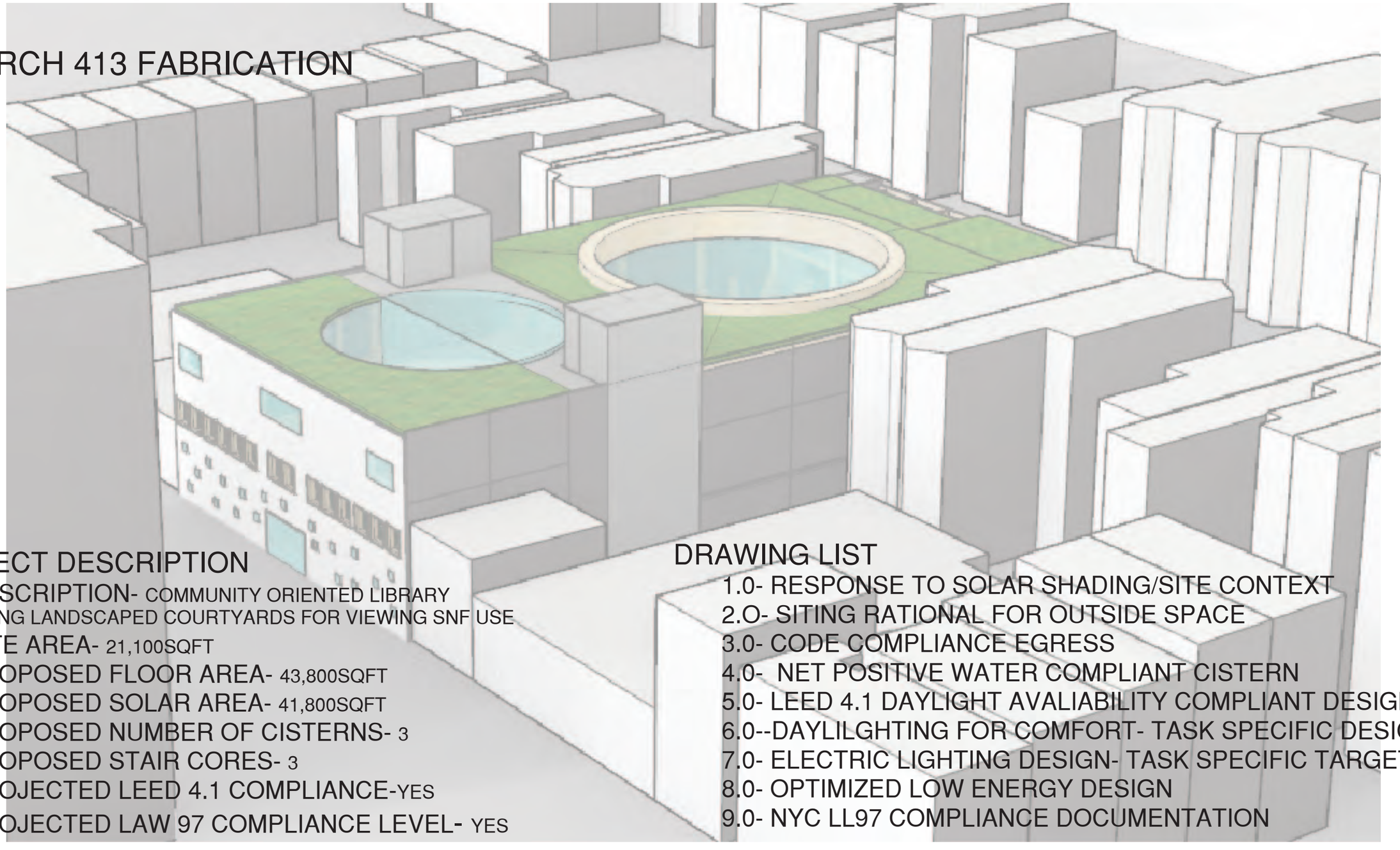
CLINTON HILL LIBRARY

ARCH 413 FABRICATION



PROJECT DESCRIPTION

DESCRIPTION- COMMUNITY ORIENTED LIBRARY FEATURING LANDSCAPED COURTYARDS FOR VIEWING SNF USE

SITE AREA- 21,100SQFT

PROPOSED FLOOR AREA- 43,800SQFT

PROPOSED SOLAR AREA- 41,800SQFT

PROPOSED NUMBER OF CISTERNS- 3

PROPOSED STAIR CORES- 3

PROJECTED LEED 4.1 COMPLIANCE-YES

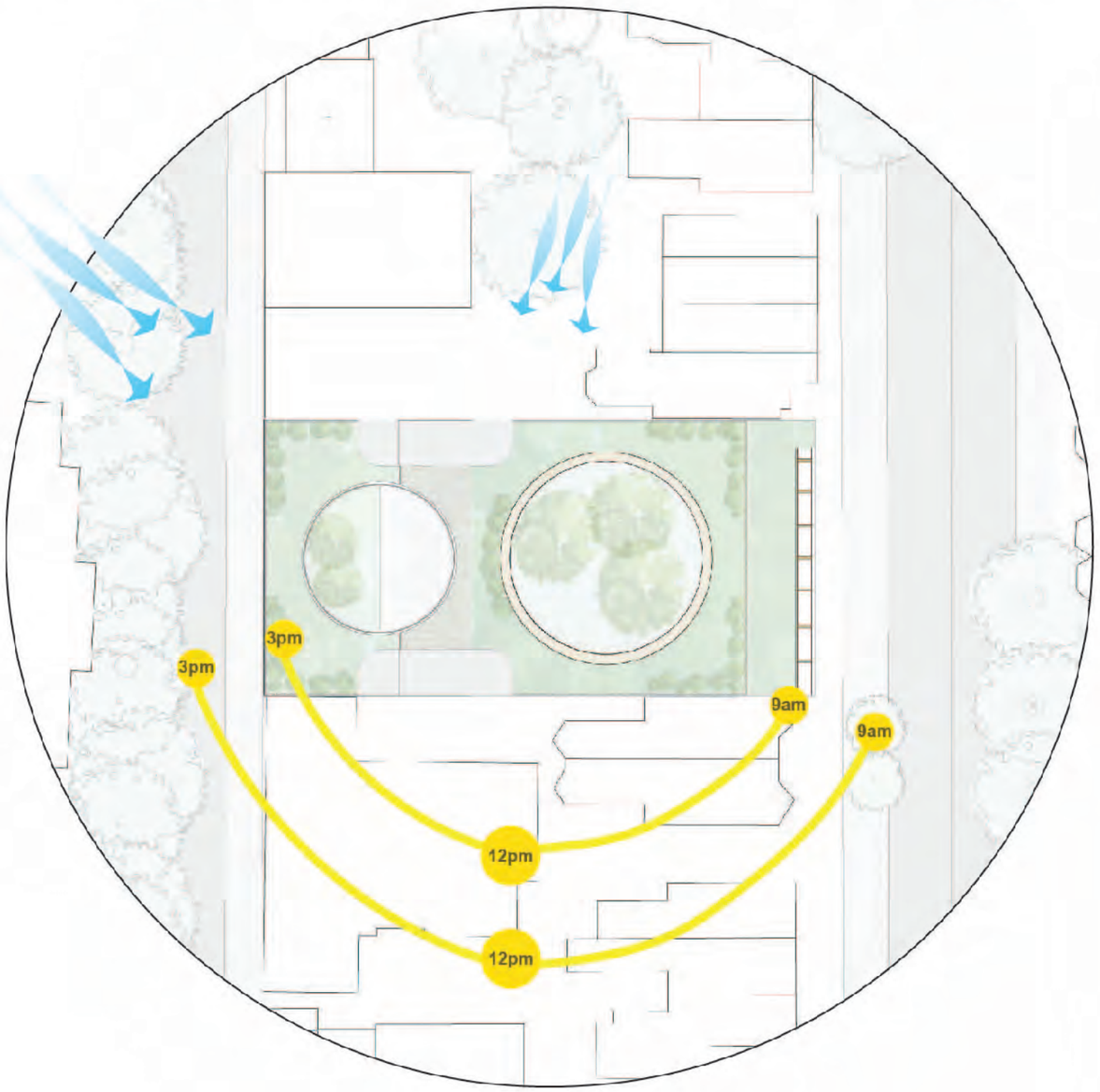
PROJECTED LAW 97 COMPLIANCE LEVEL- YES

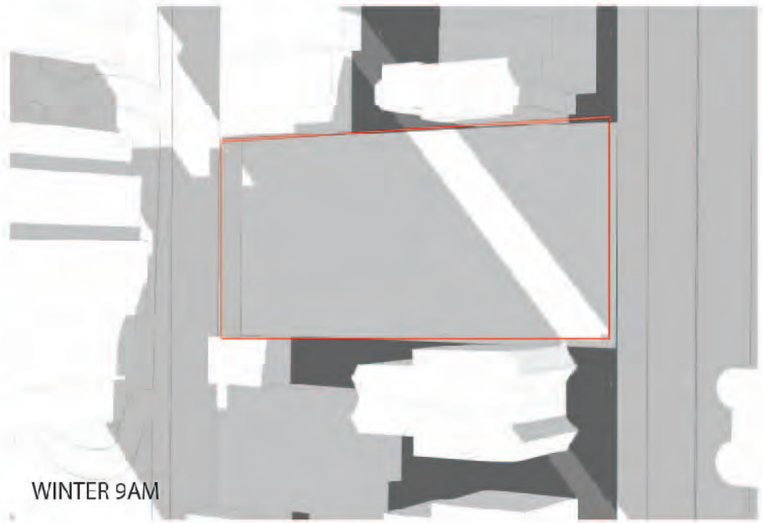
DRAWING LIST

NEW YORK INSTITUTE OF TECHNOLOGY	COURSE: NYIT ARCH 413 ARCHITECTURAL SIMULATION AND FABRICATION OPTIMIZATION	ASSIGNMENT: FINAL SUBMISSION	NAME: MADELINE METZLER	DATE: 12/16/2024	ADDITIONAL NOTES: X	PAGE NO. 1

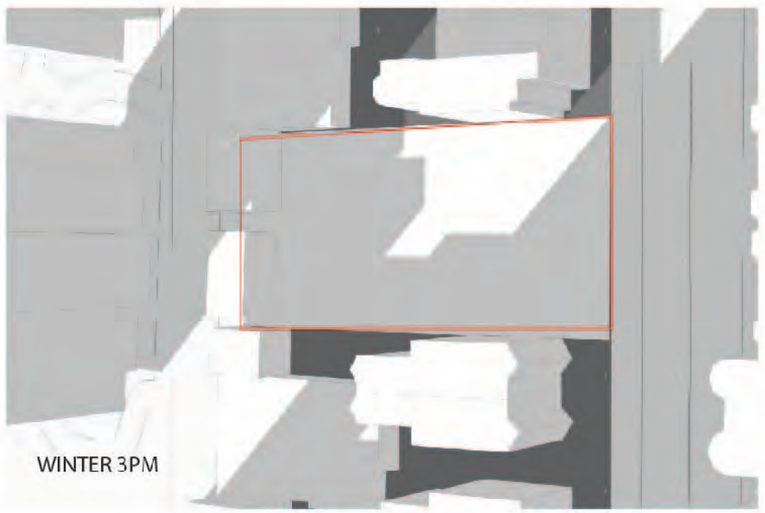
1.0- RESPONSE TO SOLAR SHADING/SITE CONTEXT

