SimBuild 2010

Energy Modeling Competition:

Competition Package

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A. General Building Description

Public School 41 is located at the corner of Avenue of the Americas and West 11th street in Greenwich Village (Manhattan). The school was built in 1958 and it is approximately 110,000 (Square Feet). It has 4 above grade stories and a basement. The basement houses most of the mechanical systems. The first floor is comprised of several classrooms, offices, an auditorium and Cafeteria with a kitchen. The second floor is classrooms and a Gymnasium. The majority of the third floor and fourth floor are classrooms with a computer lab and art room on the third floor. The following summarizes the general building characteristics and usage profile.

B. Building Information:

Building Type: School K-5th
Area: 110,000 SF
Floors: 4 Stories + Basements
Year Built: 1958
School Year: September 2 – June 4, 170 School Days
Student Population: 750
Staff Population: 110
Occupancy: Monday to Friday 8:40am – 3:00pm
After School Programs: Monday to Friday 3:00pm – 6:00pm
After School Program Space Use: Classrooms 1st, and 2nd, floor, Auditorium, Cafeteria, Gymnasium are used.
Latitude: 40°44' 9"
Longitude: -73°59' 59"
Building Orientation: Main Entrance on 11th St. is 30.39°east of true north.
Terrain Type: Urban

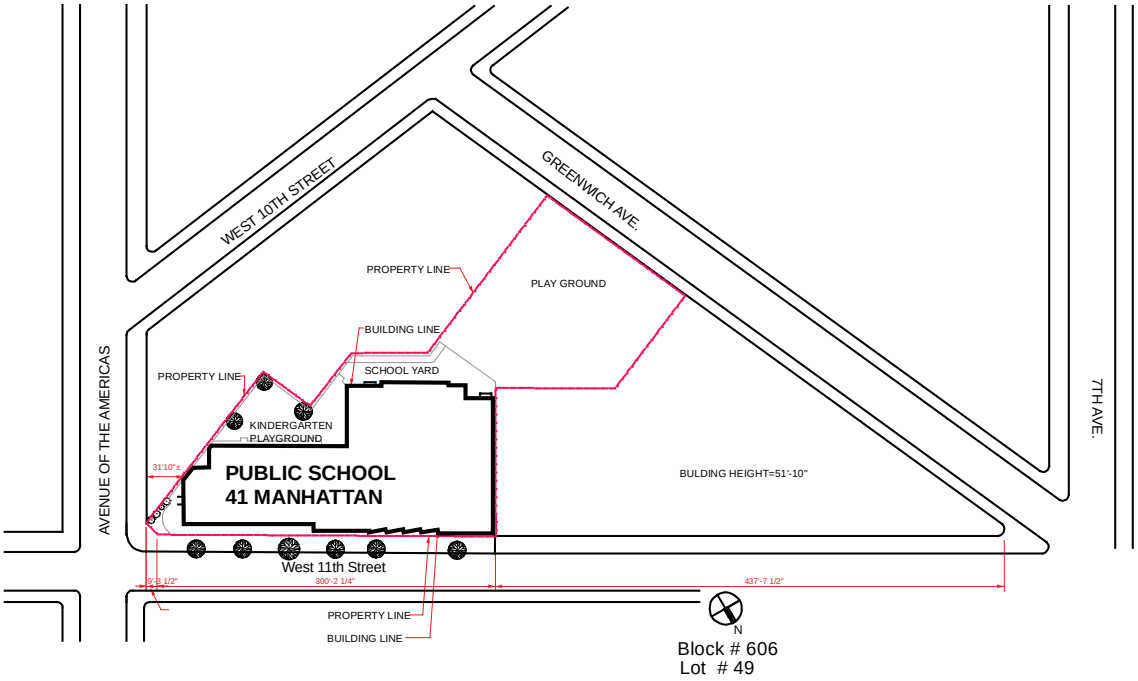


Figure 1: Site Plan

Figure 2 – Along 11th Street

Figure 3 – Main Entrance

Figure 4 – Exterior View of Auditorium & Gymnasium right above

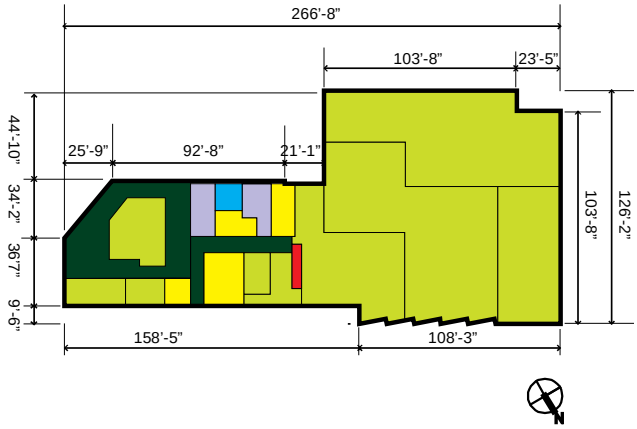
Figure 5 – Interior View of Gymnasium

Figure 6 – View from Greenwich Av. Across the playground

Figure 7 – South Entrance from playground

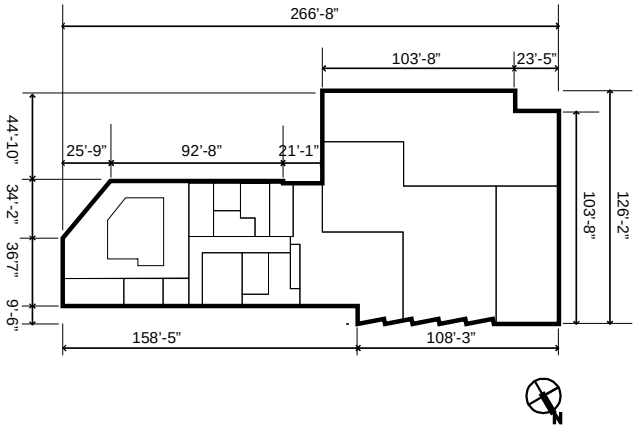
B. Building Floor Plan & Mechanical System

The following figures show Building Floor Plan and system types on each floor.
*See AutoCad Drawings for detailed dimensions.



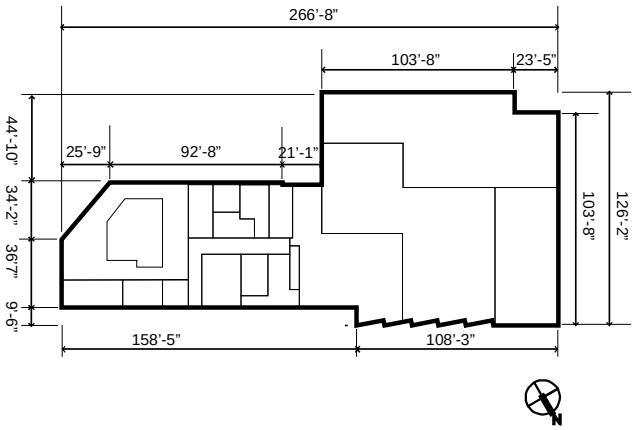
Corridor
Restrooms
Stairs
Storage
Lockers
Mechanical Room

Basement - Floor Plan



Unconditioned Space

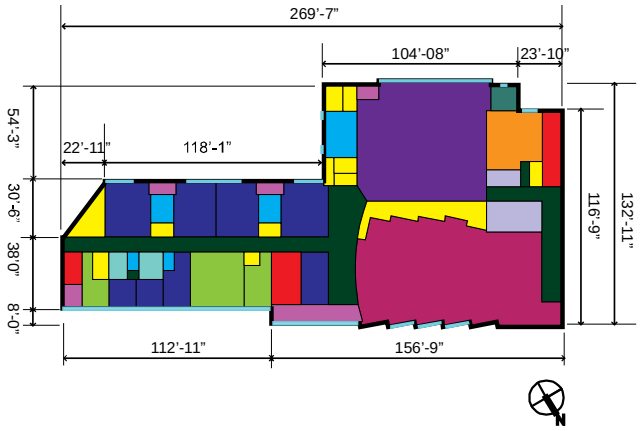
Basement - Heating System Type



Unconditioned Space

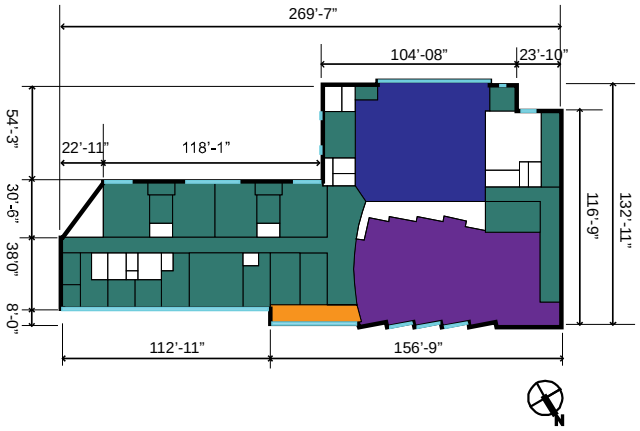
Basement - Cooling System Type

Figure 8: Basement Level



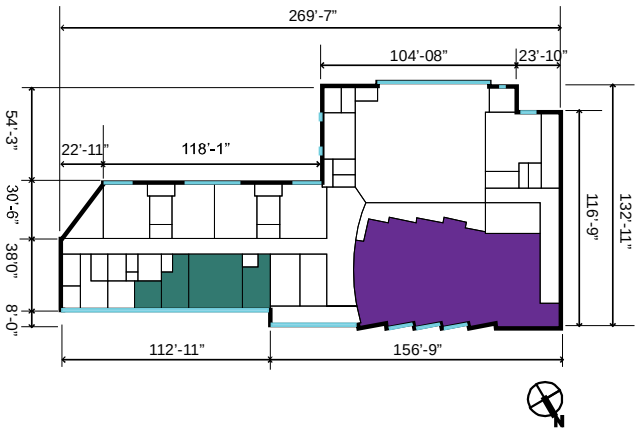
Auditorium
Cafeteria
Classrooms
Corridor
Kitchen
Kitchen Storage
Lockers
Offices
Restrooms
Stairs
Storage
Vestibule
Waiting Room

First Floor - Floor Plan



Unconditioned Space
Heating: 2 - Indirect Heaters
Heating: Perimeter Radiator
Suppl. Heating: 2 -Heating & Blower Units
Heating: 1- Unit Heater
Heating: Perimeter Radiator

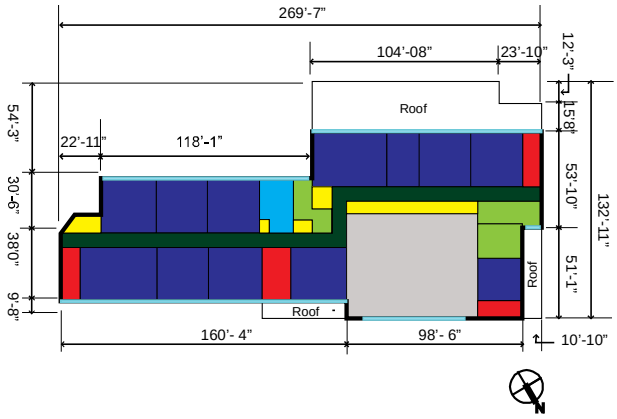
First Floor - Heating System Type



Unconditioned Space
Cooling: Packaged Water Cooler A/C
Cooling: Window A/C Unit

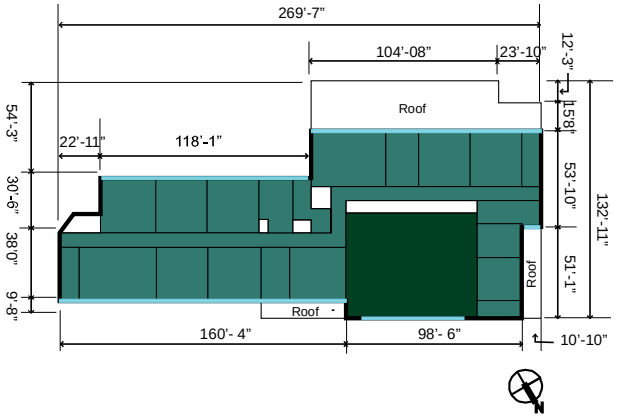
First Floor - Cooling System Type

Figure 9: First Floor



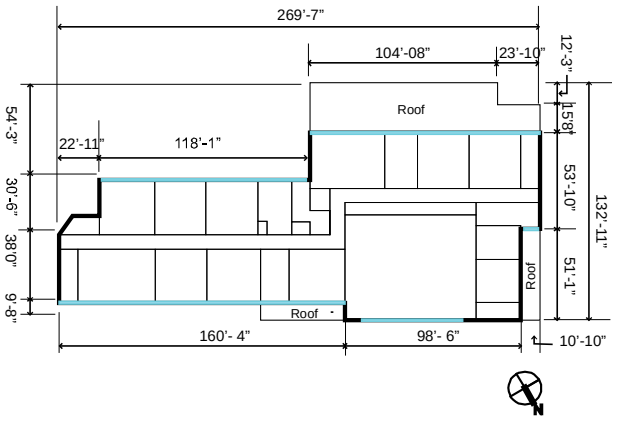
Classrooms
Corridor
Gymnasium
Offices
Restrooms
Stairs
Storage

Second Floor - Floor Plan



Unconditioned Space
Heating: 2 - Indirect Heaters
Heating: Perimeter Radiator

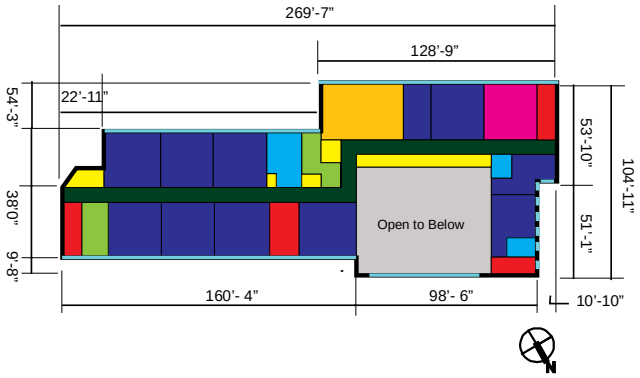
Second Floor - Heating System Type



Unconditioned Space

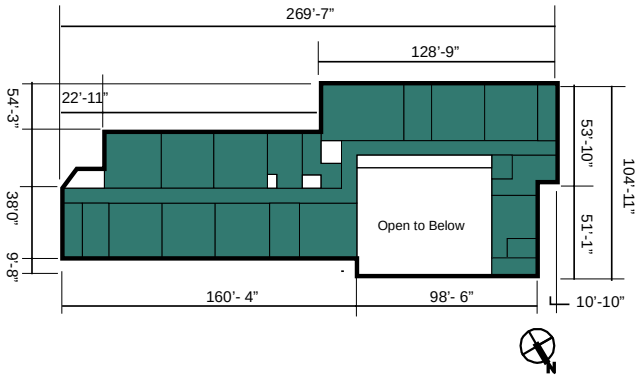
Second Floor - Cooling System Type

Figure 10: Second Floor



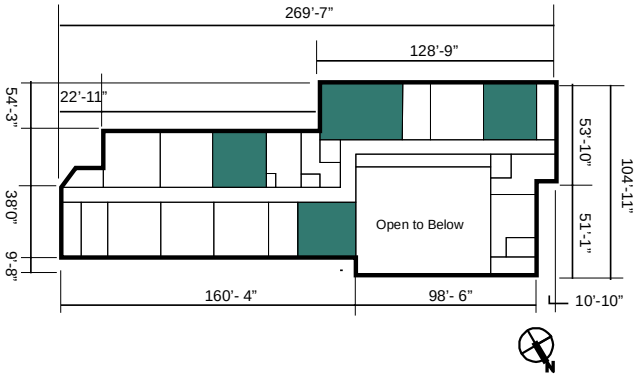
Art Room
Classrooms
Computer Lab
Corridor
Gymnasium
Offices
Restrooms
Stairs
Storage

Third Floor - Floor Plan



Unconditioned Space
Heating: Perimeter Radiator

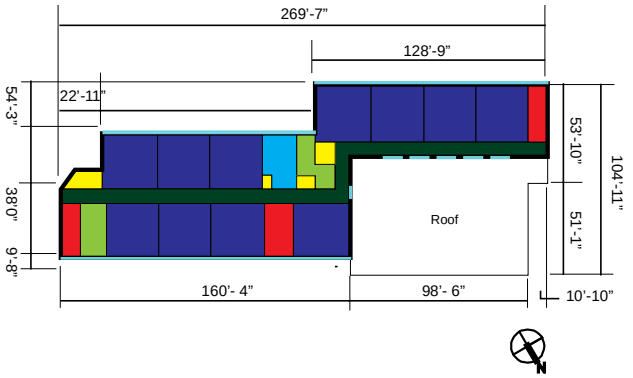
Third Floor - Heating System Type



Unconditioned Space
Cooling: Window A/C Unit

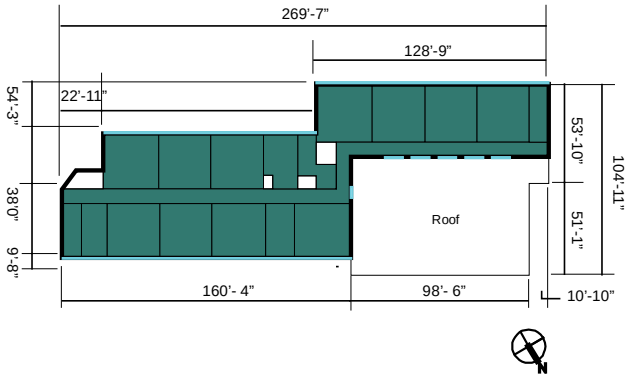
Third Floor - Cooling System Type

Figure 11: Third Floor



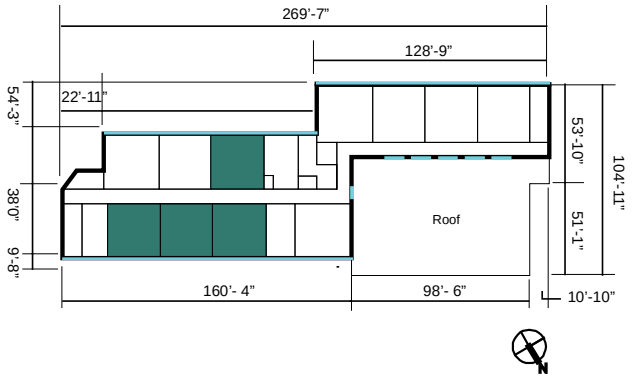
Classrooms
Corridor
Offices
Restrooms
Stairs
Storage

Fourth Floor - Floor Plan



Unconditioned Space
Heating: Perimeter Radiator

Fourth Floor - Heating System Type



Unconditioned Space
Cooling: Window A/C Unit

Fourth Floor - Heating System Type

Figure 12: Fourth Floor

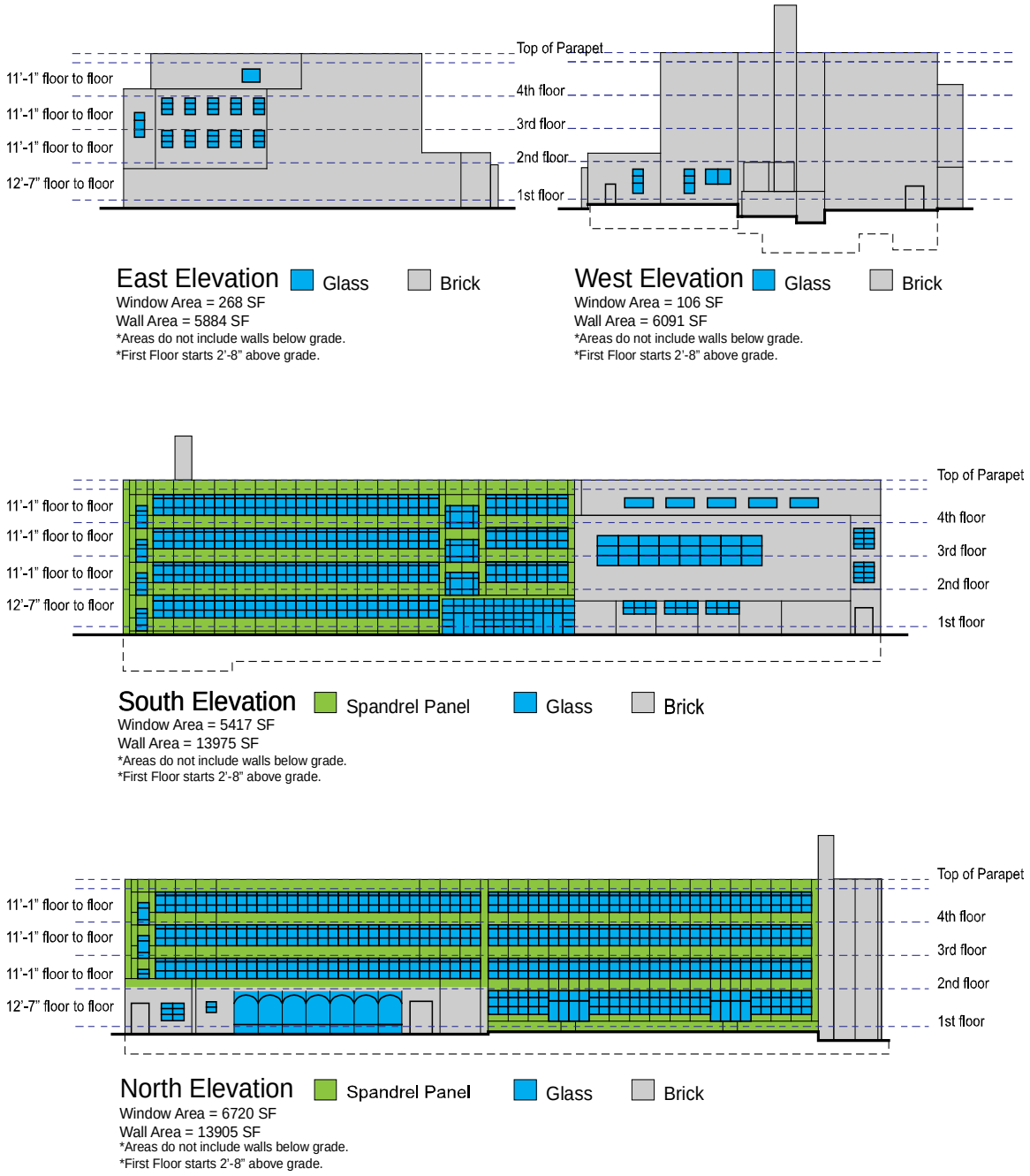


Figure 13: Elevations

C. Building Components

Exterior Walls

Wall construction materials are described from outside to inside. The areas taken by different constructions are color coded on Figure 13.

Brick Construction: 4" brick, 6" cinder block, 9-1/4" air space, 4" cinder block, 2-1/2" structural facing tile

Spandrel Construction: 1" insulated (polystyrene insulation) porcelain enamel steel spandrel panel, 3" air space, 6" cinder block, 1/2" insulation, 20ga steel shield

Walls Below Grade: 12" reinforced concrete

Roof Construction: 5/8" crushed stone and gravel, 9/16" 4-ply built up roofing, 1/2" topping board, 2-5/8" rigid insulation (polystyrene), 3/16" 1 ply felt primer, 1/2" 2-ply vapor barrier, 1-1/2" concrete plank, 6" concrete slab

Ground/Exposed Floor: 1/8" Asphalt Tile, 6" Concrete Slab

Windows: 1/4" Clear Single Glazed Special Coated MAR Resistant Polycarbonate (Lexan MR7), with Aluminium Frame

Lighting	Room Type – location, (wattage) Art Room – 3rd Floor, 1403 SF (1440W), Fluorescent Lights Auditorium – 1st Floor, 5529 SF (14785W),Incandescent Lights Cafeteria – 1st Floor, 4454 SF (3200W), Fluorescent Lights Classrooms – 1st,2nd,3rd,4th Floor, 900 SF (1440W), Fluorescent Lights Area and lighting of a typical classroom Computer Lab –3rd Floor, 903 SF (1440W), Fluorescent Lights Corridor – 1st Floor, 3144 SF (5860W), Fluorescent Lights 2nd, 3rd,4th, Floor,2396 SF (4200W), Incandescent Lights Gymnasium – 1st Floor, 4334 SF (10000W), Incandescent Lights
Lighting (continued)	Kitchen – 1st Floor, 913 SF (2425W), Incandescent Lights Kitchen Storage – 1st Floor, 200 SF (100W), Incandescent Lights Locker – 1st Floor Large Locker, 487 SF (920W), Incandescent Lights 1st Floor Small Locker, 160 SF (460W), incandescent Lights Offices –1st Floor Large Office, 876 SF (1440W), Fluorescent Lights 1st Floor Small Office, 389 SF (160W), Fluorescent Lights 2nd, 3rd, 4th, Floor Office, 389 SF (160W), Fluorescent Lights Restrooms – All, 01 Fixtures, 441 SF (100W), Incandescent Lights Stairs – All, 02 Fixtures per floor,450 SF (240W), Incandescent Lights

	Storage – Assume Each Storage Room,148 SF (100W), Incandescent Lights Vestibule –1st Floor North Entrance, 489 SF (3450W), Incandescent Lights 1st Floor South Entrance, 98 SF (300W), Incandescent Lights Waiting Room – 1st Floor, 186 SF (160W), Fluorescent Lights Basement – 24714 SF (6960W), Incandescent Lights
Daylight Dimming/Occupant Sensors	None
Other Equipment	Equipment/Plug Loads: Computer Lab –12 computers & 12 monitors Offices – 5 computers & 5 monitors Classrooms – 3 computers & 3 monitors Kitchen – Storage Refrigerator Kitchen – Frozen Food Locker Kitchen – Dishwasher (Type B) Gas Consumption: Kitchen – Range = 170,000 BTU/HR Kitchen – Roast Oven = 100,000 BTU/HR Kitchen – Kettle & Steamer Combination = 100,000 BTU/HR Cellar – #2 Oil Burner Pilot Lights = 21,600 BTU/HR
Cooling: HVAC System Type	The building has a Packaged Water Cooled System to cool the Auditorium and Window Mounted A/C Units to cool some of the Offices and Classrooms. Auditorium 1 – Packaged Single Zone DX (30% Propylene Glycol / Water) Model - VCX0543FSS, Manufacturer - Mammoth Cooling Capacity : Total = 561 MBH Sensible =349 MBH Air Cool Condenser & Outdoor Fan: Dry Cooler (30% Propylene Glycol) Model – HES-893-LGA, Manufacturer – ATS Heat Rejection: 7094 MBH Fan: Model – SF-20-50, Manufacturer – Greenheck Variable Speed Fan Supply CFM = 10,500 Return CFM = 8,940 O.A. CFM = 6,600 Static Pressure = 1.5 in. W.G. Brake HP= 4.43 Offices & 2 Classrooms Window Mounted A/C Units (12 Units Total) Units are approx. 10 yrs old Cooling Capacity: 7800 BTU CFM = 250 EER: 9.9

Heating: HVAC System Type	The building has Perimeter Radiators to heat most of the spaces. Heating & Blower Units are used as additional heaters in some spaces. Indirect heaters and unit heaters are used in spaces that don't have perimeter radiators. <u>Cafeteria</u> Perimeter Radiators Supplemental Heat: 2Units – Heating & Blower Units - Horizontal Type Fan: Capacity = 1250 CFM Supply = 1225 CFM Heating Coil : Entering Temp = 70 °F Final Temp = 92 °F <u>Auditorium</u> 2Units – Indirect Heaters Fan: Supply Capacity = 1250 CFM Supply = 1225 CFM Heating Coil : Entering Temp =70 °F Final Temp = 92 °F <u>Gymnasium</u> 2Units – Indirect Heaters Blower , Exhauster Supply = 7740 CFM, 1" static pressure inches of water, BHP 2.04 Exhaust = 5600 CFM, 3/4" static pressure inches of water, BHP 1.30 Heating Coil : Entering Temp = 70 °F Final Temp = 92 °F <u>Vestibule –Main Entrance 1st Floor</u> 1 Unit Heater - Horizontal Propeller Type Fan: High = 1200 CFM Low = 900 CFM Capacity: High = 86,000 BTU's Low = 70,000 BTU's Heating Coil : Assumed Entering Air = 60°F High Temp = 131 °F Low Temp = 126 °F
DHW	<u>Domestic Hot Water Heater</u> Supply Temperature 130°F

Boiler System	<u>Steam Boiler – For Perimeter Radiators</u> 2- #2 Oil fueled Boilers, installed 1958 Capacity 5,217 MBH Capacity/Size 60 GPH

D. ANNUAL ANERGY CONSUMPTION

ELECTRIC					
MONTH	KWH	KWH$	KW	KW$	COST/KWH
0807	48480	3183.24	184.00	5122.70	$0.066
0808	44000	3360.76	136.00	3865.59	$0.076
0809	51040	3733.62	198.40	5523.61	$0.073
0810	41920	2161.73	153.60	4276.34	$0.052
0811	45920	2471.64	156.80	4456.80	$0.054
0812	48480	2650.15	163.20	4733.81	$0.055
0901	48480	3182.17	163.20	5036.17	$0.066
0902	44160	2639.61	163.20	4750.88	$0.060
0903	50560	4328.13	163.20	4845.97	$0.086
0904	40800	2751.26	172.80	4929.65	$0.067
0905	48000	2808.19	168.00	5293.19	$0.059
0906	51360	3191.97	179.20	5573.46	$0.062

ConEd - GAS			
MONTH	THERMS	DOLLARS	COST/THERM
0807	242	$465.29	$1.92
0808	260	$457.69	$1.76
0809	286	$456.42	$1.60
0810	147	$266.55	$1.81
0811	457	$767.42	$1.68
0812	548	$920.90	$1.68
0901	579	$972.07	$1.68
0902	348	$532.93	$1.53
0903	606	$951.38	$1.57
0904	406	$518.00	$1.28
0905	438	$533.58	$1.22
0906	338	$406.69	$1.20

Fuel Oil #2	
Gallons	FUEL COST
39,800.00	$58,590.77