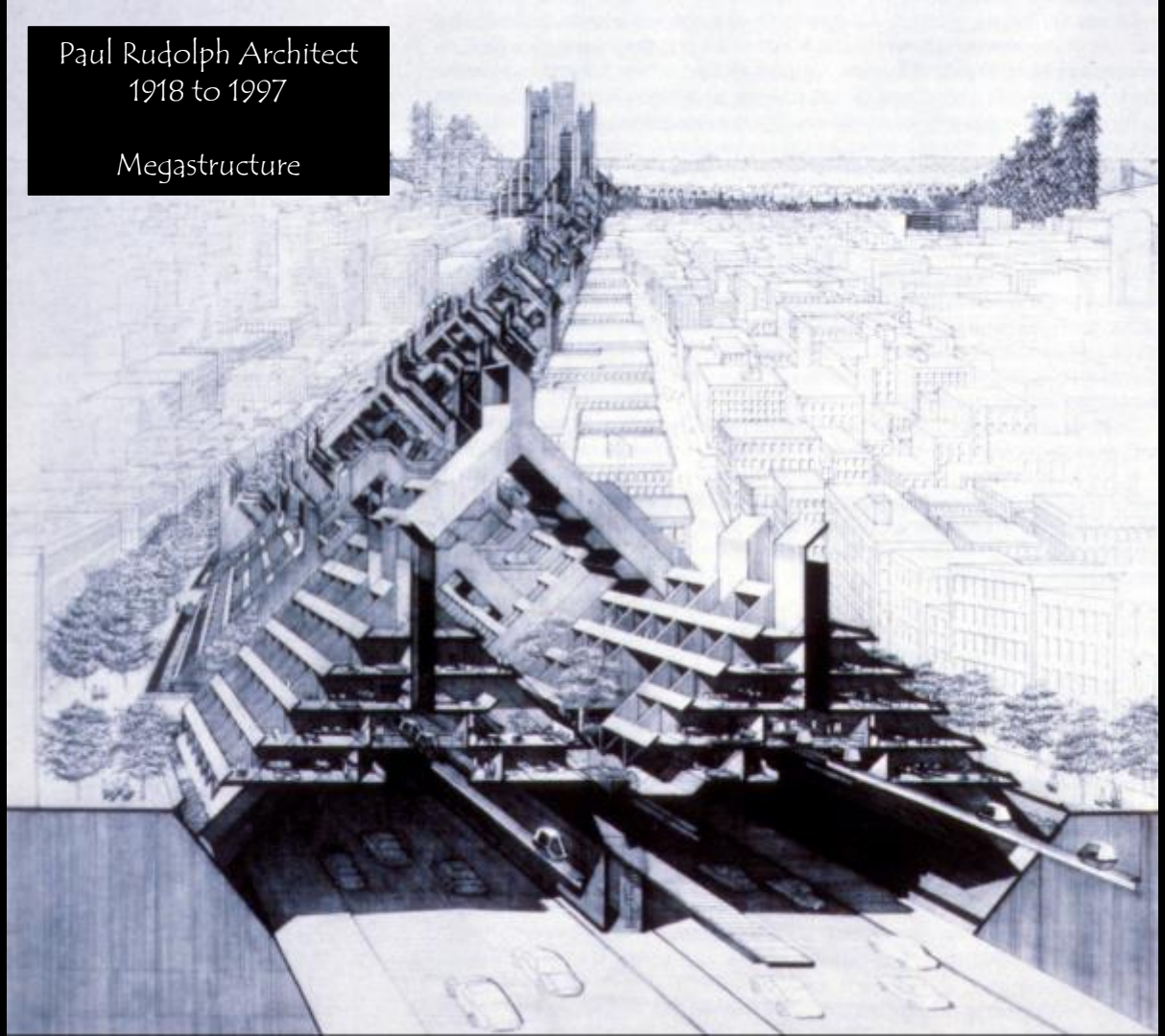
Developments in Concrete Construction

Part 3: Current Trends, Construction Methods

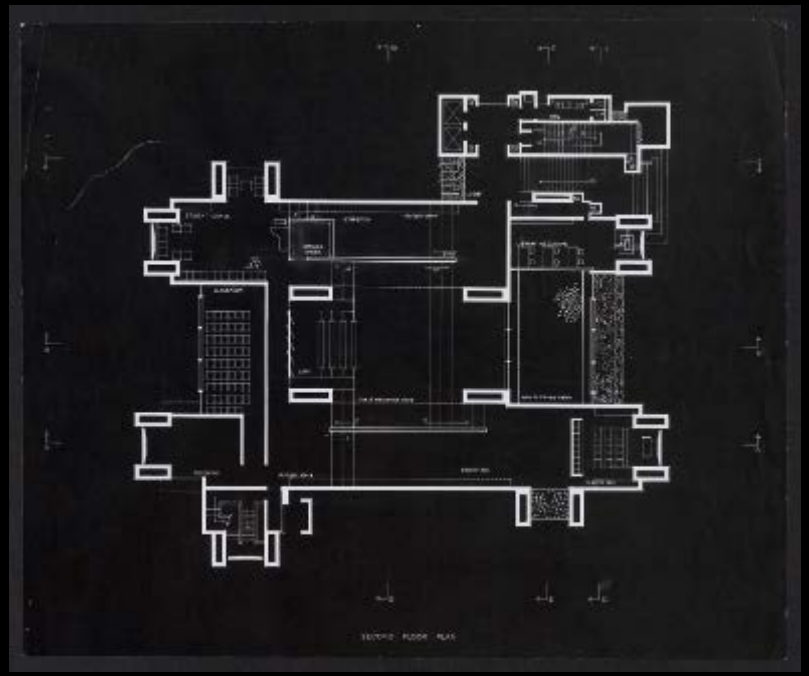
Paul Rudolph Architect
