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Pre-blended Portland Cement Plaster and Silos

Jerry L. Pozo - CSI, CDT, BS

BMI Products

MAY 16, 2013

Introduction

- Although it goes by many names, from Portland cement plaster to Hard Coat Stucco, everyone has seen, worked, or lived in a stucco-clad structure.

  As its popularity rises, proper specification and installation becomes most critical for ensuring long-term performance and crack resistance.

Today's presentation will help you better understand:

- **Field-mixing – Concentrates - Premixed products**
- **Issues affecting the plaster mix**
- **Environmentally-friendly silos and mixers**
- **Industry Personnel**
- **Plastering-related issues**
- **and….more.**

Introduction

From the Late 1990's to Present

Through Research + Development, plaster & products to render exceptional properties such as:

- increased hardness
- better flexibility to prevent cracking
- water resistance (yet remaining vapor permeable)
- better workability
- faster curing
- premixed materials
- lamina/level coat
- faster applications
- wide array of finishes
- and **more…….**have been developed.

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Introduction

- **There are 3 Types of Delivery Methods for Portland Cement Plaster**

- **Traditional field-mix**
- **Concentrate**
- **Premixed - Option for *various* Silo-mixers**

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Lets Take a Look

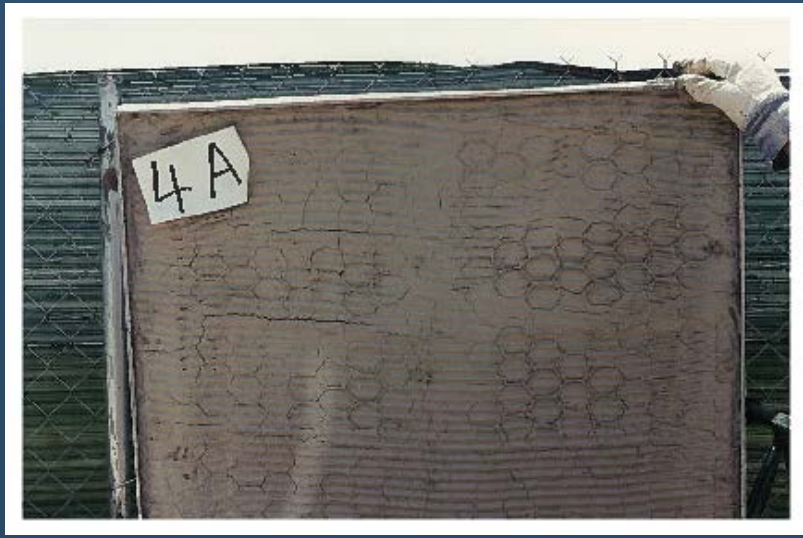
- Field-Mixed Plaster

Field Mix

- Sand piles are messy and prone to contamination
- Many jobsites do not have room for a pile
- Some locations and/or jurisdictions have regulations on storm water runoff
- Builders can face huge fines if caught allowing materials to run into storm drains

Problems: Impurities of Aggregates

- Many contractors order plaster sand with no concern for its purity
  - Should be measuring it on every job
- Many local plaster sands test above 70 and 80 and should produce solid plaster
- Lower SE sands require more water, which leads to more shrinkage cracking, lower strength, and lower density



4A: Plastic cement with a SE=49 sand (9 gallons water)

4D: Plastic cement with a SE=86 sand (6.75 gallons water)

Problems: Impurities of Aggregates

- ASTM D2419 is the Standard Test Method for Sand-equivalent Value of Soils and Fine Aggregate (SE) is an easy and fast way to test for impurities
- Add roughly equal parts sand and water, shake in bottle to put in suspension
- Allow to settle 20 minutes, measure what percentage of aggregate is sand, the higher % is better