THE SHADOW STUDY I CHOSE TO PAY ATTENTION TO WERE THE MORNING AND AFTERNOON IN THE WINTER SEASON TO SEE IF I COULD GAIN ANY DIRECT LIGHT. IT PROVED AROUND THE CENTER RECIEVED SOME DIRECT LIGHT, SO I CHOSE TO PUT MY GENERAL EXTERIOR SPACE WITHIN THE CENTER OF THE LOT IN HOPES TO USE THIS FOR GAIN OR A MORE COMFORTABLE OUTSIDE SPACE. THE WIND DIDNT PLAY A VERY BIG ROLE IN MY MASSING DECISION OTHER THAN MOVING MY EXTERIOR SPACES INWARD SO I HAVE MORE CONTROL OVER THE COMFORT LEVELS.





WINTER 9AM



WINTER 3PM

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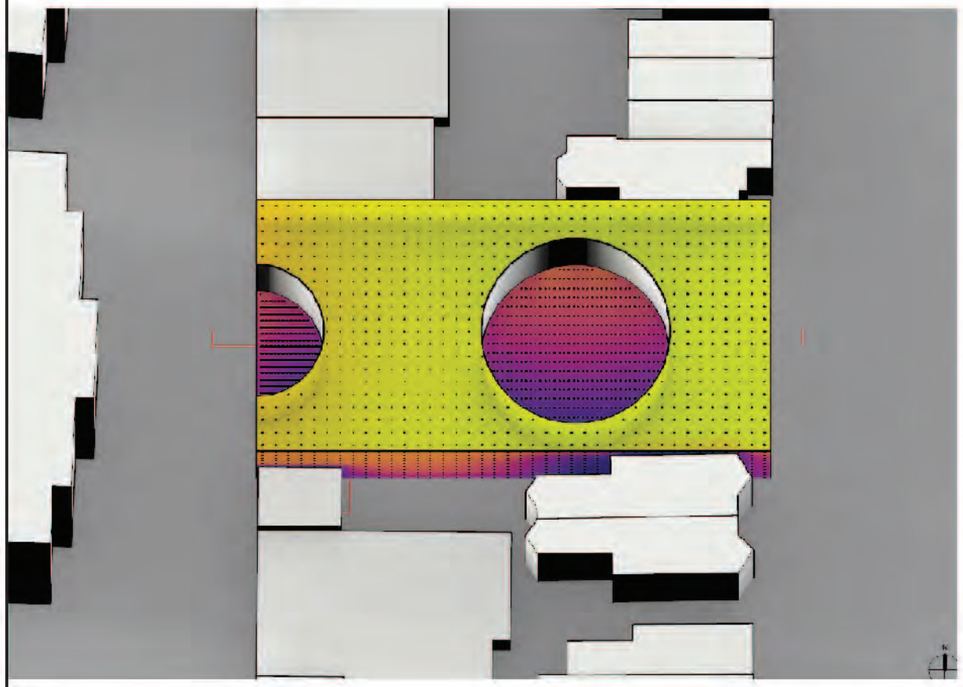
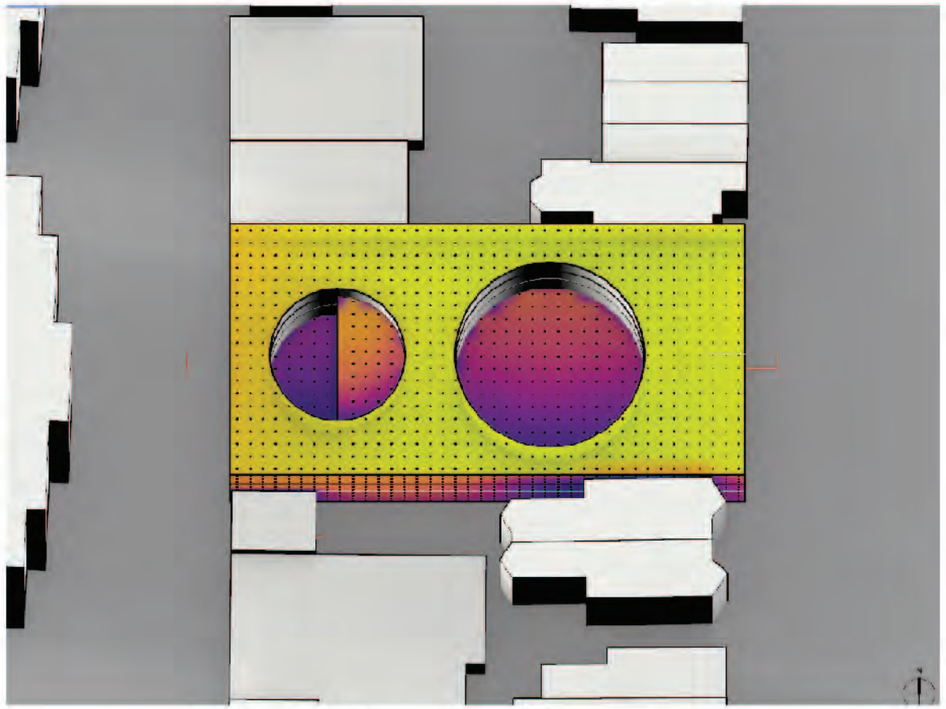
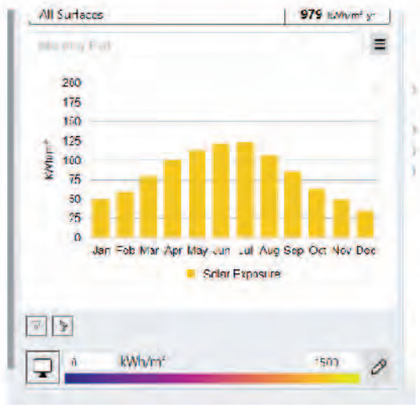
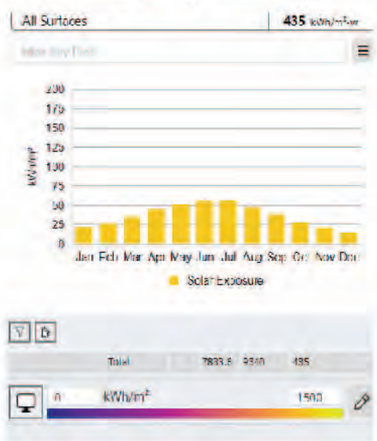
2.0- SITING RATIONAL FOR OUTSIDE SPACE