1918 to 1997

Megastructure

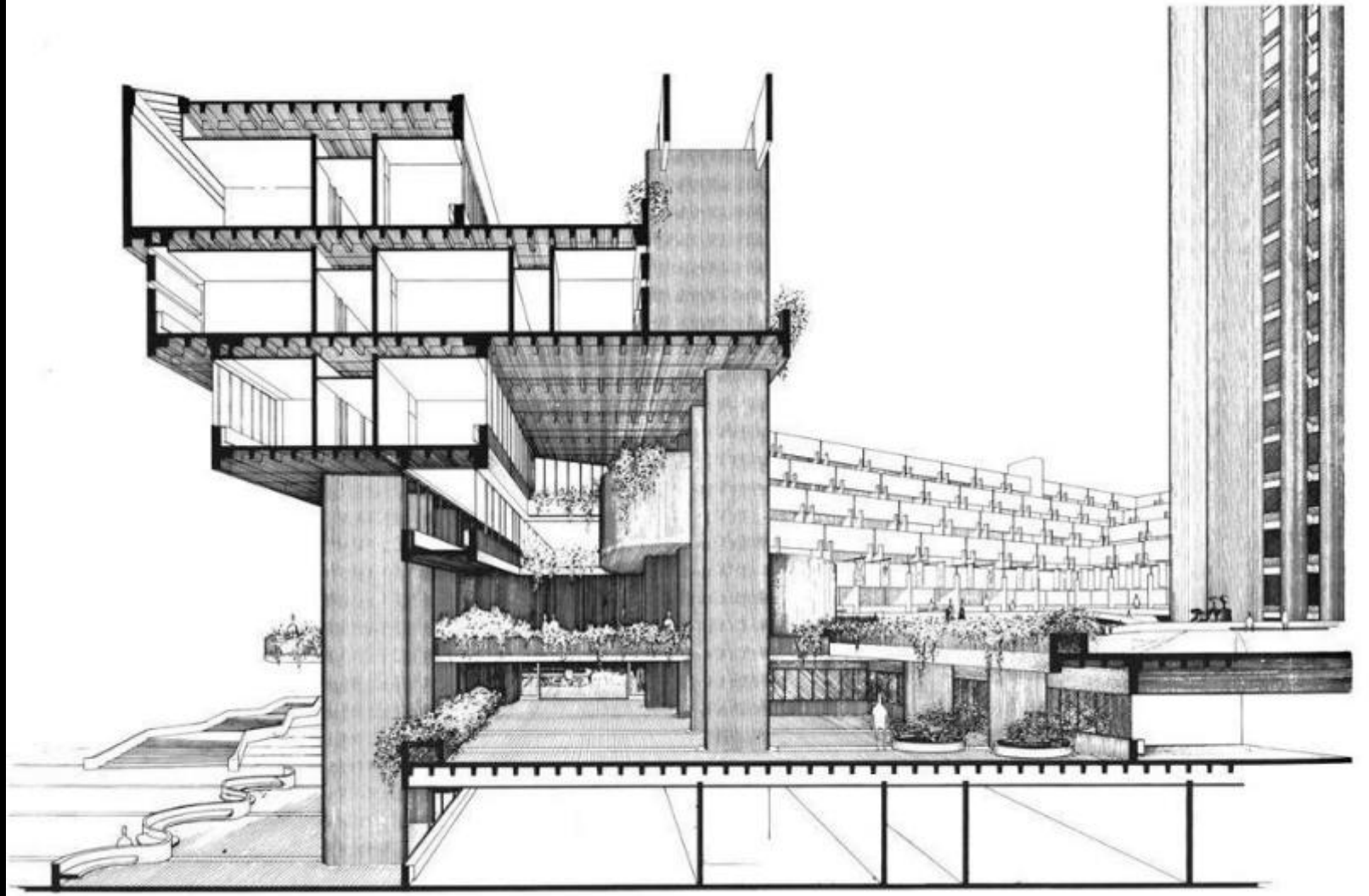


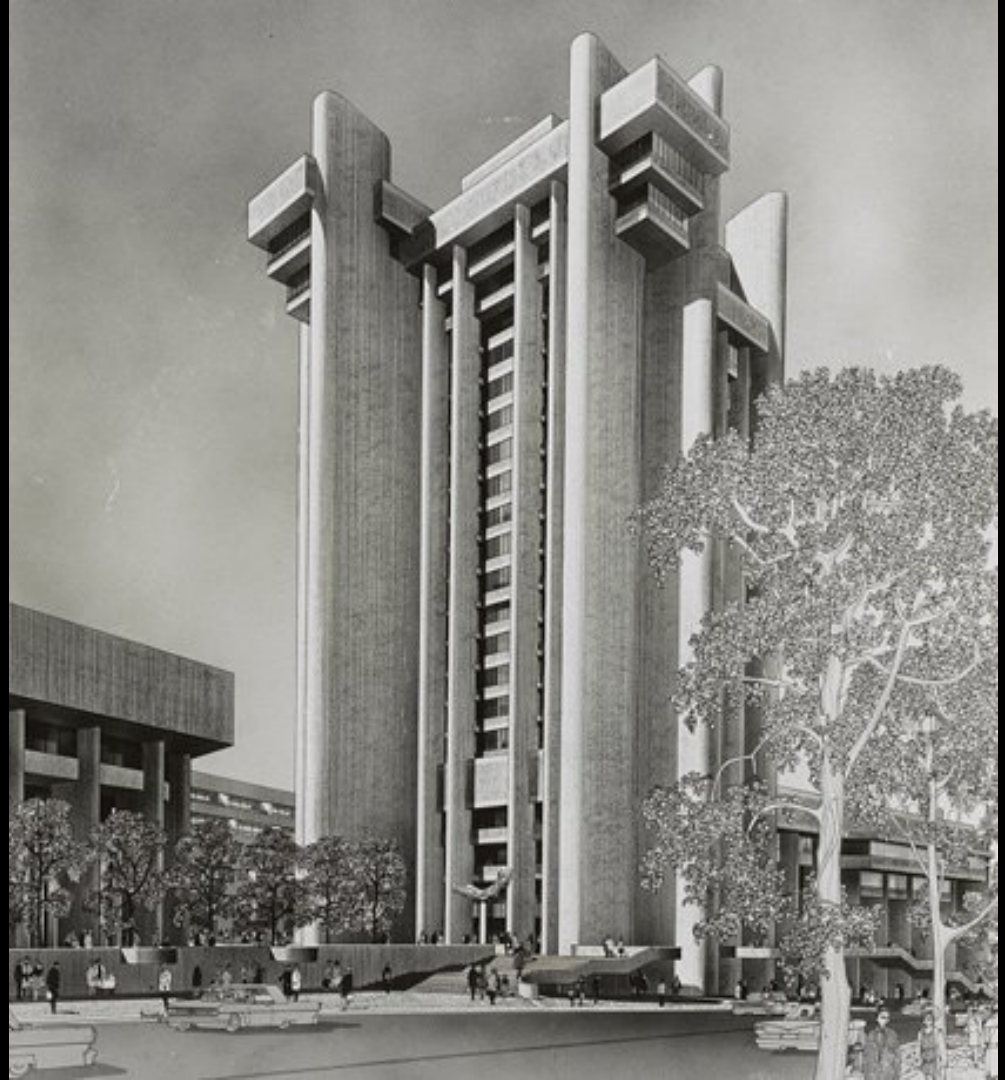
Yale Art and Architecture Building
New Haven, CN
Paul Rudolph
1963

