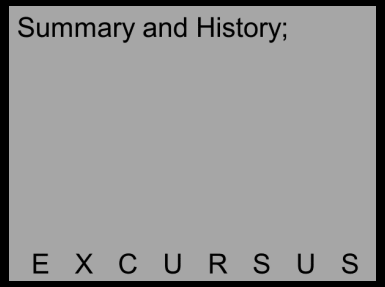
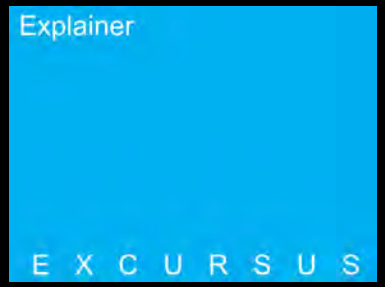
Bottom Up Innovation

Lecture Keynotes



At the beginning of each deck, as brief overview or abstract along with a brief history of its origin date, first presentation or generation

Mid deck summaries of the main points for clarity & flow



Mid deck enhanced explanation of the details behind the main points for clarity and flow

E X C U R S U S

Summary and History;

The Bottom Up Innovation technique involves an applied research approach, working on modifying actual mundane project types with market advantageous modifications. Value Office TM is used as an example of innovation on a basic building type in real time for actual projects by adopting a market based value added proposition favored by clients combined with a creative capacity desired by architects. This particular iteration of the talk frames the Bottom Innovation concept around the research efforts into the distortions of tilt wall construction technology on both market commodified building types via Patents, technological modifications and increased density.

This talk was originally given in St. louis in 2018. It has been given since in various iterations and locations including Denver, Atlanta, Phoenix and Dallas.

E X C U R S U S

The big idea here is;

The first segment of this talk deals with establishing the idea that innovation is not solely the domain of Starchitects and or Academics & the Academy.
The is an assumed barrier to entry on research for the every day architect, namely the cost of it. Not to mention the resources and willing clients. But Research per say has a much wider band width than the budget less experimentation that seems to define its as a discipline.

E X C U R S U S

Thesis……The sometimes challenges of top down innovation ….invite occasions for bottom up innovation……

Top down innovation happens in the Avant-Garde area of architectural practice

Bottom up innovation happens in the Mainstream area of practice

WTF (DTM)

Top down innovation happens in the Avant-Garde area of architectural practice

Explainer

What is an avant grade practice? Some description of the origin of the notion of the avant garde, its evolution from art to architecture and its manifestation in Starhitetcure.

Main points- Very few architects ever get access to the media

Who curates that decision?

Why do so many apparently bona fide avant garde projects look the same?

Or have no budget?

E X C U R S U S

a·vant-garde

/ˌävänt ˈgärd/

noun

noun: **avant-garde**

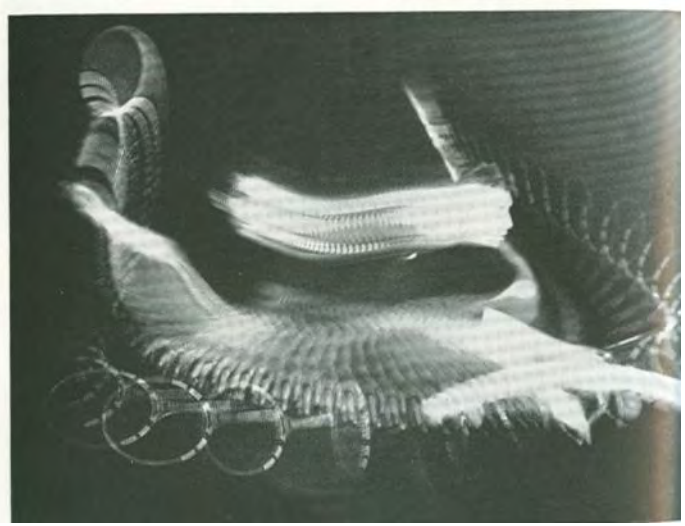
1. new and unusual or experimental ideas, especially in the arts, or the people introducing them.
   "works by artists of the Russian avant-garde"

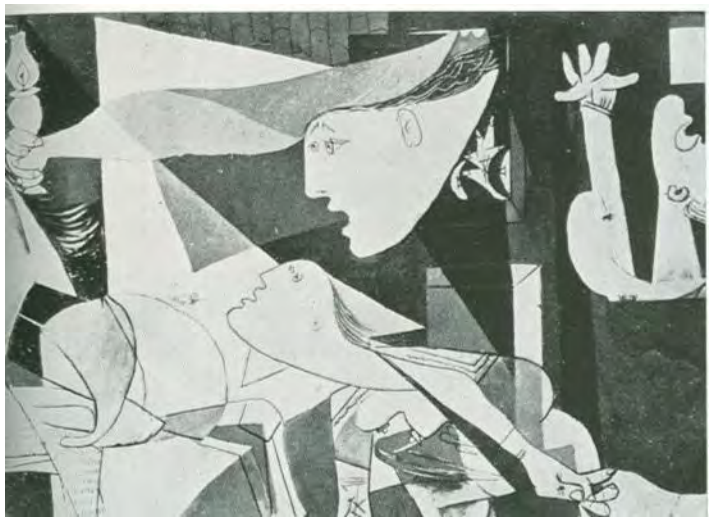
adjective

adjective: **avant-garde**

1. favoring or introducing experimental or unusual ideas.
   "a controversial avant-garde composer"
   synonyms: innovative, original, experimental, left-field, inventive, ahead of the times, cutting/leading/bleeding edge, new, modern, innovatory, advanced, forward-looking, state-of-the-art, trend-setting, pioneering, progressive, Bohemian, groundbreaking, trailblazing, revolutionary;
   More
   unfamiliar, unorthodox, unconventional;
   informal offbeat, way-out
   "this year's avant-garde fashion statement"
   antonyms: conservative


I AM IN
TRAINING
DONT KISS ME






BAUHAUS

Russian thugs vs. the avant-garde

Michael Khodarkovsky

On Aug. 14, members of the ultraconservative Orthodox Christian organization God's Will, stormed into an exhibition that had just opened at Moscow's [illegible] hall, the Manezh. The exhibition, "Sculptures We Do Not See," was a retrospective of Russian avant-garde art from the [illegible]. The intruders smashed several pieces, claiming that the exhibits were offensive to Christians and that [illegible] was punishable under a criminal code. [illegible] part of the sculpture installation titled "[illegible]" were damaged.

This is not the first time that members of God's Will have used physical force against people or events they perceive as anti-Christian and anti-Russian. But violence against avant-garde art has a special resonance in Soviet history. The Stalinist Soviet Union had no tolerance for any form of art that deviated from officially approved socialist realism.

A year after [illegible], three Moscow sculptors formed a [illegible] that [illegible] of "[illegible] nonconformism." [illegible], an [illegible] of their [illegible] — Vladimir Lemport, Vadim Sidur [illegible] Soviet Henry Moore and Nikolai Silis — the [illegible] from 1954 to 1965 and became legendary [illegible]. Unable to display avant-garde art openly, [illegible] by [illegible] their work [illegible] Soviet monuments designed in the socialist realist style [illegible]. Like many Soviet writers who wrote "into the drawer," that is, confining to drawers their work that had no chance of passing censorship, [illegible] kept their art in the basement of their workshop hoping for a better day.

That day arrived in December 1962, when the first officially sanctioned exhibition that included avant-garde art took place at the Manezh. [illegible] visited the exhibition, and their [illegible] Cold War history [illegible]. The Soviet premier, Nikita Khrushchev, was outraged by what he called "degenerate art" [illegible] "distort the faces of Soviet people," [illegible] could paint better [illegible].

When Khrushchev [illegible] the chief Soviet ideologist, Mikhail Suslov, [illegible] suggested that they should be [illegible]. Khrushchev concluded: "Soviet people do not need this stuff!" The exhibition was immediately closed, and the next day [illegible] Pravda condemned "[illegible]" in art. In fact, the closing of the exhibition [illegible] the end of the "thaw," a period of relative tolerance in the Soviet arts and letters.

In the following years, several [illegible] attempts to exhibit non-official art were [illegible] and accompanied by [illegible] of works. The most notorious case, which became known as "The Bulldozer Exhibition," took place in September 1974, when a group of [illegible] decided to set up an open-air [illegible] of avant-garde art [illegible] field on the outskirts of Moscow. Within half an hour, several bulldozers, [illegible] of undercover police officers arrived to disperse the exhibition. Some paintings were destroyed, many artists were [illegible], and some eventually were deported from the U.S.S.R.

> The Kremlin is playing a dangerous game by manipulating violent, ultranationalist groups.

It is no wonder that the violence directed at the present exhibition touched a raw nerve [illegible] those who remember the fate of avant-garde art in the Soviet Union. But the episode is also emblematic of new [illegible] in the Soviet Union. The crude and heavy hand of the Soviet [illegible] has been replaced by [illegible] God's Will, that resort to intimidation [illegible]. [illegible] the state has subcontracted [illegible] of morality to ultraconservative groups [illegible].

God's Will's violent [illegible] with Mr. Putin's return to the presidency and the [illegible] Pussy Riot in Moscow's main cathedral [illegible] 2012. Since then members of this organization [illegible] assaulting people, [illegible], and disrupting performances [illegible] complaints, the Moscow police have [illegible] refused to initiate any criminal investigation.

After the storming of the exhibition at the Manezh, the leader of God's Will, Dmitry Tsorionov, [illegible] was detained but quickly released. On Aug. [illegible] in front of the entrance to the exhibition [illegible] visitors and shouting that they [illegible] camp.

The official representative of the Moscow Patriarchate has [illegible] God's Will organization, and several government [illegible] about the attack on the Manezh exhibition [illegible] outright condemnation.

[illegible] notwithstanding, [illegible] the way the government reacted to Pussy Riot's nonviolent protest and God's Will's violent actions. Three members of Pussy Riot were [illegible], and new legislation [illegible] in 2013 made "an offense of religious feelings" [illegible]. By contrast, no criminal charges have [illegible] against the members of God's Will and their leader. [illegible] the Kremlin's own deeply conservative [illegible] have created an atmosphere of [illegible] right-wing nationalist organizations [illegible].

In its culture wars and political [illegible], the Kremlin has been increasingly relying on the support of fringe groups on the right both inside and outside [illegible]. [illegible] Mr. Putin's [illegible] right-wing motorcycle club, the Night Wolves. [illegible] riding along [illegible] the club, Aleksandr Zaldostanov. The [illegible] the club of about 5,000 members with [illegible], while Mr. Putin personally awarded Mr. Zaldostanov a medal [illegible] work." In exchange, the Night Wolves [illegible] anti-government protests in Moscow [illegible].

Desperate to [illegible] political [illegible], the Kremlin has increasingly [illegible] the church and giving the green light to [illegible] and extremist groups. [illegible] violent and fanatical elements [illegible] game. One day the Kremlin [illegible] the puppet masters have suddenly become the puppets of those they once controlled.

OBSERVATIONS ON THE QUOTIDIAN

Architecture as a profession operates on an outdated model led by avant-garde discourse where very few speak to so many about so little. Unpacked, what this means is that a critic/academic class utilizes relatively closely curated magazines and other restricted venues to theorize and discourse about an amazingly small bandwidth of building types and problem sets to an audience of professional practitioners who are relegated through exclusion to the role of audience.

Day-to-day practice seems to encounter building types, client types and general profit structures, including that of the practice itself, that seem to be excluded from the current models. The work done in these practices is systematically ignored, yet in some of this work lay virtues and value.

Across 2 major architecture magazines...

ARCHITECT **ARCHITECTURAL RECORD**

-Skidmore, Owings & Merrill (SOM)

6 features in 14 month span = 42% coverage

-Thomas Phifer and Partners

5 features in 11 month span = 45% coverage

(3 of which was the Corning Museum of Glass' Art + Design Wing)

-OMA

5 features in 16 month span = 32% coverage

-Morphosis Architects

3 features in 6 month span = 50% coverage

-Renzo Piano Building Workshop

3 features in 17 month span = 18% coverage

In 36 issues over 18 months, with an average of 6 features per month for a total of over 108 total features. 20 architects cover over half of these features.

Ok-lets talk about innovation from the ag side- what does it look like?

In general form, this is the architect's dilemma- the desire and general mind set of being on the cutting edge of form making in some way.

There are many forces that converge in the conception of architectural form and its imagination, propositions and ultimately its performance culturally or functionally or environmentally.

The Muses are not Amused

Explainer

Reference to an article here by Jorge Silvetti- *The Muses are not Amused*, Harvard Design Magazine.

E X C U R S U S

Thematization for Entertainment

Thematization for Living

l +9, periodicals

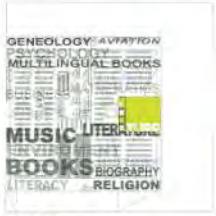
Level +10, headquarters

Level +11, roof terrace Headquarters platform

Plans scale: 1/1,500

l +5, books

Level +6, books



Level +7, books

Level +8, reading room Books platform

l +3, assembly & electronics

Level +4, mixing chamber Assembly platform

l 0, fiction

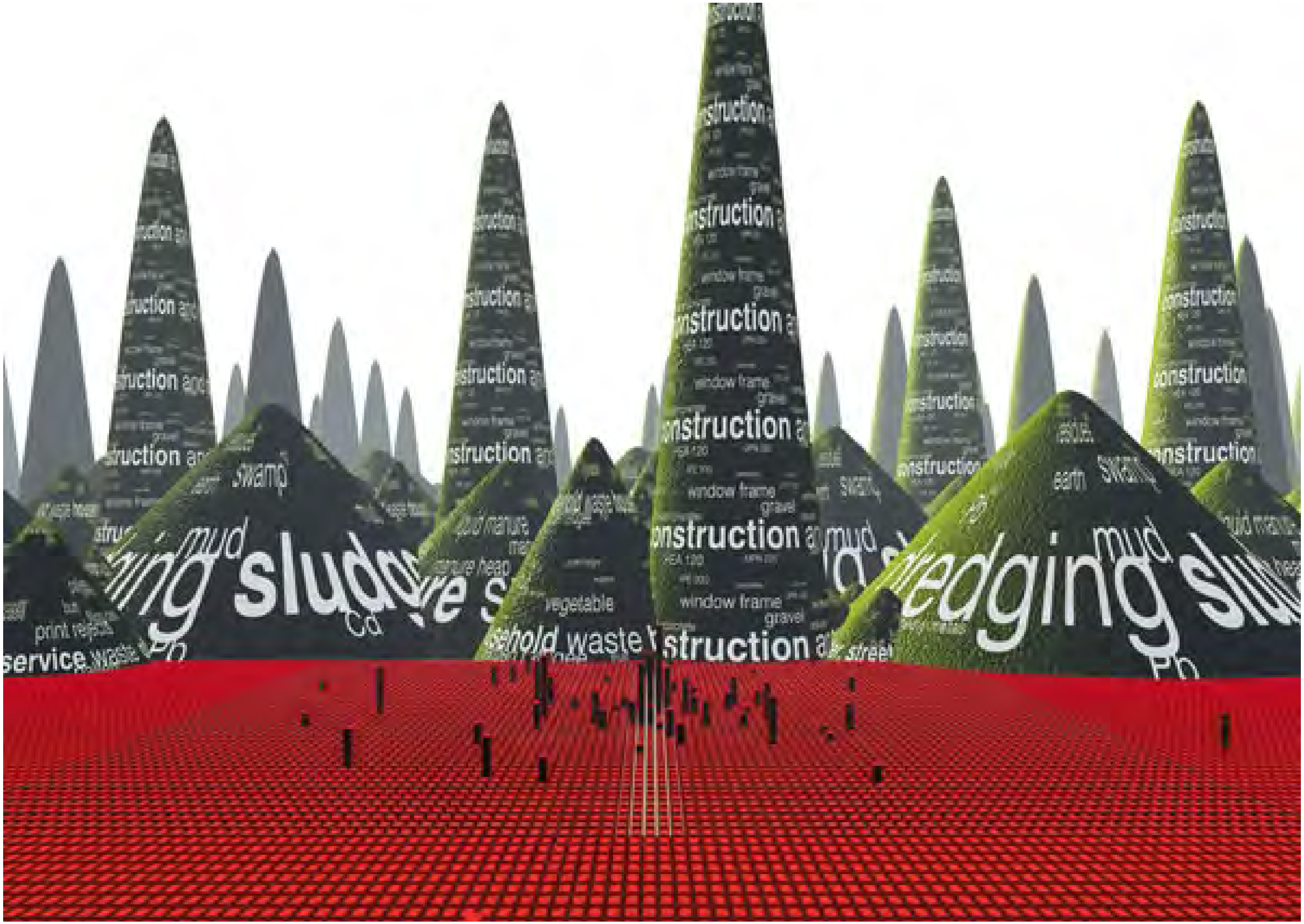
Level +1, staff

Level +2, living room Store platform

l +3, parking

Level -2, operations Kids platform

Five platforms


mud
swamp
earth
window frame
gravel
vegetable
waste
print rejects
manure heap
service

real estate
property
mortgage
development
for sale
investment
market value
architecture
appraisal
investing
building
management
property law
land value
real estate bubble
landowner
brokerage
apartment
investing
brokerage
city
housing estate
occupancy
estimation
industry
construction
lease
office
landlord
land value
property
administration
developer
development
monopoly
net lease
apartment building
house
building
real estate
agency
broker
agent
contract
leasehold
developer
building
construction
market value
property law
immovable property
real estate bubble
management
taxation
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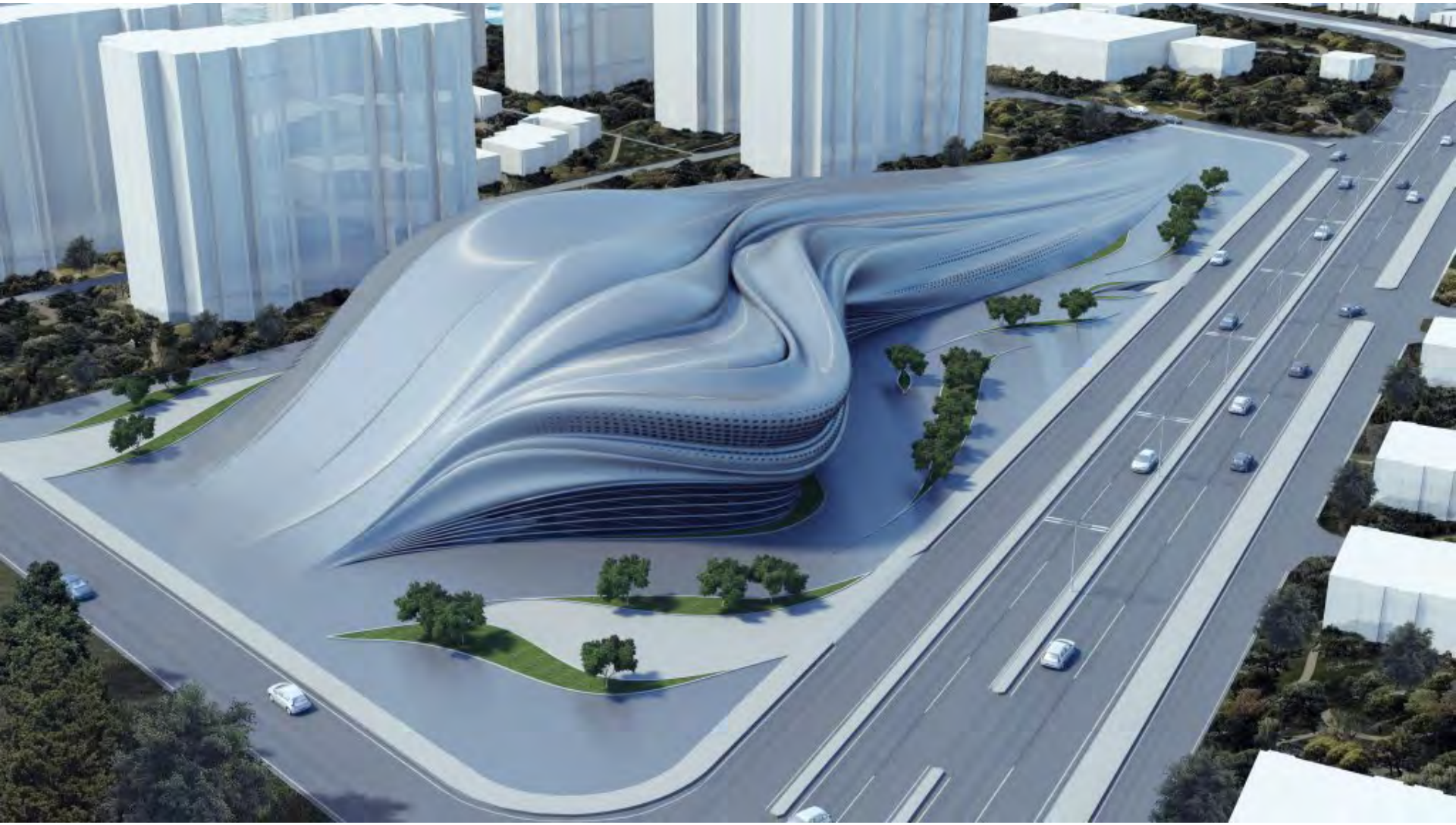
business
investment
appraisal
timeshare
property management



These are all attempts to stimulate the production of ***meaningful form***. They are derived mostly from the influences happening in discourses outside of architecture in many ways.
Cultural issues, social, economic, ideological and technological or methodological.

Cultural issues, social, economic, ideological – things like

precedent

=

HOUSE

OFFICE

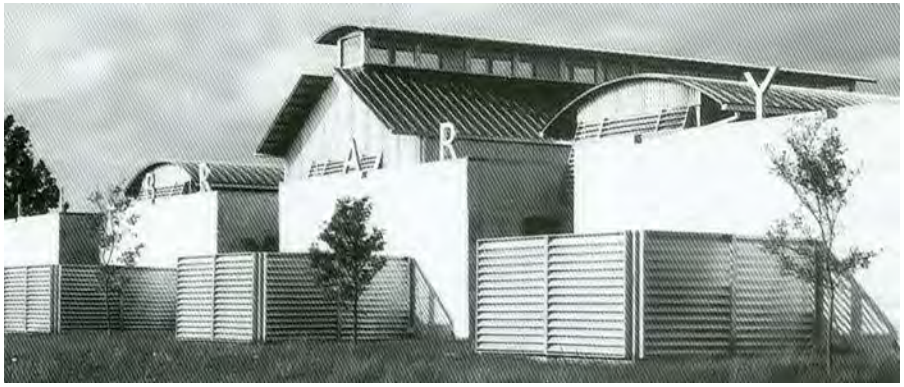
LIBRARY

=

HOUSE

OFFICE

LIBRARY



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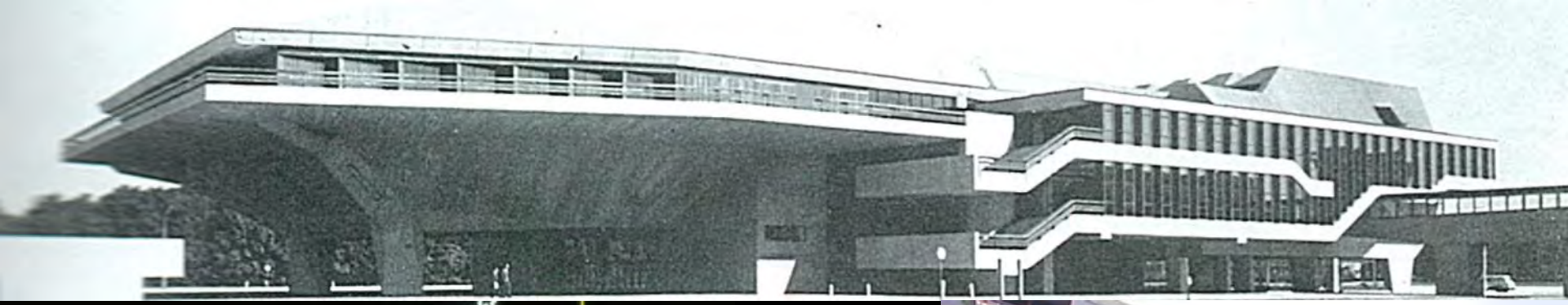
HOUSE

OFFICE

LIBRARY




Universiteit Utrecht

…….and technological or methodological

technology

Explainer

Here I am switching to point out that “technology” need not mean inaccessible university computing power and other outre forms of invention. That technology can be much more down to earth. Like tilt wall construction…..

E X C U R S U S

yet technological innovation isn’t always 3d printing, robotic assembly, graphite, titanium or polycarbonate, and lofted Boolean equations….Think Old Tech….

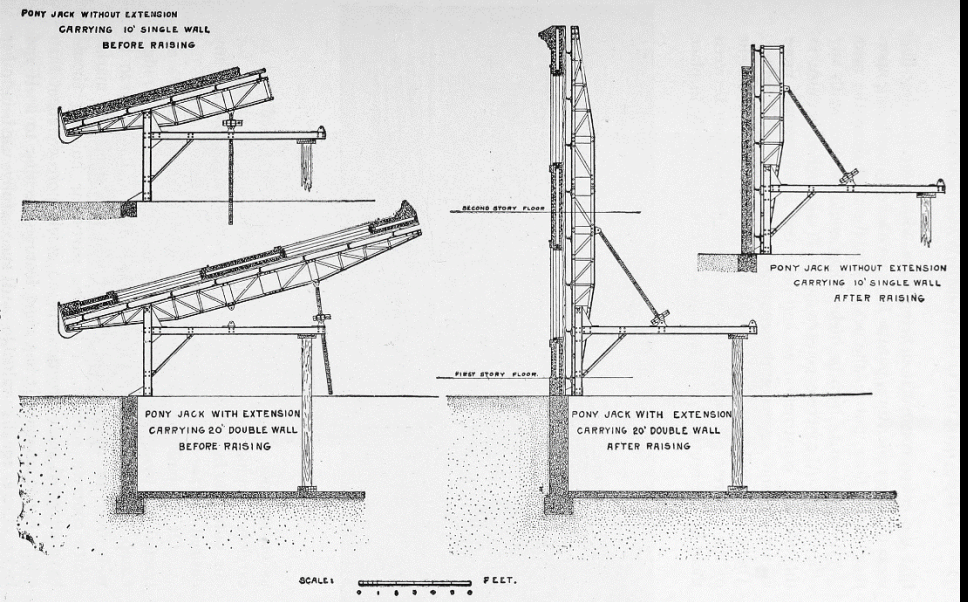


FIG. 5.—WALL RAISING JACK. LIMIT OF HEIGHT, PONY SIZE 20 FEET, STANDARD 30 FEET, JUMBO 40 FEET.

powers
brown
archit
ecture

CODA- Criticality is out and Projectivity is in…..otherwise said AG is in a panic…..rumblings in academia

George Baird
“’Criticality’ and its Discontents”

Michael Speaks- Arch Record 2002

Abandon “resistance” (*AG / Criticality*) in favor of a new, alternative and efficaciously integrated architecture that takes cues from contemporary business management…..model

Rem Koolhaas

“maybe some of our most interesting engagements are uncritical, emphatic engagements , which deal with the sometimes insane difficulty of an architectural project to deal with the incredible accumulation of economic, cultural political and also logistical issues”

Explainer

Here we are transitioning to what defines an everyday practice- one which may want, or need to, take advantage of research but in a more quotidian manner…..

