



## FAQ

### **Q: What is RASTRA?**

**A:** RASTRA® is known in the industry as a stay-in-place Composite Insulating Concrete Form (ICF). Panels are made of 85% recycled expanded polystyrene (EPS), better known as Styrofoam and 15% concrete by volume. This unique compound was developed in partnership with BASF and its technical name for the proprietary formula developed by Rastra is Thastyron™. When panels are assembled into a wall, they form a grid of 6" channels that accept reinforcing steel and concrete, which cures and hardens into a solid monolithic core. The RASTRA panel stays in place. This combination of concrete, steel and Thastyron creates an incredibly strong and energy-efficient structure.

### **Q: How long has RASTRA been around?**

**A:** The original concept for RASTRA was first developed in 1969 in Austria. In 1972 the first tests were conducted with compound EPS-concrete and soon after the first houses with the original formulation were built and are still in excellent condition today. RASTRA has been in the U.S. since 1984.

### **Q: What is RASTRA made of and how does it work?**

**A:** By volume, 85% of RASTRA is recycled and ground foam plastic; each bead covered with a thin skin of cement and additives. This changes the properties of both the concrete and polystyrene. Once combined, the material becomes fire resistant, light weight, and highly insulating. The mix of material itself is called THASTYRON, and has excellent properties as a wall material. RASTRA panels are made out of THASTYRON and shaped into large panels. Once assembled the panels form a grid of channels which are filled with reinforcement and concrete.

### **Q: Where has it been used in the past?**

**A:** RASTRA has been used successfully in almost any type of climate throughout Europe, Middle East, Asia, Northern Africa, U.S. and Mexico. Initially developed for do-it-yourself homebuilders, RASTRA is now used extensively in a wide range of commercial applications including schools, clinics, hotels, cold storages and other commercial applications up to 6+ stories high (higher with additional structures). RASTRA is used in to construct budget minded projects as well as high end properties with the same high quality.

### **Q: What is the most important feature?**

**A:** No ONE feature is more important than another. Our clients decide which features add value and which do not. With so many features and benefits to choose from its likely you will find value in more than just one.

### **Q: Has RASTRA been tested and code approved?**

**A:** Testing has been a continuous process throughout the 35+ year history of RASTRA. Extensive testing was initially done in Europe, and repeated and extended in the U.S. for all physical and structural parameters including dynamic loading. RASTRA is approved by all important codes in Europe and the U.S. including ICC.

### **Q: How does a homeowner benefit from this type of construction?**

**A:** RASTRA offers resistance to natural disasters such as tornadoes, hurricanes, earthquakes, fires and floods. RASTRA can dramatically reduce heating and cooling bills, reduce maintenance costs while providing an exceptionally comfortable and quiet indoor environment.

### **Q: Why should I use RASTRA?**

**A:** RASTRA buildings are more energy efficient, stronger, higher sound resistant, and more environmentally sustainable than any other construction method.

### **Q: What are the design possibilities and/or limitations with RASTRA?**

**A:** Virtually any design or architectural feature can be achieved with RASTRA. RASTRA can be used with any exterior finish such as wood or aluminum siding, brick, stucco and stone on the exterior, and drywall, paneling,

plaster or tile on the interior. The result is a home that looks like others in the neighborhood but has all the benefits of steel-reinforced concrete construction.

**Q: Does it cost more to build with RASTRA?**

**A:** RASTRA may cost slightly more upfront than a 2x4 or 2x6 wood framed structure if it's a simple design. However, once you introduce intricate architectural features it probably becomes somewhat less expensive to build using RASTRA. Savings are realized during the years to come, saving in energy and maintenance. With timber prices increasing, RASTRA is quickly becoming the less expensive option. There are many other potential areas to save as a result of building with RASTRA that also must be considered such as eliminating vapor barriers, eliminating membrane and wire mesh, downsizing the HVAC unit, tax credits and of course energy savings for the life of the property. When you add it up, RASTRA provides the lowest cost-of-ownership available.