1/8” silt,

2-1/2” sand

SE=2.5/2.675
SE = 93

5/8” silt,

1-1/4” sand

SE=1.25/1.875
SE = 67

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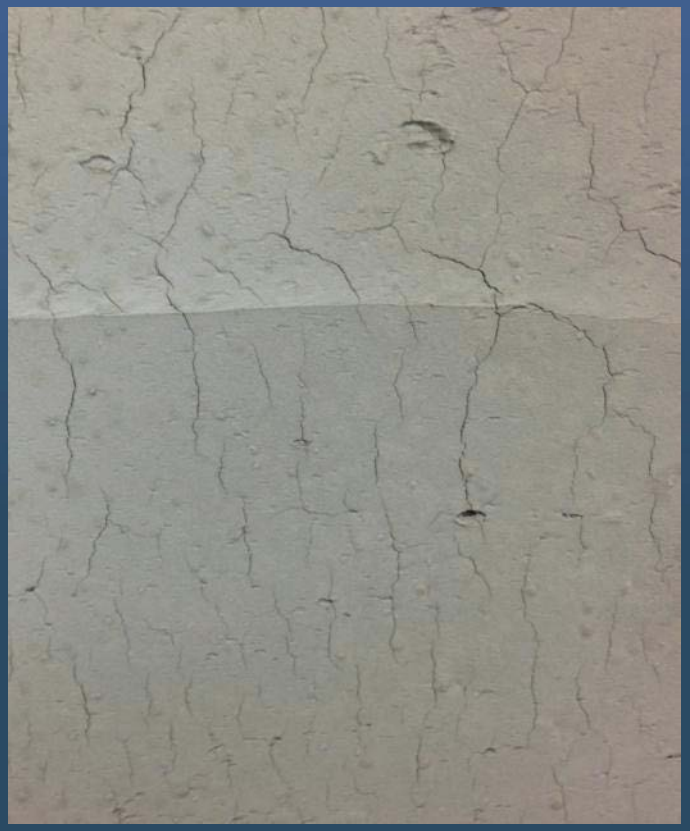
Sieve Analysis or Gradation Test

- This ASTM E-11 procedure is used to assess the particle size distribution
- It is often of critical importance to the way the material performs in use
- This being a simple technique of particle sizing is the most common

Problems: Impurities of Aggregates

- Clays
  - Absorb water from the mix, then shrink as they dry and cause cracking
  - A little clay helps plaster “slip” through the hose when pumped and improves workability, but can be problematic if too much used
- Dark aggregate:
  - Dark spots can peek through light colors in finish coat and make plaster look dirty



Problems: Impurities of Aggregates

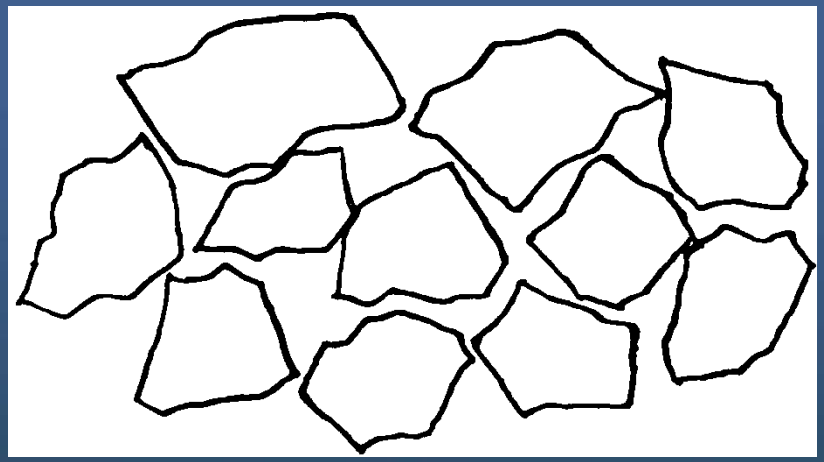
- Iron
  - Small amounts of iron contamination in the sand can lead to rust spots
  - Costly to repair
- Bond-breakers
  - Oils can affect bond between coats

Problems: Sand Gradation

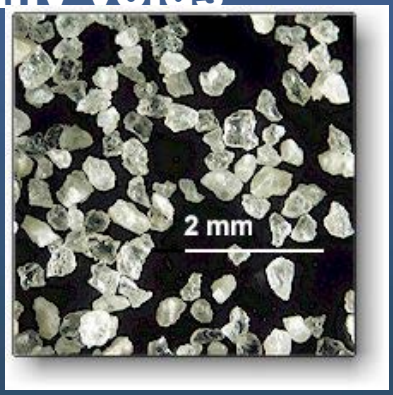
- Plaster sand should meet the requirements of ASTM C897, (not ASTM C144) which specifies a size profile of:

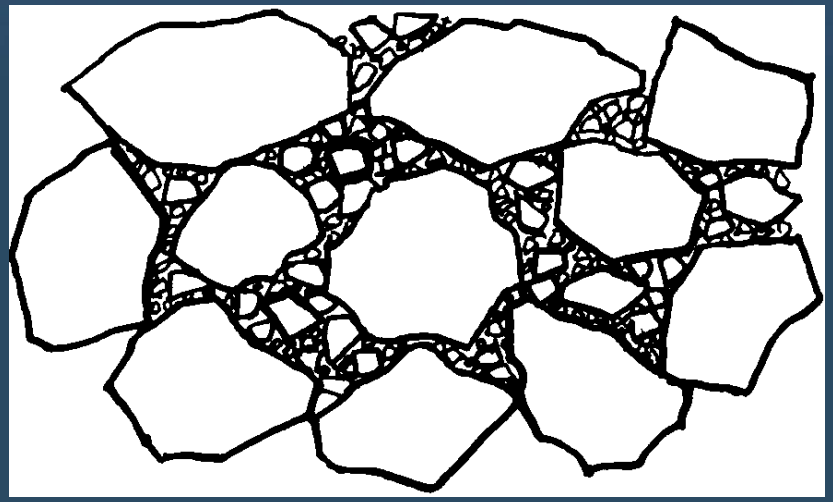
Sieve Standard	Natural Sand		Manufactured Sand	
	Max.	Min.	Max.	Min.
No. 4	0	0	0	0
No. 8	10	0	10	0
No. 16	40	10	40	10
No. 30	65	30	65	30
No. 50	90	70	80	60
No. 100	100	95	90	75
No. 200	100	97	100	90

Melding Together Properly

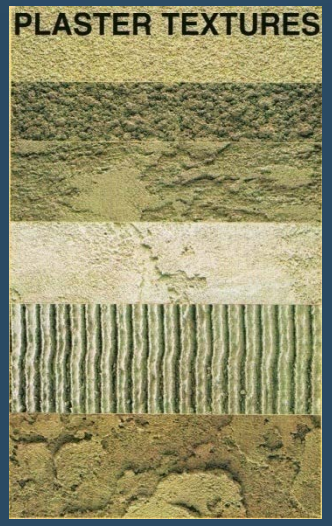


All the same size has too many voids





•Variation in sieve sizes (Gradation)



The Sand Issue

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July 2011 eNews

PRE-BLENDED PORTLAND CEMENT PLASTER BASECOATS

Ben Garcia, Expo Stucco Products

Construction specifications setting forth the minimum requirements for plastering work must be closely adhered to, whether stated in industry-wide standards and guide specifications or in local building code These written specifications establish acceptance requirements for the quality of materials and workmanship.

Portland cement plaster is a combination of cementitious material, fine aggregate, lime and water. Wh properly proportioned, these materials will provide a hard, durable plaster surface that provides reasonable resistance to weather and cracking.

A major concern voiced by many experts in the plastering field is the variation and lack of control in jo site mixing of sand and cement used in portland cement plaster for the scratch and brown coats. Sand added in excess of recommended parameters can seriously affect the integrity on the entire wall assembly.

Another growing issue is the use of sand piles on job sites. At times restricted sites and multi-story projects cannot accommodate the space required for these large mounds of sand. Some organizations restrict sand piles over concerns of airborne dust and run off in the case of storms.

The high cost of on-site injuries is a challenge. Health and safety concerns have increased over the shoveling and heavy lifting associated with field mixing. An average of 383 injuries occur per every 10,000 workers per year.

(Source: Nonfatal Occupational Injuries and Illnesses Requiring Days Away From Work, 2008, Bureau Labor Statistics, 11/24/09, http://www.bls.gov/news.release/osh2.nr0.htm)

Preblended basecoat mixes were developed to solve these challenges. Factory blended plaster mixes a specifically designed to conform to ASTM and IBC requirements for scratch and brown plaster applications. What's unique is that the mixing happens at the factory, not on the jobsite.

These mixes are complete requiring only the addition of water. This control of the mix ratio at the fact eliminates the inconsistency associated with job-site mixes. This provides a consistent mix from batch--batch which aids in producing a uniform, durable basecoat.

Factory blended portland cement plaster has excellent pumping and troweling properties for the contractor, while providing the building owner with a durable plaster.

There is no sand to shovel. All a contractor needs is to start the mixer and add water, saving time, spa and possibly money.

