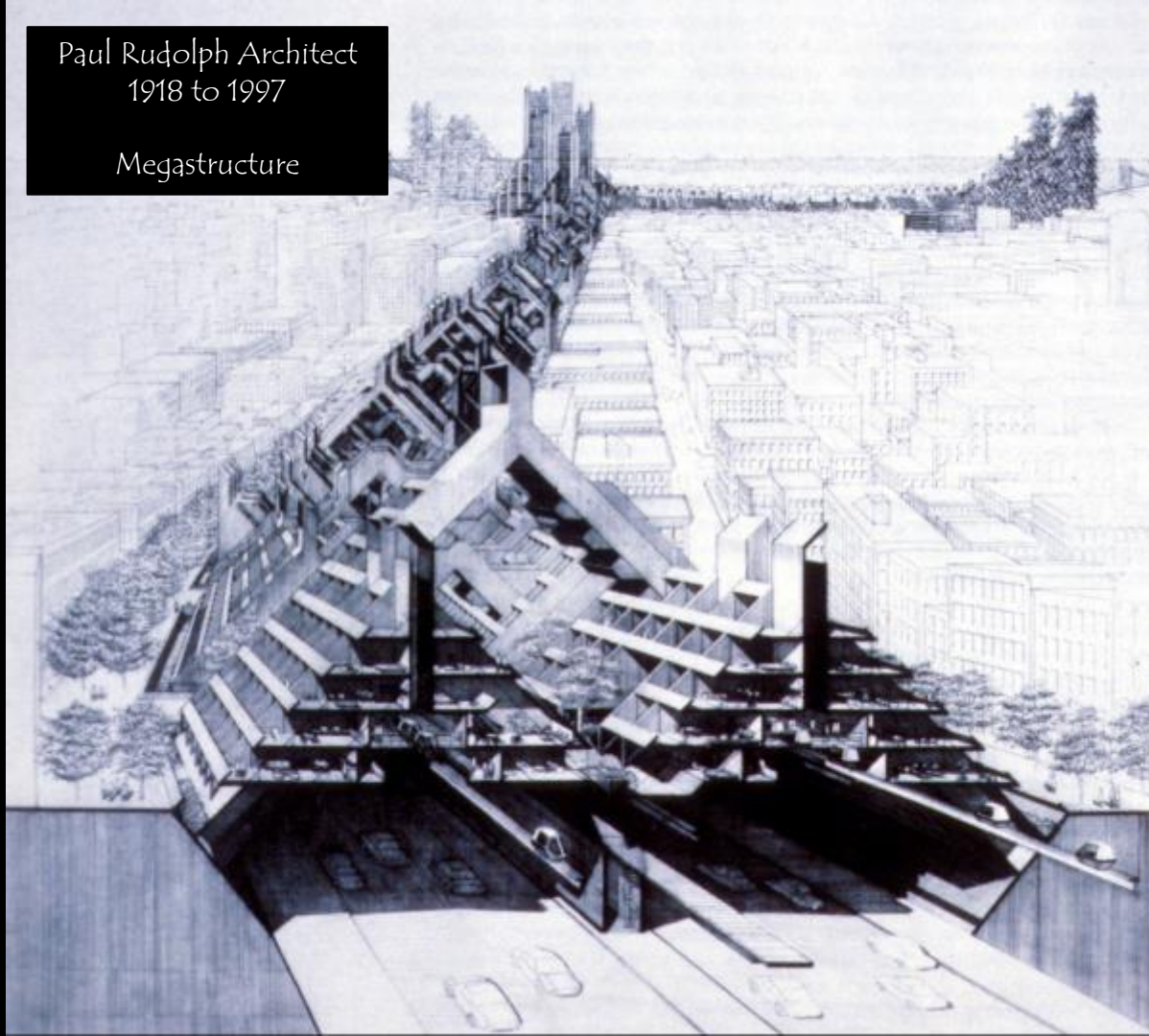


Developments in Concrete Construction

Part 3: Current Trends, Construction Methods

Paul Rudolph Architect
1918 to 1997

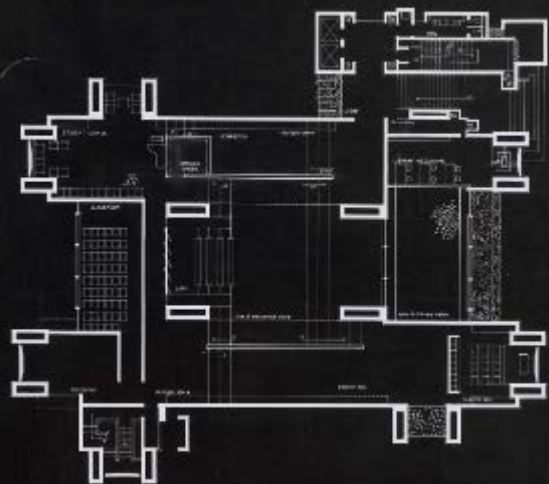
Megastructure



Yale Art and Architecture Building
New Haven, CN
Paul Rudolph
1963



NEW HAVEN It's hard to think of a building that has suffered through more indignities than the Yale School of Art and Architecture. On the day of its dedication in 1963, the architectural historian Nikolaus Pevsner condemned the oppressive monumentality of its concrete forms. Two years later the school's dean brutally cut up many of the interiors, which he claimed were dysfunctional. A few years after that a fire gutted what was left. By then the reputation of the building's architect, Paul Rudolph, was in ruins.

