Steel Framed Parking Solutions

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The Structural Steel Industry
Steel Industry Progress

1980
12 man-hours/ton

2009
0.5 man-hours/ton
40% higher strength
1/3 the energy
38% reduction in carbon emissions
67% reduction in overall emissions
EPA best industry performance
EAF Steel Production

1. Scrap Selection
2. Electric Arc Furnace
3. Ladle Refining
4. Rolling Mill
5. Continuous Casting
6. Finished Product
Do you know that structural steel framed parking garages...

...represent 11% of all structured parking spaces built in 2008?
Advantages of Steel Framed Parking Structures:

• Superior long-term durability
• Lower construction costs
• Reduced construction time
• More parking spaces
• Reduced foundation requirements
• Bright open interiors for added safety
• Reduced maintenance costs – Ease of inspection
• Vertical expansion
• Design flexibility – Façade options
• Sustainability
Do you know that structural steel framed parking garages...

...can be built with any type of deck system?
Do you know that structural steel framed parking garages...

...can be built with any type of deck system?
Pre-Topped Precast Double T’s

New York JFK Airport
Pre-topped Precast Double T’s

Tufts Health Plan
Watertown, Mass.

Manchester Airport
Pre-topped Precast Double T’s

Newark Airport, NJ
Do you know that structural steel framed parking garages...

Relative Costs

<table>
<thead>
<tr>
<th>Structure</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Steel – Metal deck</td>
<td>1.00</td>
</tr>
<tr>
<td>Structural Steel – Precast tees</td>
<td>1.35</td>
</tr>
<tr>
<td>Structural Steel – Post tensioned deck</td>
<td>1.60</td>
</tr>
<tr>
<td>Concrete post tension frame and deck</td>
<td>1.80</td>
</tr>
<tr>
<td>Precast frame and tees</td>
<td>1.50</td>
</tr>
</tbody>
</table>

Structural steel is readily available

...are cost-effective?
Do you know that structural steel framed parking garages...

Week 10 – Over 350,000 SF! *Enough Said!*

...get built faster?
Do you know that structural steel framed parking garages...

...get built faster?
Do you know that structural steel framed parking garages...
Do you know that structural steel framed parking garages...

...provide a higher service level for parking in the same footprint?
Do you know that structural steel framed parking garages...

<table>
<thead>
<tr>
<th></th>
<th>C-I-P Post-tensioned</th>
<th>C-I-P Stay-in-place</th>
<th>Precast Double Tees</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-I-P Frame</td>
<td>105-107 psf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precast Frame</td>
<td></td>
<td></td>
<td>113-115 psf</td>
</tr>
<tr>
<td>Steel Frame</td>
<td>82-84 psf</td>
<td>84-88 psf</td>
<td>94-97 psf</td>
</tr>
</tbody>
</table>

...weigh 20% less than garages using other framing systems?
Do you know that structural steel framed parking garages...

...provide a greater degree of openness and security?
Do you know that structural steel framed parking garages...

...provide a greater degree of openness and security?
Do you know that structural steel framed parking garages...

...provide a greater degree of openness and security?
Do you know that structural steel framed parking garages...

...cost less to maintain over the life of the garage?
Do you know that structural steel framed parking garages...

Portland Airport
Portland, OR

...have inherent ease of visual inspection?
Do you know that structural steel framed parking garages...

Station Square
Pittsburgh, PA

Portland Airport
Portland, OR

...can be easily expanded horizontally and vertically?
Do you know that structural steel framed parking garages...

...provides for aesthetic expression?
...and exercise greater aesthetic flexibility?
Do you know that structural steel framed parking garages...

...provides for aesthetic expression?
Do you know that structural steel framed parking garages...

...provides for aesthetic expression?
Do you know that structural steel framed parking garages...

...can fit easily on complex, irregular sites?
Do you know that structural steel framed parking garages...

Based on equivalent utilization in a building’s design

1 ton of steel = 8 tons of concrete
93% recycled content = 5% recycled content - maybe
1.0 ton CO₂/ton = 1.6 tons of CO₂/8 tons
70 gallons of water/ton = 150 gallons of water/8 tons
1,860 pounds of recycled material/ton = 480 pounds of recycled material/8 tons

AT END OF BUILDING LIFE

1,960 pounds multicyced = 3,200 pounds down-cycled/8 tons
40 pounds landfilled/ton = 12,800 pounds landfilled/8 tons

...are inherently more sustainable?
Do you know that structural steel framed parking garages...

...are the subject of several myths?
Myth #1 - Corrosion
Myth #1 - Corrosion

35 years with no maintenance

Cricklewood Hill Apartments
Pittsburgh, PA
Myth #1 - Corrosion

Preventing Corrosion in Steel Construction—Several Options:

1. Specify a multi-coat paint system with a zinc-rich primer and quality surface preparation SSPC-6 or SSPC-10
2. Specify galvanizing
3. Specify a duplex system
Myth #1 - Corrosion

How good are high performance coatings?

Without any maintenance for 15 years only 0.5% would require touch-up
Myth #1 - Corrosion

Galvanizing

www.galvanizeit.org
Myth #1 - Corrosion

Preventing Corrosion in Steel Construction—Further Considerations:
1. Take special care in the fabrication and erection process
2. Regular visual inspection
3. Adhere to suggested maintenance programs.
Myth #2 – Fire Protection

What is an open-deck parking structure?
Myth #2 – Fire Protection

What is an open-deck parking structure?
### Myth #2 – Fire Protection

Fire Protection is NOT required in all cases!

<table>
<thead>
<tr>
<th>Fire Resistive Requirement</th>
<th>IBC Type IIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition of Open Side</td>
<td>None</td>
</tr>
</tbody>
</table>

<p>| 50% of interior wall area of exterior wall |</p>
<table>
<thead>
<tr>
<th>sq ft/tier</th>
<th># of tiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 sides open</td>
<td>50,000</td>
</tr>
<tr>
<td>3 sides open</td>
<td>62,500</td>
</tr>
<tr>
<td>4 sides open</td>
<td>75,000</td>
</tr>
</tbody>
</table>

*Exception*

- unlimited
- height $\leq$ 75 ft

*the distance from any point on the deck may not be greater than 200 feet from an open side*
Myth #2 – Fire Protection

Example of Intumescent Paint
Myth #2 – Fire Protection

Example of Troweled on Fire Protection
There's always an solution in steel.