<<BACK

- Problems with Today's Sand:
- Variation of particle sizes
- Lack of quality control at jobsite
- Too much sand affects integrity of mixture
- Issue of sand piles on jobsites, cannot accommodate space, contamination, clean-up
- On site injury due to repetitive shoveling and heavy lifting

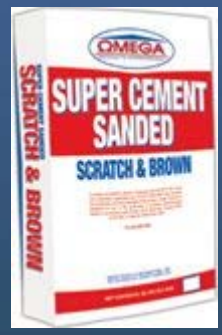
- Resolution:
- Preblended basecoat mixes were developed to solve these challenges

Advantages of Preblended Products

- High quality, consistent, premixed plaster:
  - Use dried and graded sand that complies with ASTM standards and should not have any of the problems with impurities or gradation
  - Does not rely on contractor to accurately measure the various plaster materials
  - Goes through manufacturer's Q.C./Q.A process
- Reduces cracking thanks to proper proportions and performance additives
- Consistent appearance of finish
- Cleaner overall jobsite
- Complies with storm water runoff requirements
- Less room devoted to plastering footprint on jobsite
- Less prone to contamination on jobsite

Bagged Products

- Stucco manufacturers all offer preblended base coat products
  - Scratch and brown coats
  - Continuous insulation base coats (one coat)
- Some products have different attributes
  - Additives for pumpability, water reducers, etc.
  - High early strength for accelerated work scheduling, cold weather
  - Fibers for crack-reduction, added strength
- Lowest cost next to field-mixed base coats



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Concentrates

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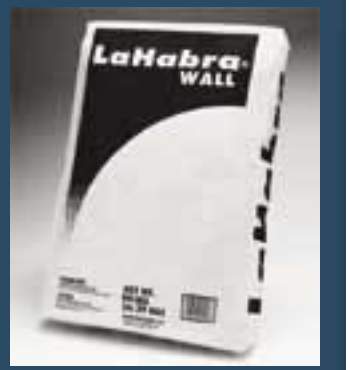
PREMIUM FIBERED STUCCO CONCENTRATE & LIQUID ACRYLIC ADDITIVE FIELD MIX SITE

MERLEX



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Silo and Separate Mixer






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Manual Labor

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10 Ton Mini Silo w/ inline mixer

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Filling the Mini-Silo

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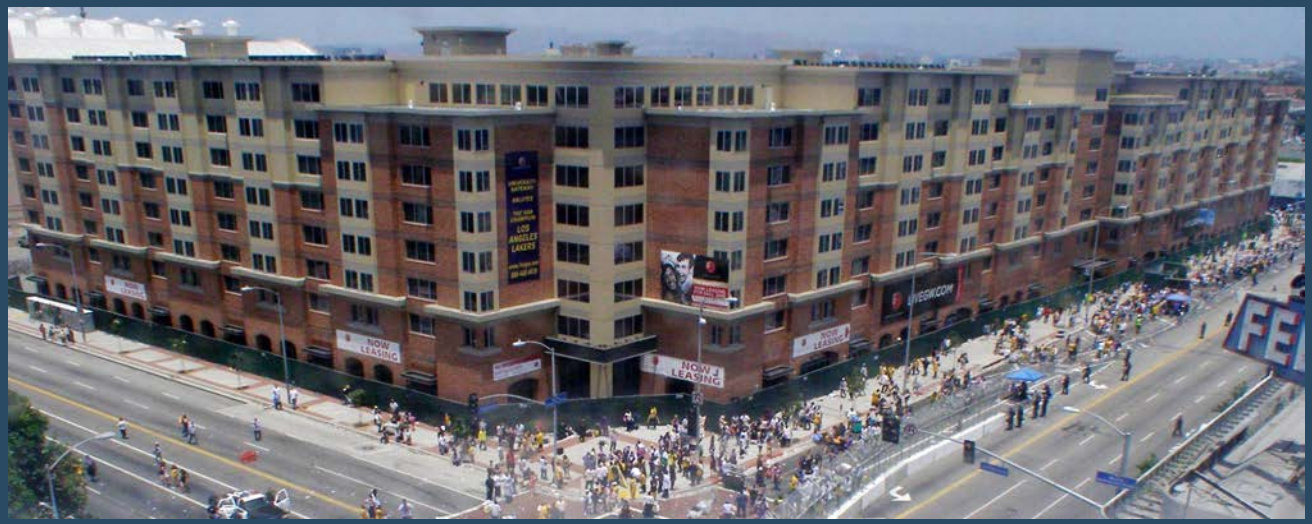
Mini Silo Servicing Project



Options for Premix

- Premixed plaster comes in a 80-90lb. bag of factory-blended materials
- Some manufacturers offer premixed Super Sacks 2,500 – 3,000 lbs using a mini-silo
- Another, an environmentally- friendly 30 ton silo/mixer

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What is an ICC Report?