E X C U R S U S

Bottom up innovation happens in the Mainstream area of practice

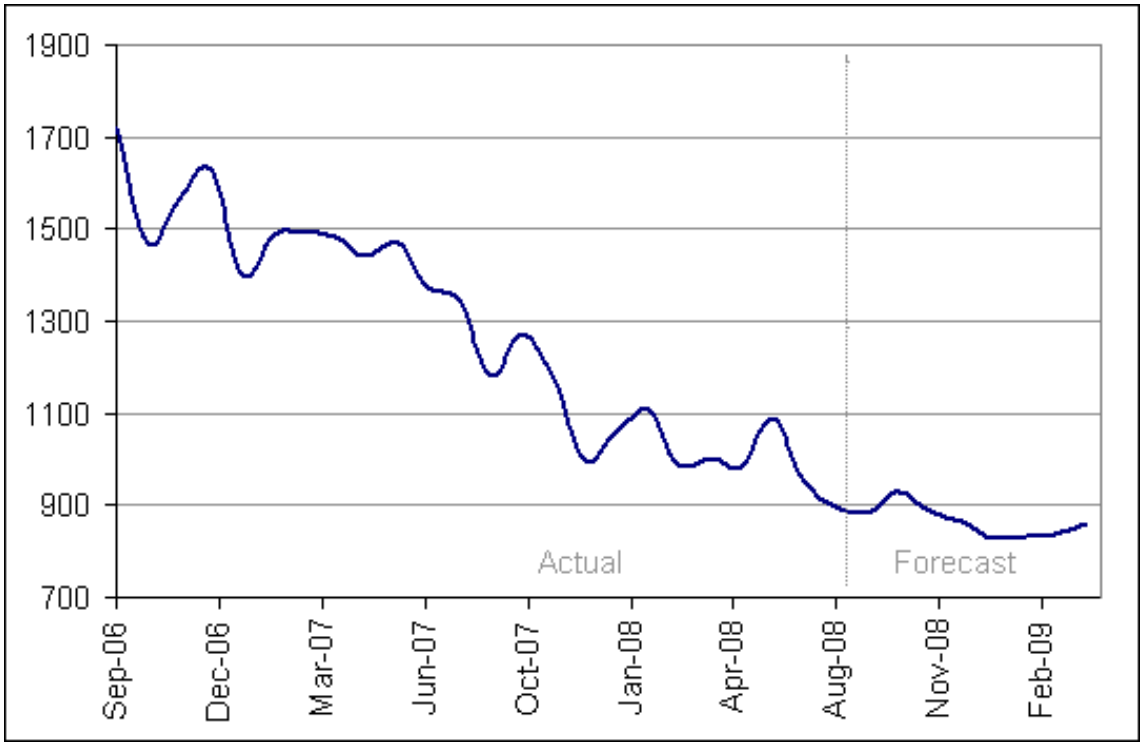
(Practices that deal with the market- everyday projects and programs- the stuff you see driving home)

How do you know as an architect if you are mainstream (*you can't believe how out of touch most architects are to believe they are SOMEHOW not*)???

If you have EVER been selected for a project based upon competitive fee- you're mainstream baby.

So How do, or how can, architects deal with “the Market”?

Post Great Recession, no business, profession or trade is planning to take up where it left off before this historic economic event. They all get the new normal. Architects however give every indication that they just need to wait until the clients "come back". When it does, it will not come back to them.



They seem to miss the meaning in the new normal-There are no more clients, only markets now. . Architects will have to "go to" the new market with a product rather than waiting for the market to come back requesting our services. The value proposition of architecture has changed. Innovation in mainstream every day practice requires that we understand markets don't behave like clients…first example-it is open 24/7/365……..

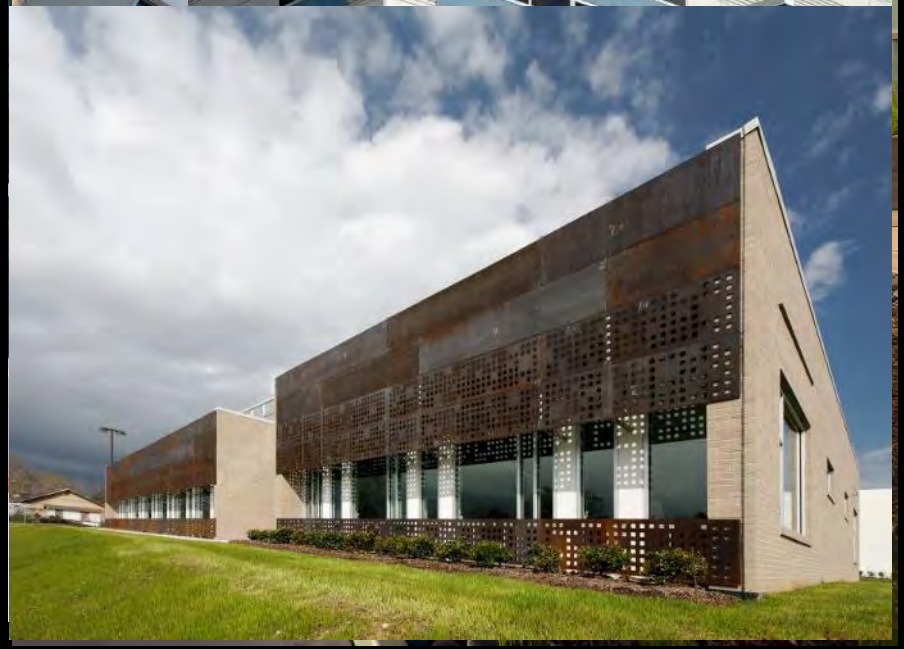
So in some ways the Market is an abstraction, like a place that exists only virtually and thus is vulnerable to wide “interpretation” when it comes to its effect on, its interaction with, something like architecture.

Here's how we interpreted the opportunity of the market- which led to our INNOVATIONS

Explainer

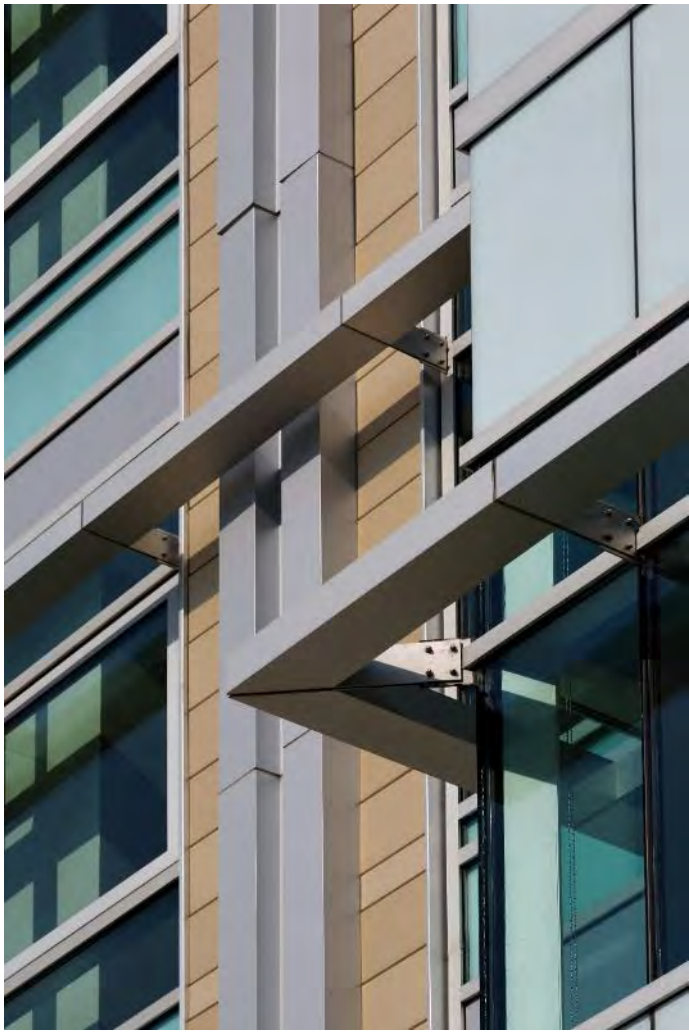
First I show what we did in or normal practice as matter of daily continuity…

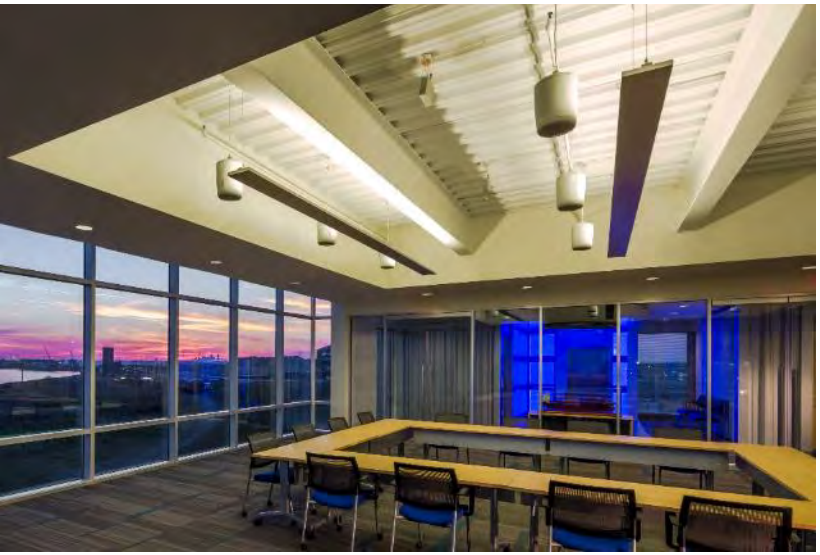
E X C U R S U S

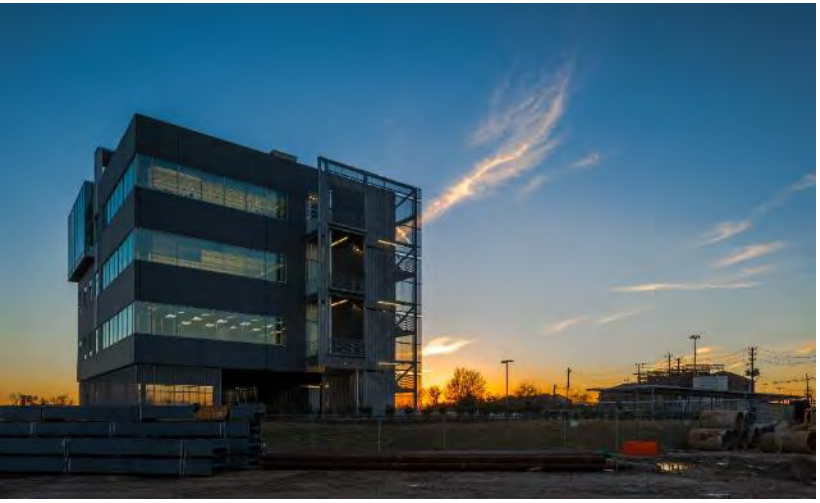


"….In reviewing and studying the works and intentional practice of **Powers Brown Architecture**, an old saying came to mind; *"architecture does not have to be for special occasions".* Powers Brown knows this and has built a practice working in realms that are most often avoided…….In some ways Powers Brown is pioneering a hybrid of critical and commercial practice, striking a balance between the two. It is a young growing firm, moving forward without the prejudice and predetermination that often narrows the field of operation. I expect Joe Powers, Jeffrey Brown and their team will set an example others will eventually follow."

-Michael Rotondi
in preface to NeoArchitecture







ADVANCE POLYBAG, INC.

ROY KELLY MULTIMODAL TERMINAL

GALVESTON TRANSIT CENTER

METRO LRT


ARABELLA


MARLOWE


THOMPSON - SAN ANTONIO

Washington & Jefferson University

Addition / Renovation of Student Rec Center

Location *Washington PA* Cost *$20million*
Area *Rec=27,375 Reno=121,205*
Completion *Fall 2017*

Westchase Long Range Plan

sustainable parcel development

Location *Houston, TX*
Area 4.3 squre miles

Explainer

Then we transition to our focus on our use of tiltwall as a more liminal opprtunity

E X C U R S U S

Tiltwall Construction

Research Division

Market Differentiator

beyond just

cool design……

=

powers brown architecture

TiltLab ™

So- We had a parallel accidental expertise in Tilt Wall building types….which we commoditized, branded and applied to the ‘normal” problems and building types we most often were commissioned to undertake.

- SSB ™
- Largest building
- Tiltwallism- we wrote the book on it
- Tallest panel
- Product Development
- Six story Load bearing Building
- Value Office ™
- Blast / Progressive Collapse

Small Smart Boxes ™



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brown
architecture

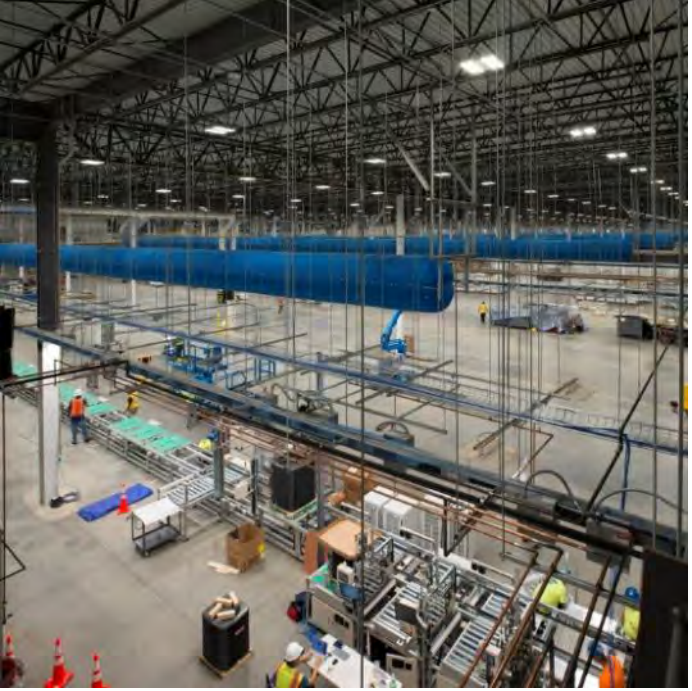






Worlds Largest tilt wall building

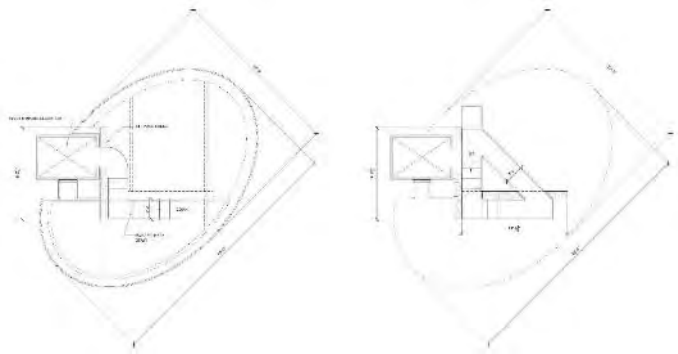
4.26 million Square feet



DAIKIN
TX TECHNOLOGY PARK

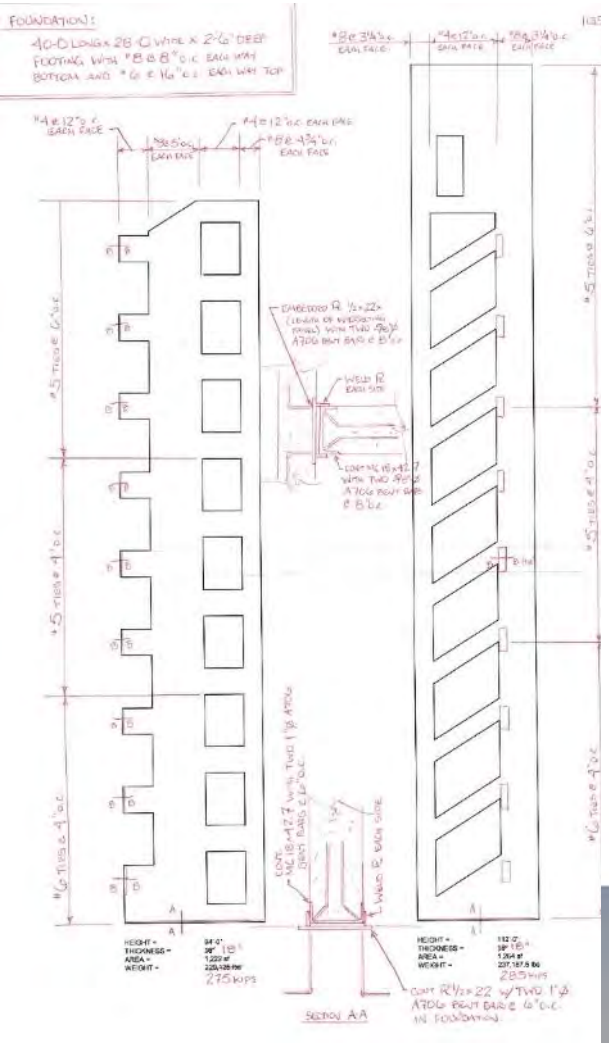
Worlds Tallest Tilt Wall Panel

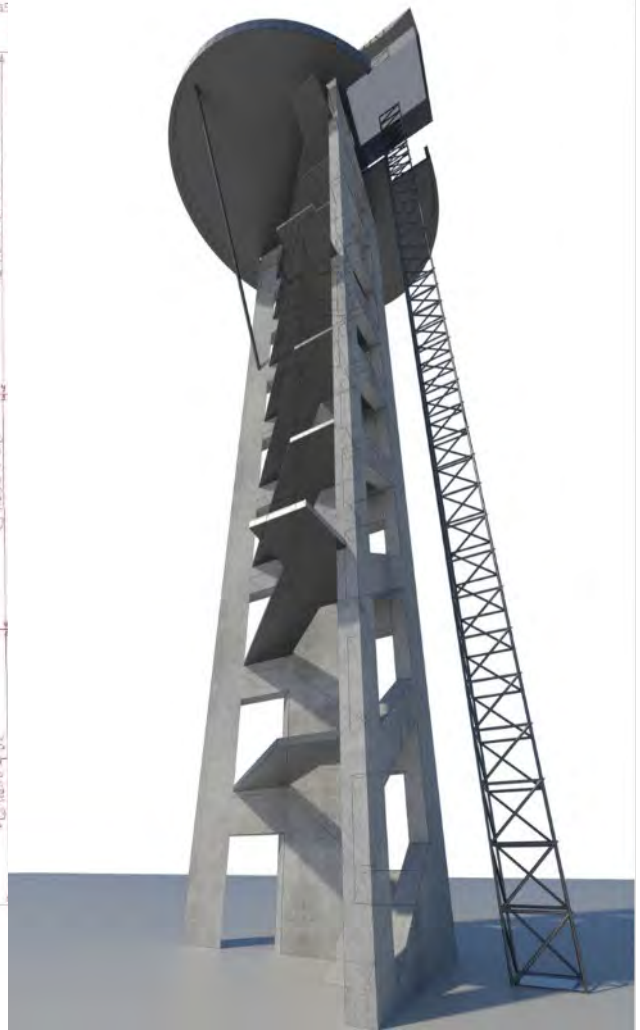
113’ feet



powers brown architecture

OBSERVATION TOWER:
GENERATION PARK
OBSERVATION TOWER





Worlds First Six story
load bearing
tilt wall building

Sierra Pines II

Worlds first DoD level 4 Blast and Blast resistant / progressive Collapse building

This research was recently published in

The Construction Specifier, August 2011

Protective Design Center (PDC)
Army's center of expertise for engineering services related to force protection and protection design

Lead developer and resources of Security Related UFC Documents

To date, the Progressive Design Council (PDC) has taken no objection to the research.

Tiltwallism-
we literally
wrote the book
on the subject….

Look inside

Flip to back



See all 3 images

Tiltwallism: Potential of Tilt Wall Hardcover – September 1, 2014

by Jeffrey Brown (Author)

Be the first to review this item

See all formats and editions

Hardcover
$41.85

8 Used from $36.57
16 New from $31.81

An introductory resource to architects and an inspiration to contractors, developers and structural consultants who have encountered Tilt Wall construction. Brown provides a full synthetic treatment of Tilt Wall construction, explaining its history, methodology, and relationship to the current architectural approaches to meaning. Inclusion of practical reference and resource sections in the book will appeal to a cross-disciplinary audience.

See the Best Books of the Month
Want to know our Editors' picks for the best books of the month? Browse Best Books of the Month, featuring our favorite new books in more than a dozen categories.

Value Office ™

powers
brown
archit
ecture

The big idea here is;

Our most successful foray into integrating research into our practice was built around integrating then advancing the use of tilt wall construction on office buildings. We eventually were able, without a major capital investment at first, to create a unique and marketable “product line”, a commodity of sorts- think back to the eerie similarity and thus commodity like appearance of certain tropes in the avant garde, called Value Office™ .

We have become known world wide for our innovation in this area. We have been both celebrated for thinking “outside of the box” and no requirement for Boolean lofting, budget busting project costs and cost overruns to achieve the “vision”. We have also been excoriated for embracing “commodification” in the scared discourse of meaningful form making….

E X C U R S U S

Bottom Up Innovation

So what does Bottom up Innovation look like inside of a mainstream everyday building type of practice? In the Context of TiltLab……

A quick run through how developments sponsored by stretching the technology of tilt wall to meet the market needs , formal needs and limitations of OFFICE buildings might lead to something outside of this building type in three steps……

Step 1 – lets look at the one building type that for one reason or another (there are very real reasons) has been at the fore front of driving load bearing tilt wall to “unprecedented heights”….Office buildings.

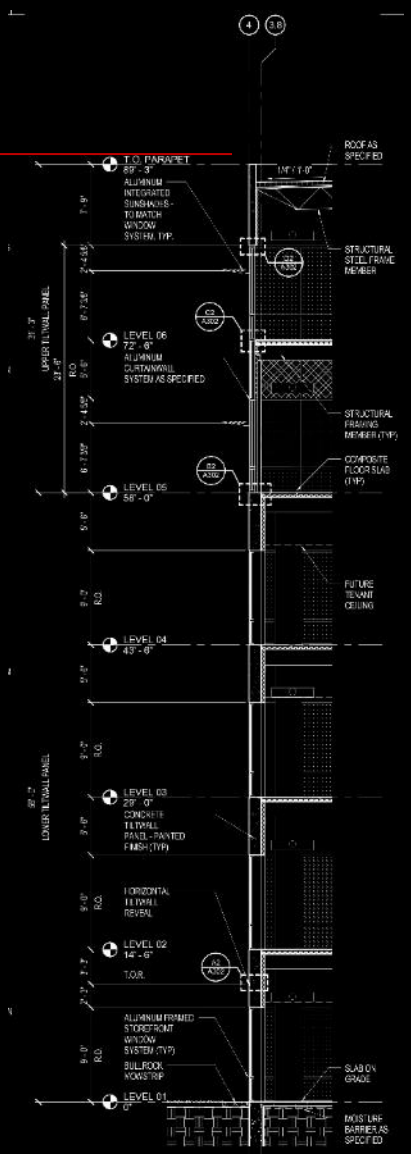
Load bearing tall walls are NOT solely the province of Tilt Wall….

119’

92’

30 FEET

But There Is A Big Difference In thickness



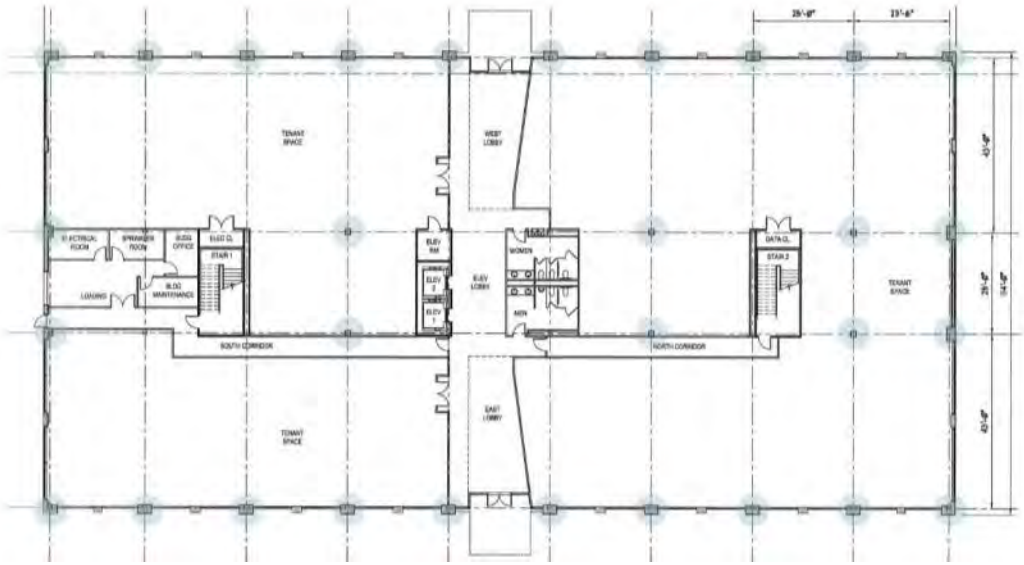
14 INCHES

Explainer

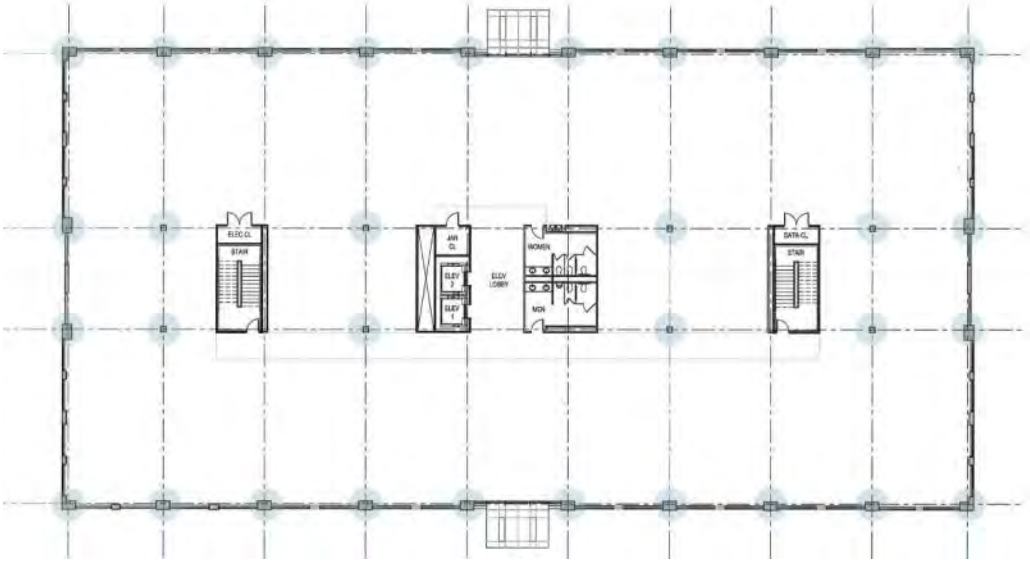
Here I am using a series of slides from an actual marketing deck in which we teach clients and markets that using loadbearing tilt wall actually IMPROVE the value proposition of class A office product….and lower the cost of construction while minimizing or eliminating design / aesthetic restrictions….

