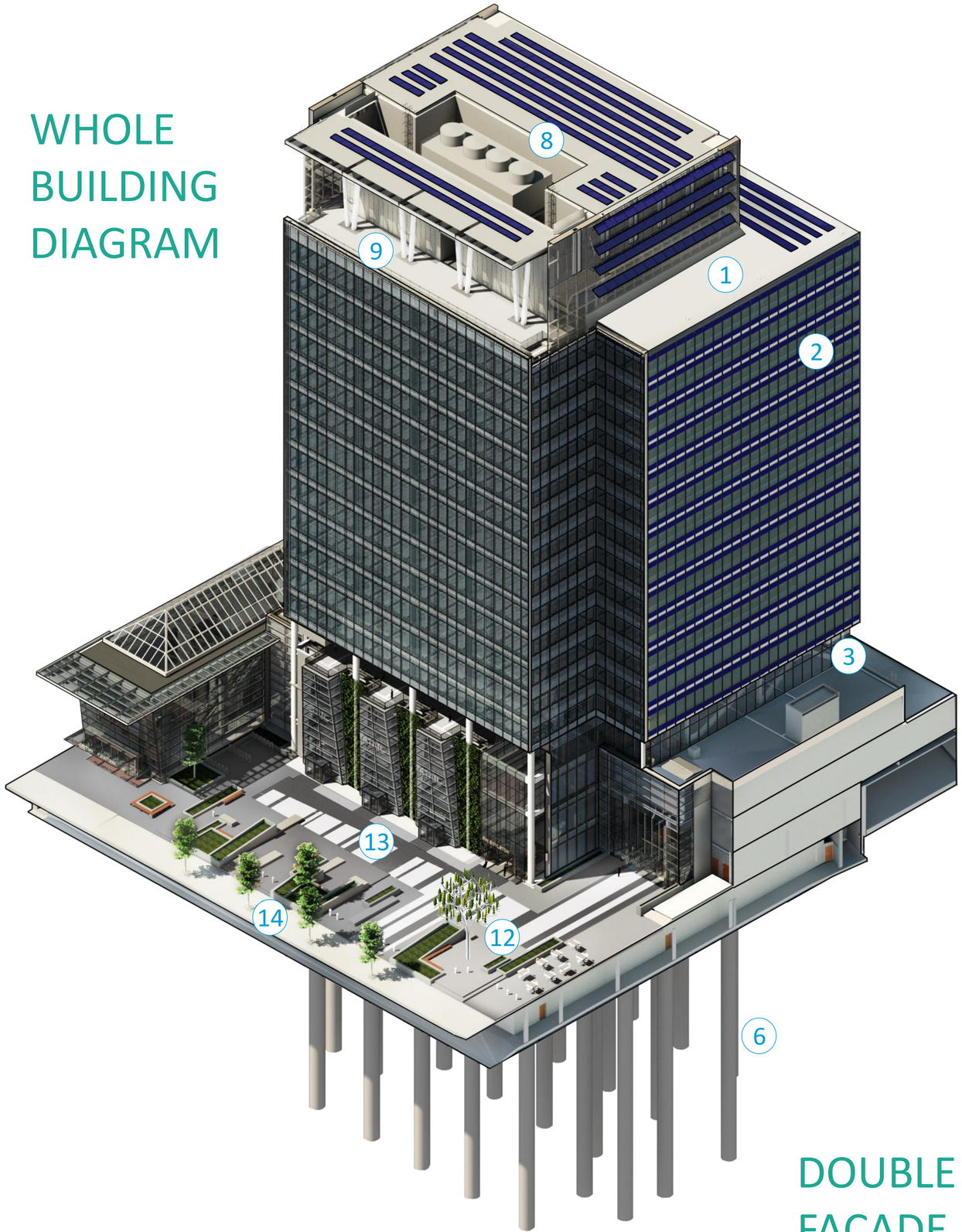
WHOLE BUILDING DIAGRAM



1 Rain Water Collection — 72.8% Run-off Reduction

2 Optimized Dual Facade — Acts as thermal boundary

3 Transfer Truss — Supports hanging columns over I-90

4 Core Structure — 12 Week Schedule Reduction

5 Escalator/Elevator Energy Saver — Saves 158,414 kWh annually

6 Geothermal Caissons — Reduces total energy needs by 8%

7 Bathtub Design — Allows for continual building operation

8 Solar Array — 343,856 kWh Array

9 Outdoor Green Space — 9,475 SF of outdoor terraces

10 RAF Air Distribution — High efficiency of air distribution

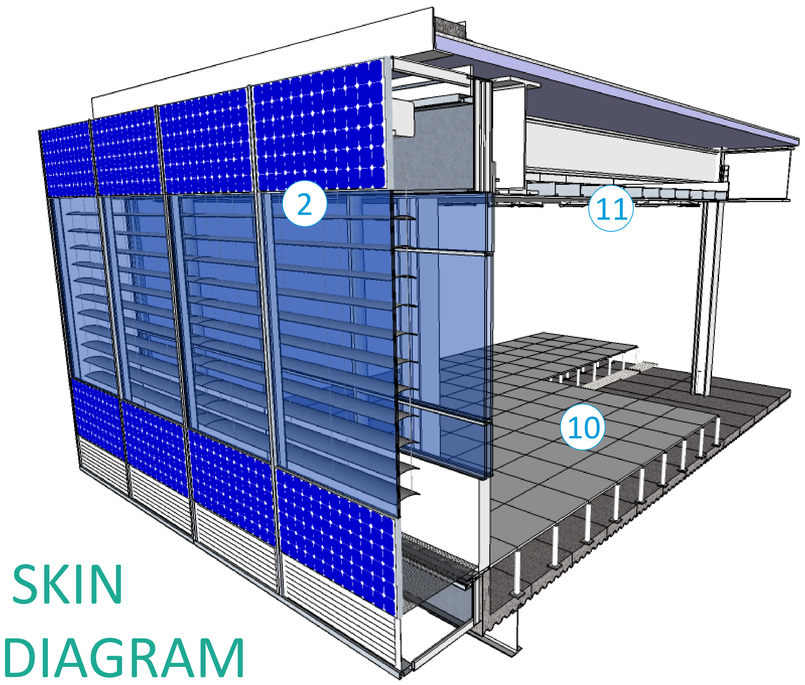
11 Advanced Lighting Controls — Reduced power consumption

12 Wind Turbine Tree — Produces 3.1 kW of energy for public

13 Interactive Kiosks — 3 Kiosks Inform and educate public

14 CO_2 Absorber — Eliminates 20.2 lbs CO_2 per day

DOUBLE SKIN FAÇADE DIAGRAM

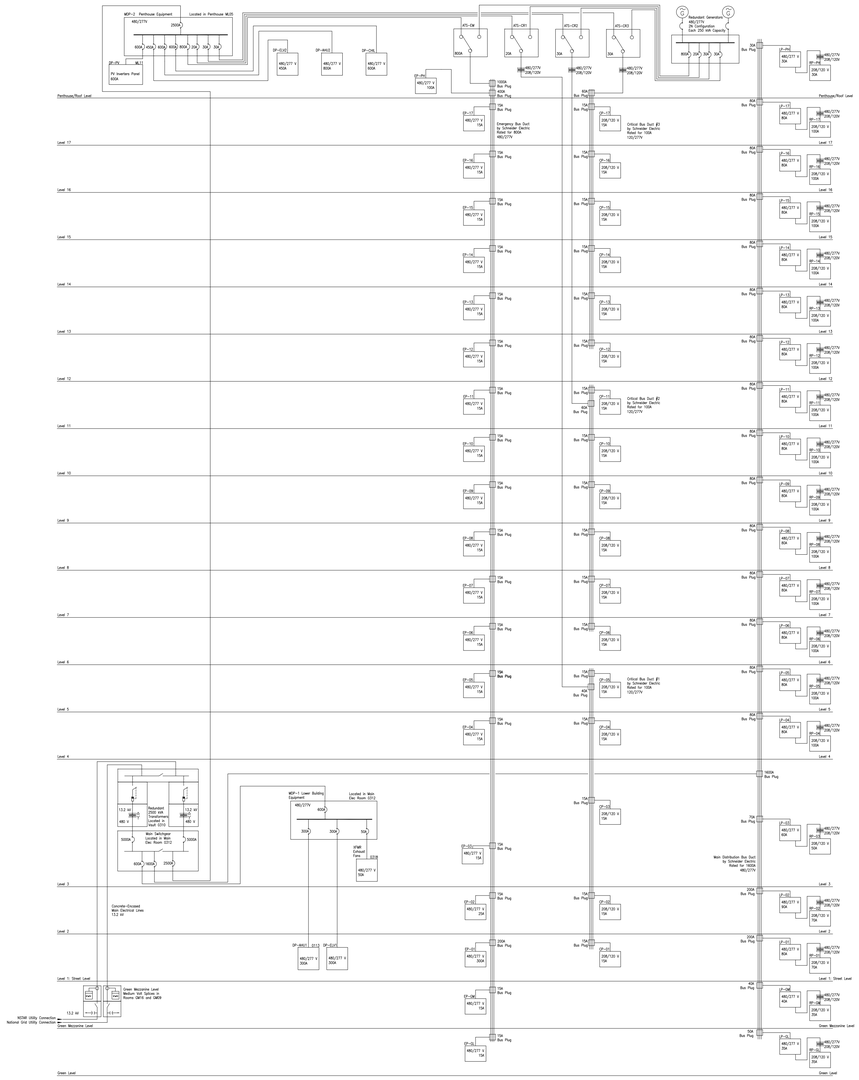


GENESIS DESIGN

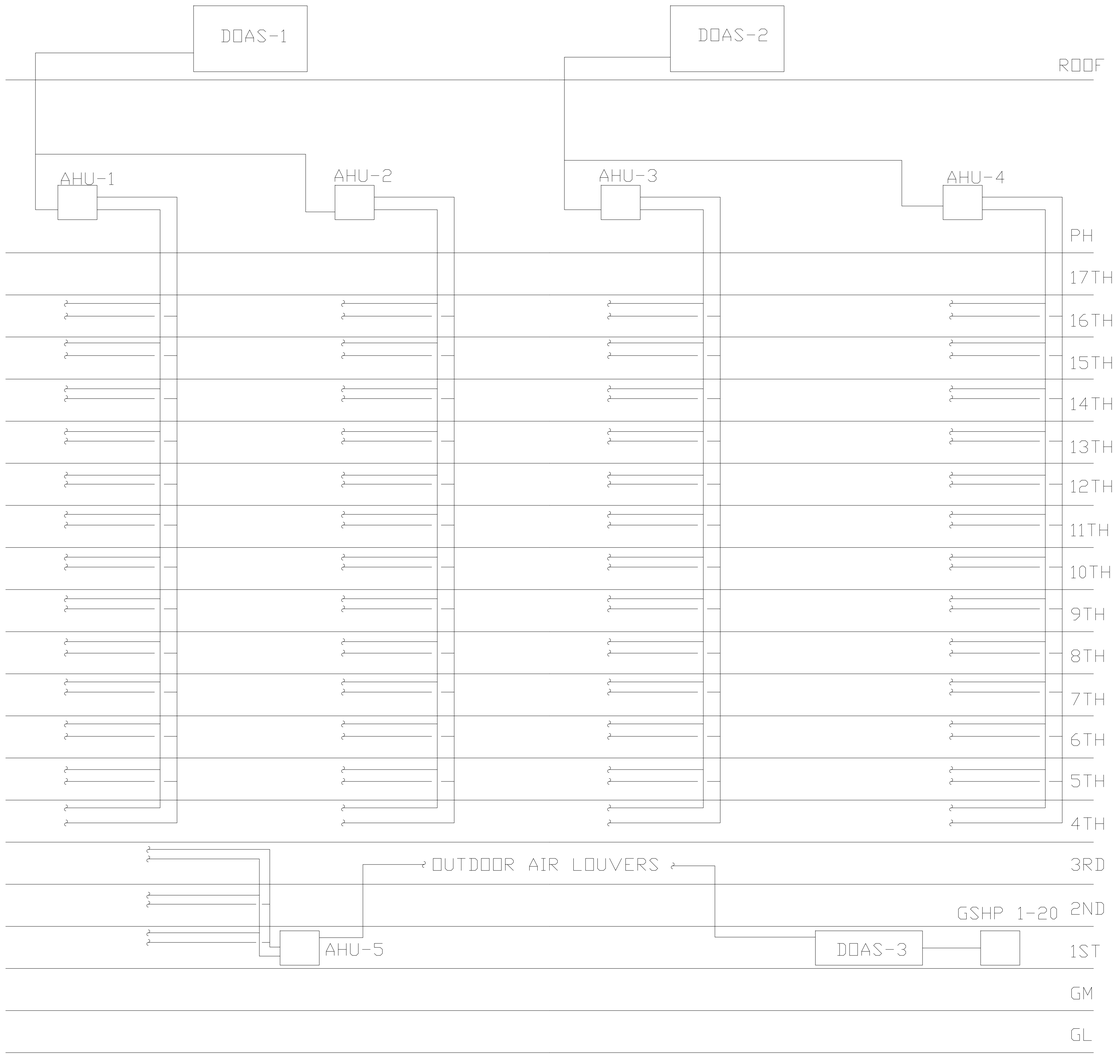
PROJECT
THE BOYLSTON STREET HIGH RISE
BOSTON, MA 02115

DRAWING TITLE
PROJECT OVERVIEW DIAGRAM

AEI TEAM NO.	02 - 2016
DATE	17 FEB 2016
SCALE	N/A
DRAWING NO.	I-01
PAGE NO.	29



SINGLE LINE DIAGRAM



AIRSIDE RISER DIAGRAM

GENESIS DESIGN

PROJECT

THE BOYLSTON STREET
HIGH RISE
BOSTON, MA 02115

DRAWING TITLE

MECHANICAL/ELECTRICAL
SYSTEMS

AEI TEAM NO.	02 - 2016
DATE	17 FEB 2016
SCALE	1/32" = 1' - 0"

DRAWING NO. I-02

PAGE NO. 30

LIFECYCLE COST ANALYSIS

While the importance of innovative design solutions to complex problems cannot be understated, they are nevertheless usually costly. Genesis Design made every effort to make decisions which made financial sense to the property owner. Higher up front costs for highly efficient systems leads to lower energy bills. In order to quantify these savings, the total building energy usage had to be calculated against a baseline building. In the Energy Use Cost Analysis table below, Genesis Design was able to reduce the energy cost per year by about $3.88 MM. This over 50% reduction was due mostly to the redesigned façade and mechanical systems. As no surprise, this is also where most of the additional cost figures come into play. As detailed in the Exterior Envelope Cost Comparison table below, the difference between a typical glazing system and the optimized dual skin façade with integrated photovoltaics is about $750/SF glazing area. This is significant, but as shown in the payback period graph, this expense can be payed off within the lifespan of the building.

