

# **Expanded Polystyrene (ESP) Green Walls / Steel SIPs**

## What are Expanded Polystyrene (ESP) Green Walls?

EPS Green Walls or Steel Structural Insulated Panels (SIPs), are structural framing panels made of densely packed Expanded Polystyrene, commonly referred to as EPS, sandwiched between two exterior sheets of galvanized steel. These panels provide structural framing, insulation, and exterior sheathing all in one piece. The panels, in theory, are similar to OSB SIPs, which is more well-known than the steel SIPs panels. OSB, or oriented strand board, is simply replaced with steel sheets to create the steel SIPs.

Steel SIPs can be used for walls and roofs in residential, commercial and specialty structures and applications. Because of the way they are constructed they are very strong, predictable, energy efficient, and cost effective, and are without costly maintenance and repair / upkeep costs offering superior performance.

### Applications:

Steel SIP construction can be used for most residential applications. Steel SIPs are recommended for commercial buildings like office complexes and less than two or three story applications.

### Advantages :

- Steel SIPs are two to three times stronger than conventional stick-and-brick constructions. This allows for more design flexibility and open floor plans.
- The steel SIP panels offer high R-values. Compared to a conventionally built-home, a steel SIP wall system is at least 25 percent more efficient. This saves the homeowner or occupant on heating and cooling costs
- Steel SIPs allow for an airtight envelope that will last over time. The steel, unlike wood, will never settle, compress, warp, rot, twist, etc., meaning you don't have to worry about creating gaps. Gaps mean air penetration which means higher costs to heat and cool the home or building.
- Since steel SIPs won't settle or warp, you no longer have to deal with walls and ceilings cracking. Also, walls will be level and square.
- With no air penetration, allergens and dust do not constantly come into the home or building. Reducing allergens and dust in the interior of the home make for a healthy atmosphere indoors, where we typically spend 80% of our time.
- Steel SIPs emit no volatile organic compounds (VOCs). They do not "off-gas" potentially harmful chemicals (like formaldehyde) and carcinogens into the home or building. OSB and stick lumber cannot offer such benefits.
- With cleaner air (especially with our air purifiers) and a well insulated structure due to the steel panels, the home or building houses comfortable interior conditions.

- Steel SIPs have received the highest seismic rating possible in the state of California. They are also resistant to hurricane-strength winds. They are rated to withstand wind loads up to 155 miles per hour.
- Steel SIPs are not vulnerable to termites. Compare this to OSB SIPs that, unless the wood is treated, is food for pests. The steel panels also discourage the growth of mold and mildew.
- Steel SIPs are constructed in the manufacturing plant. Since they are made in a controlled environment, the quality is considerable higher.
- Not only do the steel panels keep outdoor air out, but it also keeps outdoor sounds out. Steel SIPs offer superior sound acoustic insulation.
- Steel is recyclable and made from at least 28 percent recycled materials. Also, there is very little construction waste. These factors make a steel home or building have a smaller environmental footprint.
- Steel SIPs are fire resistant. In tests, the steel SIPs produced no smoke and did not allow the fire to spread. Compare this to stick-built or OSB SIPs homes and building that burn easily and actually add fuel to the fire.
- Steel SIPs will not warp, rot, twist, crack, or add heavy foundation loads.
- Steel SIPs provide a quiet interior as a result of using a dense EPS insulation core with no air leakage for sound to travel through.
- Significantly less air leakage means fewer drafts, less noise, lower energy bills, and a significantly more comfortable and healthy indoor environment.

#### Certifications:

- EPS Steel SIPs meets and/or exceed new Florida and Gulf Coast hurricane requirements with engineering up to 230 miles per hour wind loads.
- All structures are certified by licensed engineers and or architects for design and integrity based on the stringent testing requirements and protocol of Florida Building Commission, ASTM (American Society for Testing and Materials), UL (Underwriters Laboratory) extensive testing guidelines.
- Fire resistant (up to two hour load bearing ratings)
- Termite, pest, mold, mildew, and water resistant due to the highest quality and high performance building technology.