E X C U R S U S

powers brown architecture



ground floor plan



typical floor plan

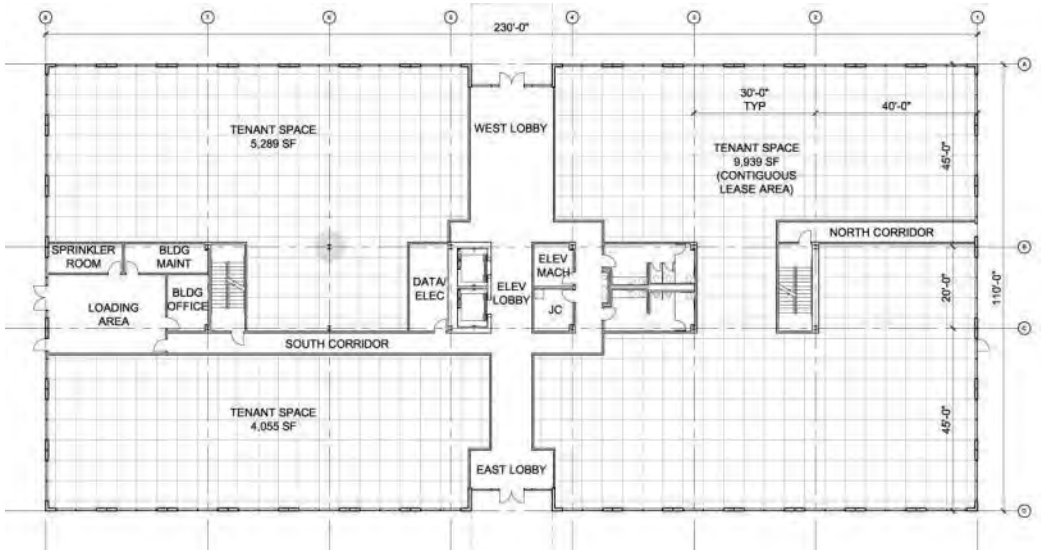
Conventional Construction

A typical office product based on a 25,300 sf floor plate and constructed conventionally has…

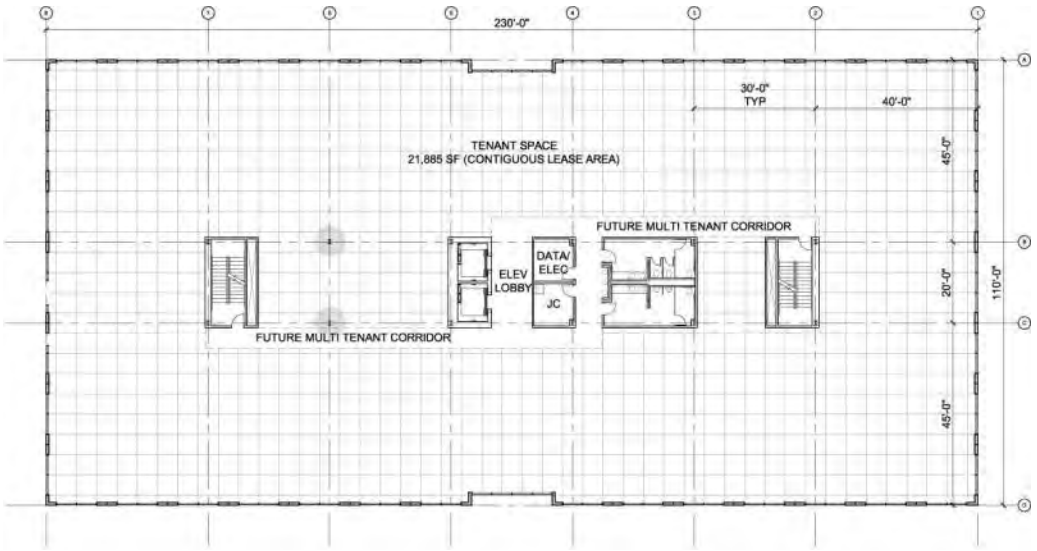
perimeter columns
columns in lease areas
43’-0” deep lease area along perimeter
total columns used = 40

Based on a preliminary pricing exercise completed in May 2007, this floor plate constructed at 4 stories would **cost approximately $10.9 million.**

powers brown architecture



ground floor plan



typical floor plan

Tilt Wall Construction

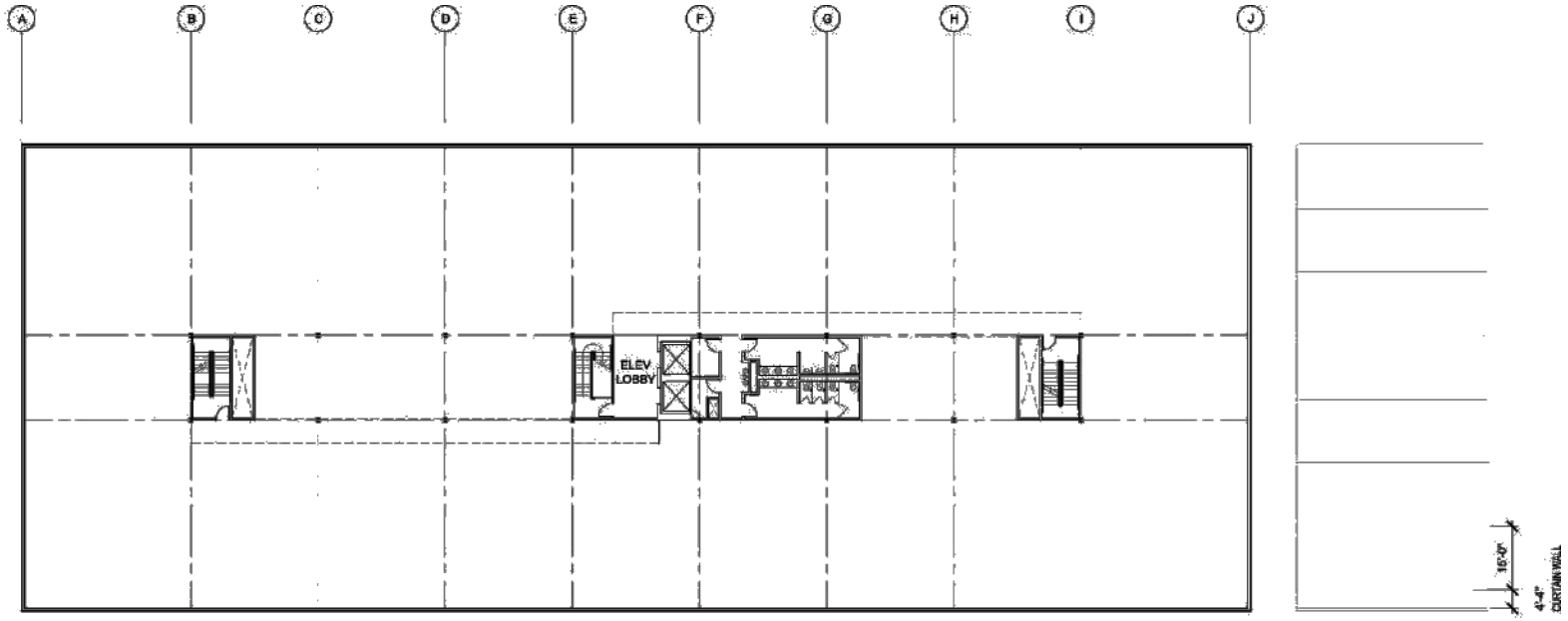
By comparison, the same 25,300 sf floor plate built utilizing tilt wall construction has…

no columns at the building's perimeter
5' leasing grid
45'-0" column free lease space along perimeter
centrally located data/electrical rooms
total columns used = 12

Based on a preliminary pricing exercise, this floor plate constructed at 4 stories would **cost approximately $8.8 million…**

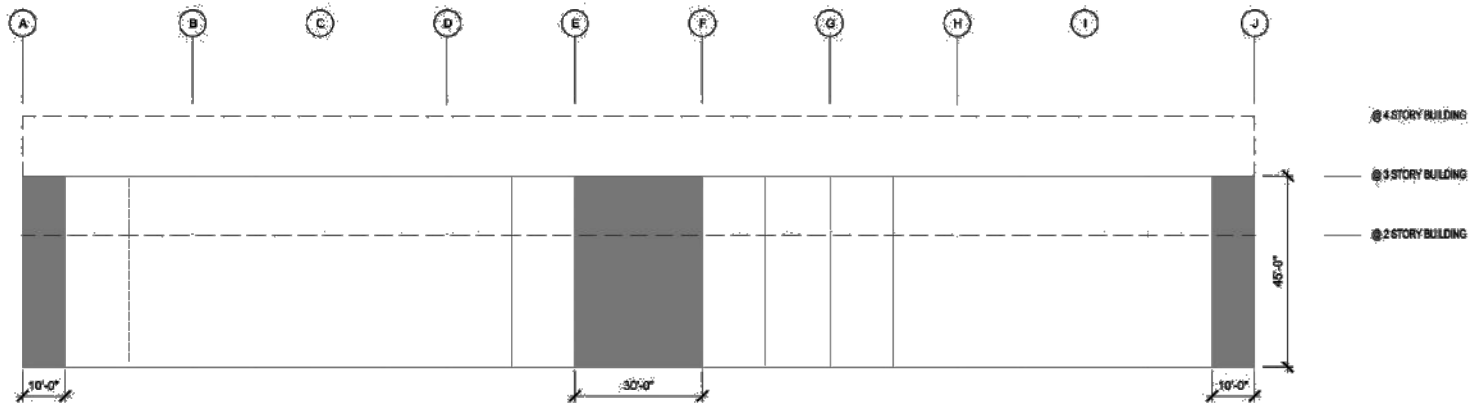
- **a savings of $2.1 million over conventional construction.**
- **a savings of 10% in steel tonnage**

powers brown architecture

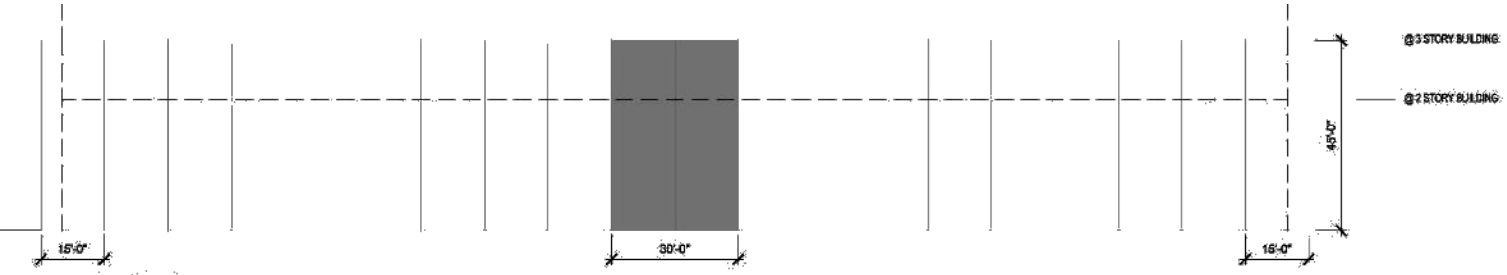


floor plate / core

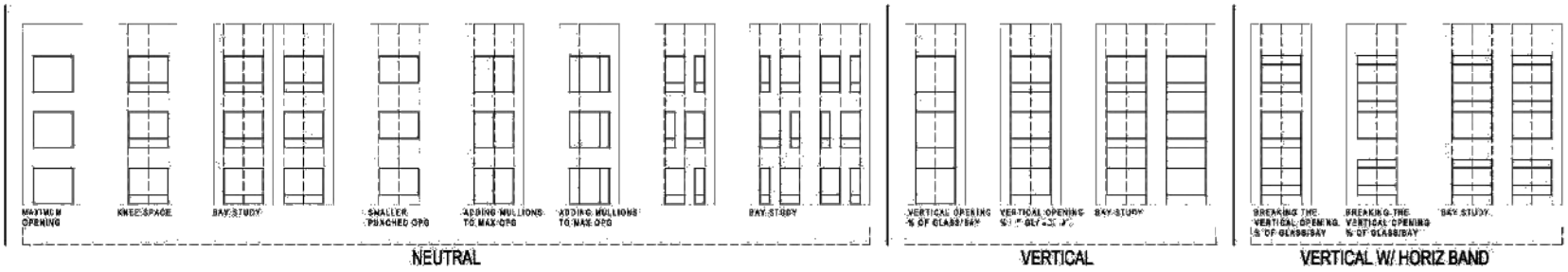
relationship to building skin



powers brown architecture



15'-0" PANELS - FULL PANELS AT EDGE
PUNCHED OPENINGS



PANEL STUDIES - ACHIEVING HORIZONTAL AND/OR VERTICAL USING: reveals / formliners / spandrel

floor plate / core

fenestration

powers brown architecture

The following is an analysis which isolates the building shell components in order to give a cost of work delta between the two systems. This is based on similar 4 story office building shells. Remember this is only a high level analysis indicative of systems that are substantially different between the two construction methods with all other factors remaining the same.

Division	Steel & Precast	Tilt Wall
Concrete	$9.45	$17.00

This is the cost of precast panels vs the cost of tiltwall panels

Steel	$30.00	$13.58

This is the reduction of structural steel required at the perimeter of the building

Sealants	$0.54	$0.36

This is the difference in quantity of panel joints to be sealed

Subtotal	$39.99	$30.94

As you can see a $9.05/sf delta savings by going with an economical tiltwall system has a large impact on overall project costs. ($724,000 on an 80,000sf building shell)

powers
brown
architecture

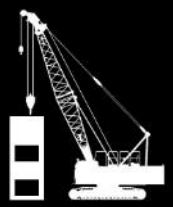
2- story 15’-30’ wide panel


10900


SAIC

powers
brown
architecture

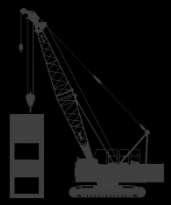
3- story 15’ wide panel




SAIC

powers
brown
architecture

4- story 15’ wide panel

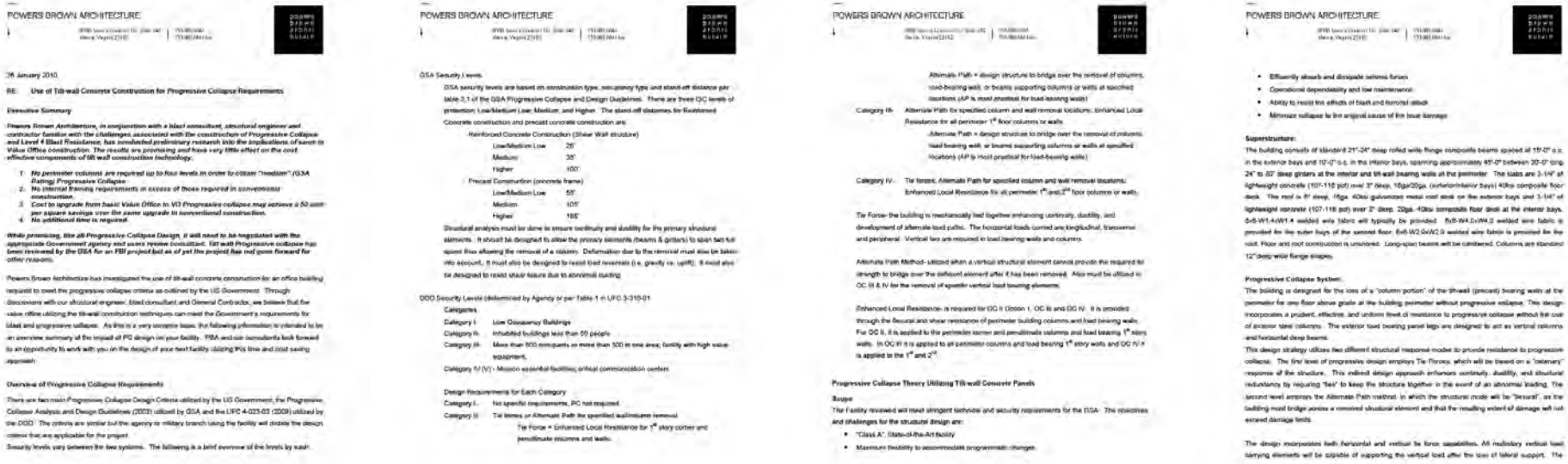



Eagle Burgmann

So we were plateaued in the market with a pretty good product- everywhere but Washington DC….

Where
Competition drove us to research
blast resistant tilt up

In January 2010 we were provoked to explore the potential of adopting the Value Office technology to Blast Resistance and Progressive Collapse Resistance.



POWERS BROWN ARCHITECTURE

26 January 2010

RE: Use of Tilt-wall Concrete Construction for Progressive Collapse Requirements

Executive Summary

Powers Brown Architecture, in conjunction with a blast consultant, structural engineer and contractor familiar with the challenges associated with the construction of Progressive Collapse and Level 4 Blast Resistance, has conducted preliminary research into the implications of same in Value Office construction. The results are promising and have very little effect on the cost effective components of tilt wall construction technology.

1. *No perimeter columns are required up to four levels in order to obtain "medium" (GSA Rating) Progressive Collapse.*
2. *No internal framing requirements in excess of those required in conventional construction.*
3. *Cost to upgrade from basic Value Office to VO Progressive collapse may achieve a 50 cent per square savings over the same upgrade in conventional construction.*
4. *No additional time is required.*

While promising, the all-Progressive Collapse Design, it will need to be negotiated with the appropriate Government agency and users review consultant. Tilt wall Progressive collapse has been reviewed by the GSA for an FBI project but as of yet the project has not gone forward for other reasons.

Powers Brown Architecture has investigated the use of tilt-wall concrete construction for an office building required to meet the progressive collapse criteria as outlined by the US Government. Through discussions with our structural engineer, blast consultant and General Contractor, we believe that the value inline utilizing the tilt-wall construction techniques can meet the Government's requirements for blast and progressive collapse. As this is a very complex topic, the following information is intended to be an overview summary of the impact of PC design on your facility. PBA and our consultants look forward to an opportunity to work with you on the design of your next facility utilizing this time and cost saving approach.

Overview of Progressive Collapse Requirements

There are two main Progressive Collapse Design Criteria utilized by the US Government, the Progressive Collapse Analysis and Design Guidelines (2003) utilized by GSA and the UFC 4-023-03 (2009) utilized by the DOD. The criteria are similar but the agency or military branch using the facility will dictate the design criteria that are applicable for the project.

Security levels vary between the two systems. The following is a brief overview of the levels by each:

GSA Security Levels

GSA security levels are based on construction type, occupancy type and stand-off distance per table 3.1 of the GSA Progressive Collapse and Design Guidelines. There are three (3) levels of protection; Low/Medium Low; Medium; and Higher. The stand-off distances for Reinforced Concrete construction and precast concrete construction are:

Reinforced Concrete Construction (Shear Wall structure)

Low/Medium Low	25'
Medium	35'
Higher	100'

Precast Construction (concrete frame)

Low/Medium Low	55'
Medium	105'
Higher	155'

Structural analysis must be done to ensure continuity and ductility for the primary structural elements. It should be designed to allow the primary elements (beams & girders) to span two full spans thus allowing the removal of a column. Deformation due to the removal must also be taken into account. It must also be designed to resist load reversals (i.e. gravity vs. uplift). It must also be designed to resist shear failure due to abnormal loading.

DOD Security Levels (determined by Agency or per Table 1-1 in UFC 3-310-01

Categories

Category I:	Low Occupancy Buildings
Category II:	Inhabited buildings less than 50 people
Category III:	More than 500 occupants or more than 300 in one area; facility with high value equipment;
Category IV (V) -	Mission essential facilities; critical communication centers

Design Requirements for Each Category

Category I:	No specific requirements, PC not required
Category II:	Tie forces or Alternate Path for specified wall/column removal

Tie Force = Enhanced Local Resistance for 1st story corner and penultimate columns and walls.

Alternate Path = design structure to bridge over the removal of columns, load-bearing wall, or beams supporting columns or walls at specified locations (AP is most practical for load-bearing walls)

Category III- Alternate Path for specified column and wall removal locations; Enhanced Local Resistance for all perimeter 1st floor columns or walls.

Alternate Path = design structure to bridge over the removal of columns, load-bearing wall, or beams supporting columns or walls at specified locations (AP is most practical for load-bearing walls)

Category IV - Tie forces; Alternate Path for specified column and wall removal locations; Enhanced Local Resistance for all perimeter 1st and 2nd floor columns or walls.

Tie Force- the building is mechanically tied together enhancing continuity, ductility, and development of alternate load paths. The horizontal loads carried are longitudinal, transverse and peripheral. Vertical ties are required in load bearing walls and columns.

Alternate Path Method- utilized when a vertical structural element cannot provide the required tie strength to bridge over the deficient element after it has been removed. Also must be utilized in OC III & IV for the removal of specific vertical load bearing elements.

Enhanced Local Resistance- is required for OG II Option 1, OC III and OG IV. It is provided through the flexural and shear resistance of perimeter building columns and load bearing walls. For OC II, it is applied to the perimeter corner and penultimate columns and load bearing 1st story walls. In OC III it is applied to all perimeter columns and load bearing 1st story walls and OC IV it is applied to the 1st and 2nd.

Progressive Collapse Theory Utilizing Tilt-wall Concrete Panels

Scope

The Facility reviewed will meet stringent technical and security requirements for the GSA. The objectives and challenges for the structural design are:

- "Class A", State-of-the-Art facility
- Maximum flexibility to accommodate programmatic changes.

- Efficiently absorb and dissipate seismic forces
- Operational dependability and low maintenance
- Ability to resist the effects of blast and terrorist attack
- Minimize collapse to the original cause of the load damage

Superstructure:

The building consists of standard 21'-24' deep rolled wide flange composite beams spaced at 15'-0" o.c. in the exterior bays and 10'-0" o.c. in the interior bays, spanning approximately 45'-0" between 20'-0" long 24" to 30" deep girders at the interior and tilt-wall bearing walls at the perimeter. The slabs are 3-1/4" of lightweight concrete (107-115 pcf) over 3" deep, 18ga/20ga. (exterior/interior bays) 40ksi composite floor deck. The roof is 6" deep, 18ga. 40ksi galvanized metal roof deck on the exterior bays and 3-1/4" of lightweight concrete (107-115 pcf) over 3" deep, 20ga. 40ksi composite floor deck at the interior bays. 6x6-W1.4xW1.4 welded wire fabric will typically be provided. 6x6-W4.0xW4.0 welded wire fabric is provided for the outer bays of the second floor. 6x6-W2.9xW2.9 welded wire fabric is provided for the roof. Floor and roof construction is unshored. Long-span beams will be cambered. Columns are standard 12" deep wide flange shapes.

Progressive Collapse System:

The building is designed for the loss of a "column portion" of the tilt-wall (precast) bearing walls at the perimeter for any floor above grade at the building perimeter without progressive collapse. This design incorporates a prudent, effective, and uniform level of resistance to progressive collapse without the loss of exterior load columns. The exterior load bearing panel legs are designed to act as vertical columns and horizontal deep beams.

This design strategy utilizes two different structural response modes to provide resistance to progressive collapse. The first level of progressive design employs Tie Forces, which will be based on a "catenary" response of the structure. This indirect design approach enhances continuity, ductility, and structural redundancy by requiring "ties" to keep the structure together in the event of an abnormal loading. The second level employs the Alternate Path method, in which the structural model will be "removed", as the building must bridge across a removed structural element and that the resulting extent of damage will not exceed damage limits.

The design incorporates both horizontal and vertical tie force capabilities. All multistory vertical load carrying elements will be capable of supporting the vertical load after the loss of lateral support. The

We produced a collaborative white paper that was conducted as a "thought experiment;" the criteria for which was DoD Low Level Blast Resistance.

The following is an analysis which isolates the building shell components in order to give a cost of work delta between the two systems. This is based on similar 4 story office building shells. Remember this is only a high level analysis indicative of systems that are substantially different between the two construction methods with all other factors remaining the same.

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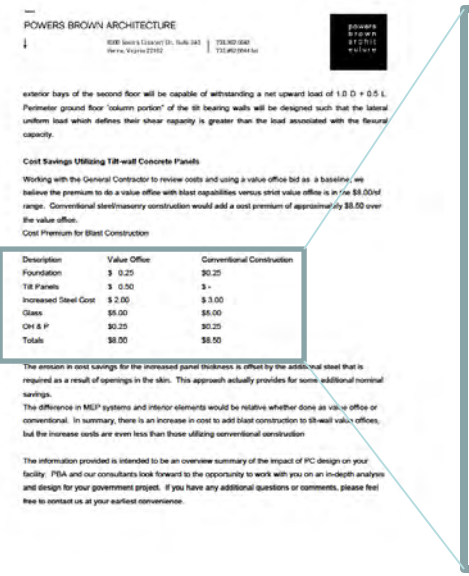
Subtotal	$39.99	$30.94

As you can see a $9.05/sf delta savings by going with an economical tiltwall system has a large impact on overall project costs. ($724,000 on an 80,000sf building shell)

Due to the lack of “real” data, we focused on components and materials that appeared to be the driver of most of the adaptations and modifications.



POWERS BROWN ARCHITECTURE

exterior bays of the second floor will be capable of withstanding a net upward load of 1.0 D + 0.5 L. Perimeter ground floor "column portion" of the tilt bearing walls will be designed such that the lateral uniform load which defines their shear capacity is greater than the load associated with the flexural capacity.

Cost Savings Utilizing Tilt-wall Concrete Panels

Working with the General Contractor to review costs and using a value office bid as a baseline, we believe the premium to do a value office with blast capabilities versus strict value office is in the $8.00/sf range. Conventional steel/masonry construction would add a cost premium of approximately $8.50 over the value office.

Cost Premium for Blast Construction

Description	Value Office	Conventional Construction
Foundation	$ 0.25	$0.25
Tilt Panels	$ 0.50	$ -
Increased Steel Cost	$ 2.00	$ 3.00
Glass	$5.00	$5.00
OH & P	$0.25	$0.25
Totals	$8.00	$8.50

The erosion in cost savings for the increased panel thickness is offset by the additional steel that is required as a result of openings in the skin. This approach actually provides for some additional nominal savings.

The difference in MEP systems and interior elements would be relative whether done as value office or conventional. In summary, there is an increase in cost to add blast construction to tilt-wall value offices, but the increase costs are even less than those utilizing conventional construction

The information provided is intended to be an overview summary of the impact of PC design on your facility. PBA and our consultants look forward to the opportunity to work with you on an in-depth analysis and design for your government project. If you have any additional questions or comments, please feel free to contact us at your earliest convenience.

cost premium for blast resistant construction*

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Tilt Panels	$ 0.50	-
Increased Steel	$ 2.00	$ 3.00
Glass	$5.00	$5.00
OH & P	$0.25	$0.25
Totals	**$8.00**	**$ 8.50**

We concluded two things- it appeared to be feasible…and that an actual test case was the only way to prove it.