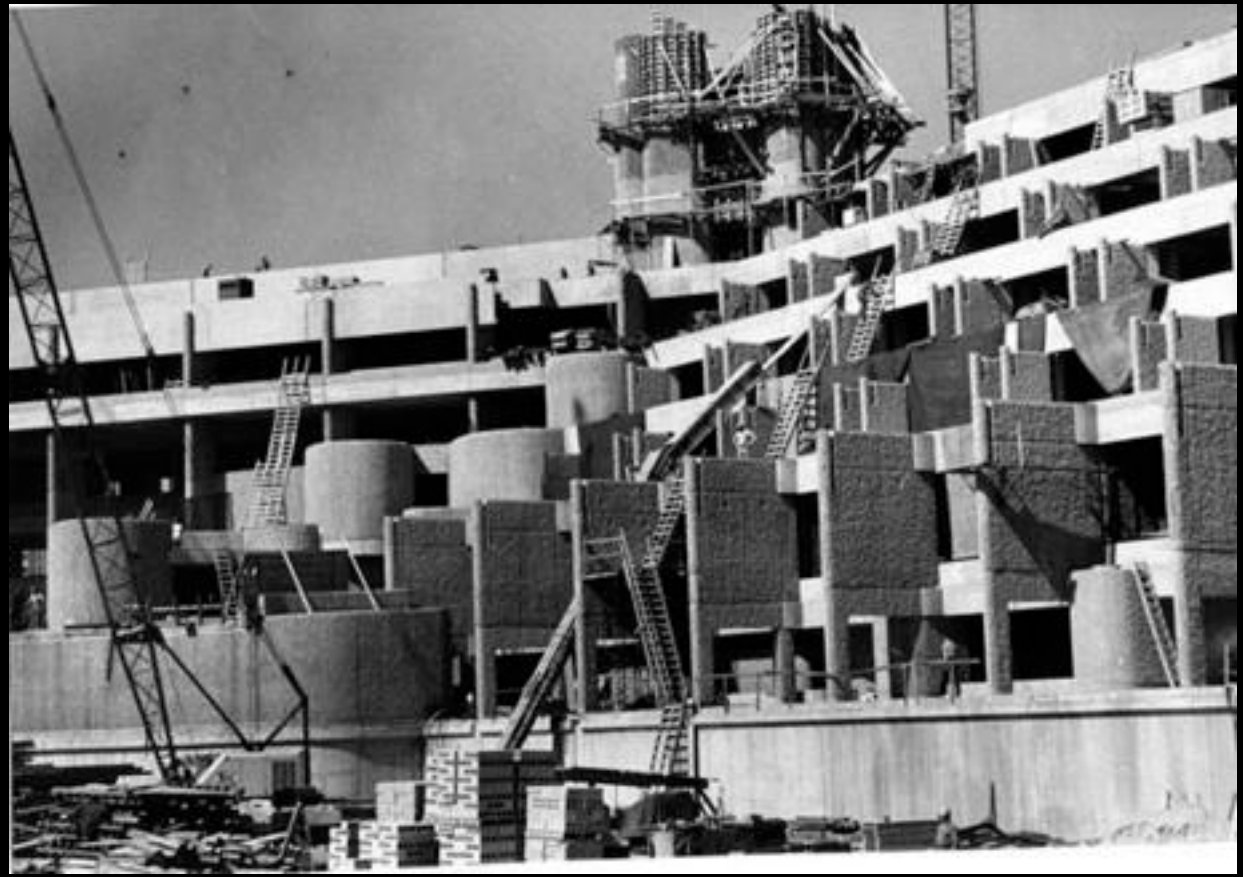
NEW HAVEN It's hard to think of a building that has suffered through more indignities than the Yale School of Art and Architecture. On the day of its dedication in 1963, the architectural historian Nikolaus Pevsner condemned the oppressive monumentality of its concrete forms. Two years later the school's 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.




