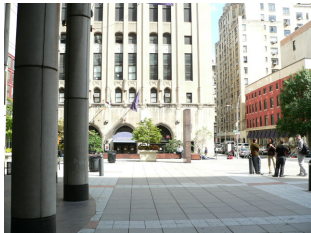


Outdoor Plaza Architecture Breadth Study



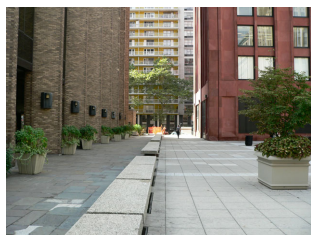
The outdoor plaza architecture breadth study explores ways in which the architecture of the space can be altered to enhance the quality of life for the New York University community.

Surrounded at the heart of the NYU Stern School of Business Campus, Gould Plaza is the intersection point of West 3rd Street and the entrances to all three buildings (Weaver Hall, Tisch Hall, and the Kaufman Center). The plaza is also a place in which students relax and interact. The plaza occupies a total area of 27,360 sq.ft.

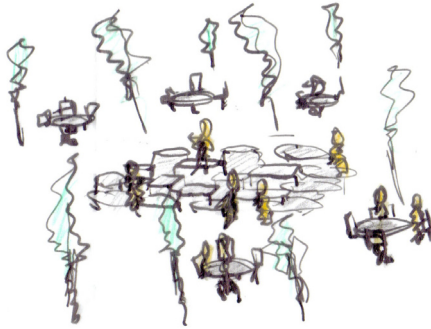


Proposed Idea

- Create special seating areas in which students can relax and have a pleasant time.
- Bring the human scale down by the use of architecture structures or trees. The surrounding buildings are too tall which creates an unpleasant physiological feel.

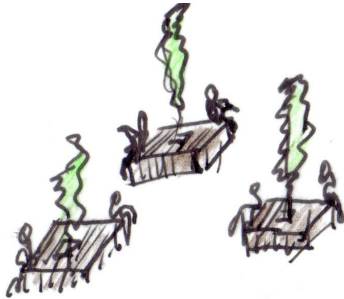


Various Design Ideas



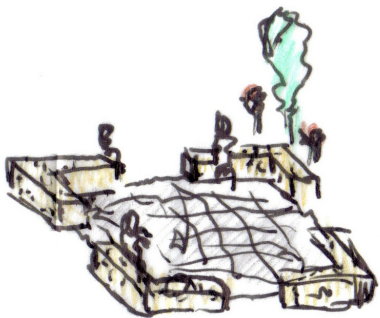
Idea 1: Hills of Stones

Create layers of stones throughout the plaza in which students can sit on and relax.



Idea 2: Wooden Squares

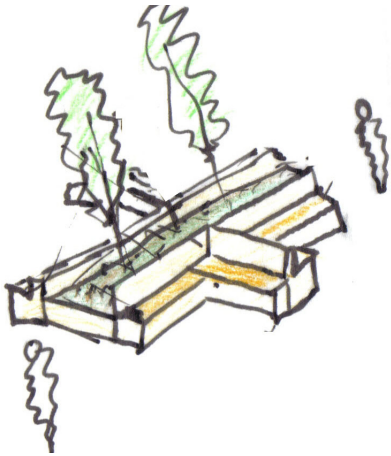
Design a wooden square in which students can sit around. A tree would be placed at the middle of the wooden square.



Idea 3: Quad

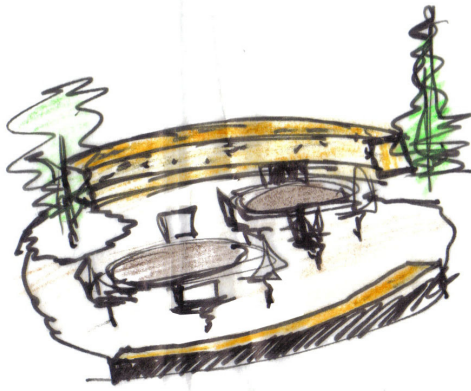
Create mini-plaza gathering spaces for students to interact.