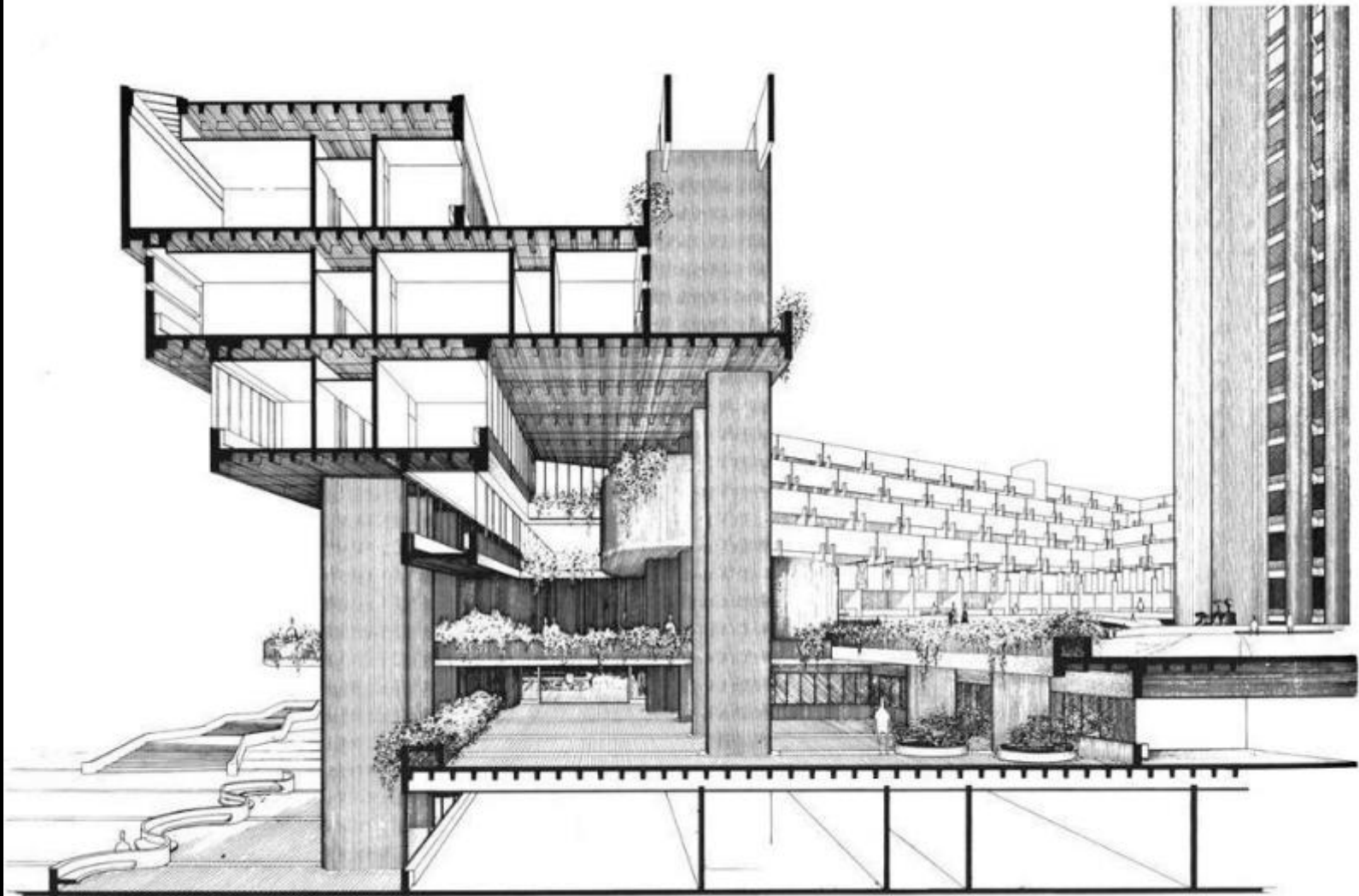


10TH FLOOR PLAN

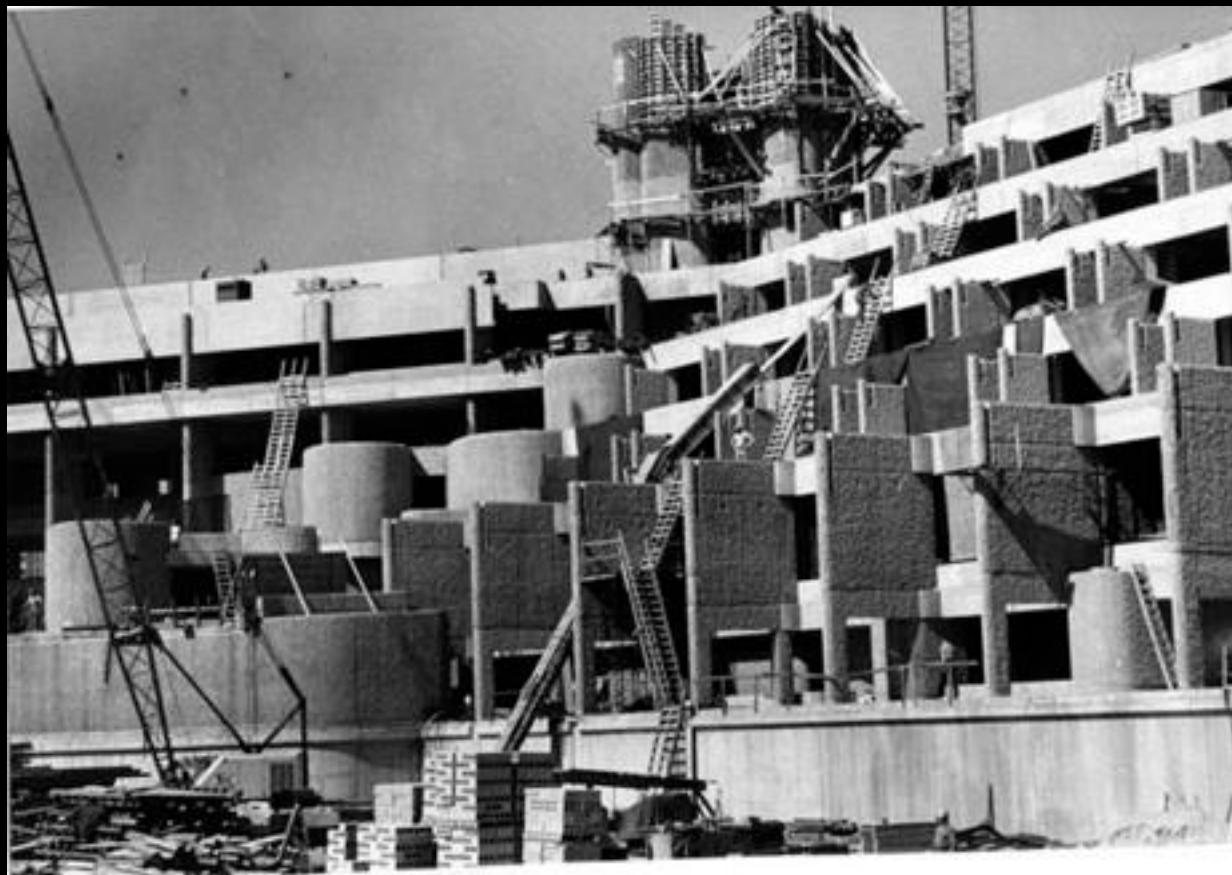


Erich Lindemann Mental Health Center
Boston, Massachusetts
Paul Rudolph
1971

















Place Bonaventure
Montreal, Quebec
Arcop
1967

Place
BONAVENTURE







Robarts Library University of Toronto
Toronto, Ontario
Mathers and Haldenby
1973





941103-57544-5729



GA

Global Architecture

Carlo Scarpa
Cemetery Brion-Vega, S.Vito, Treviso, Italy. 1970-72
Edited and Photographed by Yukio Futagawa
Text by Paolo Portoghesi



94
1123
535
94
1979
U.S.A.



The Brion Cemetery
Treviso, Italy
Carlo Scarpa
1968







St. Mary's Cathedral
Tokyo, Japan
Kenzo Tange
1964





A photograph of the Tama Art University Library, a modern building with a light-colored facade and large, arched glass windows. The building is surrounded by green trees and a paved walkway. The sky is clear and blue.