ICC EVALUATION SERVICE

Most Widely Accepted and Trusted

ICC-ES Evaluation Report

ESR-2535

Reissued April 1, 2012

This report is subject to renewal May 1, 2013.

www.icc-es.org | (800) 423-6587 | (562) 699-0543 *A Subsidiary of the International Code Council®*

DIVISION: 09 00 00—FINISHES
Section: 09 24 00—Portland Cement Plastering

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rbronze@bmi-products.com

EVALUATION SUBJECT:

BMI 690 PLASTER

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2009 *International Building Code®* (2009 IBC)
- 2009 *International Residential Code®* (2009 IRC)
- 2006 *International Building Code®* (2006 IBC)
- 2006 *International Residential Code®* (2006 IRC)

Properties evaluated:

- Structural
- Durability
- Noncombustible Construction

2.0 USES

BMI 690 Plaster is a cementitious exterior wall covering installed over exterior walls of wood or steel framed, concrete or masonry construction. The coating materials are used as the first and second coat of three-coat exterior plaster applied under 2009 and 2006 IBC Section 2512 or 2009 and 2006 IRC Section R703.6. When applied in a single coat, the coating materials are an alternative to the first and second coat of three-coat exterior plaster (scratch and brown coat). When installed over steel framing and gypsum sheathing, the BMI 690 Plaster may be installed on walls required to be Type I, II, III, IV and V construction.

3.0 DESCRIPTION

3.1 General:

The BMI 690 Plasters are factory-prepared mixtures of portland cement, lime, sand and fibers, and are reinforced with wire fabric or metal lath. The products are supplied in 90-pound (40.82 kg) bags, 2500-pound (1134 kg) super bags or in portable bulk silos (mixers) containing 30 tons (27 216 kg).

3.2 Materials:

3.2.1 BMI 690 Plaster: BMI 690 Plaster is a factory-prepared mix consisting of Type I or Type II portland cement complying with ASTM C 150, Type S lime complying with ASTM C 206 and limestone or siliceous sand meeting the gradation requirements of ASTM C 897. The mixture complies with ASTM C 926 as Plaster Mix C.

3.2.2 BMI 690 Plaster with Fibers: BMI 690 Plaster with Fibers is identical to the BMI 690 Plaster except that polypropylene fibers complying with ASTM C 1116 are added. The mixture complies with ASTM C 926 as Plaster Mix C.

3.2.3 Lath:

3.2.3.1 Wire Fabric Lath or Metal Lath: No. 17 gage, $1^1/_2$-inch (38 mm), woven wire lath or metal lath complying with the ICC-ES Acceptance Criteria for Metal Plaster Bases (Lath) AC191 and recognized in a current ICC-ES evaluation report. The lath must be furred a minimum of $^1/_4$ inch (6.35 mm) from solid substrates or framing members.

3.2.3.2 Structa Mega Lath: The lath is recognized in ESR-2017 as an alternative to No. 17 gage, $1^1/_2$-inch (38 mm), woven wire lath and metal lath described in Section 3.2.3.1.

3.2.4 Water-resistive Barrier: Application of the barrier must comply with 2009 and 2006 IBC Section 1404.2 or 2009 and 2006 IRC Section R703.2. Except as described below for wood-based sheathing, the water-resistive barrier must be either a minimum of one layer of asphalt felt complying with ASTM D 226, Type I, or a water-resistive barrier recognized as equivalent to ASTM D 226, Type I, in a current ICC-ES evaluation report.

When installation is over wood-based sheathing, the water-resistive barrier must be a minimum of two layers of Grade D kraft building paper as set forth in 2009 and 2006 IBC Section 2510.6 and 2009 and 2006 IRC Section R703.6.3, or an equivalent recognized in a current ICC-ES evaluation report.

3.2.5 Vapor Retarder: Protection against condensation must be provided in accordance with 2009 and 2006 IBC Section 1403.2. Under the IRC, a vapor retarder complying with the 2009 IRC Section R601.3 and 2006 IRC Section R318.1 must be provided, unless its omission is permitted under the exceptions to the 2009 IRC Section R601.3 and 2006 IRC Section R318.1.