Annapolis Junction – Lot 6

FBI Atlanta

3-story Value Office

Area *120,000*
Cost *8,400,000*
Completion *TBD*

Then we extended that research into progressive collapse & blast resistant tilt up

GOAL:

UNDERSTAND THE DETAILING AND COSTS TO UPGRADE A CONVENTIONAL VALUE OFFICE BUILDING TO MEET PROGRESSIVE COLLAPSE & BLAST RESISTANCE

COMPARATIVE

Sentry Gateway Building 100: a conventional “Value-Office” structure

designed by Powers Brown Architecture. Constructed in 2010 in San Antonio, Texas, the building includes:

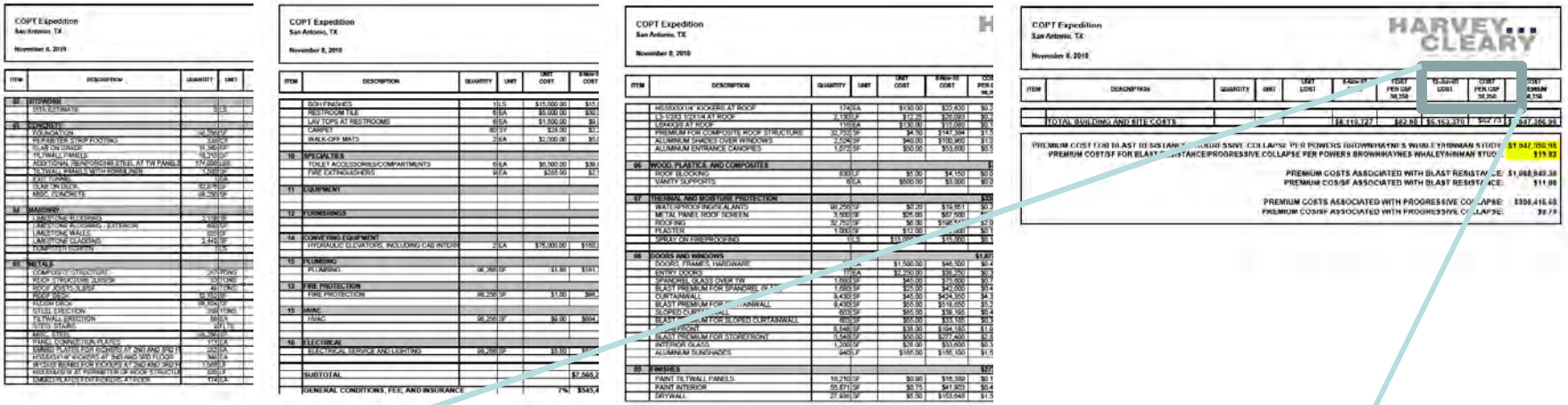
98,250 sf 3-Story value office
32,750 sf floor plate
30’ wide reinforced concrete tilt wall panels
punched aluminum storefront windows
curtainwall entry feature
composite steel and concrete floor deck
steel joist and metal deck roofing structure

The facility also incorporates functioning sunscreens at the storefront windows and is partially clad in Texas limestone at the front and back entry features. All parking is on-site and at grade.

The MEP systems are consistent with conventional office buildings and include blow-down roof top units. These systems do not impact the progressive collapse and blast requirements.

Costs

Based on actual construction costs, this core and shell building cost approximately **$6.2 million.**



12-Jun-09 COST	COST PER GSF
	98,256
$6,163,370	$62.73

For the same value office building to be designed to meet **Progressive Collapse and Blast Resistance** we need to describe the modifications and process**…**

…we actually had to calculate and engineer the modifications based upon a known entity.

Study Parameters

Progressive Collapse Analysis

UFC 4-023-03 (July 2010)
Occupancy Category III per UFC 3-301-01 (Jan 2010)

Blast-Resistance Analysis

Medium Level of Protection
Threats per UFC 4-010-01 (Jan 2007-2010)
Conventional Construction Standoff
148' to Perimeter
82' to Internal Parking

These parameters meet most stringent leasing requirement requests in local markets; therefore, if we meet these requirements, the building can be leased to any DoD entity.

Progressive Collapse Theory

Progressive Collapse is defined in the commentary of the American Society of Civil Engineers Standard 7 **Minimum Design Loads for Buildings and Other Structures** (ASCE 7) as

> *The spread of an initial local failure from element to element, eventually resulting in the collapse of an entire structure or a disproportionately large part of it.*
>
> ***Sustain local damage** with the structural system as a whole remaining stable and not being damaged to an extent disproportionate to the original local damage.*
>
> *Structures are designed to **limit the effects of local collapse** and to prevent or minimize progressive collapse.*

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Blast Resistance Theory

Medium Level of Protection
Threats per UFC 4-010-01 (Jan 2007)
Conventional Construction Standoff

148' to Perimeter
82' to Internal Parking

OC III Design Requirement
Two requirements must be satisfied: **Alternate Path** and **Enhanced Local Resistance**. The consequence of collapse is greater for this Occupancy Category, which also increases the probability of a deliberate attack.

Level of resistance to **loss of a column or wall** is provided by the Alternate Path method. Additional protection is provided by minimizing the likelihood of a non-ductile failure of the columns and walls at the building perimeter, in the first story above grade, through the Enhanced Local Resistance requirement.

Blast Resistance Theory

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Threats per UFC 4-010-01 (Jan 2007)
Conventional Construction Standoff

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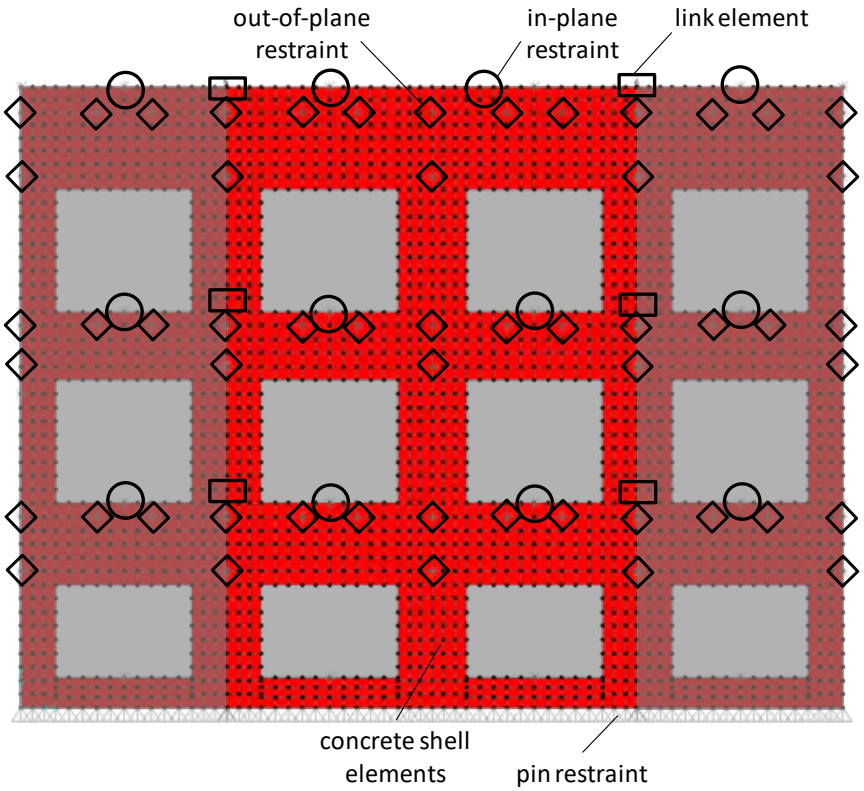
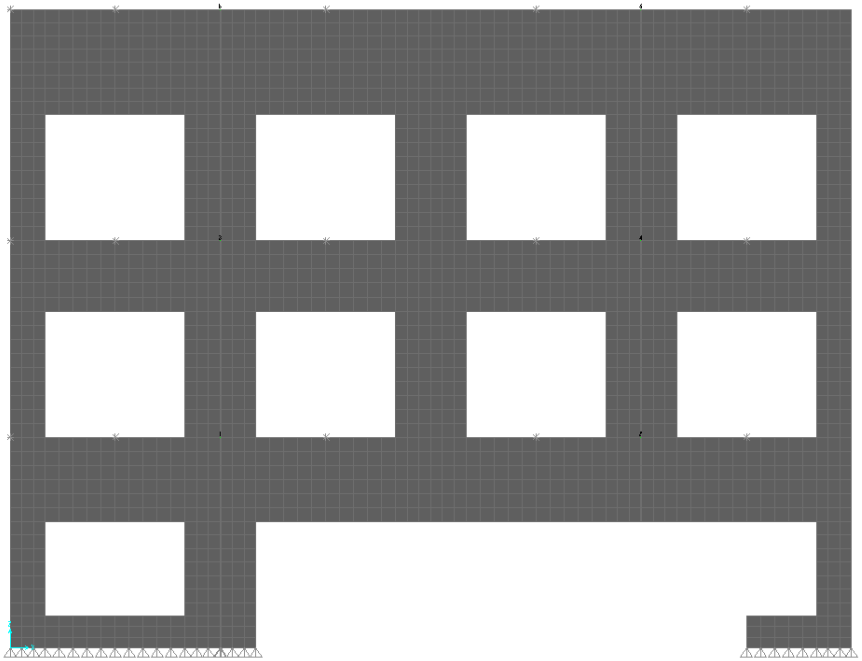
OUR **PROCESS…**



tilt-up wall model

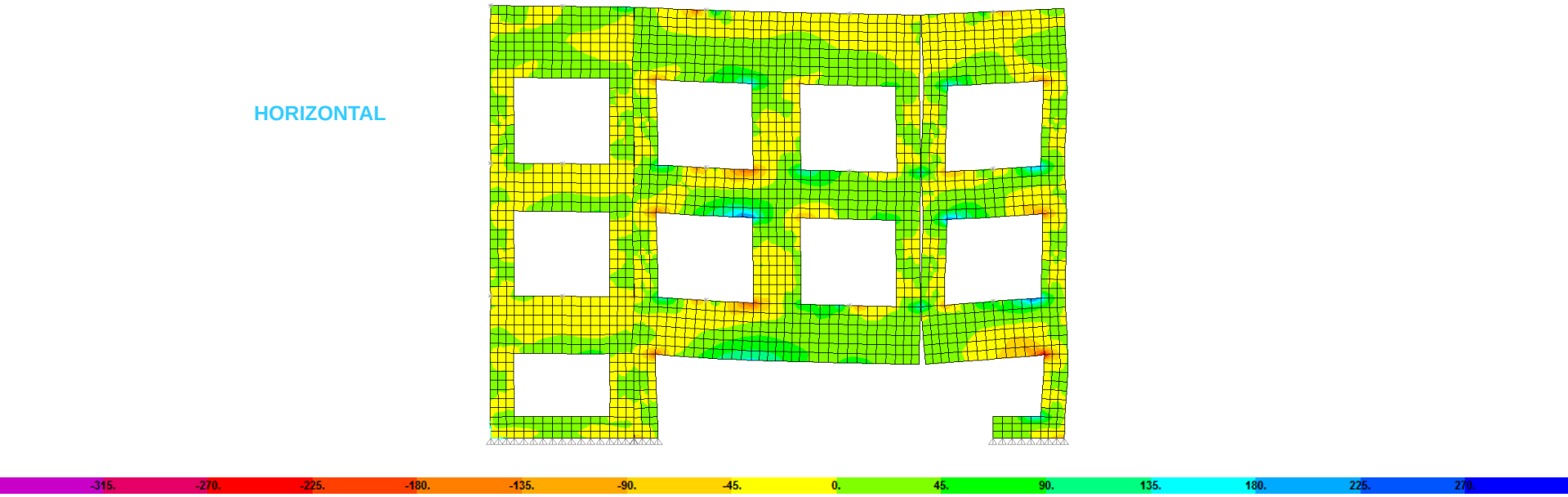
sketch of area removed



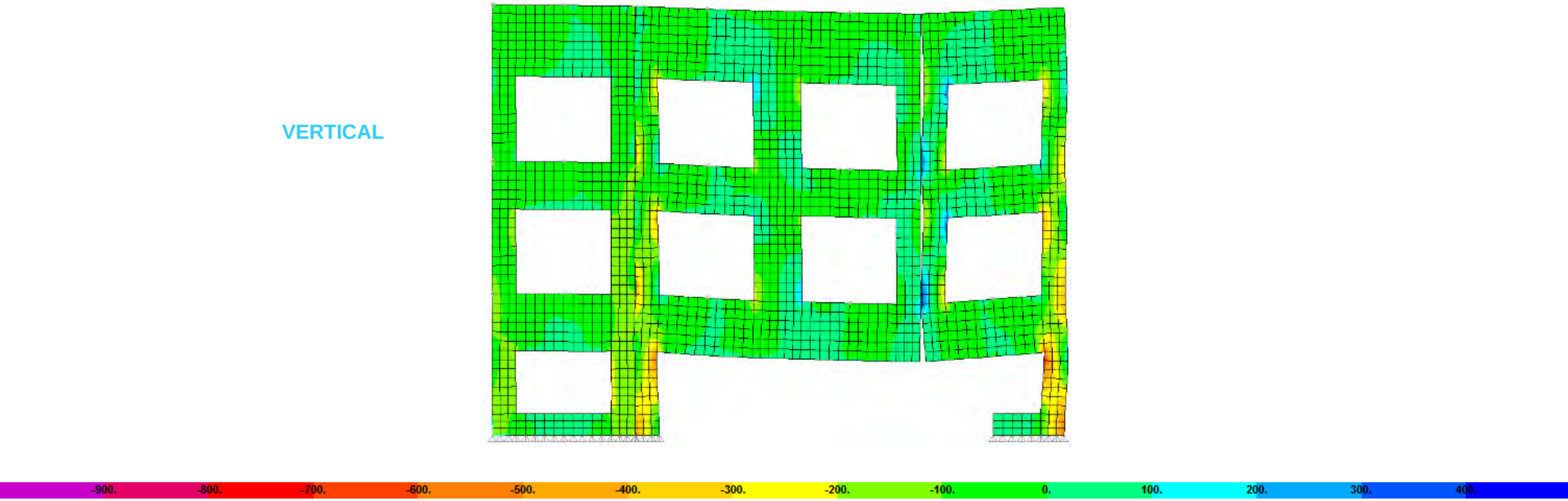
SCENARIO 1 *removal of 30' of wall across a panel joint*

wall panel shell stress and deflected shape (x100)

HORIZONTAL

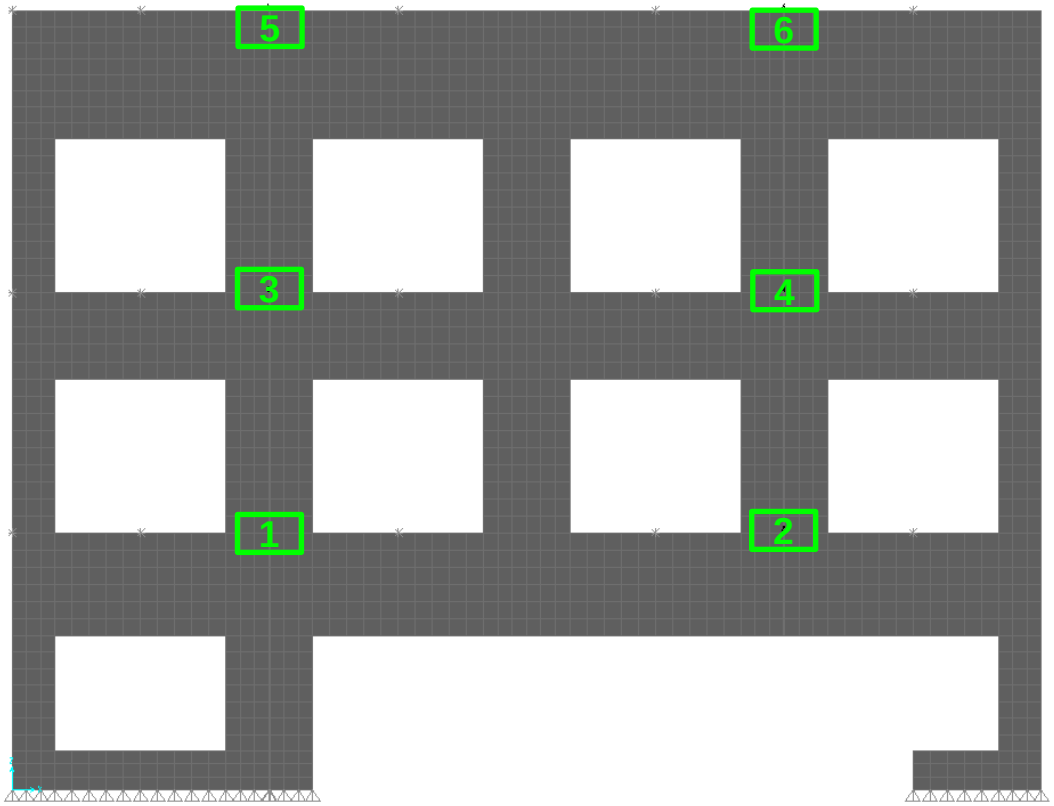


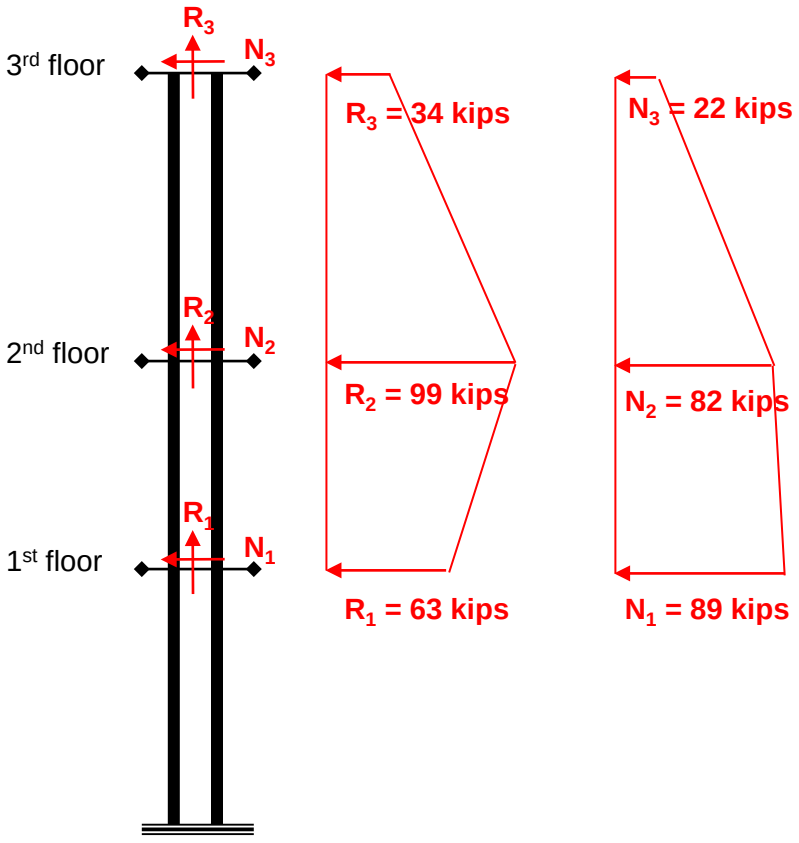
VERTICAL



SCENARIO 1 *removal of 30' of wall across a panel joint*

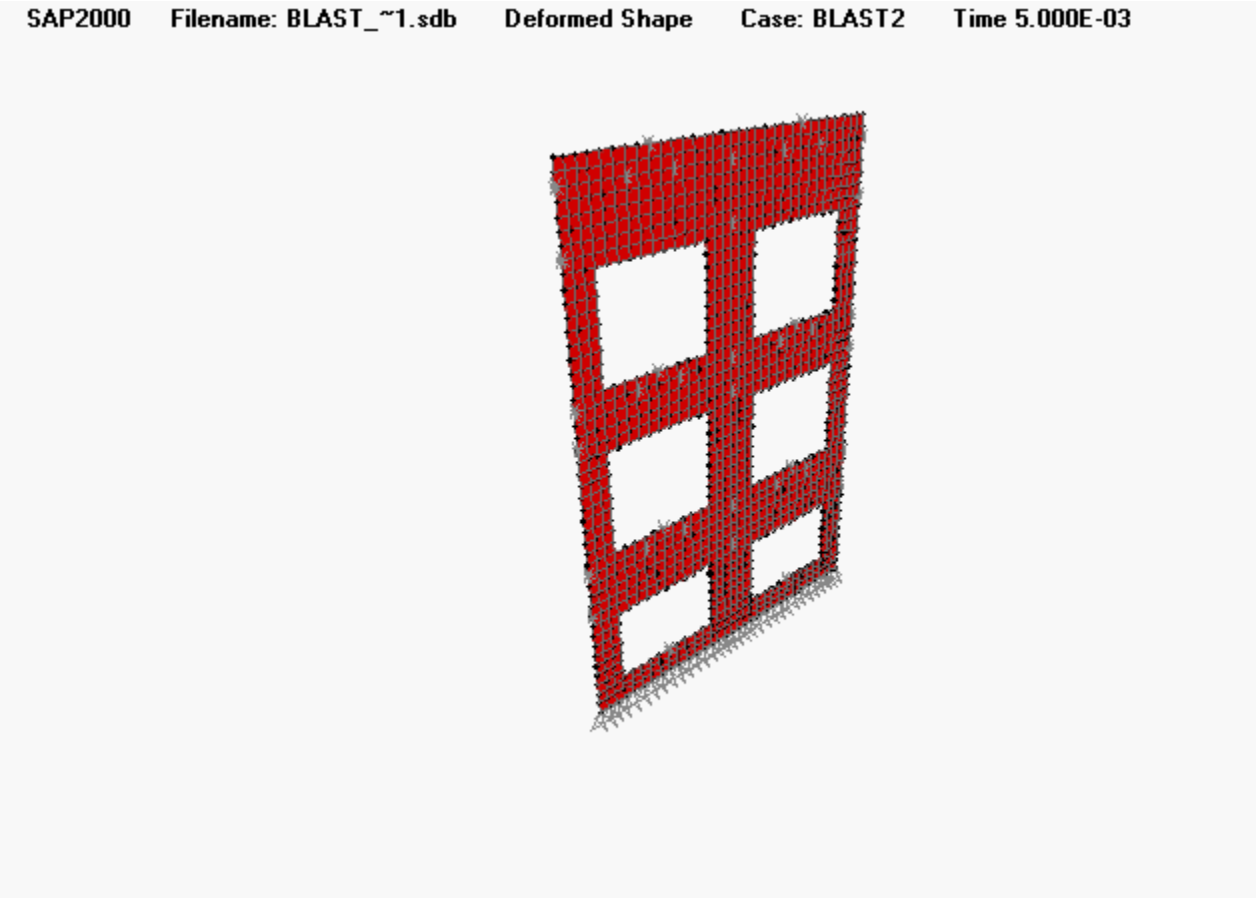
vertical and horizontal links





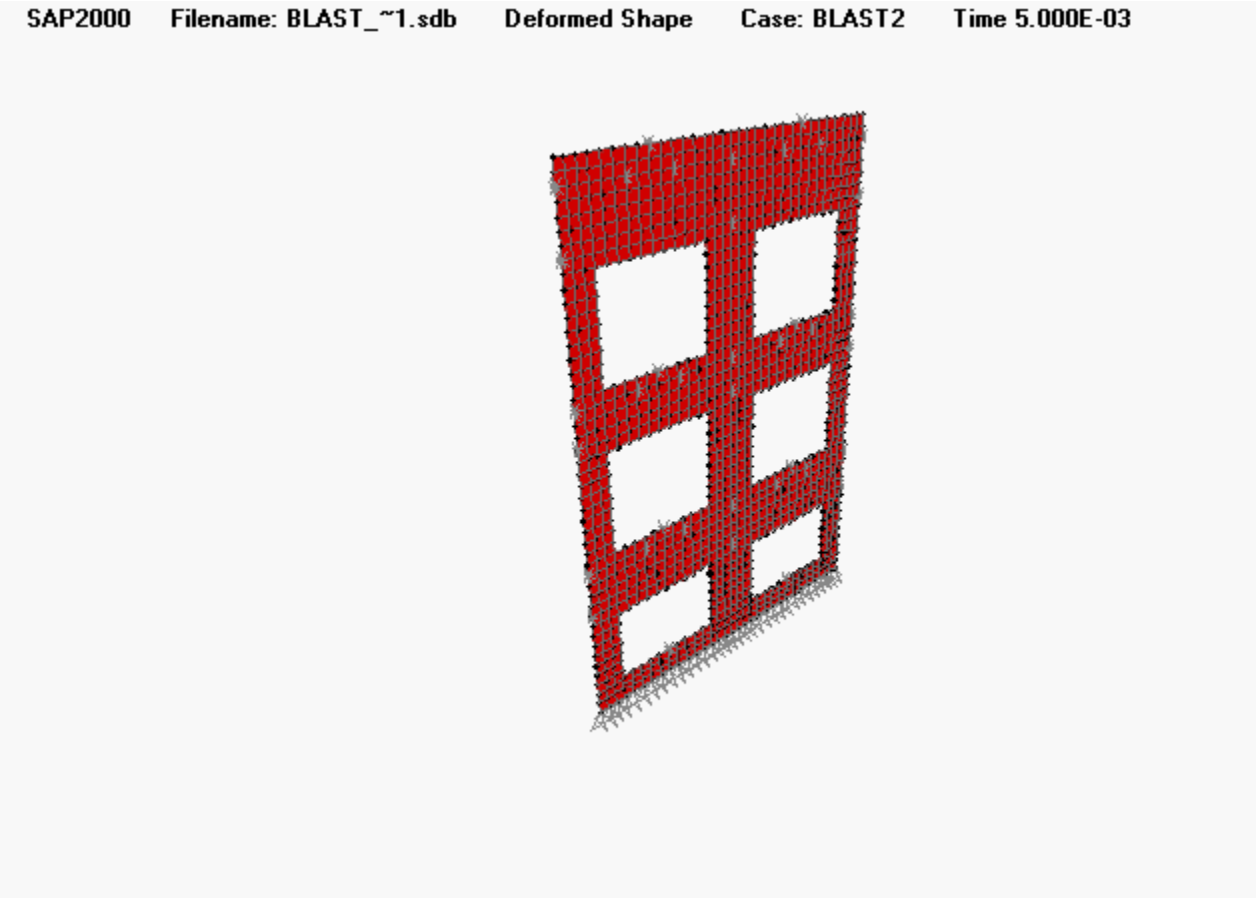
SCENARIO 1 *removal of 30' of wall across a panel joint*

deflected shape (x100)

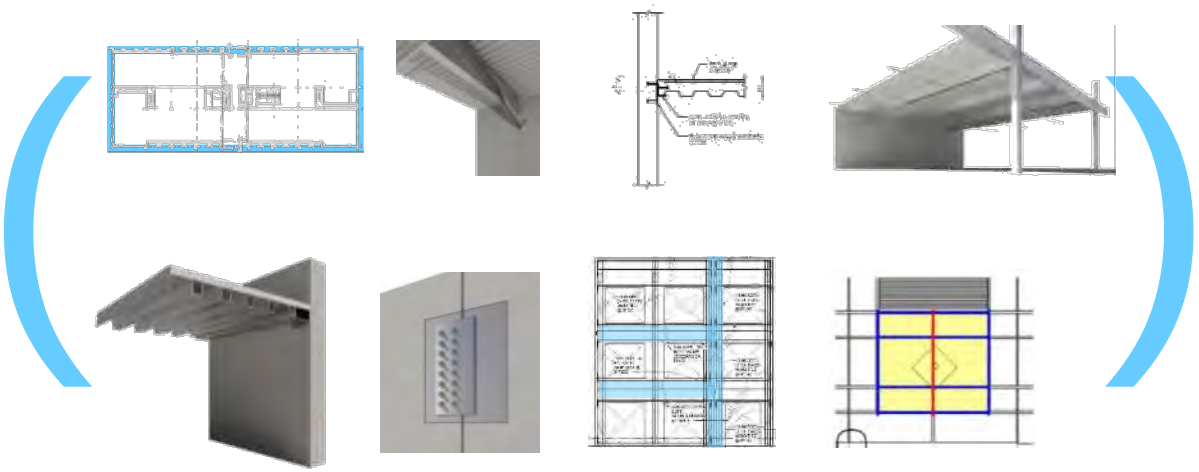


BLAST PERFORMANCE *of 30' of a single panel*

deflected shape (x100)



BLAST PERFORMANCE *of 30' of a single panel*



= $19

premium

COPT Sentry
San Antonio, TX

November 8, 2010

HARVEY CLEARY
Innovation, Quality, Integrity

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST	8-Nov-10 COST	COST PER GSF 98,256	12-Jun-09 COST	COST PER GSF 98,256	COST PREMIUM 98,256
	TOTAL BUILDING COSTS				$8,110,727	$82.55	$6,163,370	$62.73	$1,947,356.95

PREMIUM COST FOR BLAST RESISTANCE/PROGRESSIVE COLLAPSE PER POWERS BROWN/HAYNES WHALEY/HINMAN STUDY: $1,947,356.95
PREMIUM COST/SF FOR BLAST RESISTANCE/PROGRESSIVE COLLAPSE PER POWERS BROWN/HAYNES WHALEY/HINMAN STUDY: $19.82

PREMIUM COSTS ASSOCIATED WITH BLAST RESISTANCE: $1,088,940.30
PREMIUM COS/SF ASSOCIATED WITH BLAST RESISTANCE: $11.08

PREMIUM COSTS ASSOCIATED WITH PROGRESSIVE COLLAPSE: $858,416.65
PREMIUM COS/SF ASSOCIATED WITH PROGRESSIVE COLLAPSE: $8.74

This research was recently published in

The Construction Specifier, August 2011

Protective Design Center (PDC)
Army's center of expertise for engineering services related to force protection and protection design

Lead developer and resources of Security Related UFC Documents

To date, the Progressive Design Council (PDC) has taken no objection to the research.

