Portage Public Schools
2015 Bond

Schematic Design Narrative
Central High School Pool Addition

May 6, 2016

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Civil Engineering and Landscape Architecture

1.0 ATHLETIC FACILITIES

The location, orientation, and elevation of the various athletic, transportation, and building infrastructure at both campuses presents several challenges, which both are somewhat similar however also unique to each campus. At the North campus the new Football and Soccer stadiums, and two new practice fields, together with new parking facilities will be constructed along the north end of the campus. The topography of this area will require considerable earthwork operations in order to provide a generally consistent cross section in order to accommodate pedestrian and vehicular flow, as well as meet storm drainage design standards and requirements.

The athletic facilities at the Central campus include a new Football stadium, two new practice fields with new parking facilities to support the athletic events. Athletic field development at Central will require substantially less earthwork due to a gentler existing gradient. Each of the individual "athletic facilities" at both campuses have been sited and orientated to take full advantage of the surrounding site context, as well as in consideration of, and with the adjacent existing elevational control e.g. roadways, pedestrian access, and existing utility infrastructure. Track and field events will also be provided in conjunction with current MHSAA standards and requirements.

2.0 VEHICULAR AND PEDSTRIAN TRAFFIC

CENTRAL HIGH SCHOOL CAMPUS – VEHICULAR CIRCULATION

- Combined the 2 middle school parking lot access driveways into one driveway and headed it up with the existing elementary school driveway. This allowed for maintaining the existing pedestrian crossing of Westnedge and provides better vehicle traffic flow along Westnedge.
- Additional study will be necessary to analyze and provide the left turn storage required at the middle school parking lot. If adequate storage is not provided vehicles will stack in the through lane and block traffic.
- Additional study will be necessary to analyze school driveways along Westnedge to determine if right turn lanes are warranted.
- The proposed parking layout at the new middle school provides less parking spots than the existing lots provide.
- Additional study will analyze available options to potentially increase the LOS at the Mustang/Centre intersection.

CENTRAL HIGH SCHOOL CAMPUS – PEDESTRIAN CIRCULATION

- A key issue for pedestrian traffic will be to address the crossings locations along Westnedge.
- Existing pedestrian crossing location would work well with proposed middle school locker room location.
- Additional study will analyze the cost and effectiveness of adding special emphasis crosswalk markings at all pedestrian crossings.
- A 5' wide minimum green space between roadway curb and the proposed sidewalks will be implemented where possible to provide both a physical and visual separation between vehicular and pedestrian movement.

- Further study will analyze the most feasible and prudent options for pedestrian crossing of Westnedge at the current intersection, as well as at the mid-block crossing locations.

NORTHERN HIGH SCHOOL CAMPUS – VEHICULAR CIRCULATION

- Recommend adding a raised concrete pedestrian crossing along north roadway.
- Consider the use of the raised concrete pedestrian crossing at other high volume vehicle/pedestrian conflict points.
- Consider the use of HMA speed humps at longer / straight sections of road to calm traffic.

NORTHERN HIGH SCHOOL CAMPUS – PEDESTRIAN CIRCULATION

- To increase safety and efficiency at the new middle school parking lot - added sidewalk down the center of the parking rows.
- Eliminated the boulevard in front of middle school, decreased vehicle/pedestrian conflict points.
- Added north/south pedestrian sidewalk and crossings at preschool parking lot.
- Added north/south pedestrian sidewalk and crossings at high school parking lot.
- Further study will analyze the effectiveness of adding special emphasis crosswalk markings at all pedestrian crossings.

3.0 PARKING FACILITIES

Proposed parking areas at both campuses are planned to be HMA surface with concrete curb and gutter along the parking periphery. Concrete curbed landscape islands, together with intermittent concrete walks within the parking field are also planned.

CENTRAL CAMPUS

Parking Area	Existing	(ADA)	Proposed	(ADA)	LARA	City
Sports Fields	251	(14)	333	(12)		
Elementary	157	(6)	157	(6)		
Bus Parking Lot	152	(6)	159	(6)		
Middle School	286	(14)	155	(7)		
High School	811	(21)	811	(21)		
	1,657	(61)	1,615	(52)	940*	1,567**

* LARA Parking Required (1 space per 5 stadium seats)
** City of Portage Parking Required (1 space per 3 stadium seats)
Barrier Free Spaces Required = 34

NORTH CAMPUS

Parking Area	Existing	(ADA)	Proposed	(ADA)	LARA	City
Sports Fields	399	(0)	396	(8)		
Softball Field	17	(1)	74	(4)		
High School	333	(24)	356	(24)		
Overflow Parking	0	(0)	170	(0)		
Middle School	143	(6)	209	(10)		
Community H.S.	178	(9)	137	(7)		
	1,070	(40)	1,342	(53)	940*	1,567**

* LARA Parking Required (1 space per 5 stadium seats)
** City of Portage Parking Required (1 space per 3 stadium seats)
Barrier Free Spaces Required = 34

4.0 STORM WATER MANAGEMENT

This project will capture and detain stormwater runoff from the increased impervious areas (building and site) and release it to receiving detention ponds and into the existing storm drainage system at a controlled rate. Interconnected underground detention systems, e.g., storm manholes, catch basins and storm inlets will be utilized to manage the drainage areas of the proposed campus(s).

Approximately half of the existing open space now to be developed for athletics on the North campus drains to an existing outlet point (structure), and is carried off-site beneath I-94. The proposed drainage concept will not connect to this system, and thus will not increase current direct site stormwater discharge. Storm water generated by the athletic facilities and associated parking will be directed to a detention pond with an overflow structure connecting the existing storm system. At Central, the athletic facility storm management will be similar; however will not require the development of a storm detention area. The storm water discharge for the fields and new parking area will be directly connected to the existing storm system at the north property line, adjacent to the new Football field and conveyed off-site.

At grade sidewalks, truck/delivery/service areas at each middle school will surface drain towards inlets, either existing, or new and in the pavement areas, near the new building locations. The new design will redirect water further away from the buildings and athletic play areas and increase discharging storm sewer sizes/capacity, but cannot provide emergency overflow due to the constrains outside of this project area/scope.

FOUNDATION/FOOTING DRAINAGE

Foundation and under slab drains for the building's first floor will be routed towards the existing storm sewer system by gravity. No basements are planned, so no under slab and foundation drains, internal sump/pump systems will be required.

SITE UNDERDRAINS

Underdrains will be installed under athletic facilities, and at building maintenance strip, curb & gutter, and all site hardscape areas, in anticipation of project geotechnical results and industry Planning and Design Standards.

5.0 CAMPUS UTILITIES

SANITARY SERVICE

North Campus

Water service for the concession building and coaches building at the football stadium will be provided by tapping the existing water main in the drive along the north side of the high school building. Water service to the soccer field concession building will be provided by tapping the existing water main in Oregon Avenue. Water service for the new middle school and pool building will be provided by construction of a new water main loop from the existing water main

in Idaho Avenue to the existing main in Oregon Avenue. Hydrants will be installed along the loop for fire protection for the middle school and pool building.

Central Campus
Water service for the new middle school will be provided by tapping the existing main at the south side of the new school building. Water service for the football stadium concession building will be provided by tapping the existing water main in Westnedge.

SANITARY SERVICE

North Campus
Sanitary service for the concession building and team building at the football stadium will be provided by extension of the existing sanitary sewer from Oregon Avenue to the site. Sanitary service will be constructed to the individual buildings. Sanitary service to the soccer field concession building will be provided by tapping the existing sanitary sewer located north of the building. Sanitary service for the middle school and pool building will be provided by tapping the existing sanitary sewer located between the two buildings. Construction of the middle school will require the relocation of a portion of the existing sanitary sewer that is located within the proposed building footprint.

Central Campus
Sanitary service for the concession building at the football stadium will be provided by tapping the existing sanitary sewer in Westnedge. Due to grade elevations, sanitary service cannot be provided by gravity. Construction of a waste water pump station and sanitary force main will be required. Sanitary service for the new middle school will be provided by tapping the existing sanitary sewer located east of the building site.

GAS SERVICE

North Campus
Gas service for the concession building and team building at the football stadium will be provided. Extension of the gas service from the intersection of Oregon and Idaho Avenues will be required. Gas service for the concession building at the soccer field will be provided. The gas service will extend from the existing main in Idaho Avenue.
Gas service for the middle school and pool building will be provided from the existing gas main in Oregon Avenue.