#### Cost Effectiveness:

- Building with Steel SIPs generally costs about the same as building with wood frame and / or block construction, when you factor in the labor savings resulting from shorter construction time, less material waste and sorting through the wood to find unwarped and untwisted materials. Panels are straight, true, plumb, and do not twist, warp, bend, and deteriorate on the jobsite because of weather, moisture and similar job site problems.
- Structures go up faster and straighter, helping to keep construction schedules on time and controlling labor and construction costs.
- Superior structural strength and spanning ability of SIPs significantly reduces the amount of steel required, reducing steel labor and materials.

#### Electrical & Plumbing:

- The interior surface of the wall and roof panel is usually furred out with 1 ½ furring channels to promote conventional surface mounted installation for wiring and plumbing.
- Duct work can be placed in dropped ceiling areas. Where exterior wall vent pipes are necessary, chases can be formed in the foam cores or the wall framed out.
- Installing island vents or loop vents is also a common practice.

#### What makes it "green"?

- High levels of insulation and an extremely airtight envelope mean cooling and heating costs are cut by 50-60 percent. This means less energy is drawn from coal plants around the country, equating to less greenhouse gas emission.
- The air in the interior of the home, with our measures added, will be cleaner than the air on the outside of the house, making a healthy, allergen-less home or building.
- The steel is made from at least 28 percent recycled steel. It is also recyclable.
- The EPS (interior of the panel) only uses a small amount of petroleum to produce. The material saves more energy than is required to produce it

#### Misconceptions:

Some think steel SIPs, and steel framing for that matter, are dangerous during lightning storms. This is not only incorrect but really incorrect. Steel homes and buildings are actually safer than conventionally-built structures because the steel acts as a continuous ground.

#### More Qualities of Green Wall Steel SIPs:

1. The preformed steel used in steel sips are cold rolled, have high strength, low alloy,

and are 15" on center

2. Meets structural specifications from 18 mil, 50ksi and greater required
3. The thermoplastic core is a minimum of 1.0 to 3.0 pounds per cubic foot to provide structural fortification.
4. Long term thermal resistance (LTTR) has superior thermal values with no loss over time.
5. Thermoplastic with pre-formed steel frame provide thermal break with axial, lateral and rack and shear comparabilities exceeding the sum of the components.
6. The Green Panel Wall ship lap connections form a square box every four feet when assembled. This square box design when employed within the building envelope provides rack and shear stability reducing dependence on cross bracing.
7. Door and window openings are engineered into the frames with headers and additional; steel as needed or required.
8. The thermoplastic will not sustain a flame and when covered with a thermal barrier the assembly requirement for CAN/ULC S126-M is waived. The assembly is considered Class A with Gypsum board or equivalent thermal barrier and/or the building is sprinkled.
9. Steel track is sealed and anchored with specified fasteners in accordance with local building code followed by the placement of the vertical Green Wall components with the required screw pattern for the shiplaps inside and outside. The top track is applied in the same manner which creates a continuous path of steel from the foundation to the top plate. Each wall will be designed and sized to accept the floor system for the following second floor or clips and straps for the roof truss system.
10. Spacing Green Wall Systems studs standard 16 inches on center will be modified to accept any roof or floor truss spacing.
11. Exterior finishes may be applied to the Green Wall System without additional sheathing or vapor barrier following customary procedures as defined for conventional materials.
12. Brick ties may be attached directly to the vertical steel studs as well as siding of all kinds may be attached using specified fasteners.
13. Low unskilled labor can be employed to construct and complete the Green Wall System.
14. The Green Wall System is an effective thermal barrier, provides no food value for wood destroying insects and fungi.
15. The flexible recovery capability of the Green Wall System performs excellent and is of great value in seismic and hurricane win conditions.

