

SmartWall Systems[®]

The Answers!



SmartWall Advantages

Owner/Occupant

- Earlier Occupancy
- Reduced Heating & Cooling Costs
- Exceptional Fire Resistance
- Passes UL E 119 Hose Stream Test
- Sound Absorbing
- Low Sound Transmission
- Nailable Surface
- Impact Resistant
- Low Maintenance
- Wind Resistant
- Termite Proof
- Long Term Durability
- Non-Toxic
- Easy To Paint
- Excellent Life Cycle Economy
- Excellent Return on Investment

Architect-Engineer-Designer

- Greater Design Flexibility
- Less Dead Load
- Less seismic load
- Higher Strength
- Higher Strain Capacity
- Less Chipping
- Multiple Colors, Shapes & Textures
- Readily Available
- Cost Competitive
- Structural Stability
- Structure and Finish In One
- Exceptional Freeze/Thaw Durability
- Aesthetically Pleasing
- Low Shrinkage
- Less Cracking
- Less Chipping
- Excellent Energy Performance: High R-values with Thermal Mass and Low Thermal Bridging

SmartWall Systems®

SmartWall Systems is a concrete masonry wall system that outperforms other masonry and non-masonry wall systems, especially in terms of weight, energy efficiency, maintenance, appearance, fire resistance, durability and strength.

SmartWall is a mason friendly, cost effective wall system that provides speedy construction and a very high degree of customer satisfaction.

What Will SmartWall Do For Me?

Owner/Occupant – SmartWall provides a low maintenance, aesthetically pleasing structure that saves you money on the front-end by speeding construction, and provides energy savings in lower heating and cooling costs year after year. SmartWall also gives you design flexibility, unparalleled safety features, and quiet comfort.

Architect, Engineer & Designer – Available in a wide variety of colors, shapes and textures (such as split-face, split-rib, ground-face, etc.), SmartWall maximizes all the benefits of traditional concrete masonry: flexibility for design expression, durability and economy. Stronger, lighter units make walls more structurally efficient. SmartWall gives you the confidence of knowing you are specifying the best product available. Your client will also benefit from earlier completion and life cycle cost savings. Your customer's satisfaction will be the hallmark of your portfolio for many decades to come.

Masonry Contractor – SmartWall's reduced weight and high strength shorten construction time, provide safer scaffolds, decrease the potential for chips, save wear and tear on your equipment, and

make you more competitive with other wall systems. Reduced weight improves ergonomics and reduces work related injuries resulting in fewer worker compensation claims and lower insurance rates, increases mason productivity, and extends the careers of your masons. SmartWall gives you a built-in advantage and a safer working environment.

Block Manufacturer – SmartWall maximizes concrete masonry's competitiveness. By manufacturing high performance concrete masonry units, you help insure the future of the masonry industry by providing a product that is mason-friendly, owner-friendly, and which competes effectively with other wall systems.

What Makes SmartWall So Smart?

It's the aggregate. You may have heard the slogan, "It's what's inside that counts." Inside all SmartWall units is high quality structural grade expanded shale, clay or slate (ESCS) aggregate, manufactured to optimum gradation for compaction, strength, shrinkage control and uniformity of texture. The ESCS aggregate blend is mixed with water, cementitious materials, and admixtures in a precise formulation that is compacted to optimum conditions. Mixture composition may vary according to the manufacturer; however, all SmartWall units must meet or exceed the quality and performance standards (See Page 5) established for SmartWall by the Expanded Shale, Clay and Slate Institute.

SmartWall Systems® is a registered trademark of the Expanded Shale, Clay and Slate Institute, Salt Lake City, Utah.