Various Design Ideas



Idea 4: Cross

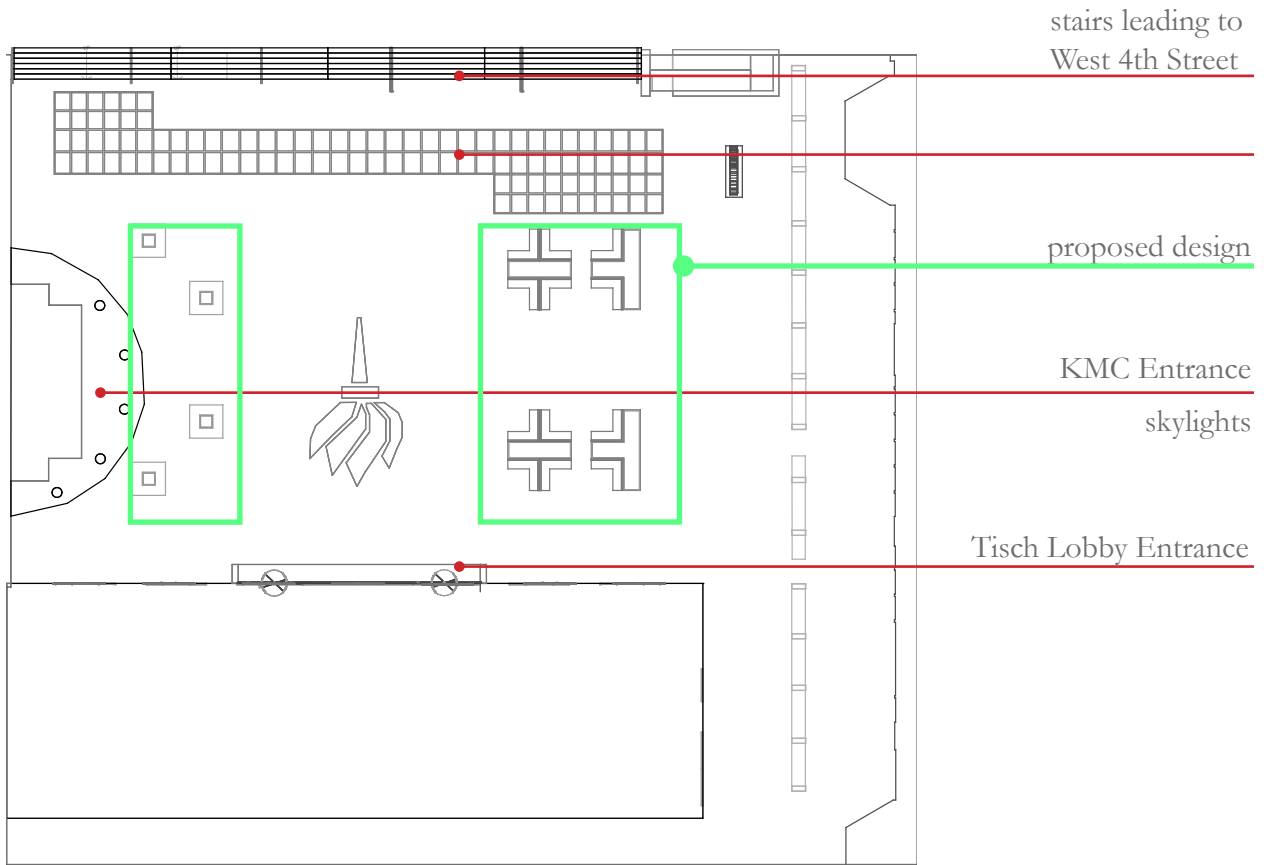
Create a cross in which students can sit at corners with trees placed in the center.



