



A Better Way to Build

## what is rastra?

RASTRA is recognized as the ultimate building solution for economical and eco-friendly construction. This stay-in-place concrete form system is made of a lightweight composite material produced with 85% recycled polystyrene and 15% cement by volume.

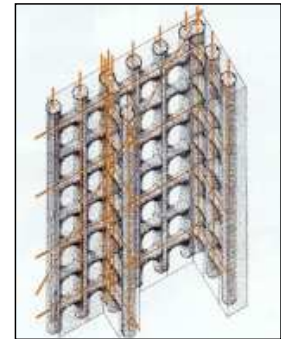
RASTRA is the solution for this century to build environmentally conscious, energy-efficient buildings that provide safe and healthy living environments.

The lightweight components that make up the RASTRA system are used to construct

residential, commercial, multi-family and industrial buildings and can be used above and below grade.

Wall strength is realized when steel reinforced concrete is added to the panels where interior cavities of RASTRA are designed to maximize strength by forming a rigid skeleton of 6" diameter columns inside the panel.

RASTRA provides an extremely strong wall using the lowest possible amount of concrete.



Cut away view of interior channels

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## environmentally friendly

*According to the National Association of Home Builders, a typical 2,000 square foot home requires over two acres of mature forest.*

RASTRA is produced from recycled post-consumer and post-industrial expanded polystyrene (Styrofoam), which is then mixed with a cement binder. By volume, RASTRA is 85% recycled polystyrene, which would otherwise would end up in landfills and never decompose. It is a truly "green" building material.

RASTRA reduces energy consumption, and with energy savings comes

environmental benefits. Specifically, the reduction of fossil fuels burned to create energy. By reducing our energy consumption, we reduce combustion by-products that produce smog and contribute to global warming. Over the life of a 30-year mortgage, a home built with RASTRA saves our atmosphere 60-90 tons of carbon dioxide (CO<sub>2</sub>) emissions.

The production of RASTRA is classified as ecologically clean. No particles or fumes are set free during its production. Only a minimum of energy is required - producing one

RASTRA panel consumes less than 2 kWh of electricity; curing requires no external energy; and no heat is involved in the production process.

All production waste is recycled and converted into new RASTRA product. In addition, remnants from the building site can also be returned and recycled.

Another measure of sustainability is increased service life. Products that last longer make a large impact on our solid landfills.

## saving energy



*RASTRA is the ultimate building solution for economical and environmentally-friendly construction.*

In the past, buildings were built with little emphasis on saving energy, largely because we enjoyed low energy prices. But these are different times. With today's unprecedented rise in energy costs, improving thermal performance is a financial decision that pays dividends for the life of the property.

Typical "advertised" R-values for new wood-frame construction are misleading. In fact, a typical wood frame home has so many air leaks, it's like having a window open

all the time, accounting for 25% to 45% of the total heat loss of the building.

An industry study concluded that ICF walls typically require 44% less energy to heat the building and 32% less to keep it cool compared to wood frame buildings. RASTRA consistently exceeds these industry averages.

RASTRA's superior R-value and air tightness greatly reduces heat loss and lowers energy consumption. By increasing thermal performance with

RASTRA, HVAC equipment operates less often, reducing energy costs.

Because less moisture filled air penetrates exterior walls, air conditioners don't work as hard to remove humidity from the air.

RASTRA even reduces heat loss from hot water pipes.

## 700% stronger

Superior strength is expected from a wall system made with a steel reinforced concrete over one made of wood. The impressive feature is just *how much* stronger.

Dynamic shear tests designed to simulate earthquake loads, have measured RASTRA to be up to **700% stronger** than wood frame walls.

Because the concrete in RASTRA steel-reinforced concrete walls cures to

strength at least 50% stronger than poured concrete, walls stand up to even the most severe weather conditions.

RASTRA has tested effectively against hurricane force winds. While you may not live in an area threatened by hurricanes, this rating is a clear indication of superior strength.

Tests were also conducted to simulate the equivalent of a Level 8 earthquake on a six-story building with no visual or measurable damage.

Strength isn't only important in the event of a natural disaster. The additional strength RASTRA provides ensures your property will last longer and require less maintenance.



## fire resistant

RASTRA's superior 4-hour fire rating helps protect life and property from the devastating loss caused by fire.

When independent tests applied 2000° F flames to one side of a RASTRA wall for 5 hours, the opposite surface of the wall increased

in temperature by only 7° F, with no ignition or smoke.

Fire tests concluded that RASTRA has a Flame Spread of zero and Smoke Density of 5 (450 is permissible).

In the event of a fire, the hydrogen oxidizes into water vapor. Carbon is set free and a minimum amount of

carbon dioxide would be present. In other words, no health hazard whatsoever is caused by the presence of polystyrene. In fact, fumes created by burning wood are far more toxic.