Tama Art University Library
Tokyo, Japan
Toyo Ito
2012

















Modern Concrete Construction Methods

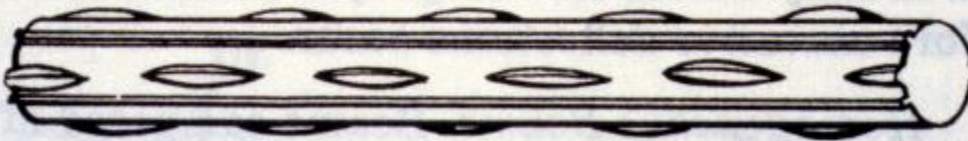
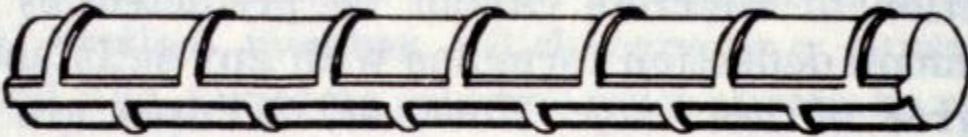
Primary ingredients of concrete:

Large aggregates

Small aggregates

Cement

Water



Steel Reinforcing Bars
Figure 19-2

Reinforcing steel
AKA
Rebar

Concrete has only compressive strength.
It is **NOTHING** without steel reinforcing.

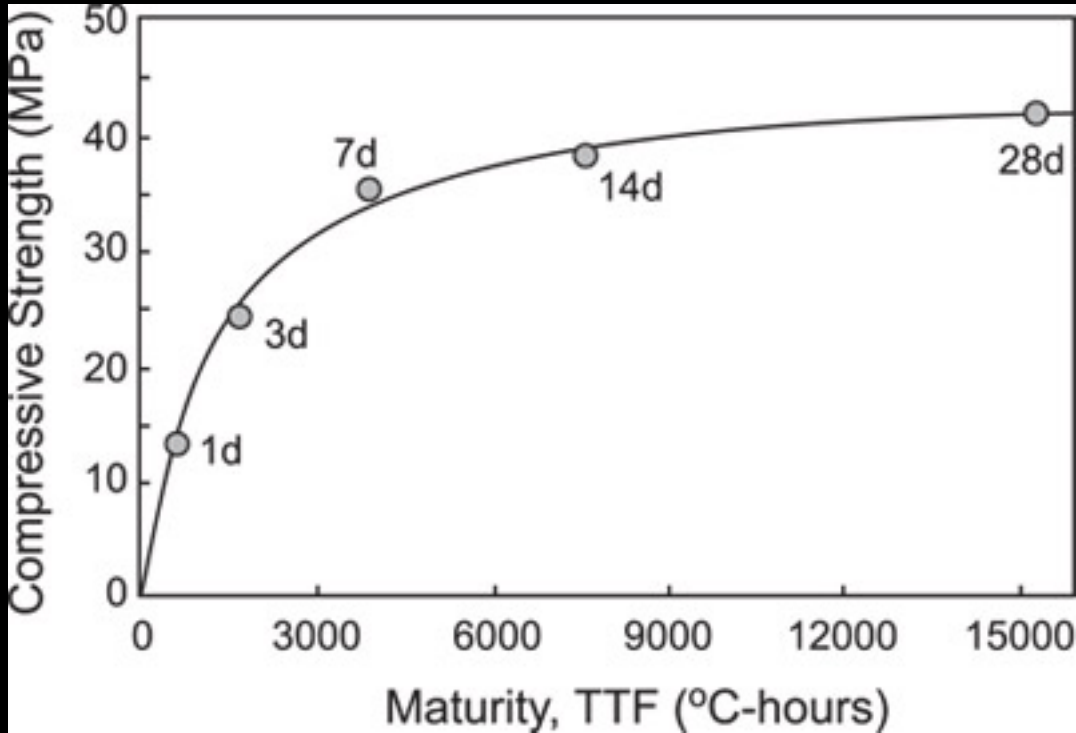






Admixtures are materials other than cement, aggregate and water that are added to concrete either before or during its mixing to alter its properties, such as workability, curing temperature range, set time or color.

Compressive strength of concrete increases over time, to maximum around 28 days. Prior to that it needs to be supported and cannot stand on its own.