Central Campus
Gas service for the concession building at the football stadium will be provided from the existing gas main in Westnedge. Gas service for the middle school will be provided from the existing gas main in Westnedge Avenue.

6.0 LANDSCAPE

It is the intent of this schematic landscape design to replace any of the existing trees that will be removed during construction with shade trees and ornamental trees proposed as replacement trees. These trees should be comparable to the number of trees that are to be removed from the site with the intent to keep views open across the campus(s). Any trees that can be preserved shall be protected with fencing and will all be a part of our construction documents as we progress through design. Additional landscape plantings will be incorporated into key areas throughout the site, focusing on the new campus green/open space at Central, and at the new campus(s) entry points.

A vegetative buffer/screen is planned along the north line of the North campus to help mitigate noise concerns from I-94. Further evaluation of the effectiveness of this mitigation measure will be made in conjunction with a sound engineer to develop the most feasible and prudent approach.

Evergreen plantings are planned along the periphery of the athletic and practice fields that are immediately adjacent to residential neighborhoods as required by LARA. This occurs at the new Football stadium, along the practice fields, and at the practice soccer field at the North campus. All plantings will match the existing vegetation throughout each campus and provide seasonal interest with flowering trees and shrubs and native plantings throughout providing a pleasant design aesthetic and for ease of maintenance.

As the designs for the campus green/open space and entry points progress it is our intent to follow the Planning and Design Standards, specifically Division 32-Exterior Improvements.

Central Campus Site Electrical Distribution

1.0 SERVICE

The campus is provided with electrical power from two overhead 8.32kV primary services. One service powers the athletic facilities and the elementary school on the west side of Westnedge Avenue and the second service powers the buildings on the east side of Westnedge Avenue.

The west side service terminates at a pole located on the north side of the access drive to the elementary school parking lot. Consumers Energy metering equipment is installed on this pole. The only service disconnecting means are fused cutouts installed on a pole crossarm.

The east side service terminates at a pole located near Westnedge on the south side of the bus loop. Consumers Energy metering equipment is installed on this pole installed near the pole are two school district owner outdoor switchgear units of which is the main disconnecting means for the service to the facility and the other which is the fire pump disconnecting means for the High School fire pump.

2.0 PRIMARY POWER DISTRIBUTION

On the west side of Westnedge, 8.32kV power is routed underground from the service pole note above to another pole located near the northwest corner of the elementary school parking lot. From this pole, overhead circuits are routed south to a padmount transformer near the elementary school and north to a padmount transformer located near the Team Building east of the football field grandstands.

In general, it doesn't appear that proposed construction will impact the 8.32kV service and distribution. Increased site loads however may require that the athletic facility transformer be increased in size.

On the east side of Westnedge, the fire pump 8.32kV service is routed underground to a transformer located on the east side of the High School building and the normal 8.32kV service is routed to an outdoor switchgear lineup located on the north side of the Middle School building. From this switchgear lineup, two 8.32kV feeder circuits are routed around the east side of the Middle School to serve two outdoor padmount transformers on the east side of the Middle School building and an outdoor padmount transformer on the west side of the Stable building. The two transformers associated with the Middle School will be removed when the building is demolished but a new feeder will be required for the Stable. The outdoor switchgear lineup appears to have an unused feeder switch which can be utilized to power the Stable transformer. There are also provisions at the east end of the lineup for the addition of another switchgear section which could be used to power the new Middle School building.

Also from the outdoor switchgear lineup at the Middle School , there is an 8.32kV circuit routed along the south side of the High School building to another piece of outdoor switchgear and three transformer located in the enclosed chiller area on the east side of the High School building. The three transformers supply power to three switchboards located within the High School electrical room. A fourth feeder from this outdoor switchgear is routed north to power a padmount transformer located at the Administration Building. Note that the fire pump transformer is located adjacent to the three High School transformers.

At the switchgear lineup on the east side of the High School, there are provisions for the addition of another switchgear section which could be used to power the pool addition to the High School.

Structural Engineering

1.0 PROJECT DESCRIPTION

The new building construction for the Central and Northern Pools and Stadium facilities will be designed to comply with the loading criteria specified by current applicable Building Codes including roof, snow, and floor live and dead loads, as well as wind and seismic lateral loads.

2.0 DESIGN LOADS

The site has a 30 pound per square foot (psf) ground snow load. The snow load will be reduced as permitted by the Building Code in areas where there are flat or sloped roofs. If there are adjacent roof projections which will cause snow drifting the load will be increased as required by the Building Code. The Pool Building and Stadium Ancillary Buildings will be categorized with a Risk Category of III with an importance factor of 1.10.

The suspended floor slabs will be designed to support all self-weights of the structural systems, architectural systems, and MEP equipment as applicable. The floor slabs will also meet all live load code requirements for the intended use of the spaces.

Wind Load Design Criteria

Basic Wind Speed:	120mph
Exposure Category:	C
Occupancy Category:	III

Seismic Load Design Criteria

Importance Factor:	1.25
Ss:	0.089 g
S1:	0.050 g

3.0 SUB-STRUCTURE

The existing soil conditions will be determined from a geotechnical investigation. A report will be prepared containing recommendations for the structural foundation design basis by a geotechnical engineer. Project specific subgrade issues will also be addressed in the report.

4.0 SUB-STRUCTURE – POOL BUILDING AND STADIUM ANCILLARY BUILDINGS

It is likely that the structural foundations will be shallow spread footings for the column pads with concrete foundation walls and strip footings. All foundations will be reinforced, cast-in-place concrete. Minimum frost depth requires that the exterior footings extend to 3'-6" below exterior grade. Interior footings can be constructed with the top of the footing 1'-0" below finish floor.

The first floor slab on grade will be a 5" thick concrete slab, reinforced with welded wire fabric (WWF). Vapor retarder will be required below slabs on grade to limit moisture transmission. The slab subgrade will be 6" minimum of engineered granular fill to provide a solid surface for concrete placement.

5.0 SUB-STRUCTURE – STADIUM GRANDSTANDS/PRESS BOX

The Grandstands and Press Boxes constructed at the Stadium sites will be supported on reinforced, cast-in-place concrete piers and spread footings. Minimum frost depth requires that

the exterior footings extend to 3'-6" below exterior grade. The piers and footings will be designed based on the information and design loads provided by the bleacher manufacturer.

6.0 SUPER-STRUCTURE – POOL BUILDING

The super-structure will be 12" reinforced concrete masonry unit (CMU) bearing walls with, at a minimum, #6 bars at 32" on center in solid grouted cores. The roof structure will consist of exposed glulam beams bearing on the CMU walls with treated roof purlins and laminated wood decking. The interior floor levels to support the viewing stands will be steel framed with a total slab thickness of 5", consisting of galvanized metal form deck and welded wire fabric. The gravity loads will be transferred to the foundations through the reinforced CMU walls. The CMU walls will also resist lateral loads imposed by wind pressures and seismic activity as applicable per the current Building Code.

Any structural steel framing exposed to a corrosive environment will be required to be hot-dip galvanized and treated with a high performance coating. All structural steel framing in rooms adjacent to a corrosive environment will be required to be hot-dip galvanized and painted or epoxy coated. Stainless steel bolts will be required for the connections in the corrosive environments as well as galvanized or zinc-plated bolts in the adjacent spaces.

7.0 SUPER-STRUCTURE – STADIUM ANCILLARY BUILDINGS

The super-structure will be 8" reinforced concrete masonry unit (CMU) bearing walls reinforced with, at a minimum, #5 bars at 48" on center in solid grouted cores. The roof structure will be low slope and consist of steel joists with metal roof deck. The CMU walls will also resist lateral loads imposed by wind pressures and seismic activity as applicable per the current Building Code.

Interior Design

The new Aquatic Facilities will welcome users through a new vestibule with wall to wall walk-off tile, ground face block walls and acoustical tile ceiling. The lobby and communicating stair will have porcelain tile floors and base, painted walls and a feature linear wood slat ceiling. The Natatorium will be a two-story space with southern yellow pine glue-laminated beams, purlins and 2" wood deck. The pool will be finished in 2x2 porcelain tile along with the surrounding pool deck and integral bench. Walls will be porcelain tile 8'-0" high with epoxy paint above and approximately 2,000 square feet of tectum panels for acoustic absorption.