Idea 5: Village

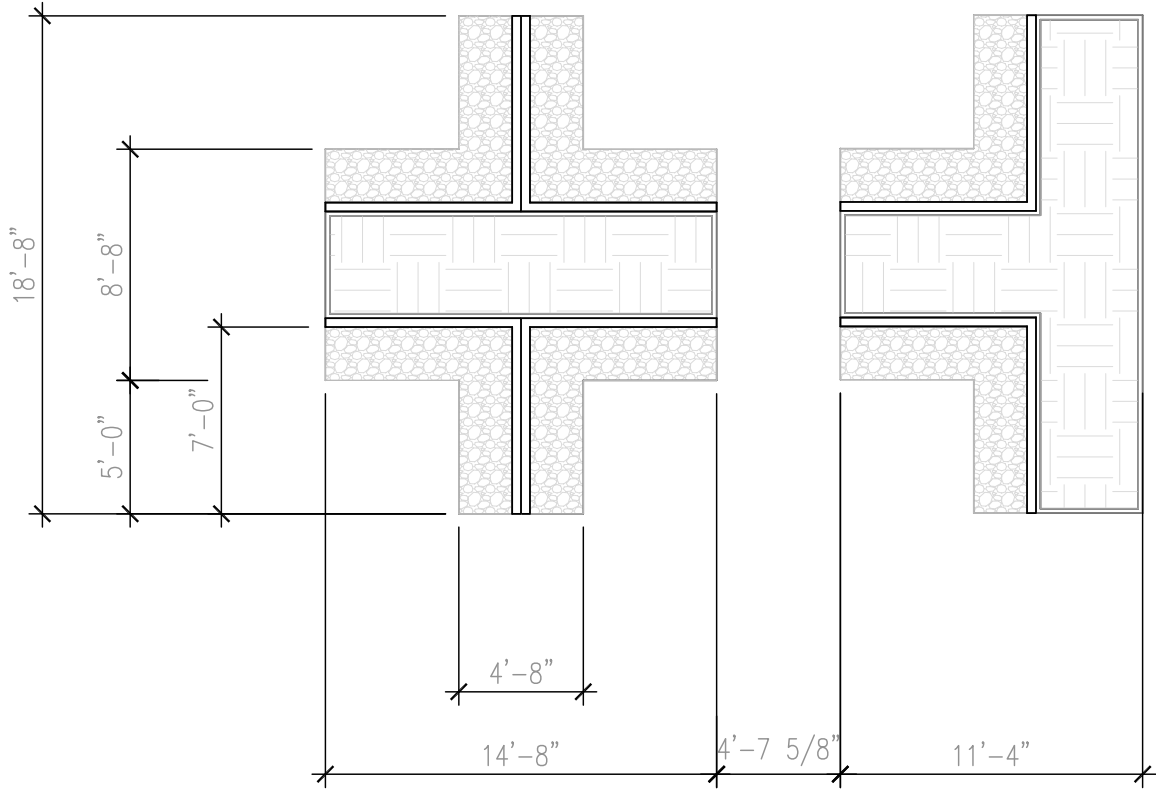
Use of curvilinear stone walls on the edge with wooden tables in the middle.