MY MASSING AT MIDTERM (LEFT) SHOWS A LARGE AMOUNT OF HEAT BEING GAINED IN THE KIDS PROGRAMED OUTSIDE SPACE (SMALLER HALF CIRCLE. I MOVED IT INWARD AND SPLIT IT UP TO HAVE THE KIDS SPACE BE MORE SHADED TO NOT OVERHEAT IN THE SUMMER AND THE OTHER HALF P TO THE THIRD LEVEL AS AN UNPROGRAMMED TERRACE LEAVING MORE ROOM FOR IT TO BE SUNNY AS A SPECIFIC TASK ISNT HAPPENING, LIKE KIDS PLAYING.









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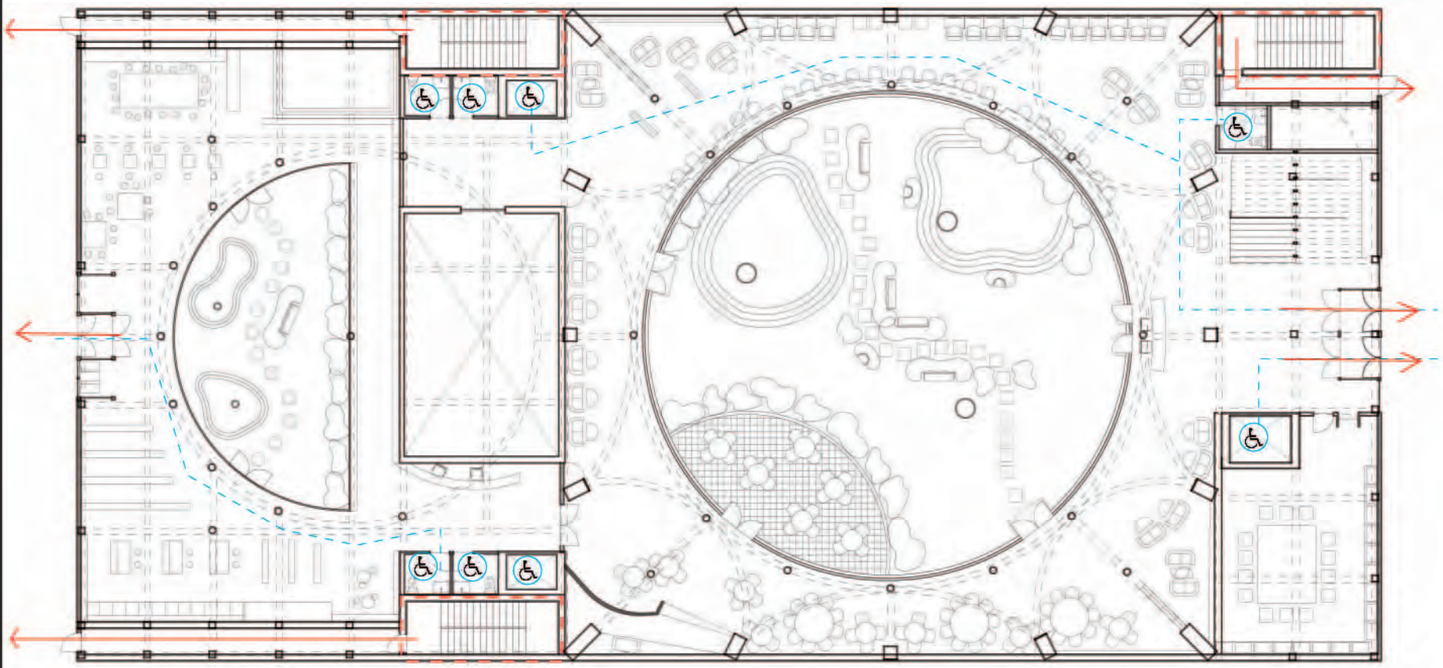
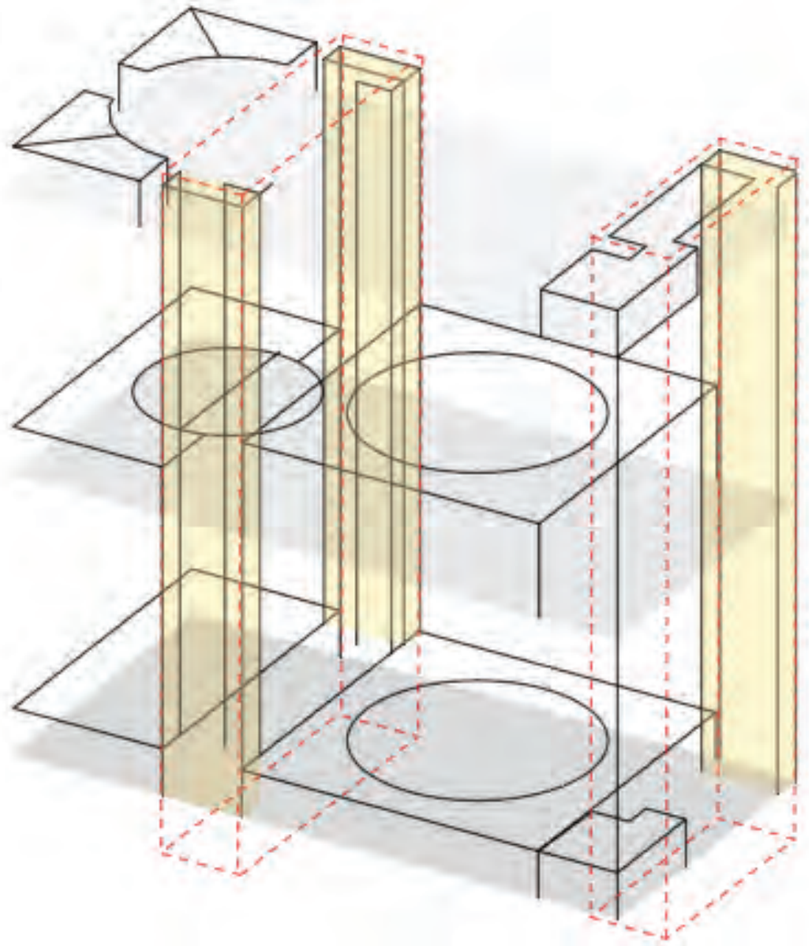
3.0- CODE COMPLIANT EGRESS



CIRCULATION ZONES

FIRE STAIRS



BUILDING SPECS-

- 3 FLOOR- BASEMENT AND ROOF ACCESS
- FLOOR O FLOOR DISANCE- 15FT
- FLOOR AREA- 20,000SQFT
- OCCUPANT LOAD FACTOR- LIRARY SPECS

STAIR CORE INPUS-

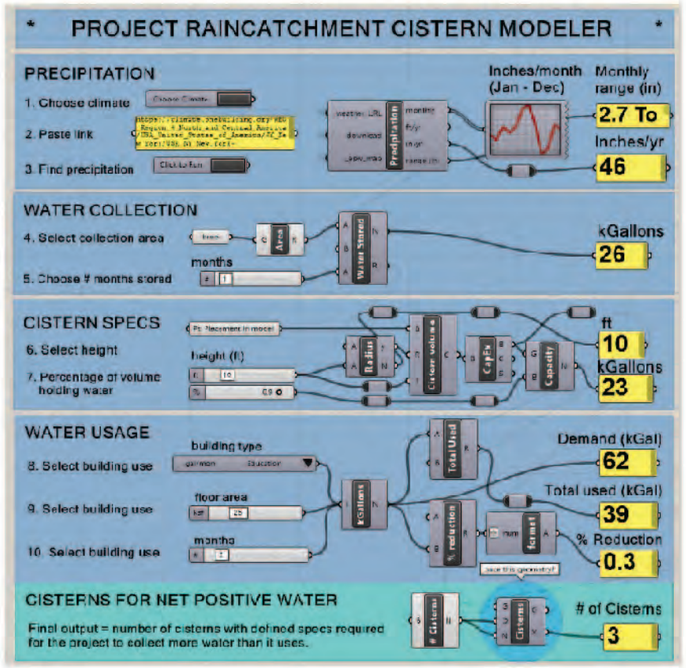
- EXTERIOR WALL- 1FT
- STAIR THICKNESS- 1FT
- STAIR RISE- 7IN
- STAIR RUN- 11IN