Toilet Rooms, Showers and Lockers rooms will consist of 2x2 porcelain tile floors and walls with epoxy painted gypsum board ceilings. Toilet partitions and lockers will be solid plastic in order to tolerate the wet conditions associated with a pool environment. The second floor Lobby Balcony will have carpet tile and resilient base with painted walls and linear wood slat ceiling. The Observation Balcony within the Natatorium will also be carpet tile with epoxy painted walls.

Tickets/Concessions will have sealed concrete floors with resilient base, epoxy painted walls and vinyl coated acoustical ceiling tile. Support spaces such as Mechanical Rooms, Electrical Rooms and Storage Rooms will have sealed concrete floors with painted walls and exposed ceilings.

Mechanical and Plumbing Systems

This Basis of Design (BOD) document is to provide an overview of the proposed mechanical and plumbing systems, equipment, materials, and associated design criteria for Portage Public Schools pool addition to the Central High School complex.

1.0 CODES AND STANDARDS

The new mechanical and plumbing systems will comply with the following codes and standards:

- Michigan Mechanical Code 2015
- Michigan Plumbing Code 2015
- International Energy Conservation Code 2015
- ASHRAE Standard 62.1
- ASHRAE Standard 90.1
- ASHRAE Standard 55
- ASHRAE Standard 15
- SMACNA Sheet Metal Construction Standards
- NFPA Standard 13
- NFPA Standard 14
- NFPA Standard 20
- NFPA Standard 90A

2.0 OUTDOOR DESIGN CONDITIONS

The following outdoor design conditions will be used in sizing the mechanical heating, ventilating, and air conditioning systems. The design temperatures are based on 2013 ASHRAE Fundamentals Handbook, using 0.4% cooling design and 99.6% heating design for Kalamazoo/Battle Creek, Michigan (Latitude 42.24N, Longitude 85.55W, elevation 873 ft ASL)

Summer Outdoor (0.4%)	90.8°F DB | 72.8°F WB
Summer Evaporation (0.4%)	75.9°F WB | 84.6°F DB
Summer Ambient Roof	95°F DB
Winter Outdoor (99.6%)	2.8°F DB
Winter Outdoor Air Intake (for AHU heating coil design)	-10°F DB

3.0 INDOOR DESIGN CONDITIONS

The following indoor design conditions will be used in sizing the mechanical heating, ventilation, and air conditioning systems:

Room or Area	Summer		Winter	
	DB F	% RH *	DB F	% RH
Offices (Coaches/ Timing)	75	50 (+/- 10)	72	-
Lobby / Balcony / Corridor	75	50 (+/- 10)	72	-
Vestibule / Stairs	Uncontrolled		65	-
Locker Rooms	78	50 (+/- 10)	72	-
Natatorium **	82	60	82	50
Spectator Area	Same as Natatorium w/ destratification fans			
IDF Rooms	70	50 (+/- 10)	70	-
Storage Rooms	78	50 (+/- 10)	72	-
Electrical Equipment Rooms	104 Maximum		50	-
Mechanical Equipment Rooms	Ventilation Only		60	-
Restrooms	78	50 (+/- 10)	72	-

* Estimated maximum indoor relative humidity during the cooling season. Direct dehumidification control will not be provided.
** Pool water temperature moisture removal rate designed for a maximum of 80°F water temperature.

4.0 BUILDING INTERNAL HEAT GAIN ALLOWANCES

The preliminary design shall use the load densities outlined below for sizing the mechanical heating, ventilation and air conditioning systems. The listed lighting densities are the maximum allowable per ASHRAE 90.1-2010.

Internal heat gain diversity at the room level will be 100% for lighting, people, and equipment. Internal heat gain diversity at the system level will be 90% for lighting, 100% for people, and 80% for equipment.

Space Type	Occupant Gains			Lighting	Equipment
	Density	Heat (btu/hr/p)		Gains	Gains
	(p/1000 ft²)	Sensible	Latent	(W/sqft)	(W/sqft)
Office, Enclosed	5	250	200	1.11	150 / s
Lobby / Balcony	30	250	200	1.2	1.0
Vestibule / Corridor	-	-	-	0.66	-
Stairs	-	-	-	0.69	-
Locker Rooms	-	-	-	0.75	-
Natatorium	-	-	-	1.2	-
Spectator Area	150	245	145	0.79	-
Restrooms	-	-	-	0.98	-
Storage / Equipment Rooms	-	-	-	0.63/0.95	Actual

5.0 VENTILATION RATES

Outside air ventilation rates will be in accordance with the Michigan Mechanical Code or ASHRAE 62.1, whichever one is more stringent. Ventilation rates provide the required amount of fresh air to occupied spaces as well as replace air that has been exhausted out of the building. The system will be designed and controlled to provide the required ventilation rates throughout the air handling systems' full operational range.

Outdoor air intake locations are to be located a minimum of 10' from any exhaust fan discharge, plumbing vent, or other pollutant source, except where applicable codes and standards dictate further separation distances.

Toilet rooms will have a minimum air change rate of 10 air changes an hour. Locker rooms will have a minimum air change rate of 10 air changes per hour. Janitor closets, recycling or trash storage rooms, or other pollutants will be provided with dedicated exhaust systems to ensure the spaces are negatively pressurized relative to adjacent occupied spaces.

A demand controlled ventilation system, utilizing CO_2 monitoring will be used in the lobby area (occupant load of 30 people per 1000ft² and having the potential for highly fluctuating occupant loads). It will be employed to optimize ventilation rates to occupied zones and save energy associated with conditioning outside air.

6.0 INDOOR NOISE AND VIBRATION CRITERIA

Design sound levels listed shall be based on ASHRAE Applications Handbook – 2015, Chapter 48, Table 1 "Design Guidelines for HVAC-Related Background Sound in Rooms".

Corridors and Lobbies	NC 40
Enclosed offices	NC 30

Major rotating loads such as pumps, air handling unit fan assemblies, and large inline fans, shall be provided with vibration isolation devices and mass attenuation (concrete support pads).

All ducts and pipes within mechanical areas will be provided with vibration isolation hangers.

7.0 DUCT SIZING CRITERIA

VAV Supply Air Ducts (upstream of VAV box)	1,500 FPM maximum velocity 0.2"/100 ft. maximum air pressure drop
VAV Supply Air Ducts (downstream of VAV box)	800 FPM maximum velocity 0.08"/100 ft. maximum air pressure drop
CAV Supply Air Ducts	1200 FPM maximum velocity 0.08"/100 ft. maximum air pressure drop
Supply Air Outlets	425 FPM maximum velocity
Return Air Ducts	1,500 FPM maximum velocity 0.10"/100 ft. maximum air pressure drop
Return Air openings	500 FPM maximum velocity

General Exhaust Air Ducts	1,000 FPM maximum velocity 0.10"/100 ft. maximum air pressure drop
Outside air intake openings	500 FPM maximum

8.0 DUCT MATERIALS AND PRESSURE CLASS

VAV Supply Air Ducts (upstream of VAV box)	Galvanized steel (G90), unlined +6" W.G.
VAV Supply Air Ducts (downstream of VAV box)	Galvanized steel (G90), lined +2" W.G.
Natatorium / Locker Supply	PVC Coated Galvanized steel (G90), unlined +6" W.G.
Return Air Ducts	Galvanized steel (G90), unlined -4" W.G.
General Exhaust Air Ducts	Galvanized steel (G90), unlined +/- 2" W.G.
Natatorium / Locker Return / Exhaust	PVC Coated Galvanized steel (G90), unlined +/- 2" W.G.
Intake/Relief Ducts	Galvanized steel (G90), unlined +/- 6" W.G.

All sheet gauges, joint construction, and reinforcement method shall be per SMACNA "HVAC Duct Construction Standards", latest edition.

All air handling systems which contain automatically closing dampers shall be provided with positive or negative pressure relief doors of a quantity and size to prevent ductwork collapse or rupture.

Any duct located below 8' AFF in mechanical rooms shall be provided with PVC jacket.