Construction of Water Harvest System

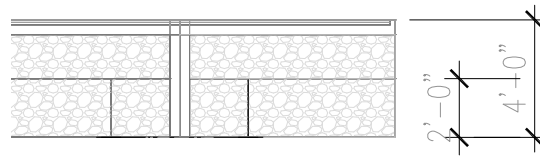


Seating System 1

Plan of Seating System 1

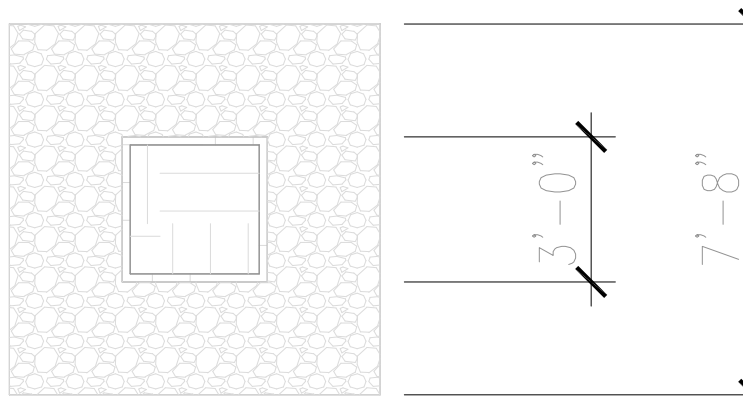


Section of Seating System 1

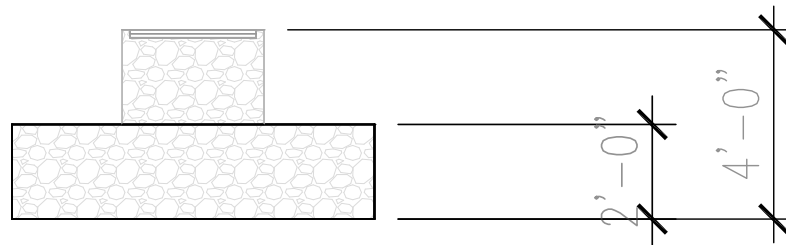


Seating System 2

Plan of Seating System 2



Section of Seating System 2



Rendering of Seating System 1

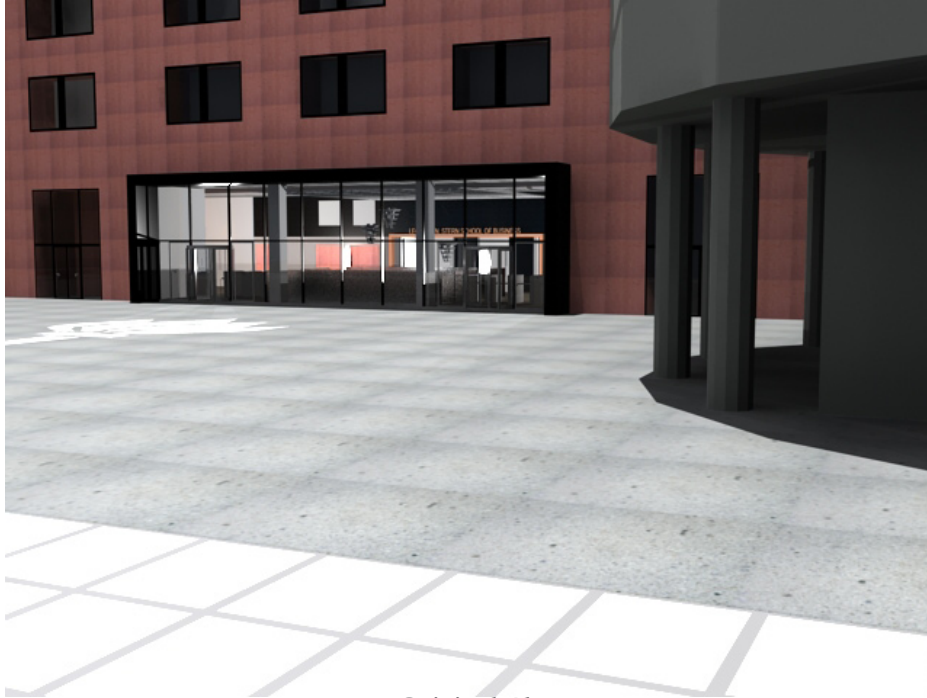


Original Plaza



Proposed Solution

Rendering of Seating System 2



Original Plaza



Proposed Solution

Rendering of Seating System 2



Seating System 1



Seating System 2

Rendering of Seating System 2



Proposed Solution

Design Summary

By creating a mix of different furniture systems, the design would help foster interactions amongst the New York University Community. The design is also able to introduce urban greenery into the plaza. The trees will provide a relaxing and laid back atmosphere. At the same time, the designed system does not interrupt the traffic flow on the plaza.

Rainwater Harvest Breadth Study

The world's total supply of usable freshwater is only about 200,000 km³ of water, which is less than 1 percent of all freshwater resource. The world's total supply of usable freshwater is only about 200,000 km³ of water, which translates to less than 1 percent of all freshwater resource on Earth. The rest of the water is considered too salty to drink, too deep below the Earth's surface to reach, or too frozen up in ice fields and glaciers too access. Thus, every portion of water should be utilized efficiently.

The Rain Water Harvest Breadth study involves designing a rainwater catchment system that can utilize the captured rainwater on Gould Plaza. With the captured rainwater, the water can be pumped back into the building to be reused for flush toilets and urinal stalls. The rainwater system on Gould Plaza would be considered as a graywater system.

Benefits of harvesting rainwater

- Free
- Conserve municipal and well water
- Gravity fed systems to conserve energy
- Low in salts, help reduce flooding, and erosion
- Water quality falls between groundwater and surface water



Construction of Water Harvest System

Rainfall would be captured from the existing storm drainage system beneath Gould Plaza. The floor of Gould Plaza consists of 4' x 4' stone tiles elevated. The elevated stones have gaps on all four sides. Rainwater will naturally flow down the gaps into the storm drainage system. The rainwater will first go through a waste water treatment system to clean the water and then get directed to storage in the cistern. When water is needed, pumps will be used to pump the water back into the building.

Components needed for rainwater harvest system

- Catchment Area: 25,500 sq. ft. Gould Plaza.
- Pre-storage filtration: Keep particle and debris out of cistern.
- Rainwater conveyance: system of existing gutters, downspouts, and piping used to transport water from the plaza back into the buildings.
- Water treatment system: treat water clean for urinal and toilet flushing.
- Ideal to remove particles down to 5 microns.
- Cistern: Storage system for rain water harvest.
- Water delivery: pump required to deliver water from cistern back to the building.

Rainwater Harvest System

- Propose a dual waste piping system. One system would run collected rain water to the tank. The second pipe would connect to a sewer line in case of overflow of the graywater collection. A control valve would be included so the graywater can be switched to the sewer line when the overflow becomes apparent.
- Graywater should not be stored for long a period. Microorganisms will used up oxygen and anaerobic bacteria will take place. Creating unpleasant odors.
- Graywater may contain pathogens

Construction of Water Harvest System

The existing drain consists of two types of 4" drain. The drains handle 1,470 sq.ft. and 2,115 sq.ft. of rainfall. The large regions of the plaza will utilize the larger 4" drain to cover more water. The corners of the plaza will utilize the smaller 4" drain.

