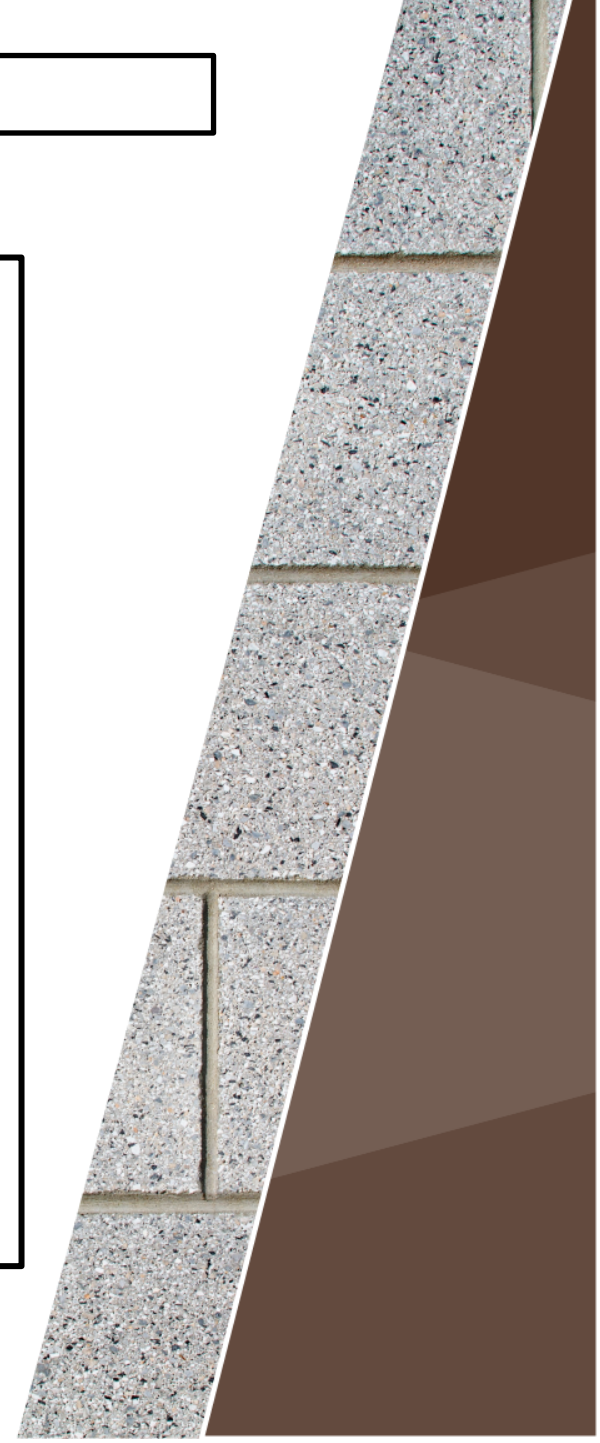
Two ways to make mortar.





Factory Pre-blended mortar:

- Locally Processed Aggregates
- Gradation Quality Control
- Aggregates Dried to < .5% Moisture
- Stored in Silos Along with Cementitious Components
- Individually Weighed Raw Materials
- Computer Controlled
- Each Product is Completely Blended for Optimal Consistency
- Packaged from 80lbs and 3000lbs
- Batch Tags on Every Pallet





It's All
About
Consistency



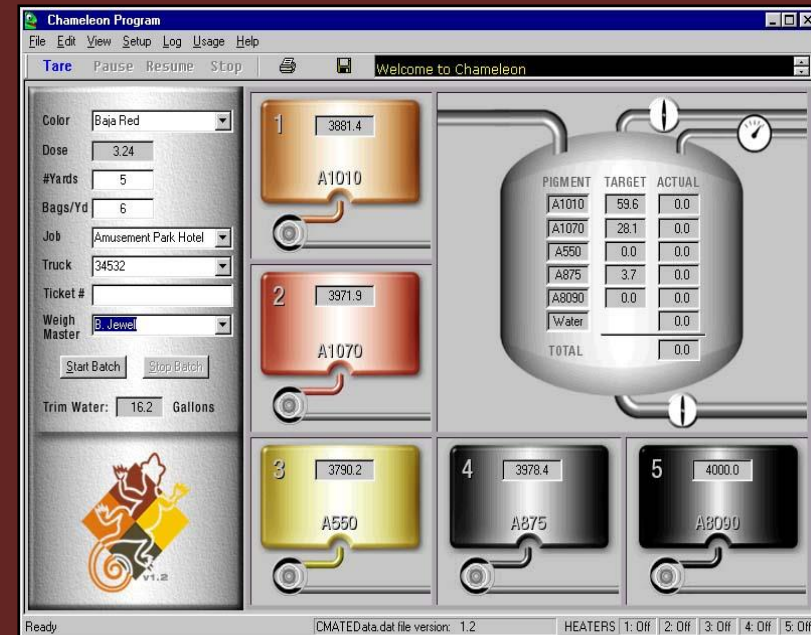


How do you want your colors made?