Erich Lindemann Mental Health Center
Boston, Massachusetts
Paul Rudolph
1971



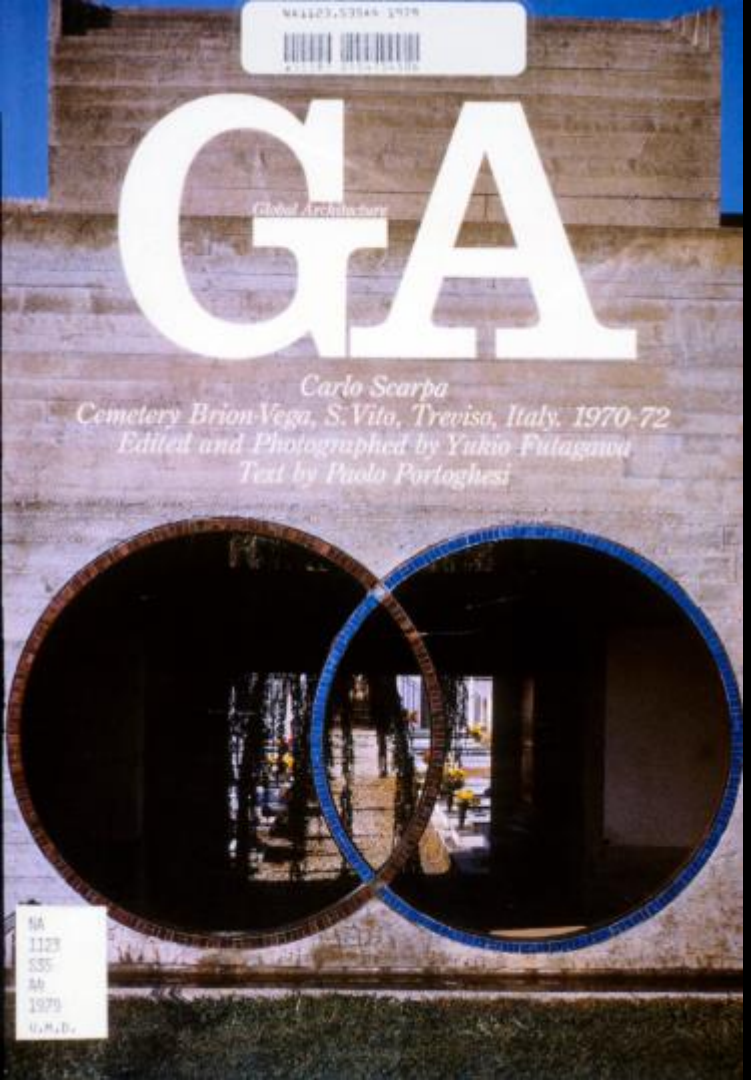





Place Bonaventure
Montreal, Quebec
Arcop
1967
BONAVENTURE
McDonald

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


University of Guelph
Guelph, Ontario
Circa 1970s



The Brion Cemetary
Treviso, Italy
Carlo Scarpa
1968

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

Tama Art University Library
Tokyo, Japan
Toyo Ito
2012

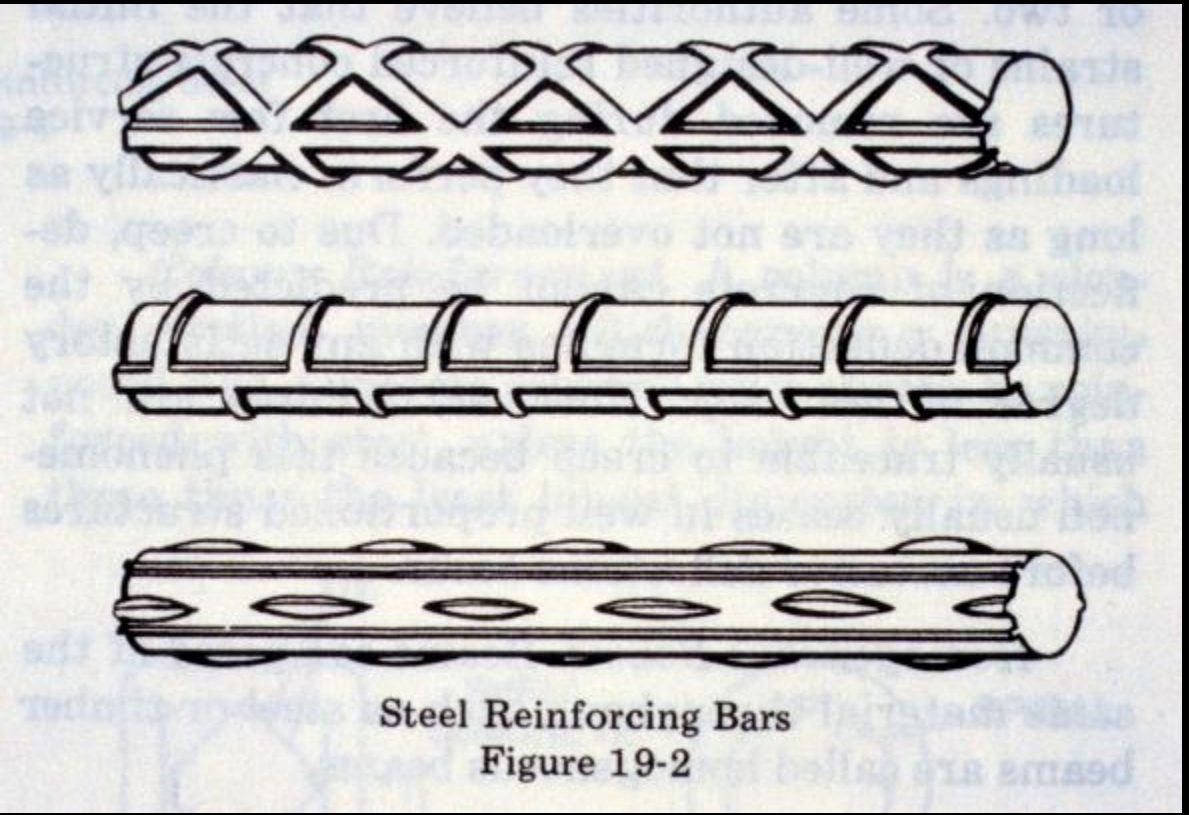

代

Expo '98 Portuguese National Pavilion
Alvaro Siza Vieira

Modern Concrete Construction Methods

Primary ingredients of concrete:

Large aggregates
Small aggregates
Cement
Water



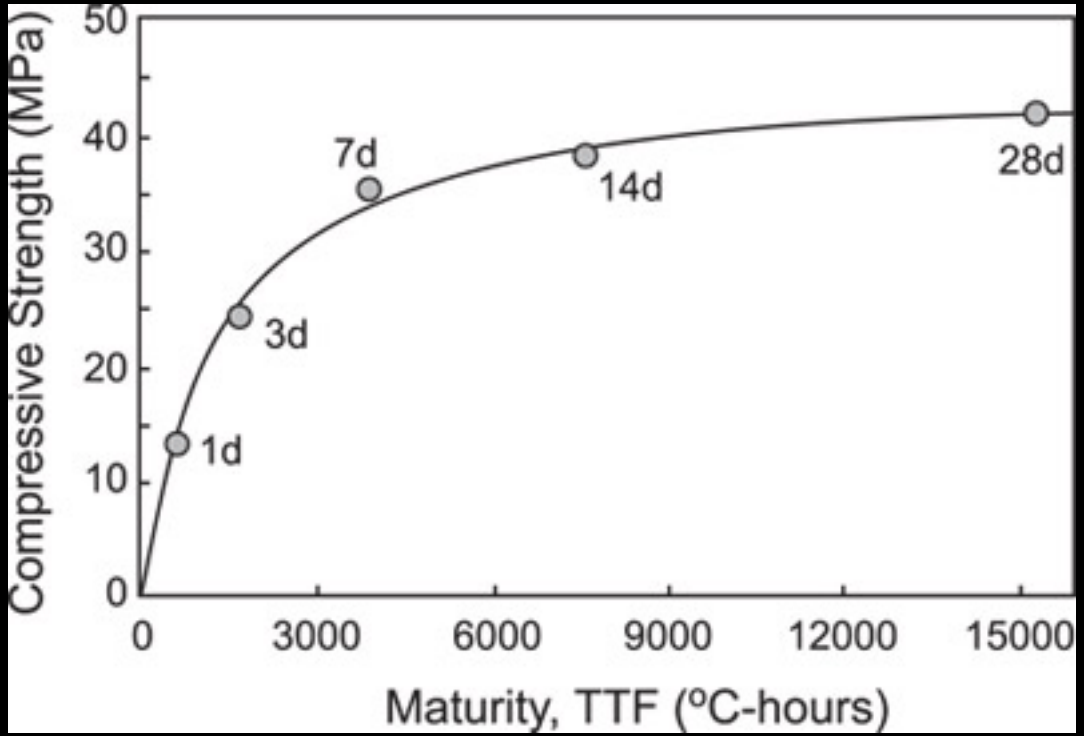
Steel Reinforcing Bars
Figure 19-2

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.