Gutter Size		
Size of Drain (in.)	Flow (gpm)	Horizontal Areas Square Feet at Rainfall Rates
4	144	1470
4	144	2115

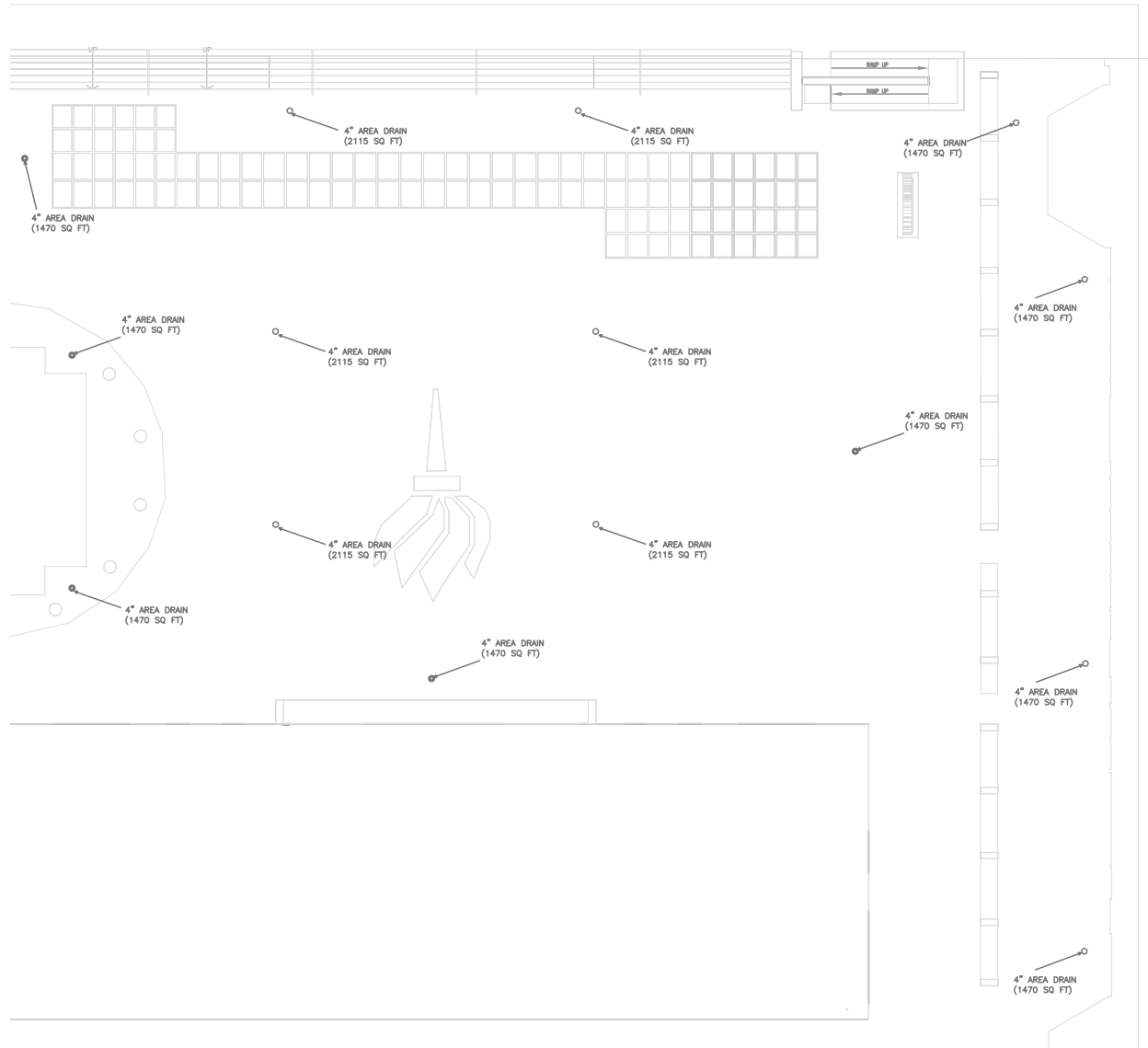
Number of Drain Needed		
Total Area of Plaza/allowable horizontal area = number of drains		
Plaza Area	Allowable Area	Drains Needed
12,750	1,470	9
12,750	2115	6