And we discovered that a 300+ ton crane was required to do this government work- usually at a cost of less than $1 per square foot


LIEBHERR

AJBP 7 / 8

4-story Value Office

Area *126,400 SF*
Cost *$85/SF*
Completion *2013 / 2014*

So- we applied this thinking of 30’ panels to our 3 story wheel house market-and created a mini boom with the 25’ glass line…

3- story 30’ wide panel
And no 300 ton crane….at first…

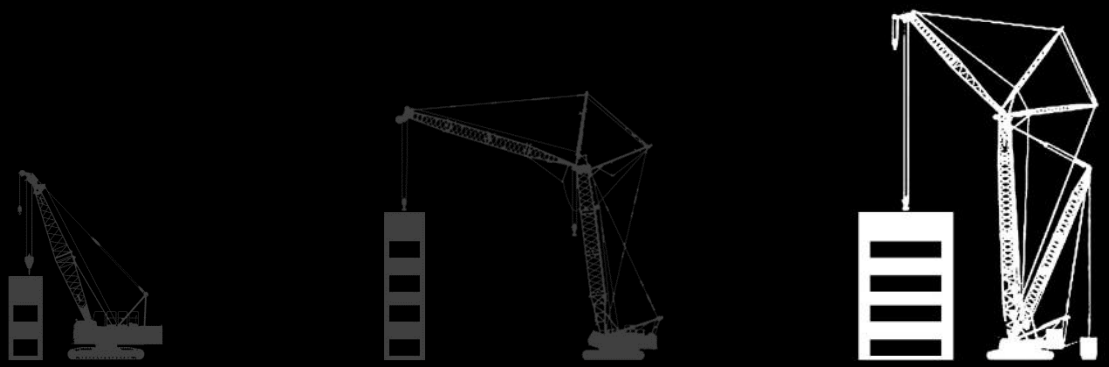

Texas Instruments


Wallis State Bank

typical tilt wall *column-free exterior walls*

Then we speculated about 30’ wide 4 story panels in the “normal” market- they reproduced the exact glassline of pre-cast and curtainwall….

4- story 30’ wide panel- which kicked in that 300 ton crane. Which it turns out is no additional cost in many markets….



Connection Park

3.5-story Value Office

Area *146,471 SF*
Cost *TBD*
Completion *TBD*

CORE Parkway Central

CORE Parkway Central

WestGate 1, 2 and 3

MMHS MOB

4-story Value Office

Area *102,000 SF*
Cost *$8,845,517*
Completion *Spring 2015*

Dow Lake Jackson OB

4-story Value Office

Area *240,000 SF*
Cost *$21,804,263*
Completion *May 2015*

Milestone Parkway

4-story Value Office

Area *120,000 SF*
Cost *$8,400,000*
Completion *TBD*

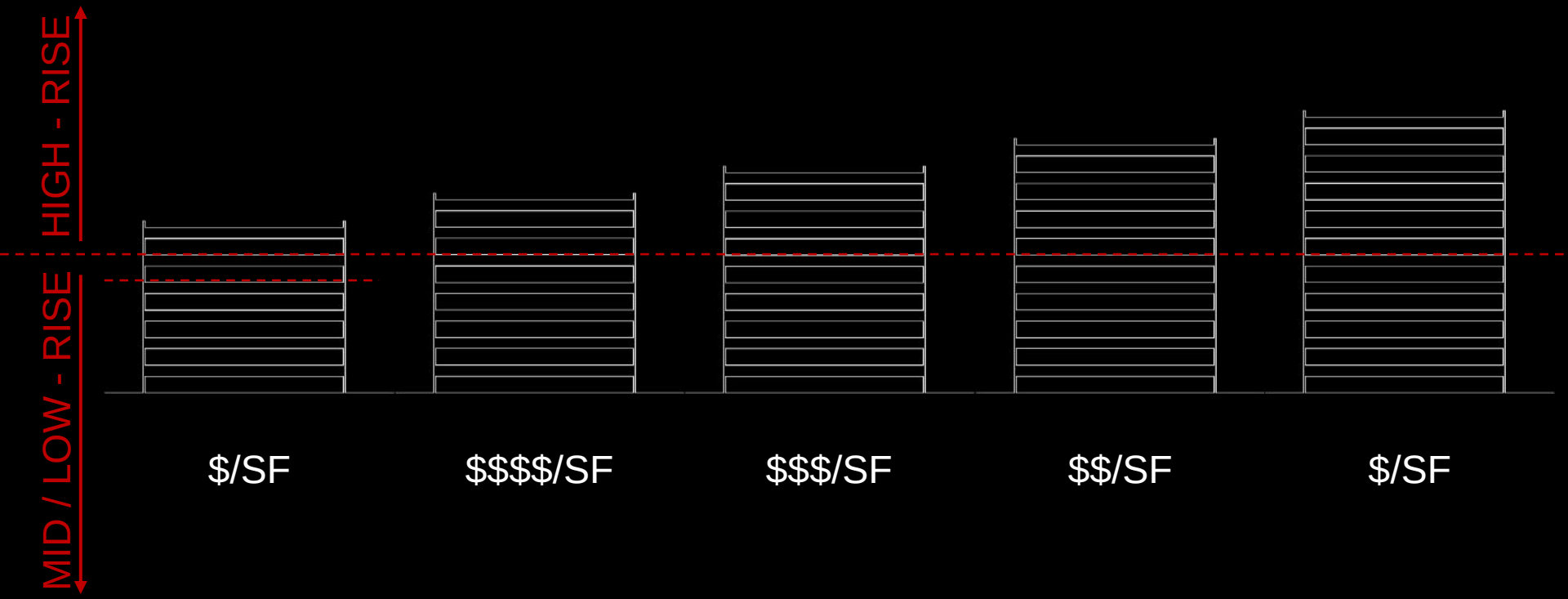
Everson Development

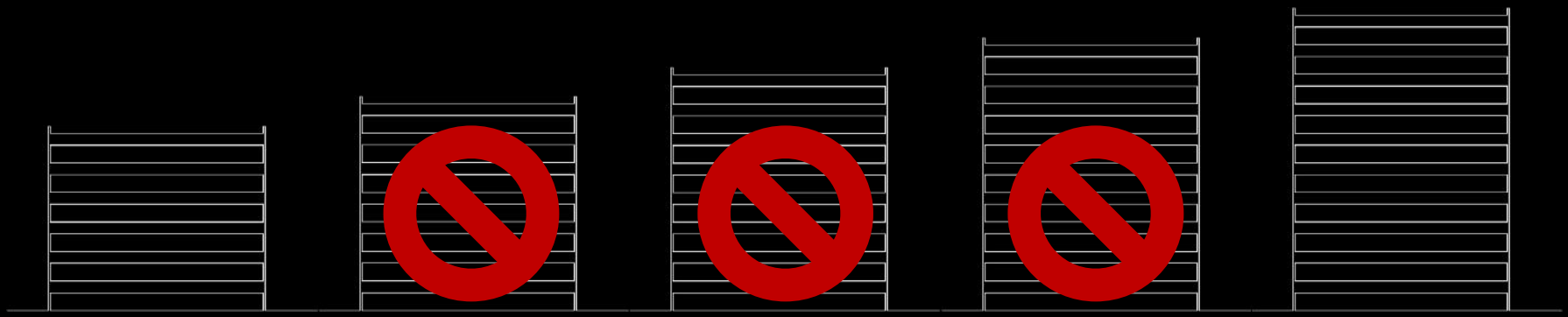
4-story Value Office

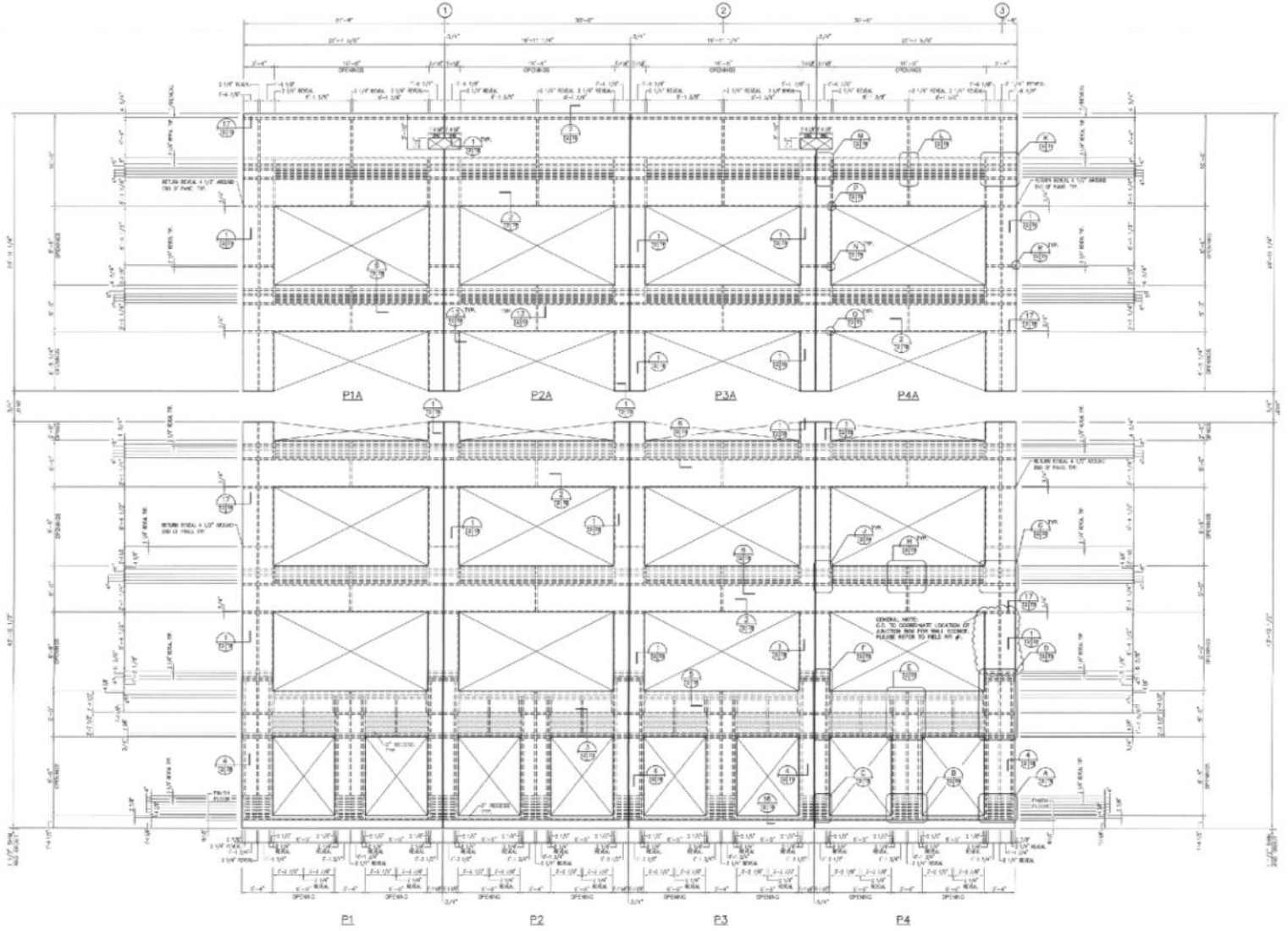
Area *240,000 SF*
Cost *TBD*
Completion *TBD*

powers
brown
archit
ecture

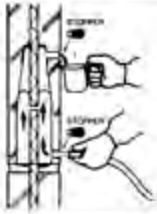
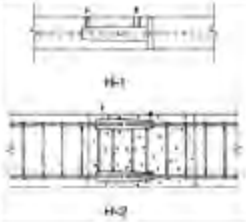
The speculative developer office market has a gap from 6 stories to 10 stories- created by the high-rise code costs. So at 4 stories, we were leaving 2 on the table….

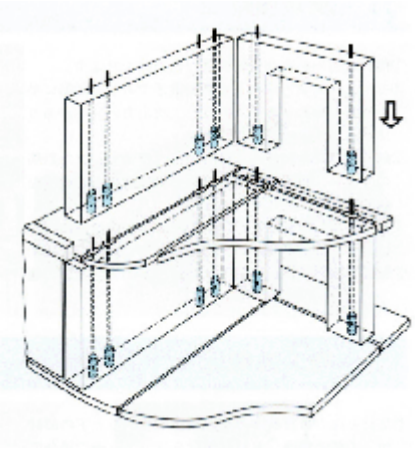

HIGH - RISE
MID / LOW - RISE
$/SF
$$$$/SF
$$$/SF
$$/SF
$/SF


$/SF
$$$$/SF
$$$/SF
$$/SF
$/SF



Large Opening Panel

SYSTEM	PRE-GROUT™ PRE	POST-GROUT™ PG	HORIZONTAL H-1 & H-2
OPERATION			



How It Works

5- story 30’ wide panel
4 +1 stack
60’ wide top panel

WestGate 1, 2 and 3

typical tilt wall *column-free exterior walls*

WestGate 1, 2 and 3

WestGate 1, 2 and 3

Stream Greenhouse

Stream Greenhouse

Legacy at Fallbrook

5-story Value Office

Area *218,250 SF*
Cost *$16,368,750*
Completion *May 2015*

Legacy at Fallbrook

Westway Plaza

5-story Value Office

Area *323,921 SF*
Cost *$26.4 Million*
Completion *Fall 2015*

6- story 25-35’ wide panel
4 +2 stack

Sierra Pines II

Sierra Pines II

Sierra Pines II

6-story Value Office

Area *162,181 SF*
Cost *$18,000,000*
Completion *December 2014*

Sierra Pines II

Katy Ranch Crossing

6-story Value Office

Area *157,497 SF*
Cost *$12,000,000*
Completion *TBD*

Memorial Herman Cypress

6-story Value Office

Area *157,497 SF*
Cost *$12,000,000*
Completion *TBD*

Confidential

6-story Value Office

Area *252,000 SF*
Cost *TBD*
Completion *TBD*

Explainer

Here I am segueing to how we expanded the notion of **height** in tilt wall, from office buildings, to other building types tilt wall as a technology had already made a foray into but not achieved maximized potential on.

E X C U R S U S

Step 1 – lets look at the one building type that for one reason or another (there are very real reasons) has been at the fore front of driving load bearing tilt wall to “unprecedented heights”….

Step 2- lets just take a quick tour of the inventory of building types that or which have been undertaken with the tilt wall method….

Industrial / Manufacturing-86

Religious-24

Libraries-4

Municipal-33

Government-4

Shopping / retail / Entertainment-95

Museums-4

Art / Cultural /Infrastructure-5

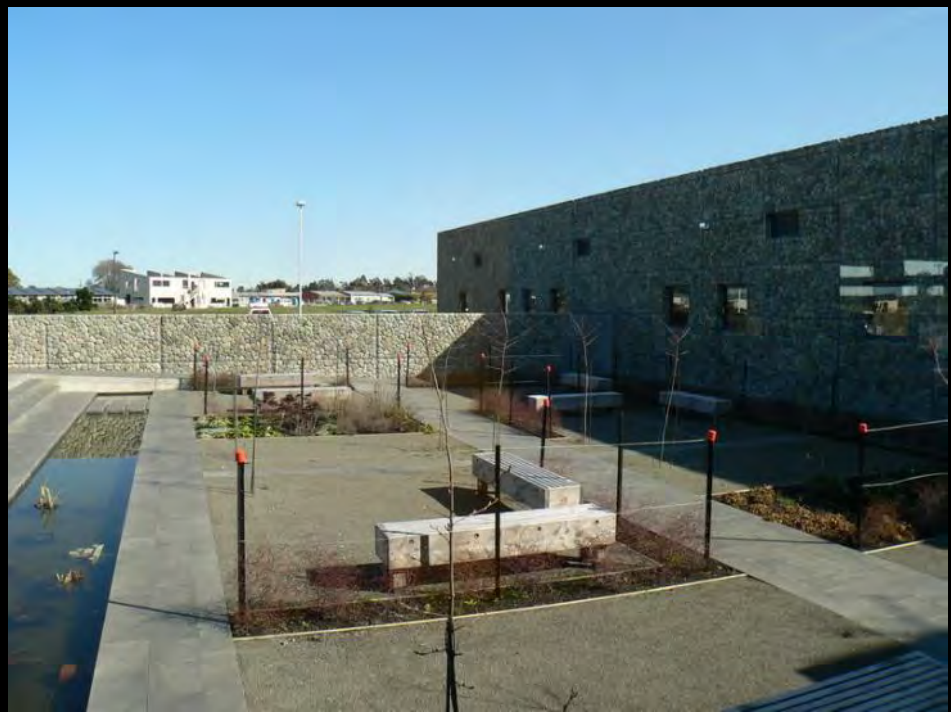
Sports-5

Education, Hospitality, Housing

RELIGIOUS:
CHAPEL OF ST. IGNATIUS
STEVEN HOLL ARCHITECTS

LIBRARY:
WHITE TANK BRANCH LIBRARY & NATURE CENTER
DWL ARCHITECTS + PLANNERS

MUNICIPAL:
SELWYN DISTRICT COUNCIL HQ
ATHFIELD ARCHITECTS



GOVERNMENT:

SOCIAL SECURITY ADMINISTRATION

OFFICE OF DISABILITY ADJUTICATION AND REVIEW

RETAIL:
TOWN CENTRE AT LAUREL

MUSEUM:
SLAM - NEW EAST BUILDING
DAVID CHIPPERFIELD
ARCHITECTS

ART / INFRASTRUCTURE:
GENERATION PARK
OBSERVATION TOWER

INFRASTRUCTURE:
1800 MILITARY TRAIL PARKING GARAGE

Manufacturing

INDUSTRIAL:
BAY AREA BUSINESS PARK

SPORTS:
TRITON BALLPARK AND MARYE ANNE FOX CLUBHOUSE
GENSLER

EDUCATION:
LONE STAR COLLEGE ENERGY AND MANUFACTURING INSTITUTE
HUITT-ZOLLARS

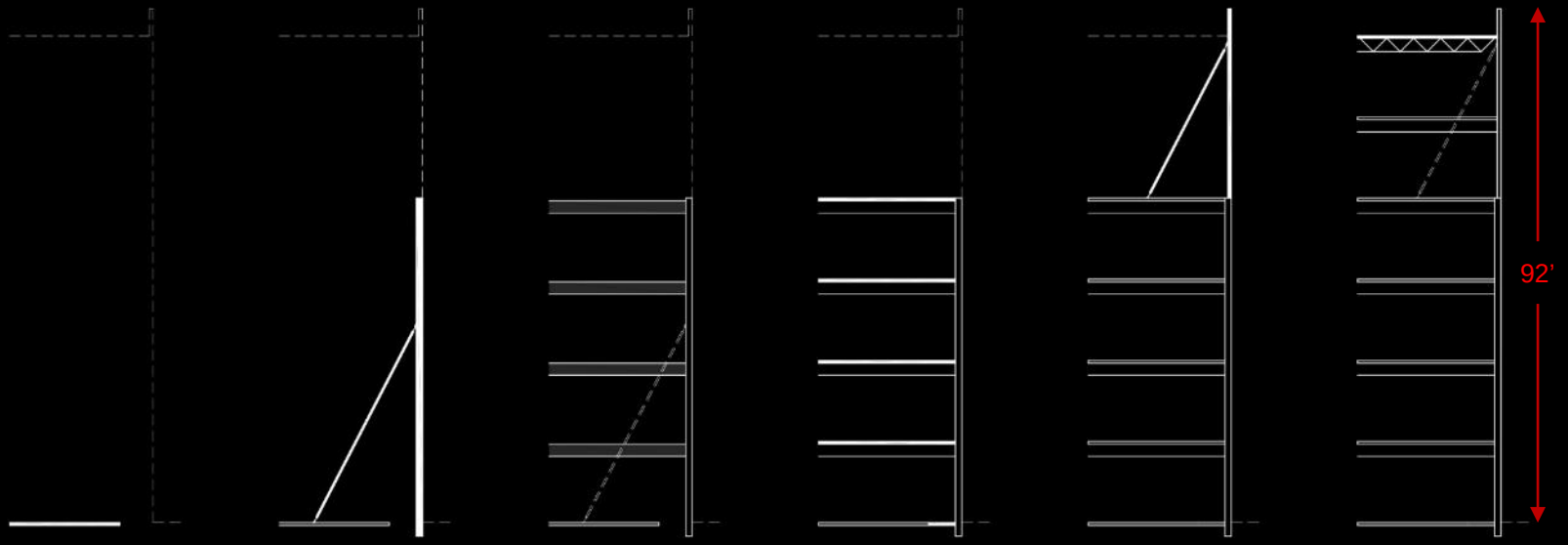
HOSPITALITY:
EMBASSY SUITES LOS MARLINS

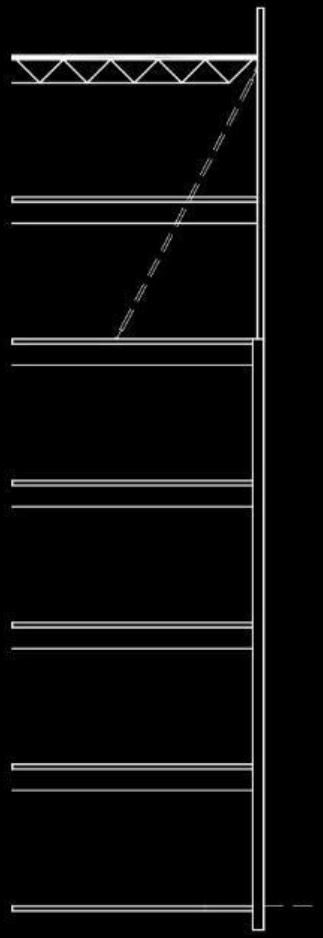
HOUSING:
PLANAR HOUSE
STEVEN HOLL ARCHITECTS

Step 1 – lets look at the one building type that for one reason or another (there are very real reasons) has been at the fore front of driving load bearing tilt wall to “unprecedented heights”….

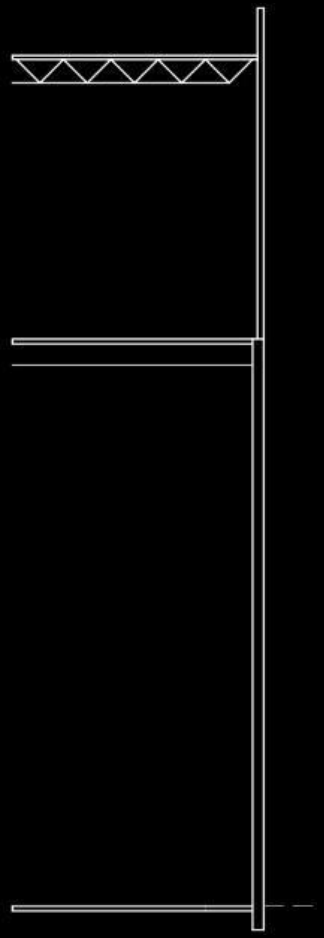
Step 2- lets just take a quick tour of the inventory of building types that or which have been undertaken with the tilt wall method

Step 3- lets speculate about how exploiting the newfound achievable heights in office may apply to different building types and problems…

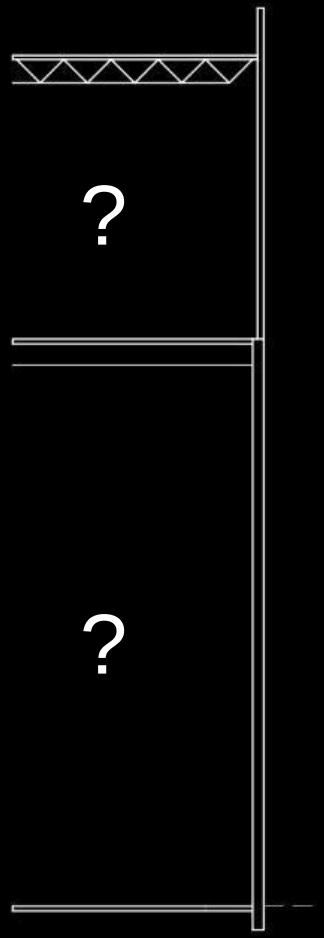

92’



Type office building
wall section



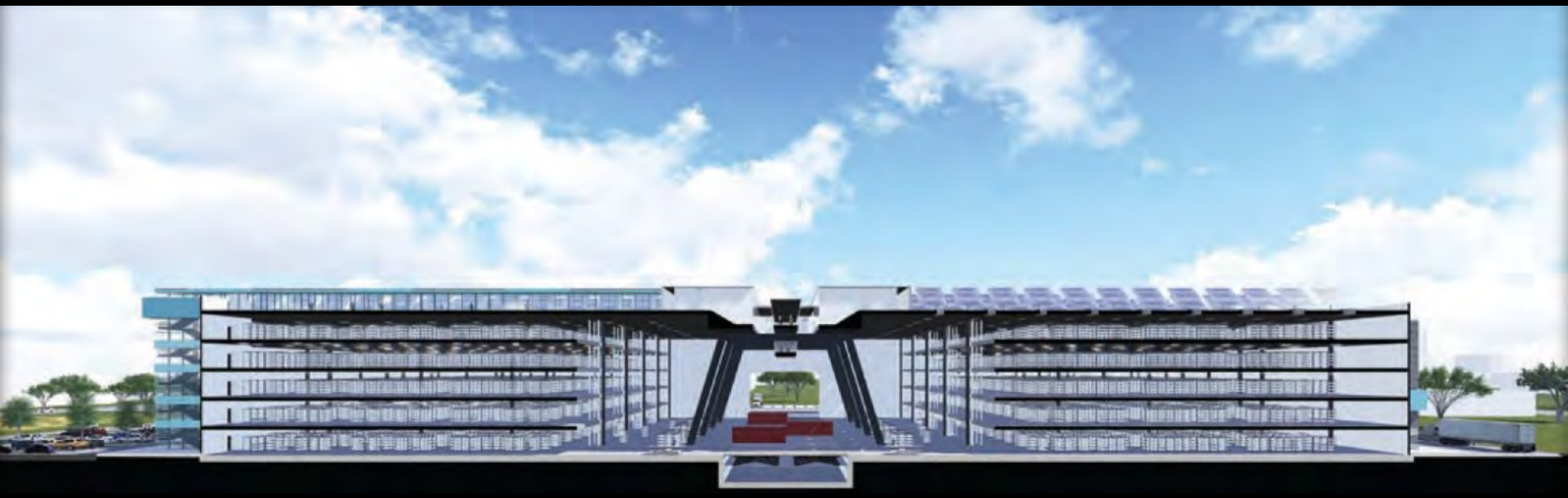
Elements required for
constructability



Now what are the possibilities?