**Q: How much money can I expect to save on my utility bills?**

**A:** An industry study concluded that on average buildings built with RASTRA require 44% less energy to heat the building and 32% less energy to cool the building compared to wood frame construction. RASTRA consistently exceeds these averages.

**Q: Are RASTRA buildings safer than wood framed buildings?**

**A:** Yes. RASTRA buildings are up to 700% stronger than wood frame buildings. As a result, RASTRA walls are more able to withstand severe weather such as hurricanes and tornadoes. RASTRA provides a 4-hour fire rating as opposed to 15 minutes for a comparable wood framed wall.

**Q: How does RASTRA compare to concrete block or poured wall construction?**

**A:** When cured, the concrete in RASTRA walls is 50% stronger and use less concrete than traditional poured walls. RASTRA provides insulation and is ready to finish, making it a cost effective and less labor-intensive choice. RASTRA also is far less labor intensive to use where there are frequent openings and/or popouts as are frequently the case in residential construction.

**Q: What will RASTRA mean for the future value of my home?**

**A:** As energy costs continue to rise, and as ICF construction is more widely understood and appreciated it's reasonable to project that RASTRA built houses will command a 10-15% premium over comparable wood frame homes in the not too distant future.

**Q: How well does RASTRA hold up in a fire?**

**A:** Experience shows that any concrete structure is far more likely to remain standing through fire than one built with wood. Concrete does not break down until it is exposed to thousands of degrees Fahrenheit - far hotter than a typical house fire, for an extended period of time. In fact, when 2000°F flames were held against one side of a RASTRA panel for five hours, the opposite side realized a temperature increase of only 7°F *with no ignition or smoke*. No RASTRA walls ever failed structurally, in contrast to wood-frame walls, which typically collapse in one hour or less. Tests have concluded that RASTRA produces zero Flame Spread.

**Q: Won't the foam burn or give off harmful emissions?**

**A:** No. In a fire, no health hazard whatsoever is caused by the presence of polystyrene. The National Research Council reviewed the numerous existing studies of fire emissions and concluded that the emissions from polystyrene are less toxic than those of typical softwoods now used in home construction. Tests have concluded that RASTRA produces a Smoke density of 5 (450 is permissible).

**Q: How does RASTRA resist tornado and hurricane-force winds?**

**A:** Debris driven by high winds presents the greatest hazard during tornadoes and hurricanes. Recent laboratory testing at Texas Tech University compared the impact resistance of residential concrete wall construction to conventionally framed walls and concluded that concrete walls to be far superior. Tests revealed that 2x4" projectiles shot at a naked Rastra wall at 55ft/sec speed did not penetrate more than 2" deep.

"Only concrete wall systems (such as RASTRA) and concrete masonry, successfully demonstrate the strength and mass to resist the impact of wind-driven debris. The wood-frame walls failed to stop the penetration of airborne hazards".

**Q: Can RASTRA be used in earthquake areas?**

**A:** Yes. If properly reinforced, RASTRA can provide significant protection during earthquakes. If you live in an earthquake zone, you should consult a structural engineer to determine what reinforcement method is required in your area.

**Q: What is the average R-value of RASTRA walls?**

**A:** Walls made of RASTRA provide a much higher Effective R-value than wood frame insulated walls. While framed walls with fiberglass advertise R-values ranging from R-13 to R-19, RASTRA provides an Effective R-value range of R-24 to R-46. The equivalent R-value performance of RASTRA consists of three factors. First is the R-value of the expanded polystyrene. Second, the thermal stability of massive concrete walls reduces the temperature fluctuations and, consequently, the heat load requirements that are common to wood-frame buildings. Finally, air leakage (infiltration) accounts for up to 40% of the heat load requirements of a wood-frame building. RASTRA eliminates this air infiltration with a dense wall assembly. As a result, with the combined performance of the R-value of the expanded polystyrene, the stabilizing effects of the thermal mass of the concrete, and the reduced air infiltration, RASTRA provides a superior thermal barrier.

