

DIVISION: 03-CONCRETE
Section 031510-Concrete Anchoring

DIVISION: 04-MASONRY
Section 04081-Masonry Anchoring

DIVISION: 06- WOOD AND PLASTICS
Section 06093 Adhesives

DIVISION: 07-THERMAL AND MOISTURE PROTECTION
Section 07210 Building Insulation

BSW, BW, TR, AND STR WALL ANCHORAGE SYSTEMS

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1.0 SUBJECT

BSW, BW, TR and STR wall Anchorage systems

2.0 DESCRIPTION

2.1 General:

BSW, BW, TR, and STR wall anchorage systems described in this report are masonry or concrete wall reinforcement techniques. These wall systems are constructed with two component SR foam poured in place against an existing masonry material, a structural sheathing, and metal or wood wall studs see figure 1.

The BSW and the BW wall systems consists of a wood or metal stud wall spaced at no more than 24" O.C. constructed on the inside face of an unreinforced masonry or concrete wall with structural sheathing fastened to the wall stud assembly with screws on the side of the studs nearest the masonry or concrete. A 2" minimum average gap is left between the sheathing and the masonry or concrete wall. The gap can narrow as small as 1" in small areas. This gap is filled with SRFOAM.

For TR and STR walls the stud assembly is placed against the masonry or concrete wall with a structural sheathing installed on the opposite face. The foam material is installed to fill the stud cavities. For the TR system every cavity is filled with SRFOAM. For the STR system alternating stud cavities are filled.

For BSW, BW, and TR wall systems the thermal properties of the SRFOAM has a thermal resistance R-value of 7.0 per inch thickness. The STR wall system is not intended for use in providing thermal resistance.

2.2 Materials:

The SRFOAM material is a specialty insulating structural foam adhesive. SRFOAM is a two component cellular plastic with a density of approximately 2 lbs per cubic foot. Metal wall studs and tracks are to be composed of steel complying with ASTM A653. Structural properties to be calculated based on the 2007 North American Specification for the Design of Cold-Formed Steel Structural Members.(AISI)" Wood wall studs shall be in compliance with American Forest & Paper Association "Manual for wood construction, 2005 National Design Specification"(2005 NDS). Wood wall studs specified in the catalog are specified as D.F #1 or better grade. Sheathing material shall be APA rated wood structural sheathing. Other grades of materials can be used if they can be shown to work by a licensed professional engineer.

2.3 Design:

Allowable compression, tension and shear loading for SRFOAM are set forth in Table 1. Wood wall stud and sheathing are to be designed based on the 2005 NDS. Metal studs and all associated connections shall be designed based on the AISI. For masonry walls or concrete walls without a clean substrate as defined in section 2.4 applicable reduction factors are set forth in Table 2. The components of the system including the wall sheathing, studs, and associated anchorage must be designed based on the generally accepted engineering principals based on the 2009 *International Building Code* by a qualified design professional. At locations where the wall is covered by paint or other latent material a determination of the amount of area by percentage on any 4 sq. ft. area must be determined. At locations where the loose or latent materials present on the wall exceed 5% of any 4 sq. ft. area, the shear and tension values of the foam must be reduced based on Table 2.

2.4 Installation:

The existing surface(s) of unreinforced masonry, unreinforced brick or concrete walls must be free of all coatings to the existing substrate and oils and debris, contaminates or paint that adheres to the existing surface that is to provide for the SR Foam bond. Surface areas free of coatings, oils and loose latent materials are to be cleaned with a light brushing. Areas that are not satisfactorily cleaned must be inspected and a determination of the percentage of area reduction for any 4 square feet area must be determined. The adhesive properties in the area of question must be reduced in accordance with section 2.3.

This report is an evaluation summary for the use, and inspection of the SR wall anchorage systems. The report has been submitted as requested by the City of Portland, Oregon for acceptance and approval. Use of this product beyond the scope of this report will require additional review and approval by the local building official.

The stud walls are installed and sheathed. All associated fasteners and anchorage are installed. Wall cavity corners, edges, electrical service boxes, and conduit are to be sealed to minimize leakage during the fill process. TR walls are to have fill ports between each stud bay to be filled spaced at 4 ft. on center vertically. BSW and BW walls ports are to be spaced no greater than 4' o.c. each way. SR foam is not to be installed into wall cavities with standing water or placed in wall cavities with knob and tube wiring.