Energy Usage Cost Analysis		
	Baseline	Boylston Street High Rise
Energy Consumed (kWh/yr)	36,674,491	17,239,906
Cost of Energy ($/kWh)	$ 0.1999	$ 0.1999
Cost per year ($/yr)	$ 7,331,230.75	$ 3,446,257.21
	Yearly Savings	$ 3,884,973.54

OPTIMIZED DUAL FAÇADE COST ANALYSIS

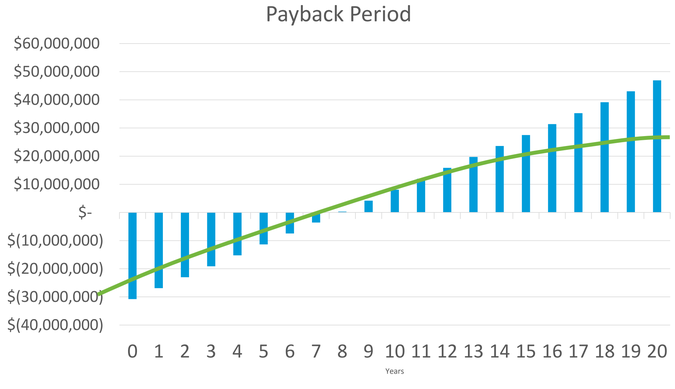
While the double skin façade had numerous positive impacts on the mechanical loads for the building, it comes at a high initial cost. To calculate the construction cost of building this system, the exterior enclosure cost was first estimated per square foot of glazing area. The double skin portion was then estimated to be 2.5 times the cost of a typical system based on the recommendation of a façade manufacturer. This includes a unitized system with integrated photovoltaics. This number was then applied to 40% of the total exterior enclosure, the portion of the building which has the double skin façade. This cost will be payed back however, due to the mechanical savings that it will achieve.

Exterior Envelop Cost Comparison					
	Unit	Quantity	% Total	Cost/Unit	Cost
Typical Curtainwall System	SF	52,194	60%	$ 499.85	$ 26,089,030.80
Double Skin System	SF	34,796	40%	$ 1,249.62	$ 43,481,718.00
		Boylston Street High Rise Total			$ 69,570,748.80

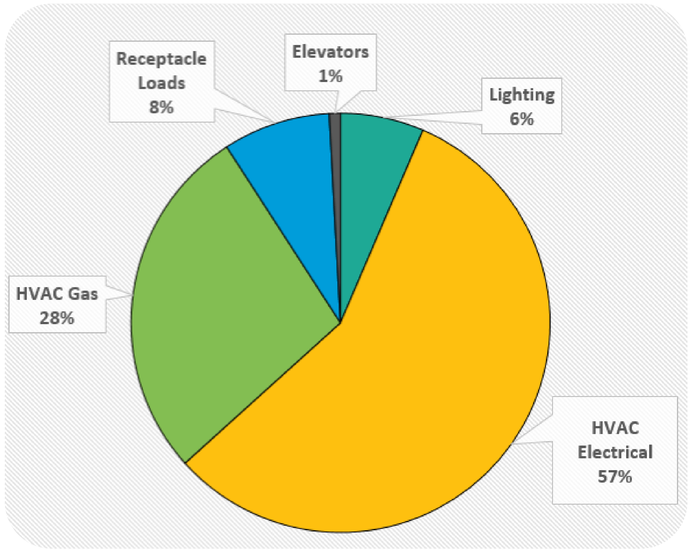
PAYBACK FOR HVAC & DOUBLE SKIN FAÇADE

In order to calculate payback period, an initial investment had to first be calculated. The cost differential between the baseline building and the Genesis Design model was used as the investment total. The cash flow used to calculate payback is the savings generated by the efficient design. While the analysis made represents a linear payback model, in reality the payback would flatten after 10 or so years due to the replacement and regular maintenance of system components. This expected actual return is modeled by the green curve on the graph.

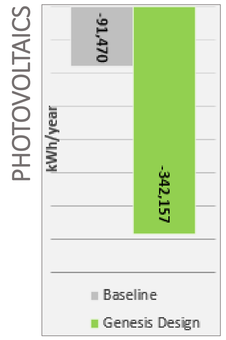
Baseline Building	Boylston Street High Rise	Initial Investment	Cash Flow	Payback
$ 271,000,000.00	$ 301,782,707.00	$ 30,782,707	$ 3,884,974	7.92 years

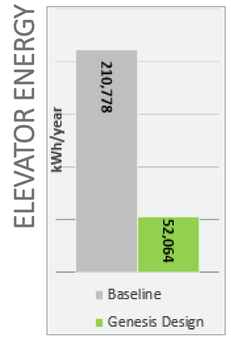


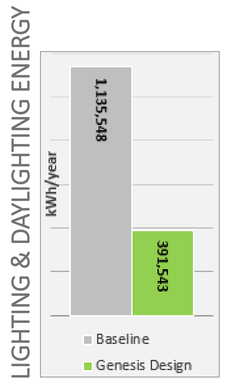
BUILDING ENERGY USAGE

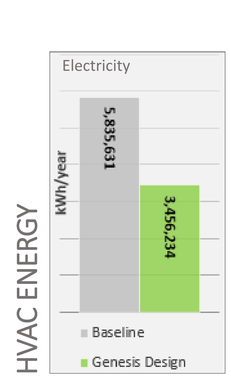


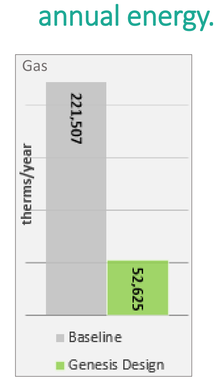
Note: Photovoltaic energy production was proportionally subtracted from each slice (except HVAC Gas) to accurately distribute the energy savings.









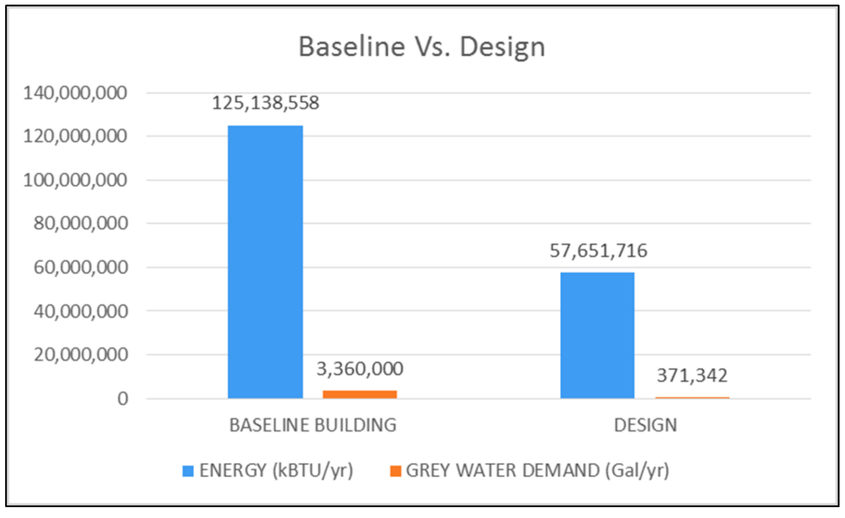


At **5,604 MWh/year**, this overall design uses **59.77% less energy** than the baseline design.

- The photovoltaic system supplements **6.11% of the building's annual energy.**

MECHANICAL REDUCTION ASSESSMENT

	BASELINE BUILDING	*DESIGN*	*PERCENT REDUCTION*
ENERGY (kBTU/yr)	125,138,558	57,651,716	***54%***
GREY WATER DEMAND (Gal/yr)	3,360,000	371,342	***89%***



The graph to the right shows the mechanical building reductions from the initial baseline building analysis. The table shows the total energy reduction of 54% and reduction of water demands by 89%. This is accomplished through a rain water collection system on the roof and plaza levels. This water will be used in the restroom facilities as well as a secondary water source for the vertical green wall.

GENESIS DESIGN

PROJECT
THE BOYLSTON STREET HIGH RISE
BOSTON, MA 02115

DRAWING TITLE
ENERGY & LIFECYCLE ANALYSIS

AEI TEAM NO. 02 - 2016

DATE 17 FEB 2016

SCALE SEE DRAWINGS

DRAWING NO. I-03

PAGE NO. 31

BOYLSTON STREET HIGH RISE SCHEDULE

The scheduled activities are broken down into the main stages of construction including: Site Securement, Demolition and Substructure, Super Structure (1-4), Super Structure (5-17), Roof, Mall Entrance, and Plaza. The total duration for each construction division is listed below.

- Demolition/Substructure – 6.5 Months
- Floors 1-4 – 7 Months
- Floors 5-17 – 7 Months
- Penthouse – 2 Months
- Mall Structure – 2.5 Months

RETAIL AND OFFICE SPACES

The super structure is divided into two sections: Floors 1-4 and Floors 5-17. The design of these two sections of the building allowed for two unique opportunities to save both time and money while allowing early occupancy for portions of the building.

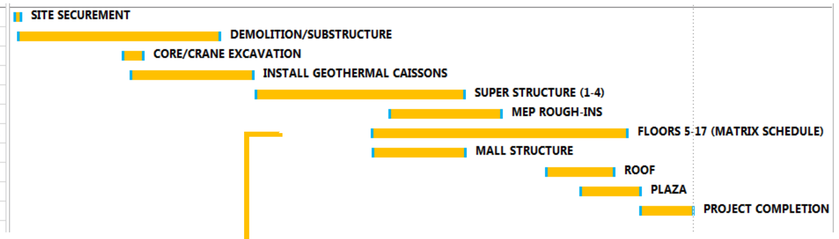
- The scope of work provided by our design and construction team includes complete fit out of the office floors (4-17). The retail space will include a core and shell construction with MEP rough-ins. Therefore, the construction schedule has been planned in order to complete the core, shell, and rough-ins of the lower three allowing the future tenants to begin their preferred finishes. The spaces being turned over will include the first three floors of retail space as well as portions of the food court.
- The remaining office floors proved ideal for a Matrix schedule as each floor is identical and offers a unique opportunity for a repetitive construction schedule. Shown on the right is an expanded view of this portion of the schedule with the sequencing of work. The main sections were broken down into structure/envelope, core work, MEP work, and finishes. These tasks are completed through a linear progression of tradesmen that have been carefully developed and sequenced in an effort to minimize overlapping work.

MATRIX SCHEDULE

The office matrix schedule is divided into four main sections which include the structure, the envelope, the MEP rough-in, and the interior finishes. Each division is comprised of grouped tasks that best fit together in regards to timing, location of work, and contractor priority. The blue division is the super structure; the work for this division is scheduled in two floor increments while the remaining work is scheduled by floor. The 3-D cut section of a typical office space shows a few of the tasks and their corresponding number link in the schedule.

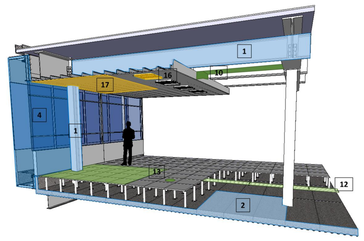
The total duration for each floor is approximately 100 Days which is primarily a combination of the structure, the envelope, and interior work. The total duration of the 13 office floors is approximately 7 months. The combined design and construction techniques effectively reduced the baseline schedule by 3 months from 21 months to approximately 18 months.