Industrial-86

INDUSTRIAL:
NAIOP DISTRIBUTION CENTER OF THE FUTURE COMPETITION WINNER
WARE MALCOMB



powers
brown
architecture

powers
brown
architecture

Manufacturing-86

MANUFACTURING:
ADVANCE POLYBAG

Education- k-12 and higher ed- use Klein and UH Lab

Klein HS 5 Competition

KLEIN COLLINS HS CAMPUS

65 ACRES

330,000 SF FOOTPRINT

27.7% IMPERVIOUS AREA

KLEIN HS CAMPUS

45 ACRES

368,000 SF FOOTPRINT

28% IMPERVIOUS AREA

KLEIN OAK HS CAMPUS

64 ACRES

300,907 SF FOOTPRINT

25% IMPERVIOUS AREA

KLEIN FOREST HS CAMPUS

49 ACRES

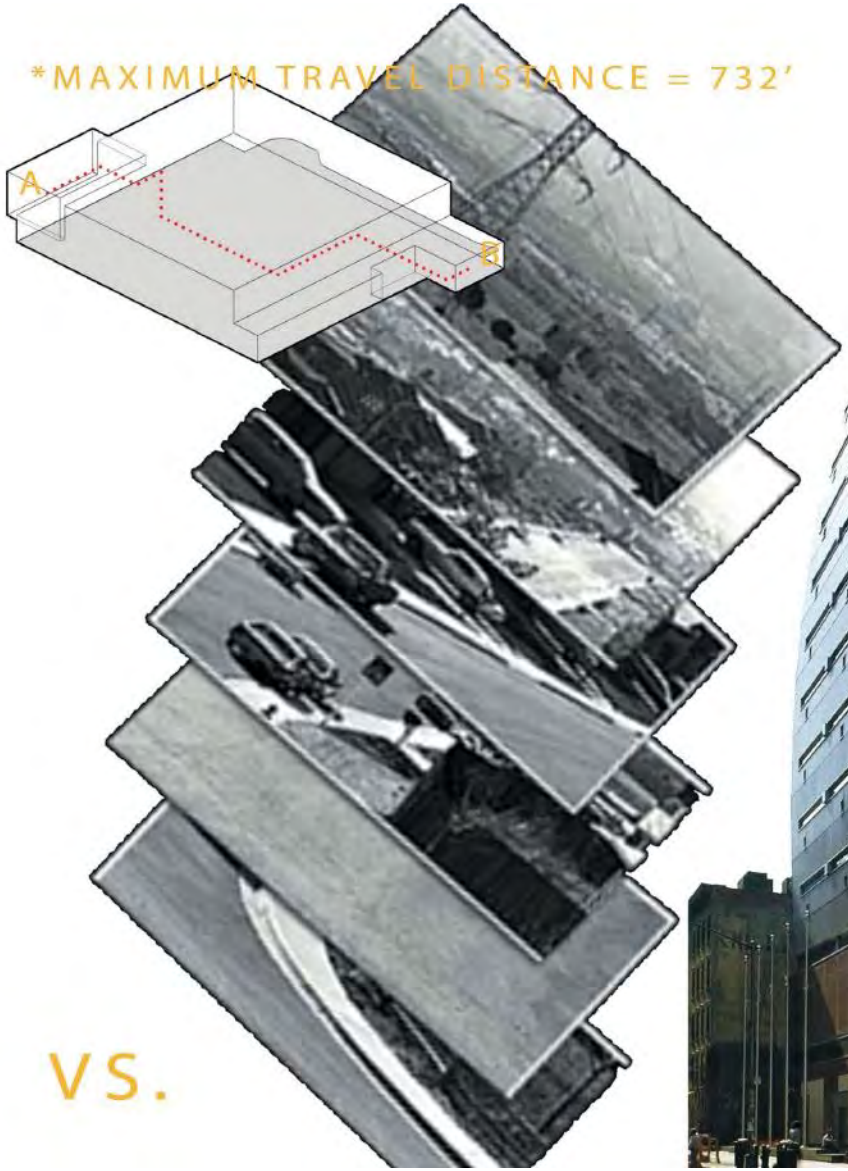
251,410 SF FOOTPRINT

31% IMPERVIOUS AREA

CURRENTLY, CAMPUSES TELL US: "WE NEED MORE LAND!"

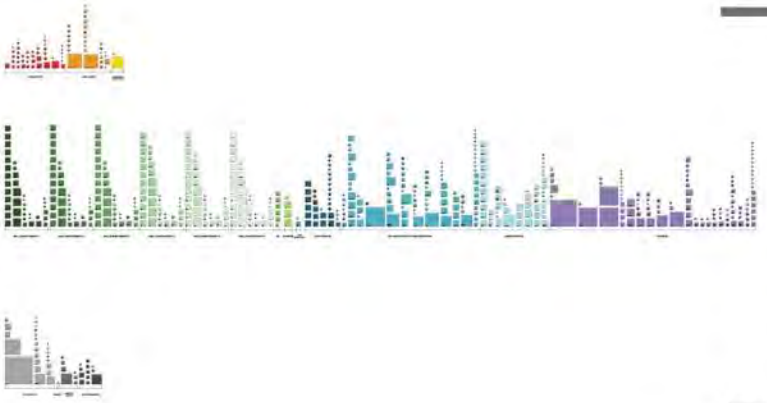
*ALL CAMPUS STATISTICS ARE APPROXIMATIONS

*MAXIMUM TRAVEL DISTANCE = 732'



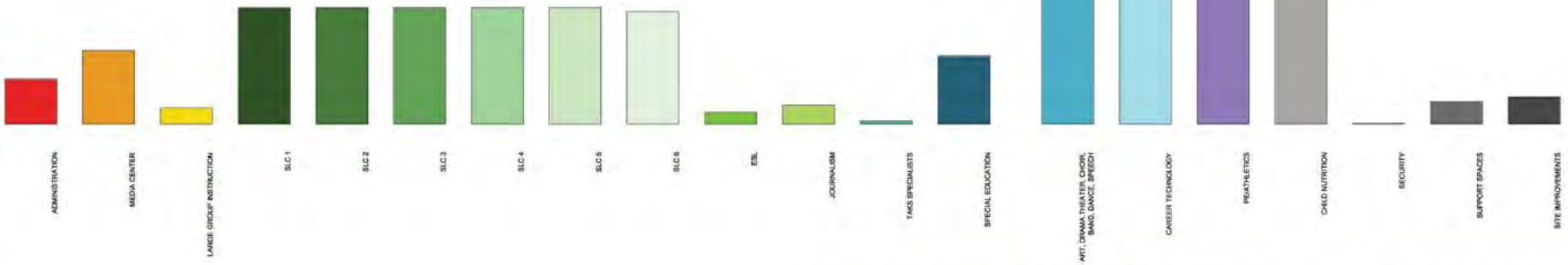
VS.

COMPACT



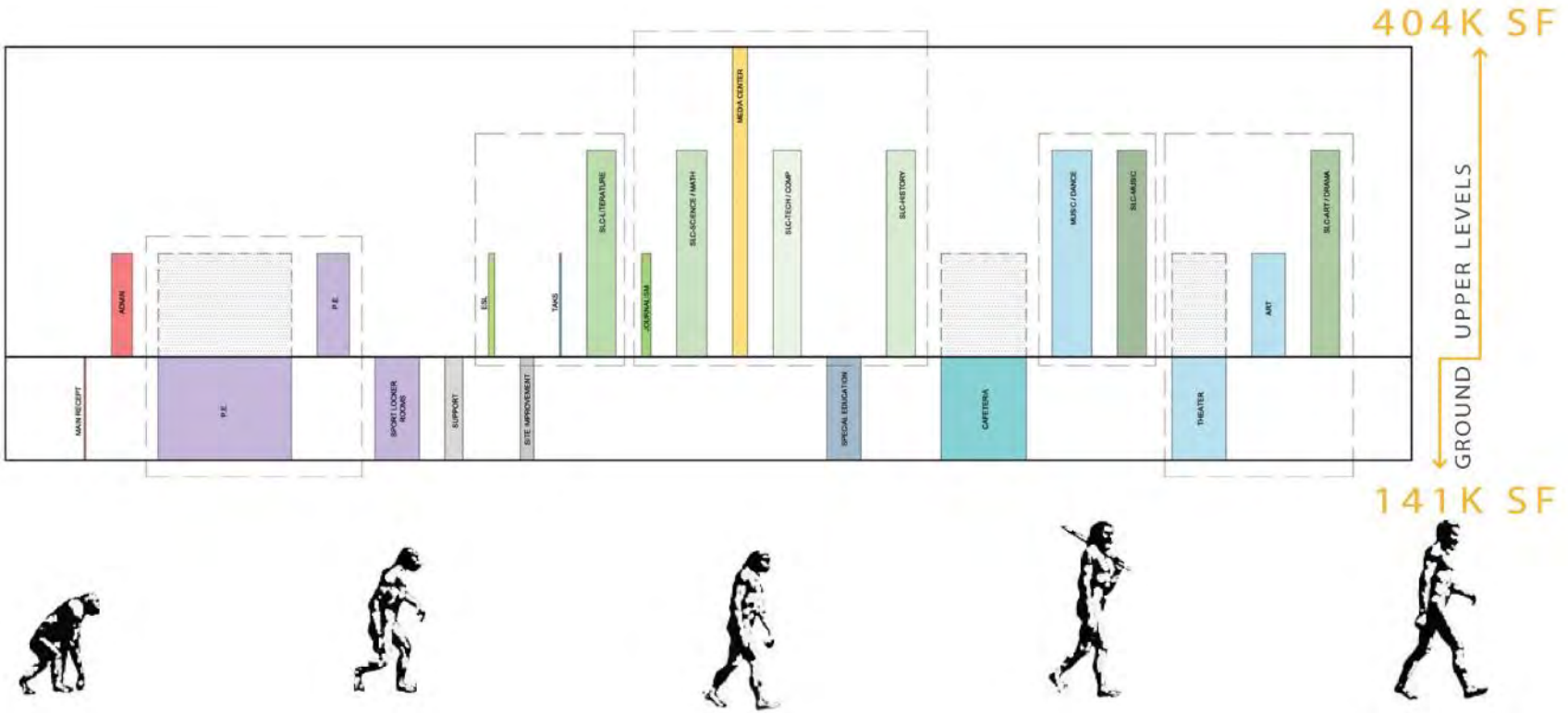
(PROVIDED DRAFT PROGRAM FOR HIGH SCHOOL NO. 5)

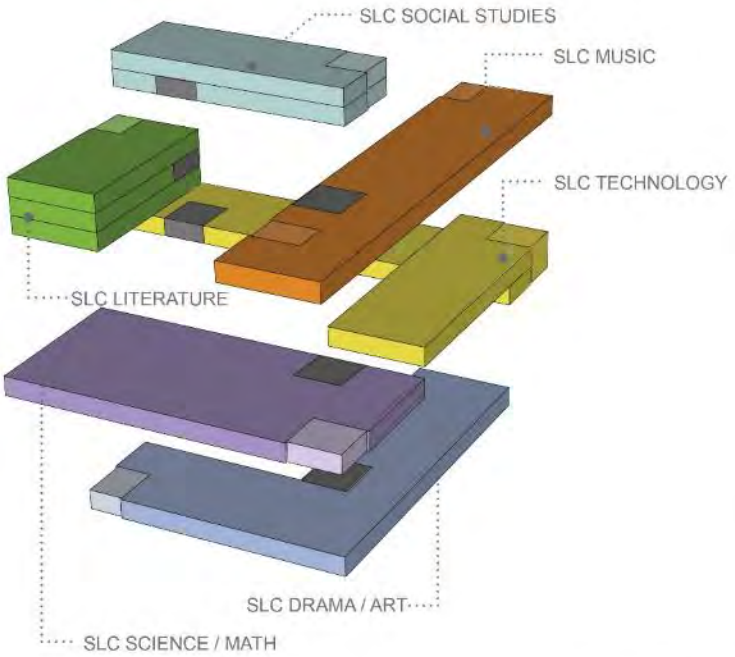
PROGRAM SUMMARY:

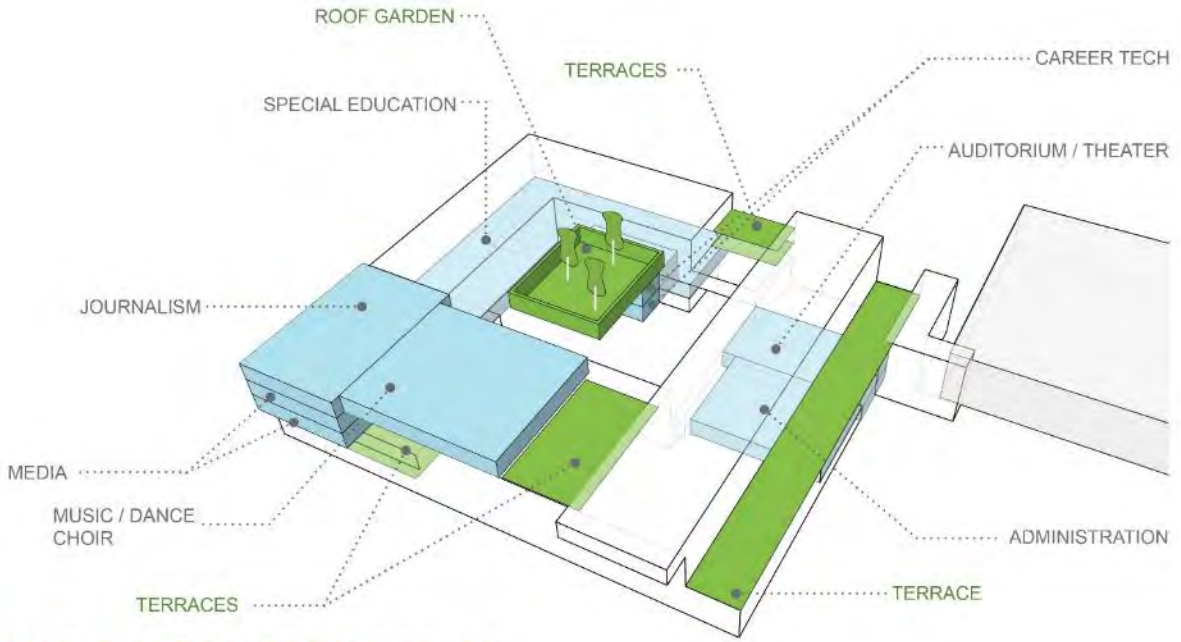


(WE BEGAN BY EXAMINING THE PROGRAM)

IS THE SAME OLD FORM INHERENT IN THE "DNA", OR CAN IT EVOLVE / MUTATE IN NEW WAYS TO ADAPT TO THE CHANGING EDUCATIONAL ENVIRONMENT?

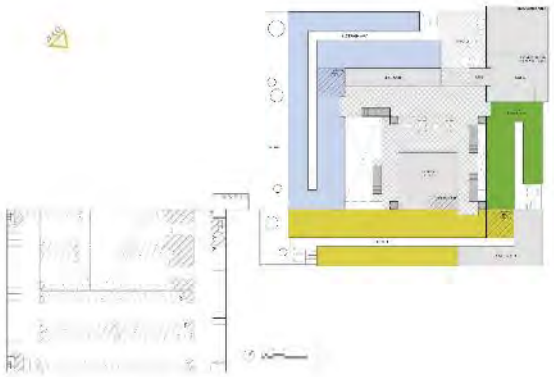






MIXTURES OF INDEPENDENCE AND INTERDEPENDENCE.

FLOOR PLAN: LEVEL 05



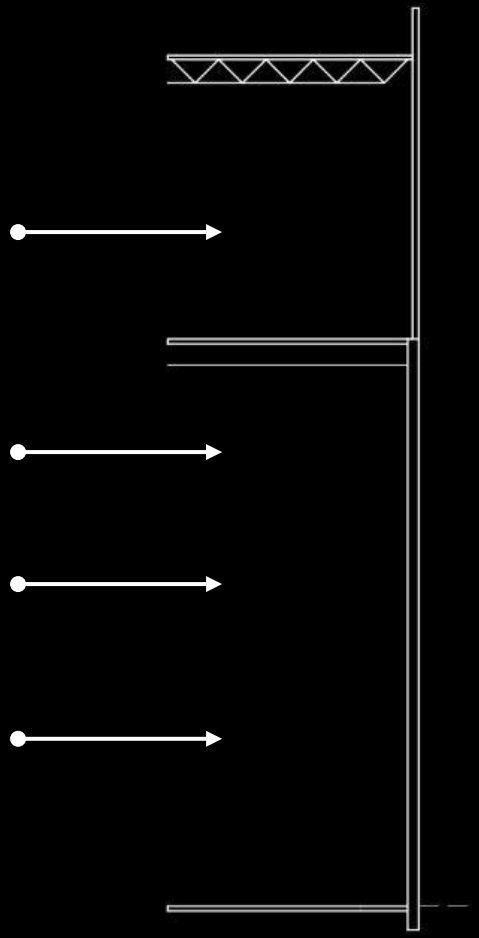
FLOOR PLAN: LEVEL 03

FLOOR PLAN: LEVEL 04

FLOOR PLAN: LEVEL 02

FLOOR PLAN: LEVEL 01

CASE STUDY: KLEIN I.S.D HIGH SCHOOL NO. 5




slc music
slc tech
slc drama / art
slc math / science
slc literature
cafe
gyms
special education
administration
gym lockers
gym lobby
atrium
cafeteria
4
3
2
1


slc music
slc tech
slc drama / art
slc math / science
slc literature
cafe
gyms
special education
administration
gym lockers
gym lobby
atrium
cafeteria
6
5
4
3
2
1

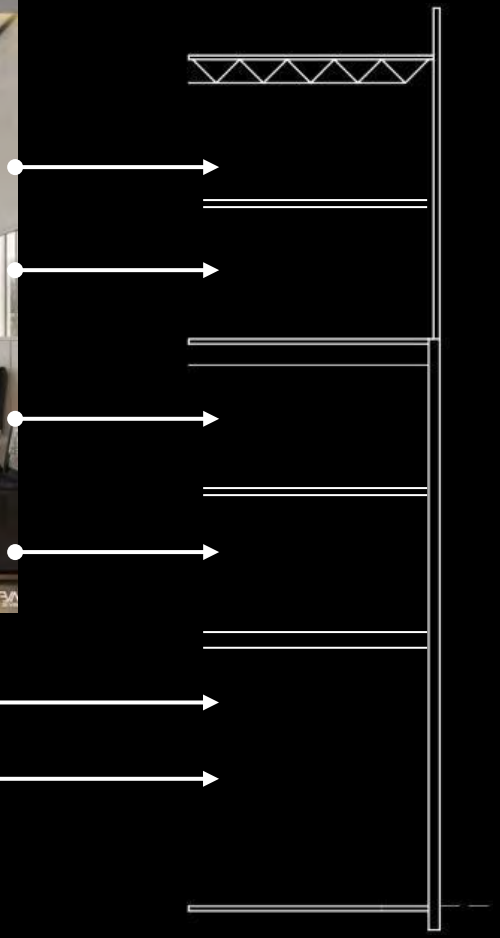
CASE STUDY: KLEIN I.S.D HIGH SCHOOL NO. 5

34.8 ACRES

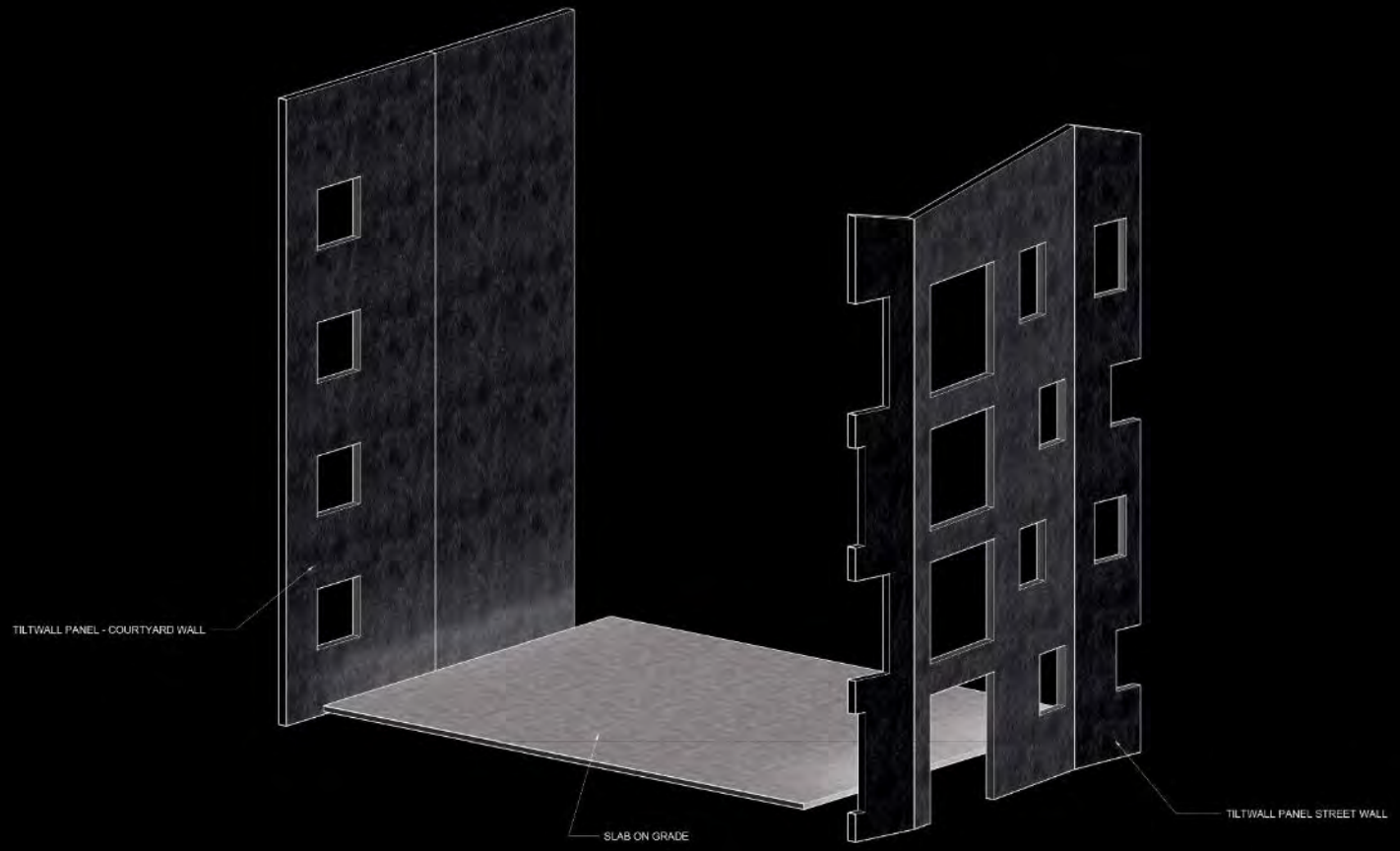
CASE STUDY: KLEIN I.S.D HIGH SCHOOL NO. 5