9.0 PIPE SIZING CRITERIA

HVAC Piping, < 2-1/2"	4 FPS max. velocity 4.0 ft /100 ft equivalent length max. pressure drop
HVAC piping 3" through 12" size	8 FPS max. velocity 4.0 ft / 100 ft equivalent length max. pressure drop
Domestic Water Piping	5 FPS max. velocity 3 psi /100 ft equivalent length max. pressure drop
Gravity Drainage and Vent Systems	Sized per Michigan Plumbing Code and ASPE methods

10.0 PIPE MATERIALS AND JOINING METHODS

System	Material	Joining Method
Hydronic piping (2" and smaller)	Copper, Hard Drawn Type L	Soldered
Hydronic piping (2 ½" and larger)	Steel, Schedule 40	Welded
Air conditioning condensate piping	Copper, Type L	Soldered
Fire protection piping – wet (2" and smaller)	Steel, Schedule 40	Screwed or flanged
Fire protection piping – wet (2 1/2" and larger)	Steel, Schedule 40	Screwed, flanged, or grooved
Aboveground Natural Gas (1" and smaller)	Black Steel, Schedule 40	Threaded
Aboveground Natural Gas (1 1/2" and larger)	Black Steel, Schedule 40	Welded
Belowground Natural Gas	Black Steel, Schedule 40 or soft annealed copper	With containment piping and vent.
Underground sanitary	PVC, Schedule 40	Solvent Weld
Underground storm	PVC, Schedule 40	Solvent Weld
Aboveground sanitary, waste, and vent	Hub-less PVC, Schedule 40	No-Hub Couplings Solvent Weld
Aboveground primary and secondary roof drainage	Hub-less PVC, Schedule 40	No-Hub Couplings solvent Weld
Domestic water, 2" and smaller	Copper, Type L	Soldered
Domestic water, 2 1/2" and larger	Copper, Type L	Wrought Soldered

Any outdoor piping requiring insulation shall be provided with a protective, embossed aluminum jacketing system.

Any piping located in mechanical rooms at an elevation lower than 8' AFF shall be provided with a protective PVC jacket.

11.0 FIRE PROTECTION SYSTEMS – GENERAL

A fire sprinkler system will be served from a new site water supply system which will be a combined 6" domestic and fire water service and split inside the building. The fire service connection is estimated at 4-inch and will connect to a new listed backflow preventer. The system will be provided in accordance with most recent editions of NFPA 13.

All areas of the new building will be provided with fire sprinkler protection in accordance with NFPA 13, the Michigan Building Code and the requirements of the local fire marshal.
Fire sprinkler systems will be zoned by floor, and will be provided with individual floor control assemblies consisting of control valves, water flow switches, and test and drain assemblies.

A dry fire protection system is not anticipated. Freeze-proof heads will be reviewed for any areas subject to freezing.

SPRINKLER HEADS

- Rooms without ceilings: Upright sprinklers.
- Rooms with suspended ceilings: Concealed sprinklers.
- Wall mounting: Sidewall sprinklers.
- Spaces subject to freezing: Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as required.
- Special applications: Extended-coverage, flow-control, and quick-response sprinklers as required.
- Manufacturers: Reliable Automatic Sprinkler Co., Tyco Fire & Building Products, Victaulic Company, Viking Corporation

12.0 PLUMBING SYSTEMS – GENERAL

In general, all new sanitary, waste, vent, domestic water supply, storm water drainage and foundation drainage systems will be installed in all new areas of construction.

12.1 Sanitary, Waste, and Vent Piping Systems

New gravity sanitary waste and vent piping will be provided throughout the building in accordance with the Michigan Plumbing Code. The new system will connect to new or existing site sanitary mains, depending on size, location, and invert elevation.

A new 8" sanitary building lead will serve the pool backwash, all locker room drain, toilet room drains and mechanical room drains as well as all plumbing fixtures and showers in the natatorium area.

Elevator shafts shall be equipped with a sump and any hydraulic elevators or dock levelers shall be equipped with oil separation.

SUMP PUMPS

- Duplex, submersible, quick disconnect complete with controller and sump cover. Poured in place concrete or pre-cast sump.
- Manufacturer: Bell & Gossett, Weil.

12.2 Storm Water Piping Systems

All new building areas will be provided with a new primary and secondary storm drainage system. Primary roof drains and piping will route horizontally and vertically through the building as required and will connect to new site underground storm mains. Secondary roof drainage systems will also route similarly to the primary piping system and will spill to grade at exterior locations with bronze downspout covers.

There will be 4 new site underground storm mains. One 6" main will be required at the north side, two 6" mains at the east side and one 6" main at the south side.

All new lower level pool equipment areas will receive perimeter drain tile on both sides of the foundation wall, and with lateral runs spaced every 10-15' underneath all new slabs underground. Drain tile will empty into a storm sump and will be pumped to the site storm water system with a duplex submersible pump system.

Storm piping in canopies or other areas subject to freeze conditions will be provided with self-regulating electric heat trace with master shutdown connectivity from the building management system.

12.3 Domestic Water Systems

New distribution piping shall be sized and based on ASPE and the Michigan Plumbing Code. Isolation valves and drains will be provided per floor. Room isolation valves will be provided where required.

A new 4" water main extending from the site main shall be provided and sized accordingly. A new meter and duplex backflow preventer assembly shall be installed.

No water softening of domestic systems is planned at this time.

The new system will provide a minimum of 35 PSI water pressure at the most remote system point to satisfy the demand for domestic hot and cold water.

The water flow test may determine a booster pump is required. The booster system will be a duplex skid mounted packaged system in which each pump is capable of 100% load with the second pump being redundant as backup. Each pump will be controlled via VFD. The booster system will also include a hydropneumatic tank with a pressure control sensor.

12.4 Domestic Water Heaters

DOMESTIC HOT WATER HEATERS

- Condensing, High Efficiency
- Manufacturers: Aerco, Lochinvar, Rheem

One new 199,999 Btu/hr gas-fired, high efficiency condensing water heater and separate 200 gallon storage tank will serve bathing and hand washing fixtures.

The heater will generate water at 140°F. The hot water will be mixed with a master mixing valve down to 130°F and distributed to fixtures. Point of use mixing valves will be provided for hand washing fixtures. Hot water recirculation shall be provided on all branches over 25 feet from the main or as needed. The hot water will return at approximately 120°F.

DOMESTIC HOT WATER CIRCULATION PUMP

- Inline, close coupled pump. All bronze NSF rated construction.
- Manufacturers: Armstrong, Bell & Gossett (basis of design), Peerless, or Taco

MIXING VALVES

- Master mixing valve: ASSE 1017 lead free, rough bronze, thermostatic mixing valve
- Point of use: ASSE 1070 under counter, chrome plated, lead free, thermostatic mixing valve

12.5 Plumbing Fixtures

The plumbing fixtures will be selected to be water efficient and low maintenance. The fixtures will meet minimum ADA standards where required. The mechanical rooms will have a wall hydrant and/or service sink. Janitor's closets will be provided with a cast iron floor mounted mop receptor and extra hot and cold water connections with vacuum breakers.

Exterior hose bibbs will be located around the perimeter of the new addition at a spacing of approximately 100'.

A combination eyewash/shower unit will be provided in the mechanical room.

MANUFACTURERS:

- China – American Standard, Crane
- Flush valves - Kohler, American Standard
- Stainless steel sinks - Elkay or Just Manufacturing
- Lavatory and sink faucets - Chicago Faucet, Kohler, T&S Brass, American Standard

WATER CLOSETS

- Wall mounted, top spud, siphon jet with elongated bowl
- White, open front seat with check hinge
- Sensor operated, hard wired (1.6 gpf) flush valve

URINALS

- China – American Standard, Crane
- Wall mounted, top spud, siphon jet type with integral side panels
- Sensor operated, hard wired (1.0 gpf) flush valve

LAVATORIES – PUBLIC RESTROOMS

- Wall mounted multiple station wash-fountains
- Sensor operated, hard wired (0.5 gpm) faucets

LAVATORIES – SINGLE TOILET

- Vitreous china lavatory with grid drain
- Sensor operated, hard wired (0.5 gpm) faucet

MOP SINK

- Floor mounted 24"x24" cast-iron
- Wall mounted 8" body with vacuum breaker faucet
- 3' high splash panels and hose and bracket on wall

HOSE BIBBS

- Mechanical spaces-non-freeze with dual check valve and T-handle key

WALL HYDRANTS

- Freezeless backflow protected with loose key and cover

TRAP PRIMERS

- Electronic manifold type

ELECTRIC WATER COOLERS

- Stainless steel, vandal-resistant, bi-level with bottle filling station
- Manufacturers: Acorn, Elkay, Halsey-Taylor

13.0 BUILDING HVAC SYSTEMS – GENERAL

New HVAC equipment, distribution systems, and controls will be provided for all newly constructed areas.