**Q: What about comfort?**

**A:** Walls built with RASTRA effectively buffer the interior from the outdoors. The thick RASTRA walls sharply reduce fluctuations in temperature, air infiltration and noise. Room-to-room temperatures are more consistent. RASTRA keeps the inside more comfortable and less drafty than ordinary wood frame walls. With regard to noise, studies have shown that compared to a typical wood-frame wall, only about one-third as much sound penetrates a RASTRA wall.

**Q: Do you waterproof a RASTRA wall?**

**A:** Yes. Like any below-grade construction, waterproofing is required. Recommended waterproofing consists of a protective sealant applied to the Rastra surface, coupled with a drainage mat surrounding the foundation wall. A drain at the footer is recommended and may be required by code. Foundation walls should be allowed to cure for a minimum of 7 days and the first floor set in place or the top of wall braced prior to backfilling. The backfill material should be well drained and free of construction debris and large rocks. Once in place, backfill should be properly compacted and graded so that water does not collect around basement walls. Landscaping should be kept clear of the immediate perimeter to prevent accidental water damage from irrigation.

**Q: Is a Vapor Barrier required?**

**A:** No. The combination of concrete and polystyrene acts as a natural barrier against air and moisture.

**Q: How popular is this building technique?**

**A:** Construction of ICF built homes continues to grow at an impressive rate. It's estimated that in 1998, nearly 20,000 homes in the U.S. were constructed with ICF construction. It's anticipated that soon more than 100,000 homes will be built annually with ICF walls. RASTRA has been producing ICF panels throughout the world since 1972. Since the creation of RASTRA, over 9 million units have been sold worldwide.

**Q: Is this building technique approved by code organizations?**

**A:** Yes. Every major code organization in the United States and Canada has accepted this construction technique. RASTRA homebuilding has proven successful in every region and climate. The 2000 and 2003 International Residential Codes have a section on ICF construction. RASTRA is approved by the International Code Council (ICC), Legacy Report ER-4203, ER- 9955 (SBCCI), and UL classified under design U915.

**Q: Is it difficult for subcontractors to work with this material?**

**A:** No. Subcontractors (electricians, plumbers and drywall) easily adapt to working with RASTRA. Once familiar with the product, many tradesmen actually prefer working with RASTRA over wood frame walls. No special tools are required.

**Q: Are termites attracted to RASTRA?**

**A:** No. Expanded polystyrene (EPS) has no nutritive value to insects, including termites. Frankly, termites really dislike both polystyrene when it is covered with concrete and, of course concrete. There is nothing to eat so they find other places to nest. The concrete serves as a solid barrier to termite and carpenter ant infestation.

**Q: How quiet are RASTRA walls?**

**A:** RASTRA provides a sound transmission classification of approximately STC 50 to 55, which is many times as quiet as a typical wood-framed wall. Loud noises outside a RASTRA building will be reduced to a whisper inside the building.

**Q: Why is RASTRA considered environmentally-friendly?**

**A:** In a building's life cycle (from construction to demolition) the greatest ecological impact is the amount of fuel needed to heat and cool the building over its useful life. RASTRA represents a preferred environmental choice because of significant savings in natural resources needed to maintain a comfortable temperature.

A reduction in the use of heating oil reduces CO<sub>2</sub> emissions which contribute to global warming. It's estimated that a RASTRA home for example eliminates 2-3 tons of CO<sub>2</sub> emissions each and every year, 60-90 tons over the life of a 30-year mortgage.

RASTRA removes polystyrene, which never disintegrates, from post-consumer and post-industrial waste streams.

Building with RASTRA, which has a greatly extended service-life, reduces the amount of construction waste that enters our solid waste stream.

Producing one RASTRA panel consumes less than 2kWh per panel. No heat is used during the forming process.

All production waste is recycled.