Housing- East River

CASE STUDY: EAST RIVER MULTI-FAMILY

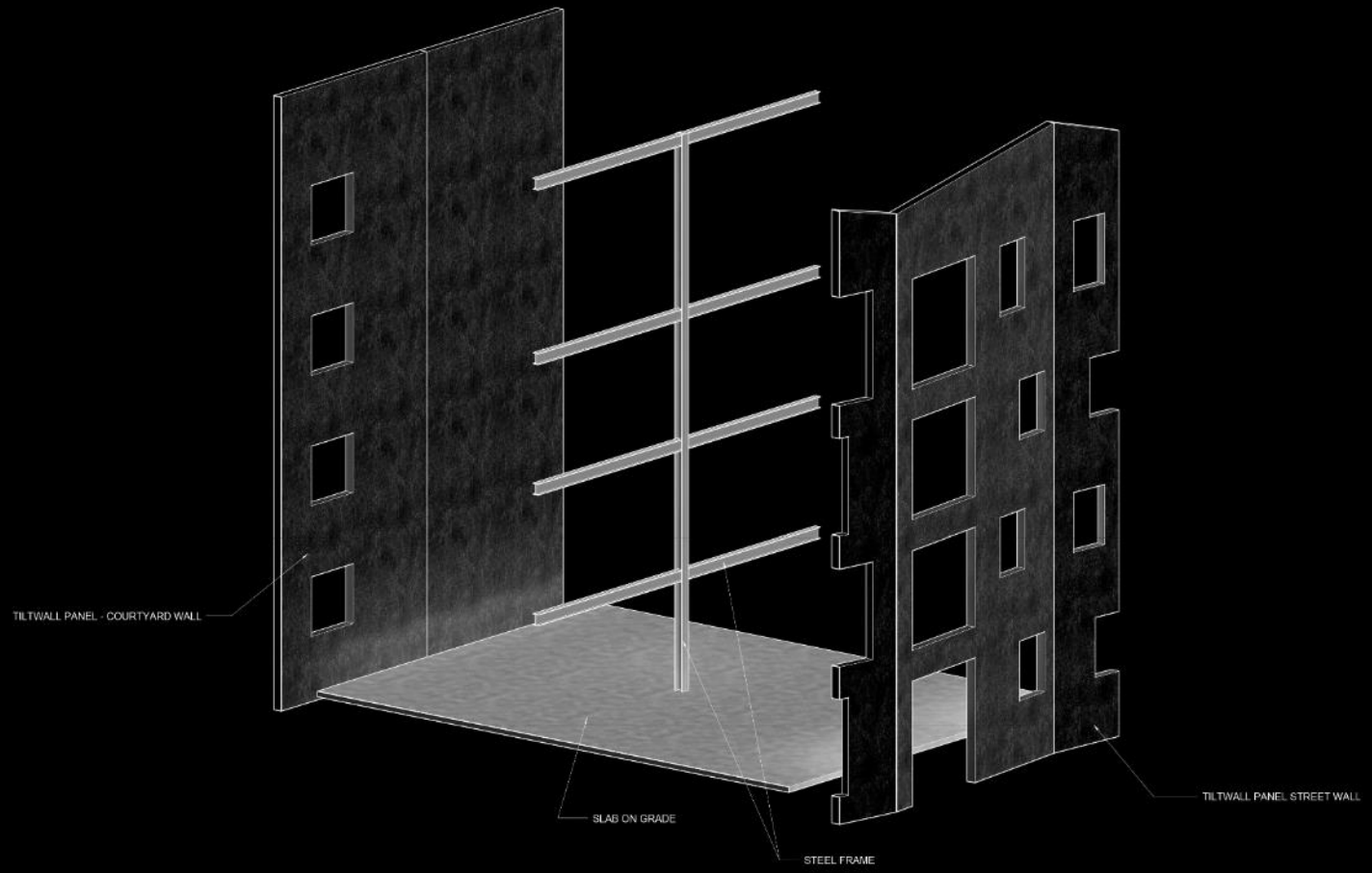


CASE STUDY: EAST RIVER MULTI-FAMILY



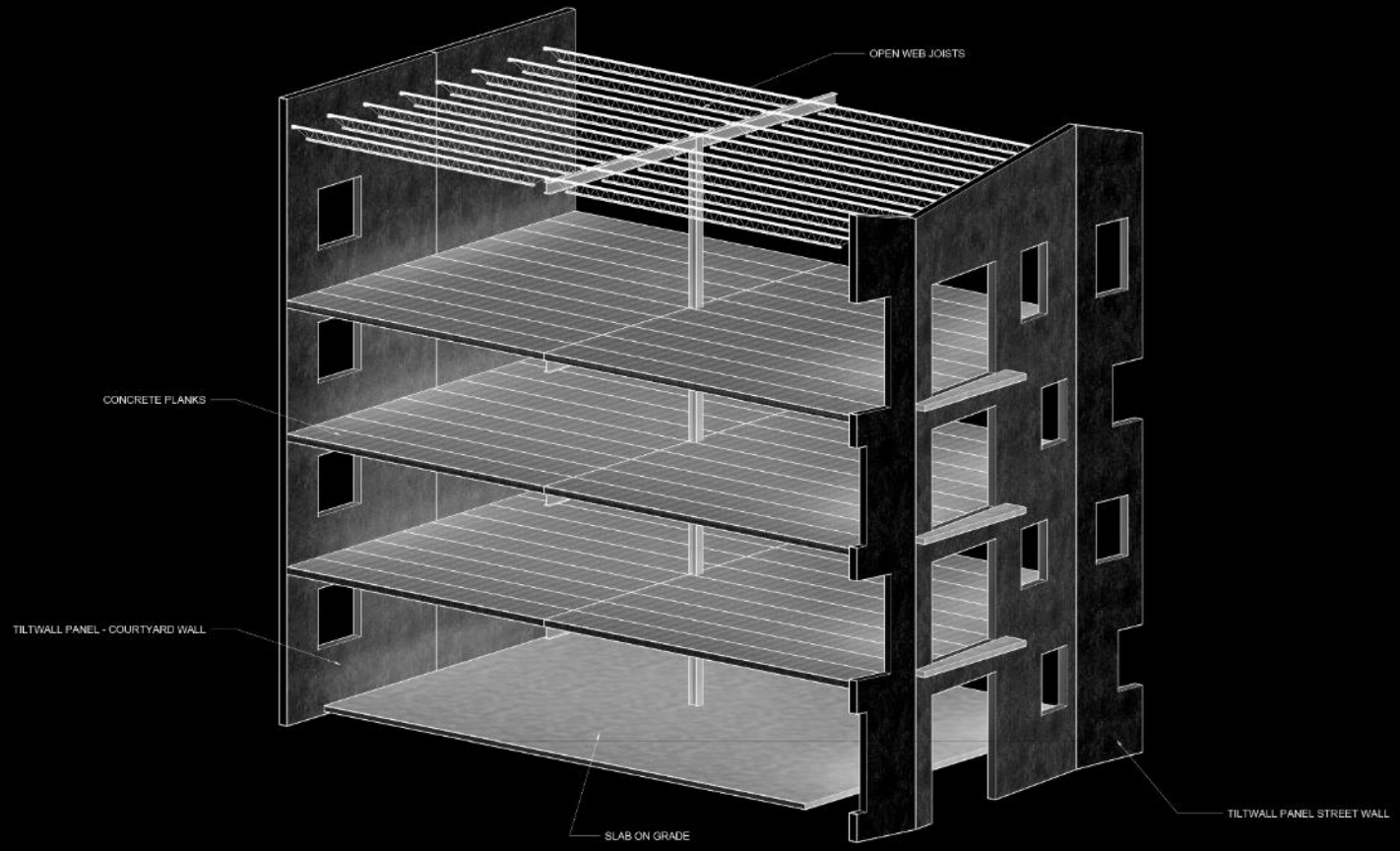
SLAB ON GRADE + TILTWALL

CASE STUDY: EAST RIVER MULTI-FAMILY



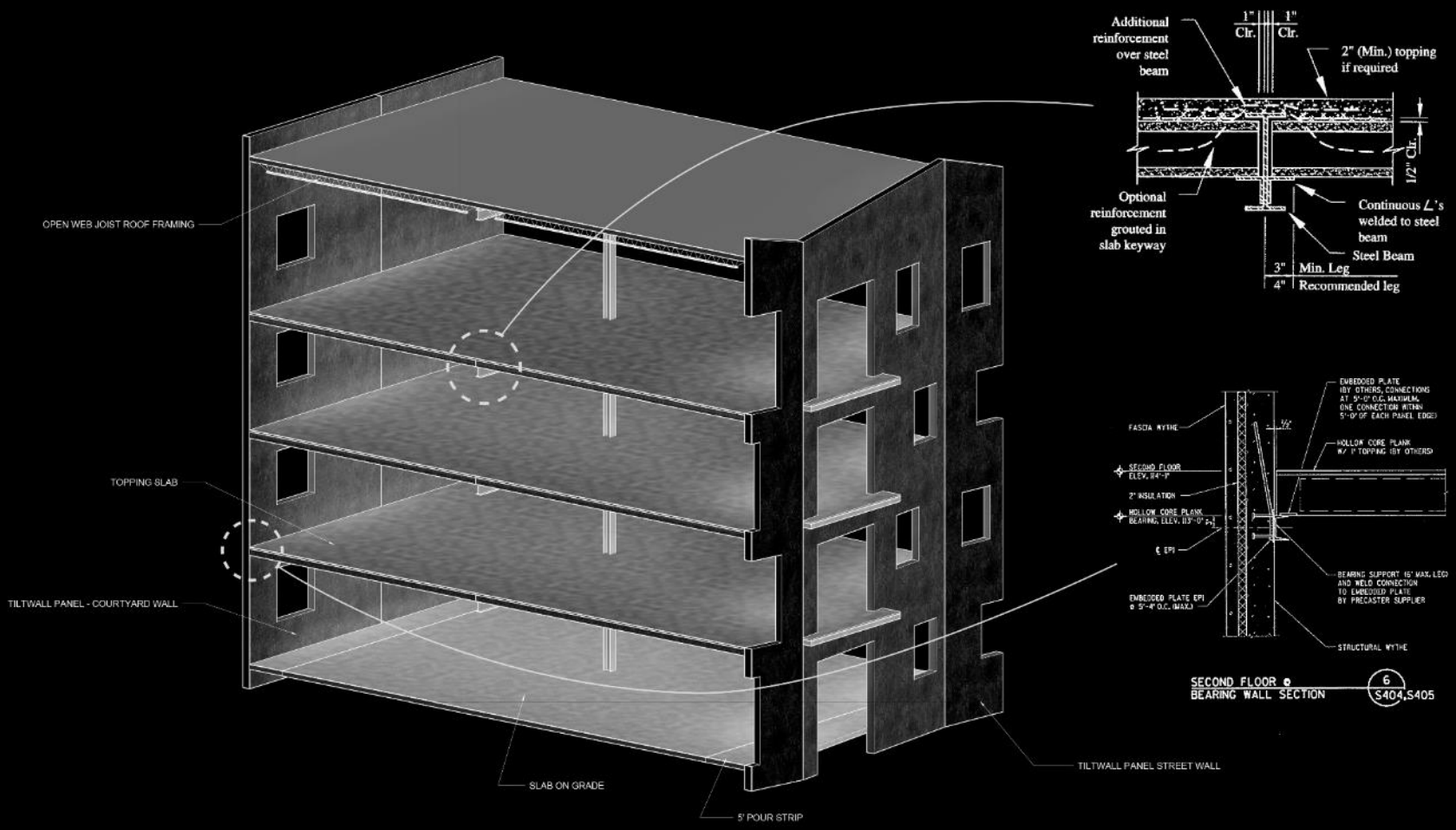
SLAB ON GRADE + TILTWALL + STEEL FRAME

CASE STUDY: EAST RIVER MULTI-FAMILY



SLAB ON GRADE + TILTWALL + STEEL FRAME + CONCRETE PLANK FLOORS & OWJ ROOF

CASE STUDY: EAST RIVER MULTI-FAMILY

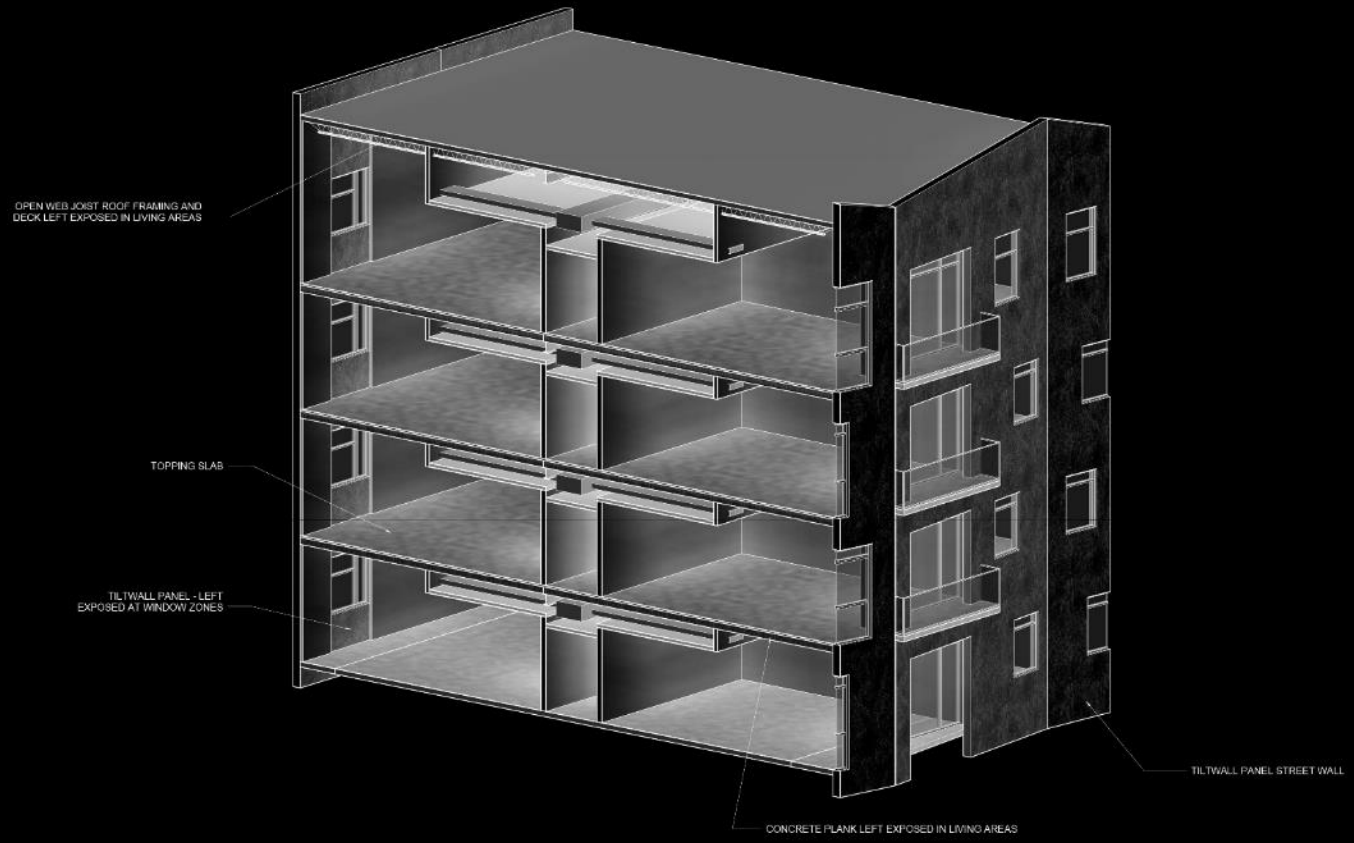


SLAB ON GRADE + TILTWALL + STEEL FRAME + CONCRETE PLANK FLOORS & OWJ ROOF + TOPPING SLAB & ROOF

CASE STUDY: EAST RIVER MULTI-FAMILY

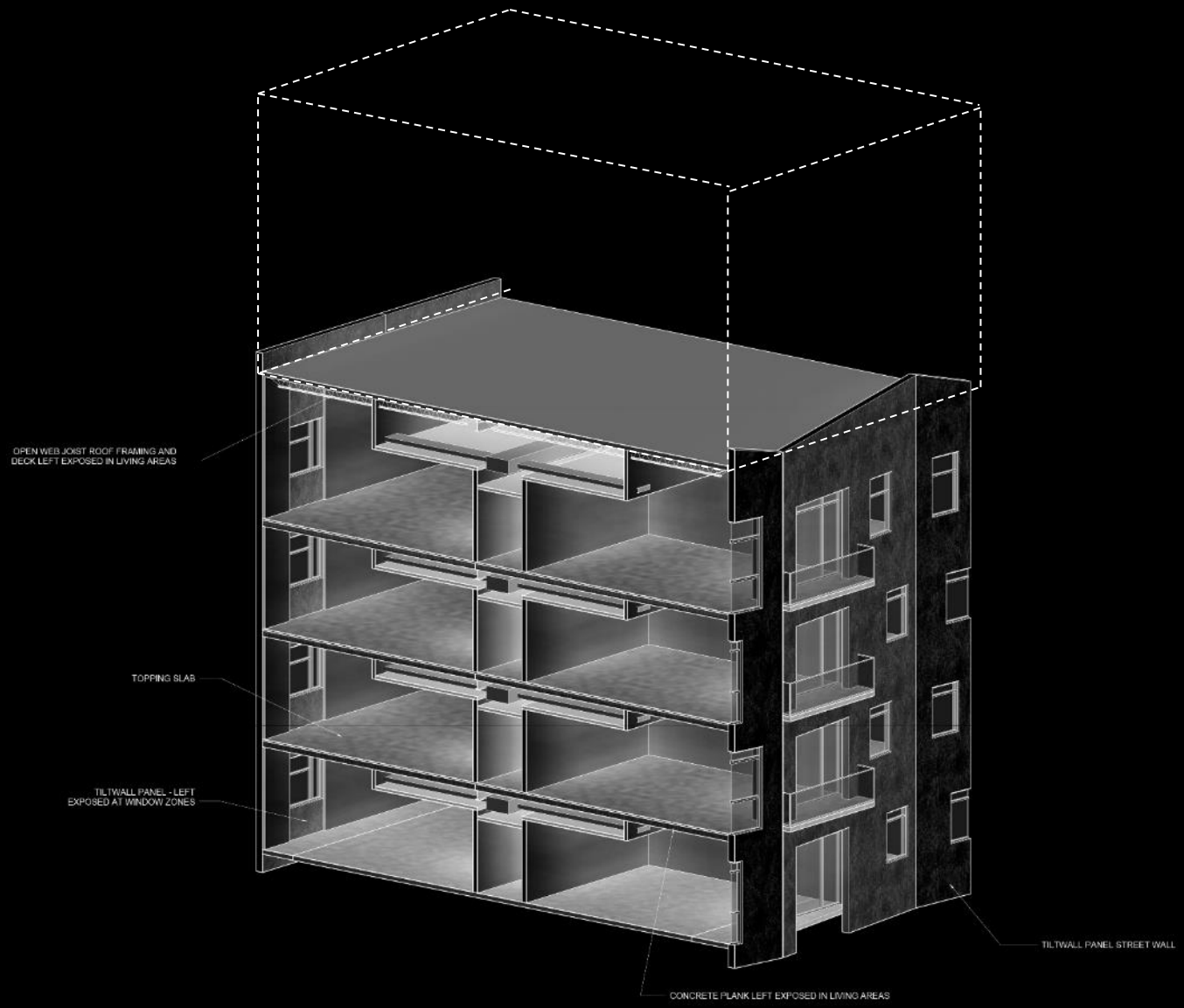
SLAB ON GRADE + TILTWALL + STEEL FRAME + CONCRETE PLANK FLOORS & OWJ ROOF + TOPPING SLAB & ROOF + BUILDING SYSTEMS

CASE STUDY: EAST RIVER MULTI-FAMILY



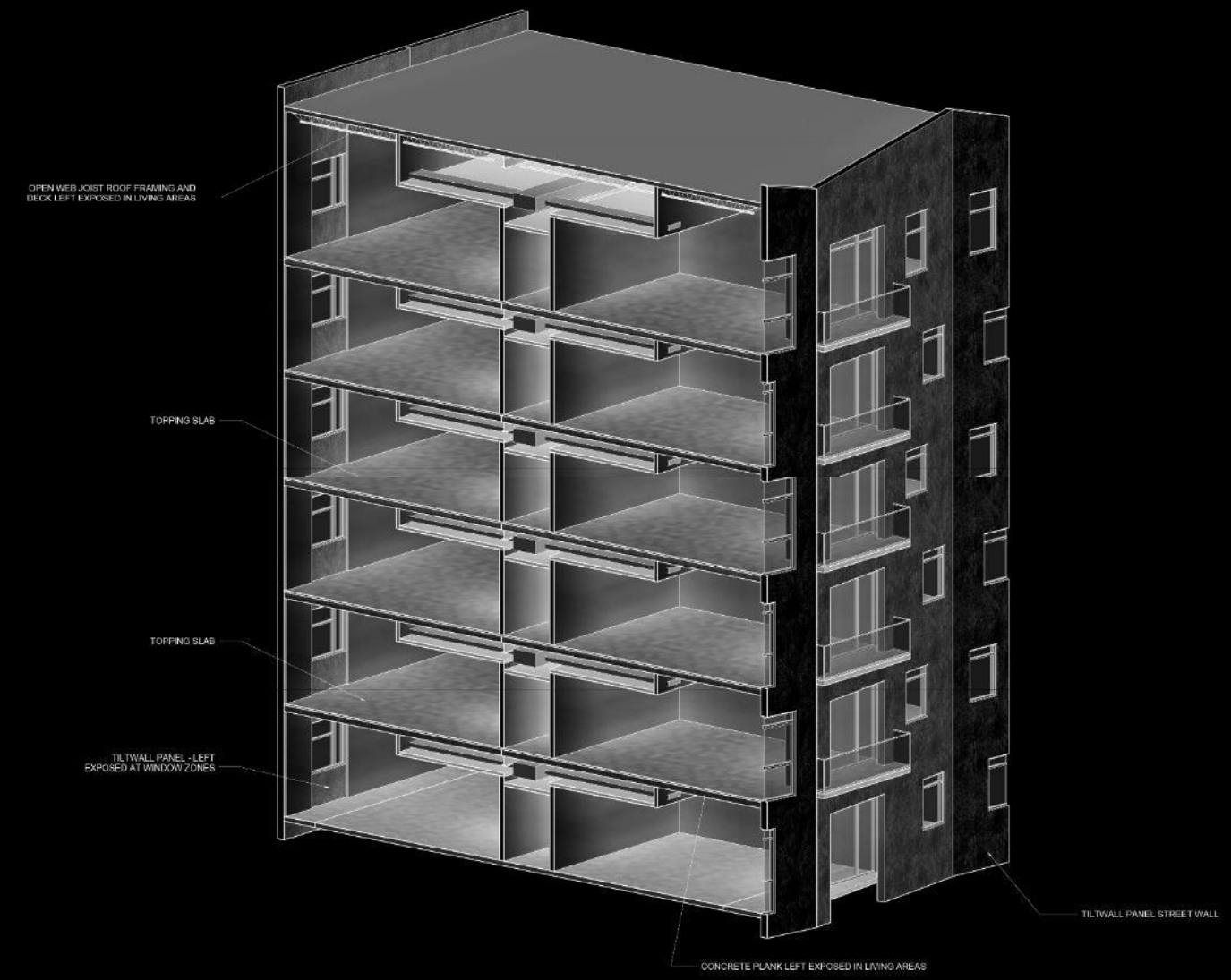
SLAB ON GRADE + TILTWALL + STEEL FRAME + CONCRETE PLANK FLOORS & OWJ ROOF + TOPPING SLAB & ROOF + BUILDING SYSTEMS = STRUCTURAL BAY

CASE STUDY: EAST RIVER MULTI-FAMILY



SLAB ON GRADE + TILTWALL + STEEL FRAME + CONCRETE PLANK FLOORS & OWJ ROOF + TOPPING SLAB & ROOF + BUILDING SYSTEMS = STRUCTURAL BAY

CASE STUDY: EAST RIVER MULTI-FAMILY



SLAB ON GRADE + TILTWALL + STEEL FRAME + CONCRETE PLANK FLOORS & OWJ ROOF + TOPPING SLAB & ROOF + BUILDING SYSTEMS = STRUCTURAL BAY