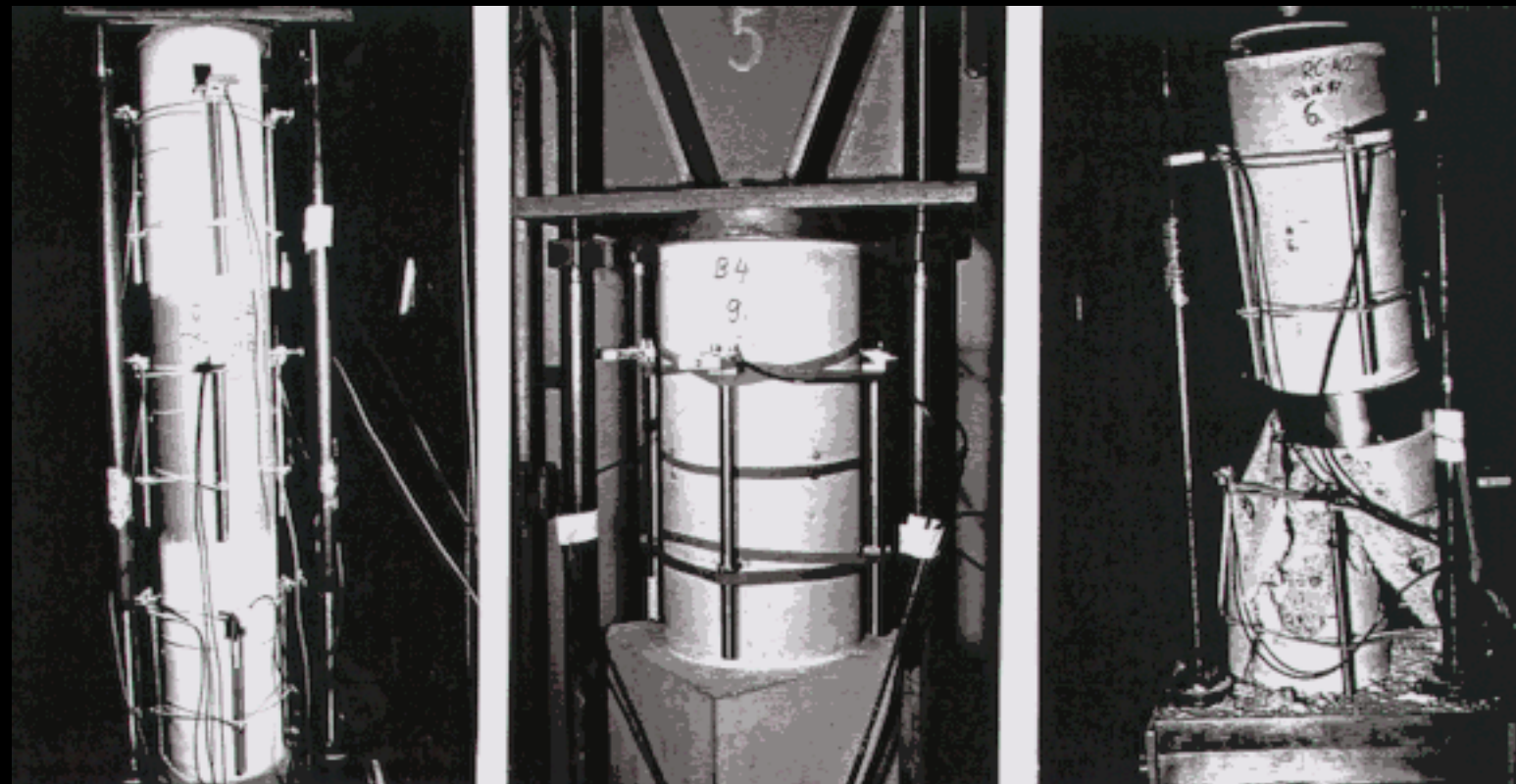
Slump Test: to determine the workability of the concrete (% water mostly)





Cylinder Test:

Concrete samples are taken from each batch on site, allowed to cure, then tested to check for quality.



Formwork







Insulated concrete forms for cold weather pouring at
Skydome (Rogers Centre) Toronto



Slip forming, as the name suggests is a sliding-form construction method of supporting the pouring of concrete structures.

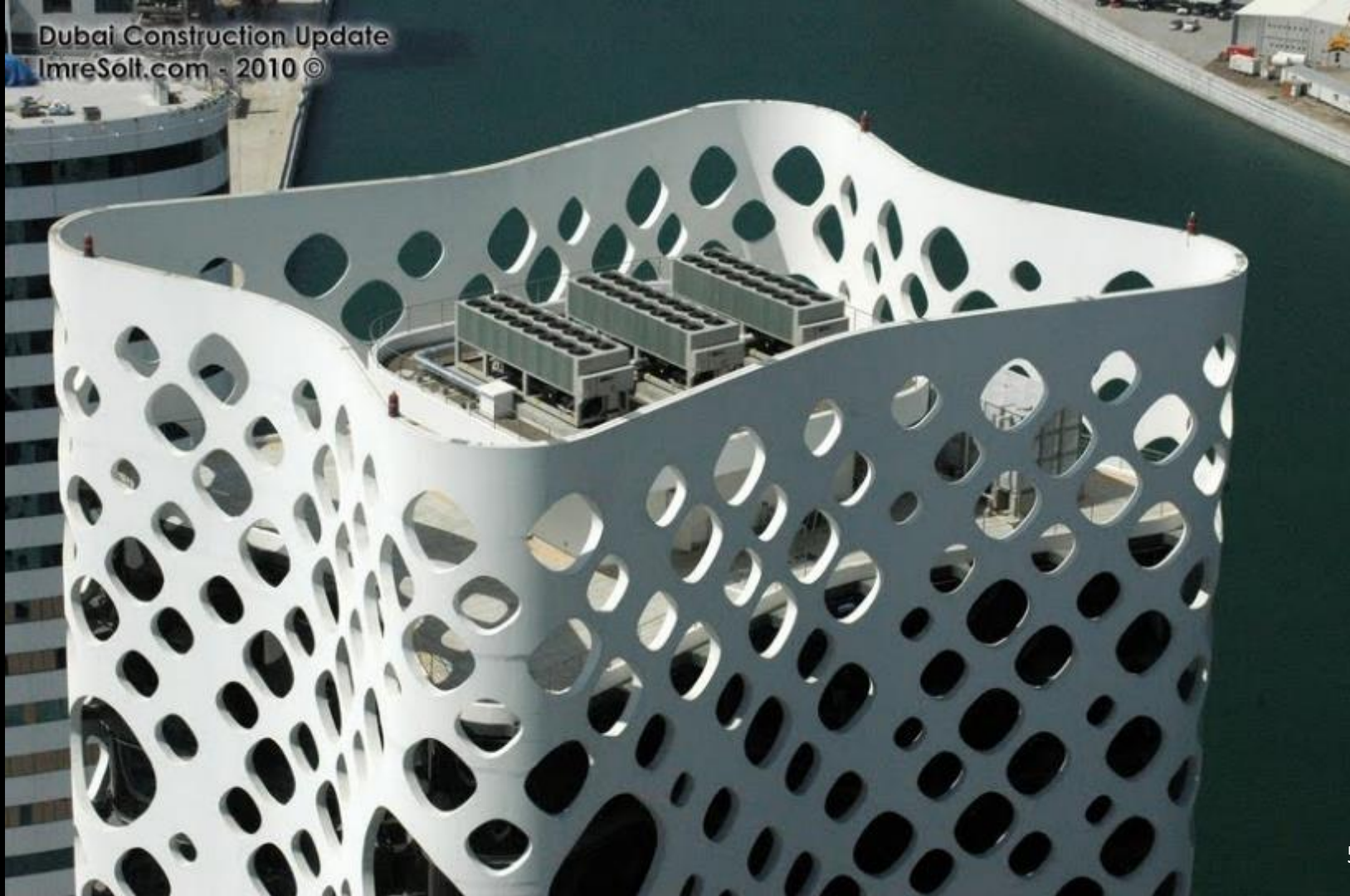
Slip forms are pulled along horizontally or raised vertically as the concrete is placed.