*Flow data from 1997 Uniform Plumbing Code

*Maximum Allowable Horizontal Area From Existing NYU Concourse Drawing

Breadth Study - Water Harvest System

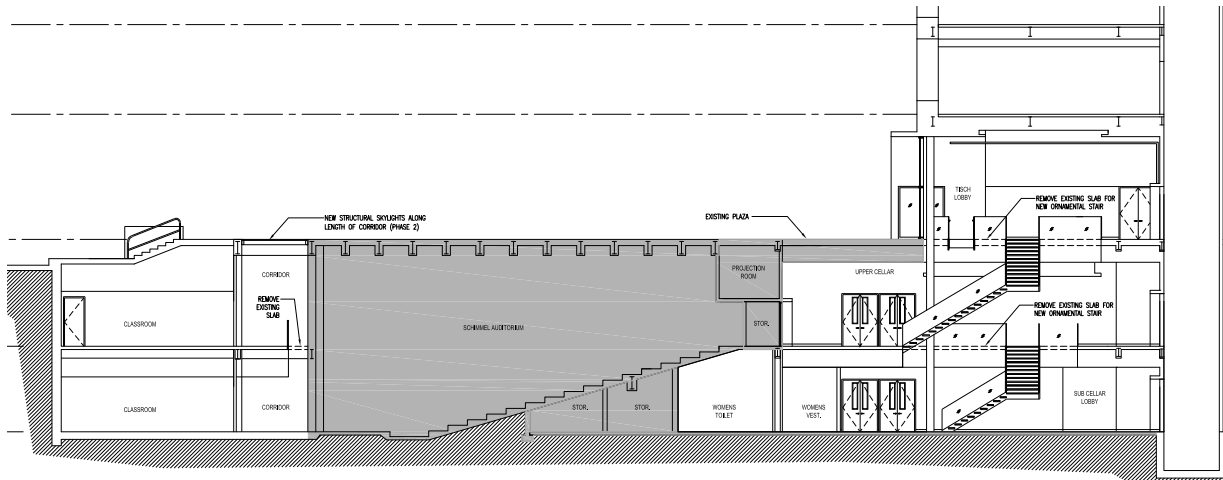
Construction of Water Harvest System



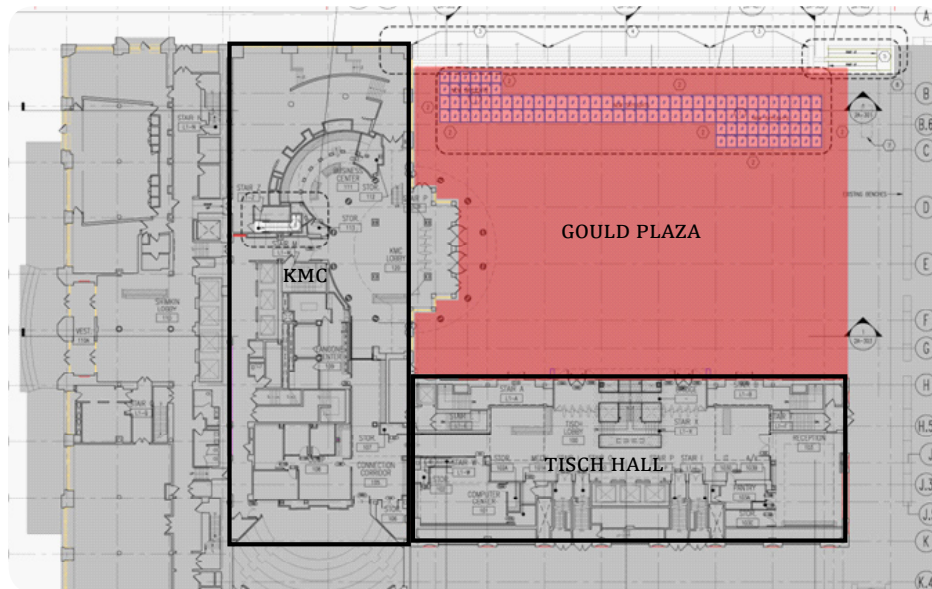
Breadth Study - Water Harvest System

Data on New York City

Gould Plaza is located at the heart of the NYU Stern School of Business campus. Surrounded by Weaver Hall, Tisch Hall, and the Kaufman Center, Gould Plaza provides NYU students a place to relax and have a good time. Gould Plaza is also a major traffic intersection since the entrances of the three buildings are connected to the plaza. The total area of Gould Plaza is 25,500 sq.ft.



Gould Plaza Section (view from east)



NYU Business School Campus

Breadth Study - Water Harvest System

Water Consumption of New York University

The water usage for NYU was determined by calculating the water usage of students and staff. For the academic school year of Fall 2008, there are a total of 5,984 members in the NYU community. These members include undergraduate students, MBA full time and part time students, PhD students, MS Global Finance students, and faculty members.