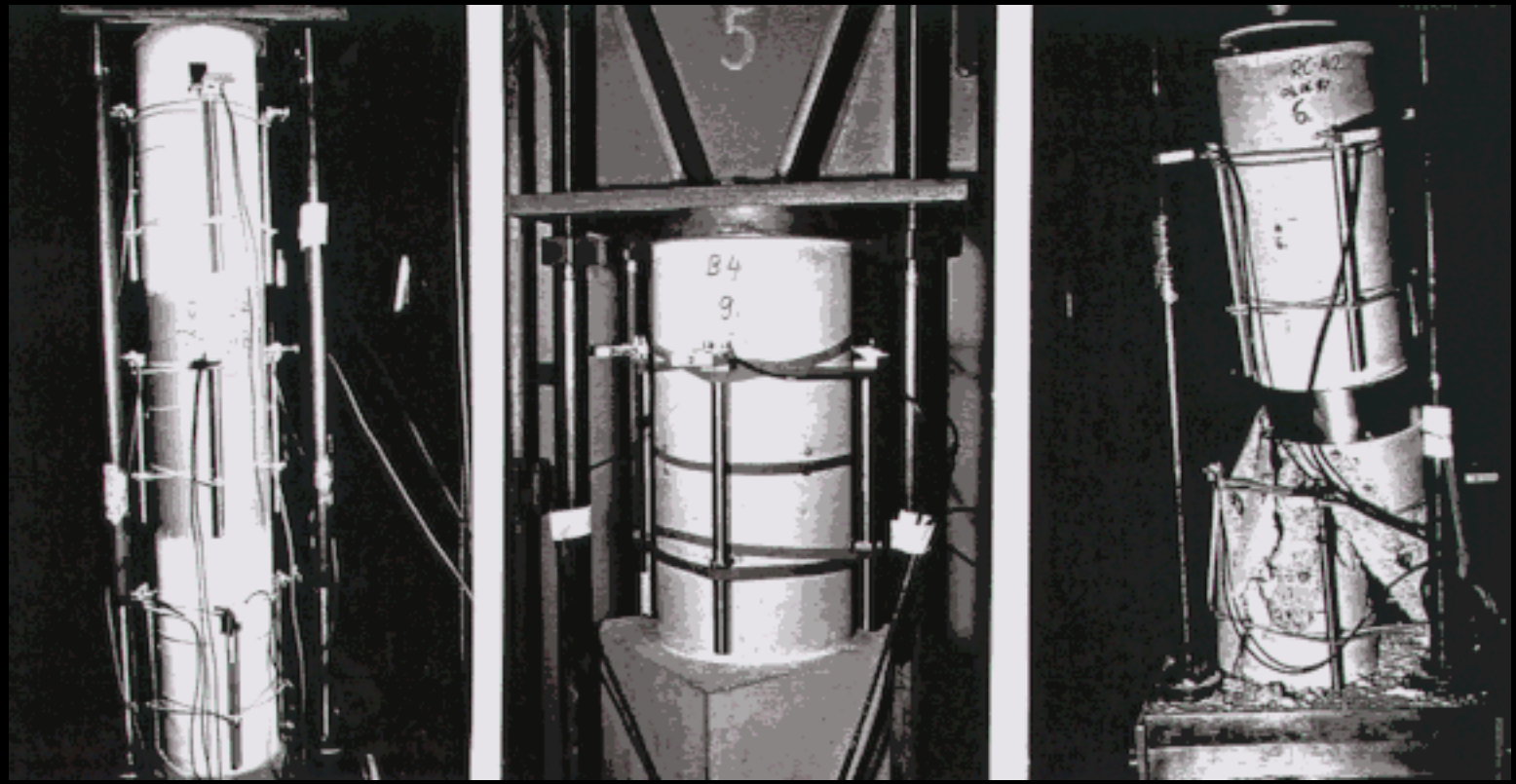
Compressive strength of concrete increases over time, to maximum around 28 days.
Prior to that it needs to be supported and cannot stand on its own.



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.


5
B4
9
RC-A2
6

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


Dubai Construction Update
ImreSolt.com - 2010 ©

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

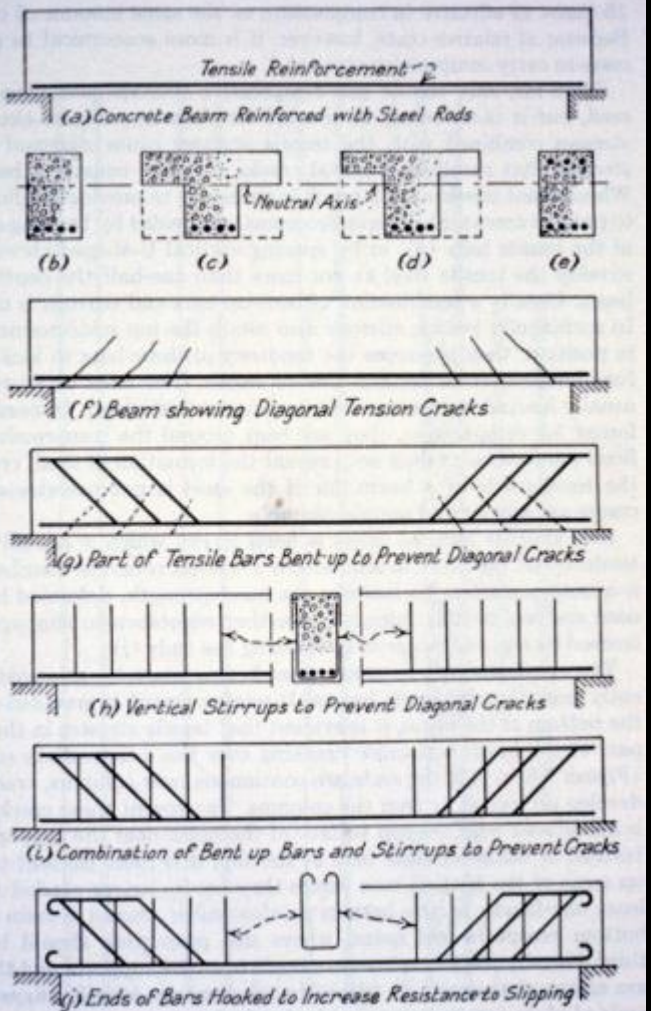


FIGURE 7.5 Simple reinforced concrete beams.