13.1 Heating Generation Systems

2 new high efficiency heating hot water boilers will be provided in a new mechanical room on the balcony level south of the seating area. The boilers will serve building and pool heating requirements. New distribution pumps, air separator, expansion tank and chemical feeder will also be provided. New distribution piping will be routed throughout the addition. Piping within the natatorium itself will be kept to a minimum and serve only perimeter heating needs.

13.2 Hydronic Heating Distribution Systems

The heating system will be piped in a primary secondary piping arrangement. Each boiler will be provided with a constant flow primary pump. Two variable speed, secondary heating hot water pumps, each sized for 100% of the heating requirement of the addition will be provided. System shall rotate one pump as

being the lag pump. The pump speed and staging will be controlled by two differential pressure devices to maintain required system flow.

The secondary pumping loop would include two way valves at all coils with a two-way minimum flow bypass valve and a magnetic flow meter to ensure any pump is running above its minimum speed during low load conditions.

The heating system supply temperature will reset from 160 degrees F to 120 degrees based on outside air temperature.

The heating system piping will be divided into several regional loops to maximize variable flow pump efficiency.

Recessed finned tube radiation in architectural enclosures and anodized aluminum linear bar grilles or Runtal-type panel radiators shall be provided at all spaces with exterior exposures. Entrances shall be provided with cabinet unit heaters or concealed fan coils. Mechanical spaces shall be provided with hot water propeller unit heaters.

13.3 Cooling Generation Systems

Each primary air distribution system will utilize either a packaged DX cooling rooftop unit or a remote rooftop DX condensing unit to provide cooling throughout the pool addition. Systems will utilize multiple stages of cooling, and digital scroll compressors maximize efficiency.

13.4 Stand-alone Cooling Systems

Stand-alone split system air conditioning units shall be provided for the elevator machine room, and IDF room (if applicable). Remote condensing units shall be located on the roof.

14.0 AIR DISTRIBUTION SYSTEMS – GENERAL

All new spaces will be served by energy recovery air handling units (AHU) with overhead supply air and overhead return air or low enclosed return/exhaust air (natatorium). Supply and exhaust systems will be a fully ducted galvanized (G90) steel, or PVC coated (locker exhaust, pool supply and exhaust) sheet metal distribution system. Ductwork in spaces without ceilings shall be round spiral duct.

All air handling units will be provided with supply and return/exhaust fan arrays (multiple direct drive plenum fans), economizer/mixing box section, cartridge filters, hot water preheat coil (with dedicated circulation pump per coil), and DX cooling coils. Enthalpy energy recovery will be provided in all air handling units. Indoor units shall be mounted on 6" base rails, and 6" concrete housekeeping pads. Outdoor units shall be mounted on a 24" roof curb. Air handling units will also include perforated noise attenuating sections up and downstream of fans.

In general, diffusers located within 2'x2' acoustical ceiling tile systems will be based on the SPD model by Price, with spaces employing hard or specialty ceiling systems utilizing modular linear diffusers (SDS, JSP, ASP models by Price). Diffusers located within hard ceilings will be provided with remotely actuated manual balancing dampers (Metropolitan Air Products) for test and balance purposes.

The natatorium will utilize a fabric distribution system based on ductsox.

Fire or fire/smoke dampers will be provided at all locations where ducts penetrate shafts or other rated assemblies.

14.1 Natatorium

The pool area will be served by a dedicated fixed plate heat exchanger dehumidification AHU located in the balcony level mechanical room. Supply and exhaust duct distribution for the pool will be PVC coated ductwork and stainless steel accessories. Supply ductwork penetrating horizontally into the pool area will connect to a fabric duct loop. Return ductwork will be routed down in a duct chase to a low return grille.

14.2 Locker Rooms

The locker rooms and dry land room will be served by a dedicated fixed plate heat exchanger energy recovery AHU located in the balcony level mechanical room. Supply and exhaust duct distribution for the lockers will be PVC coated ductwork and stainless steel accessories. Supply and return/exhaust ductwork will route horizontally within the locker room ceiling spaces. VAV boxes with hot water reheat coils will be located above ceilings with accessibility in mind, and utilized to create temperature control zones within the locker room space.

14.3 Lobby/Commons

These spaces will be served by a dedicated enthalpy wheel heat exchanger energy recovery AHU located on the roof. VAV boxes with hot water reheat coils will be located above ceilings with accessibility in mind, and utilized to section off zones within both levels of the space. Supply and return ducts will be routed overhead above ceilings with ceiling mounted supply outlets and return grilles will be located near floor level.

14.4 Main Entry Vestibule / Stairs

The main entry vestibule will be served by a concealed, low profile fan coil unit with a hot water coil. Low level air returns and properly located specialty diffusers will ensure adequate air movement in this transient space. Fan coils will be located as near as possible to these spaces while ensuring that proper access for maintenance is provided.

Less-used exit stairs will be provided with hot water unit heaters or cabinet unit heaters.

14.5 Miscellaneous Spaces

A dedicated blower coil unit and a dedicated exhaust system will be provided for the pool filter mechanical room. Low returns will be provided to ensure airflow to lower levels of the space. Return/exhaust ductwork within this space will be PVC duct to handle the corrosive transported air.

15.0 BUILDING ENERGY MANAGEMENT AND CONTROL SYSTEMS

All new HVAC equipment will be provided with Direct Digital Controls (DDC) with all new points and graphics mapped over to the existing high school front end.

Electric actuation will be provided for valves and dampers. A combination of control and monitoring points will be provided for each piece of equipment. Each device will utilize energy saving algorithms, such as duct static pressure reset, supply air temperature reset, heating hot water temperature reset, heating hot water pressure reset, hot water pump speed optimization and differential pressure reset. CO_2 monitoring will be provided in all densely occupied spaces and a demand controlled ventilation reset scheme will be employed for all systems served by variable air volume air handling units.

Interface to third party equipment controllers, such as lighting control systems, variable frequency drives, generators, or utility meters will be accomplished via a networked BACnet interface, hardwire points, or a combination of both.

Standby power is not planned for the building's control hardware.

Electrical Systems

This section of the Schematic Design Narrative provides an overview of the proposed electrical system, equipment, materials, and associated design criteria for the Portage Public Schools.

1.0 CODES AND STANDARDS

The electrical system shall comply with the following Codes and Standards:

- Michigan Building Code 2012
- 2014 Michigan Part 8 Electrical Code (National Electrical Code 2014 adopted by reference)
- NFPA 101 Life Safety Code 1997
- NFPA 72 2010
- Michigan School, College and University Fire Safety Rules
- Michigan Uniform Energy Code (ASHRAE 90.1-2007 adopted by reference)
- Illuminating Engineering Society of North America (IESNA) – Tenth Edition

2.0 NATATORIUM ELECTRICAL SERVICE

The Portage Public School District is a primary service customer.

Each new Aquatic Facility will be served from one dedicated 750 kVA pad-mounted transformer located in an exterior enclosure adjacent to the facility. The secondary voltage of each transformer will be 480Y/277V. New medium-voltage transformers will be less-flammable liquid-filled type, dead-front type, with distribution-class surge arrestors.

The pad-mounted transformers will be served from new PPS medium-voltage (8.32KV) campus primary service equipment. New medium voltage switches and distribution will be provided.

3.0 LOW-VOLTAGE POWER DISTRIBUTION (600V AND LESS) – NORMAL POWER SYSTEM

A Main Electrical room will be constructed on the 2nd level. This room will house a new service-entrance rated main switchboard with an integral customer meter (monitored by the building management system) and with integral surge suppression. The switchboard, at 480Y/277V, will have a 1200AF/1200AT 80% rated main circuit breaker with ground fault protection. The main circuit breaker will be solid-state type with long-time and short-time adjustability.

For preliminary design purposes, the following densities will be used (all load densities are based on 28,300 gross square footage).

New 480Y/277V Loads	
Mechanical Equipment	22.0 VA per square foot
General Lighting (Building Average)	1.0 VA per square foot
Subtotal (480Y/277V)	23 VA per square foot
	651 kVA
	800 Amps (at 480Y/277V)

New 208Y/120V Loads

Receptacles	2.0 VA per square foot
Small Mechanical & Misc.	0.5 VA per square foot
Subtotal (208Y/120V)	2.5 VA per square foot
	71 kVA
	196 Amps at 208Y/120V

The above preliminary electrical loads will be verified and optimized during the forthcoming design phases to reflect the actual loading values.