SmartWall Advantages

Mason Contractor

- Mason Friendly
- Up to 40% Less Weight
Compared To Heavy
Masonry Units
- Less Mason Fatigue
- Fewer Injuries
- Improved Ergonomics
- Fewer Worker
Compensation Claims
- Opportunity For Both
Male & Female Masons
- Extends Masons' Careers
- Speedy Construction
- Rarely Collapses
Bed Joints
- Reduced Wear
On Equipment
- Less Weight On Scaffolds
- One Mason On A 12" Unit
- Reduced Job Overhead
- Lower Labor Cost
- Lower Over-all Wall Cost
- Built-in Advantages

Block Manufacturer

- Maximizes Concrete
Masonry Competitiveness
- Less Chipping
- Expands Masonry Market
- Customer Satisfaction

SmartWall Is The Answer!

What Is ESCS?

ESCS (Expanded Shale, Clay or Slate) is a unique, structural grade ceramic aggregate manufactured by expanding select minerals in a rotary kiln at more than 1000°C. The material selection and production are strictly controlled to insure a uniform, high quality product that is structurally strong, stable, durable and inert, yet also light weight and insulative. ESCS aggregate is used in structural lightweight concrete for high-rise buildings, bridges and other exposed structures.

Why Is Reduced Weight A Benefit?

The ESCS structural grade aggregate in SmartWall units provides numerous benefits: Labor, handling and transportation costs are reduced; energy, acoustical and structural performance are enhanced. Reduced weight means less dead and seismic load. This allows greater design flexibility, and often provides significant economies.

What About SmartWall's Structural Stability and Fire Resistance?

Because the ESCS aggregate in SmartWall units has been fired and expanded under extreme heat, the aggregate is insulative and thermally stable; thus, SmartWalls have exceptional fire ratings. ESCS has a coefficient of thermal expansion significantly lower than most ordinary aggregates. SmartWalls can withstand extreme heat and the thermal shock of high pressure fire-hose spray without cracking, caving in, or deforming. They remain intact, ready for reuse after a fire. Proven performance in real world fires has substantiated the excellent fire endurance documented in laboratory test programs. SmartWalls have successfully withstood hose stream exposure after a four-hour fire test. An

eight-inch SmartWall easily provides a minimum two-hour rating. Higher ratings can be specified. SmartWall gives you that extra margin of safety that can save lives and dollars.

ESCS aggregate, when combined with high temperature resistant cements, provides the refractory used in kilns, boilers, fire boxes, chimney linings, etc., for residential and industrial applications worldwide.

Two, three and four-hour fire ratings are available. Contact your local SmartWall supplier.

How Strong Is SmartWall?

By optimizing ESCS aggregate gradation and other mix proportions, a very high strength-to-weight ratio is obtained. All SmartWall units exceed ASTM minimum strength by more than 32%. While all SmartWall units must have a **minimum net compressive strength of 2500 psi**, higher strengths are easily achievable when required for structural reasons, a real benefit to design and economy.

Does SmartWall Reduce Noise? YES!

SmartWall's high sound absorption and low sound transmission provide a quiet, peaceful living and working environment. With SmartWall a Noise Reduction Coefficient (NRC) of 0.50 is achievable. SmartWall provides the ideal balance of NRC and STC for excellent noise control.

What About Termites and Decay?

The materials in SmartWall are impervious to attack by termites and will not decay.

SmartWall Is The Answer!

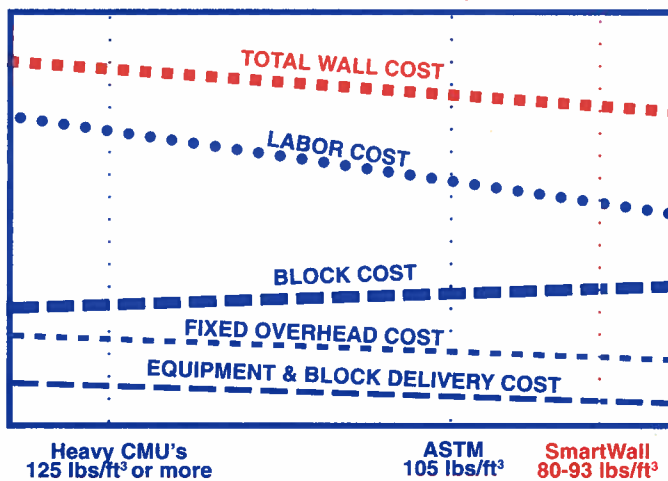
Is SmartWall Cost Effective? YES!