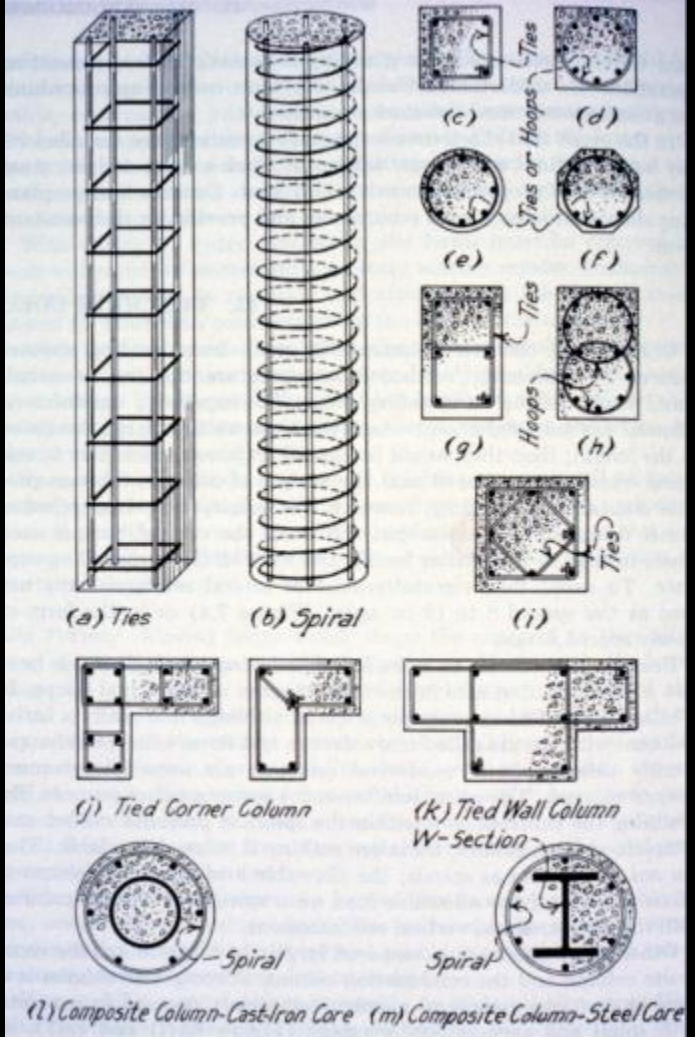


FIGURE 7.4 Reinforced concrete columns.

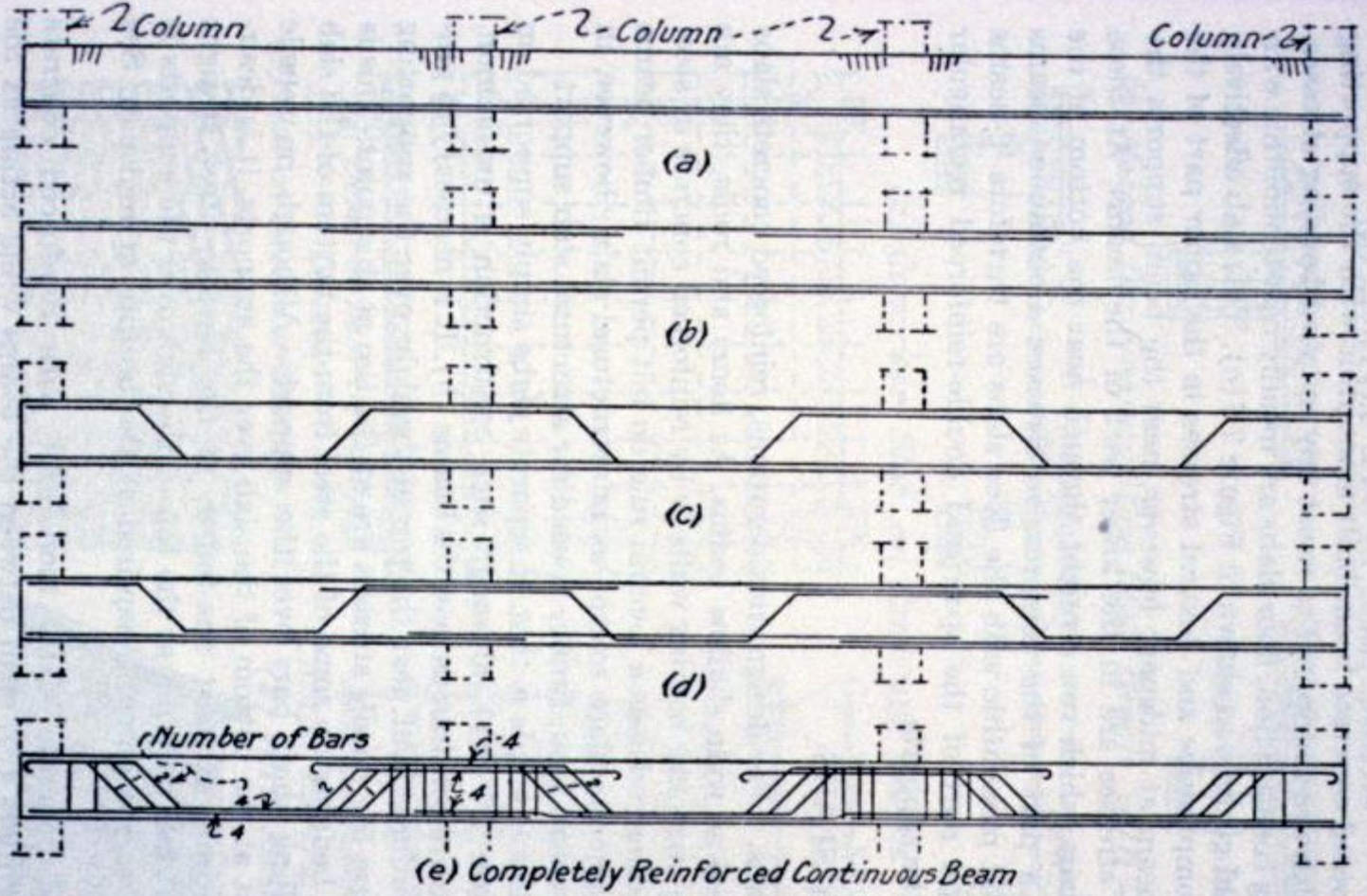
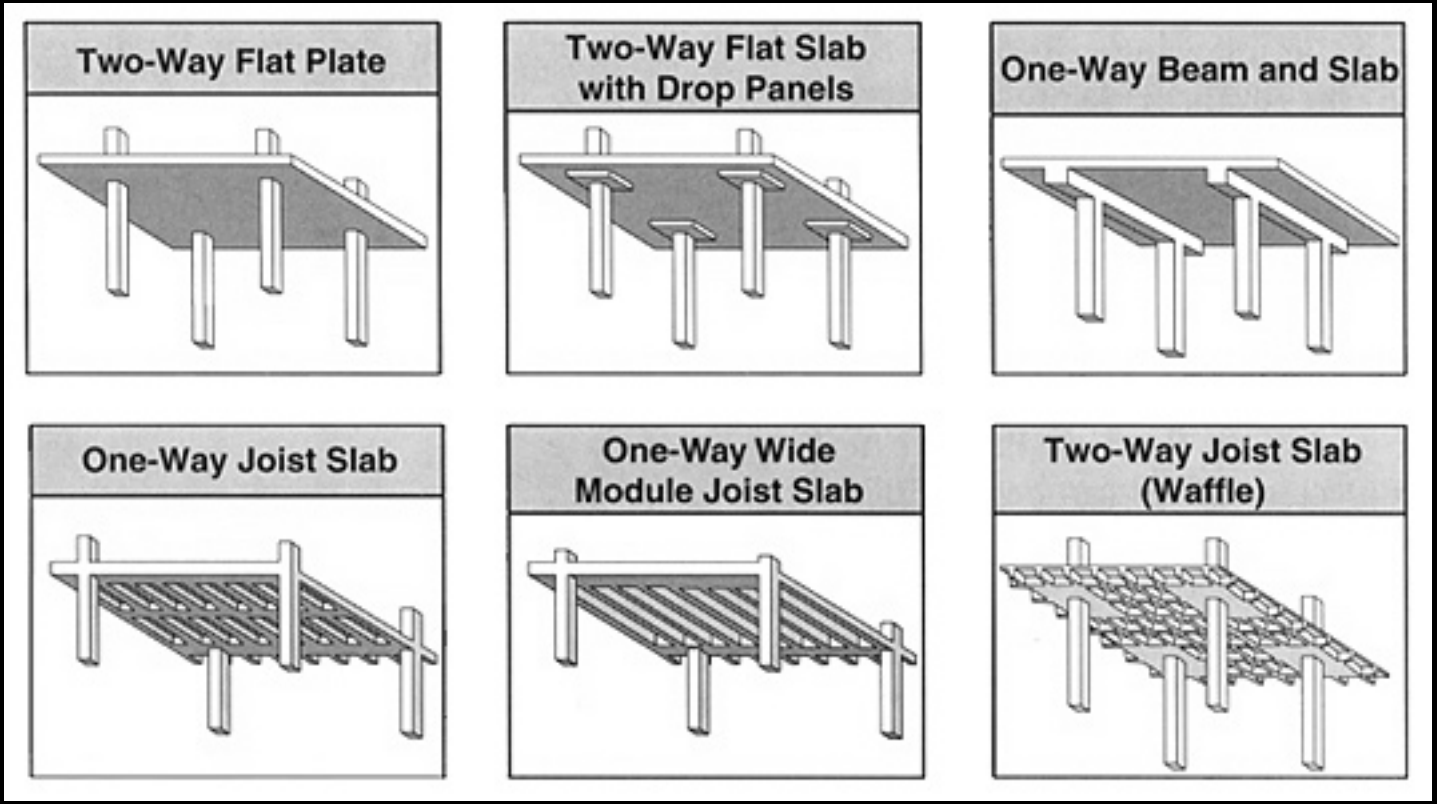