Distribution and branch circuit panelboards will be provided in electrical rooms. Feeders and panel buses will be copper, and will include 20% (minimum) spare capacity for future loads. Feeder neutral conductors will be sized at 200% of the panel ampacity where a majority of non-linear loads are served.

All new switchboards, distribution panels and branch panelboards will be by Square D.

208Y/120V branch circuit panelboards will be designed with integral surge suppression and 20A minimum circuit breakers.

Where variable frequency drives are furnished with the equipment, circuit breakers will be mounted in distribution panels.

Horizontal and vertical bus bars in panelboards will be copper.

Panelboard buses will be sized in accordance with the following:

Minimum Bus Sizes:

Panel Type	**Minimum Feeder Size**
480Y/277V Distribution panels	200A
208Y/120V Distribution panels	400A
208Y/120V General branch panels	60A

Voltage drop calculations will be completed as the project design develops. Feeders and branch circuit conductors will be sized to minimize voltage drop and losses throughout the building.

Short circuit calculations will be completed as the project design is developed based on estimated feeder lengths. The results of the calculations will be used to determine the short circuit ratings for the electrical equipment. The equipment will be fully rated for the available fault current at each location.

Design voltages will be as follows:

Motors 1/2 HP and larger	460V, 3-phase, 3-wire
Motors smaller than 1/2 HP	120V or 208V, 1-phase
Lighting, interior general	277V, 1-phase
Lighting, exterior	277V, 1-phase

4.0 LOW-VOLTAGE POWER DISTRIBUTION (600V AND LESS) – EMERGENCY POWER SYSTEMS

A new 70 kW/87.5 kVA 480Y/277V, 3 phase, 4 wire, natural gas generator will be provided for each new aquatic facility. The generator will serve life safety loads, such as emergency lighting and will also serve standby loads such as the battery-backed fire alarm system. The generator will be located in an exterior screen wall enclosure and will be specified with a Level II sound-attenuating weatherproof housing. Separate transfer switches will serve the life safety and standby loads per code.

5.0 RACEWAYS, BOXES AND CONDUCTORS

Branch and feeder conductors will be Type THHN/THWN or XHHW stranded copper in conduit with a minimum size of #12 AWG for power and lighting. Threaded plastic or nylon insulated wire nuts will be used for conductors #10 AWG or smaller. Pre-insulated mechanical connectors will be used for conductors larger than #10 AWG.

MC Cable is acceptable for short runs where installation is neat and organized in accordance with Portage Public School District standards.

The minimum conduit size will be 1/2". Rigid, galvanized, threaded conduit will be used for main building feeders and where subject to physical damage, such as in storage rooms below 8'-0" AFF. Electrical metallic tubing (EMT) with set-screw fittings will be used in interior partitions and above suspended ceilings. For branch circuits, MC Cable will be used above lay-in ceilings for final connections to light fixtures, and concealed within walls for final connections to receptacles, 8-foot maximum length, as permitted by Portage Public School District standards.

A dedicated neutral conductor will be provided for each new 277V and 120V phase conductor.

Connections to vibrating equipment will be made with liquid-tight flexible metallic conduit.

6.0 GROUNDING

All equipment and non-current carrying metal parts of the electrical system will be grounded in accordance with the NEC. An equipment grounding conductor will be routed with the circuit conductors for all feeders and branch circuits.

7.0 WIRING DEVICES

New receptacles shall be 20 ampere, 125 volt, NEMA 5-20R configuration, back wired specification-grade type with brushed stainless steel cover plates.

Ground Fault Circuit Interrupter (GFCI) receptacles will be used outdoors, in toilet and locker rooms, within 6 feet of sinks and other water sources, and at other locations as required by the NEC.

Electric water coolers and vending machines will be connected to GFCI circuit breakers for ease of test/reset.

Exterior receptacles will be weather resistant-type (labeled "WR") and will be provided with While-In-Use cast aluminum wet location covers.

8.0 POWER STUDIES AND TESTING

The contractor will be required to hire a qualified electrical testing agency to prepare a Fault-Current and Overcurrent Protective Device Coordination Study for review and approval. The study will not include Arc Flash Hazard analysis.

Third-party testing, including thermographic scanning, will be required for all electrical distribution equipment.

9.0 LIGHTING SYSTEMS

Lighting fixtures will be selected and located to enhance aesthetics and provide adequate illumination levels. The primary fixture types will utilize LED and Ceramic Metal Halide light sources.

LED fixtures will utilize 80+ CRI LEDs and electronic drivers. Dimming LED drivers will be 0-10V type with a minimum dimming level of 10% light output, except where lower minimum dimming levels are required. All light fixtures shall be specification grade, with a minimum 5 year warranty.

Natatorium lighting will consist of linear "light pipe" type lighting fixtures. These fixtures will span the length of the pool, for even, continuous illumination on the entire pool surface. The distance between the linear fixtures will be selected to provide an average light level of 50 foot candles. Light fixtures will consist of a metal halide "light engine" located at each end of the pipe, with the light traveling down the length of the light pipe by way of reflectors inside the pipe. This design provides a smoothly lit light source over the pool. When relamping is needed, the metal halide lamps are easily accessed above the pool deck. Additional LED lighting fixtures will also be provided above the pool deck (between light pipe rows), and above the seating areas as required. These fixtures will be pendant mounted or wall mounted, and will be served from the emergency generator to provide emergency egress lighting.

For support spaces for the Natatorium (locker rooms, shower rooms, etc), a combination of linear and downlight sources shall be utilized. All locker room fixtures will be of durable quality to prevent damage and extend the life of the fixtures. All shower room fixtures will be Wet Location rated. All support spaces will be illuminated to a minimum of 15-25 foot candles, depending on their use, and emergency lighting shall be provided where required.

In areas where fine visual tasks are being performed, higher light levels will be provided to a minimum of 25 foot candles. Emergency lighting will be provided in spaces that house electrical equipment, or in spaces that serve multiple occupants. The corrosive atmosphere of the natatorium will be taken into consideration when selecting appropriate light fixtures and accessories.

Specialty lighting will be provided in pool lobby and entrance areas. Decorative style, pendant-hung LED light fixtures will be used to provide sufficient illumination, while providing an aesthetically pleasing result. In areas with higher ceilings, wall mounted, concealed, indirect lighting fixtures may be used to provide even illumination. In areas with lower tiled or gypsum ceilings, open or decorative downlights shall be used to provide illumination to an average of 15-20 foot candles.

Mechanical and electrical rooms will utilize industrial LED fixtures, to provide IES recommended lighting levels. These fixtures shall have a satin lens to provide diffusion of light throughout the space and to prevent light glare. Fixtures shall be impact resistant where necessary to ensure

that they are not damaged during regular use of the spaces. In spaces with a low ceiling, fixtures shall be surface mounted, and in spaces with higher or no ceilings shall have chain-hung fixtures, with additional up light distribution.

All light sources will have a color temperature of 3500 Kelvin. All light fixtures will be independently supported from structure.

All exit signs will be LED type, AC only, with die-cast housings.

Exterior lighting will consist of wall mounted LED fixtures to accentuate façade design and recessed LED soffit fixtures for general illumination. Lighting fixtures at exits from building will be tied into generator to provide emergency egress lighting to required levels.

Exterior area lighting will utilize LED light sources and may consist of a combination of bollard-type or pedestrian-scale walkway lights, and in-ground fixtures.

10.0 LIGHTING LOAD DENSITIES AND LIGHTING LEVELS

The lighting load density for the North and Central Middle Schools will be designed in accordance with ASHRAE 90.1-2007. Maintained lighting levels will comply with the latest recommendations of the Illuminating Engineering Society of North America (IESNA).

11.0 EMERGENCY LIGHTING

Emergency lighting will be powered from a new on-site natural gas generator. LED light fixtures will be utilized for the egress lighting. Night lights will be provided in the corridors (connected to the generator) to provide minimal lighting when lights in the corridor are in the "Off" position. Emergency lighting will be provided in the following areas:

- All paths of egress
- Natatorium
- Toilet rooms
- Locker rooms
- Mechanical and electrical rooms
- Outside legally-required egress doors

Maintained emergency lighting levels will not be less than 1 foot-candle average. The minimum emergency lighting level will be 0.1 foot-candle, and the maximum-to-minimum foot-candle ratio will not exceed 40:1.