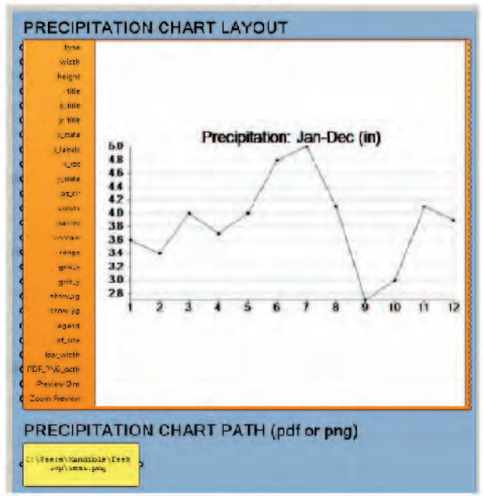
DESINED CORE DIMENSIONS-

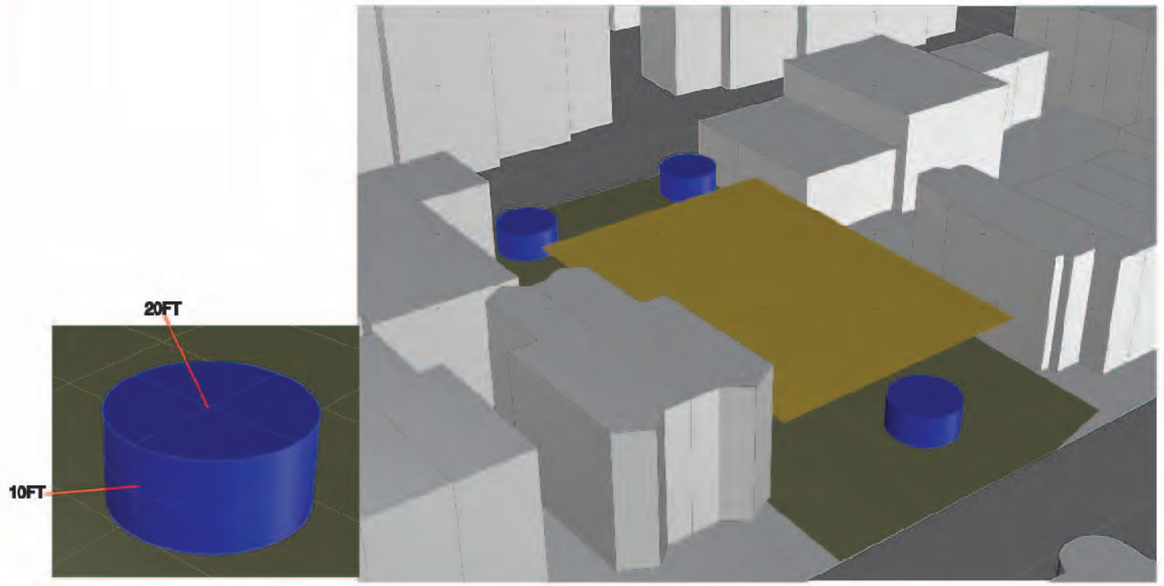
- HIEGHT- 6FT- BASEMENT TO ROOF ACCESS
- CORE WIDTH- 11.FT
- CORE LENGTH- 20FT
- 3 CORES IN TOTAL

WE USED GRASSHOPPER (A VISUAL CODING LANGUAGE) TO CREATE STAIR CORE MASSINGS IN OUR PROJECT RHINO MODELS. THE SCRIPT ALLOWED US TO IMPUT THE PROJECT DIMENSIONS AND SPECIFICATIONS AND DESIRED DIMSIONS OF THE CORE, FROM THAT IT CREATES A DESIGNED TO CODE GEOMTRIC MODEL OF THE STAIR CORE. IVE PROVIDED A LIST OF THESE DPECIFICATIONS, A CODE COMPLIANT DISGRAM, AND THE LOCATION WITHIN THE PROJECT THE CORES ARE.

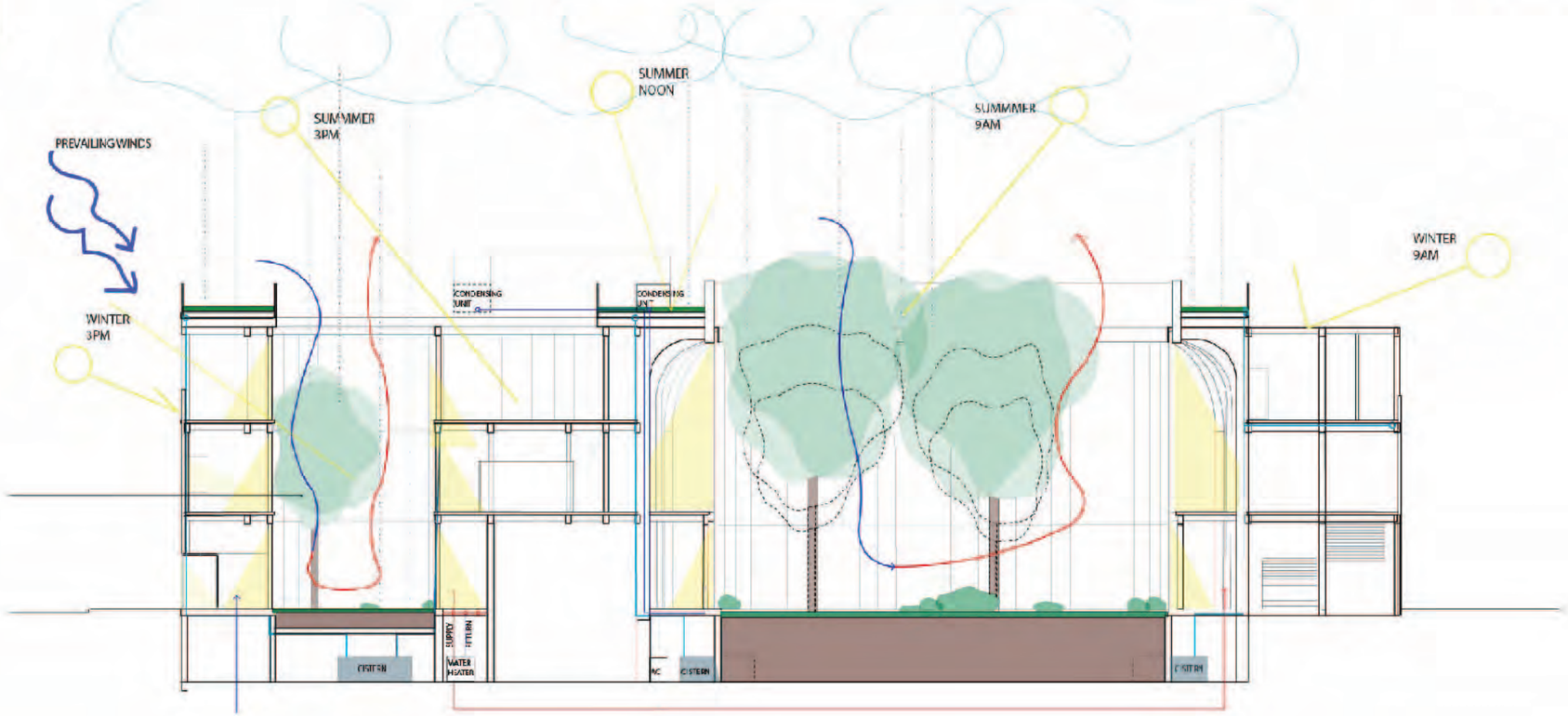
4.0- NET POSITITVE WATER COMPLIANT DESIGN