CASE STUDY: EAST RIVER MULTI-FAMILY

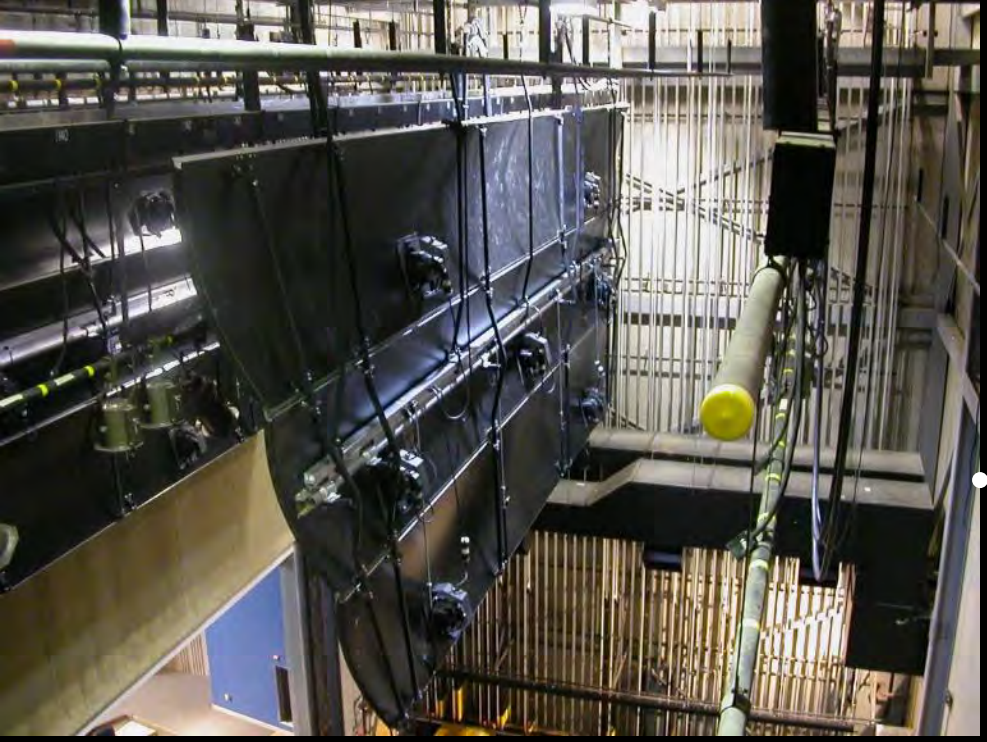
CASE STUDY: EAST RIVER MULTI-FAMILY

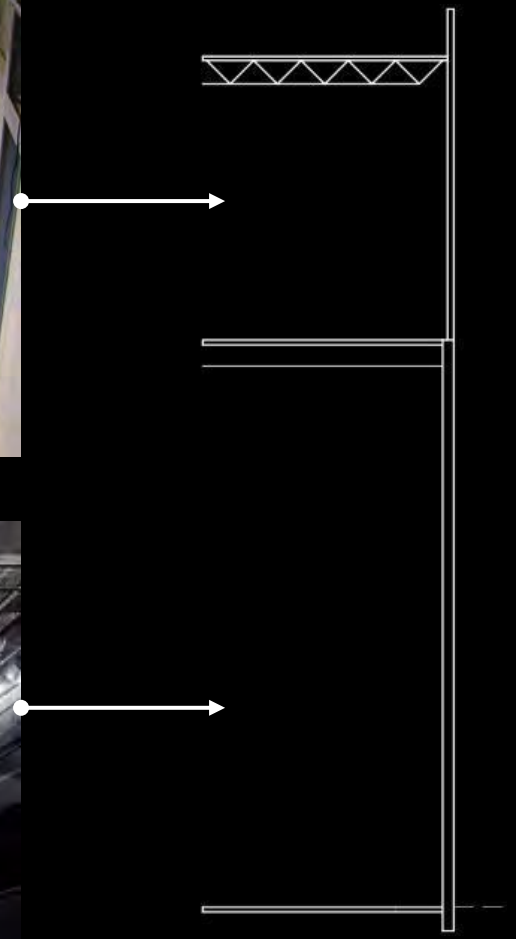
CASE STUDY: EAST RIVER MULTI-FAMILY

CASE STUDY: EAST RIVER MULTI-FAMILY

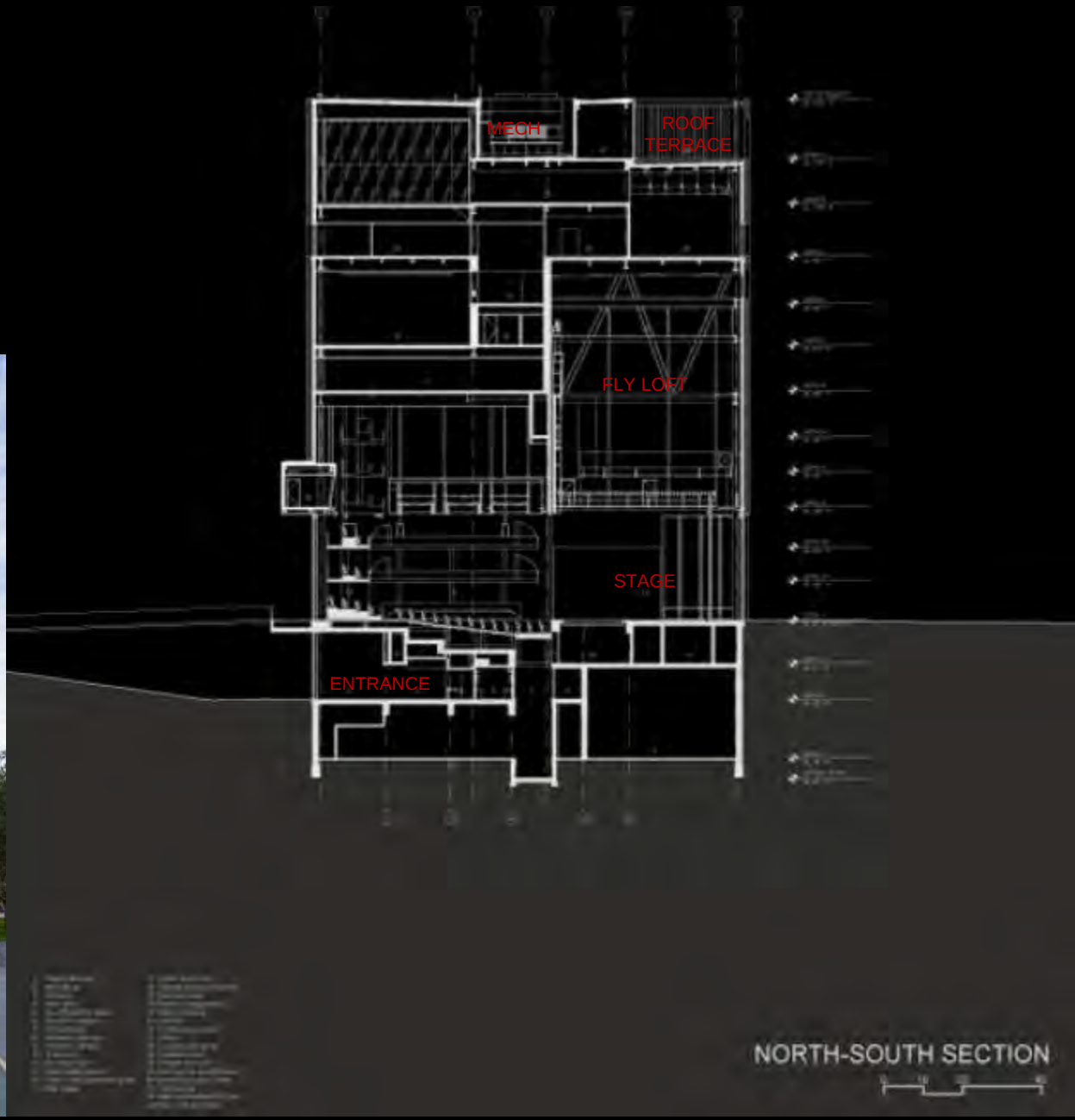
Performance Theatre

CASE STUDY: WYLY THEATER



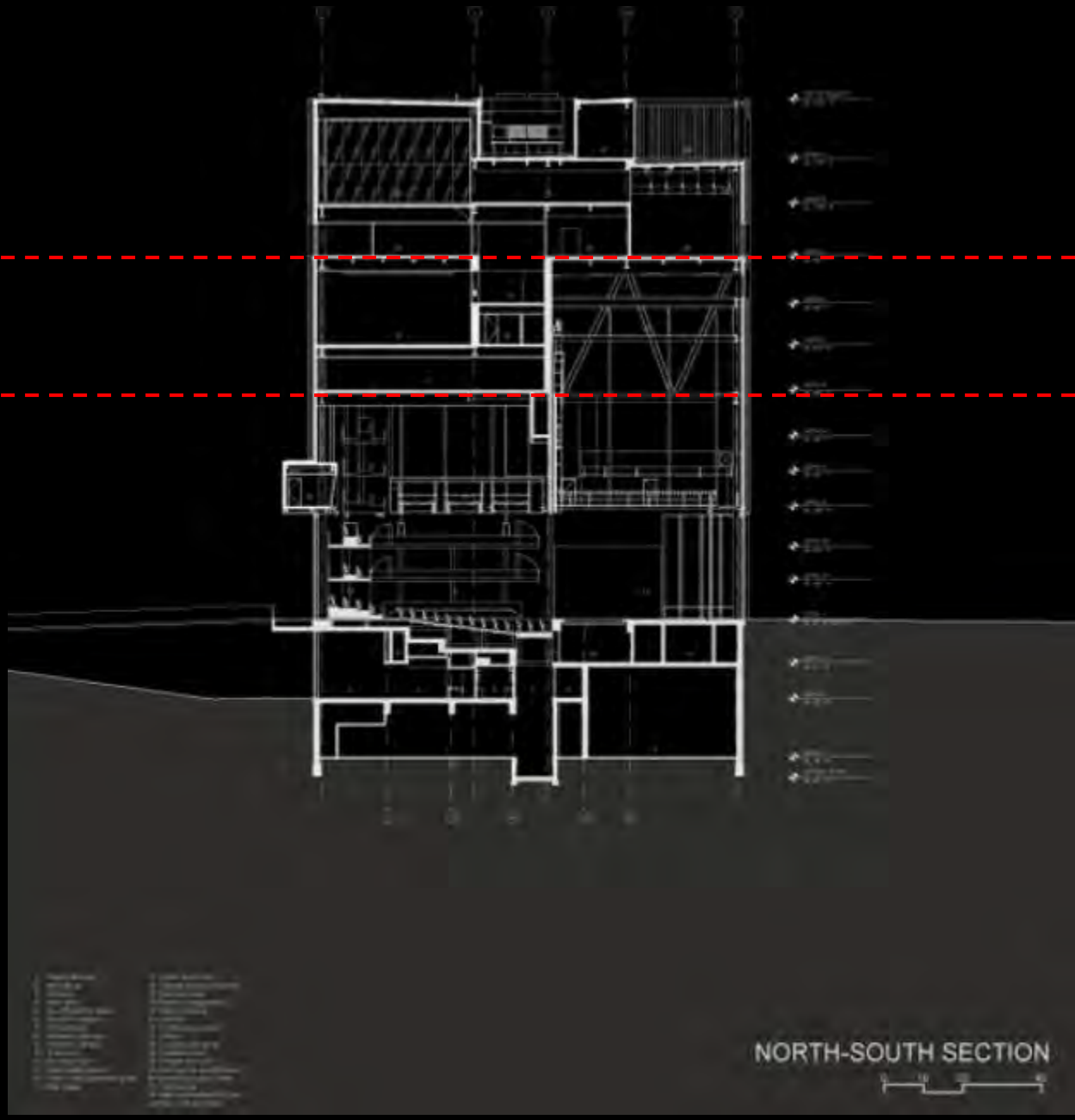


CASE STUDY: WYLY THEATER



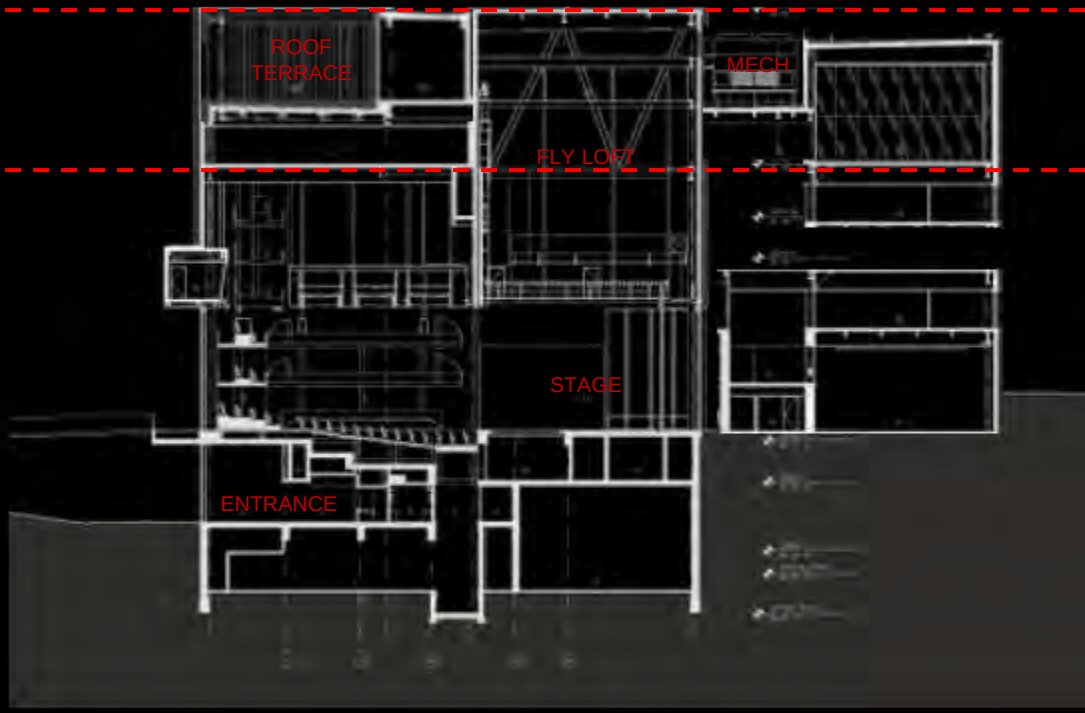
2-story 60’ panel height

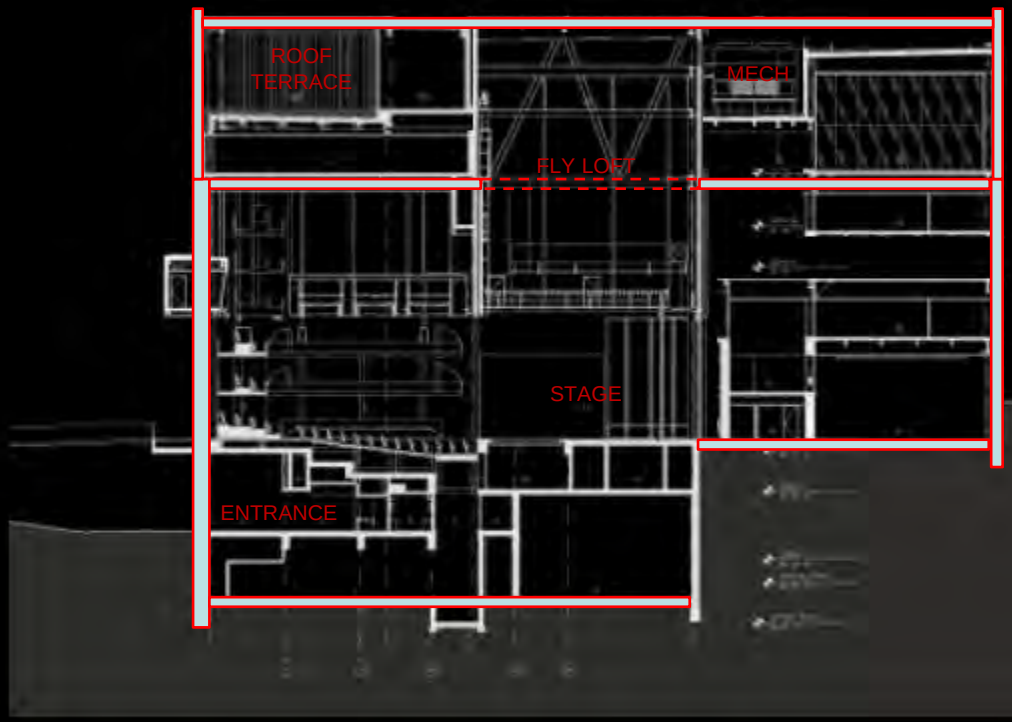
4-story 30’ panel height



2-story 60’ panel height

4-story 30’ panel height

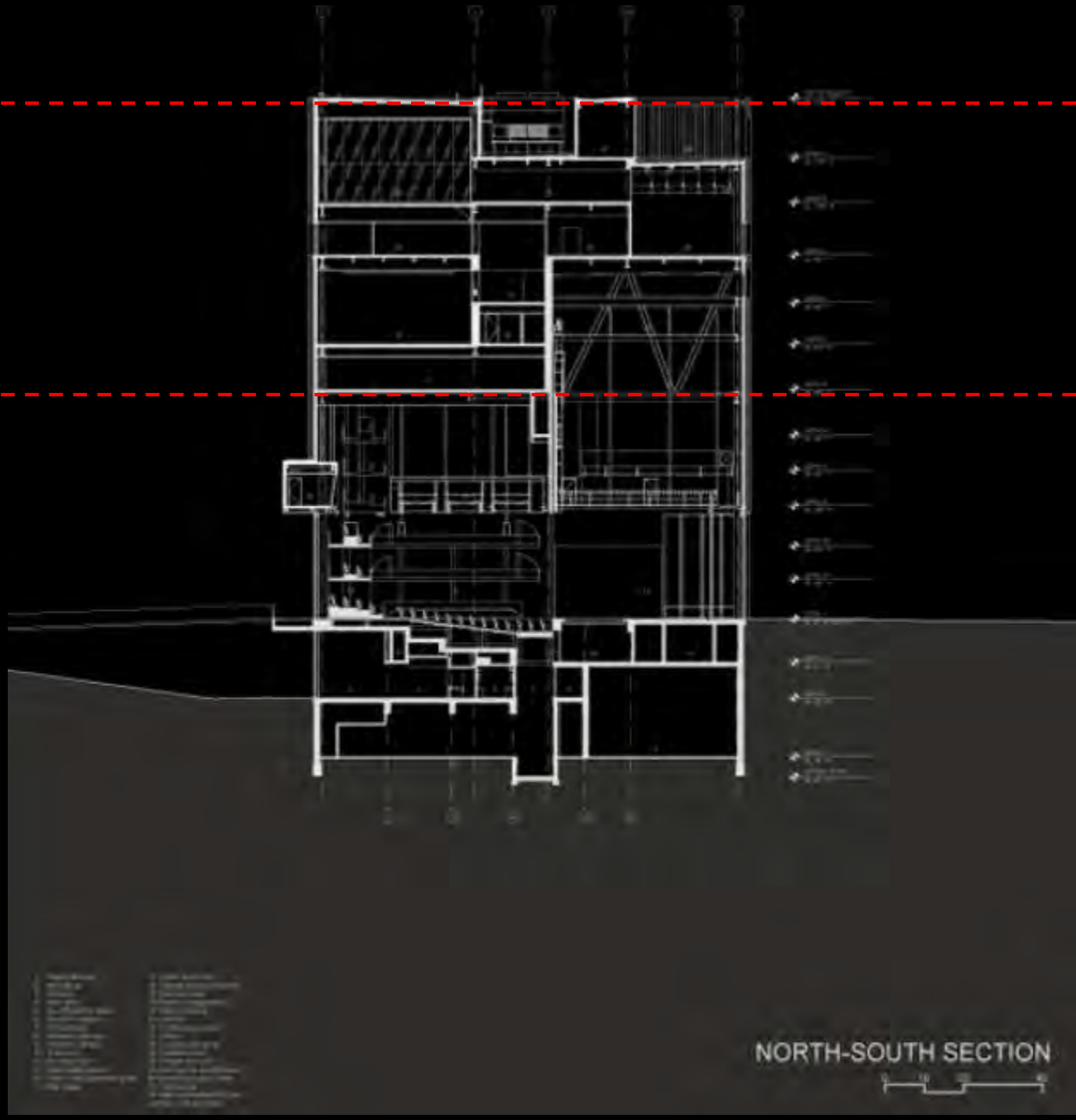


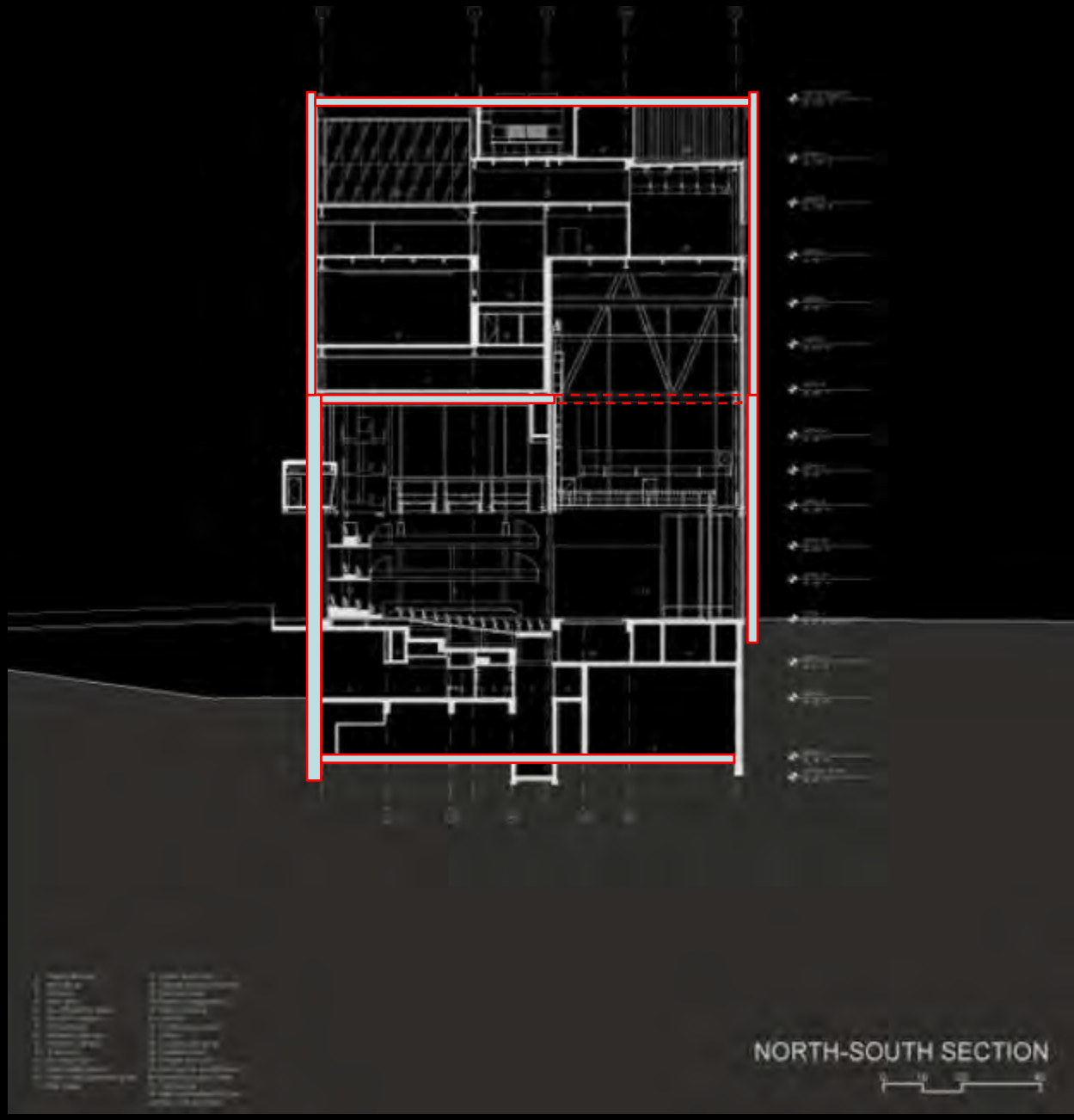

ROOF
TERRACE
MECH
FLY LOFT
STAGE
ENTRANCE

Or- why not 8 levels?

4-story panel height

4-story panel height




NORTH-SOUTH SECTION

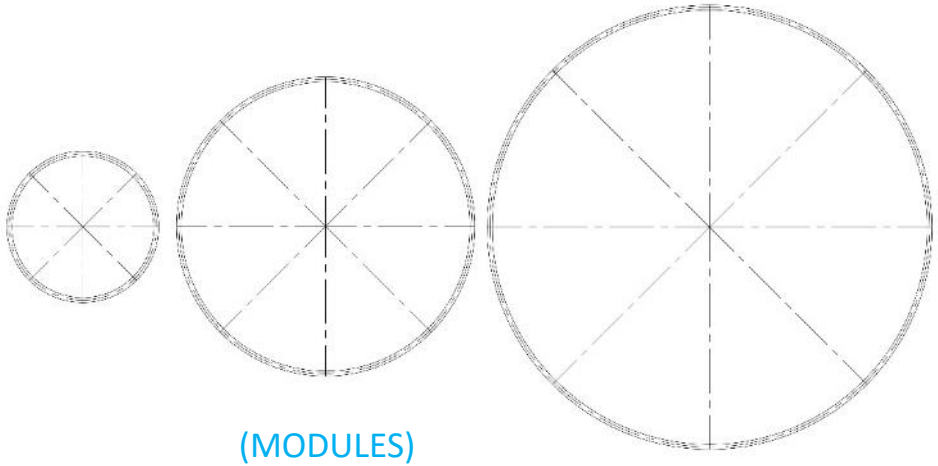
The big idea here is;

In conclusion we want to illustrate that Bottom up Innovation is a framework for pushing boundaries and that once engaged, many branch opportunities begin to develop.
Illustrated on the last few slides is the very early work we did that eventually developed into out award winning patent – Geoform.

E X C U R S U S

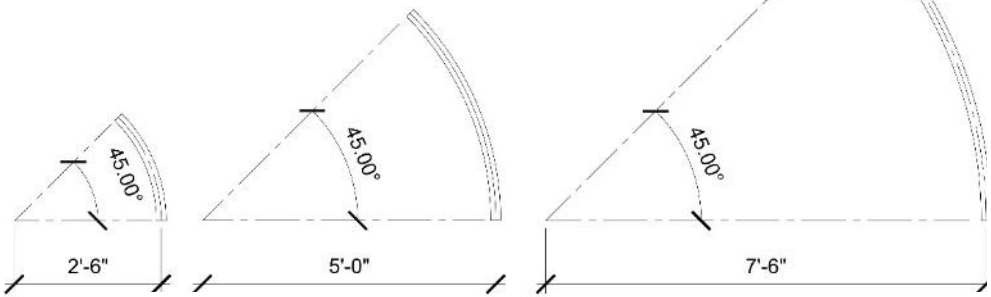
Product Development

GeoForm



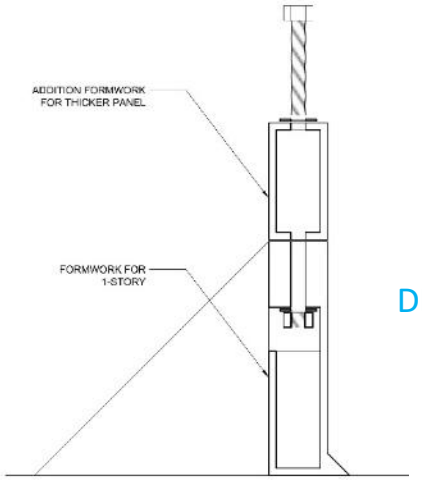
(MODULES)

30 60 90

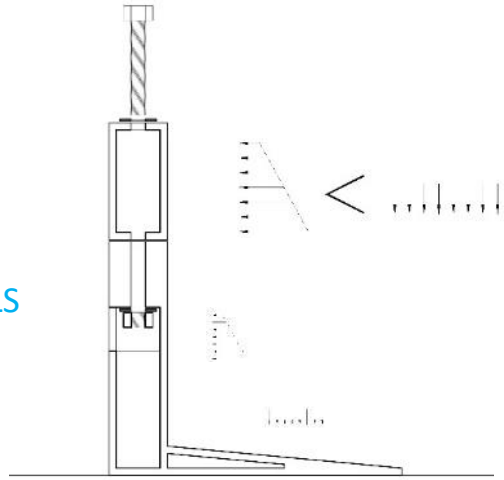


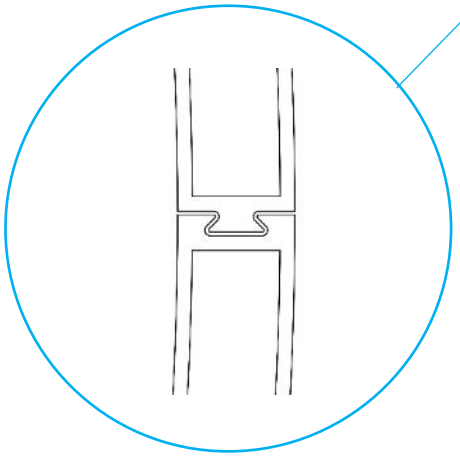
(JOINTS / EDGES)

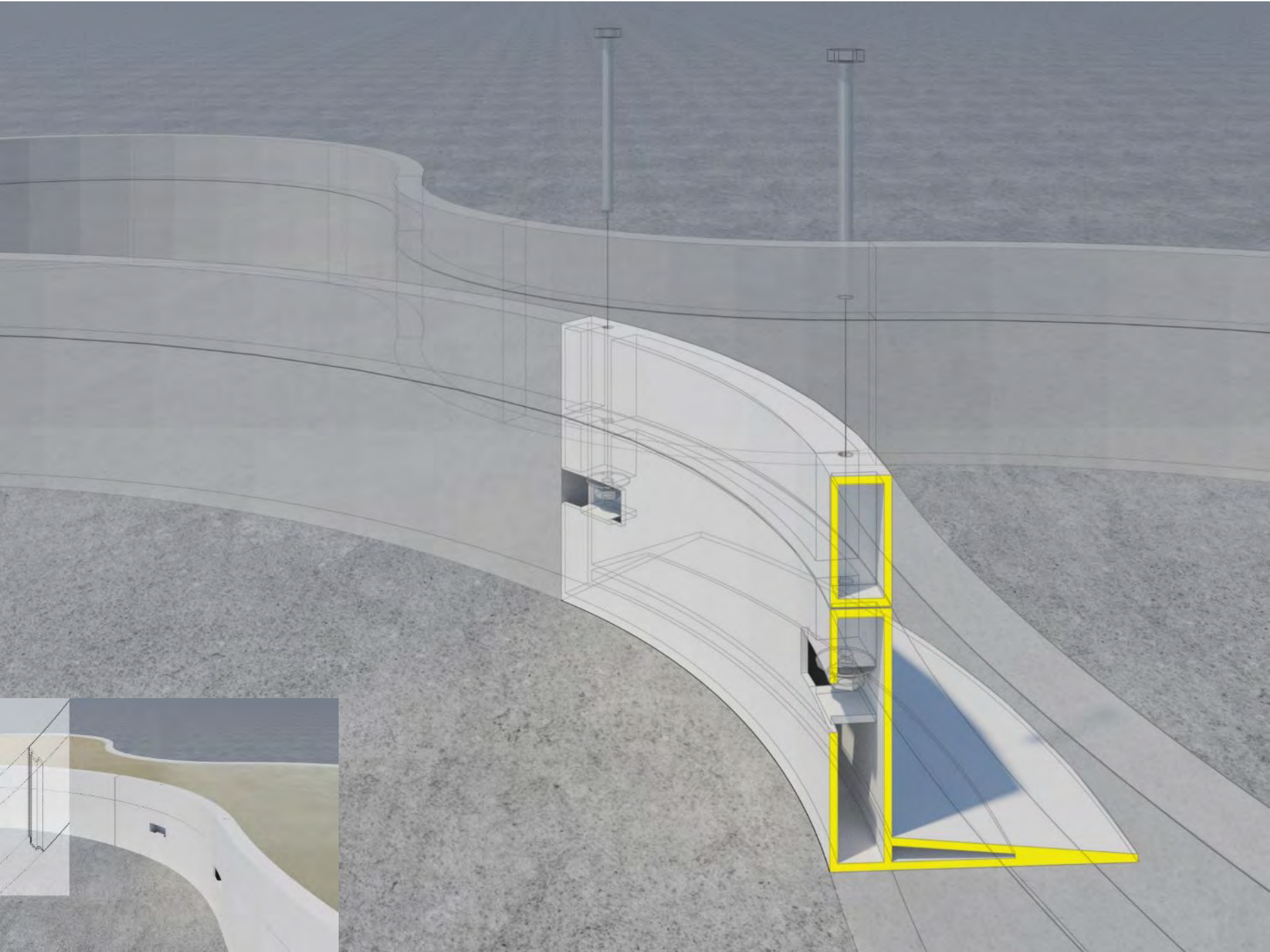
(APERTURES)



DETAILS







My own thoughts are that it is not the medium you work in its what you do with it to generate content.

To bring it full circle- Bottom up Innovation is there when or if you look for opportunities in the everyday. For us Tilt Wall Technology was a catalyst for invention and market differentiating advantage.

Yours?