By hand...



By factory...





Eliminate contamination

When field batching...



- Soluble salts
- Dirt mixed into the sand

When preblended...





Better for our environment

When field batching...



When preblended...





Preferred by masons and GCs

Increased workability and productivity.



Safer, with less injuries.





Great for any masonry project!



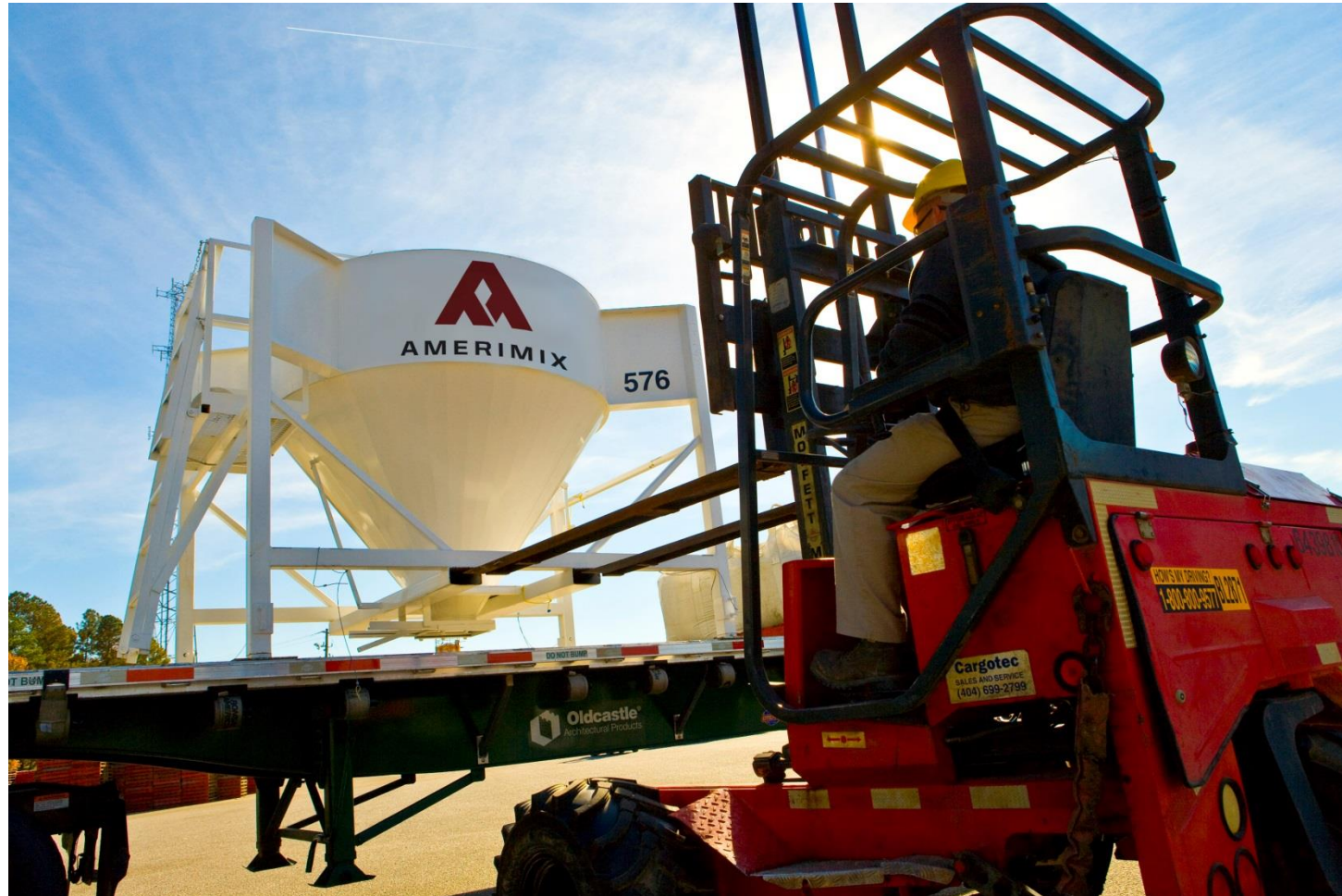


Great for any masonry project!