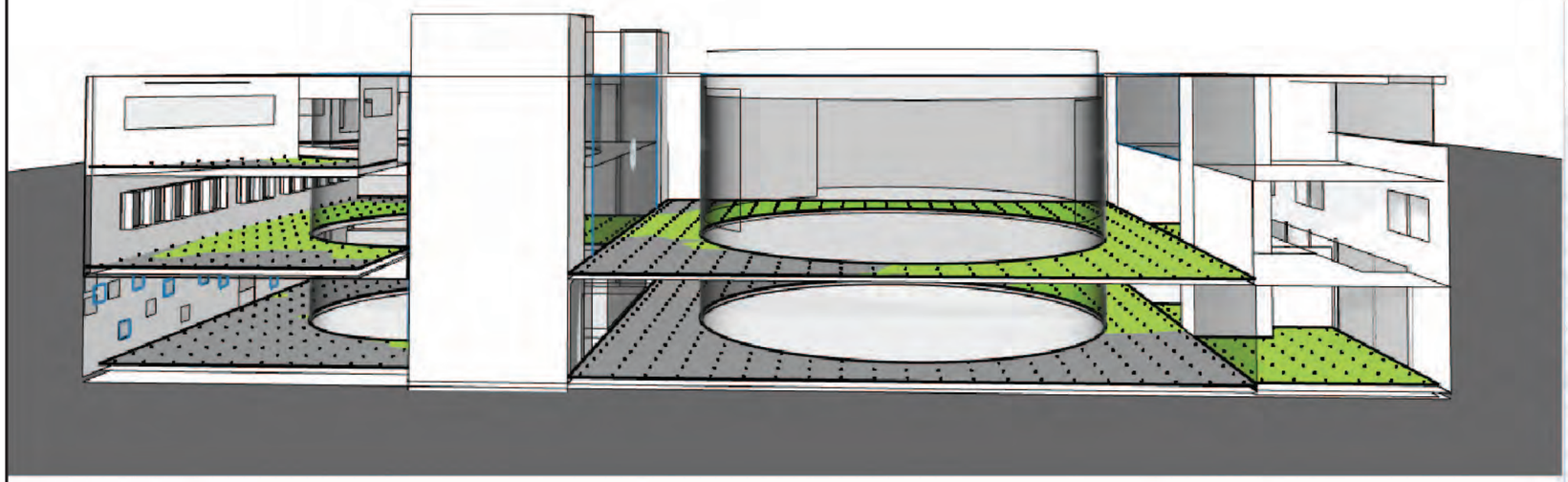




WE UTILIZED GRASSHOPPER AGAIN TO CREATE AN ESTIMATED COMPLIANT CISTERN SETUP. THE SCRIPT IS LINKED TO THE LOCAL WEATHER FILE THATS CALCULATED WTH THE ROOF AREA TO ESTIMATE HOW MUCH WATER COULD BE COLLECTED. THATS CALCULATED WITH THE BUILDING USE TYPE AND ESTIMATED CONSUMPTION TO ESTIMATE THE NUMBER OF CISTERNS TO STORE ENOUGH WATER TO BE REUSED ON THE SITE.



5.0- LEED 4.1 DAYLIGHT AVALIABILITY COMPLIANT DESIGN



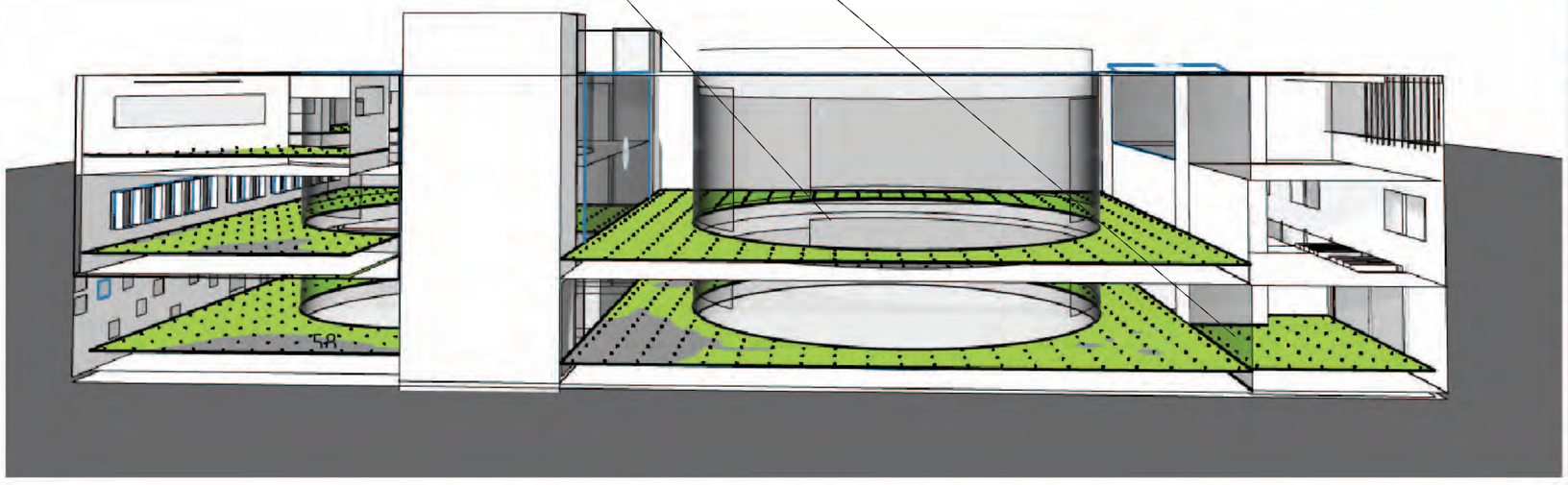
1* credit	52.1% $sDA_{300/50\%}$	34.2% $ASE_{1000,250}$	952 avg lux	52.1% blinds open

* ASE > 10% in one or more spaces. Glare control strategy must be explained.

ID	Description	Tags	Sq.ft	Spacing[ft]	sDA	ASE	ASE.blinds
COMMUNITY ROOM			887	5.0	100.00%	43.75%	0.00%
kids			3466	5.0	19.88%	1.86%	0.00%
main mezz			273	5.0	100.00%	93.33%	0.00%
entry			520	5.0	100.00%	80.00%	0.00%
staff			1266	5.0	100.00%	19.05%	0.00%
sr			3082	5.0	58.39%	31.39%	0.00%
main reading room			5731	5.0	72.80%	64.80%	0.00%
classroom			1230	5.0	79.31%	41.38%	0.00%
classroom			1104	5.0	50.60%	13.73%	0.00%
Total			23,30		52.15%	34.20%	0.00%

0 — 50 — 100%

WITHOUT ANY SHADING DEVICES AND MOSTLY OPAQUE INTERIOR WALLS THE REGULARLY OCCUPIED SPACES DIDNT AVERAGE A HIGH ENOUGH sDA TO MEET LEED4.1 AS WELL AS WAY TOO MUCH GLARE. I BEGAN TO EXPERIMENT WITH REFLECTIVE STRIPTS ALONG THE INTERIOR COURTYARD GLASS TO REFLECT MORE LIGHT INTO THE FIRST FLOOR PROGRAM SPACES AS WEALL AS CREATE A MORE EVEN DAYLIGHT DISTRIBTUTION ENERVYWHERE. AS WELL AS MAKING PARTITION WALLS THAT DONT REQUIRE PRIVACY GLASS AND WAS ABLE TO COME TO A PRETTY GOOD RESULT JUST FOCUSING ON SHADING FOR COMFORT AND CONTROLING LIGHT.



3 credits	76.8% $sDA_{300/50\%}$	0.9% $ASE_{1000,250}$	871 avg lux	84.5% blinds open

ID	Description	Tags	Sq.ft	Spacing[ft]	sDA	ASE	ASE.blinds
staff			960	5.0	100.00%	0.00%	0.00%
sr			3073	5.0	69.34%	1.46%	0.00%
kids			3466	5.0	74.53%	0.62%	0.00%
messy			5745	5.0	54.00%	0.40%	0.00%
COMMUNITY ROOM			887	5.0	100.00%	2.08%	0.00%
classrom NW			1196	5.0	71.93%	3.51%	0.00%
main reading room			5731	5.0	88.80%	0.00%	0.00%
CLASSROOM SW			1066	5.0	70.00%	4.00%	0.00%
Total			22,06		76.76%	0.87%	0.00%