Emergency lighting transfer devices will be required (one per switchleg), to turn generator-backed emergency lights on in the event of utility power failure.

12.0 LIGHTING CONTROL SYSTEMS

In corridors, large gathering spaces and other paths of egress, unswitched night lighting will be provided for ease of navigation. The remaining lights in these spaces will be controlled through the lighting relay panel and the Building Management System (BMS).

Night lighting will also be strategically located at stairway entrances, stairways, vestibules and areas that require security cameras, as required for proper camera operation.

Occupancy sensors will control lights in a stand-alone manner in classrooms and other smaller, discrete rooms, such as offices, conference rooms, toilet rooms and storage rooms. The lighting and occupancy sensors in these rooms will not be connected to a lighting control panel.

Occupancy sensors and other automated lighting control systems will not be used in potentially hazardous spaces, such as electrical rooms, mechanical rooms, and elevator control and maintenance areas.

Exterior lighting fixtures will be controlled by the lighting control system with building automation system override.

Exterior lighting will be photocell-controlled with building automation system override.

13.0 FIRE ALARM SYSTEM

For the new natatorium building at the north site, a new addressable fire alarm system with voice evacuation capability will be provided per NFPA requirements. Notification will be by speaker/strobes and strobes. The Fire Alarm Control Panel will be provided with data interface with an auto dialer connected to dedicated phone lines for remote notification. The main fire alarm panel will be located in a protected area and a remote annunciator panel will be located in the main vestibule.

For the central site, the existing High School fire alarm system will be extended to serve the natatorium addition.

The FA system will interface with the building automation system to indicate position of dampers.

Photoelectric smoke detectors will be provided in electrical rooms, telecommunications rooms, and storage areas. Heat detectors will be provided in mechanical rooms.

System programming will be such that dirty smoke detectors will generate a trouble signal in lieu of an alarm condition.

Duct smoke detectors will be installed in new mechanical air handling units and in all ducts with smoke dampers.

Fire protection system tamper and flow switches will be monitored by the fire alarm system.

Fire alarm wiring will be installed in conduit, except that plenum-rated fire alarm cabling may be routed in j-hooks above accessible ceilings. Fire alarm wiring will be red in color.

14.0 COMMUNICATIONS AND AUXILIARY SYSTEMS

Raceways and boxes will be provided for the following communications and auxiliary systems:

- Fiber optics, interior and exterior
- Structured cabling
- Audio-visual systems

- Specialty electronics for athletic venues
- Digital signage
- PA/Clock/Bell systems
- Access control
- Video surveillance systems

The minimum conduit size for communications systems will be 1-inch.

THE BAR BELOW SHOWS GRAYSCALE FROM WHITE TO SOLID BLACK

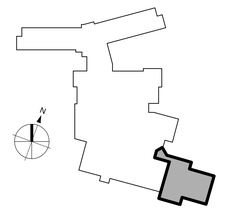
WHITE — BLACK

FLOOR PLAN GENERAL NOTES

1. ALL DIMENSIONS ARE FROM COLUMN REFERENCE LINE TO FACE OF PARTITION, UNLESS NOTED OTHERWISE.
2. PROVIDE FRT WOOD BLOCKING AT ALL WALL MOUNTED SHELVING, CABINTES, TOILET, PARTITIONS, GRAB BARS, HAND RAILS, EQUIPMENT, ETC.
3. REFER TO DRAWING G021 FOR WALL ACCESSORIES AND VISUAL DISPLAY / SURFACE MOUNTING INFORMATION
4. REFER TO DRAWING A420 FOR ALL INTERIOR PARTITION TYPES.
5. ALL MASONARY PARTITIONS ARE TYPE K8 UNLESS NOTED OTHERWISE.
6. ALL GYPSUM PARTITIONS ARE TYPE A3 UNLESS NOTED OTHERWISE.
7. MAINTAIN FIRE RATINGS AT SPECIFIED WALLS. REFER TO CODE COMPLIANCE PLANS FOR RATED WALL LOCATIONS.
8. PROVIDE TILE BACKER BOARD AT ALL WALL LOCATIONS SCHEDULED TO RECEIVE TILE FINISHES. REFER TO ROOM FINISH SCHEDULE FOR LOCATIONS.
9. REFER TO ROOM FINISH SCHEDULE FOR WALLS TO RECEIVE ABUSE RESISTANT GYPSUM BOARD.
10. PROVIDE FRT PLYWOOD BACKING PANELS IN ALL MDF, IDF, TELECOM, AND ELECTIRCAL ROOMS FROM 1'-0" AFF TO 9'-0" AFF ON ALL WALLS.

CONSTRUCTION NOTES

#	
1	EWC RE: PLUMBING
2	DRINKING FOUNTAIN RE: PLUMBING
3	SUIT SPINNER



KEY PLAN (NTS)

c2ae elevating human achievement
www.c2ae.com

Portage Public Schools CENTRAL HIGH SCHOOL POOL ADDITION
1535 S WESTNEDGE AVE. PORTAGE, MI 49002

FIRST LEVEL FLOOR PLAN

REVISIONS

REV	DESCRIPTION	DATE
	SCHEMATIC DESIGN	2018.05.08
	DESIGN DEVELOPMENT	2018.08.24

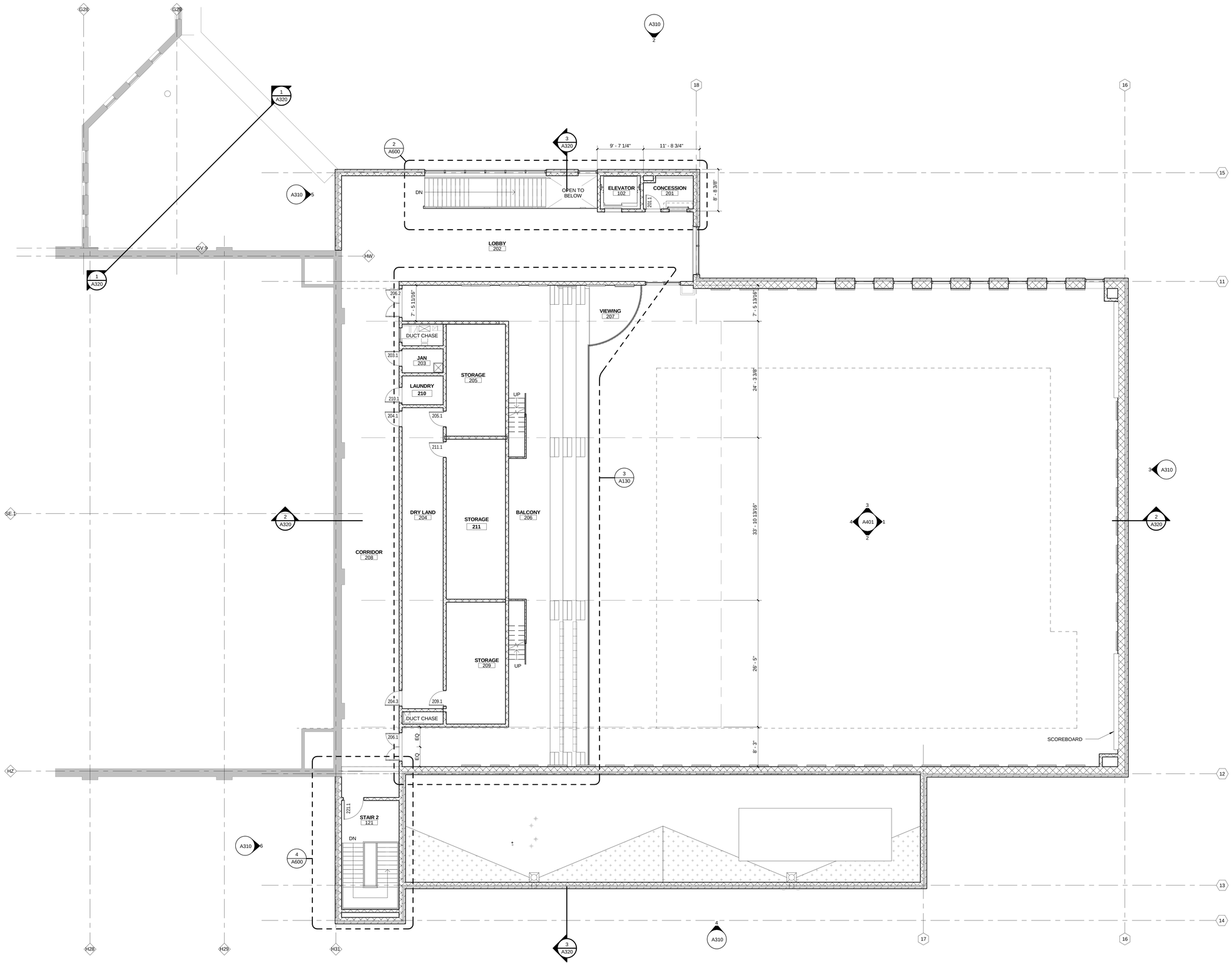
SCALE: 1/8" = 1'-0"
PROJ. # 160018
DATE 10/12/2018
SHEET
A111

