Composite Concrete Cryogenic Tank (C³T): A Precast Concrete Alternative for LNG Storage

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April 18, 2013
C³T
Composite Concrete Cryogenic Tank

Past

Present

Future

Photo courtesy BergerABAM

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C³T is…
Composite Concrete Cryogenic Tank

- Full containment LNG storage
- A modern, safer version of a proven concept
  - 19 concrete LNG tanks built between 1950-1980
  - Some are still in service today in Philadelphia and Barcelona
C³T is…
Composite Concrete Cryogenic Tank

Approx. panel dimensions: 34m x 3.6m x 0.3m - 0.45m
Approximate panel weight: 100 tons each

Photo courtesy DN Tanks
C³T is…
Composite Concrete Cryogenic Tank

- Inner and outer tanks walls assembled from precast, prestressed concrete panels with an integrated carbon steel vapor barrier on the outside surface.
- Tank Walls are wrapped with high strength prestressing strand, which is then covered in shotcrete.
C³T is…
Composite Concrete Cryogenic Tank

Photo courtesy DN Tanks
Secondary Tank Liner
Secondary Tank Wall
Circumferential Prestressing Strands Covered by Shotcrete
High-Strength Steel Hold Downs

Perlite
Shotcrete Cover
Primary Tank Liner
Primary Tank Wall
LNG Liquid
9% Ni Steel Tank Floor Plate
Tank Bottom Insulation
9% Ni Steel Subfloor Plate
Embedded Heating Conduit
Concrete Base Slab
Compressed Wood
C^3T – A Comparison with Conventional LNG Storage Tanks for 160,000 m^3, USGC

<table>
<thead>
<tr>
<th></th>
<th>9Ni Steel Tank</th>
<th>C^3T</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inner tank</strong></td>
<td>9% Nickel Steel</td>
<td>PC/PS concrete panels with thin CS liquid/vapor barrier</td>
</tr>
<tr>
<td><strong>Outer tank</strong></td>
<td>Cast-in-place Concrete</td>
<td>PC/PS concrete panels with thin CS liquid/vapor barrier</td>
</tr>
<tr>
<td><strong>TIC</strong></td>
<td>Reference</td>
<td>10-15% savings</td>
</tr>
<tr>
<td><strong>Schedule</strong></td>
<td>Reference</td>
<td>6-8 months improvement</td>
</tr>
</tbody>
</table>
# C³T – A Comparison with Conventional LNG Storage Tanks for 160,000 m³, USGC

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<tr>
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<td><strong>Reference</strong></td>
</tr>
<tr>
<td><strong>Construction Logistics</strong></td>
<td><strong>Reference</strong></td>
</tr>
<tr>
<td><strong>Design / Construction Method</strong></td>
<td><strong>Standardized / one-size-fits-all approach</strong></td>
</tr>
</tbody>
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C³T’s Flexibility in Design: Tank Construction Fit to Project Constraints

C³T is comparable to modular construction.

Prefabricated wall panels can...

- move significant amount of work away from construction site.
- move work to ground that usually occurs above grade with conventional tanks.
- help sites with high labor costs, constricted lay-down space, and weather interference.

Photo courtesy DN Tanks
C³T – Current Status

- Base design by JIP, with improvements by Chevron
- Chevron developed initial construction procedures
- Chevron is conducting laboratory material qualification testing, in progress
- NFPA 59A now refers to ACI 376 in lieu of ACI 318
Next Steps

2013

- Material Qualification Testing to be completed in 2013
- Expected DNV “Fitness for Service” certification

2014 and beyond

- Constructability test to demonstrate that the wall panels can be fabricated, erected, and joined within required tolerances, cost and schedule
- Deployment to a Major Capital Project
Conclusion

260 ft X 112.16 ft primary tank
(79.25 m X 34.2 m)

160,000 m$^3$