0 — 50 — 100%

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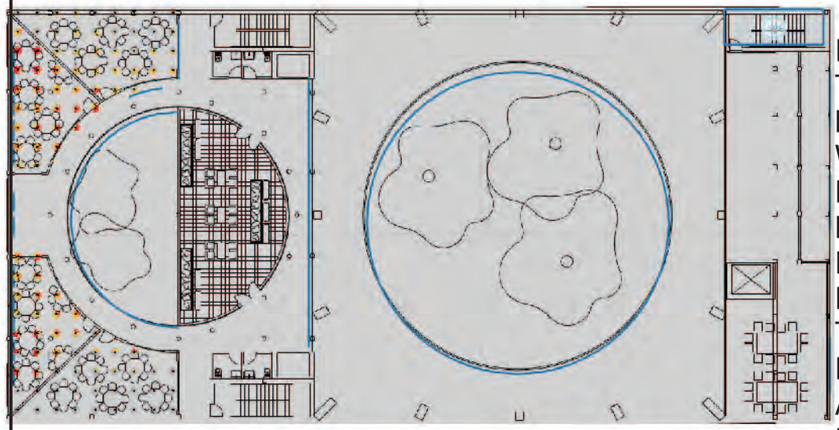
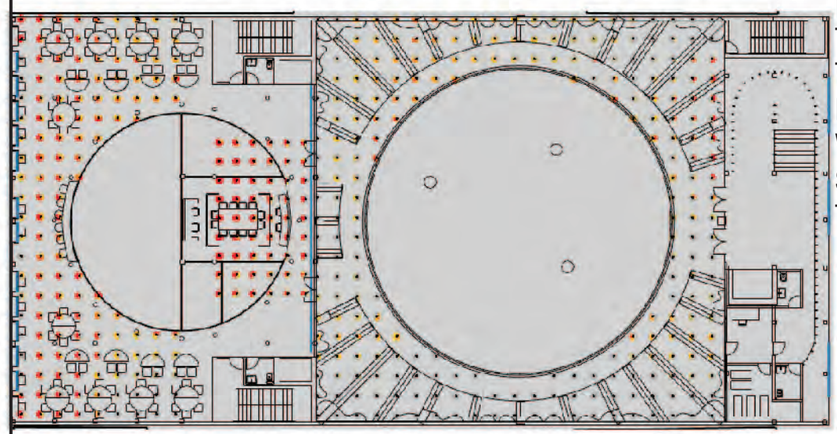
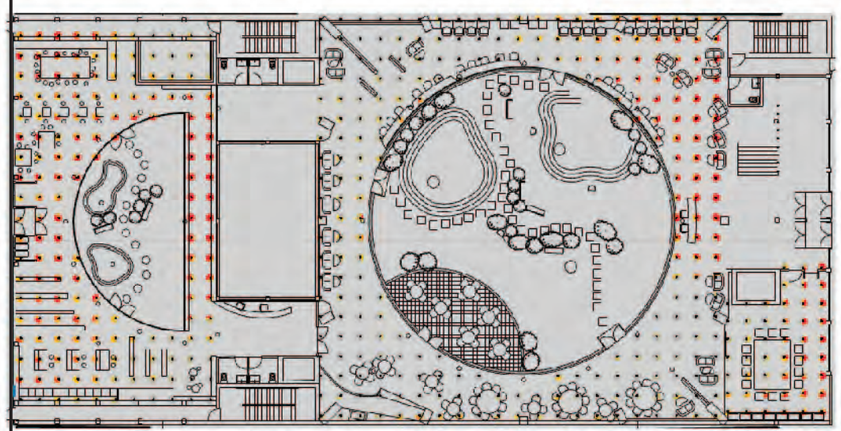
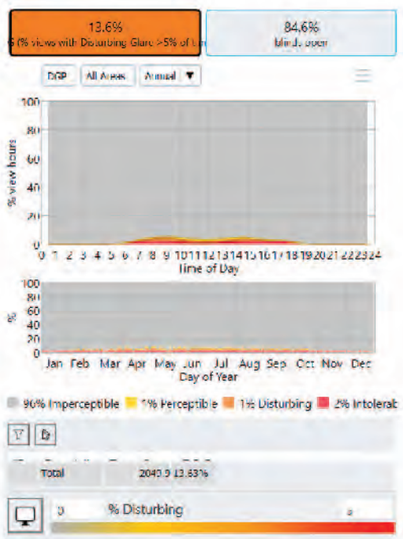
6.0- DAYLIGHTING FOR COMFORT- TASK SPECIFIC



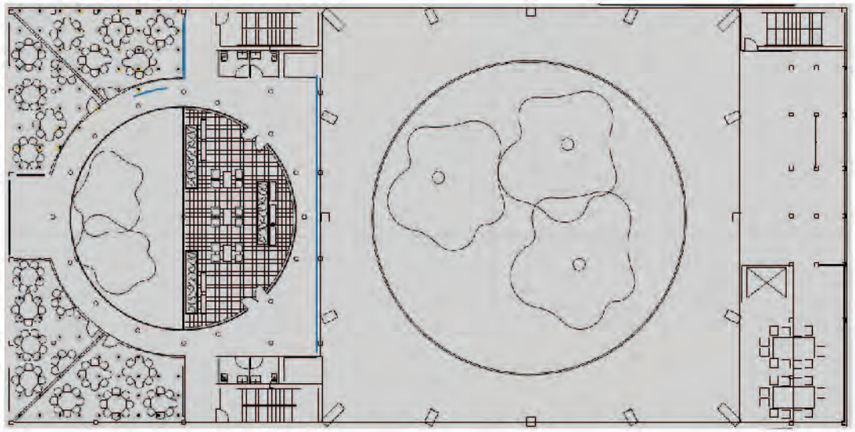


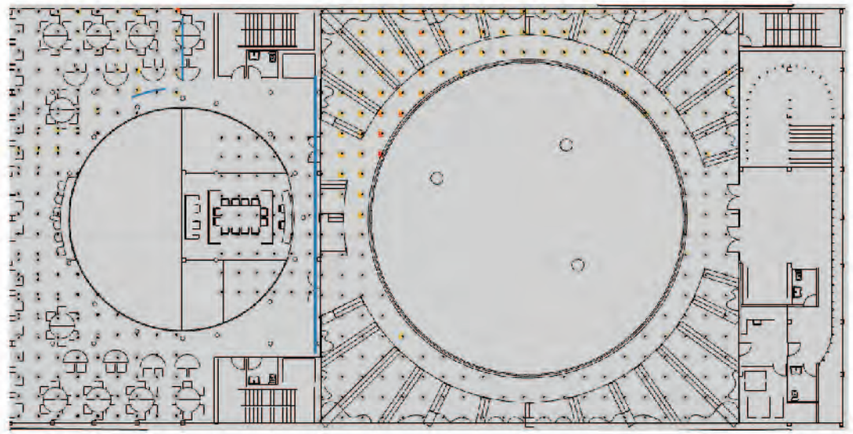


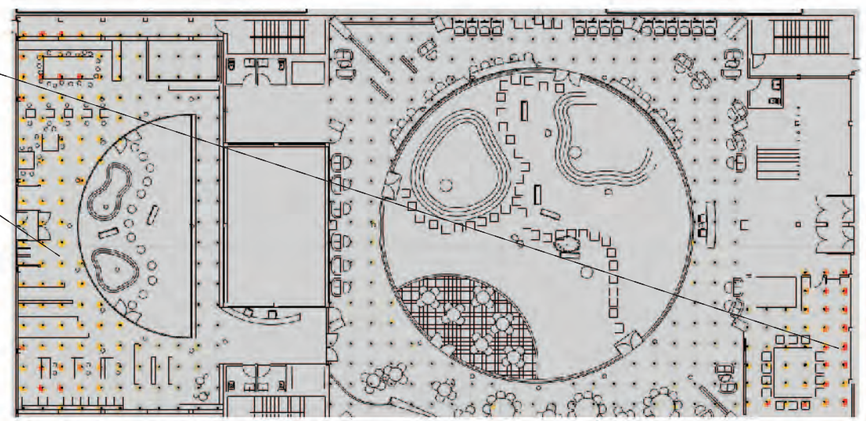
I DID MOST OF MY TASK SPECIFIC GLARE MEDIATION IN TANDIM WITH THE DAYLIGHTING PART BUT DID UTILIZE THE RADIANCE RENDER TO DIG A LITTLE DEEPER THAN THE AVERAGES PROVIDED BY THE ASE CHART. I REMOVED MOST OF IT THROUGH SHIFTING THE SHADING DEVICES DEVELOPED WITH THE sDA SLIGHTLY TO REMOVE TO REFLECT IT.



I ACTUALLY ENEDED UP FINDING A GOOD AMOUNT OF THE DIRECT LIGHT THAT WAS LEFT IS FOR SHORT (TOLERABLE) PERIODS OF TIME OR ALONG THE KIDS ENTRANCE FACADE THE DIRECT LIGHT IS PLAYFUL . NOT OBSTRUCTING ON DESKS SO I CHOSE TO LEAVE SOME.