FIGURE 7.6 Continuous reinforced concrete beams.

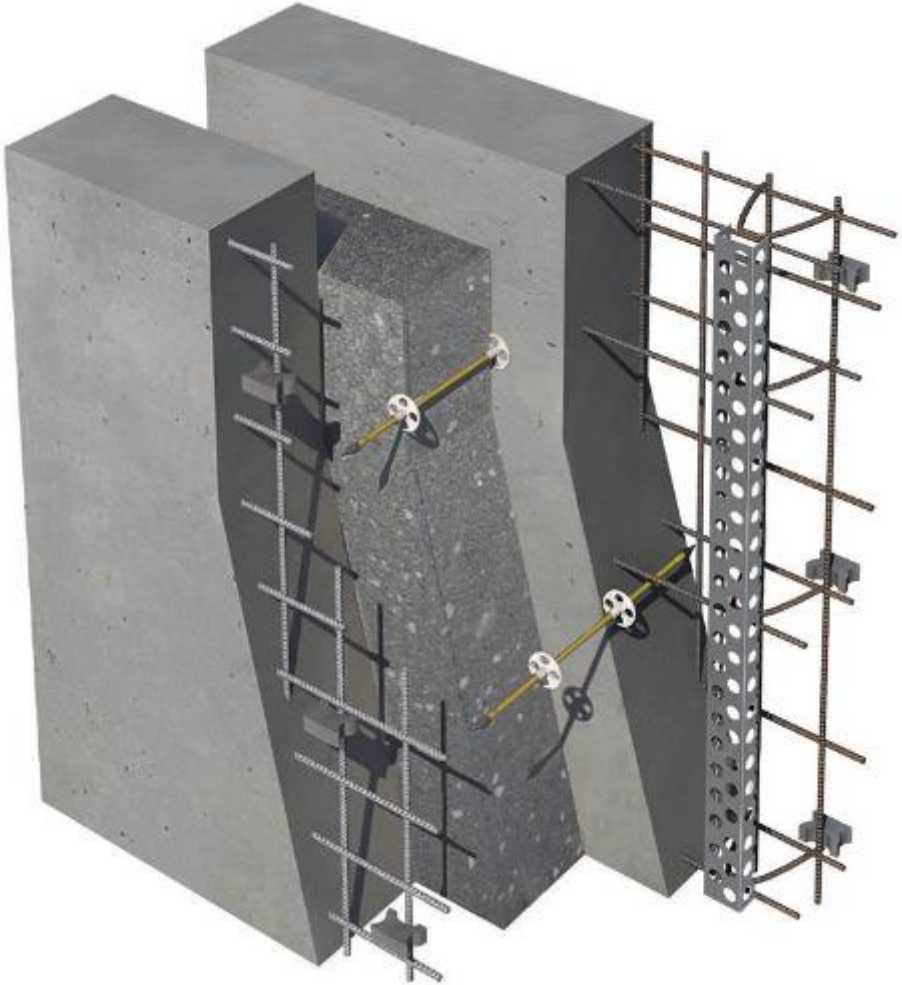

Two-Way Flat Plate
Two-Way Flat Slab with Drop Panels
One-Way Beam and Slab
One-Way Joist Slab
One-Way Wide Module Joist Slab
Two-Way Joist Slab (Waffle)