In the event of fire, only those beads closest to the surface of a RASTRA wall will melt.



## LEED

The most recognized environmental program is the US Green Building Council Leadership in Energy and Environmental Design (LEED) Green Building Rating System. LEED promotes a whole-building approach with performance criteria in five areas: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

The high performance thermal envelope of RASTRA offers a significant contribution towards achieving all 10 of the **Energy & Atmosphere Credit 1** Optimize Energy

Performance Points.

**MR Credit 2.1 and 2.2** seeks to reduce construction waste. RASTRA typically factors in 2 -5% waste, much lower than most other wall materials.

**The Environmental Quality Credits 3.2 and 4.1** are concerned with the reduction of pollutants. The EPS foam used to produce RASTRA emits no VOCs or formaldehyde, nor does it produce any CFCs or HCFCs during manufacturing.

**The Recycled-Content Credit MR 4** is applicable for RASTRA built projects because the forms are manufactured with 85%

recycled expanded polystyrene (EPS).

**Sustainable Sites Credit 5.1** calls for reducing the development footprint and limiting site disturbance to conserve existing natural areas. Building with RASTRA reduces impact to a construction site.

The airtight nature of a RASTRA wall allows for better control of air flow required by **Credit EQ2, Increased Ventilation Effectiveness:** additional outdoor air ventilation (v2.2) or effective delivery and mixing of supply air (Canada v1).

*Please contact us for a more detailed report on RASTRA and LEED.*



*RASTRA is an ecological sound building material, consuming recycled raw materials, taking them permanently out of the waste stream and producing a healthy living environment.*

## interior comfort

In an independent survey, owners of 74 new ICF homes and 73 new wood frame homes were asked what they liked about their homes. Over 80% of the ICF owners mentioned *comfort*, compared with only 22% of wood frame owners.

Being in a RASTRA built home is a comfortable experience. This results from more consistency in room-to-room temperature & humidity, improved air quality, and a much quieter space.

By restricting air leaks and improving the insulation value of the exterior walls, air temperature is more consistent. It virtually

eliminates the "cold spots". The heavy RASTRA wall gives it the heat-absorbing property of "thermal mass".

RASTRA is a porous, material containing small insulating bodies and tiny air pockets, which are responsible for the low specific heat of the wall-surface material. Therefore, the wall surface maintains a temperature that is very close to the average comfort level.

RASTRA's unique composition absorbs sound and creates a quiet space. Noise that normally passes through wood frame walls is absorbed. If RASTRA is used

as an interior wall solution, privacy is enhanced in delicate areas of the home such as walls common to bathroom and bedroom for example. Theater rooms with surround sound systems are enhanced with a more acoustical wall system.

Air quality is improved by HVAC units being more effective in removing irritants which cause discomfort to the eyes, nose and throat.

The solidity of concrete construction reduces flexing in floors, as well as shifting and vibration from the force of the wind or the slamming of a door.

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## indoor air quality



*People spend 90% of our time inside. This makes indoor air quality very important*

Scientific evidence has shown that the air inside the places we live and work can be more polluted than the air outdoors. This poses a serious health risk to occupants. Poor indoor air quality can lead to sore eyes, throat, and nose, headaches, increased susceptibility to viruses, and asthma-like symptoms.

The porous composition of RASTRA allows a slow interchange of air, which in turn allows the building to "breathe." The exchange is

slow enough that it does not allow heat or cold to escape but helps maintain good air quality, preventing "sick building syndrome." This slow exchange of air also prevents condensation that can lead to mold growth.

In blower door tests, RASTRA tested at 0.0379 air changes per hour or once every 26 hours. Because so much unfiltered air leaks into a wood-frame building, the interior air changes completely .5 times per hour or once every 2 hours.

It's easiest to control indoor air quality in a RASTRA building. The air exchanger continually pumps fresh, clean air into the heating and cooling system keeping the interior environment clean, healthy and comfortable. This keeps the interior air virtually free of airborne dust, pollen and other allergens.

Replacing lumber with RASTRA also removes wood preservatives which leach into the interior space.

## maintenance

Maintenance is reduced in several areas that save you time and money for the life of the property. This money saving feature reduces your cost-of-ownership, a good selling feature when you sell.

Traditional wood frame construction is prone to ongoing maintenance over the life of the property.

**Wood Rot** – Eliminating wood frames eliminates wood rot caused by moisture

and insects.

**Paint** – Because RASTRA is dimensionally stable, in other words it does not expand and contract like wood, paint is less susceptible to cracking and lasts longer.

**Stucco** – Most stucco cracks are caused by wood frame substrate walls that twist and warp. RASTRA is dimensionally stable and greatly reduces stucco

cracks that allow moisture to enter the wall cavity.