The SmartWall system provides speedy construction that lowers contractors' overhead costs, and affords earlier building occupation. Additionally, SmartWall's reduced weight lowers equipment and material delivery costs. It also reduces the cost of foundation and structural supports, and provides on-going energy savings. Mason friendly SmartWall units help insure a healthy and productive work force. This also helps reduce construction cost. SmartWall provides up-front savings as well as economic benefits that accrue over the useful life of the structure.

What About Water Penetration?

SmartWall can reduce water penetration in two ways: the concrete mixture and ease of placement. By optimizing the aggregate gradation, admixture use, and cementitious content, SmartWall units are very tightly compacted in the block machine. This produces higher strengths, tighter textures, and fewer interstitial voids – all three contribute to reduced water absorption and permeability. These three qualities also enhance the effectiveness of water repellent coatings. Additionally, masons are able to lift and place SmartWall units more easily and consistently, which also contributes to producing a more water-tight wall.

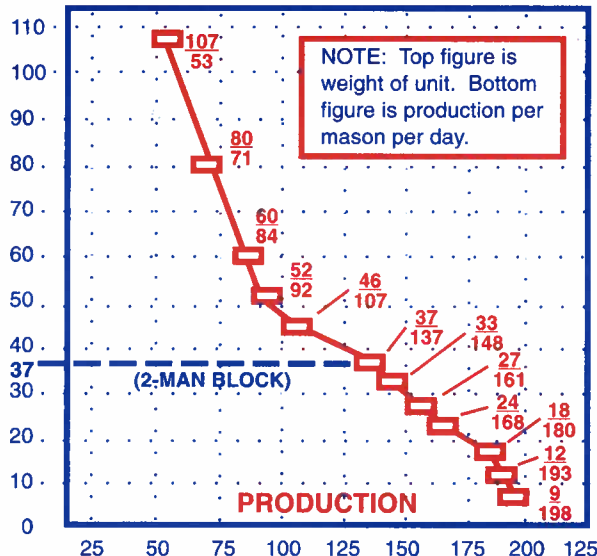
WALL COST TRENDS



What About Durability?

Freezing and thawing testing programs conducted at both the University of New Brunswick and the University of Nebraska at Lincoln show that properly designed mixtures using ESCS aggregate in high performance concrete masonry perform as well as, if not better than comparable mixtures containing ordinary aggregates. The high performance mixtures were tested in concrete masonry and segmental retaining wall units.

THE EFFECT OF WEIGHT ON PRODUCTION



Why Does Mason Productivity Increase?

Mason productivity is primarily determined by the weight of the units being used. Since labor is usually 60% of the total finished wall cost, productivity is of critical importance.

Reference: Rynold V. Kolkosk, *Masonry Estimating*, The Aberdeen Group, Addison, IL

SmartWall Advantages

Energy Efficiency

- High R-Values
- Optimized Thermal Mass
- Low Thermal Bridging
- Reduced Heating And Cooling Costs
- Better Insulation
- Slow Energy Release

SmartWall Is The Answer!

Is SmartWall Energy Efficient? YES!

SmartWall provides superior energy conservation by combining high R-values with thermal mass and low thermal bridging. Wall heating and cooling costs may be reduced by as much as 60%! The concrete in SmartWall has up to 2.5 times the thermal resistance of the concrete in a typical heavy block. This significantly reduces thermal bridging, maximizes the effectiveness of core insulation, and results in the high R-value of SmartWall. Even an un-insulated SmartWall performs as well as core-insulated heavy units! (See Table Below)

In addition to thermal resistance, SmartWall also benefits from thermal mass – the *flywheel* effect that minimizes peaks and valleys in heat load as a wall responds to daily changes in ambient temperature. Walls with optimized thermal mass reduce overall energy use, compared to non-masonry walls. SmartWall has the proper balance of thermal mass and thermal resistance for optimum performance.