SITE SECUREMENT	5 days
DEMOLITION/SUBSTRUCTURE	122 days
CORE/CRANE EXCAVATION	13 days
INSTALL GEOTHERMAL CAISSONS	75 days
SUPER STRUCTURE (1-4)	126 days
MEP ROUGH-INS	68 days
FLOORS 5-17 (MATRIX SCHEDULE)	155 days
MALL STRUCTURE	56 days
ROOF	41 days
PLAZA	36 days
PROJECT COMPLETION	33 days



GENESIS DESIGN MATRIX SCHEDULE (OFFICE LEVELS)

FLOORS	MONTH 1					MONTH 2							MONTH 3							MONTH 4							MONTH 5							MONTH 6							MONTH 7							MONTH 8						
5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																																		
6							6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																																		
7		1	2	3	4	5			6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																														
8									6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																																
9			1	2	3	4	5				6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																												
10												6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																												
11				1	2	3	4	5					6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																										
12														6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																										
13					1	2	3	4	5						6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																								
14																6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																							
15						1	2	3	4	5								6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																					
16																			6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																			
17							1	2	3	4	5									6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																			



TASK #	ACTIVITY DESCRIPTION	RESPONSIBILITY
1	ERECT/GUARD	STRUCTURAL
	ERECT BEAMS	STRUCTURAL
	PLACE/DETAIL STEEL DECKING	STRUCTURAL
	INSTALL FIRE PROTECTION	CM
2	PLACE REBAR	STRUCTURAL
	INSTALL SLAB FORMWORK	CONCRETE
	POUR LEVATED SLAB	CONCRETE
	INSTALL TEMP UTILITIES	ELECTRICAL
3	INSTALL STAIR SUPPORTS	STRUCTURAL
	POUR STAIR TREADS	STRUCTURAL
	FIREPROOF STEEL	FIRE PROTECTION
	STRUCTURAL INSPECTION	CM
4	INSTALL DUAL FACADE (S-W)	SPECIALTY
	INSTALL GLASS FACADE (N)	SPECIALTY
5	INSTALL COMPOSITE FACADE (E)	SPECIALTY
	INSPECT CONNECTIONS	CM

TASK #	ACTIVITY DESCRIPTION	RESPONSIBILITY
6	INSTALL MECHANICAL RISERS	MECHANICAL
	INSTALL PLUMBING/FP RISERS	PLUMBING/FP
	INSTALL ELECTRICAL/COMM RISERS	E/R
	INSPECT AND INSULATE	CM
7	INSTALL PREFAB CHASE WALL	PLUMBING
	LAY CORE WALL CEILING TRACKS	INTERIORS
	LAY CORE WALL OFFICE TRACKS	INTERIORS
	INSTALL STEEL PARTITIONS	INTERIORS
8	CORE ROOMS MECHANICAL ROUGH-IN	MECHANICAL
	CORE ROOMS L/E ROUGH-IN	L/E
9	CORE ROOMS PLUMBING ROUGH-IN	PLUMBING
	CORE ROOMS FP ROUGH-IN	FP

TASK #	ACTIVITY DESCRIPTION	RESPONSIBILITY
10	INSTALL OVERHEAD RETURN DUCTS	MECHANICAL
	INSTALL OVERHEAD ELECTRICAL LINES	ELECTRICAL
	INSTALL OVERHEAD FP RUNS	FP
	INSTALL CEILING GRID SUPPORTS	INTERIORS
11	BATHROOM PLUMBING/FITOUT	PLUMBING
	IN-WALL ELECTRICAL ROUGH-IN	ELECTRICAL
	PLACE DRYWALL	INTERIORS
	FIRE CAULKING FOR PENETRATIONS	FP
12	INSTALL UNDERFLOOR ELECTRICAL RUNS	ELECTRICAL
	INSTALL UNDERFLOOR VESDA SYSTEM	FP
13	PLACE RAISED ACCESS FLOOR	INTERIORS
	INSTALL MECHANICAL DIFFUSERS	MECHANICAL
14	INSTALL DOOR FRAMES	INTERIORS
	INSTALL CEILING GRID	INTERIORS

TASK #	ACTIVITY DESCRIPTION	RESPONSIBILITY
15	INSPECT CLOSE IN WALLS	INTERIORS
	PRIME AND PAINT WALLS	INTERIORS
16	INSTALL LIGHT FIXTURES	LIGHTING
	INSTALL FIRE SUPPRESSION HEADS	FP
	HANG DOORS	INTERIORS
	INSTALL PLUMBING FIXTURES	PLUMBING
17	INSTALL ENGINEERED FLOOR TILES	INTERIORS
	INSTALL BATHROOM FLOORING	INTERIORS
	INSTALL CEILING GRID	INTERIORS
	INSTALL BASE TRIM	INTERIORS
18	FINAL CLEAN	CM
	FIRE ALARM TESTING	FP/CM
	HOWEWELL MANUAL TESTING	ELECTRICAL/FP
	MECHANICAL P/W TESTING	MECH/CM
19	PERFORM AS-BUILT DRAWINGS	CM
	FINAL INSPECTION	CM
	SIGNOFF	CM
	FLOOR COMPLETION	CM

SCHEDULE & COST IMPACTS

The selection of building systems proved challenging for each of the options as no one decision can be made without affecting another. For instance, the decision to make a building more resilient or sustainable has a significant effect on both the cost and duration of a project. The same is true for the remaining selected systems. Though there are both positives and negatives associated with each system it is important that they are recognized and properly accounted for during the planning stage. The flow chart to the right shows the simplified process in which Genesis Design handled system selection. The key steps to this process are identifying the system pros and cons and planning accordingly. In doing so, the project can progress while maintaining a timely schedule and reasonable budget. A sample list of these systems are listed below.

- Concrete Core vs. Steel Brace Frame Core – The choice to use a steel core increased the daily steel erection productivity for schedule reduction by approximately 4 days per floor. However, the increase in cost for material and interior finishes is 50%; this factor includes the material, labor, and general conditions cost associated with the different systems.
- Curtain Wall vs. Dual Façade – The decision to pursue this unique design was heavily dependent on mechanical benefits; however, the negative impact on cost and time associated with the dual-optimized façade proved extensive. The cost factor is approximately 2.5x greater than that of a curtain wall system. There is also additional maintenance costs as well as added features such as the vertical solar panels. The time associated with the dual façade is essentially double the time for a single façade as each layer is typically erected separately.

Each of these system decisions, as well as the other project decisions, were analyzed for their associated pros and cons. The cons were often associated with impacts to both the schedule and budget; therefore, each option worked together to create both innovative and integrative techniques to mitigate the effects.

THE INTEGRATIVE TECHNIQUES

The first step was looking at how to best mitigate the time impacts associated with each decision. The primary time constraint was in the dual façade; therefore, the construction team and structural engineers created an effective solution. The façade is originally designed to be erected in two separate layers effectively doubling the time. Therefore, we created a reinforcing structure that will be assembled during the prefabrication process to allow the two layers to be erected simultaneously. Additionally, the brace frame core was assessed for time savings in order to reduce the cost of on site labor and general conditions. The analysis revealed a 5 week schedule reduction effectively reducing on site costs; the result proved to be a more economical and sustainable decision than that of a concrete core.

The next step was analyzing the systems for budget improvements. The greatest impact on the cost was the dual façade; therefore, reducing this effect was analyzed first. This was accomplished through several advanced construction techniques as well as maintenance programs. The construction team and lighting/electrical engineers consulted one another in creating an efficient yet maintainable façade. This was accomplished through system monitoring through the BAS. This allowed for proper maintenance scheduling to reduce lifecycle costs and increase system performance. The additional techniques utilized by the Genesis Design team are described further in the Construction Report.

BRAINSTORMING

Creative team process for deriving innovative systems for application.

SYSTEM ANALYSIS

Completing an integrative assessment of system pros and cons.

SYSTEM SELECTION

Choosing the systems that best fit with the project and team goals.

PLANNING

Adjusting techniques to better mitigate the cons and benefit from the pros.

APPLICATION

Applying the techniques effectively throughout all phases of the project.

Boylston Street Highrise Estimate

SPEC	Bid Package Name	Bid Package	% of Total	Cost per SF	Cost
02 00 00	Existing Conditions	BP-02	1.10%	$ 7.05	$ 2,868,528
03 00 00	Concrete	BP-03	7.5%	$ 48.06	$ 19,558,148
04 00 00	Masonry	BP-04	0.10%	$ 0.64	$ 260,775
05 00 00	Metals	BP-05	10.5%	$ 67.28	$ 27,381,407
06 00 00	General Trades	BP-06	0.85%	$ 5.45	$ 2,216,590
07 42 00	Wall Panels	BP-07A	4.5%	$ 28.83	$ 11,734,889
07 50 00	Membrane Roofing	BP-07B	0.3%	$ 1.92	$ 782,326
07 81 00	Applied Fireproofing	BP-07C	0.45%	$ 2.88	$ 1,173,489
08 00 00	Openings	BP-08	14%	$ 89.71	$ 36,508,543
09 00 00	Finishes	BP-09	4%	$ 25.63	$ 10,431,012
12 00 00	Furnishings	BP-12	3%	$ 19.22	$ 7,823,259
14 00 00	Conveying Equipment	BP-14	5.2%	$ 33.32	$ 13,560,316
21 00 00	Fire Suppression	BP-21	2.4%	$ 15.38	$ 6,258,607
22 00 00	Plumbing	BP-22	3.9%	$ 24.99	$ 10,170,237
23 00 00	HVAC	BP-23	12.7%	$ 81.38	$ 33,118,464
26 00 00	Electrical	BP-26	15.7%	$ 100.60	$ 40,941,723
27 00 00	Communications	BP-27	2%	$ 12.82	$ 5,215,506
28 00 00	Electronic Safety & Security	BP-28	2%	$ 12.82	$ 5,215,506
31 00 00	Earthwork	BP-31	6.4%	$ 41.01	$ 16,689,620
32 00 00	Exterior Improvements	BP-32	3.4%	$ 21.79	$ 8,866,360
		Hard Costs Total	**100%**	**$ 640.76**	**$ 260,775,305**
90 00 00	Miscellaneous				
	Architectural Design Fees				Inc'd In Design Fees
	Geotechnical Borings				$ 30,000
	Civil Engineering				Inc'd In Design Fees
	Structural Engineering				Inc'd In Design Fees
	MEP Engineering				Inc'd In Design Fees
	General Contingency		2%		$ 5,215,506.10
	IPD Design Fees		7.5%		$ 19,558,147.88
	General Conditions		6.2%		$ 16,203,748.59
		Soft Costs Total			**$ 41,007,403**
				Grand Total	**$ 301,782,707.57**

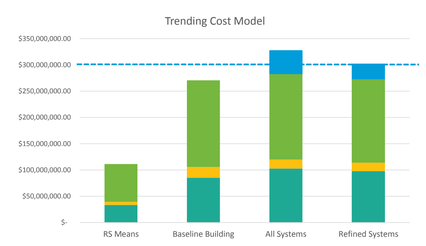
COST CONTROL

Genesis Design developed several estimates and schedules in order to efficiently plan for the Boylston Street Highrise construction. The estimate is broken down by bid packages based on CSI Masterformat Specification sections. These Bid Packages comprise the hard (or direct) costs of constructing the building.

The façade of the building is composed of Bid Packages 07A and 08; these represent the greatest percentage of the hard costs due to the nature of the double-skin façade. The cost increase is due to having twice the glazing surface area as a typical façade, and having building integrated photovoltaics. To estimate this cost, it was first determined that the double skin façade would be roughly 40% of the total exterior enclosure. It was then decided that a double skin façade with integrated photovoltaics would cost 2.5 times as much as a traditional curtainwall system. To get a total cost for the façade, 40% of the exterior enclosure cost (07A and 08) was increased by 2.5. It is important to note that the higher initial cost of construction will be mostly offset throughout the buildings life in the form of energy savings.

By utilizing the Integrated Project Delivery method (IPD), Genesis Design is able to save the owner on soft costs. All design fees are incorporated into a single contract with Genesis Design. This allows the owner to partake in savings because any money saved on the project is distributed evenly among all parties involved. The contractual relationship ensures that any savings generated will be split between the owner, construction manager, and architect/engineers.