We're done!



Any Questions??

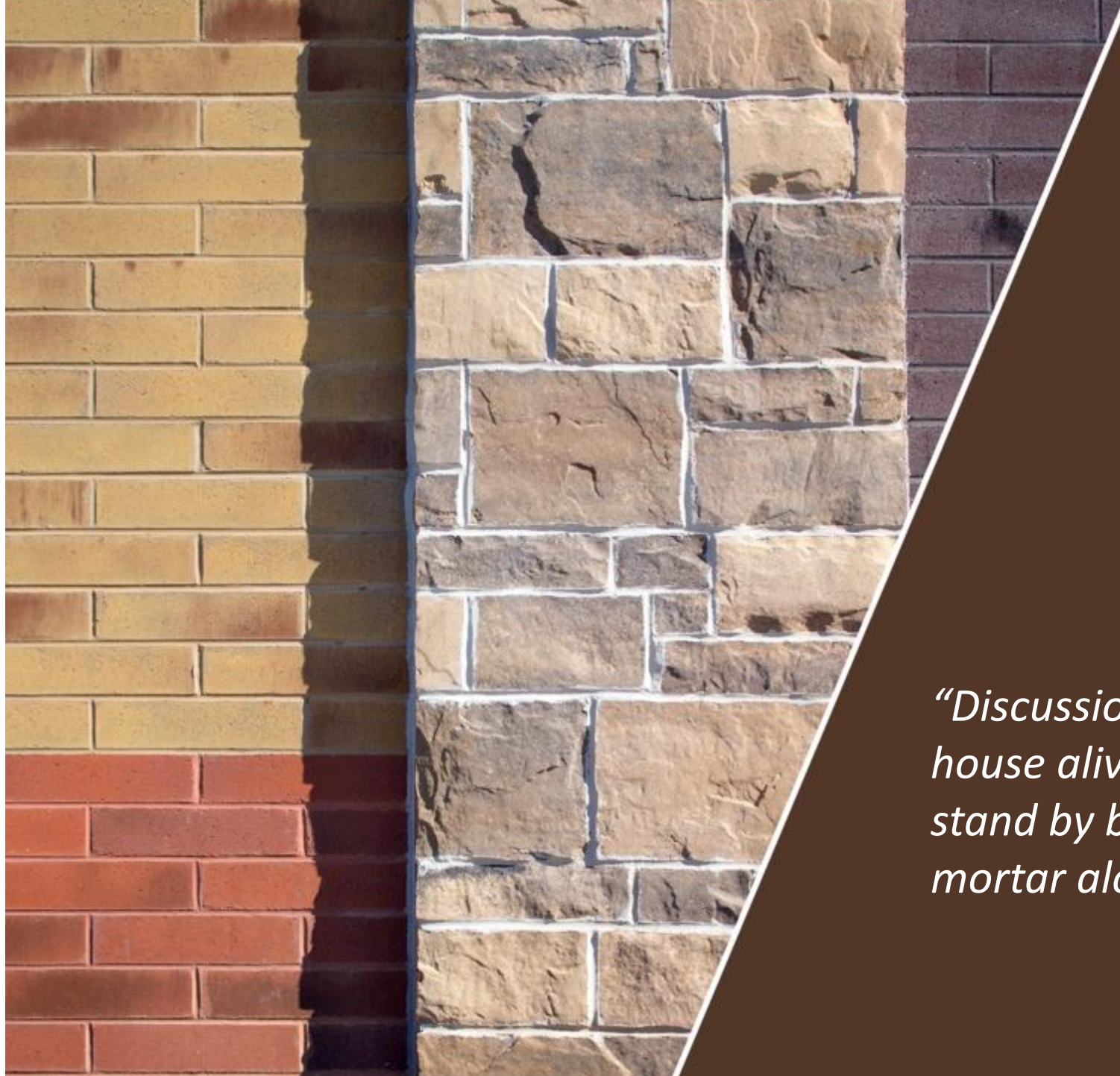
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"Discussion keeps a house alive. It cannot stand by bricks and mortar alone."

- EM Forster

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