**Q: Do I need an engineer to review my building plans?**

**A:** Residential steel reinforcement for Insulating Concrete Forms is covered in Sections R611 of the IRC 2000, 2003 codes. A contractor can use the prescriptive charts to determine the requirements for most residential construction in Seismic Zones A&B, with some additional parameters in C&D. Designs that fall outside of the parameters (e.g. extra-tall walls, large openings) require an engineer to review the plans. They will ensure that your construction project meets local code requirements as well as ensure proper design loads for hurricanes, earthquakes and other natural environmental conditions. Commercial buildings generally require engineering.

**Q: Can radius and angled walls be constructed with RASTRA?**

**A:** Rounded walls are easily constructed by miter cutting the form, installed in a vertical column, at the proper angle and using PU foam to join the edges. Special shapes are easily created by shaping the Thastyron with rasps. The Installation Guide available on our web site provides calculations for this purpose.

**Q: Since RASTRA provides a more air tight shell, will mold and mildew be a problem?**

**A:** No. The key to controlling mold is to control moisture. Thastyron's unique properties allow walls to slowly "breathe". This controlled exchange of air is not enough to allow heat or cold to escape but effectively controls moisture to prevent mold that causes sick building syndrome. Air conditioners also dehumidify indoor air more effectively because the air exchange rate is greatly reduced with RASTRA.

**Q: Is it hard to remodel a RASTRA home?**

**A:** No. Remodeling contractors can easily cut openings into a RASTRA wall. Most tool rental stores have concrete cutting saws for rent for cutting openings. Rounded walls are easily constructed by miter cutting the form, installed in a vertical column.

**Q: What is "Effective" R-value?**

**A:** Expressing R-value as an "effective" or "dynamic" R-value has become standard for mass wall systems. Most ICF manufacturers quote Effective R-value as their R-value, although they do not always clarify what the value represents. For example, an EPS type manufacturer may advertise R-values of 35 - 50. EPS alone cannot provide this high value (5" of pure EPS only results in an R-value of 20 +/-). Fiberglass insulation manufacturers do not practice this method of rating because it's not in their best interest as the whole wall R-value is considerably lower than their own stated R-values. They also do not control the entire solution as mass wall manufacturers do. The rating is based on the fact that temperature swings are partly delayed by mass built into the walls or other components of the building. This mass is able to store energy. The Effective R-value is a much more accurate measurement of the entire insulating solution.

**Q: Can roof and floor dimensions using RASTRA extend wider than 10'?**

**A:** Yes. You can build wider spans using RASTRA End Panels by supporting the ends of two panels where they meet and placing girders inside the channel. You have to support the elements for pouring the concrete and camber them. Floor spans up to 20' - 25' are possible and economical with RASTRA.

**Q: Do I need to add drywall to satisfy fire code requirements?**

**A:** No. It is not necessary to cover RASTRA walls as the panel itself is rated "non-combustible" and satisfies all necessary fire test requirements.

**Q: Can Lintels be made entirely of RASTRA?**

**A:** Lintels are usually made of RASTRA, using RASTRA elements horizontal and an end element on the bottom with reinforcement and stirrups. Wood lintels are mainly used for decorative purpose.

RASTRA adhesive foam bonds very well and even windows have been just foamed in. Although, some contractors like to buck out window and door openings with wood, it is not necessary. Windows can be framed with either end elements or flat panels or just cut out and the cavities blocked. Window/door frames can be bolted to the concrete cores. If you have recessed windows the method of using strips of 2" flat panels to frame them in is common. Make certain that all horizontal areas and window sills are caulked and waterproofed.

**Q: How much foam sealant is needed, or how many elements can be glued with one 27 oz. bottle?**

**A:** You can install a minimum of 10 panels with one can of glue. If you lay them horizontally even more. Glue is applied with a gun offered by a number of companies. We suggest that you buy one with metal tips not plastic and purchase two so you have a backup. Two cans of cleaner should be sufficient for an average size home.