O-14 Tower
RUR Architects
Dubai, UAE
2010
106m











RYERSON UNIVERSITY STUDENT LEARNING CENTRE

Ryerson Student Centre
Toronto, Canada
Snohetta
2015





10 Hudson Yards
New York City, USA
KPF Architects
2015
267.7m







Sonotube:
A disposable formwork for concrete columns



Reusable plastic or steel
forms for columns



Reusable steel forms at the Leslie Dan School of Pharmacy, Toronto





Flying forms







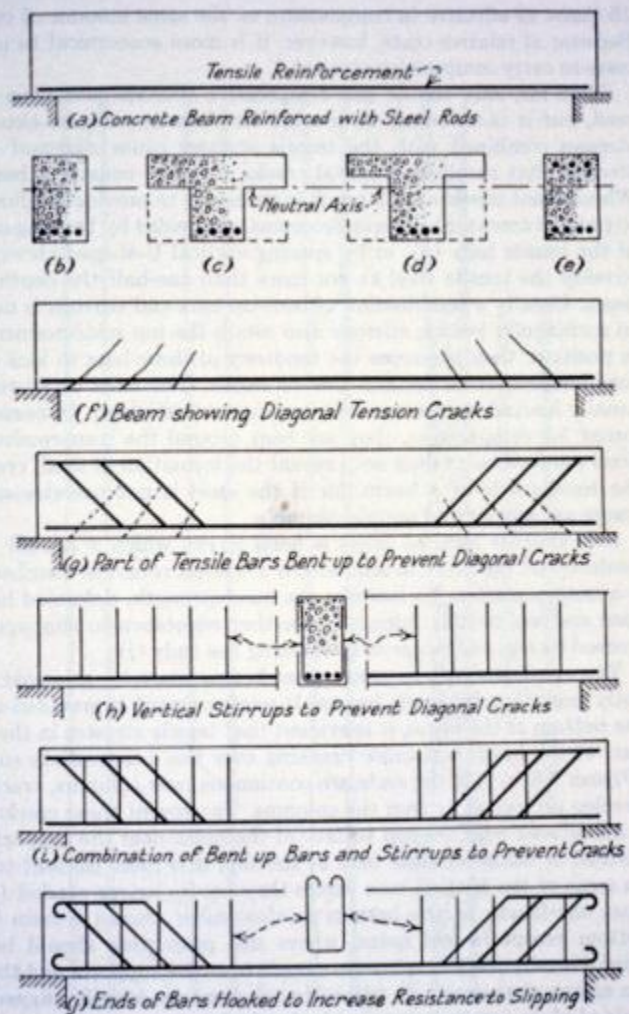


FIGURE 7.5 Simple reinforced concrete beams.