Item	Contract Value	Items of Note
Performance Bond	$2,000,000	A performance bond is included in the general conditions estimate although it is unknown if this will be required by the owner. The bond was calculated at 2/3% total project cost. If no bond is required, the cost will be deducted from the budget.
Project Field Office	$136,800	The field office for this project is located 4.5 blocks away on Newbury Street. It was decided that a higher quality field office would lead to better communication among the team members.
Electronic Submittals	$13,000	Electronic submittal system will be utilized; now almost industry standard for saving paper and time by reducing RFI turnaround time and submittal approval.
Educational Kiosks	$9,750	Educational touch screen kiosks will be implemented into the final design as well as during construction.
General Contingency	$2,000,000	Existing interlocking steel sheet pile wall may require repairs upon inspection.
Façade Testing	$120,000	Local MA based testing facility will test façade mock-up for wind/water loads.
Hoist	$575,000	USA Hoist estimate for delivery, set-up, dismantle. Also includes pad and electricity.
Tower Crane	$936,000	Estimate for the Terex Tower Crane specified for 16 months. Includes pad and electricity.
Temporary Crane	$20,000	Estimate for 2 day rental of Terex telescoping T340-1 XL truck crane.



BID PACKAGES & COST MODEL

The table to the left represents the overall budget for the Boylston Street Highrise. This estimate was broken down by bid packages based on Masterformat Specification sections. This fair value estimate is what the owner can expect to pay for each area of the building. Areas of note include bid packages 05 and 08. These sections are somewhat inflated due to the expensive nature of the double skin façade. The graph above is a trending cost model of how the estimate developed over time for this project. The refined systems represents the final cost estimate, after applying value management tactics to the design.

SPEC	PROJECT TASKS	LAB. COST/UNIT	MAT. COST/UNIT	ABR.	UNITS	MAT. COST ($)	LAB. COST ($)	TOTAL
00 00 00 PROCUREMENT & CONTRACTING	Building Permit - City of Boston	$ -	$ -	LS	1	$ 2,500,000.00	$ -	$ 2,500,000.00
	Mechanical Permit	$ -	$ -	LS	1	$ -	$ -	Inc'd in 23 00 00
	Electrical Permit	$ -	$ -	LS	1	$ -	$ -	Inc'd in 26 00 00
	Plumbing Permit	$ -	$ -	LS	1	$ -	$ -	Inc'd in 22 00 00
	Fire Suppression Permit	$ -	$ -	LS	1	$ -	$ -	Inc'd in 21 00 00
	Warrant of Survey for Curbs/Sidewalks	$ -	$ -	LS	1	$ 1,250.00	$ -	$ 1,250.00
	Sidewalk Encroachments	$ -	$ -	LS	1	$ 750.00	$ -	$ 750.00
	Street Encroachments (Cab Stand)	$ -	$ -	LS	1	$ 5,160.00	$ -	$ 5,160.00
	Street Closures	$ -	$ -	LS	1	$ 5,000.00	$ -	$ 5,000.00
	Performance Bond	$ -	$ -	LS	1	$ 2,000,000.00	$ -	$ 2,000,000.00
	Subtotal							$ 4,512,160.00
01 00 00 GENERAL EXPENSES	Project Field Office	$ -	$ 7,600.00	MO	16	$ 121,600.00	$ -	$ 121,600.00
	Educaton Kiosks	$ -	$ 3,250.00	LS	3	$ 9,750.00	$ -	$ 9,750.00
	Scheduling	$ -	$ -	MO	18	$ -	$ -	Inc'd in 01 30 00
	Job Photos	$ -	$ 250.00	MO	18	$ 4,500.00	$ -	$ 4,500.00
	Project Signage	$ -	$ 5,000.00	LS	1	$ 5,000.00	$ -	$ 5,000.00
	General Clean-Up	$ -	$ 3,000.00	EA	17	$ 51,000.00	$ -	$ 51,000.00
	Final Clean-Up ($3,500 per floor)	$ -	$ 3,500.00	EA	17	$ 59,500.00	$ -	$ 59,500.00
	Dumpsters	$ -	$ 2,400.00	MO	18	$ 43,200.00	$ -	$ 43,200.00
	Printing Costs	$ -	$ 500.00	MO	18	$ 9,000.00	$ -	$ 9,000.00
	Engineering & Layout	$ -	$ -	LS	1	$ -	$ -	Inc'd in 90 00 00
	Street/Sidewalk Repairs	$ -	$ -	SF		$ -	$ -	Inc'd in 32 00 00
	Field Office Equipment	$ -	$ 1,000.00	MO	18	$ 18,000.00	$ -	$ 18,000.00
	Soils Conservation	$ -	$ -	LS	1	$ -	$ -	Inc'd in 31 00 00
	Electronic Submittals	$ -	$ 13,000.00	LS	1	$ 13,000.00	$ -	$ 13,000.00
	Mail/Federal Express	$ -	$ 250.00	MO	18	$ 4,500.00	$ -	$ 4,500.00
	Miscellaneous Safety	$ -	$ 2,000.00	MO	18	$ 36,000.00	$ -	$ 36,000.00
	General Contingency	$ -	$ -	LS	1	$ 2,000,000.00	$ -	$ 2,000,000.00
	Subtotal							$ 2,375,050.00
01 30 00 ADMINISTRATIVE REQUIREMENTS	Project Executive: 5 hrs/wk for 72 wks	$ 225.00	$ -	HRS	360	$ -	$ -	$ 81,000.00
	Senior Project Manager: 20 hrs/wk for 72 wks	$ 200.00	$ -	HRS	1,440	$ -	$ -	$ 288,000.00
	Project Manager: 40 hrs/wk for 72 wks	$ 175.00	$ -	HRS	2,880	$ -	$ -	$ 504,000.00
	Project Manager: 40 hrs/wk for 72 wks	$ 175.00	$ -	HRS	2,880	$ -	$ -	$ 504,000.00
	MEP Coordinator: 40 hrs/wk for 72 wks	$ 185.00	$ -	HRS	2,880	$ -	$ -	$ 532,800.00
	MEP Coordinator: 20 hrs/wk for 72 wks	$ 185.00	$ -	HRS	1,440	$ -	$ -	$ 266,400.00
	BIM Coordinator: 20 hrs/wk for 72 wks	$ 165.00	$ -	HRS	1,440	$ -	$ -	$ 237,600.00
	Superintendent: 40 hrs/wk for 72 wks	$ 175.00	$ -	HRS	2,880	$ -	$ -	$ 504,000.00
	Superintendent: 40 hrs/wk for 72 wks	$ 175.00	$ -	HRS	2,880	$ -	$ -	$ 504,000.00
	Assistant Superintendent: 30 hrs/wk for 72 wks	$ 155.00	$ -	HRS	2,880	$ -	$ -	$ 446,400.00
	Assistant Superintendent: 30 hrs/wk for 72 wks	$ 155.00	$ -	HRS	2,880	$ -	$ -	$ 446,400.00
	Field Engineer: 40 hrs/wk for 72 wks	$ 125.00	$ -	HRS	2,880	$ -	$ -	$ 360,000.00
	Field Engineer: 40 hrs/wk for 72 wks	$ 125.00	$ -	HRS	2,880	$ -	$ -	$ 360,000.00
	General Superintendent: 20 hrs/wk for 72 wks	$ 195.00	$ -	HRS	1,440	$ -	$ -	$ 280,800.00
	Project Administrator: 10 hrs/wk for 72 wks	$ 125.00	$ -	HRS	720	$ -	$ -	$ 90,000.00
	Safety Director: 10 hrs/wk for 72 wks	$ 165.00	$ -	HRS	720	$ -	$ -	$ 118,800.00
	Subtotal							$ 5,524,200.00
SPEC	PROJECT TASKS	LAB. COST/UNIT	MAT. COST/UNIT	ABR.	UNITS	MAT. COST ($)	LAB. COST ($)	TOTAL
01 45 00 QUALITY CONTROL	Third Party Document Review	$ -	$ -	LS	1	$ 10,000.00	$ -	$ 10,000.00
	Engineering/Layout	$ -	$ -	LS	1	$ 35,000.00	$ -	$ 35,000.00
	Site Survey	$ -	$ -	LS	1	$ 50,000.00	$ -	$ 50,000.00
	Concrete/Caisson Testing	$ -	$ -	LS	1	$ 140,000.00	$ -	$ 140,000.00
	Masonry Testing	$ -	$ -	LS	1	$ 40,000.00	$ -	$ 40,000.00
	Structural Steel Testing	$ -	$ -	LS	1	$ 87,000.00	$ -	$ 87,000.00
	SOFP Testing	$ -	$ -	LS	1	$ 45,000.00	$ -	$ 45,000.00
	Façade Testing	$ -	$ -	LS	1	$ 120,000.00	$ -	$ 120,000.00
	Subtotal							$ 527,000.00
01 50 00 TEMPORARY SERVICES	480 Volt; 3-Phase Construction Service	$ -	$ -	LS	1	$ -	$ -	Inc'd in 26 00 00
	Temporary Power	$ -	$ -	LS	1	$ -	$ -	Inc'd in 26 00 00
	Temporary Lighting	$ -	$ -	LS	1	$ -	$ -	Inc'd in 26 00 00
	Temporary Water Services	$ -	$ -	LS	1	$ -	$ -	Inc'd in 22 00 00
	Neighbor Service Relocations	$ -	$ -	LS	1	$ -	$ -	$ 50,000.00
	Portable Electric Heaters (4 per floor)	$ -	$ 1,500.00	EA	68	$ 102,000.00	$ -	$ 102,000.00
	Telephones	$ -	$ 400.00	MO	18	$ 7,200.00	$ -	$ 7,200.00
	Potable Water	$ -	$ 800.00	MO	18	$ 14,400.00	$ -	$ 14,400.00
	Portable Toilets	$ -	$ 3,200.00	MO	18	$ 57,600.00	$ -	$ 57,600.00
	Fire Extinguishers @ Stairwells (20 lb CO2)	$ -	$ 175.00	EA	102	$ 17,850.00	$ -	$ 17,850.00
	Site Security Fencing	$ -	$ 18.75	LF	690	$ 12,937.50	$ -	$ 12,937.50
	Jersey Barriers Rental	$ -	$ 26.00	LF	140	$ 3,640.00	$ -	$ 3,640.00
	Shoring & Bracing	$ -	$ -	LS	1	$ -	$ -	Inc'd in 31 00 00
	Perimeter Building Enclosures (17 Levels)	$ 0.72	$ 0.95	SF	88,170	$ 83,761.50	$ 63,482.40	$ 147,243.90
	Removable Corrales for Deliveries (17 Levels)	$ 22.00	$ 46.00	LF	138	$ 6,348.00	$ 3,036.00	$ 9,384.00
	Toe Boards at Slab Perimeter	$ 1.65	$ 5.05	LF	11,425	$ 57,696.25	$ 18,851.25	$ 76,547.50
	Dewatering Equipment	$ -	$ -	LS	1	$ -	$ -	Inc'd in 31 00 00
	Debris Chute: 17 Story	$ -	$ 63,750.00	LS	1	$ 63,750.00	$ -	$ 63,750.00
	Material Hoist; 2 operators @ $120/hr ea.	$ 240.00	$ -	HRS	2,640	$ 575,000.00	$ 633,600.00	$ 1,208,600.00
	Tower Crane	$ -	$ 58,500.00	MO	16	$ 936,000.00	$ -	$ 936,000.00
	Tower Crane Operator	$ 120.00	$ -	HRS	2,560	$ -	$ 307,200.00	$ 307,200.00
	Temporary Truss Truck Crane	$ -	$ -	LS	1	$ 20,000.00	$ -	$ 20,000.00
	Truss Crane Operator	$ 140.00	$ -	HRS	16	$ -	$ 2,240.00	$ 2,240.00
	General Clean-Up	$ 475.00	$ 1,275.00	MO	18	$ 22,950.00	$ 8,550.00	$ 31,500.00
	Waste Disposal Dumpsters: 30 cy dumpsters	$ 150.00	$ 850.00	EA	60	$ 51,000.00	$ 9,000.00	$ 60,000.00
	Security Guards	$ 7,280.00	$ -	MO	18	$ -	$ 131,040.00	$ 131,040.00
	Guard Shack	$ 5.76	$ 125.00	SF	19	$ 2,375.00	$ 109.44	$ 2,484.44
	Scaffolding; Sidewalk Bridge at Mall Entrance	$ 36.75	$ 112.10	LF	25	$ 2,802.50	$ 918.75	$ 3,721.25
	Subtotal							$ 3,265,338.59
						GENERAL CONDITIONS TOTAL		$ 16,203,748.59

GENERAL CONDITIONS

One of the first areas of the budget created for this project was the general conditions. Staffing a project of this magnitude and depth is very challenging. By developing the general conditions costs early, the owner is able to see where these costs are coming from. As expected, staffing the project is where most of the general conditions costs are held. The general expenses portion of the general conditions budget is also significant, however, this is mainly due to the general contingency. If not fully utilized, this money will return to the owner, further reducing the overall project cost. Highlighted in gold are several general conditions items that are very important to the project. An explanation of these line items can be found in the table below. The general conditions account for about 5.5% of the total project cost.