Calculating the overall effect of thermal mass and thermal resistance in a wall's dynamic response to the environment is a complicated task, one that the ASHRAE 90.1 energy code uses a computer program, ENVSTD*, to perform. However, the results can be

dramatic. For example, using ENVSTD to compare the energy performance of a 12" SmartWall with perlite core insulation to an R-19 batt insulated metal stud wall shows that SmartWall outperforms the metal stud system! ENVSTD factors many variables besides opaque wall properties, including glass area, shading overhangs, and building orientation. Using ENVSTD and SmartWall, energy efficient buildings can be designed that comply with energy codes without the need for *added-on* insulation. In many cases a single-wythe SmartWall does the job.

The energy performance of SmartWall is not just smart, it's a money saver!

*Note: ENVSTD stands for ENVELOPE STANdard; refer to ESCSI Information Sheet #3201 for more information on ENVSTD and the energy comparison made in this example.

How Does It look? What About Color?

Not only does SmartWall resist chipping and cracking, its more uniform texture produces sharp corners and surfaces that provide structure and finish. If desired, SmartWall is readily paintable. SmartWall is available in the same wide range of sizes, colors and textures as other concrete masonry units.

R-Values For Concrete Masonry Walls⁽¹⁾ (Exposed Both Sides)

Unit Size	Concrete Unit Weight lbs/ft ³	Cores Empty	With Core Inserts	Cores Filled With Perlite
8x8x16"	SmartWall ⁽²⁾	2.5	4.0	6.6
	Heavy CMU's ⁽³⁾	1.9	2.6	3.2
12x8x16"	SmartWall ⁽²⁾	2.7	4.4	9.5
	Heavy CMU's ⁽³⁾	2.0	2.7	4.4

(1) R-Values are mid-range per NCMA TEK 6.1A & 6.2A. R in (h • ft.² • °F)/BTU

(2) SmartWall at 90 lbs/ft³ (3) Heavy CMU's at 135 lbs/ft³

SmartWall Systems® Guide Specifications

Guide Specification (Short Form): Sec 04810 - Unit Masonry Assemblies:

SmartWall Systems walls shall be constructed using high performance concrete masonry units manufactured by a SmartWall systems producer certified by the Expanded Shale Clay and Slate Institute, Salt Lake City, Utah. The concrete masonry units shall meet the requirements of ASTM C 90 *Standard Specification for Load Bearing Concrete Masonry Units* and the following additional requirements:

- The concrete masonry unit shall have a minimum net compressive strength of 2500 psi (17 Mpa) and a density not exceeding 93 lb/cu ft (1500 kg/m³), determined in accordance with ASTM C 140 *Sampling and Testing Concrete Masonry Units*.
- The lightweight aggregate used in the manufacture of the concrete masonry units shall be structural grade expanded shale, clay or slate manufactured by the rotary kiln process, and shall meet the requirements of ASTM C 331 *Standard Specification for Lightweight Aggregate for Concrete Masonry Units*.

SmartWall Units, Maximum Jobsite Weight (Mass) of SmartWall Units ⁽¹⁾

Size	Not To Exceed	Size	Not To Exceed
4" x 8" x 16"	18 lbs. (8.0 kg)	10" x 8" x 16"	33 lbs. (14.5 kg)
6" x 8" x 16"	23 lbs. (10.5 kg)	12" x 8" x 16"	36 lbs. (15.5 kg)
8" x 8" x 16"	26 lbs. (11.5 kg)	8" x 8" x 24"	38 lbs. (17.0 kg)

The maximum job weight of SmartWall units is based on typical net volumes and may vary depending on the block mold configuration.