ICC-ES Evaluation Reports are not to be construed as representing aesthetics or any other attributes not specifically addressed, nor are they to be construed as an endorsement of the subject of the report or a recommendation for its use. There is no warranty by ICC Evaluation Service, LLC, express or implied, as to any finding or other matter in this report, or as to any product covered by the report.

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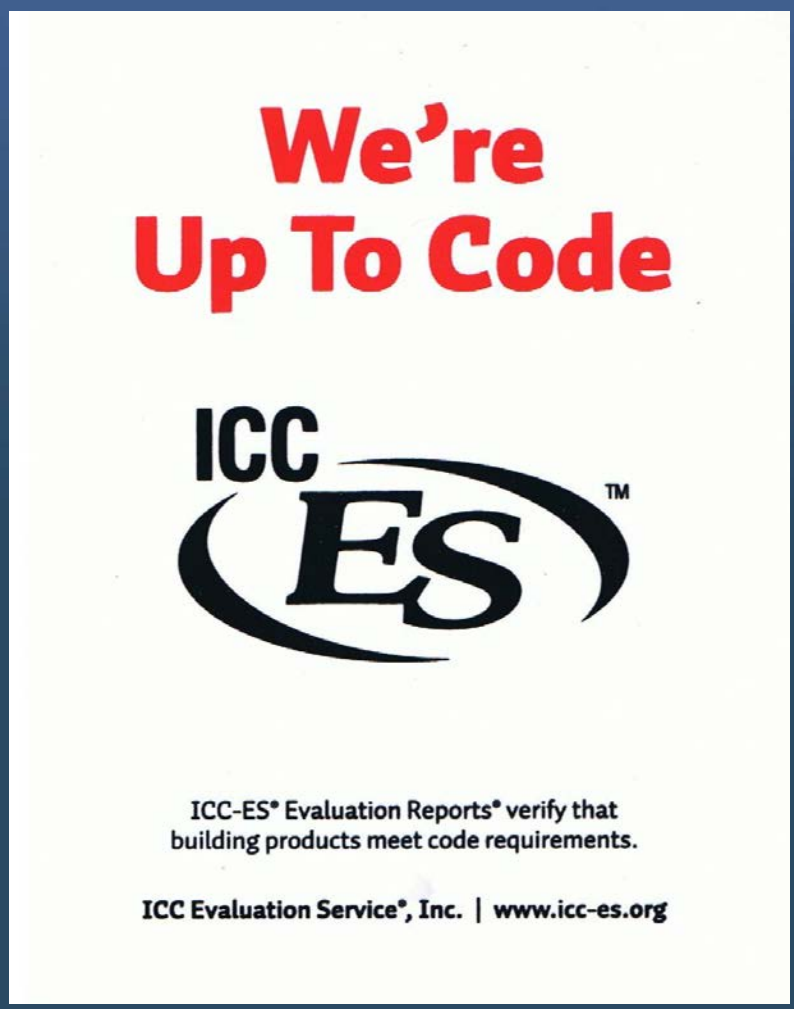


LEED Accreditation Points

- These are categories which most Premixed & Engineered Plaster can earn LEED accreditation points for a project under **Material & Resources**:

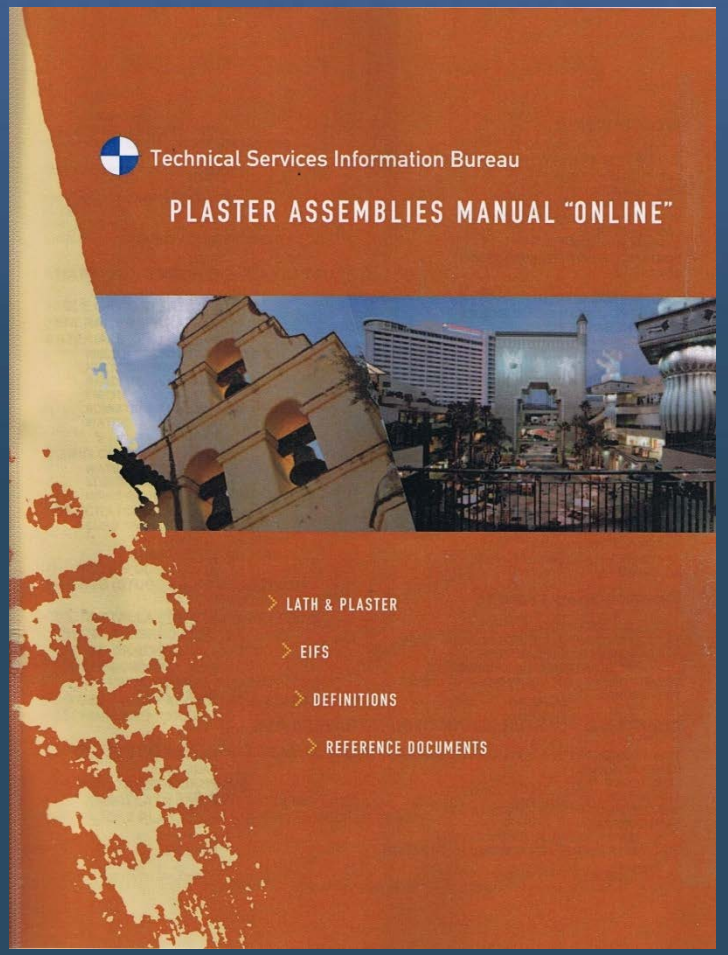
- Storage & collection of recyclables
- Construction waste reuse or recycling
- Reuse of materials
- Use of local materials and fabrication (within 500 miles)
- Airborne dust collection system and air quality (silos)
- Storm drain pollution prevention program