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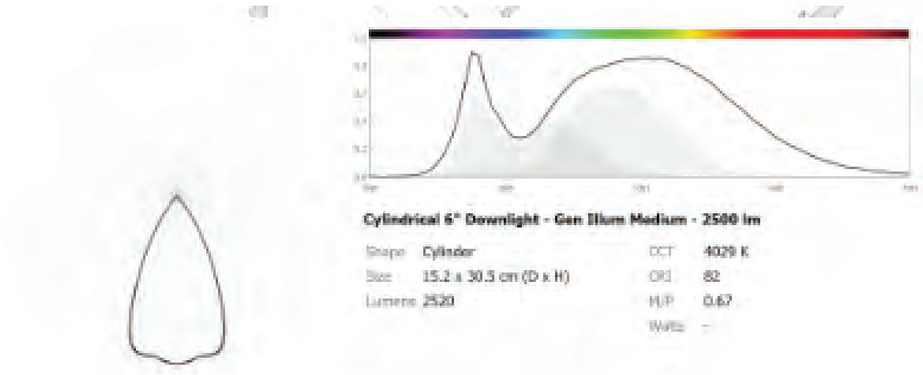
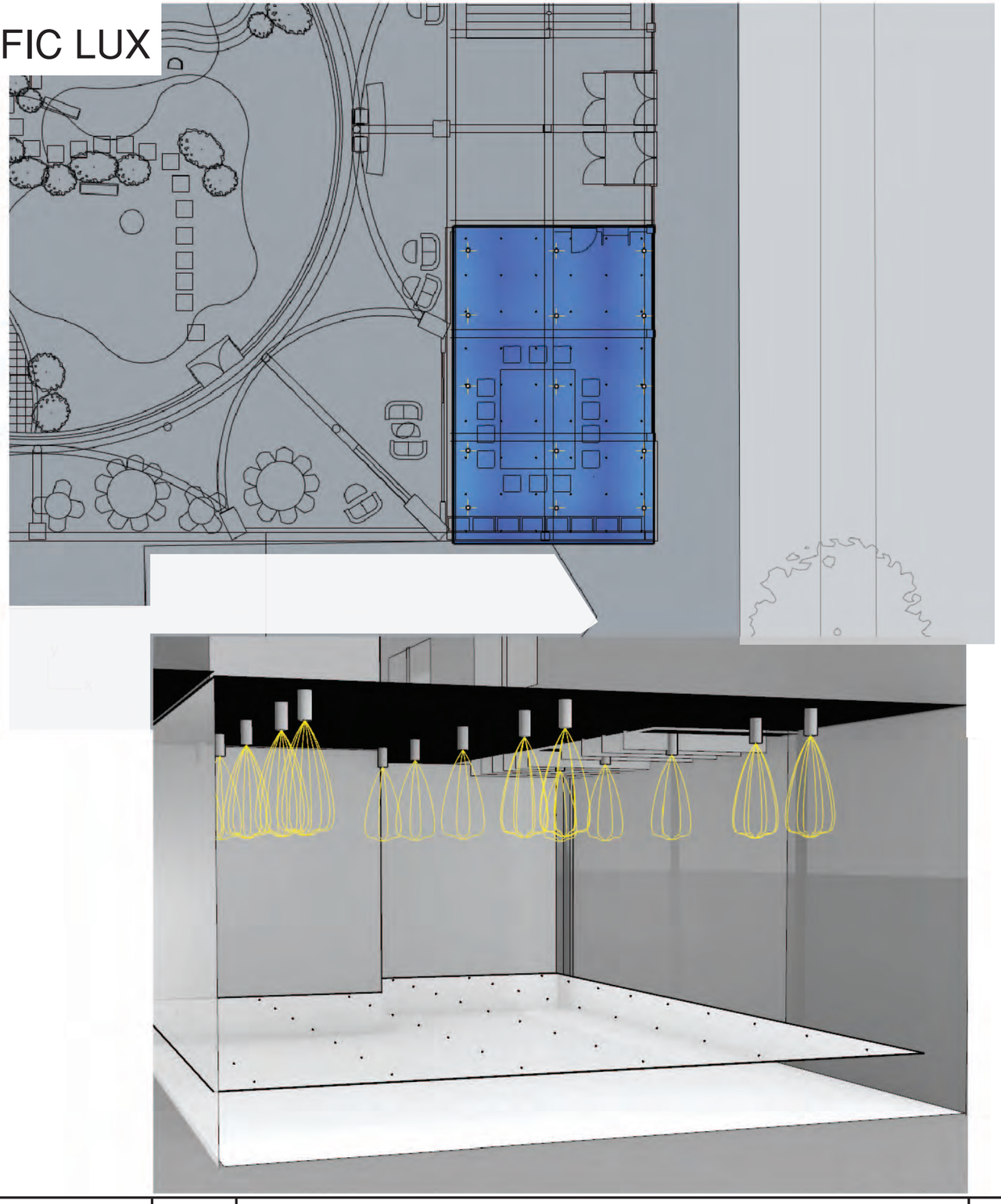
7.0- ELECTRIC LIGHTING DESIGN- TASK SPECIFIC LUX

I CHOSE THE COMMUNITY ROOM SPACE TO MEET THE TASK SPECIFIC ELECTRIC LIGHTING SIMULATION BECAUSE IT FELT PROBABLE TO BE USED AFTER DARK AS WELL AS ITS PROXIMITY TO THE STREET THAT THEN, WITH THE WINDOWS, CAN BE USED TO LIGHT UP THE SIDEWALK AT NIGHT IF ITS BEING USED.



TARGET LUX GENERAL ASSMEBLY- 30FC

A 3X5 ARRAY OF THE CYLINDRICAL 6" DOWNLIGHT FROM CLIMATE STUDIO YEILED A SUFFICIENT LIGHTING SETUP THAT CAN ALLOW FOR LESS OR MORE LIGHT WAS NECCESSARY TO THE TIME OF DAY AND PROGRAM AT THE TIME.



8.0- OPTIMIZED LOW ENERGY DESIGN

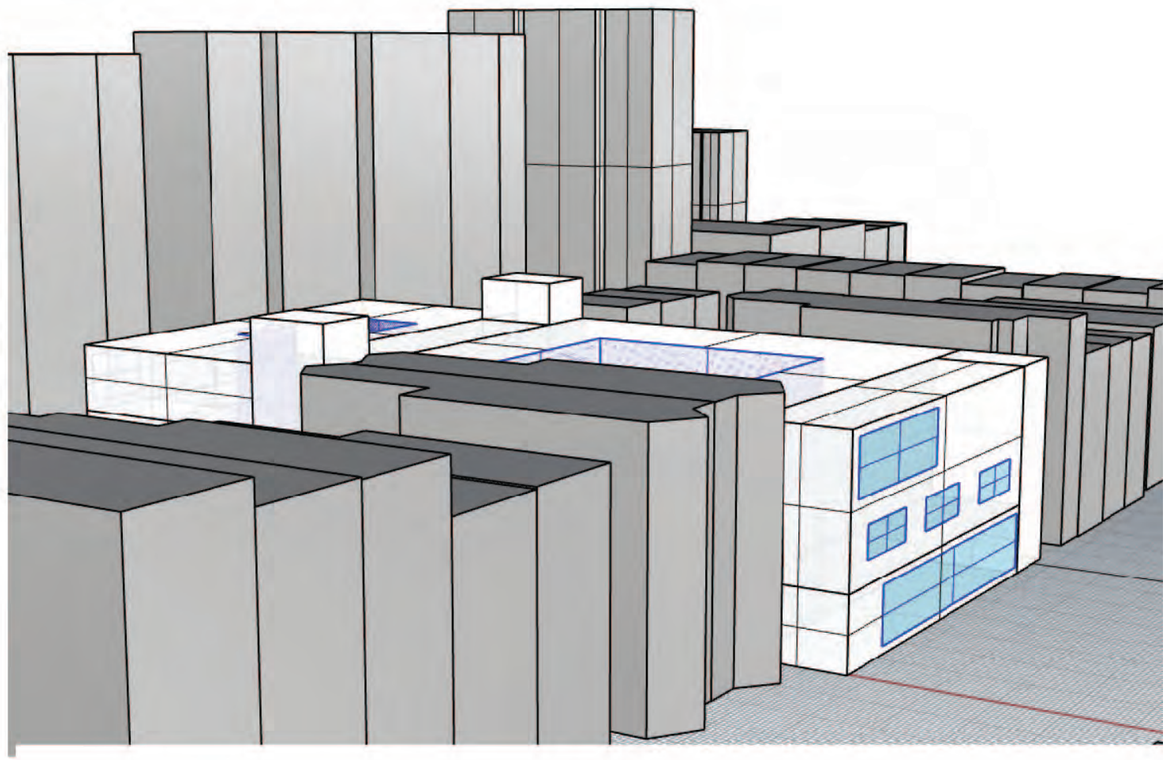
TO COMPLETE THE THERMAL ANALYSIS FOR MY DESIGN IN CLIMATE STUDIO I HAD TO SIMPLIFY THE GEOMETRY INTO STRAIGHT SURFACES WITH THE SAME SQUARE FOOTAGE, BUT I WAS STILL ABLE TO ACHIEVE A COMPARABLE RESULT.