GENERAL CONDITIONS SUMMARY		
	Procurement & Contracting	$ 4,512,160
	General Expenses	$ 2,375,050
	Administrative Requirements	$ 5,524,200
	Quality Control	$ 527,000
	Temporary Services	$ 3,265,339
	Subtotal	$ 16,203,749

GENESIS DESIGN

PROJECT
THE BOYLSTON STREET HIGH RISE
BOSTON, MA 02115

DRAWING TITLE
COST & SCHEDULE

AEI TEAM NO. 02 - 2016

DATE 17 FEB 2016

SCALE SEE DRAWINGS

DRAWING NO. I-04

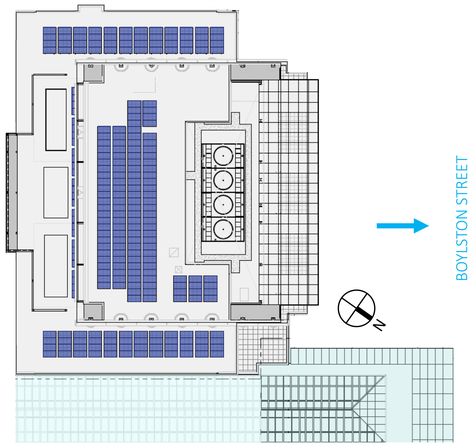
PAGE NO. 32

ORIGINAL vs. GENESIS DESIGN ROOFTOP PV

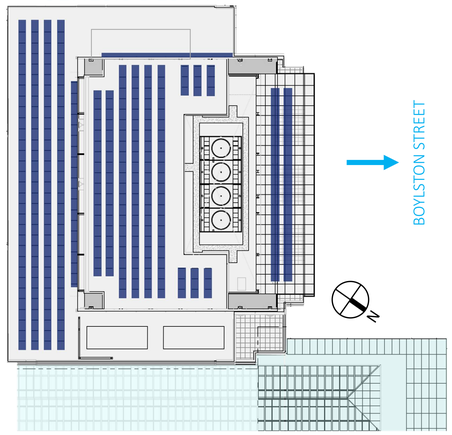
Genesis Design chose to make several modifications to the original rooftop design and photovoltaic layout:

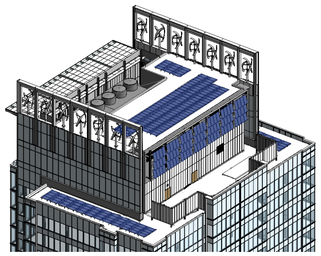
- **Incorporate a large PV array on the south roof:** the original design placed generators on the South roof. Since this is one of the most optimal opportunities for solar panels, the generators were relocated to the East roof to make room for one of the building's best-performing PV arrays.
- **Tilting the roof PVs:** Roof PVs are not tilted at 10º in the roof zones and 35º on the wall-mounted zones to produce more electricity than the original design.
- **Getting rid of shadows:** Since PV array production is dramatically affected by partial shadowing, the wind turbines on the original design would be detrimental to the system's performance. Genesis design got rid of these turbines to optimize the performance of the upper roof PV array.

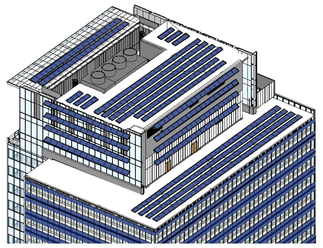
ORIGINAL DESIGN



GENESIS DESIGN





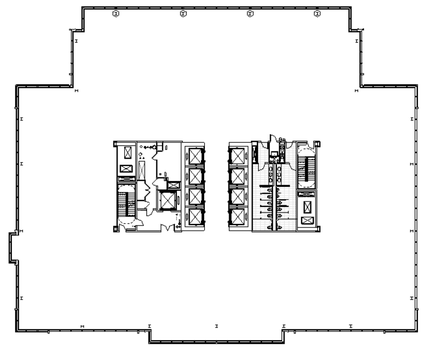


ORIGINAL vs. GENESIS DESIGN EXTERIOR ARCHITECTURE

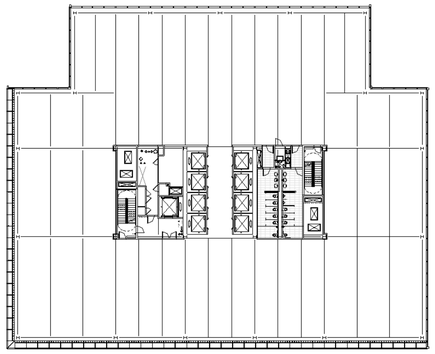
Genesis Design chose to make several modifications to the building framing layout:

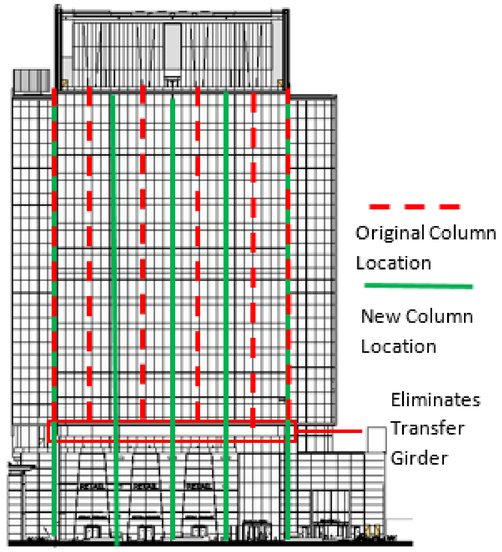
- **Simplified Framing Layout:** the framing layout was simplified to make bays more regular and remove the exterior indentations that were on the original architectural layout. This decision led to a simplified construction process while allow for additional interior space.
- **Space for Double Skin Facade:** By simplifying the layout and removing indentation out and into the building, the team was able to make room on the exterior for an uninterrupted double skin façade.

ORIGINAL DESIGN



GENESIS DESIGN





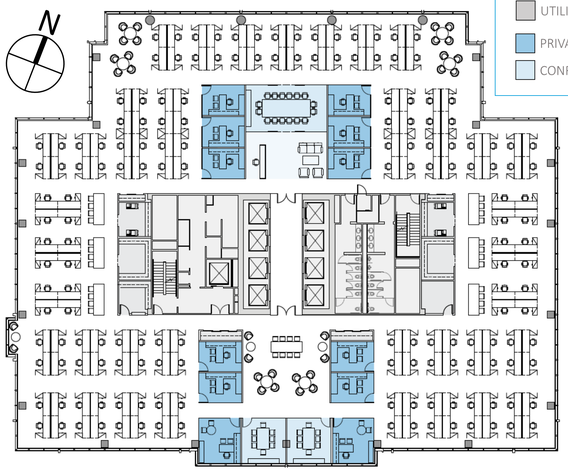
ORIGINAL vs. GENESIS DESIGN COLUMN LAYOUT

Genesis Design chose to make several modifications to the original column layout of the building:

- **Eliminate Transfer Girders:** the original design placed at coordinates that led to the column line having to shift at the retail level. This led to the creation of heavy transfer girders to transfer the load into an eccentric lower column.
- **Reduce Overall Building Weight:** By moving the column lines to line up from the top of the building down to the plaza, the transfer girders were eliminated reducing the overall weight of the structure by 26,000 lbs. from the original column layout.
- **Simplify Construction:** Since the columns lines extending directly from the top of the building to the plaza, a straight forward column erection sequence was established, reducing construction time and hence cost.

ORIGINAL OPEN OFFICE

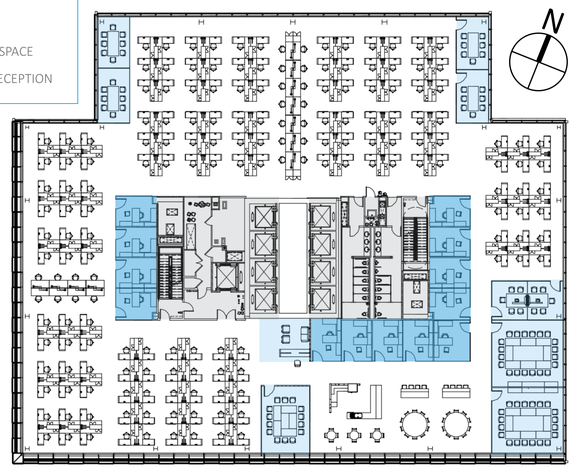
SCALE: 3/64 = 1' – 0"



12 original private offices
3 original conference Rooms
164 original workstations

GENESIS DESIGN OPEN OFFICE

SCALE: 3/64 = 1' – 0"



13 new private offices
9 new conference Rooms
178 new workstations

Larger breakroom
High flexibility
More support areas

ACHIEVING A BETTER OPEN OFFICE DESIGN

There are many pros and cons associated with open office spaces. Cons include lack of privacy, sickness spread in close quarters, and the feeling of stress. However, Genesis Design combats the cons to attract tenants to the Boylston Street High Rise, and the chart on the right summarizes the design strategies used. In terms of electrical design, by creating opportunities to bring daylight into the interior space, higher occupant comfort and happiness is achieved while also reducing lighting and cooling loads.

GENESIS DESIGN

PROJECT
THE BOYLSTON STREET HIGH RISE
BOSTON, MA 02115

DRAWING TITLE
ARCHITECTURAL OPTIMZATION

AEI TEAM NO.	02 - 2016
DATE	17 FEB 2016
SCALE	SEE DRAWINGS
DRAWING NO.	I-05
PAGE NO.	33

DOUBLE SKIN FAÇADE INTEGRATION

The design and construction of a double skin façade is truly an integrative process due to the complex nature of the system. All project members need to have input in the design, from the mechanical load reduction to the daylighting characteristics. Structural connection details and the construction process including quality control planning also are critical to the design of a successful system.

COST BREAKDOWN

While the double skin façade had numerous positive impacts on the mechanical loads for the building, it comes at a high initial cost. To calculate the construction cost of building this system, the exterior enclosure cost was first estimated per square foot of glazing area. The double skin portion was then estimated to be 2.5 times the cost of a typical system based on the recommendation of a façade manufacturer. This includes a unitized system with integrated photovoltaics. This number was then applied to 40% of the total exterior enclosure, the portion of the building which has the double skin façade. This cost will be payed back however, due to the mechanical savings that it will achieve. See drawing I-03 for a lifecycle analysis.

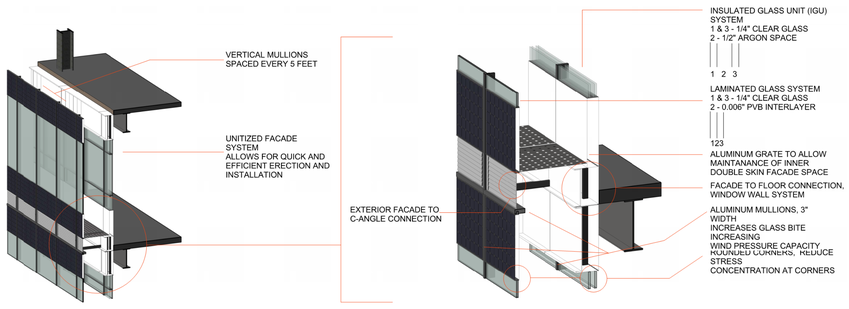
Exterior Envelop Cost Comparison					
	Unit	Quantity	% Total	Cost/Unit	Cost
Typical Curtainwall System	SF	52,194	60%	$ 499.85	$ 26,089,000.00
Double Skin System	SF	34,796	40%	$1,249.62	$ 43,482,000.00
				Total	$ 69,571,000.00

MAINTANENCE

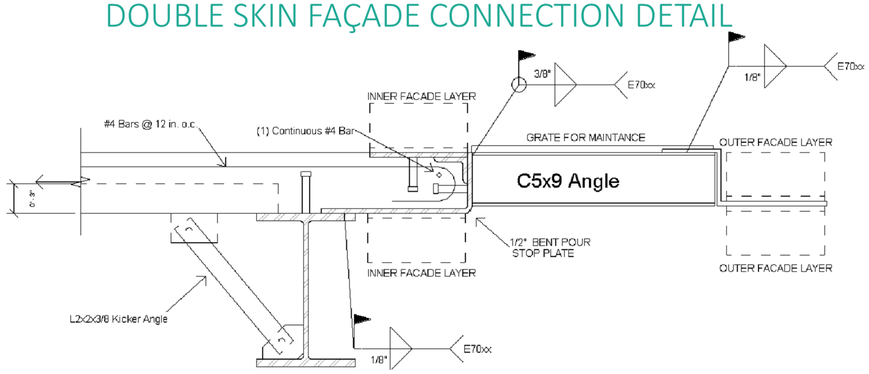
Small access doors are to be placed every 40 feet across the façade. A cleaner is to enter the cavity to clean the inside of the windows while standing on the supportive grate below. The outside of the windows are to be cleaned using the standard harness and pulley system.

WAREMA's LONWORKS automated control uses solar position tracking to position the cut off angle of slats to exclude direct solar radiation and make the best possible use of diffused daylight. As for the structure of the slats, first a black coating is applied to the perforated aluminum band. A second layer of RAL 9006 white selective paint is applied. The selective coating only reflects visible light into the room, while ultraviolet and infrared radiations are absorbed by the slat and reflected as heat radiation within the double skin, not into the interior. In this, the blinds ensure good convection which is the drawing of heated air upward through the chimney affect. Please refer to the **Mechanical Narrative, Section 7.1** for the natural ventilation and mechanical performance of the double skin façade. The horizontal blinds are used throughout the double skin on the Boylston Street High Rise's south and west facades.