Newest Plaster Manual

2012

- Plaster Assemblies Manual

- www.tsib.org
-
- (714) 221-5530



Plaster Resources

- PLASTER RESOURCES

- 2012 Plaster Assemblies Manual by TSIB (MUST HAVE)
- 2010 Plaster Textures & Acrylic Finishes by TSIB (MUST HAVE)
- 2008 Selected ASTM Standards by TSIB
- 2007 Portland Cement Plaster (Stucco) Manual by PCA
- 2007 Builders Guide to Stucco – Lath and Plaster by Max Schwartz with Walter F. Pruter
- 1997 Portland Cement Plaster/Stucco Resources Guide by the Northwest Walls & Ceilings Bureau, or other local plastering industry offices (OUTDATED)
- 1997 Exterior Insulation and Finish Systems Design Handbook by Robert G. Thomas

Our Industry Bureaus

- **Plaster Industry Bureaus and Directors:**

Mark Eisenmann	NWCB	206-524-4243
Terry Kastner	NWCB	206-524-4243
James Johnson	WACA	415- 519-9963
Frank Nunes	WACA	925-600-0475
Michael M. Logue	TSIB	714-256-1244
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Melody Shupe	APLC	619-749-1667
Robert Campbell	WWCCA/LV	702-319-2717
Albert Carrillo	WWCCA/ AZ	480-829-9133

Advantages of Silos

Advantages of Silo Systems

- **#1** BENEFIT: Quality Control and Quality Assurance

- Preblended materials to exact ASTM C 926 Standard
- Material contributes to LEED accreditation points
- Greater productivity and efficiency of labor force
- Inherently safe delivery method - lessens contractor liability
- Silo/mixer/pump function as *single unit* making for a efficient delivery system and cost effectively brings Portland cement plaster to their point of use
- All materials are weighed prior to blending assuring consistency
- Uniform color throughout the job
- No freezing of product in winter, no water damage to products
- Environmentally-friendly, re-useable silos, no dust or disposal of bags, no waste of product

What Our Industry is Saying

- "Once you adjust the water flow to the silo-mixer, the mix will come out consistently all day long. You just push a button on and off and it takes the workload and stress of your hod carrier"
- "One person does the work of many other laborers and their health is much better not shoveling sand all day long and lifting heavy sacks. This system prevents back injury."
- Due to environmental concerns, silos cut down or eliminate any dust which is an advantage since it is a more controlled environment."
- "The only time you see the product is when it comes out of the mixer in wet form."
- "One of the biggest problems in the field has been consistency. Since the product is premixed, it takes away that issue of uncertainty and not having the right amount of each ingredient"
- "You get the right mixture every time. There is no way you can go wrong with it."
- "The silo delivery system for plaster (in my opinion) is the future. Field mixed products are an inaccurate science and with the level of scrutiny our contractors are under on projects, this system is perfect."

Whatchawannano?

August 2010 | San Diego CSI SpecTickle | Page 5

SILOS: Not Just For Grain Anymore

When I hear the term "silo," my mind conjures up our great American Midwest or California's Central Valley.