**Q: What are staples used for?**

**A:** Staples are used to temporarily hold panels in place while the glue sets, or even during the pour. We sell them in boxes of 100. Alternatively you can use bungee-cords.

**Q: What is a "squeeze" used for?**

**A:** A squeeze is used to lift panels. Particularly, if you use a lifting device such as a Genie lift or backhoe to lift panels up high. If you plan to do this manually you do not need it. Instead of a squeeze you can simply use lifting tapes and sling them through the cavities.

**Q: During construction, how much wall bracing is needed?**

**A:** Unless you need to make cutouts in the cells, a vertical support is needed every 5' – 10'. You can do that with common 2x4's with or without turnbuckle ends nailed to them.

**Q: How is drywall fastened to RASTRA?**

**A:** To attach drywall to RASTRA, it's not necessary to use mechanical fasteners. Most contractors simply place patches of drywall mud on the back side of the sheetrock and "glue" it to the wall. Once the drywall is in place tap it slightly with a rubber mallet to distribute the mud. If you are more comfortable installing a few screws once the drywall is in place, feel free to do so. Screws can be removed or left in place.

**Q: How is siding fastened to RASTRA?**

**A:** For siding you can either fasten furring strips to the concrete core with Tapcon or similar or use steel angles (by Simpson) which are hammered into the RASTRA wall, before grouting and fasten the wood with self tapping/drilling screws.

**Q: Does RASTRA have the same termite problems as traditional ICF systems?**

**A:** No. Other types of ICF systems use two solid layers of Styrofoam to insulate the concrete, like a concrete sandwich. The termites use the soft Styrofoam layer as a place to tunnel and nest. For this reason, in heavily infested termite areas, building codes do not permit the use of EPS ICF's below grade.

RASTRA avoids this problem because our product is made of small EPS beads, coated with a thin skin of concrete, and then mixed into a concrete matrix. Termites and rodents do not attack this material because of the cement content. There is no way to build a tunnel through the small EPS beads.

**Q: What plaster and stucco systems do you recommend?**

**A:** There are many opinions about stucco. We typically recommend a traditional mineral based stucco mix. There are also some which contain fiber reinforcement. In Europe practically all RASTRA buildings are finished with mineral based stuccos, some with an admixture of tiny polystyrene particles for extra insulation (called Rhodipor). There are acrylic and PU based finish coats which are supposed to allow the stucco to breath. A chemical product which has some breathability is Sonneborn (SonoWall FT) or Western Stucco (Western One Coat). Most EIFS products (Dryvit, Sto, Synergy etc.) do not breath as well.

For interior plaster all gypsum based plaster mixes work well. Our experience has shown that a continuous mixer with a pump that blows plaster onto the wall before its trowled off is the fastest and least expensive way to apply plaster.

**Q: Is polystyrene toxic?**

**A:** No. Polystyrene is an organic substance consisting only of hydrogen and carbon. During the polymerization process polystyrene is "injected" with a gas in order to expand the tiny beads when heated with steam. Usually pentane is used. In the early stage of production after expansion, some gas can be emitted. RASTRA uses only recycled materials which do not contain any remnants of gas. The expanded polystyrene itself is completely non-toxic and does not out gas. If it did, the material could not be used as food containers and drinking cups. Finished RASTRA walls have been tested for toxicity and found to be non-toxic.

**Q: What do RASTRA customers to do with their construction waste?**

**A:** Cut-offs can be recycled by returning them to the factory. However, if the distance is too far, cost (and use of fuel) for transport could make it unfeasible.

**Q: Is RASTRA waterproof?**

**A:** No. RASTRA is not waterproof. In below grade installations you have to waterproof a RASTRA wall very carefully as you would with concrete. On stem walls waterproofing generally is not necessary, as there is just soil on one side. RASTRA does not wick water as water does not ascend a RASTRA wall. RASTRA dries out (drains water) almost instantly.