STRUCTURAL CONSIDERATIONS



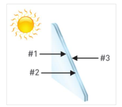
DOUBLE SKIN FAÇADE CONNECTION DETAIL



GLASS TYPES SPECIFICATIONS

DOUBLE SKIN: SOUTH & WEST FACADE

EXTERIOR SKIN GLASS
CLEAR



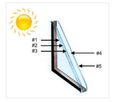
#1) 1/4" (6mm) clear
#2) .060" (1.52mm) PVB interlayer
#3) 1/4" (6mm) clear

INTERIOR SKIN GLASS
VNE1-63

#1) 1/4" (6mm) clear VNE-63 #2
#2) 1/2" (13.22) argon space
#3) 1/4" (6mm) clear

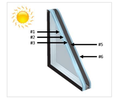
CURTAIN WALL: NORT & EAST FACADE

VISION GLASS
CLEAR / VNE1-63



#1) 1/4" (6mm) clear
#2) .060" (1.52mm) PVB
#3) 1/4" (6mm) clear VNE1-63 #4
#4) 1/2" (13.2mm) argon space
#5) 1/4" (6mm) clear

SPANDREL GLASS
CLEAR / VNE1-63 & V903

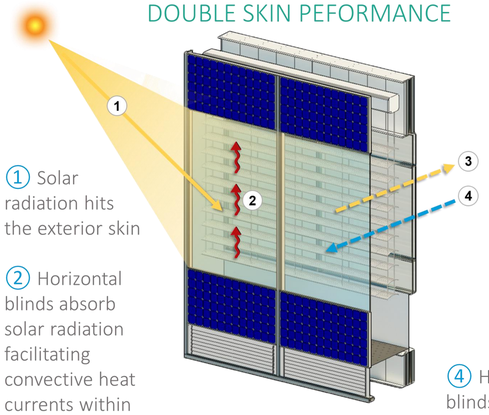


#1) 1/4" (6mm) clear
#2) .060" (1.52mm) PVB
#3) 1/4" (6mm) clear VNE1-63 #4
#4) 1/2" (13.2mm) argon space
#5) 1/4" (6mm) clear with Viraspan V903 #4

Product Code	Glass Construction	Transmittance				Reflectance				U-Value						
		Argon	Visible Trans	Solar Trans	UV Trans	Exterior Refl	Interior Refl	Solar Refl	UV Winter	UV Summer	SC	SHGC	RHG	LSG		
Clear	9/16" (14mm) Laminated	No	85%	60%	<1%	7%	7%	6%	0.95	0.87	0.81	0.71	175	1.2		
VNE1-63	1" (25mm) Insulating	Yes	62%	24%	5%	10%	10%	37%	0.25	0.21	0.32	0.28	68	2.21		
Clear / VNE1-63	1-5/16" (31.96mm) Laminated Insulating (Coating #4)	Yes	60%	22%	<1%	9%	10%	18%	0.24	0.20	0.32	0.28	67	2.14		
Clear / VNE1-85 & V903	1-5/16" (31.96mm) Laminated Insulating (Coating #2) with Viraspan V903 (Coating #4)	Yes	n/a	n/a	<1%	9%	n/a	n/a	0.24	0.20	n/a	n/a	n/a	n/a		

Interlayer Material	Primary Application							
	Blast Mitigating (low-medium)	Blast Mitigating (medium-high)	Hurricane Resistant (small missile)	Hurricane Resistant (large missile)	Ultraviolet Protection	Aesthetic	Acoustic	Safety
Polyvinyl butyral (pvb) .030"	X				X		X	X
Polyvinyl butyral (pvb) .060"	X		X		X		X	X
Polyvinyl butyral (pvb) .090"	X			X	X		X	X
Saflex® SilentGlass Acoustic .030"					X		X	X
SentryGlas® .060"	X			X	X			X
SentryGlas® .090"	X			X	X			X
SentryGlas® .100"	X			X	X			X
StormGuard™ .100"		X		X	X			X
Vanceva® Storm .077"		X		X	X			X
Vanceva® Color					X	X		X

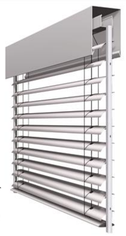
DOUBLE SKIN PEFORMANCE



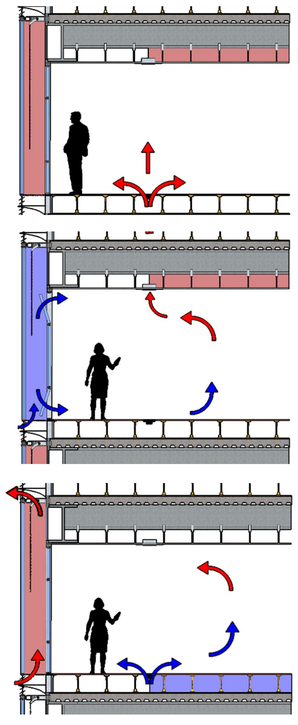
① Solar radiation hits the exterior skin

② Horizontal blinds absorb solar radiation facilitating convective heat currents within air gap

③ Horizontal blind operability also eliminates direct solar glare while continuing daylighting



④ Horizontal blinds maintain views from interior to exterior



SUMMER

In summer mode, the façade control scheme opens both the top and bottom louvers in order to ventilate the cavity. Heat gain between the panes along with wind velocity will create a natural buoyancy naturally causing the air to rise out of the cavity. The system essentially is set to cool itself off in order to avoid over heating. This set up assists in controlling the envelope load of the building.

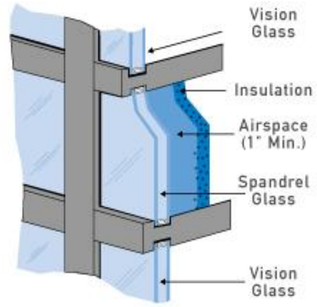
Hybrid Natural Ventilation

During ideal outdoor air weather conditions, with a temperature range of 50 to 65 degrees Fahrenheit and a maximum relative humidity of 65%, the façade will open completely and condition the space using only outside air. The office areas will be negatively pressurized in order to draw the outside air through the windows and across the floor plan. This control sequence allows supply pumps and fans to the AHU's and DOAS to be turned of completely, leaving only return fan on to pressurize the office space.

WINTER

During the winter months, the cavity is set to close itself completely. The solar shading devices are designed to absorb and capture heat, essentially heating the space using solar gains. This captured radiation acts a temperature barrier between the outdoor air and room air. This control sequence significantly reduces envelope load during the winter months.

SPANDREL WALL WITH INSULATION



Spandrel glass was used to aesthetically harmonize with the vision glass as well as hide raised axis floor and ceiling construction from the exterior. On gray, overcast days, a greater visual disparity is created versus minimized contrast for other weather conditions. The ceramic frit of the spandrel glass does not affect U-value performance. The insulation behind the air space gives the wall construction a higher R-value. Collaboration and special care in calculating window-to-wall ratios were done with the Mechanical team to optimize the energy performance of the facades.

GENESIS DESIGN

PROJECT
THE BOYLSTON STREET HIGH RISE
BOSTON, MA 02115

DRAWING TITLE
DOUBLE SKIN FAÇADE INTEGRATION

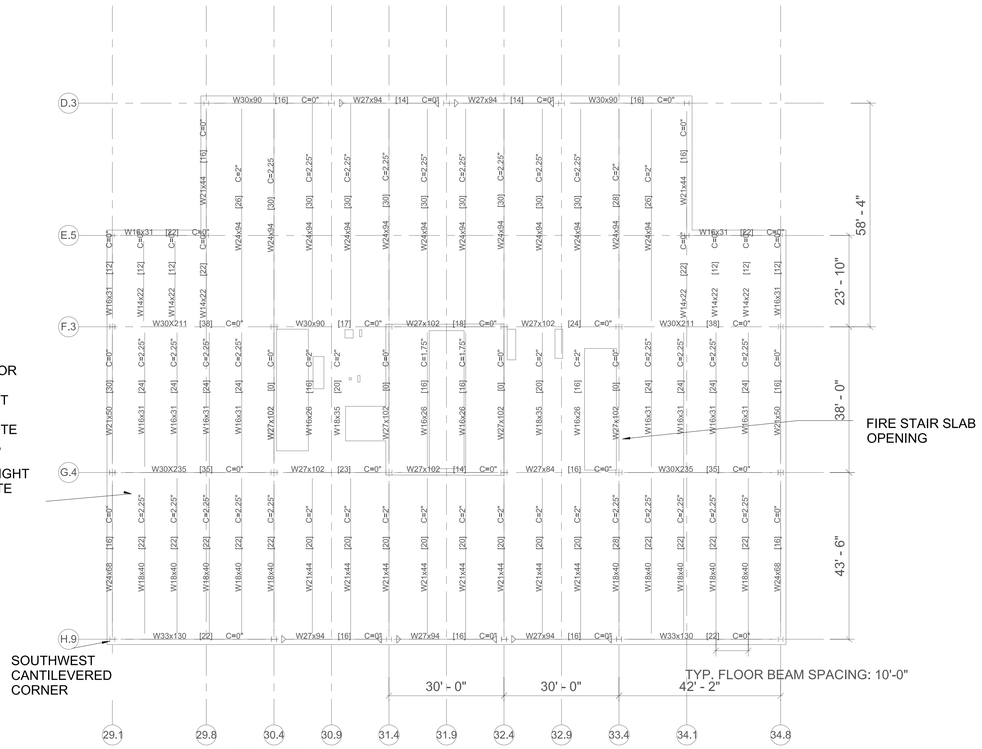
AEI TEAM NO. 02 - 2016

DATE 17 FEB 2016

SCALE SEE DRAWINGS

DRAWING NO. I-06

PAGE NO. 34



TYP. FLOOR SLAB: VULCRAFT 2VLI19 (2" COMPOSITE DECKING, 3.25" LIGHTWEIGHT CONCRETE TOPPING

FIRE STAIR SLAB OPENING

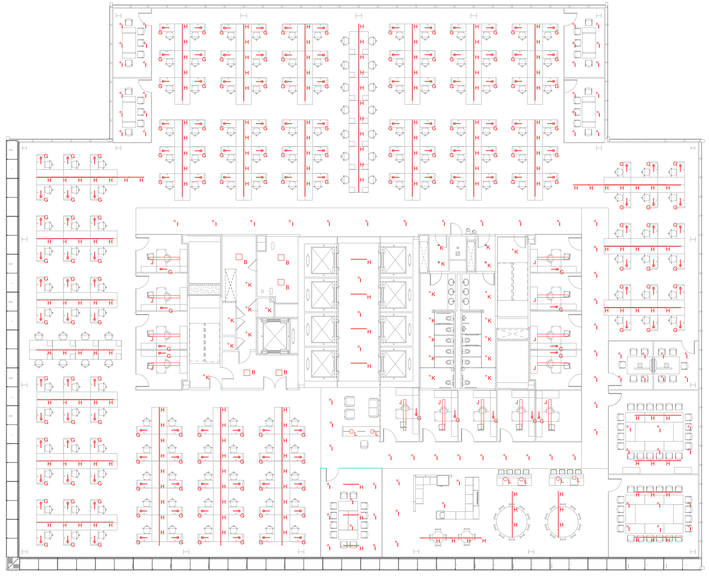
SOUTHWEST CANTILEVERED CORNER

TYP. FLOOR BEAM SPACING: 10'-0"