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

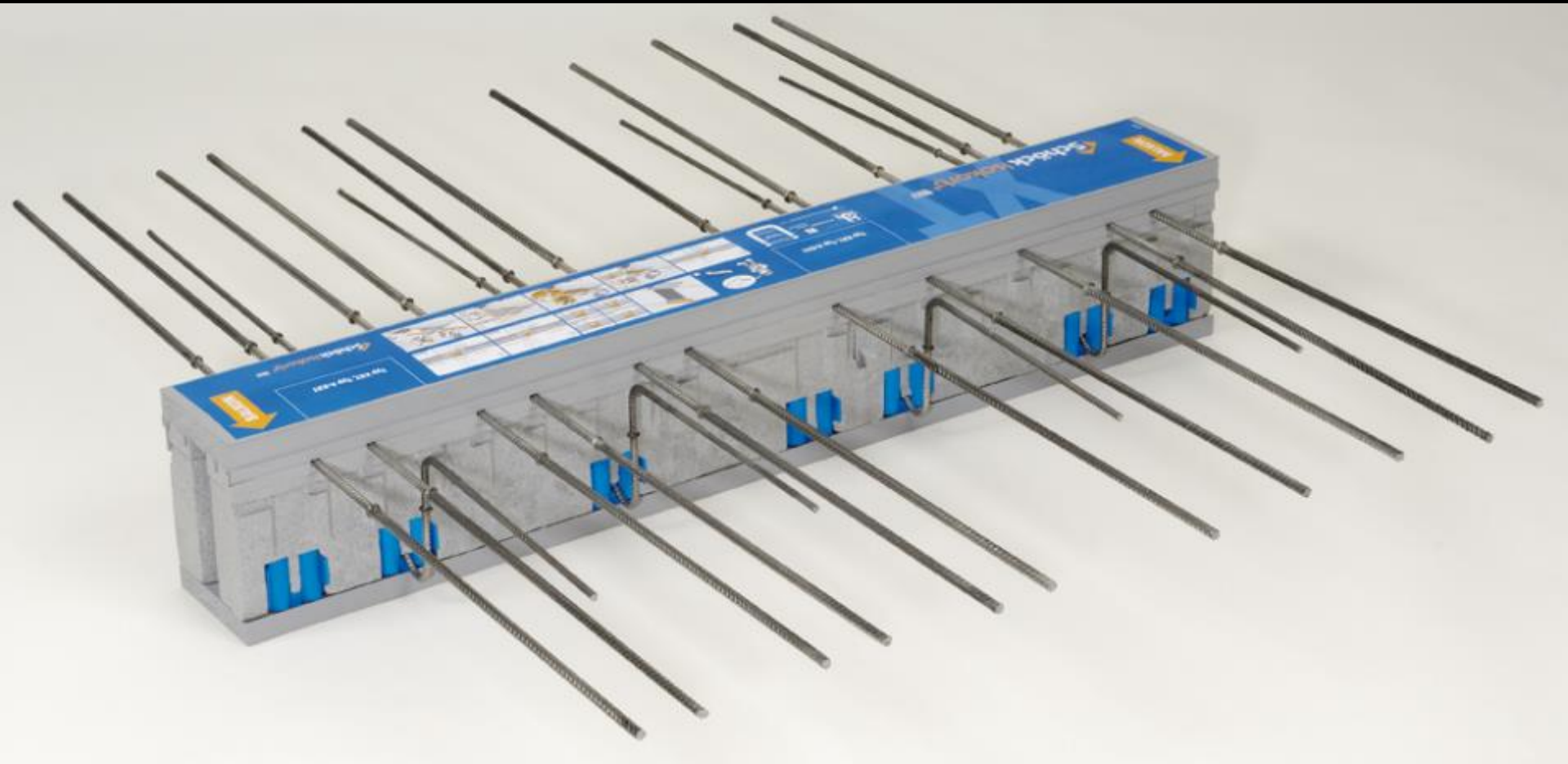
The steel deck acts as a permanent form as well as adding strength

Thermal bridges are the CURSE of concrete framing

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



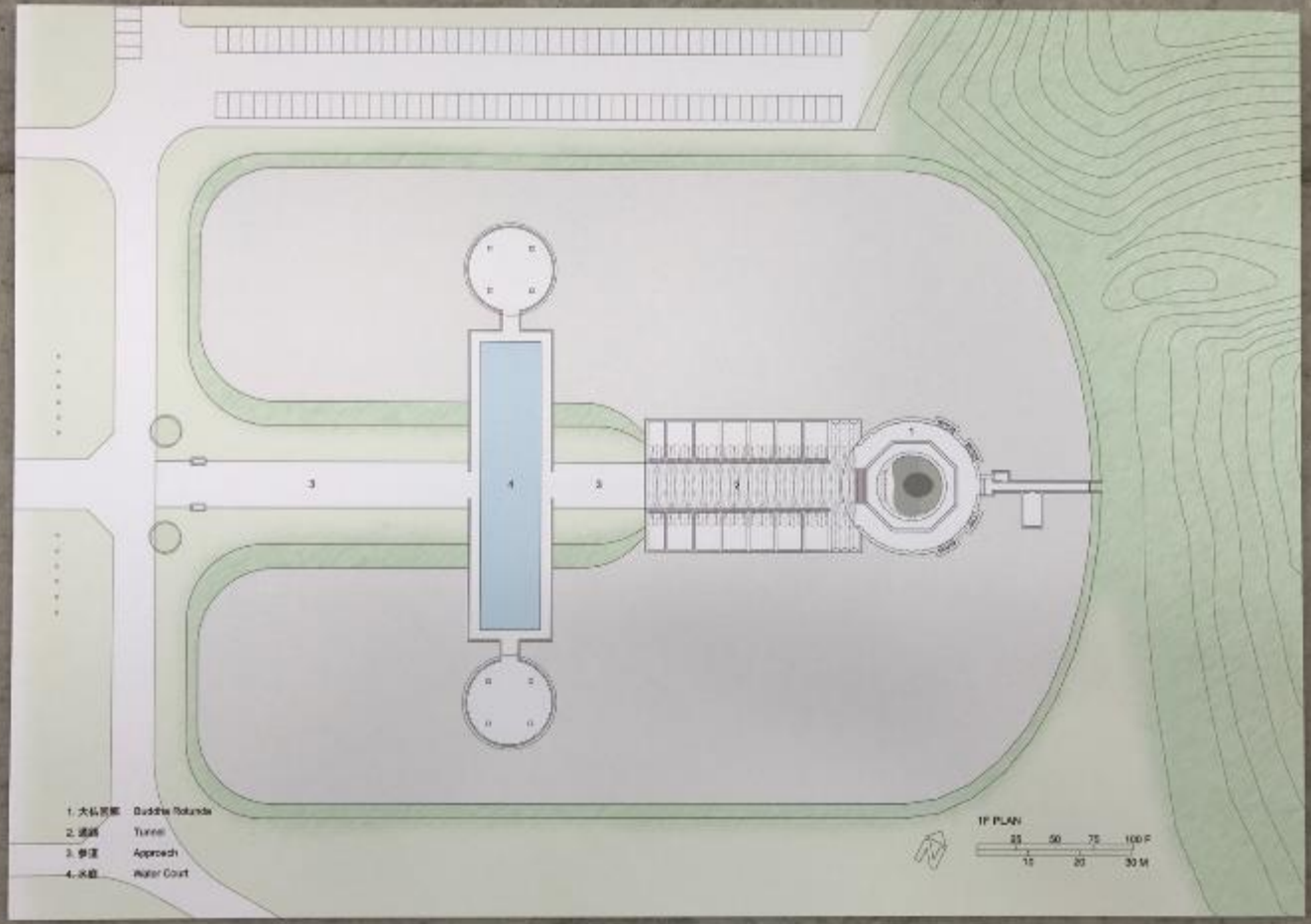
Special detail for having exposed concrete on both sides of the wall with thermal insulation in the middle



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 Cemetary
Sapporo, Japan
Tadao Ando
2017


1. 大仏殿 Buddha Rotunda
2. 通路 Tunnel
3. 参道 Approach
4. 水庭 Water Court
1F PLAN
25 50 75 100 F
10 20 30 M

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

Best of 2019

Concrete: the most destructive material on Earth

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."