Rustic silos...those towering structures alongside a barn, on some back road through the American farmlands. They were influenced by grain storage pits of the "old world" and corn cellars of native America. They were built of wood, fieldstone, tile, brick, concrete and steel.

Today, silos have become a popular and common sight on urban jobsites, housing premixed and engineered products for the construction industry.

Europeans have used silos for dry construction products for over four decades. They dislike cluttered jobsites with pallets, sacks, bags, cartons, jugs, and a huge pile of sand. There are more than 150,000 servicing the market from Sweden to Italy, and over 50,000 silos in Germany alone. The U.S. marketplace is just now recognizing and embracing this significant delivery system.

Many U.S. projects have gained acceptance from this method of delivery. Of course, standard 90 lb bags or 2,500 lb "super sacks" are also still available.

Plaster, mortar and stucco are factory-made blends of sands and binders. With silos, an automated batch system controls the mixing process of dry materials to ensure consistency of the products. The final product is tested in the manufacturer's laboratory for quality assurance and is then transported as a dry, premixed product to the construction site. Testing is done by an independent laboratory to confirm the manufacturer's test results.

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Bulk dry material such as premixed and engineered plaster can be held in a 27' silo on an 8' x 8' pad. A continuous mixer, electrical and water sources are then hooked up; mixing the product using a control switch can begin. It is then pumped to the walls and ceilings as needed.

Obviously, the most significant factor of premixed and engineered products is quality control/assurance from start to finish. Also, it lessens the liability of the contractor from heavy lifting, bending, shoveling, and mixing errors. Finally, it leaves jobsites clean, dry and uncluttered.

Sand is another issue of concern. Many quarries are running dangerously low on quality sand, so suppliers are substituting river sand and pulverized rock. Much of this *low quality* material leads to excessive cracking.

Many formulations of sand are possible. Different formulations for different applications are possible. High quality sand is clean and well-graded, without impurities that lead to cement/sand reactions.

Many plastering subcontractors report that once they use the silo delivery system, they will never go back to sand piles and bagged materials again. Subcontractors also report: increases in worker productivity, less injury, reduced material handling, safer material storage and no damage due to weather conditions.

By eliminating field mixing, sand piles, job debris, and uncontrolled water, this process is a real advance for the construction industry. It can possibly satisfy LEED requirements to prevent jobsite mess, air pollution, and prevent pollutants from entering the storm drain system.

Today, construction industry professionals feel that premixed products and silo delivery systems will be a "big part" of the future of plastering and other dry-mix applications.

THE AUTHOR: Jerry L. Pozo, CSI, CDT, BS, has over 25 years' experience in the plastering industry. His background includes manufacturing, distribution, education, and architectural consulting/specifications. He resides in the Sierra foothills, and covers the Pacific West Coast for BMI Products Inc. — jpozo@bmi-products.com

EDITED BY ROB SMITH

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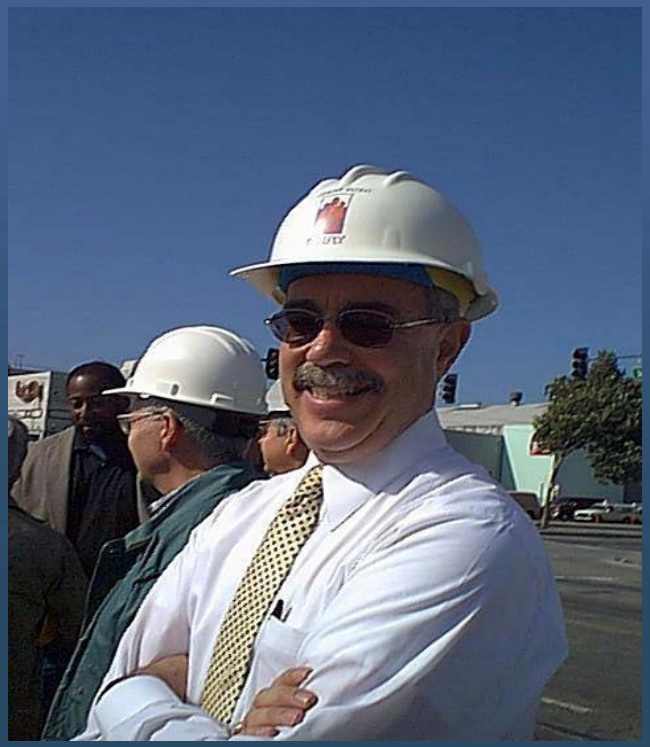

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