SRFOAM is placed in wall cavities and allowed to expand, such that it does not exert a pressure on cavity walls in excess of 10 PSF, in lifts not exceeding 48 inches in height. Prior to filling wall cavity SRFOAM is applied to an open container to verify equal mixing of components.

Once the material is placed, the material is to remain undisturbed for at least 4 hours. Clean up of all cavity wall leaks is recommended within the first ½ hour of placement.

2.5 Inspection:

A periodic structural observation of the SRfoam installation by a certified Seismic Rehab inspector shall be conducted at prior to the start of filling the wall. The observation shall include verify the component materials, the color and consistency of the mixed material coming out of the gun and the initial set cell structure prior to injecting any material into the wall. Prior to installation inspector shall verify the material is not beyond the expiration date. The observation shall verify the initial fill procedures are being followed.

2.6 Miscellaneous:

The SRFOAM wall material is available in 55 Gallon drums. The product has a shelf life of 1 year. Storage temperatures for containers are between 65 Degrees F, and 75 Degrees F. Containers shall be stored indoors, protected from any water contact.

The SRFOAM material has a flame spread rating per ASTM E84 of less than 20. The smoke density is less than 350. The Fuel contribution is zero, and an Oxygen index of 23. SRFOAM may be used in within fire-resistive construction provided it is being used to resist only Lateral.

2.7 Identification:

The SRFOAM is identified by labels on the packaging indicating the manufacturer's name, product name (SRFOAM) are placed on the containers. Each

component shall be labeled as part "A" or part "B" respectively.

3.0 EVIDENCE SUBMITTED

Test data reports provided by Professional Service Industries (PSI), an independent testing lab. PSI Test report include the following SRFoam and plywood tensile testing dated May 2004 Report number 689-363436-002; SRFoam and Brick testing dated January 2004, Report number 689-36436-001; Adhesive bond strength testing and PSI Test 1 dated January 2002 project number 689-16537-1 dated January 2002. Testing was observed by representatives from the City of Portland, and Miller Consulting Engineers, Inc. Data includes shear and tension testing under aging conditions using full scale masonry wall cavity. The test included a sample of each masonry type as well as wood and steel.

4.0 FINDINGS:

That the SR Contractor LLC wall anchorage and strengthening systems described in this report comply with the 2009 International Building Code, subject to the following conditions:

- 4.1 **The SRFOAM is, identified and installed in accordance with the manufacturer's instructions, and this report.**
- 4.2 **Allowable shear, compression and tension values for SRFOAM are as noted in Table 1. Reduction of loading as a result of loose or latent material to be determined in accordance with Section 2.3 of this report.**
- 4.3 **Calculations justifying that the applied loads comply with this report are submitted to the building official for approval.**
- 4.4 **SRFOAM is not permitted for use in conjunction with fire-resistive construction. Exceptions would be:**
 - **SRFOAM resists Lateral loading only.**
 - **For other than Lateral loading, special consideration is given to fire exposure conditions.**
- 4.5 **SRFOAM is limited to installation in cavities without standing water**

This report is subject to re-examination in 3 years

TABLE 1- ALLOWABLE SHEAR AND TENSILE STRESSES FOR SRFOAM (psf) ^{1,2,3,4,5,6,7}

Wall Component	Allowable Shear Masonry/concrete	Allowable Tension Masonry/concrete	Allowable compressive	Allow Tension Wood
SRFOAM	245	472	1800	822

For SI: 1 inch =25.4 mm, 1lbf=4.48 N, 1 psf = 992.16 kPa

¹Tabulated values are based on the adhesive contact area to wall face and sheathing. For a reduction in contact area as a result of contaminates, loose or latent materials refer to Table 2.

²Bond strengths are based on a factor of Safety of 5.0; compression factor of safety 2.0

³Tabulated values are for adhesive directly to sound CMU, brick, clay tile, concrete wood or steel

⁴Displacement of SRFOAM for tabulated allowable tension values is 0.032 inches per 1 inch thickness of foam. For other foam thicknesses multiply displacement by depth.