**HVAC** – Because the interior air is better controlled in a RASTRA built building, the HVAC unit doesn't work as hard or often. Fewer on-off cycles reduces wear and tear on the HVAC unit and extends its useful service life.

Reduced maintenance saves money and provides more free time.

## safety



*An aerial view of New Orleans taken after Hurricane Katrina. The only home left standing in this area was built with ICF panels.*

One of the most important features of any building is its ability to protect human life.

RASTRA's steel reinforced concrete walls provide a safe and secure environment.

RASTRA steel-reinforced concrete walls are tested to be at least 50% stronger than conventionally poured concrete and up to 700% stronger than wood frame walls. Safety when you need it most.

### Safety features include:

- Highly fire resistant – 4 hour rated @2000°F; material will not ignite; produces no toxins
- Flame Spread 0; Smoke Density 5 (450 permissible)
- Effective against hurricane force winds
- Effective barrier from wind-driven debris.
- Earthquake tested up to magnitude level 8 with no structural damage
- Cleaner indoor air quality

# cost-of-ownership

The true value of any building material is what it costs over its useful life and how it contributes to the overall cost of the project. That's great news for RASTRA.

When you build with RASTRA, savings are possible in several areas including downsizing to a less expensive HVAC unit, tax credits, lower insurance premiums, eliminating membrane and wire mesh on stucco installations; eliminating the need for an additional vapor barrier.

Heating and cooling costs are reduced by at least 40% each and every year.

Maintenance costs are reduced because timber that shrinks, warps and rots is replaced by dimensionally stable RASTRA. HVAC units have a longer service life because it doesn't work as hard or often to maintain environmental settings.

As energy costs continue to rise, and as ICF construction is more widely understood, it's reasonable to project

that RASTRA properties will command a 10-15% premium over comparable wood frame structures in the not too distant future.

RASTRA is the least expensive option by far over the life of the property providing the lowest cost-of-ownership available.



*Installing energy saving features and not maximizing the thermal performance of the exterior wall is like walking over quarters to pick up nickels*

# insects +

The mixture of cement and polystyrene in RASTRA creates an undesirable environment for insects.

Insects actually hate this stuff. If you were a bug would you chew on concrete when the neighbor's house was built from wood?

Unlike other ICF systems that use foam panels, RASTRA

doesn't provide a place for termites, carpenter ants and other insects could use to migrate and nest.

As lumber decomposes it becomes more susceptible to insects. RASTRA eliminates this problem.

Small rodents that are usually attracted to wall cavities to nest have no

place to hide with RASTRA.

Because there are no insects, there's no reason to use pesticides that leach in to nearby soil.



# quiet

RASTRA provides outstanding acoustical performance. The increased mass and density of RASTRA provides a very effective sound barrier, keeping outside noise from penetrating exterior walls.

Compared to a typical wood frame wall, 75% to 85% less sound passes through a RASTRA wall. Scientists describe loud speech on the opposite side of a RASTRA wall as, "virtually inaudible."

In an independent survey, owners of 74 new ICF homes and 73 new wood frame homes were asked what features they liked. Over 60% of ICF homeowners mentioned the quietness of their homes, versus only 2% of wood frame homeowners.

Interior walls built with RASTRA reduce the movement of airborne sound from one room to another. Privacy is enhanced.

RASTRA buildings with

RASTRA have a noticeable "quietness". RASTRA provides sound attenuation of up to 53 dB (12" wall with covering on both sides), more than sufficient for separation walls between apartments, condominiums, offices and hotels.

RASTRA is often used to create sound-sensitive rooms such as theater rooms, sound studios or media rooms.

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# applications

### Single Family Homes

Increasing prices in lumber and energy have accelerated the use of ICFs in residential construction.

### Multi-Family

Condominiums, apartments and hotels represent a rising and significant application for RASTRA. Due to the necessity

for increased firewall protection and sound deadening between units, above grade RASTRA walls are becoming an increasingly popular and cost effective option.

### Basements

In cold climates, energy experts tell us up to 40% of a home's heat loss is through the

ground. RASTRA creates the perfect basement walls for locking out winter, and keeping warm, heated air inside.

### Commercial Buildings

About 1/3 all ICFs are used in commercial construction, both for foundations and for above-grade walls. Construction cycles are reduced.

# about rastra

The development of RASTRA dates back to 1968 when engineers set out to design an affordable wall system using modern-age materials that was easy to install. After years of study and refinement, RASTRA was born. Today RASTRA

operates manufacturing facilities throughout the world and has an installation base of over 9 million units.

The future looks bright for RASTRA as the world becomes more concerned about saving energy and

using more eco-friendly building materials.

To learn more about what RASTRA can do for you, please contact your nearest RASTA facility.