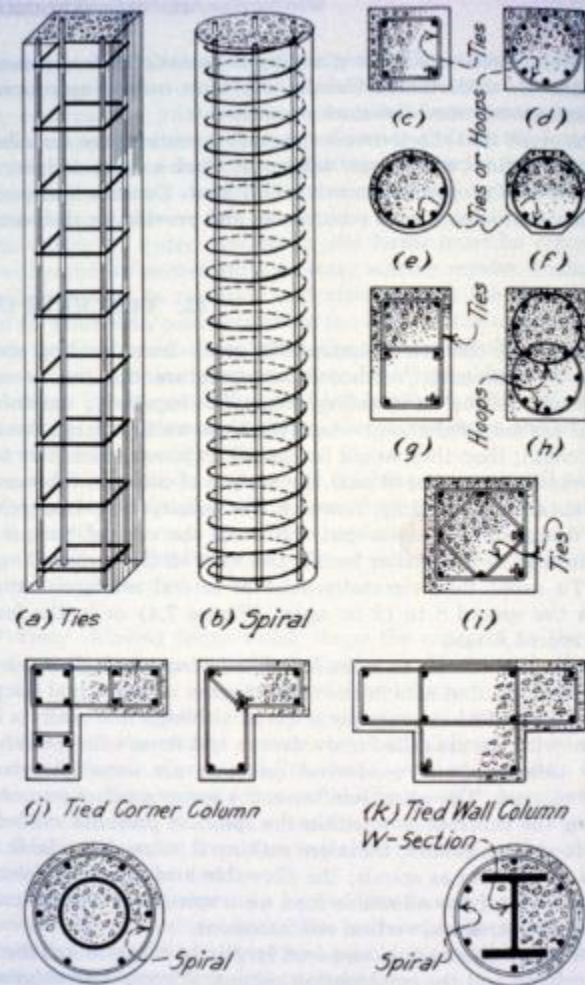
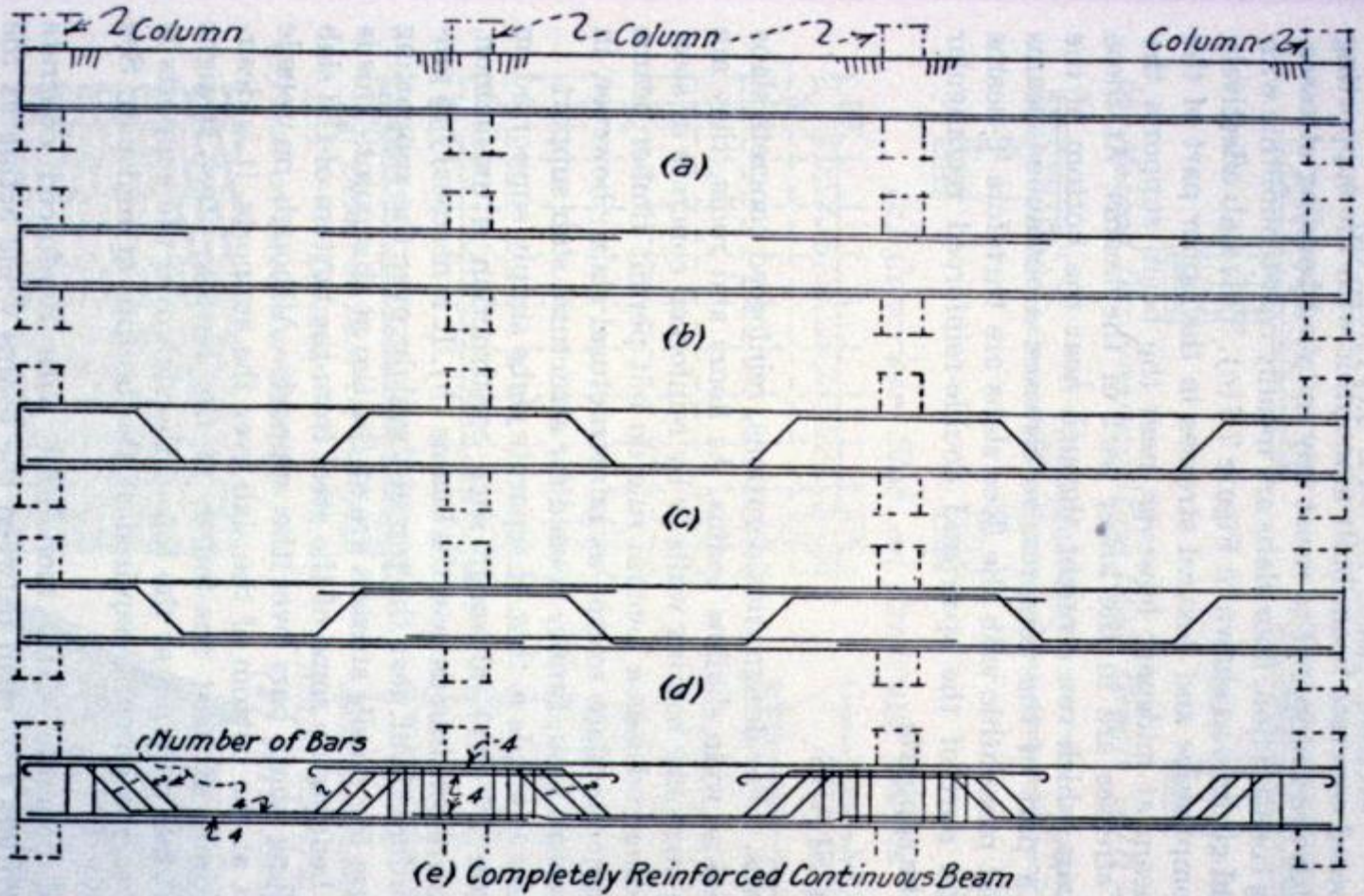


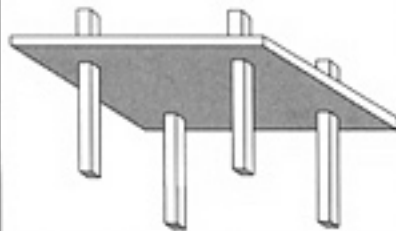
FIGURE 7.4 Reinforced concrete columns.



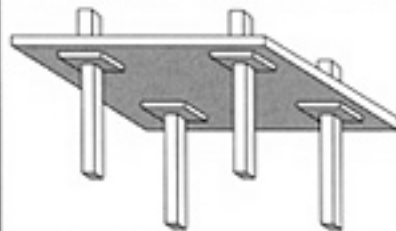
(e) Completely Reinforced Continuous Beam

FIGURE 7.6 Continuous reinforced concrete beams.

Two-Way Flat Plate



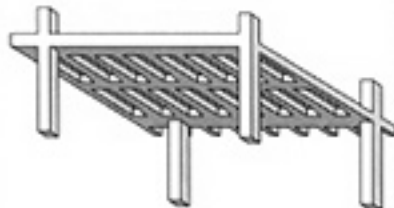
Two-Way Flat Slab with Drop Panels



One-Way Beam and Slab



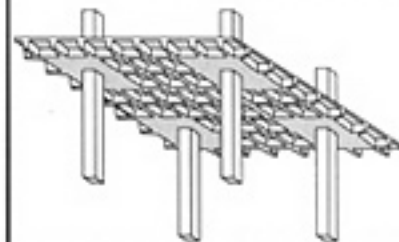
One-Way Joist Slab



One-Way Wide Module Joist Slab



Two-Way Joist Slab (Waffle)





Composite decks use the combined strength of steel decking, reinforcing and the concrete slab