Critical places on RASTRA walls are recessed windows or parapets (horizontal areas), where water can sit and leak through cracks in stucco and gets caught in the wall and has to drain out somewhere. On vertical surfaces we never saw a problem. As a matter of fact, there are some houses in Europe, which have left without stucco for many years - one house we know of has been built 1987 and the family lives in it since 1987 and still has no stucco (2005); they have no problems and wait until they have enough money. With the 2-layer stucco you should not have any problem with your house, if the critical areas are well taken care of.

**Q: Are dust particles of RASTRA toxic?**

**A:** No. When you cut or rasp RASTRA the dust is not toxic in any way, but the dust can lead to irritation of the upper respiratory system. We recommend wearing a protective mask and goggles.

**Q: Do reinforcing rods need to be centered within the wall cavity?**

**A:** As per our ICC report we are generally not required to install rebar in the center of the channels except in some seismic zone applications. The horizontal rebar is approved to rest directly on the RASTRA panel, the vertical rebar require "hand centering" only, except when special engineering requires vertical rebar to be place on one side of the channels, for instance in high retaining walls. All tests and calculations submitted to ICC have been made on this assumption. Some people understandably want the horizontal rebar centered for maximum results. In this case you can just use cut rebar or screws and lay them across the channel to support the horizontal reinforcement.

**Q: How difficult is it to plan and build with RASTRA, can I do it myself?**

**A:** Although, the panels are modular, planning is not limited to any pre-set dimension or shape. RASTRA can be cut with ease with common woodworking tools. There is no limit to the imagination for the designer. RASTRA was originally developed with the do-it-yourself builder in mind. It only takes about 15 minutes to learn the basics.

**Q: Does it need some kind of finish?**

**A:** Building codes allow RASTRA to be left uncovered indoors or out as it is non combustible and serves as a thermal barrier. Homes have been left uncovered for years in Europe enduring frost and thaw. RASTRA has a

porous mineral surface that accepts any kind of stucco or plaster very well, without the need of netting or special preparation of the surface.

**Q: Can RASTRA be used to create more sophisticated designs, like curved walls or arches?**

**A:** As a matter of fact, sophistication lends itself to RASTRA. It can be cut, rasped or sculptured into almost any shape. Curved walls, for instance, can be built by beveling the flanks of the RASTRA element, or arches of any shape are made by cutting into the RASTRA elements the shape of the arch before grouting and blocking off the concrete by a piece of thin plywood. After the concrete is cured you just take out the remainder of the element and use it somewhere else. Any shape is easier with RASTRA than with any other building material.

**Q: What would a homeowner like about his RASTRA home compared to a wood frame home?**

**A:** Certainly the first impression would be the ambience. A quiet, safe and cozy environment with little temperature and moisture variations. Certainly he or she would come to like lower utility bills. Some simply would like the fact that they used an environmentally sound product and contributed to sustain our nature for the generations to come.

**Q: How does RASTRA compare to straw bale construction?**

**A:** Straw bale walls have been reinvented as a "green" building material and promoted as good insulation. Although, straw was a great material in the old days, it has some drawbacks in modern times. First of all the wall thickness takes away a great percentage of the building space. Straw bale walls are good for a very rustic look, however, because the straw bale substrate is 'less than solid' plaster tends to crack and open paths for insects, rodents and termites. As moisture infiltrates, the life cycle of a straw bale house is limited or at least involves serious maintenance. There are of course other issues like fire and structural considerations.

With RASTRA we have created a system which avoids all these problems. RASTRA, same as straw bale, is a recycled material. It has high insulation values with a wall thickness coping with typical designs. RASTRA is virtually maintenance free and almost unlimited lifetime can be expected. RASTRA is non combustible and has been tested under a 5 hour fire exceeding 2000°F (un-plastered). Like straw-bale, RASTRA goes up very quickly and there is no need for highly experienced installers. After all RASTRA was initially developed for the do-it-yourself builder.

For more information please visit [rastra.com](http://rastra.com)