⁵Displacement of SRFOAM for tabulated allowable shear values is 0.0379 inches per 1 inch thickness of foam. For other foam thicknesses multiply displacement by foam depth.

⁶Sections 2.3 through 2.6 contain special design considerations

TABLE 2- REDUCTION IN SRFOAM ADHESION AS A RESULT OF LOOSE, LATENT SURFACE MATERIALS, OR CONTAMINATES ON ADHESION SURFACE

AMOUNT AREA REDUCTION OF ADHESIVE BOND AREA	REDUCTION FACTOR FOR SHEAR ADHESION	REDUCTION FACTOR FOR TENSION ADHESION
LESS THAN 5%	1.0	1.0
10%	0.9	0.9
20%	0.8	0.8
30%	0.7	0.7
40%	0.6	0.6
50%	0.5	0.5
60%	0.4	0.4
70%	0.3	0.3

¹Tabulated reduction factors apply to any 4 sq. ft. area of the adhesive bond surface.

²Area reduction of adhesive bond surface in excess of 70% will require cleaning of adhesive surface prior to filling SRFOAM.

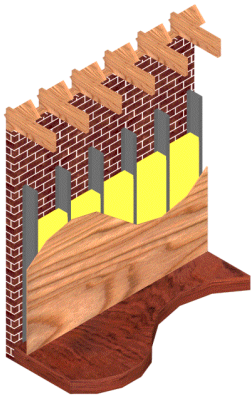
³In lieu of the reduction factors in this table, a pull test of the adhesive may be performed for every 750 square feet of wall surface area to justify loading capacity to local building official.

⁴Tabulated values in this table do not apply to walls with a lightly brushed clean finish without contaminates or loose materials.



SR Wall Systems fig 1.

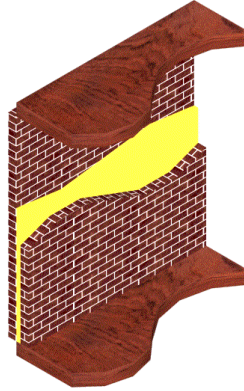
The SR Wall Systems insulate, reinforce and strengthen new and existing construction against drafty environments creating a more comfortable environment.



Thermally Reinforced
Wall (TR Wall System)

TR SYSTEMS

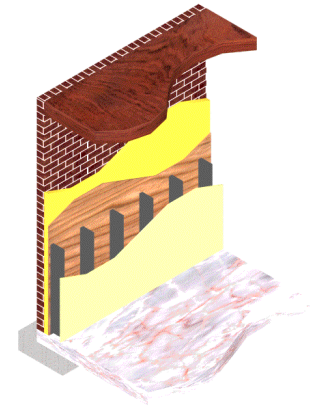
- Studs are installed against the wall being reinforced and tied into the diaphragm. (See illustration above)
- Sheathing is installed over the studs creating a cavity.
- SR Foam is installed in the cavity to adhere the cavity to the existing wall.



Masonry Composite Earthquake
(MCE Wall System)

MCE SYSTEMS

- Fill between existing walls with SR foam creates a bond and composite action between the existing walls strengthening the existing walls out-of-plane capacity.



Basement Wall (BSW Wall System)
Bonded Wall (BW Wall System)

BW SYSTEMS

- Similar to TR with studs outside of sheathing

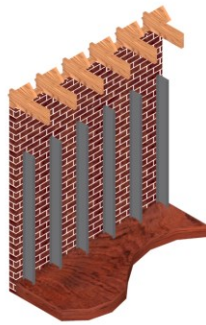
BSW SYSTEMS

- Same as the BW system except used in basement applications so the SR foam is used mostly in compression.

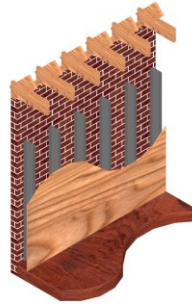
The ingredient that ties all the patented wall systems together is **SR's SRfoam™**



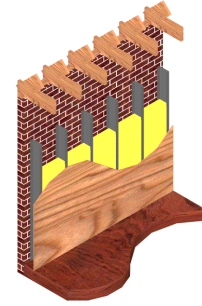
New or existing masonry
or concrete wall



1. Attach metal studs to
ceiling and floor in front
of wall



2. Attach sheathing to
studs



3. Inject SRfoam™ into
wall cavity