The steel deck acts as a permanent form as well as adding strength

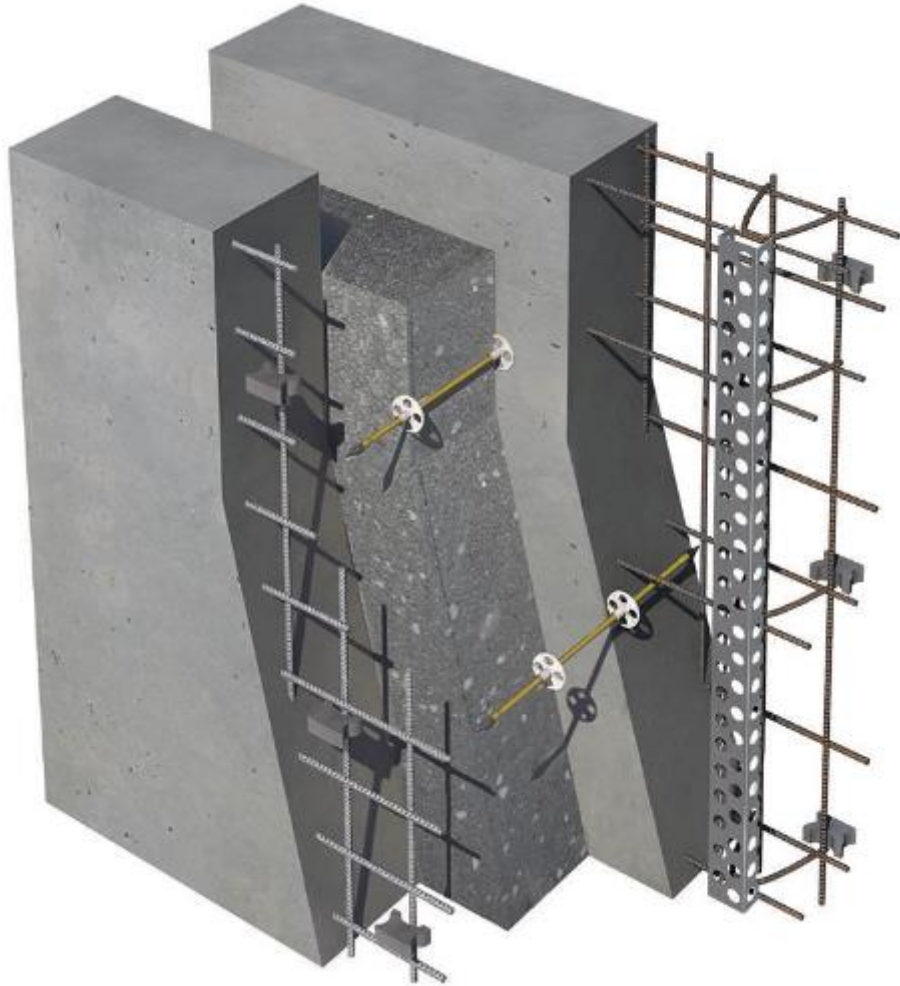






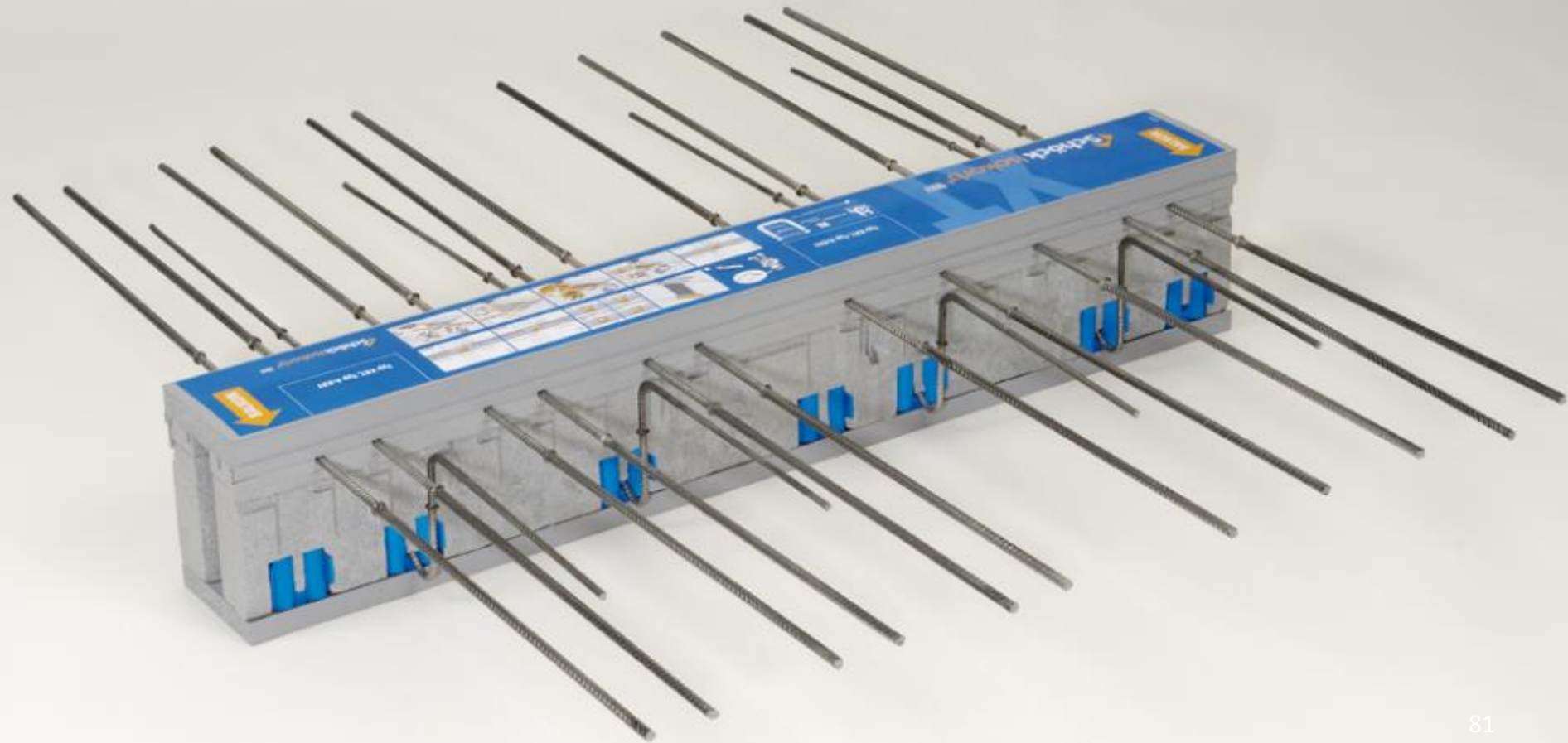
Thermal bridges are the CURSE of
concrete framing