The water usage for this breadth study will be the water consumed by the toilet and urinal flush. The toilets and urinals picked for NYU are low in water consumption usage. The toilet and urinal stall consumes 1.6 gpf and 1.0 gpf respectively. If each person was estimated to flush the toilet 5 times a day, the average per capita gallon usage would be 8. Furthermore, estimation have been made that only 80% of the student and faculty population would use the lavatory on a daily basis on the NYU campus. The calculation also takes into account the number of academic days, which is a total of 145 days for the 2008-2009 academic school year. This does not take into account the summer school year since the water usage of the summer will be a lot lower compared to the fall and spring school year. The total water usage for toilet and urinals for the 2008-2009 academic school year is 3,887,206 gallons.

Water Usage from NYU students				
Water Usage (g/cd)	Students + Staff	Usages (gpd)	Academic Year (gal)	Estimated Academic Year (gal)
8	5,984	38297.6	5,553,152	3,887,206

NYU Academic Calender 2008-2009: Fall days of class				
September	October	November	December	Total days
20	21	17	15	73

NYU Academic Calender 2008-2009: Spring days of class					
January	Febuary	March	April	May	Total days
5	19	17	22	9	72

Breadth Study - Water Harvest System

Gould Plaza Harvested Water

New York City is a suitable location to harvest water. The annual average rainfall is 41.5 inches. On average, New York City receives about 3 inches of rain. The calculated harvest water on Gould Plaza is 4,749,426 gallons per year. This number was determined by multiplying the average New York City rainfall and the square footage of Gould Plaza. Assuming that the efficiency of the harvest water system is at 60%, the total water captured would be 4,749,426 gallons.

Average Rainfall of New York City													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
mm	80.9	73	92.1	91.8	103.4	82.6	94.5	94	87.6	75.9	88.2	89.2	1054.3
inches	3.2	2.9	3.6	3.6	4.1	3.3	3.7	3.7	3.4	3	3.5	3.5	41.5

*data from NCDC Cooperative Stations

Calculate water produced by Gould Plaza:

$(\text{Area of Plaza}) \times (\text{Average Rainfall NYC}) = \text{Total Rainfall}$

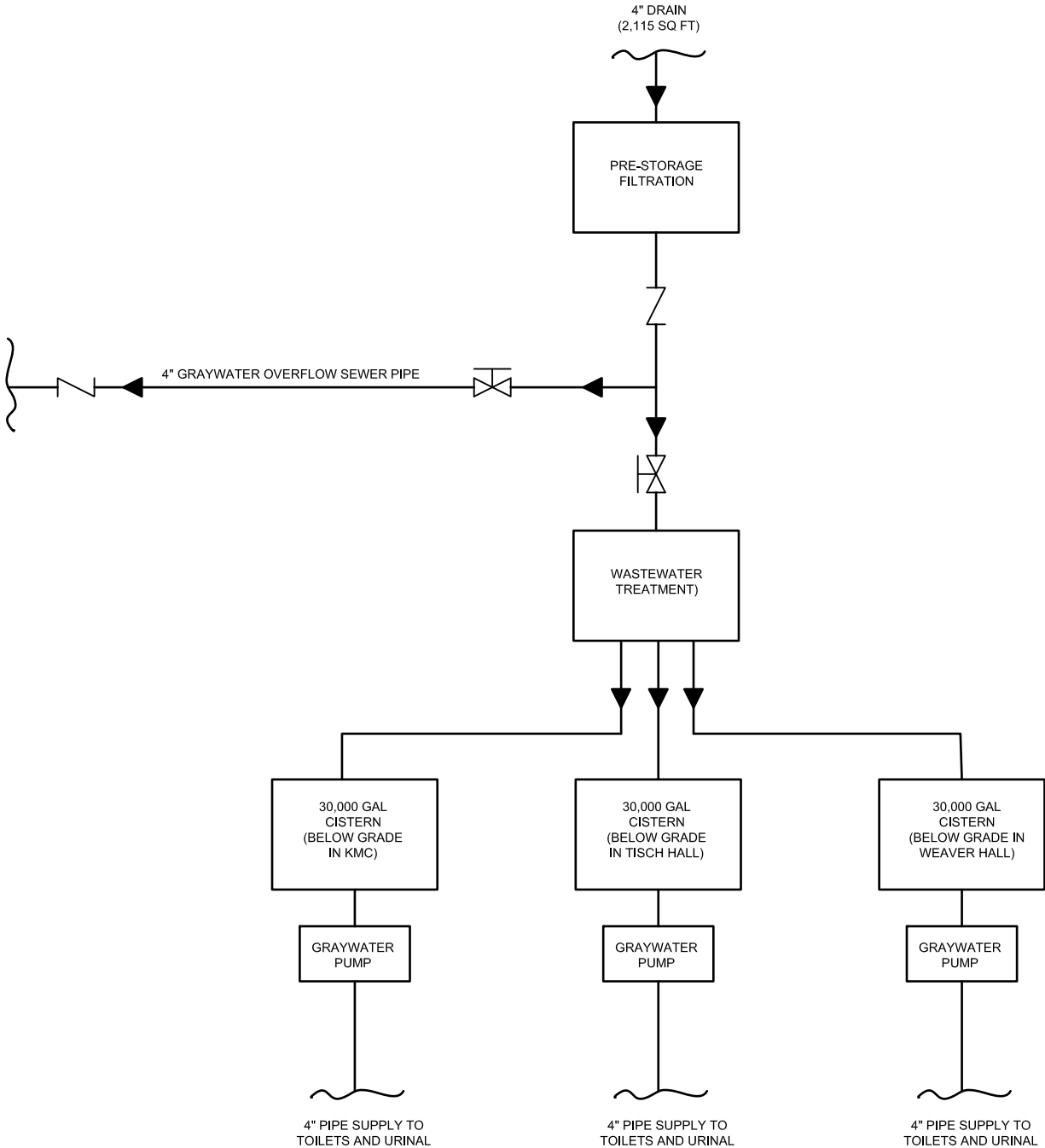
It is assumed that the drainage system of Gould Plaza would only be 60 efficient.

The total water produced would be 60% of the water produced.

Gould Plaza Average Rainfall					
Area (sq.ft.)	Average Rainfall NYC (inch)	Average Rainfall NYC/month (ft3)	Total Rainfall (ft3)	Volume needed at 60% efficiency (ft ³)	Gallons needed per year
25,500	41.50	88,188	1,058,250	634,950	4,749,426

Breadth Study - Water Harvest System

Gould Plaza Harvested Water



Key Components of Waste Water Treatment



Waste Water System: GE ZeeWeed 500

The ZeeWeed 500 would be a perfect waste water treatment system for the harvested rainwater. The system measures 3'x 6'x 8'. Water is filtered through the microscopic pores in each strand. Suspended solids, bacteria, pathogens, and certain viruses can be blocked off. The wastewater system treats about 13,000 gallons per day.



Cistern

The tank would store about 30,000 gallons of treated water. That is equivalent to about two days of rainwater.

The cistern would measure to be about 15' x 10' x 9'.

Weaver Hall, Tisch Hall, and the Kaufman Center will each have its own cistern in the basement. Each tank will hold about 10,000 gallons of water.

It is recommended that the captured water from Gould Plaza is treated. The graywater may contain pathogens and viruses.

Breadth Study - Water Harvest System

Rainwater Harvest System Cost

The Rainwater Harvest System would cost about \$155,330 to install. The cost to pay the New York City Water Board for water bills of toilets and urinal stalls would be about \$30,000. If the Rainwater Harvest System were to be installed, the payback period would be 5 years.

RAINWATER HARVEST SYSTEM		
System Components	Material Cost	Installation Cost
Wastewater Treatment	63,360	9,812
Drain System	9,900	11,550
Pre-storage Water Filter (Sediment removal)	1,169	221
Pumps	20,500	640
Pipes	15,375	9,975
Cistern	30,000	2,000
Cost	\$110,304	\$32,198
Location Factor (New York City)	1.09	
Total Sum	\$155,328	

*based on ES Means System D44 42 General Water Treatment Equipment, Mechanical Systems G3010 120 1000, D221436.13 Roof Drains, Domestic Water Filtration 223219, Rain Water Drainage D2040, Wastewater Treatment System 44 41 13.17. Factors were applied accordingly to adjust for each system component.

NEW YORK UNIVERSITY WATER BILL				
Fiscal Year	Water Rate per 100 cf (748 Gals)	Sewer Rate per 100 cf (748 Gals)	NYU Water Load (cf)	Total Cost
2008	\$2.02	\$3.67	519680	\$29,570

Water Harvest Treatment

The rainwater harvest system implemented in Gould Plaza can help NYU save water. The produced water for Gould Plaza is more than enough for the water consumed by the NYU community. Overall, there will be a surplus of 862,220 gallons of water. The payback period for the rainwater harvest system would only be about 5 years.

The rainwater harvesting system would also help promote New York University's reputation as an environmentally conscious university. Already, New York University's Sustainable Task Force sponsors a number of 'Green Grants' to promote sustainability. New York University is also one of the top buyers of green energy among national universities.

It is recommended that New York University consider the construction of a Water Harvest System at Gould Plaza.