16. The Green Wall System is typically 4 foot in width, and 8to20 feet high with thickness of 4 to 6 inches.
17. Protective coatings can be selected to meet or exceed specific requirements of any project. T
18. Metal panels & metal siding installed in front of CBS construction (ASTM C90) or 5/8" (5 ply) plywood supported by 2x studs or 25x6 – 18 gage metal studs, each at 16" on center are exempt from impact from impact & positive pressure tests.

Keywords & Abbreviation:

Green Building – increase the efficiency of a building's use of natural resources.

LEED – Leadership in Energy and Environment Design

LTTR – Long Term Thermal Resistance

PATH – Partnership for Advanced Technology in Housing

ICC – International Compliance Code

BOCA – Building Officials Code Association

SBCCI – Southern Building Compliance Code Institute

NOA – Notice of Acceptance (local product approval)

NER – National Evaluation Report

ENERGY STAR – Energy Compliance Base on Independent Criteria

Florida Building Code – Florida Building Code

HWVZ – High Wind Velocity Zone – Coastal Barrier Islands Florida

EPS – Expanded Polystyrene

CFSEI – Cold Formed Steel Engineered Institute

NASA – North America Steel Alliance

Green Panel Wall System

1. A 100% green buildings materials systems

2. Construction with recycled steel and Expanded Polystyrene upon request
3. Available in 4" wall thickness with R-Value 28
4. Available in 6" wall with R-Value 33
5. Standard wall plate height of 8'0" to 16'0"
6. Other sizes available per specifications
7. Dual steel stud construction spaced 16" on center facing each other
8. Gauge of steel studs 18 gauge equal 2X6
9. Gauge of steel studs 20 gauge equal 2X4
10. Coating on steel studs per specifications require G-60 or G-90
11. Mold testing show no evidence that supports growth fungi
12. Mildew testing show no evidence that support growth of fungi
13. Termites have no food source
14. UL-94 flammability test rated for EPS Grade 54 @94 HF-1
15. Complies with Federal Toxicity Regulation ASTM-578
16. Has no construction site waste with dumpster fees
17. Dramatically reduces utility costs
18. Dramatically reduces construction costs
19. Green building tax rate credit
20. LEED Certified Building Material

Questions & Answers:

### 1: Why build with EPS and steel?

Residential EPS and steel framing members are cost effective, light weight, easy to handle, and manufactured in conditions that allow strict quality control. When designed properly, the result is solid, non-combustible, and durable. Because EPS and steel can be pre-cut to desired lengths and are stable materials, you don't need to sort out defective pieces and can erect a frame faster. Also, steel scrap has value and can be recycled.

### 2: Will a home look different than the rest in my development?

No, only if you want it to. In fact, because of steel and EPS' properties your architect can design your home with larger open spaces. With steel framing, walls will remain straight and true, preventing call backs due to nail pops and shrinkage cracks. Finishes can be the same as you are accustomed to using.

### 3: What about the environmental impact of steel and ESP construction?

The overall recycling rate of the steel industry is 66%, the highest in the country, offering an environmentally sound home framing alternative. Steel framing scrap is a valuable commodity that should not end up in a landfill. EPS foam is also being recycled worldwide and is 100% recyclable.

### 4: What about cost?

The price of steel SIPs has been relatively constant over the last decade. While the price of traditional framing materials has been erratic and growing at a rate much faster than inflation, steel SIPs' prices have only experienced small quarterly adjustments. Builders interviewed nationwide have affirmed that framing with steel is less expensive than traditional framing.

### 5: Can steel SIP homes be energy efficient?

Yes. Steel SIPs will exceed governmental energy efficiency standards. In addition, by staying straight and true, the steel framing helps prevent cracks due to shrinkage or warping, thus preventing air leaks that result in a costly loss of energy.

### 6: Will steel SIPS interfere with portable radios, phones, or TV reception?

No. Waves pass through the space between the studs, allowing the use of all radios, phones, and television sets in your home.

