

# THE BENEFITS OF INSULATED METAL PANELS

## Using IMPs in Different Climate Zones

The energy savings that can be achieved by using IMPs varies by geographical location. In order to illustrate the effect, a hypothetical commercial warehouse was modeled using a US Department of Energy (DOE) building energy modeling system. This building was modeled with two different envelope configurations in four geographical locations. The parameters for the study are as follows:

### 100' x 200' x 20' Commercial Warehouse

- ½:12 roof (nominally flat)
- 8-25' Modules, each with:
  - (2) 8' x 10' overhead dock doors on north wall, nominally closed
  - (4) 4' x 4' double pane bronze tinted windows and (1) 3' x 7' ¼" single pane bronze glass door on the south wall
  - 20' x 25' office space with 10' ceiling with plenum above
  - 80' x 25' warehouse full height
- Office operating Monday through Friday, 8 a.m. to 5 p.m.
  - Heating Set Points – 70°F (8-5), 64°F otherwise
  - Cooling Set Points – 76°F (8-5), 82°F otherwise
- Warehouse (24-7)
  - Heating Set Point – 68°F
  - Cooling Set Point – 78°F
- HVAC System
  - Electric direct expansion cooling
  - Natural gas furnace

### Two Scenarios Investigated

- Single skin metal panels with R-11 fiberglass insulation on the walls and R-19 fiberglass on the roof (ASHRAE 90.1-2007 minimum) compressed at framing members with light painted walls and Galvalume roof
- 2" IMP walls and 3" IMP roof (thinnest panels that meet the same ASHRAE requirements)
  - Cool Roof in Houston
  - Painted roof in Boston and Minneapolis
  - Galvalume Plus® in Phoenix

**NOTE 1:** These results are based on energy modeling using the US Department of Energy (DOE) DOE-2 software as described above with TMY2 climatological data obtained from the National Renewable Energy Labs for the noted locations. This software is a tool used for comparison purposes only; it does not purport to predict actual energy savings. It is the same kind of tool used to evaluate energy code compliance using performance methods.



## Phoenix, AZ

		Single Metal Skin	Insulated Metal Panel	Annual Savings
<b>Energy Consumption</b>	Space Cooling (MWh)	63.40	58.70	7.41%
	Ventilation (MWh)	14.94	13.50	9.64%
	Total Electricity (MWh)	78.34	72.20	<b>7.84%</b>
	Space Heating (MBTU)	27.90	22	<b>21.15%</b>
<b>GHG Creation</b>	Tons of CO <sub>2</sub>	63.57	58.39	<b>8.16%</b>
<b>Peak Cooling Loads</b>	Wall Conduction (kBTU/h)	32.00	20.50	35.94%
	Roof Conduction (kBTU/h)	84.90	62.70	26.15%
	All Loads (kBTU/h)	322	290	<b>9.94%</b>
<b>Peak Heating Loads</b>	Wall Conduction (kBTU/h)	32.70	21.20	35.17%
	Roof Conduction (kBTU/h)	37.40	29.10	22.19%
	All Loads (kBTU/h)	105	86	<b>18.10%</b>

See Note 1.



## Boston, MA

		Single Metal Skin	Insulated Metal Panel	Annual Savings
<b>Energy Consumption</b>	Space Cooling (MWh)	13.60	12.83	5.66%
	Ventilation (MWh)	11.20	10.80	3.57%
	Total Electricity (MWh)	24.80	23.63	<b>4.72%</b>
	Space Heating (MBTU)	402	363	<b>9.70%</b>
<b>GHG Creation</b>	Tons of CO <sub>2</sub>	41.75	38.68	<b>7.35%</b>
<b>Peak Cooling Loads</b>	Wall Conduction (kBTU/h)	18.70	11.90	36.36%
	Roof Conduction (kBTU/h)	65.20	42.90	34.20%
	All Loads (kBTU/h)	256	229	<b>10.55%</b>
<b>Peak Heating Loads</b>	Wall Conduction (kBTU/h)	48.30	30.80	36.23%
	Roof Conduction (kBTU/h)	57.20	46.40	18.88%
	All Loads (kBTU/h)	197	170	<b>13.71%</b>

See Note 1.

**NOTE 2:** The GHG production is based solely off of natural gas and electricity energy savings using the EPA Greenhouse Gas Equivalencies Calculator.





## Minneapolis, MN

		Single Metal Skin	Insulated Metal Panel	Annual Savings
<b>Energy Consumption</b>	Space Cooling (MWh)	15.90	14.80	6.92%
	Ventilation (MWh)	11.90	11.00	7.56%
	Total Electricity (MWh)	27.80	25.80	<b>7.19%</b>
	Space Heating (MBTU)	594	541	<b>8.92%</b>
<b>GHG Creation</b>	Tons of CO <sub>2</sub>	54.68	50.19	<b>8.21%</b>
<b>Peak Cooling Loads</b>	Wall Conduction (kBTU/h)	25.70	16.40	36.19%
	Roof Conduction (kBTU/h)	71.10	48.00	32.49%
	All Loads (kBTU/h)	270.40	239	<b>11.61%</b>
<b>Peak Heating Loads</b>	Wall Conduction (kBTU/h)	66.60	42.70	35.89%
	Roof Conduction (kBTU/h)	79.00	64.40	18.48%
	All Loads (kBTU/h)	267	229	<b>14.23%</b>

See Note 1.

## Houston, TX

		Single Metal Skin	Insulated Metal Panel	Annual Savings
<b>Energy Consumption</b>	Space Cooling (MWh)	50.40	42.68	15.32%
	Ventilation (MWh)	13.23	10.97	17.08%
	Total Electricity (MWh)	63.63	53.65	<b>15.68%</b>
	Space Heating (MBTU)	55.37	55.69	<b>-0.58%</b>
<b>GHG Creation</b>	Tons of CO <sub>2</sub>	53.44	45.55	<b>14.76%</b>
<b>Peak Cooling Loads</b>	Wall Conduction (kBTU/h)	29.20	18.62	36.23%
	Roof Conduction (kBTU/h)	89.50	33.30	62.79%
	All Loads (kBTU/h)	291	225	<b>22.68%</b>
<b>Peak Heating Loads</b>	Wall Conduction (kBTU/h)	39.10	25.00	36.06%
	Roof Conduction (kBTU/h)	45.20	39.00	13.72%
	All Loads (kBTU/h)	150	130	<b>13.33%</b>

See Note 1.