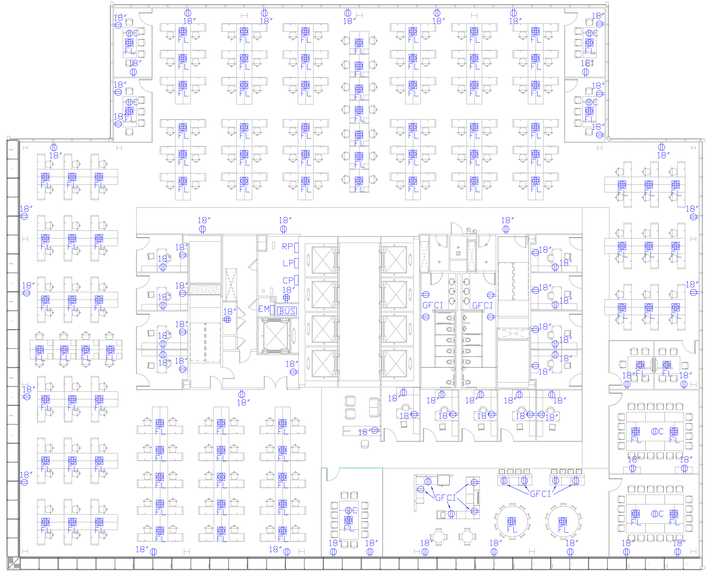
STRUCTURAL FRAMING PLAN

MECHANICAL DIFFUSERS AND RETURN DUCTS PLAN

NOTE:
THESE DETAILS REPRESENT FLOORS 5-17



ELECTRICAL LIGHTING PLAN



ELECTRICAL POWER PLAN

GENESIS DESIGN

PROJECT
THE BOYLSTON STREET HIGH RISE
BOSTON, MA 02115

DRAWING TITLE
TYPICAL OFFICE FLOOR

AEI TEAM NO.	02 - 2016
DATE	17 FEB 2016
SCALE	1/16" = 1' - 0"
DRAWING NO.	I-07
PAGE NO.	35

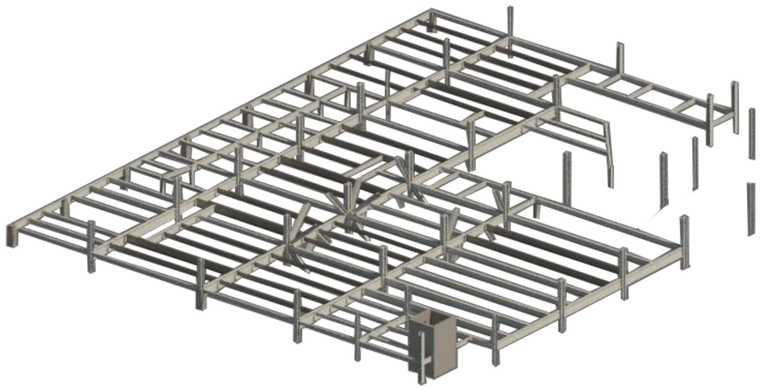
SCOPE OF WORK

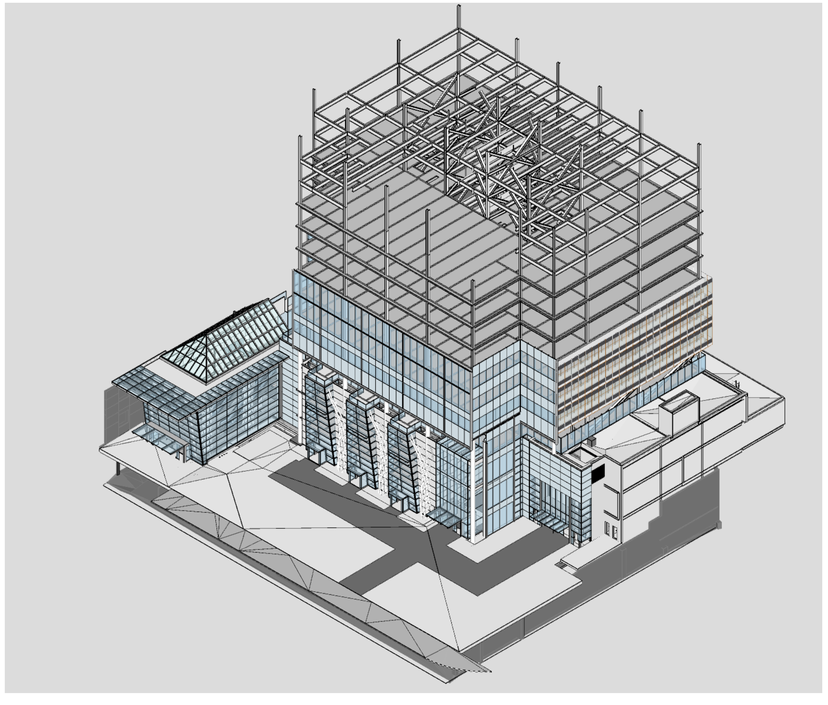
Before beginning the design of the Boylston Street High Rise, it was important to define the exact scope of work. It was decided that the office levels (floors 4-17) would be completely designed and fit out ready for tenant move in. These floors were fully designed and estimated based on a typical floor plan which Genesis Design developed. This includes the design of a flexible office space capable of accommodating several different types of tenants. All potential tenants will benefit from the multiple layer redundancy built into the systems on which the building operates.

The food and retail area of the building (floors 1-3), were designed to a core and shell level. Mechanical and lighting/electrical rough-ins will be provided, however the space will be left to be fit-out at the discretion of the owner and retail tenants. This area was also estimated at a core and shell level, meaning finishes and fixtures were removed from the cost estimate.

Because of the compact nature of the matrix schedule, Genesis Design will be able to turn the retail area of the building over to the owner approximately 6 months before the building is finished. This was done in an effort to allow the owner to select tenants and finish these areas as they see fit. It is not expected that the retail areas will be finished before the completion of the projects upper floors, so partial building occupancy should not be required. Partial occupancy comes with inherent safety risks, as it would be hazardous to allow customers on the first floors of a building which is under construction. It is the goal of Genesis Design to finish upper floors as the retail area of the building is complete, allowing for total building occupancy in late December, 2017.

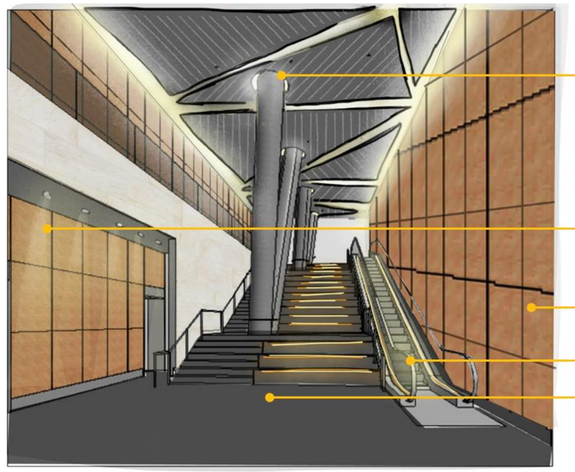
FRAMING PLAN FOR RETAIL AREA



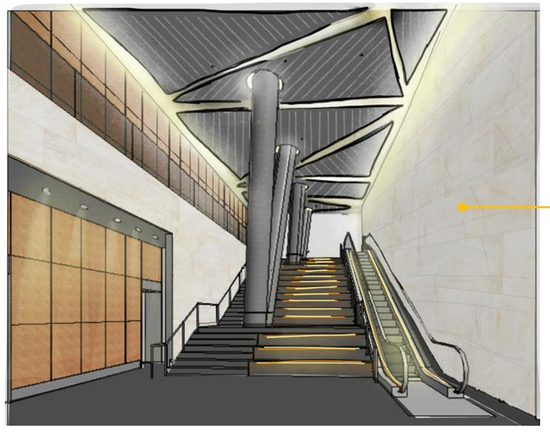


Exterior enclosure begins. Floors 1-3 turned over for tenant fit-out.

GENESIS DESIGN OFFICE LOBBY OPTION 1



GENESIS DESIGN OFFICE LOBBY OPTION 2



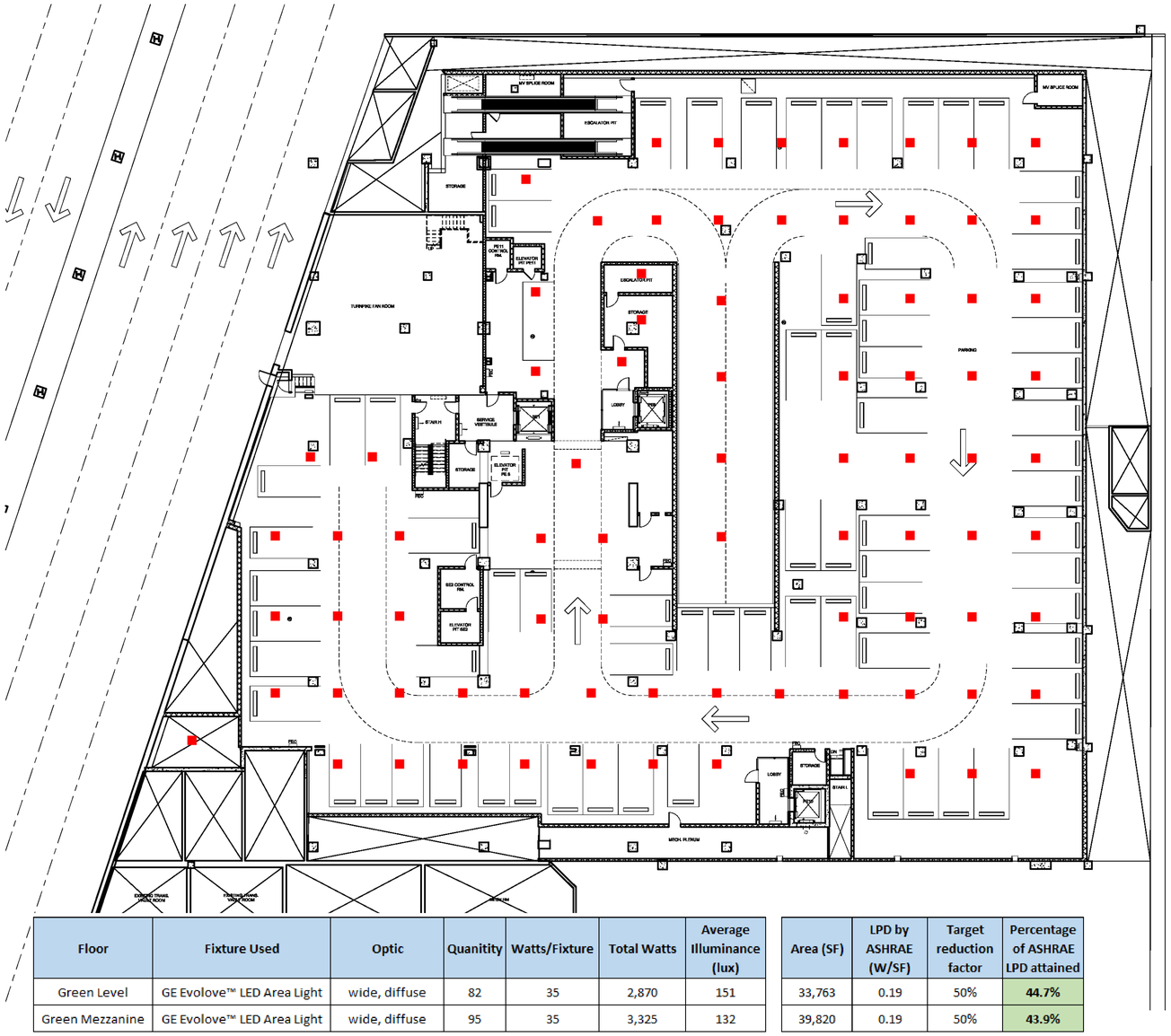
INSPIRATION IMAGE

ORIGINAL LOBBY DESIGN

GENESIS DESIGN

PROJECT	THE BOYLSTON STREET HIGH RISE BOSTON, MA 02115
DRAWING TITLE	LOBBY RETAIL FOOD HALL
AEI TEAM NO.	02 - 2016
DATE	17 FEB 2016
SCALE	SEE DRAWINGS
DRAWING NO.	I-08
PAGE NO.	36