### 7: What about lightning?



The steel frame offers its occupants better protection than any other construction system. Scientists recommend seeking shelter in steel frame structures during lightning storms because the steel frame provides a path to the ground, reducing the likelihood of explosions, secondary fires, or personal injury.

8: Will my home rust?

No. The use of galvanized steel frame components protects your home from rust.

9: Can my house be built to resist earthquakes and hurricanes?

Yes. Positive connection and the strength of EPS and steel provide great protection against earthquakes and hurricanes. Steel's high strength and ductility make it the best construction material for earthquake resistant design.

10: Will steel framing and/or EPS affect the indoor air quality?

No. Steel and EPS is recommended for chemically sensitive and environmentally conscious homeowners who seek good indoor air quality. Steel frames and EPS foam do not need to be treated for termites and are free of resin adhesive and chemicals normally present in other construction materials.

11: Will I be able to remodel my home?

Yes. Since steel framing and EPS foam allows for larger spans, a home can be designed without interior load-bearing partitions, making it easier for homeowners to complete alterations without effecting the structure.

12: How do I hang pictures in a steel SIP home?

As in traditional homes, depending on the weight of the picture, you can hang it from the drywall with toggle bolts or hangers. Heavier objects can be hung from screws attached directly into the studs, which can easily be found with a magnet.

13: Will I have to pay higher insurance premiums for my homeowners insurance?

No. As a matter of fact, because of steel SIPs' excellent performance record in earthquakes, and because it is not effected by termites and is non-combustible, homeowners may be able to save on insurance premiums.

14: Will I be able to sell my home?

Your home does not need to look any different than your neighbors, and should sell just as easily. Because of steel SIPs' high strength and durability, homes will last and retain values longer than traditional construction. In fact, if you take advantage of steel SIPs' strength and flexibility by designing wide open spaces, you will have additional selling features.

15: Will the house need bigger footings and foundations?

No. Steel SIPs weigh much less than wood framing components. The foundations, and even the seismic design loads can be smaller.

16: Can I find plumbers and electricians to work on the house?

Plumbers and electricians have worked with steel framing in commercial construction for years and are very familiar with it. Steel studs have pre-punched holes that allow faster and easier installations of plumbing and electric work than in conventional homes.

17: Is steel SIPS readily available?

Steel and EPS foam are both readily available throughout the country and can be purchased in stock lengths, pre-engineered, panelized systems, or custom cut. Because of the growing use of steel and EPS in residential constructions, local lumberyards and commercial building supply warehouses are adding steel framing components to their inventory. Builders can also purchase steel directly from the manufacturer.

18: Can I build a steel framed house close to the seashore?

Yes. With the use of galvanized steel members that are recommended and common in almost all applications. In addition, you should provide a standard, well-insulated weather barrier as required for any home under construction.

19: What is Enhanced Screw Retention ?

Steel SIPs greatly reduces the possibility of screw stripping. Screw stripping can occur for a number of reasons, including inferior screw and/or gypsum or steel variations. Steel SIPs ensures every screw is in contact with a material thickness greater than the nominal gauge of the steel. Furthermore, the location of screws creates inward pressure around the point of contact as a pull-out force is applied.

20: Who benefits form using Green Wall Systems?

### Contractors

- Improved productivity and quality
- Tighter stud to track friction fitting
- Sight line on flanges for more precise joints
- Improved safety by reducing sharp edges and lips
- Differentiation — you install a premium product with better sound, fire and performance characteristics

### Owner and Architects

- Approved, better, and quieter building.
- Less noise transmission through walls and ceilings.
- UL® Fire Rated assembly.
- UL Classified product.

### Suppliers

- Supply your customers with the best products available
- You provide a preferred recognized brand
- Limits your exposure and liability
- Cosmetically preferred and easily identifiable
- Reduced product damage — resists dents and dings
- Improved safety by reducing sharp edges and lips

Pictures:

