ROCKFORD BOARD OF EDUCATION
INVITATION FOR BID ON SUPPLIES, MATERIALS, EQUIPMENT OR SERVICES FOR SCHOOL DISTRICT NO. 205 ROCKFORD, ILLINOIS

RFQ No. **16-67 Commissioning Agent Services**

DATE: **Tuesday, June 14, 2016**

RE: **ADDENDUM NO. 1**

To All Bidders:

Attached are modifications, clarifications and/or corrections for the Project Manual and are hereby made a part of the contract documents. Please attach this addendum to the Project Manual(s) in your possession. Please note the receipt of this addendum on the bid form. Bidders shall review changes to all portions of this work as changes to one portion may affect the work of another.

All questions should be emailed to Tamara Pugh at tamara.pugh@rps205.com

Refer all questions relative to the business aspect, Instructions to Bidders, Special Conditions, and questions concerning the technical aspect of the documents to the Purchasing Process Manager by email at tamara.pugh@rps205.com.

RFQ 16-67 Commissioning Agent Services

Addendum One

June 14, 2016

Please address the following in your response to the RFQ:

1. Describe your approach to commissioning.
2. Identify the systems you propose to commission.
3. Describe how you will use the basis of design document in the commissioning plan
4. Describe how you plan to participate with the owner and design team during the design process
5. Describe your commissioning plan
6. Identify and describe the content of any documents that you will incorporate into the bid specifications for commissioning.
7. Describe how you plan to manage the commissioning program during construction.
8. Identify any meetings you plan to organize and the participants you expect to attend. Will you issue meeting minutes and manage the open issue lists?
9. Do you anticipate additional site visits other than the above identified meetings? If so, please identify the quantity and purpose.
10. After functional testing is complete, do you anticipate on participating in the resolution of the issues identified in the functional testing report?
11. How long do you anticipate needing to complete the functional testing?
12. Do you have staff available to perform functional testing at both schools at the same time?

Please refer to the attached Basis of Design for the two new elementary schools.

END OF ADDENDUM ONE

Basis of Design - DRAFT

Project Name:

Rockford Public Schools: 2 New Prototype Elementary Schools

Date: 06/09/2016

Prepared By: CannonDesign, Inc.

REVIEWED

Owner

Name: Rockford Public Schools District 205 *Date:*

District Program Manager

Name: Ragnar Benson *Date:*

Architect

Name: Keri VanSant, Architecture *Date:* June 6, 2016

Interiors

Name: Raquel Morales *Date:* May 10, 2016

Engineers (S, M, E, P, T)

Name: Justin Holmes, Structural *Date:* April 29, 2016

Name: Keith Hammelman, Mechanical, Plumbing *Date:* June 3, 2016

Name: John Economou, Electrical, Technology *Date:* 04/06/2016

Commissioning Authority

Name: *Date:*

OVERVIEW

The Basis of Design is created to document the reasoning and assumptions made early in the design process. The Basis of Design includes technical language to document the thought processes used by the design team while developing the systems. The document is organized by individual disciplines (e.g., Architectural, Mechanical/HVAC, Plumbing and Fire Protection, Electrical, etc.) and provides details on the criteria for the selection of components, systems, manufacturers, or layouts, assumptions made by designers during this process, and codes, standards or guidelines that influence the design.

The Basis of Design is intended to assist in key building design and operations areas and to present this critical information in a format for easy reference. Broadly stated, these goals are;

- to assist the entire design team with effective collaboration;
- to provide the building owner with a comprehensive picture of the design goals and intentions;
- to establish building performance goals;
- to assist with cost and value assessments;
- to evaluate maintenance considerations for building and systems during design;
- to communicate to the building construction team the performance goals; and
- to inform building management and operations of the original assumptions, operational characteristics and limitations of the systems.

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1. PROJECT DESIGN CONTEXT AND GOALS

1.1 Project Information

TABLE 1-1. PROJECT INFORMATION

Project Name	2 New Prototype Elementary Schools
Address	2 different site locations to be determined
Client	Rockford Public Schools District 205
Gross Square Footage	Targeted 84,000 SF
Rentable Square Footage	N/A
Useable Square Footage	
Project Budget	$17,829,611 / $17,929,611
Major Function / Building Type	Public Schools
Occupancy Type	Education
Construction Type	Type 2B
Program Description	Single prototype building design to a 4-strand elementary with grades K-5

1.2 Design Context

Delivery Method/Project Procurement:

Design/ Bid/ Build

Phasing:

Early site package to include mass grading and building pad preparation for greenfield site (Site Bravo). Site is to be determined by RPS 205.

Extent of Existing Conditions Retained/Reused:

No existing buildings to be retained or reused once new buildings are constructed.

Context of Existing Facilities and Surroundings:

Site Alpha is located in an urban context with residential housing on 3 sides. Site Bravo is located on a rural greenfield site with residential housing to the west and farmland to north, east and south.

Client/Team Assessment of Facilities and Context:

To be determined once sites are confirmed.

1.3 Design Objectives

Client Goals, Vision & Intentions:

Design a single prototype building that communicates the vision of 5 existing schools, merging into the 2 new buildings. Design to be as efficient as possible to maximize the project budgets.

Site Goals:

Separate bus, car and pedestrian traffic to the greatest extent possible.

Image Goals:

None specifically stated.

Performance Goals:

Meet minimum IECC code requirements; some District standards exceed 2009 IECC (which is required)

Main Project Challenges:

Design of single prototype building for 2 new elementary schools on 2 different sites; merging 5 schools into 2 buildings

Third Party Certification (i.e. LEED Platinum):

None

1.4 Energy Performance Goals

TABLE 1-2. BASELINE STANDARDS

Baseline Standard	Metric	Goal
Architecture 2030 Challenge	Design Year Goal	
ASHRAE 90.1 - 2007	Percent of optimization as compared to baseline	10%
Design to Earn ENERGY STAR	EPA Energy Performance Rating (must be greater than 75)	75 or greater
Local Energy Code Requirements	IECC 2009	IECC 2015
Exemplary Owner Goals *(For example: net zero, net contributor, Living Building, etc.)*	None	

TABLE 1-3. TYPICAL BUILDING TYPE BASELINE FOR ENERGY USE

Primary Use	Percentage of Total	Reduction Target Y/N
Cooling		
Heating		
Ventilation		
Lighting	0.87 W/sqft	
Plug loads	3 W/sqft	
Hot Water		

1.5 Building System Expected Life Goals

TABLE 1-4. BUILDING SYSTEMS EXPECTED LIFE

System	Subsystem	Expected Life (in years)
Exterior closure	Exterior walls/cladding	
	Windows	
Conveying	N/A	
	N/A	
Plumbing	Hot water heaters	10 years
HVAC	Air Handling Units	25 years
	Air Cooled Chillers	20 years
	Temperature Controls	15 years
Fire Protection	Sprinkler Heads	30 years
Electrical		

1.6 Commissioning Objectives

Special Testing & Inspection Goals:

Training & Demonstration Goals:

Documentation Goals:

2. SITE AND CLIMATE DATA

2.1 General

TABLE 2-1. GENERAL SITE & CLIMATE DATA

	Value (units)
Latitude/Longitude	42.2711° N, 89.0940° W
Elevation (1st floor finished floor elevation)	TBD; varies at each site
Clearness Number	
Summer Outdoor Air Design Dry Bulb/Wet Bulb	
Ground Reflectance	

2.2 Geotechnical

TABLE 2-2. GEOTECHNICAL DATA

	Consideration
Bearing Capacity	TBD
Percolation Rate	TBD
Soil Conductivity	TBD
Cut and Fill Balance	TBD

2.3 Precipitation

TABLE 2-3. AVERAGE ANNUAL PRECIPITATION

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
inches	1.37	1.41	2.32	3.35	4.02	4.65	3.95	4.59	3.35	2.67	2.58	1.98	**36.24**

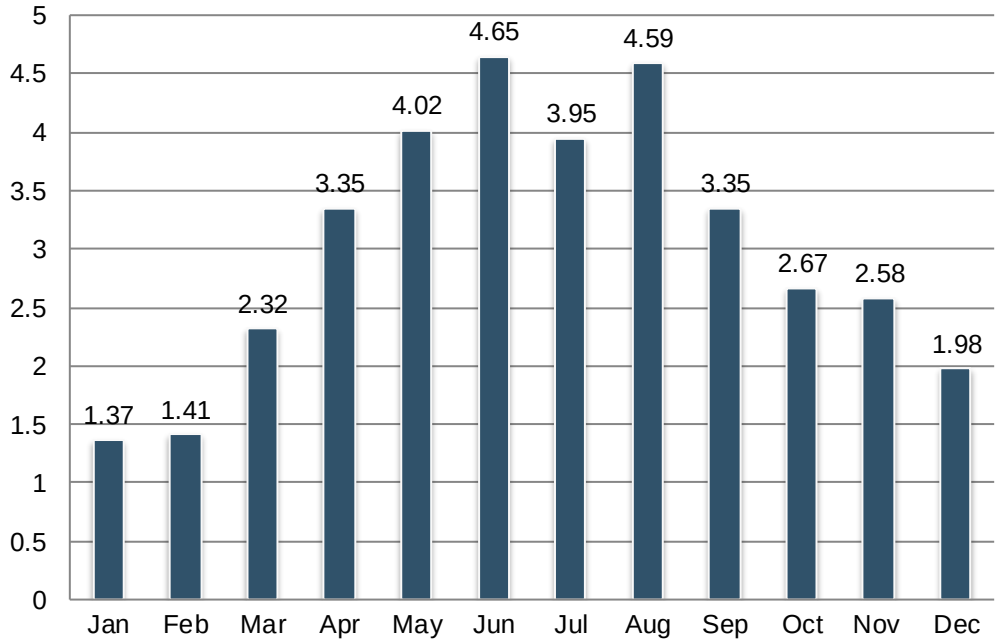

Figure 2-1. Average annual precipitation.

2.4 Temperature

TABLE 2-4. ANNUAL TEMPERATURE PROFILE (°F)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average(°F)	21.5	25.9	37.2	49.4	60.1	69.8	73.8	71.9	63.9	51.7	38.9	25.4	**49.13**
Max (°F)	29.5	34.2	46.9	60.7	71.8	81.1	84.5	82.4	75.4	62.7	47.6	33.2	**59.17**
Min (°F)	13.5	17.7	27.5	38.1	48.4	58.5	63	61.3	52.4	40.7	30.3	17.7	**39.09**

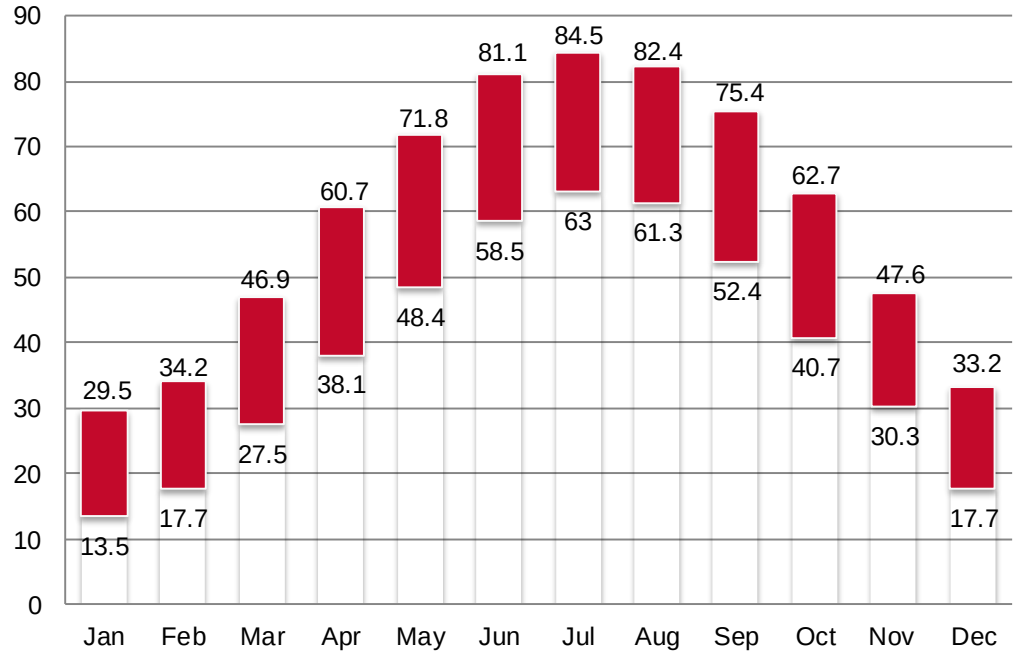

Figure 2-2. Mean daily minimum and maximum temperature.

Figure 2-3. Average Temperature (°F)

TABLE 2-5. MINIMUM/MAXIMUM DESIGN TEMPERATURES (°F)[1]

	ASHRAE 0.5%	ASHRAE 1%	ASHRAE 2%
Max (DB/WD)			
Min (DB)			

[1] For use in design of heating and cooling systems. Actual values used to be included in HVAC section.

TABLE 2-6. HEATING AND COOLING DEGREE DAYS[1]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Heating DD	1348	1093	862	476	198	31	3	11	117	422	782	1226	**6569**
Cooling DD	0	0	0	8	47	175	274	223	84	9	0	0	**820**

[1] Information to be used in Energy Modeling.

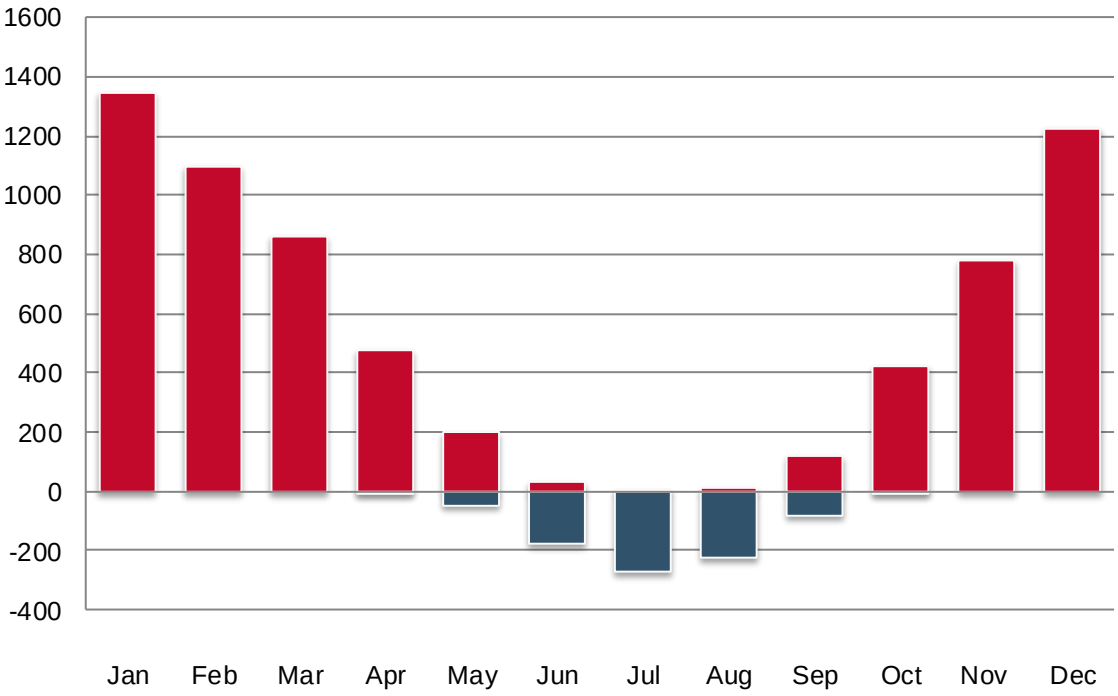

Figure 2-4. Heating and cooling degree days.

2.5 Humidity

TABLE 2-7. RELATIVE HUMIDITY

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
AM	79	80	79	77	78	80	84	89	87	83	81	82	**82**
PM	73	71	68	62	62	63	66	69	68	65	71	75	**68**

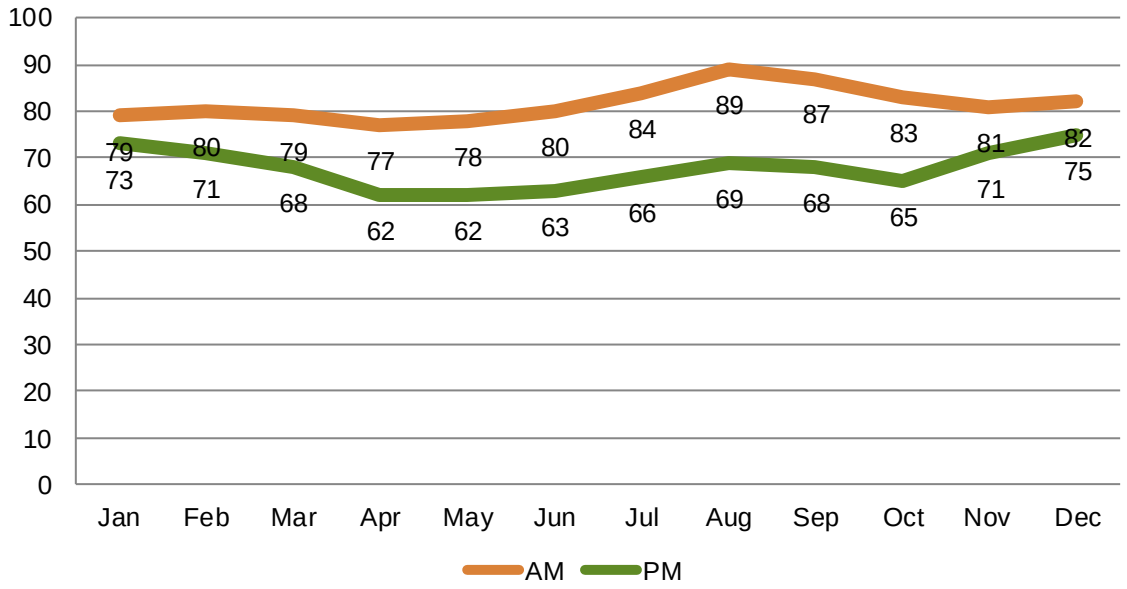

Figure 2-5. Relative humidity.

2.6 Solar

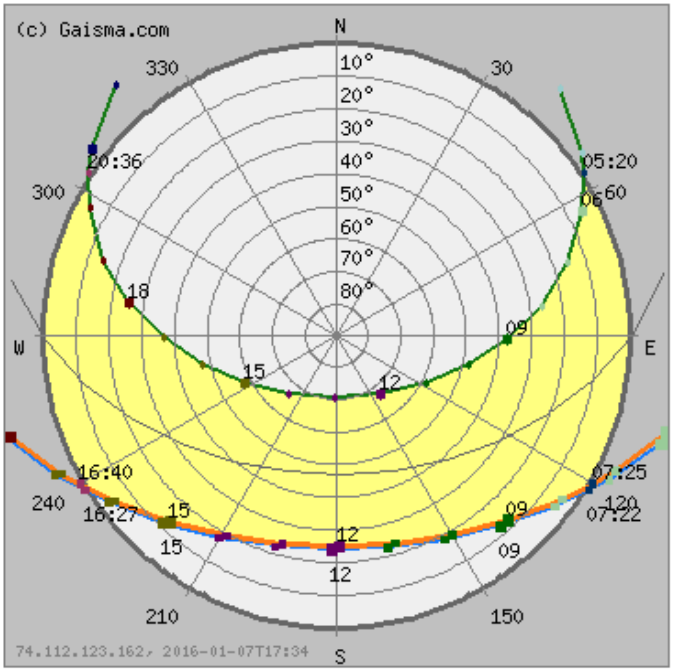

Figure 2-6. Sun path diagram from

http://www.gaisma.com/en/dir/us-country.html

TABLE 2-8. SOLAR HEATING POTENTIAL (CUMULATIVE SOLAR INSOLATION IN BTU/SF/DAY)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Horiz	380	580	790	1040	1290	1440	1410	1230	950	650	380	300
South	750	810	720	630	560	520	540	640	740	800	630	610
East	280	390	500	620	730	790	780	710	580	440	260	220
West	280	390	480	600	720	790	790	710	580	430	260	220
North	130	180	240	300	360	410	390	320	260	190	130	110

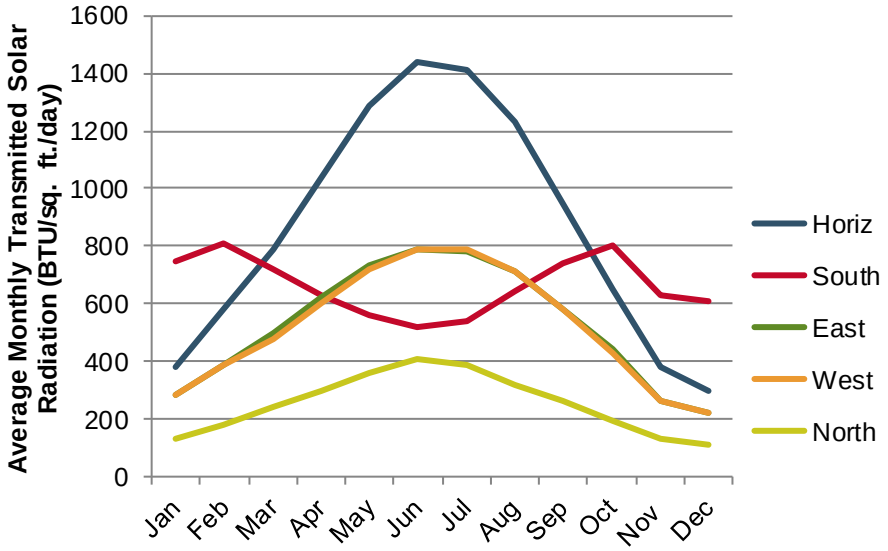

Figure 2-7. Solar heating potential.

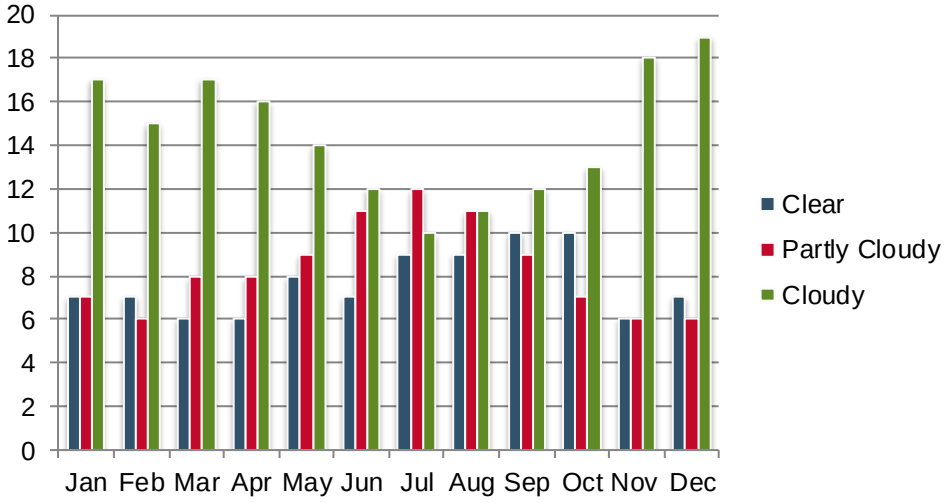

Figure 2-8. Clear versus cloudy days.

2.7 Wind

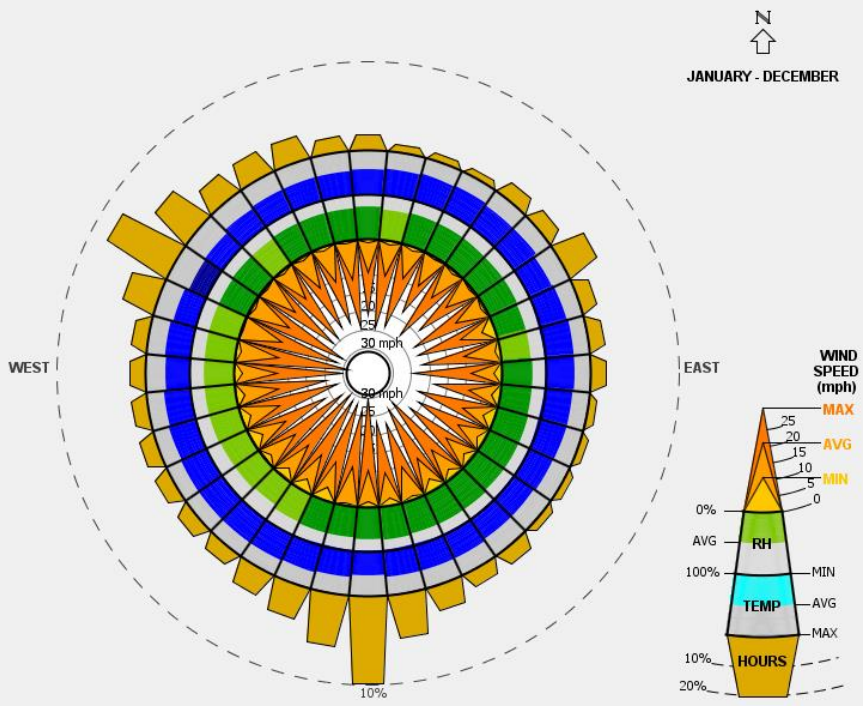

Figure 2-9. Regional wind rose.

3. FACILITY AND PROGRAM DATA

3.1 General Transportation Expectation

TABLE 3-1. TRANSPORTATION EXPECTATIONS

Building Users	Transportation Option Percentages				
	Single Use Auto	Vehicle Pool	Public Transportation	Pedestrian	Bicycle

Describe the path that employees/guests will use to enter/leave the project. Define levels of public/private space:

3.2 Operational Hours of Use[1]

TABLE 3-2. OPERATIONAL HOURS

Space Type[2,3]	Space Use	Weekday Occupied Time	Saturday Occupied Time	Sunday Occupied Time	Holiday Occupied Time	Arrival Schedule

[1] For use in energy modeling and HVAC calculations and system selection.
[2] Use ASHRAE 90.1 Lighting Power Densities Space-by-Space Method for space type definitions. This can be found in Table 9.6.1 in ASHRAE 90.1 2007.
[3] Space type definitions should be consistent throughout Basis of Design.

Special Food Service Requirements:

Special Security Requirements[1]:

[1] Reference CannonDesign Owner's Project Requirements, Sections 1.4 and 2.2.

4. CODES, STANDARDS AND REQUIREMENTS

4.1 **Civil** (Including Site Water Management)

TABLE 4-1. CIVIL CODES AND STANDARDS[1]

Type	Name of Code/Standard/Edition	Why Used
Professional		
State		
Local	Rock River Water Reclamation District	
Owner's Criteria		

[1] Include Title 1, Reports.

4.2 Architectural/Building

TABLE 4-2. ARCHITECTURAL/BUILDING CODES AND STANDARDS[1]

Type	Name of Code/Standard/Edition	Why Used
Professional	2009 International Building Code (With Amendments)	National Building Code adopted by Part 180 (School Code)
State	Illinois Administrative Code Part 180	
Local	City of Rockford Code of Ordinances	
Owner's Criteria[2]		
Building Use Licensing	N/A	

[1] Research any local amendments to technical provisions of model codes.
[2] Include insurance underwriter design criteria if applicable.

4.3 Sustainability

TABLE 4-3. SUSTAINABILITY CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
LEED Certification	N/A	
LEED Product	N/A	
LEED Target Level	N/A	
Checklist Complete	N/A	

4.4 Accessibility

TABLE 4-4. ACCESSIBILITY CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
Federal	2010 ADAAG	
State	Illinois Accessibility Code 1997	
Local		
Owner's Criteria		

4.5 Special Zoning, Landscape, Appearance Laws/Ordinances (where applicable)

TABLE 4-5. SPECIAL ZONING AND LANDSCAPE CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
Professional		
State		
Local		
Owner's Criteria		

4.6 Energy Conservation

TABLE 4-6. ENERGY CONSERVATION CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
Professional	IECC 2009	Energy performance guideline
State	IECC 2009	State Board of Education
Local	IECC 2015	
Owner's Criteria	IECC 2015	

4.7 **Structural** (ASTM UniFormat II A10, A20, & B10)

TABLE 4-7. STRUCTURAL CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
Primary Structural Standard		
Loads	ASCE 7, 2005	IBC 2009
Concrete	ACI 318, 2008	IBC 2009
Masonry	ACI 530, 2008	IBC 2009
Steel	AISC 360, 2005	IBC 2009
Steel (Seismic)	AISC 341, 2005	IBC 2009
Cold-Formed Steel	AISI NAS 01, 2007	IBC 2009
Wood	AF&PA NDS, 2005	IBC 2009
Other Standards		
Welding	AWS D1.1, 2004	IBC 2009
Elevator Loads	ASME A17.1, 2007	IBC 2009

.

4.8 **Plumbing** (ASTM UniFormat II D20)

TABLE 4-8. PLUMBING CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
State	Illinois Plumbing Code	ISBE Required
Local	Illinois Plumbing Code	ISBE Required
Owner's Criteria	Illinois Plumbing Code	

4.9 **Mechanical** (ASTM UniFormat II D30)

TABLE 4-9. MECHANICAL CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
Professional	ASHRAE 55, 62.1	
State	IMC 2009	ISBE Requirement
Local	IMC 2009	ISBE Requirement
Owner's Criteria	IMC 2009	ISBE Requirement

4.10 **Fire Protection** (ASTM UniFormat II D40)

TABLE 4-10. FIRE PROTECTION CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
Professional	NFPA 72 – Fire Alarm Code NFPA 13 - Sprinkler Requirements	Minimum industry standard
State	State Building Code	Minimum industry standard

4.11 Fire Protection Analysis Summary

The complete project code analysis should be referred to for further detail.

TABLE 4-11. FIRE PROTECTION ANALYSIS

Consideration	Requirement
Fire Alarm Design Basis	ADA, State Codes, NFPA 72, State Fire Marshall
Occupancy Classification	Education
Rating of Structure	0
Maximum Fire Area	58,000 SF + Frontage Increase
Maximum Smoke Area	N/A
Rated Separation Requirements	2HR Fire Wall
Maximum Height	75', 3 Stories
Exit Travel Distance	250'-0" Max (Sprinklered)
Atriums	N/A
Classification/High Rise	N/A
Fan Shutdown or Smoke Control	Fan Shutdown for greater than 2,000 cfm
Fan Shutdown by Fire Alarm or BAS	Fan Shutdown by Fire Alarm
Command Center Location	Main Entrance
Voice Communication (YES or NO)	N/A
Firefighter Communication Type	N/A
Fire Pump Annunciation	Yes
Elevator Shaft Sprinklered w/ Shutdown	N/A
Municipal Fire Type	
Mass Notification System Integration	N/A

4.12 **Electrical** (ASTM UniFormat II D50)

TABLE 4-12. ELECTRICAL CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
Professional	NFPA 70 – National Electrical Code 2011	
State	NFPA 70 – National Electrical Code 2011	
Local	NFPA 70 – National Electrical Code 2014	
Owner's Criteria	NFPA 70 – National Electrical Code 2011	
Building Use Licensing Requirement		

4.13 Exterior and Site Lighting

TABLE 4-13. LIGHTING CODES AND STANDARDS[1]

Type	Name of Code/Standard/Edition	Why Used
Professional	1. IESNA Handbook 2011/ 10th Edition 2. ICC 2015	1. Minimum industry lighting standard 2. Energy performance guideline
State	IECC 2009	Illinois State Board of Education
Local	IECC 2015	
Owner's Criteria	IECC 2015	

[1] *Coordinate with local ordinances and exit discharge lighting requirements.*

4.14 Interior Lighting

TABLE 4-14. INTERIOR LIGHTING CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
Professional	1. IESNA Handbook 2011/10th Edition 2. ICC 2015	1. Minimum industry lighting standard 2. Energy performance guideline
State	IECC 2009	Illinois State Board of Education
Local	IECC 2015	
Owner's Criteria	IECC 2015	

4.15 Structural Cabling

TABLE 4-15. STRUCTURAL CABLING CODES AND STANDARDS

Type	Name of Code/Standard/Edition	Why Used
Professional	Bicsi TDMM	Minimum industry standard
State	NFPA 70 – National Electrical Code 2011	
Local	NFPA 70 – National Electrical Code 2014	
Owner's Criteria	NFPA 70 – National Electrical Code 2011	

5. SITE DESIGN

5.1 General

TABLE 5-1. GENERAL SITE DESIGN

Site Component	Acres	%	Rationale
Total Site Area/Property Area			
Development Area/Limits of Work			
Building Footprint Area			
Hardscape/Impervious Area			
Softscape/Pervious Area			
Open Space Area			

5.2 Hardscape/Impervious Area Design

TABLE 5-2. HARDSCAPE DESIGN

Component	Acres	%	SRI1	Runoff Coeff.	Rationale
Road Area					
Parking Footprint Area					
Pedestrian-Oriented Hardscape Area					
Sidewalk/Path/Curb Area					

[1] *Solar Reflectance Index*

5.3 Softscape/Pervious Area Design

TABLE 5-3. SOFTSCAPE DESIGN

Component	Acres	%	Irrigation Req. (July)	Runoff Coeff.	Rationale
Non-Native Planting Area					
Pedestrian-Oriented Planting/Softscape Area					
Native Habitat Area					

5.4 Parking/Transportation Design

TABLE 5-4. PARKING DESIGN RATIONALE

Parking Type	Acres	Spaces	%	Rationale
On-Grade Parking		90		75 Staff, 15 Visitor (plus required ADA spaces)
On-Grade Covered Parking	N/A			
Structured Parking	N/A			
Low-Emitting Vehicle Parking/Plug-in Stations	N/A			
Bicycle Parking				

5.5 Stormwater Management Design

TABLE 5-5. STORMWATER MANAGEMENT DESIGN

	Unit	Rationale
Design Storm		
Discharge Rate		
Discharge Volume		
Detention/Retention Volume		
Usable Stormwater Storage (July)		
Erosion & Sedimentation Control Measures (temporary)		
Water Quality Control Measures (permanent)		

[1] *Design Storm should correspond to one of the values listed in Site & Climate.*

5.6 Site Utilities/Infrastructure

TABLE 5-6. SITE UTILITIES DESIGN

Utility	Site Location(s)	Source Utility	Rate	Contact
Electricity		ComEd		
Natural Gas		Nicor		
Water (Potable)				
Sanitary Sewer		Rock River Water Reclamation District		
Storm Sewer		Rock River Water Reclamation District		
Telephone		Comcast		
CATV		N/A		
Satellite		N/A		

5.7 Site Amenities

TABLE 5-7. SITE AMENITIES DESIGN

Feature	Rationale

6. STRUCTURAL

6.1 Design Tools

TABLE 6-1. STRUCTURAL PROGRAMS USED

Type of Design/Analysis Program	Name of Program(s) Used
General 3D Finite Element Analysis	RISA 3D, version 13.0
Steel Framing (gravity and lateral)	RAMSteel, release 13.0

6.2 System/Material Selection

TABLE 6-2. REASONING FOR BASIC STRUCTURAL GEOMETRY SELECTION

Component	Span	Reason
Typical Column Spacing	N/A	
Typical Beam Spacing	6’-8’ floor and roof beams	Deck span capability
Special – Cantilever	N/A	
Special – Transfer Girder	N/A	
Typical Floor to Floor Height	12-15’	

TABLE 6-3. STRUCTURAL SELECTION

Component	System	Reason for Selection
Foundation System	Shallow spread footings	
Slab-On-Grade	5" normal weight concrete w/ blended fiber reinforcement, compacted sub-base, drainage course, vapor barrier and fine granular fill	
Floor Slab System	5 1/4" composite slab consisting of 3 1/4" light weight concrete on 2" galvanized steel deck	
Roof System	1 ½" galvanized steel roof deck	
Beam and Columns	steel w-columns, floor beams, and girders; K & LH series steel roof joists	
Lateral Framing System	reinforced masonry shear walls	
Exterior Skin	4” brick and 8”/12” CMU backup	

TABLE 6-4. SPECIAL SYSTEM/MATERIAL REQUIREMENTS

Component	Special Requirement
Canopy	N/A
Loading Dock	N/A
Progressive Collapse	Per ICC 500-2014
Vibration	N/A
Transfer Girder/Truss	N/A
Storm Shelter	Per ICC 500-2014

6.3 Serviceability Criteria

TABLE 6-5. SERVICEABILITY REQUIREMENTS

Component	Special Requirement
Vibration	N/A
Deflection	LL deflection < L/360

6.4 Special Gravity Load Considerations

TABLE 6-6. LIVE LOAD REQUIREMENTS

Occupancy or Use	Uniform, psf	Concentrated, lbs	Special Requirement
Schools			
Classrooms	40	1000	
Corridors above first floor	80	1000	
First floor corridors	100	1000	
Stairs and Exit-ways	100		
Storage			
Lights	125		
Heavy	250		
Partitions (when LL<100psf)	20		
Mechanical Rooms	125		Mechanical equipment weights
Gymnasium, Main Floors, Balconies	100		
Roof Load	20 minimum		100 minimum at Storm Shelter

TABLE 6-7. DEAD LOAD REQUIREMENTS

Load	Uniform, psf	Materials & Special Requirement
Ceilings/MEP	10	lay-in, acoustical, gyp
Roofing	10	adhered membrane

6-8. SNOW LOAD REQUIREMENTS

Variables	Materials & Special Requirement
Ground Snow Load	Pg = 25 psf
Exposure Factor	Ce = 0.9
Importance Factor	Ls = 1.1

6.5 Special Lateral Load Considerations

TABLE 6-9. WIND DESIGN DATA

Variables	Value	Special Requirement
Basic Wind Speed	90 mph	250 mph (Storm Shelter)
Importance Factor	1.15	1.00 (Storm Shelter)
Exposure Category	C	

TABLE 6-10. SEISMIC DESIGN DATA

Variables	Value	Special Requirement
Site Classification	TBD	
Spectral Response Acceleration, Sds	TBD	
Spectral Response Acceleration, S1	TBD	
Occupancy Category	III	
Importance Factor	1.25	
Seismic Design Category	TBD	
Architectural Component Bracing Ip = 1.0 Ip = 1.5 Mechanical/Electrical Component Bracing Ip = 1.0 Ip = 1.5	 Required/Exempt Required/Exempt Required/Exempt Required/Exempt	

6-11. MATERIALS REQUIREMENTS

Material	Special Requirement
Concrete	
Footings	f'c = 3000 psi, normal weight
Foundation Walls, Columns, Beams	f'c = 4000 psi, normal weight
Retaining Walls	f'c = 4000 psi, normal weight
Slab on Grade	f'c = 3000 psi, normal weight
Slab on Steel Deck	f'c = 3000 psi, normal/light weight
All Other Concrete	f'c = 4000 psi, normal weight
Reinforcing	
Typical Reinforcing Bar	ASTM A615, Grade 60
Welded Wire Fabric	ASTM A185
Blended Steel Fibers	Novomesh (850/950)
Welded Reinforcing Bar	ASTM A706, Grade 60
Structural Steel	
Wide Flange Shapes, WT's	ASTM 992
Channels & Angles	ASTM 36
Pipe	ASTM A53, Grade B
Hollow Structural Sections (Rectangular & Round)	ASTM A500, Grade B
Open Web Steel Joists	SJI Compliant
Base Plates	ASTM A571, Grade 42
All Other Steel Members	ASTM A36
High Strength Bolts, Nuts, & Washers	ASTM A325 or A490 (min ¾" diameter)
Anchor Bolts	ASTM F1554
Welding Electrodes	E70xx
Steel Deck Welding Electrodes	E60xx min
Steel Deck	
2" Composite 20 gauge, Galv. G60	ASTM A653 SQ, Grade 33 min
1 ½" Type B Roof 20 gauge, Galv. G60	ASTM A653 SQ, Grade 33 min

7. ARCHITECTURAL

7.1 System Modeling

Simulation programs have been used to increase the accuracy and reduce the time required for calculations of many of the design parameters required.

TABLE 7-1. ARCHITECTURAL SIMULATION PROGRAMS USED

Type of Simulation Program	Name of Program(s) Used
Concept Design	Sketchup, Adobe Photoshop, Illustrator
BIM	Revit 2016
Energy Modeling	N/A
Daylighting	N/A

7.2 Fire Ratings

Construction Type:

IBC 2009, Construction Type 2B

TABLE 7-2. REQUIRED HOURS OF FIRE RESISTANCE

Component	Required Hours of Fire Resistance
Columns	0
Columns Supporting Roofs Only	0
Beams - Structural Frame	0
Beams - Secondary Members	0
Beams Supporting Roofs Only	0
Floor Construction	0
Roof Construction	0

7.3 Envelope System Selection

TABLE 7-3. REASONING FOR SELECTION OF BUILDING COMPONENTS

System	Selection Criteria	Maintenance (High/Medium/Low)
Roof	TPO membrane 1/2" cover board 6” polyisocyanurate roof insulation (R=33)	Low
Opaque Walls	Masonry cavity walls: 4” face brick (w/ graffiti coating) 2-1/2" polyiso insulation Fluid-applied air/vapor barrier Reinforced concrete masonry unit (CMU) bearing wall Minimum 8’ high anti-graffiti coating (or as needed for masonry coursing)	Low
	Metal Framed wall: Composite metal wall panel Weather barrier over plywood faced polyiso insulation (3”, R16.5) A/V barrier over 5/8” exterior sheathing Cold-formed metal framing	
Glazing System (framing system)	BOD Manufacturer: EFCO 406 Aluminum frame storefront system, thermally broken, non operable, anodized finish (6 ½” deep)	Low
Opaque Glazing	1” insulated units Spandrel: Ceramic-coated glazing PPG	Low
Vision Glazing	1” insulated units BOD: Solarban R-100 by PPG Window Sizes: Standard and masonry unit opening, keep above floor to accommodate casework Security: Laminated glazing by PPG Laminated glazing at all entry access points, including interior vestibule doors (for security)	Low
Exterior Doors	Entrances: Thermally-broken aluminum-framed storefront system with insulated glazing, medium style door, outside glazed, BOD: EFCO 406	Entrances: Low

	Support Area Doors: Thermally broken heavy gage hollow metal frames w/ insulated hollow metal doors, CD investigating fiberglass alternatives	Support Area: Medium

TABLE 7-4. SLAB ON GRADE SELECTION

	Minimum Energy Code R Value[1]	Project R Value
Perimeter Insulation	IECC 2015: R-10 for 24" below	R=10

[1] Enter minimum R-value per ASHRAE 90.1 (or relevant energy standard). These values will be used for default system design until actual values are determined.

TABLE 7-5. BELOW GRADE WALLS SELECTION

	Minimum Energy Code R Value[1]	Project R Value
Perimeter Insulation	IECC 2015: R-7.5ci	R=10

[1] Enter minimum R-value per ASHRAE 90.1 (or relevant energy standard). These values will be used for default system design until actual values are determined.

TABLE 7-6. ROOFING SELECTION

Construction Type[1]	U-values	SRI2	Maintenance (High/Med./Low)	Owner Warranty Req.
IECC 2015:Insulation entirely above roof deck Selection: TPO, 6" polyisocyanurate roof insulation	IECC 2015: R=30ci U=1/30ci U=.033 Insulation Selection: R=33	Selection: TPO, Low Slope, White: 99	Low	20 Years

[1] Construction types should indicate roofing system used.
[2] Solar Reflectance Index:
- low-sloped roof (less than 2:12) = 78 or greater
- steep-sloped roof (greater than 2:12) = 29 or greater

TABLE 7-7. OPAQUE WALL SYSTEM(S) SELECTION

Construction Type[1]	**Minimum Energy Code R-Value**[2]	**Project R Value**	**Infiltration** (Shell Tightness)[3]	**Maintenance** (High/Medium/ Low)
Masonry Cavity Wall	IECC 2015: Mass: R=11.4ci	2-1/2" polyiso insulation: 13.75		Low
Composite metal wall panel	Metal framed: U-Value=0.064 R=1/0.064= 15.625	polyiso insulation 3", R=16.5		Low

[1] List for each type of construction (i.e. insulated metal panel, spandrel, masonry, etc.)
[2] Enter minimum R-value per ASHRAE 90.1 (or relevant energy standard). These values will be used for default system design until actual values are determined.
[3] List for assembly using firm standard of 0.04 CFM/sq.ft. at 1.57 PSF.

TABLE 7-8. DAYLIGHTING GOALS

Space Type	**Daylight Foot Candle Range**[1]
All spaces with exterior windows	30-50 foot candles based on foot candle criteria as indicated for each respective space (classroom, office, etc.)

[1] Recommend a min. of 25 fc and a max. of 500 fc in a clear sky condition on September 21 at 9:00 am and 3:00 pm.

TABLE 7-9. WINDOW SYSTEM(S) SELECTION

Wall Area	**System**	**Percentage (100%)**
Vertical Fenestration Area – North	TBD	TBD
Vertical Fenestration Area – South	TBD	TBD
Vertical Fenestration Area – East	TBD	TBD
Vertical Fenestration Area – West	TBD	TBD
Vertical Fenestration Area – Total[1]	TBD	TBD
Skylight Fenestration	TBD	TBD

[1] Recommend no greater than 40% transparent glazing area for overall envelope.

TABLE 7-10. WINDOW COMPONENTS SELECTION

Construction Type[1]	Glass Type	Frame Type	Glass U-value[2,3]	Glass shading Coefficients[2,3]	Visible Light Transmittance (VLT)[3]	Maintenance (High/Medium/Low)
Aluminum Frame Storefront System 6 ½" deep, non operable	PPG Solarban R-100		U=.27	.27	42%	Low

[1] Construction types include curtain wall, punched openings, ribbon windows, and skylights.
[2] Enter minimum values per ASHRAE 90.1 (or relevant energy standard). These values will be used for default system design until actual values are determined.
[3] Recommend minimum U-value of 0.26, Shading coefficient of 0.44 and VLT of 70% (these values are based on Viracon VE1-2M). Glass U-value is not the same as assembly U-value. This value will need to be provided by the manufacturer, when established. Frame material and construction can adversely affect overall opening energy performance.

TABLE 7-11. EXTERIOR DOOR AREA

Gross Wall Area		
Exterior Door Area		

TABLE 7-12. EXTERIOR DOOR SELECTION

Door Type[1]	Vestibule Y/N	U-value
Exterior aluminum framed storefront system	Y at entry only	U=.27
Hollow Metal door	N	U=.7

[1] Exterior door type might include flush insulated, revolver, glazed, etc.

7.4 Interior Systems Selection

TABLE 7-13. REASONING FOR INTERIOR COMPONENTS SELECTION[1]

System	Location	Reason Selected	Maintenance (High/Medium/Low)	Reflectance Level[2]
Interior Doors	Finished Areas	Wood – Clear Maple	Low	N/A
	MEP and back of house areas	Hollow Metal - Painted	Low	N/A
Interior Frames	All Areas	Hollow Metal – Painted, 4” at head	Low	N/A
Interior Walls	Corridors, student toilet rooms, storage, mechanical and electrical rooms	Concrete masonry units (CMU), Painted	Low	N/A
	Between classrooms, office areas, staff and kindergarten toilet rooms.	Gypsum board partition: (2) layers of painted 5/8” gypsum wall board each side of metal stud framing w/ sound attenuation blanket (extend to underside of deck)	Low	N/A
Interior Base	Resilient tile / carpet/ sealed concrete	4” Rubber coved wall base: Johnsonite Traditional Rubber Flooring in cove profile	Low	N/A
	Ceramic Tile Floor	Ceramic Mosaic Tile Base: Daltile – Product to match ceramic mosaic tile flooring	Low	N/A
	Quarry tile floor	Quarry tile base: Daltile – Product to match Quarry Tile Flooring. Cove Profile, 6” high	Low	N/A
	Gymnasium	Vented Rubber Base, Per Athletic Floor Manufacturer	Low	N/A
Ceiling	General classrooms, corridors, offices, cafeteria (clouds w/ Compasso edge)	2' x 2' acoustical ceiling tile, tegular edge: USG-Radar Clima Plus	Low	N/A
	Kitchen, serving	2' x 2' acoustical ceiling tile: Armstrong – Health Zone Optima	Low	N/A

	Toilet rooms, entry vestibules, soffits at classroom entries and other specialty spaces	Gypsum Board, painted: Sherwin Williams, Primer: ProMar 200 Zero VOC Interior Latex Primer, B28W2600 First&Second Coats: ProMar 200 Zero VOC Interior Latex Flat, B30-2650 Series		N/A
	Gymnasium, Cafeteria, Music, storage rooms, MEP areas	Painted overhead exposed structure (Acoustical metal deck at exposed areas, Joists, Steel)	Low	N/A
Flooring	Classrooms, offices	Carpet tile: Material Used at Gregory	Low	N/A
	Corridors, Nurse's Office, Staff Lounge (sink), PE Off.	Resilient floor tile: UpoFloor Quartz Tile. Sizes vary per location and pattern	Low	N/A
	Gymnasium	Wood athletic flooring w/ striping: Aacer Scissorloc II with Air Flow System	Low	N/A
	Vestibules	Carpet tile walk-off mat (extend approx. 15'-0" into corridor): Use same Manufacturer as Gregory	Low	N/A
	Kitchen/ Serving	Quarry tile- 6"x6": Daltile – Quarry Tile, 6" x 6"	Low	N/A
	Mechanical, electrical, kiln, storage areas	Sealed concrete	Low	N/A
Ceramic Tile	Toilet rooms (floor pattern)	Ceramic mosaic tile: Daltile – Keystones Mosaic 2"x2"	Low	N/A
Interior Glass	3"W x 33"H lite in classroom doors	¼" Clear tempered	Low	N/A
Metal	N/A	N/A	N/A	N/A
Counter Surfacing	Base Cabinets	Solid Surface	Corian	N/A
Wood Species	N/A	N/A	N/A	N/A
Specialty Finish	Wall	Paint- gypsum board – Satin or	Med	N/A

	Finishes	Eggshell Sherwin Williams Primer: ProMar 200 Zero VOC Interior Latex Primer, B28W2600 First&Second Coats: Pro Industrial Pre-Catalyzed, Water-Based Epoxy, K45-150		
		Paint-gypsum board – Flat Sheet for Ceilings above 8'-0" Sherwin Williams Primer: ProMar 200 Zero VOC Interior Latex Primer, B28W2600 First&Second Coats: ProMar 200 VOC Interior Latex Flat, B30-2650 Series		
		Paint- CMU Sherwin Williams Block Filler: PrepRite Latex Block Filler B25W25 First&Second Coats: Pro Industrial Pre-Catalyzed, Water-Based Epoxy, K-46-150		
		Paint – Ferrous Metal – Semi-Gloss Sheen Sherwin Williams Primer: Pro-Cryl Universal Primer, B66-310 Series First&Second Coats: Pro Industrial 0 VOC Acrylic, B66-650 Series		
		Paint – Zinc-Coated (Galvanized) Metal – Semi-Gloss Sheen Sherwin Williams Primer: ProCryl Universal Primer, B66-310 Series First&Second Coats: Pro Industrial 0 VOC Acrylic, B66-650 Series		
		Ceramic tile, 1/2 running bond pattern Daltile: Rittenhouse Square, 3" x 6"		

7.5 Interior Accessories Selection

TABLE 7-14. REASONING FOR INTERIOR ACCESSORIES SELECTION

Item	Reason Selected	Location	Maintenance (High/Medium/ Low)
Washroom Accessories	18” Grab Bar, Bobrick, Surface Mount; 42” Grab Bar, Bobrick, B-6881 Satin Finish, Surface Mount; 36” Grab Bar, Bobrick, B6806, Satin Finish, Surface Mount; Hand Dryer, American Specialties Inc, 0165, Surface Mount; Mirror, Bobrick, B-290 2436, Surface Mount 3’-4” AFF Toilet Partition, Floor Mount Paper Towel Dispenser, Bobrick, Surface Mount Toilet Paper Dispenser, Bobrick, Surface Mount Sanitary Napkin Vendor, Bobrick, B-3706 25, Semi Recessed Sanitary Napkin Disposal, Bobrick, Partition Mounted.		
Visual Display Units	Tackboard Primary Teaching Wall: • Kindergarten – (1) 4’ x 6’ • Upper Grades – (1) 4’ x 6’ Secondary Teaching Wall: • Kindergarten – (1) 4’ x 8’ • Upper Grades - zero	Classrooms Natural-Cork Tackboard with Aluminum Trim Equal Manufacturers: Claridge, PolyVision, AARCO Products, Inc., Best-Rite Manuf., Marsh Industries, Tri-Best Visual Display Products.	

	Markerboard Primary Teaching Wall: • Kindergarten – (1) 4’ x 6’ • Upper Grades – (1) 4’ x 6’ Secondary Teaching Wall: • Kindergarten – (1) 4’ x 8’ • Upper Grades – (2) 4’ x 8’	Classrooms Porcelain-Enamel Markerboard, low gloss finish Equal Manufacturers: Claridge, PolyVision, AARCO Products, Inc., Best-Rite Manuf., Marsh Industries, Tri-Best Visual Display Products.	
Smartboard	District furnished, district installed	Classrooms	
Graphics/Signage			
Window Treatments	Manual roller shade: Draper Inc. Woven fabric, with 1% openness factor	Classrooms, offices	
Lockers	Metal 15”W x 12”D x 36”H	Corridors (Grades 1-5) 100 lockers per strand	
Acoustical Wall Panels	2” fabric wrapped panel Rebound by Conwed Designscape, Designtex fabric	Music Classroom, Gymnasium (entire perimeter)	
Ceiling Suspended Reflector Panel	Ovation reflector panel by Kinetics Noise Control	Music Classroom,	
Gymnasium Equipment	Basketball backstops (4 motorized) BOD: Model 2000 FS by AALCO Manufacturing	(7 panels) 6’H x 2’W)Behind backstops	
	Athletic wall mats		
	Volleyball standards and inserts (2)		
	Scoreboard (1)	Nevco, Model 2700 (Indoor) Basketball / Volleyball / Wrestling Scoreboard, 8’ x 3’ x 8”, Digit size 13”/9”, Digit Color Super Bright Red and Amber	

	Bleachers	Hussey Seating Company Gym Bleachers, available space to courtline 11'-2", Open Size 8'-2", Walking Space 3'-0", 4 Rows at 24", Available Width 70', Capacity 118	
Casework	Plastic laminate base cabinet with sink, Wilsonart	Art, Music, Teacher's Lounge, Nurse Office	
Counter Surfacing	Solid Surface, Corian	Base Cabinets	

7.6 Acoustical Environment

TABLE 7-15. SPECIAL VIBRATION CONCERNS

Space Type	
Autism Rooms	
Learning Studios	
Collaboration Areas	
Commons Area	
Gymnasium	
Library/Media Center	
Music	
Cafeteria	

TABLE 7-16. SPECIAL ACOUSTICAL REQUIREMENTS AT PROPERTY LINE (ZONING REQUIREMENTS, COMMUNITY CONCERNS, SITE CONDITIONS)

North	
South	
East	
West	

TABLE 7-17. REASONING FOR CRITERIA

Space Types	Ceiling / Floor Assembly Sound Transmission Rating (STC)	Wall Assembly (STC)	Ceiling CAC	SRC/ NRC	Reason Selected
Overall Project Goal	TBD				
Special Space Types: Autism Classrooms	TBD				
Public Spaces	TBD				
Corridors	TBD				

8. MECHANICAL/HVAC DESIGN

8.1 System Modeling

Simulation programs have been used to increase the accuracy and reduce the time required for calculations of many of the design parameters required. Assumptions needed for the simulations are documented herein.

TABLE 8-1. HVAC SIMULATION PROGRAMS USED

Type of Simulation Program	Name of Program(s) Used
Energy Modeling[1]	E-Quest, as necessary
Cooling/Heating Load Design Program	Trane Trace 700
Ductwork Sizing Program	N/A – Calculated via a ductulator
Piping Sizing Program	N/A – Calculated with a B &G sizing guide.
Air Handling Unit Selection Program	Vendor Selections
Noise Calculation Program	

[1] Reference Architectural Section. If different mechanical software is used, not this here.

8.2 Criteria

TABLE 8-2. PRELIMINARY LOAD ASSUMPTIONS[1]

	Assumption	Reasons for Assumption
Heating (Btu per square foot)	30	
Cooling (square feet per ton)	500	
Ventilation (cfm per square foot)	1.2	

[1] To be used in concept design.

8.3 Zone Criteria

TABLE 8-3. INTERNAL LOADS CRITERIA (OCCUPIED MODE)[1]

Space Type	Lighting[2,4]	Occupants				Equip General[3,4]	Equip 1[4]	Equip 2[4]
	W/sq. ft	#	Sq.ft./ Occ	Sensible Heat Btu/h	Latent Heat Btu/h	W/sq. ft	W/sq. ft	W/sq. ft
Open Office								
Private Office								
Corridor								

[1] To be used as design progresses to corroborate preliminary design assumptions.
[2] Coordinate lighting w/sq. ft. with electrical engineer.
[3] Use Equip General for assumed values at early stage and numbered equipment for specific items at later stage.
[4] Reference Electrical Section for lighting and equipment load criteria.
** Internal load notes:*

8.4 Airflows

TABLE 8-4. AIRFLOW CRITERIA[1]

Space Type	Outside Airflow		Supply Airflow	Exhaust Airflow	VAV Minimum	Infiltration
	CFM/Person	CFM/ sq.ft.	CFM/ sq.ft.	CFM/ sq.ft.	Sq.ft./Occ	CFM/sq.ft.
Open Office						
Private Office						
Corridor						

[1] To be used as design progresses to corroborate preliminary design assumptions.

8.5 Design Conditions

TABLE 8-5. AMBIENT/OUTDOOR DESIGN CONDITIONS

Season	Dry Bulb / Coincident Wet Bulb (Fº)	Wet Bulb / Coincident Dry Bulb (Fº)	% ASHRAE
Summer	92/74		
Winter	-8		

TABLE 8-6. INDOOR DESIGN CONDITIONS

Space Type	Summer Indoor Design		Winter Indoor Design		Noise Level
	Dry Bulb Fº	RH (%) Range	Dry Bulb ºF	RH (%) Range	NC
Open Office	78	30-60%	72		
Private Office	78	30-60%	72		
Corridor	78	30-60%	72		

8.6 Preliminary System Options

Refer to Mechanical Narrative.

8.7 System Design Criteria

TABLE 8-7. AIR-SIDE SYSTEM DESIGN CRITERIA[1]

Design Assumptions	Value (units)	Reason for Value
Supply Air Temperature (summer/winter)	55/60	
Airflow Control (constant/variable)	Variable	
Air Distribution System Diversity	90%	
Cooling Coil Entering Air Dry Bulb/Wet Bulb Temperature	81/68	
Cooling Coil Leaving Air Dry Bulb/Wet Bulb Temperature	55/54	
Heating Entering/Leaving Air Dry Bulb Temperature	35	
Infiltration Value		
Outside Air Percentage (max/min)		
Intake Sizing Requirements		
Economizer High Limit Dry Bulb Switch Over Point		
System Peak Cooling Load (hour ___ of ___ month)		
Design System Peak Cooling Load		
Reheat Minimum Value		
Maximum Duct Noise Level/Ceiling Effect		
Fan Heat Gain Accounted For		
Duct Heat Gain Accounted For		
Duct Leakage Accounted For		
Spare/Future Capacity	N/A	No future growth

[1] *To be updated as design progresses.*

TABLE 8-8. WATER-SIDE SYSTEM DESIGN CRITERIA: HOT WATER SYSTEM[1]

Design Assumption	Value (units)	Reason for Value
Supply Water Temperature	150	
Return Water Temperature	120	Desire to operate in condensing mode
Flow Control (constant/variable)	Variable	
Pumping Arrangement (primary/secondary, primary only, variable primary, etc.)	Primary Only	
Coil Control Valves (two-way/three-way)	Two-way	Three-way provided for minimum flow control
Freeze Protection (ethylene glycol/propylene glycol/etc.)	Propylene	Freeze protection of heating coils in Roof Mounted AHU's..
Spare/Future Capacity	N/A	

[1] To be updated as design progresses.

TABLE 8-9. WATER-SIDE SYSTEM DESIGN CRITERIA: CHILLED WATER SYSTEM[1]

Design Assumption	Value (units)	Reason Selected
Supply Water Temperature	44	
Return Water Temperature	54	
Flow Control (constant/variable)	variable	
Pumping Arrangement (primary/secondary, primary only, variable primary, etc.)	Variable primary	
Coil Control Valves (two-way/three-way)	Two way	Minimum flow will be provided via a three-way or bypass valve.
Freeze Protection (ethylene glycol/propylene glycol/etc.)	Propylene	
Spare/Future Capacity	N/A	

[1] To be updated as design progresses.

TABLE 8-10. WATER-SIDE SYSTEM DESIGN CRITERIA: CONDENSER WATER SYSTEM[1]

Design Assumption	Value(units)	Reason Selected
Supply Water Temperature	N/A	
Return Water Temperature	N/A	
Flow Control (constant/variable)	N/A	
Pumping Arrangement (primary/secondary, primary only, etc.)	N/A	
Coil Control Valves (two-way/three-way)	N/A	
Freeze Protection (ethylene glycol/propylene glycol/etc.)	N/A	

[1] To be updated as design progresses.

TABLE 8-11. WATER-SIDE SYSTEM DESIGN CRITERIA: STEAM SYSTEM[1]

Design Assumption	Value (units)	Reason Selected
Supply Temperature	N/A	
Pressure	N/A	
Condensate Return	N/A	
Coil Control	N/A	

[1] To be updated as design progresses.

Other systems to be considered:

- **Natural Gas**

TABLE 8-12. SYSTEM DESIGN CRITERIA FOR ADDITIONAL SYSTEMS[1]

Design Assumption	Value (units)	Reason Selected
Natural Gas	PSI	Smaller Gas piping ahead of regulators.

[1] To be updated as design progresses.

8.8 Component Selection Criteria - Reasoning for Selection of Equipment

TABLE 8-13. COMPONENT SELECTION CRITERIA

Equipment	Type	Criteria for Selection
Chillers	Air Cooled	
Boilers	Condensing	
HVAC Pumps	Base Mounted	
Air Handling Units	Modular	Roof mounted
Humidifiers	N/A	
Computer Room Units	Split system Cassette	Small load and wall mounted units.
Sound Attenuators	Inline	
VAV Boxes	Hot water reheat	
Variable Frequency Drives		
Exhaust Fans	Centrifugal Roof	
Smoke Exhaust System	N/A	
Cabinet Heaters	Recessed	
Hot Water Unit Heaters	Exposed	
Electric Unit Heaters	N/A	
Fan Coil Units	N/A	
Control System	DDC	Tied into a JACE panel and communicated to district
Ductwork	Galvanized	Ductwork will be medium pressure upstream of VAV-Boxes and low pressure downstream of VAV-Boxes.
Diffusers/Grilles	Painted Steel	Painted steel diffusers and grilles will used throughout
Chilled Water Piping	Steel and Copper	Welded pipe used for greater than 4” pipe, threaded and solder below 4”
Hot Water Piping	Steel and Copper	Welded pipe used for greater than 4” pipe, threaded and solder below 4”
Fin Tube Radiation	Hot water	Limited locations and will be ceiling mounted radiant panels where possible.
Expansion Tanks	Bladder	
Fuel Oil/ Natural Gas/Propane	N/A	

9. ELECTRICAL DESIGN

9.1 System Modeling

Simulation programs have been used to increase the accuracy and reduce the time required for calculations of many of the design parameters required. Assumptions needed for the simulations are documented herein.

TABLE 9-1. ELECTRICAL SYSTEM SIMULATION PROGRAMS USED

Type of Simulation Program	Name of Program(s) Used
Interior Lighting Software	AGI
Exterior Lighting Software	AGI
Power Systems Studies (load flow, short circuit, voltage drop)	SKM
Power Systems Studies (coordination, arc flash)	SKM
Generator Sizing	SKM & Manufacturer's Program

9.2 Load Criteria

This section documents specific numbers used in the design of the building. These assumptions are an essential part of making the transition from the Project Intent to installed equipment.

TABLE 9-2. DESIGN ELECTRIC UTILITY LOADS[1]

Occupancy or Equipment Type	Lighting (VA/sq.ft.)	Receptacle Load (Plug Load) (VA/sq.ft.)	Miscellaneous Equipment (Process) (VA/sq.ft.)	HVAC Equipment (VA/sq.ft.)	Miscellaneous Equipment (KVA)
School	0.87 VA/sqft	3 VA/sqft		5 VA/sqft	1 VA/sqft

[1] *To be updated as design progresses.*

9.3 Utility Service

TABLE 9-3. UTILITY SERVICE SELECTION

Locations	New or Existing	Metered Voltage	Overhead or Underground	Single or Dual Feeders	Notes
Main Electrical Room	New	Yes 480V / 3 Phase, 4 Wire	Underground	Single	

9.4 Equipment and Circuit Sizing Criteria

TABLE 9-4. EQUIPMENT AND CIRCUIT SIZING CRITERIA

Load	Voltage	Phase	Long Continuous Load/Demand Factors	Circuiting Criteria
Interior Lighting	120	1	100%	1800 VA max/ckt
Exterior Lighting	120/208	1	100%	1800 VA max/ckt
Motors ½ HP and Larger	208/480	3	100%	
Motors Less Than ½ HP	120	1	100%	
Receptacles	120	1	Per NEC 220.44	1800 VA & 5-6 max/ckt
Fire Pump	480	3	100%	2-hour rated
Elevators	480	3	Per NEC 620.14	
Miscellaneous Equipment				

9.5 Interior Lighting Design Criteria

TABLE 9-5. INTERIOR LIGHTING DESIGN CRITERIA[1]

Space Type	Foot-Candle Level	Type of Lighting System	Controls
Classroom	40-50	LED	VS/OS/PC/LD
Office (Perimeter)	30	LED	PC/VS/LD
Corridor	20-30	LED	Relay
MEP Equipment Room	25	LED	LMS
Gym	50	LED	VS/OS/PC/LD
Toilets	30-40	LED	VS
Cafeteria	30	LED	VS/OS/PC/LD

[1] Reference Architectural Section for reflectance levels.
Abbreviations:
BAS = Building Automation System
BL = Bi-Level Switching
CD = Centralized Dimming
CS = Central System
LD = Local Dimming
LMS = Local Manual Switch
OS = Occupancy Sensor
PC = Photocell/Ambient Light Sensor
TC = Time Clock
VS = Vacancy Sensor

9.6 Exterior Lighting Design Parameters

TABLE 9-6. EXTERIOR LIGHTING DESIGN PARAMETERS

Exterior Area	Foot-Candle Level	Controls	Lamp Type	Ground Reflectance	Property Line Light Level	IESNA Lighting Zone
Exterior Building Façade	Per IECC	PC/TC				
Signage	5-15	PC/TC				
General Site	Per IECC	PC/TC				
Parking Lot	0.5 UNO	PC/TC				

Abbreviations:
BAS = Building Automation System
LMS = Local Manual Switch
OS = Occupancy Sensor
PC = Photocell
TC = Time Clock

9.7 Receptacle (Plug Load) Requirements

TABLE 9-7. RECEPTACLE REQUIREMENTS

Space Type	Type	Quantity	Control
Offices	Standard	1 Quad at desk location and 2 Duplexes	N/A
Classrooms	Standard GFCI if next to sink	Teaching Wall 1. Quad at teacher station 2. Quad at smartboard location 3. Duplex at middle of wall 4. Duplex near door Back Wall 1. 3 Duplexes for student workstations 2. Duplex at middle of wall 3. Quad at 1 end. Exterior Wall 1. 2 Duplexes Corridor Wall 1. 1 Duplex	N/A
Computer Classrooms	Standard	1 duplex per workstation, and other requirements to match classrooms	N/A
Corridors	Standard	50 feet O.C.	N/A
Toilets, Janitor's Closets, Kitchens Adjacent to Sinks	GFCI	Minimum 1 Duplex per location	N/A
Vending/Pantry	Standard	1 Duplex on dedicated circuit per equipment	N/A
Conference Rooms	Standard	1 duplex at 3 walls 1 quad at 4th wall 1 quad at smartboard location	N/A
Systems Furniture	Standard	Local as required	N/A
External Door Locations	GFCI	1 near each entry	N/A
Other Areas	Generally standard	Local as required	

9.8 Emergency Power Supply Load Requirements (Non-Healthcare)

TABLE 9-8. NON-HEALTHCARE EMERGENCY POWER SUPPLY LOAD REQUIREMENTS

Equipment	NEC Branch	Gen Set Step	VA/sq.ft.	VA Load
Egress Lighting	Emergency (NEC 700)	1	0.2	
Exit Signs	Emergency (NEC 700)	1	Included	
Fire Alarm	Emergency (NEC 700)	1	0.02	
Elevators	Standby (NEC 701)	2		
Lighting – MEP Rooms	Standby (NEC 701)	2	0.1	
IT/Technology Equipment	Optional (NEC 702)	3	0.5	
Mechanical Equipment	Optional (NEC 702)	3		
Security Equipment	Optional (NEC 702)	3		
Storm Shelter (based on passive ventilation scheme)	Emergency IBC 500	Battery Light Fixtures, Emergency Battery Units and Battery Exit Signs, small UPS unit for exhaust fan bac-up power		

9.9 Component Selection

TABLE 9-9. COMPONENT SELECTION

Equipment	Product Type	Basis of Design Mfrs	Reason for Selection	Test[1]	Cx[1]
Life Safety Equipment					
Fire Alarm System	Analog addressable	EST, Notifier	Code/Risk/Quality	I	Y
Engine-Generator Sets	Diesel/Natural gas	Caterpillar, Cummins	Code/Risk/Quality	I	Y
Automatic Transfer Switch	Contactor type/bypass	ASCO, Russelectric	Risk/Quality	I	Y
Lightning Protection	Franklin Rod (Faraday Cage)	Erico, Thompson	Risk (See Assessment) (Client Declination Letter)	I	Y
Control Equipment		***Big 4: Eaton, GE, Siemens, Square D***			
Occupancy/Vacancy Sensors	Local area zoning	Wattstopper, n-Lite	Code/Options/Quality	C	Y
Electric Power Management System	Digital monitoring & control	Big 4	Proactive FM/Microgid/Smartgrid/ LEED/Energy Performance	I	Y
Low Voltage Control System	Relay/Ckt Bkr/Digital	GE/Big 4/Encillium, n-Lite	Energy Performance	I	Y
Dimming System	Scene selection	Lutron, n-Lite	Function/Task/Quality	C	
Low Voltage (LV) Equipment	***Copper Bus***		***Quality***		
Electronic Panelboards	Bolt-on Breakers/Door-in-door	Big 4		C	
Switchboards		Big 4		C	
Transformers	CSL-3 Rated/75-225 KVA range	Big 4	Payback/Low Arc Flash	C	
Motor Controllers	Motor circuit protector/fuse	Big 4	Adjustability/Cost	C	
Luminaire Systems	Premium/ Commercial/ Economy	As selected Lamps: GE, Philips Ballasts: Advance	Quality/LEED/ Aesthetics	I	Y
Wiring Devices	Hospital/Commercial /Residential	Hubbell, Leviton, P&S	Quality	C	
Filtering Devices					
Surge Suppression Devices	Shunt spikes for electronic protection	Current Technologies	Risk	C	
Uninterruptible Power Supplies (UPS)	Static (battery)/ Rotary (flywheel)/ Hybrid/included with owner equipment	Powercon/Liebert/ Vycon	Reliability/Maintenance/ Sustainability	I	Y

Wiring Methods					
Wireways	Metal	Wiremold	Flexibility	C	
Wind	Climate	As Selected	Carbon Footprint, Microgrid	I	Y
Miscellaneous					
Protective Device Coordination Study	Fault/Arc Flash/Load Flow/Coordination study by successful equipment supplier	Big 4	Code/Reliability/Safety	I	Y
Equipment Labels	Screw-on Lamacoid ID/Adhesive raceway labels/Warning signs/Barcoding		Code/Safety/Maintainability	I	Y
Rubber Mats	At electrical assemblies for grounding & slip protection		Safety	I	Y

1 Testing and Commissioning Key:
C = Contractor *O = Owner*
I = Independent *Y = Yes*

Note: See Electrical Schematic Narrative and/or Specifications for additional manufacturers, systems or products details.

10. FIRE PROTECTION DESIGN

10.1 Simulation Programs Used

TABLE 10-1. FIRE PROTECTION SIMULATION PROGRAMS USED

Type of Simulation Program	Name of Program(s) Used
Hydraulic Calculations	HydraCalc version 50

10.2 System Selection

Reference code section for fire regulation related requirements.

TABLE 10-2. REASONING FOR REQUIRED FIRE CONTROL SYSTEM SELECTION

Required Fire Control System	Reason
Fire Sprinklers	Code Requirement

TABLE 10-3. REASONING FOR OWNER REQUESTED FIRE CONTROL SYSTEM SELECTION

Owner Requested Fire Control System	Reason

TABLE 10-4. FIRE SYSTEM INFRASTRUCTURE REQUIREMENTS

System infrastructure	Requirement
Water Source	Municipal
Pressure/Flow	(indicate data source)
One/Two source	One

10.3 System Design Criteria

Provide design criteria associated with project systems.

TABLE 10-5. FIRE PROTECTION SYSTEM DESIGN CRITERIA

System	Criteria
Fire Sprinklers	NFPA 13

10.4 System Type and Component Selection

TABLE 10-6. REASONING FOR FIRE PROTECTION SYSTEM TYPE AND COMPONENT SELECTION

Equipment	Description	Reason for Selection
Sprinkler System	Wet and Dry Sprinklers	Code Requirement
Standpipe System	Not Required	
Clean Agent System	Not Required	
Water Mist System	Not Required	
Fire Suppression System	Ansul	Owner Requirement
Pre-action		
Fire Pump	Not Required	
Storage Tank	Not Required	

11. PLUMBING DESIGN

11.1 Potable Water Source

TABLE 11-1. POTABLE WATER SOURCES

Source	Municipal
Pressure/Flow	(indicate data source)
One/Two source	One

11.2 System Selection

The following contains a narrative and table of each type of system, which include:

TABLE 11-2. REASONING FOR PLUMBING SYSTEM SELECTION

System	Description	Reason for Selection
Potable Water	For Plumbing Fixtures	Code Requirement
Non-Potable Water	Not Required	
Sanitary Waste Water	For Plumbing Fixtures	Code Requirement
Storm Waste Water	For Roof Drainage	Code Requirement
Grey Water	Not Required	
Irrigation		
Special Waste	Grease Waste	Kitchen
Laboratory Gas	Not Required	
Medical Gas	Not Required	
Pure water (RO, DI)	Not Required	

11.3 Component Selection

TABLE 11-3. REASONING FOR PLUMBING COMPONENT SELECTION

Equipment	Reason for Selection
Water Heaters	Copper Fin – Owner Requested
DHW Circulation Pumps	Owner Standard
Sump Pumps	Owner Standard
Sanitary Piping	Code Requirement/Owner Standard
Vent Piping	Code Requirement/Owner Standard
Potable Water Piping	Code Requirement/Owner Standard
Interceptors (grease, solids, fuel, lint)	Code Requirement/Owner Standard
Storm Piping	Code Requirement/Owner Standard
Sewage Ejectors	Owner Standard
Sump Pumps	Owner Standard
Booster Pumps	Not Required
Lab Gas Piping	Not Required
Natural Gas Piping	Code Requirement

11.4 Fixture Unit & Flow Rates - Supply

TABLE 11-4. FIXTURE UNIT & FLOW RATES - SUPPLY

Fixture Type	Fixture Units	Flush / Flow Rate	Battery/Electric/ Manual	Duration/Frequency of Use
Water Closet	10	1.28 gpf	Battery	1flush
Urinal	10	.125 gpf	Remote Flush via BAS control	1 flush per 10 minutes per district standard
Shower Head	2	1.6 gpm	Manual	5 minutes per use
Lavatory	2	.5 gpm	Battery	12 seconds per cycle
Service Sink	3	2.5 gpm	Manual	5 minutes per use
Pantry/Kitchen Sink	4	1.5 gpm	Manual	15 seconds per use
Drinking Fountains	.25	---	Manual	10 seconds per use

11.5 Fixture Unit & Flow Rates - Waste

TABLE 11-5. FIXTURE UNIT & FLOW RATES - WASTE

Fixture Type	Fixture Units	Duration/Frequency of Use
Water Closet	8	1 flush
Urinal	8	1 flush
Shower	3	5 minutes per use
Lavatory	1	12 seconds per cycle
Service Sink	3	5 minutes per use
Pantry/Kitchen Sink	2	15 seconds per use
Drinking Fountains	.5	10 seconds per use

11.6 Domestic Water Sizing Criteria

TABLE 11-6. DOMESTIC WATER SIZING CRITERIA

Criteria	Unit	Value
Minimum Pressure Residual Delivered	Psi	35
Maximum Pressure Delivered	Psi	80
Pressure Loss	Psi/100 ft	10
Maximum Velocity (CW)	Feet/Sec	8
Maximum Velocity (HW)	Feet/Sec	4
Maximum Velocity (HWR)	Feet/Sec	4
Hunter's Curve Applies	Y/N	N

11.7 Domestic Hot Water Distribution Criteria

TABLE 11-7. DOMESTIC HOT WATER DISTRIBUTION CRITERIA

Temperature at Heater	140° F
Maximum Temperature to Fixtures	110° F
Temperature to Kitchen Dishwasher	180° F
HWR Delta T	10° F

11.8 Storm Water Sizing Criteria

See ***Site and Climate Data*** section for peak rainfall rates and indicate what rate and duration is being used here.

12. TECHNOLOGYDESIGN

12.1 Utility Service

TABLE 12-1. UTILITY SERVICE SELECTION

Locations	New or Existing	Overhead or Underground	Notes
Main Distribution Frame	New	Underground	

12.2 System Selection

13. TABLE 12-1. TECHNOLOGY SYSTEM CRITERIA

Equipment \ System	Description	Design Criteria
Telecommunication Rooms	Rooms that hold Structured Cabling Systems, Security System Controls, Network Electronics	Rooms shall be a minimum of 120 square feet. Room are required for every 30,000 square feet of floor plate. Each room will be constructed to ANSI/TIA/EIA-607 Standards.
Structured Cabling System	Low voltage cabling that connects equipment devices to network electronics.	Panduit will be used as the basis of design. System will utilize Category 6A components. System will comply with BICSI TDMM standards
Fiber Backbone	Fiber optic cabling typically connecting active network electronics within the telecommunication rooms	Each telecommunication room will utilize a 50 micron (OM3) 12 strand fiber cable
Copper Backbone	Copper cable typically connecting the analog systems within the telecommunication rooms.	Each telecommunication room will utilize a Category 5E 25-pair cable.
Access Control	System that provides electronic card access to door locks.	Existing S2 Netbox platform will be expanded to serve as a common platform for alarm, access control, and duress. Areas to receive access control will be Entrance and exit points; telecommunication Rooms; Electrical Rooms; Mechanical Rooms.

Alarm / Duress	Active system that alerts a trigger event through audible or other means	Existing S2 Netbox platform will be expanded to serve as a common platform for alarm, access control, and duress.
CCTV	Active system that allows remote visual monitoring of areas	Existing Raptor IP CCTV system will be expanded to serve as a common platform. New camera location will include: Entrance and exit points; parking lot; Receiving; Café and Gymnasium

13.1 Infrastructure Requirements

TABLE 12-2. INFRASTRUCTURE REQUIREMENT

Space Type	Type	Information Outlet Quantity
Office	Standard	1. 2-Port with Category 6A cables at desk location.
Classrooms	Standard	Teaching Wall 1. 1-Port with Category 6A cables at Teacher workstation 2. 1-Port with Category 6A cables at smart board location 3. 2-Port with Category 6A cables at TV location. 4. 1-Port with Category 6A cables at Interactive Projector location. Back Wall 1. 3-Port with Category 6A cables at Student Station. 2. 1-Port with Category 6A cables at back wall location, on either end. Ceiling 1. 1-Port with Category 6A at Wireless Access Point location.
Other Areas	Standard	Ceiling 1. 1-Port with Category 6A at Wireless Access Point location. 2. 1-Port with Category 6A at Camera location.

13.2 Component Selection

TABLE 12-2. COMPONENT SELECTION

Equipment	Product Type	Basis of Design Mfrs	Reason for Selection
Security Equipment			
Access Control	VoIP	S2 Netbox	District Standard
Door Entry	VoIP	AiPhone	District Standard
CCTV System	VoIP	Raptor	District Standard
CCTV Camera	VoIP	Intensifier	District Standard