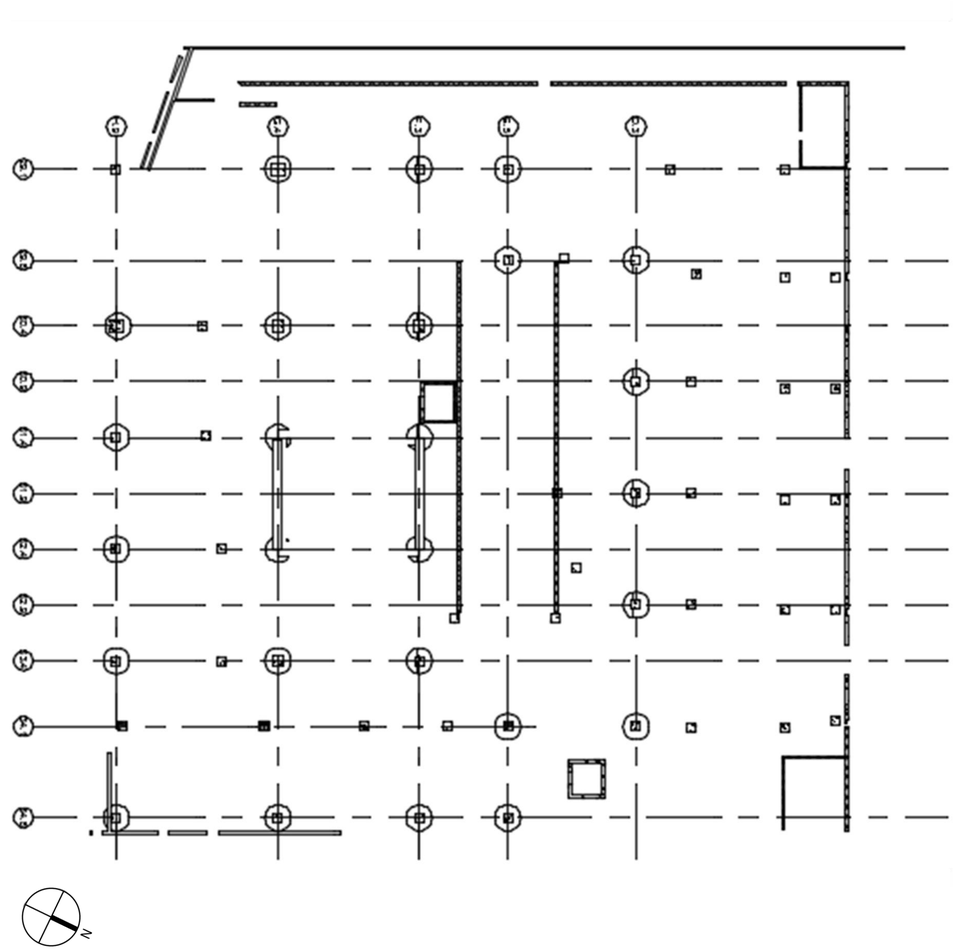
PARKING GARAGE STRUCTURE LAYOUT

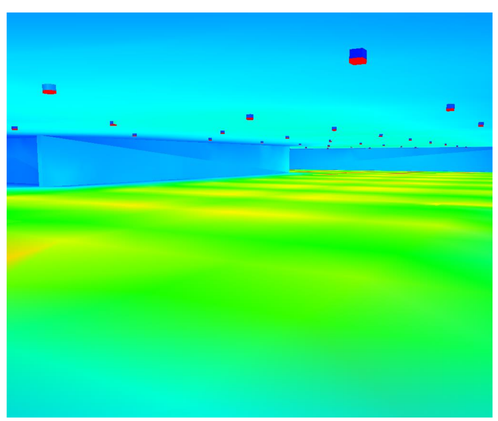


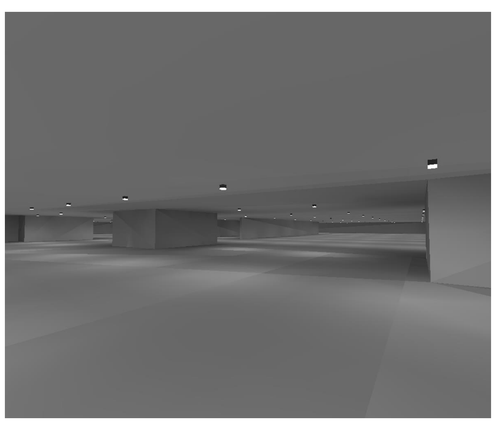
Floor	Fixture Used	Optic	Quanitity	Watts/Fixture	Total Watts	Average Illuminance (lux)
Green Level	GE Evolove™ LED Area Light	wide, diffuse	82	35	2,870	151
Green Mezzanine	GE Evolove™ LED Area Light	wide, diffuse	95	35	3,325	132

Area (SF)	LPD by ASHRAE (W/SF)	Target reduction factor	Percentage of ASHRAE LPD attained
33,763	0.19	50%	**44.7%**
39,820	0.19	50%	**43.9%**

PARKING GARAGE STRUCTURE LAYOUT







PARKING GARAGE LIGHTING DESIGN & CONTROLS

Genesis Design chose to light the two parking garage levels with LED luminaires in order to fall below 50% of the ASHRAE lighting power density baseline. The challenge of this large space was the shallow ceiling height of 8.5 feet; it was necessary to find highly efficient fixtures with as wide of an optical distribution as possible. The Evolve™ LED fixture by GE was specified:

- **High efficiency of 121 lumens/watt** (4,220 lumens, 35 watts)
- **Wide, diffuse lens** allows for a wide vertical distribution (blue) and a symmetrical horizontal distribution (red)
- **Motion-sensing option** allows for luminaires to dim to 50% when there is no occupancy.
- Between the two spaces, an average **of only 44.3% of the ASHRAE LPD** allowance was used.
- **Lighting shall be controlled by occupancy sensors that automatically reduce lighting power of each luminaire by a 30% when there is no activity detected within a zone after 30 minutes**. Lighting zones are seen above (none above 3,600 ft). There are no daylight zones.

GENESIS DESIGN

PROJECT
THE BOYLSTON STREET HIGH RISE
BOSTON, MA 02115

DRAWING TITLE
SUBGRADE LEVELS

AEI TEAM NO. 02 - 2016

DATE 17 FEB 2016

SCALE SEE DRAWINGS

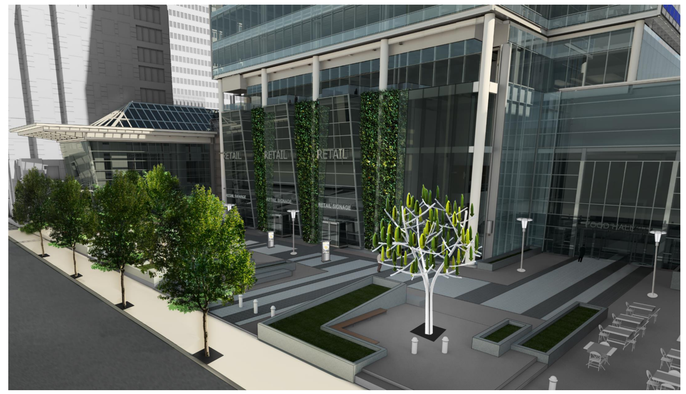
DRAWING NO. I-09

PAGE NO. 37

THE BOYLSTON STREET PLAZA

The city of Boston issued a Green Initiative plan with the goal to create a healthier and more sustainable city. Part of this future vision is the implementation and improvement of public spaces. Therefore, we at Genesis Design have created a public space that encompasses the city goals as well as our own goals of **Sustainability**, **Resiliency**, and **Integration.** The final design includes several innovative features that provide quality to the city, support to the environment, and comfort to the people. Below is a graphic summary of the plaza features and the intangible benefits that they provide to the city and its population. The figure to the right shows the location of these features.

1 Rain Water Collection
2 Vertical Green Wall
3 Seating Nooks
4 Touch Screen Kiosks
5 Wind Turbine Tree
6 CO2 Absorber
7 Safety Planters/Bollards
8 Café Seating
9 Bike Racks
10 Light Poles



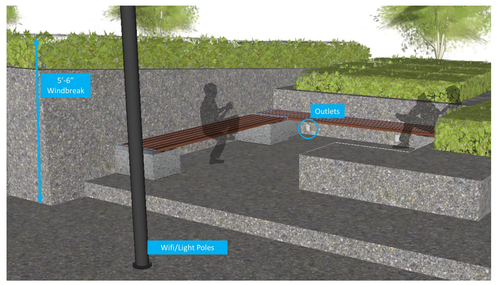
PLAZA SPACES: SEATING NOOKS

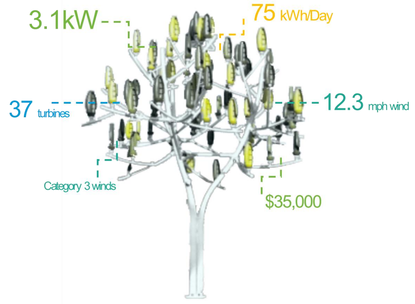
The plaza will feature several different spaces; the two primary spaces include the seating nooks/café and the walkways. The café and seating nooks promote a relaxing atmosphere designed for occupant lounging and socializing while the walkways are meant for flow of foot traffic to and from the Boylston Street High Rise amenities. The distinguishing difference between these two spaces is in the masonry patterns; subliminally suggesting where to walk and where to lounge. The seating nooks are designed to provide occupant comfort and safety; see the figure to the right. The nooks are enclosed by reinforced concrete planters that provide protection from vehicular traffic. The planters also feature a sloping shape that provides a unique aesthetic look while protecting the occupant from the forces of the wind. Within the planters will be climate appropriate vegetation, most likely evergreen shrubbery, to provide both a visual break from the surrounding concrete landscape as well as provide added wind breakage.

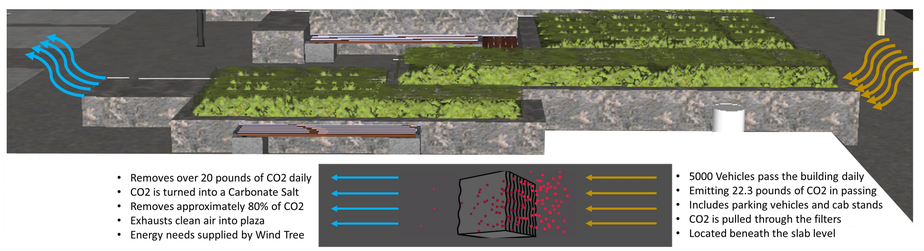
The nooks will also be equipped with GFCI receptacles which will be powered through the wind tree energy; see figure to the right. Occupants will be able to access this for free to power their electronic devices. Additionally supporting these electronic services will be a Wi-Fi station and light post combination; providing both 4G LTE service and lighting safety.

Lastly, the nooks will be comprised of both Green concrete and reclaimed lumber benches to further support the Boylston Street High Rise goal of sustainability. The wood products will be supplied by Jarmak Corporation while the Green concrete will be provided by Boston Sand and Gravel; see the Construction Document for further details.

Embedded within the central planter is a CO_2 absorbing device. The premise behind the device is to absorb the equivalent amount of CO_2 emitted by vehicles passing and parking in front of the building. The table to the right shows the summary calculations on how this will be accomplished. In summary, the device will absorb over 20 pounds of CO_2 a day and will supply the clean air to the center of the Plaza.







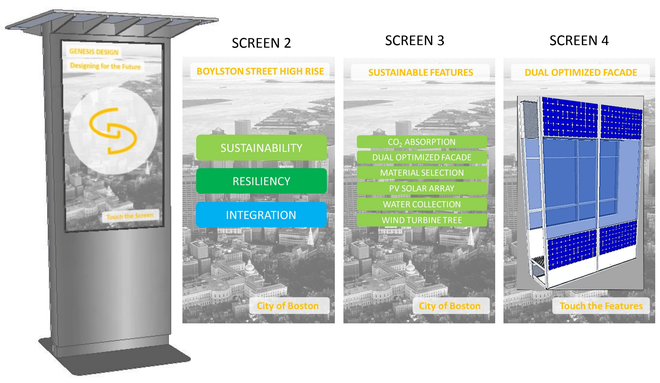
- Removes over 20 pounds of CO2 daily
- CO2 is turned into a Carbonate Salt
- Removes approximately 80% of CO2
- Exhausts clean air into plaza
- Energy needs supplied by Wind Tree

- 5000 Vehicles pass the building daily
- Emitting 22.3 pounds of CO2 in passing
- Includes parking vehicles and cab stands
- CO2 is pulled through the filters
- Located beneath the slab level

INTERACTIVE TOUCH-SCREEN KIOSKS

We at Genesis Design strongly believe in our founding goals of **Sustainability**, **Resiliency**, and **Integration.** We believe that these drivers promote a healthy city and natural environment. The Boylston Street High Rise stands as a benchmark to Green building and contains many innovative features and systems that often go unnoticed. Therefore, we have integrated three kiosks throughout the plaza space to educate the public on what the Boylston Street High Rise and accompanying Plaza are doing to create a better future for the city of Boston and its population.

Each kiosk will contain three options: To learn about the Building; to learn about the Shopping Center; or to learn about the city of Boston. The images to the right show the sequence of screens one may encounter in wanting to learn about the High Rise features. The option to learn more about the shopping centers will include a map of the mall as well as any other advertisement options they wish to include. The third option will provide a layout of the city including the major landmarks and the many businesses and activities available. Lastly, the kiosks will make an initial debut during the construction activity to better mitigate the negative aspects associated with change within a city.



VERTICAL GREEN WALL

The plaza will also feature a vertical green on the front façade of the building. The integration of a green wall within the Boston climate proved particularly challenging. The initial goals for this feature were to create a sustainable plaza design that provided both flexibility and branding to the tenants of the building. The primary challenge in accomplishing these goals was finding the right vegetation to withstand the harsh climate and north-facing facade. Several case studies were conducted including the vegetative green wall at the Brighton Branch Library in Boston as well as the aquarium in Vancouver to determine if this feature would be feasible. The resulting research revealed a possibility of evergreen vegetation or grass species capable of surviving cold climates and indirect sunlight. A sample visual of this vertical green wall is shown below.

There are immense benefits to a vertical green wall to the city, the building, and the people. The green wall is an iconic aesthetic that displays both prestige in sustainability as well as branding for the building. The visual benefits also promote occupant health and productivity; a study associated with the USGBC. The physical attributes also benefit building such as: Thermal Increase, Wind Barrier, Sound Absorber, and CO_2 Absorber.

The main issues associated with the vertical green walls include the maintenance and watering of vegetation and the structural supports necessary to support the structure. The maintenance associated with the particular species utilized in the wall require minimal to no maintenance as is the characteristic of the species. Additionally, any watering that will be required will be supplemented by the water collection system. Lastly, the vertical wall will be freestanding; supported by the plaza slab and intermittently anchored to the façade. The slab supports were taken into consideration when designing for the construction loads.

GENESIS DESIGN

PROJECT
THE BOYLSTON STREET HIGH RISE
BOSTON, MA 02115

DRAWING TITLE
PLAZA DESIGN

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