What Are SmartWall Unit Details?

General Information on SmartWall high performance concrete masonry units:

The information below is for general use only. For exact shapes and physical properties, contact your supplier:

Unit Size (inches)	Maximum Jobsite Weight lbs. ⁽¹⁾	Minimum Weight Savings Percent ⁽²⁾	Concrete Unit Weight Oven Dry lbs/ft ³ (93 Max)	Wall R-Value ⁽³⁾		Wall ⁽⁴⁾ HC Value
				No Insulation	UF Foam Insulation	
12x8x16	36	37	80-93	2.7	10.1	8.7
10x8x16	33	28	80-93	2.6	8.3	7.8
8x8x16	26	27	80-93	2.5	7.0	6.7
6x8x16	23	23	80-93	2.4	NA	5.6
4x8x16	18	31	80-93	2.1	NA	4.3
8x8x24	38	38	80-93	2.5	7.0	6.4

(1) Oven dry weights will be less than jobsite weights and will depend on unit shape and the concrete unit weight used. The maximum jobsite weights are given just for field control to help insure SmartWall units are being used. For maximum oven dry weights of SmartWall units, contact your supplier.

(2) When compared to heavy concrete masonry at 135 lbs/ft³

(3) R-Values are based on ASTM minimum required block dimensions and 90 lbs/ft³ concrete unit weight using series parallel method (air film included). R in (h • ft² • °F)/BTU.)

(4) Wall HC (Heat Capacity) is based on ASTM minimum required block dimensions, 90 lbs/ft³ concrete unit weight and mortar. HC in BTU/(ft² • °F)

**SmartWall
Is The
Answer!**

How Does SmartWall Compare With Other Systems?

	Wood Frame	Tilt-Up 145 lbs/ft ³	Metal Stud	Heavy Concrete Masonry ⁽²⁾	SmartWall ⁽¹⁾
Mason Friendly					X
Opportunity for Female Masons					X
Low Thermal Bridging	X				X
Thermal Mass		X		X	X
Fire Resistant		X		X	X
Lower Fire Insurance Rates		X		X	X
Passes UL E 119 Hose Stream Test		X		X	X
Quiet Comfort		X		X	X
High Sound Absorption					X
Low Sound Transmission		X		X	X
Nailable	X				X
Impact Resistance		X		X	X
Termite Proof		X	X	X	X

(1) SmartWall at 90 lbs/ft³ (2) Heavy CMU's at 125 lbs/ft³ or more

Why Is SmartWall Just Now Being Introduced?

In recent years the rules have changed. The challenges of competing wall systems, the growing cost of construction, the high cost of worker compensation insurance, the heightened focus on energy and real world fire performance, and the opportunity for female masons have created a demand for high performance masonry materials. SmartWall meets the needs of today's market, and gives specifiers all the best reasons to choose concrete masonry over competing wall systems.

Where Can I See SmartWall?

Can I Talk To Someone Who Has First-Hand Experience?

There are many SmartWall projects already in service. They include strip malls, office buildings, high-rises, and many other industrial, commercial, and residential structures. For more information, just give us a call.

**SmartWall
Is The
Answer!**

Notes:

What is "HEAVY" Masonry?

Anyone who has lifted a concrete masonry unit made with ordinary aggregate knows it's heavy! ASTM defines masonry at 125 lbs/ft³ or more as "Normal Weight."

Let's be realistic. "Normal Weight" concrete masonry is **HEAVY!**

A Publication of



Expanded Shale, Clay and Slate Institute
Pohly-Klin Structural Engineering Associates

Expanded Shale, Clay and Slate Institute
35 E Wacker Drive, Suite 850
Chicago, IL 60601
801-272-7070 • www.escsi.org

x : 801-272-3377 • www.escsi.org