Details *MUST* be developed to insert a
thermal (insulation) break between the
exterior and interior



Special detail for having exposed concrete on both sides of the wall with thermal insulation in the middle















432 Park Avenue
New York City, USA
Rafael Vignoly Architect
2015
426m









56 Leonard Street
New York City, USA
Herzog & deMeuron
2016
250.2m















Makomanai Takino Cemetery
Sapporo, Japan
Tadao Ando
2017

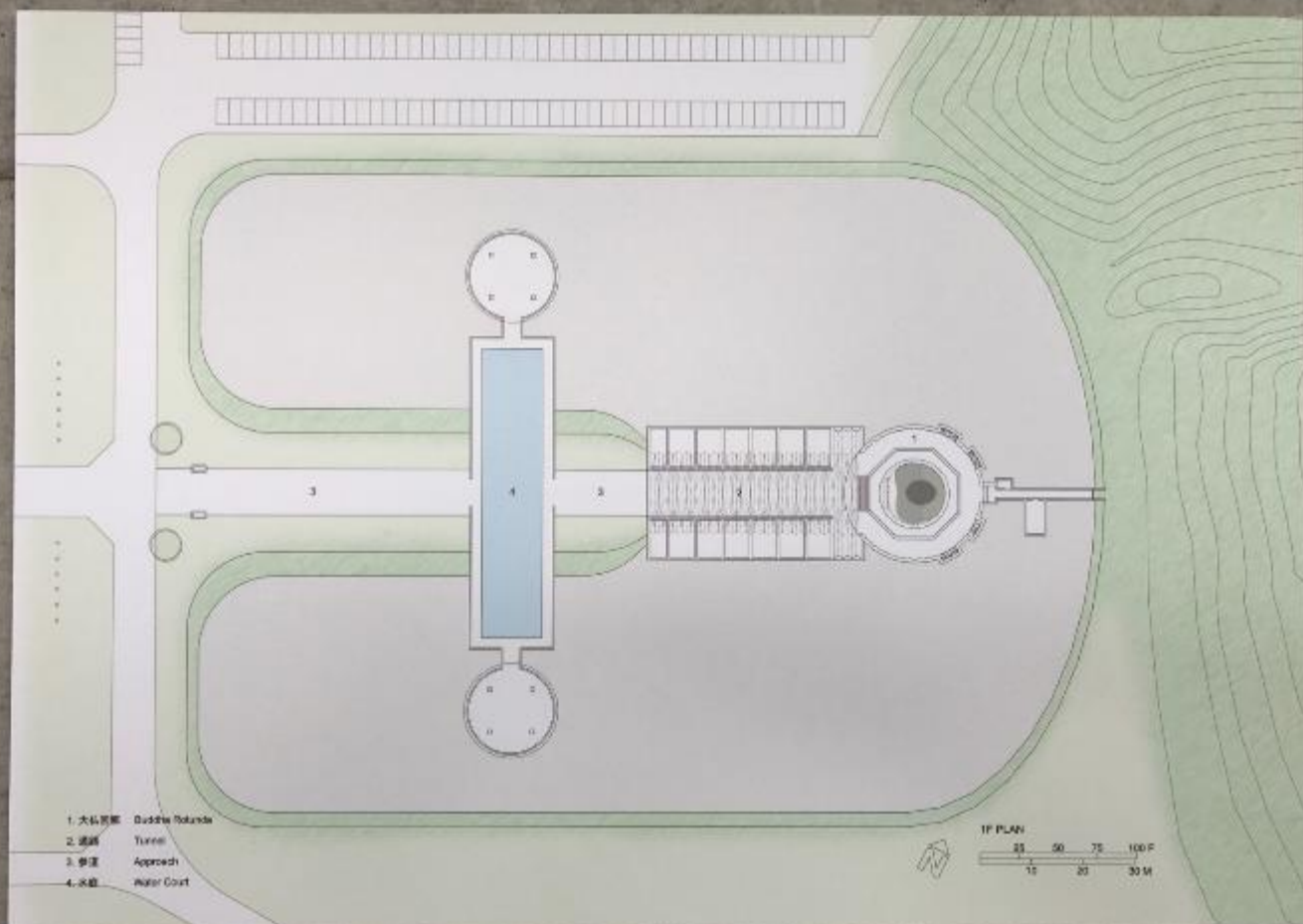
















































Best of 2019

Concrete: the most destructive material on Earth

▲ Limestone quarries and cement factories are often sources of air pollution. Photograph: Zoonar GmbH (Alamy)

After water, concrete is the most widely used substance on the planet. But its benefits mask enormous dangers to the planet, to human health - and to culture itself

- [A brief history of concrete: from 10,000BC to 3D printed houses](#)
- Editor's pick: best of 2019. We're bringing back some of our favorite stories of the past year. [Support the Guardian's journalism in 2020](#)

by [Jonathan Watts](#)

In the time it takes you to read this sentence, the global building industry will have poured more than 19,000 bathtubs of concrete. By the time you are halfway through this article, the volume would fill the Albert Hall and spill out into Hyde Park. In a day it would be almost the size of China's Three Gorges Dam. In a single year, there is enough to patio over every hill, dale, nook and cranny in England.

After water, concrete is the most widely used substance on Earth. If the cement industry were a country, it would be the third largest carbon dioxide emitter in the world with up to 2.8bn tonnes, surpassed only by [China](#) and

"After water, concrete is the most widely used substance on Earth. If the cement industry were a country, it would be the third largest carbon dioxide emitter in the world with up to 2.8bn tonnes, surpassed only by China and the US."