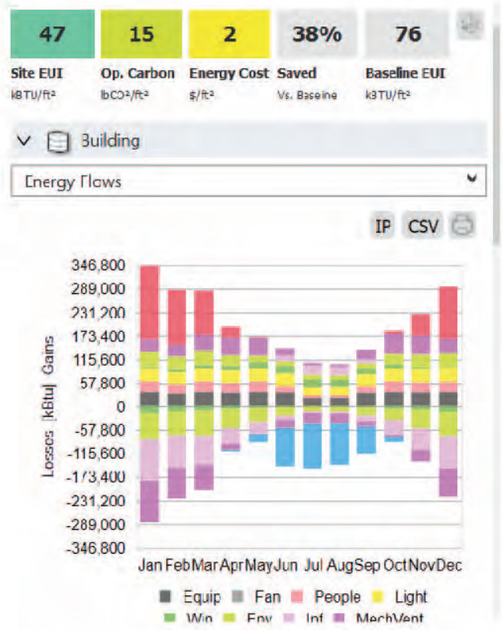
I STARTED THE PROCESS WITH THE TEMPLATE 90.1 LIBRARY USE TYPE. I BEGAN THE OPTIMIZATION PROCESS BY SPEPERATING THE ZONES INTO SENSIBLE OCCUPANCY NUMBERS/ INFILTRATION NUMBERS.

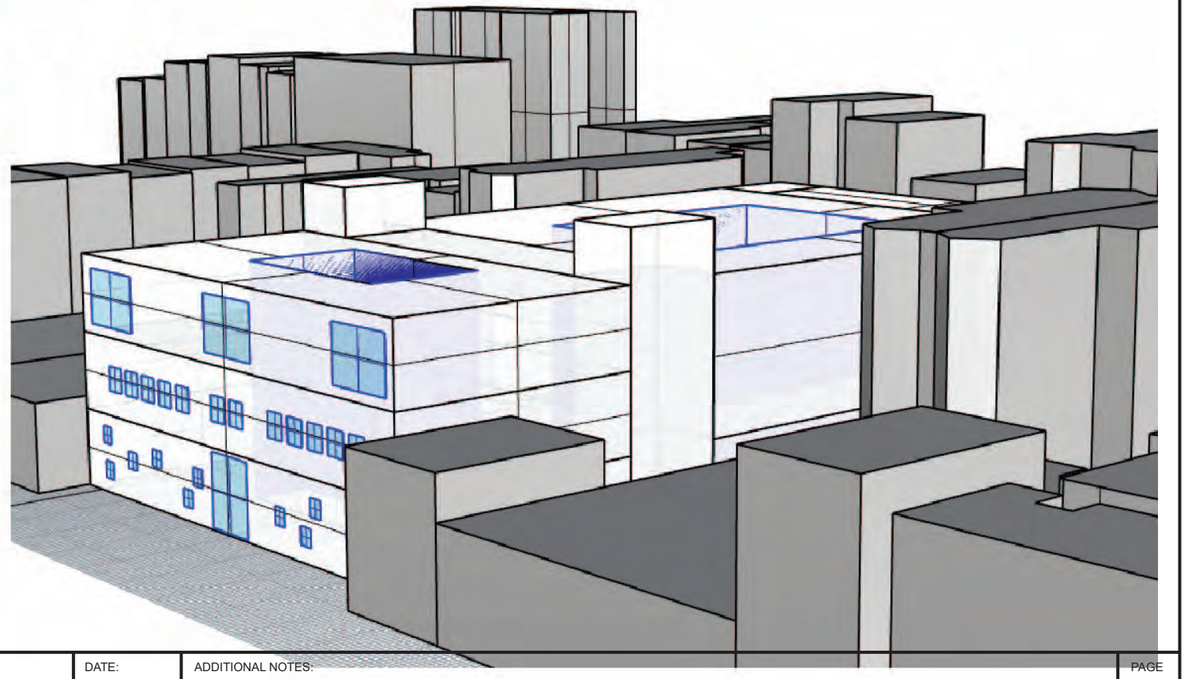
THEN UTILIZED THE PROJECT SPECIFIC FACADE ENVELOPE ASSEMBLY AS WELL AS CUSTOM WINDOWS FOR SPECIFIC FACADES/AREAS OF THE PROJECT. AS WELL AS ADDING ACCURATE FRAMES/SHADE FOR THE WINDOWS PER THE sDA/GLARE STUDY.

FINALLY I CREATED SPECIFIC LIGHT AND ENERGY SCHEDULES FOR THE DIFFERENT ZONES AS WELL AS SCHEDULES SPECIFIC TO THE ELECTRIC NEEDS OF THAT SPACE WHICH FOR MANY WAS VERY LITTLE/CHANGES SEASONALLY.

ALSO MESSED AROUND WITH DIFFERENCE BETWEEN BOILER AND ELECTRIC HEATING SYSTEMS AND INFILTRATION/VENTILATION NEEDS, YIELED SIMILAR RESULTS.







9.0- NYC LL 97 COMPLIANCE DOCUMENTATION

FINALLY WE USED GRASSHOPPER TO CREATE SIMULATION SCHEDULES FOR THE UTILIZATION OF NATURAL VENTILATION REFRENECED WITH THE LOCAL CLIMATE FILE FOR A SPECIFIC RANGE OF TEMPERATURES WHEN THIS IS USABLE. THIS ON TOP OF THE OPTIMIZED ENVELOPE/OPERATION SYSTEM HAD A SIGNIFICANT AFFECT ON THE SITE EUI. A SCRIPT WAS ALSO USED TO SIMULATE THE AMOUNT OF SOLAR ENERGY THAT COULD BE PRODUCED BY A CANOPY COVERING THE GREEN ROOF. THESE NUMBERS REFERNECED WITH THE SIMULATION ITERATION FROM THE PREVIOUS PAGE ILLISTRATE THE LEVEL OF COMPLIANCE PER THE LL97 STANDARDS FOR THE DECADES TO COME. MY DESIGN WITH MAX AMOUNT OF SOLAR REAL ESTATE USED AND FULLY (.9) OPERABLE WINDOWS FOR VENTILATION PRODUCED A MODEL THATS COMPLIANT THROUGH 2050.

LL97 COMPLIANCE WORKSHEET

Sim #	Allowed Operation Carbon ($lbCO_2/sf$)					Design			Loads			CO2			Compliance			
	Occup	2024	2029	2035	2050	Run Description	Build area (sf)	LL97 applies	SiteEUI (kBTU/sf)	PV (kBTU/sf)	Total (kBTU/sf)	Co2 (lb/sf)	Coeff (CO_2/kBTU)	Total CO_2 (lb/sf)	2024	2029	2035	2050
1	A	23.68	9.26	TBD	3.09	BASELINE 90.1SCHOOL CZ4	450,000	YES	132	40	92	33	0.25	23.00	YES	NO	TBD	NO
2	A	23.68	9.26	TBD	3.09	SPECIFIED OCCUPANCY/USE	450,000	YES	93	40	53	25	0.27	14.25	YES	NO	TBD	NO
3	A	23.68	9.26	TBD	3.09	SPECIFIED WALL /WINDOW	450,000	YES	77	40	37	21	0.27	10.09	YES	NO	TBD	NO
4	A	23.68	9.26	TBD	3.09	NATURAL VENTILATION SCHEDULE- LARGE OPENINGS	450,000	YES	49	40	9	15	0.31	2.76	YES	YES	TBD	YES
5	A	23.68	9.26	TBD	3.09	SPECIFIC ENERGY SCHEDULE BASED ON DAYLIGHTING	450,000	YES	31	40	-9	11	0.35	-3.19	YES	YES	TBD	YES