50% CD REVIEW

THE BAR BELOW SHOWS GRAYSCALE FROM WHITE TO SOLID BLACK

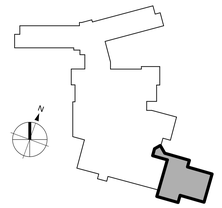
BLACK

WHITE



1 SECOND LEVEL FLOOR PLAN

1/8" = 1'-0" REFERENCED ON **1 / A310**



KEY PLAN (NTS)

c2ae
elevating human achievement
www.c2ae.com

Portage Public Schools CENTRAL HIGH SCHOOL POOL ADDITION

8135 S WESTNEDGE AVE, PORTAGE, MI 49002

SECOND LEVEL FLOOR PLAN

REVISIONS

REV	DESCRIPTION	DATE
	SCHEMATIC DESIGN	2016.06.30
	100% DESIGN DEVELOPMENT	2016.08.05

SCALE 1/8" = 1'-0"

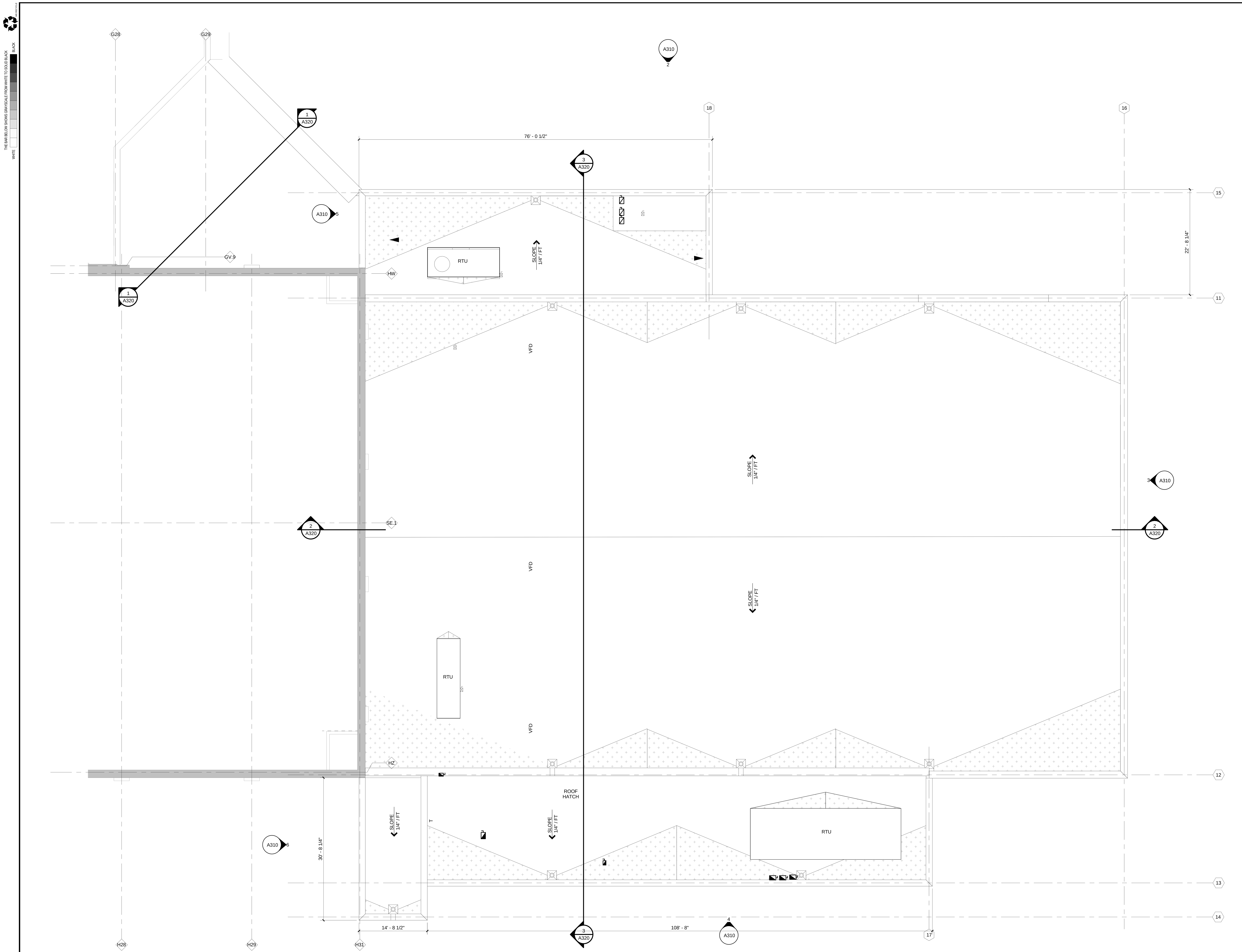
PROJ. # 160018

DATE 10/12/2016

SHEET

A112

50% CD REVIEW



ROOF LEGEND

TAPERED INSULATION

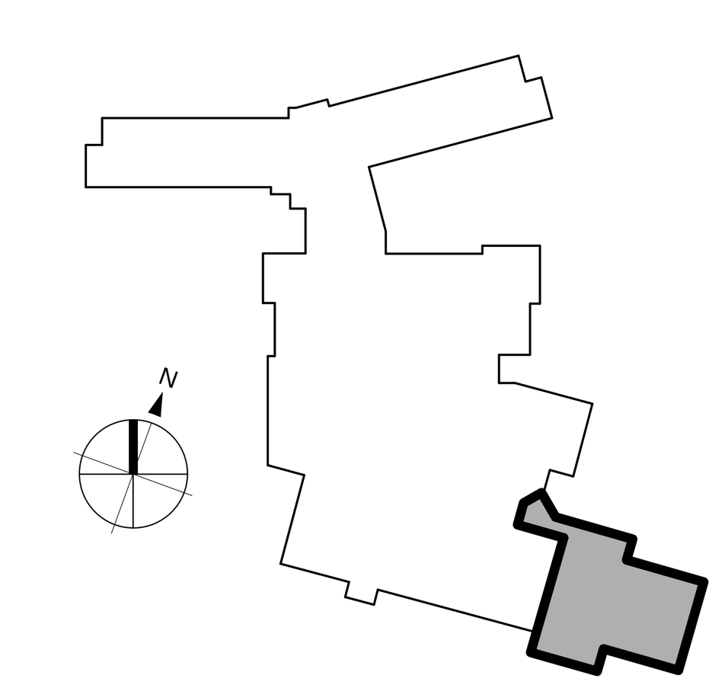
SLOPE DIRECTION CREATED BY STRUCTURE

SLOPE DIRECTION CREATED BY TAPERED INSULATION

SLOPE — SLOPE REQUIRED BY TAPER

OVERFLOW DRAIN (OFD)

ROOF DRAIN (RD)



KEY PLAN (NTS)

c2ae
elevating human achievement
www.c2ae.com

Portage Public Schools CENTRAL HIGH SCHOOL POOL ADDITION

8135 S WESTNEDGE AVE, PORTAGE, MI 49002

ROOF PLAN

REVISIONS

REV.	DESCRIPTION	DATE
	SCHEMATIC DESIGN	2016.05.09
	100% DESIGN DEVELOPMENT	2016.08.05

SCALE: 1/8" = 1'-0"

PROJ. #: 160018

DATE: 10/12/2016

SHEET

A113

50% CD REVIEW

THE BAR BELOW SHOWS GRAYSCALE FROM WHITE TO SOLID BLOCK

BLACK

WHITE

CONSTRUCTION NOTES

#	
1	EWC RE: PLUMBING
2	DRINKING FOUNTAIN RE: PLUMBING
3	SUIT SPINNER

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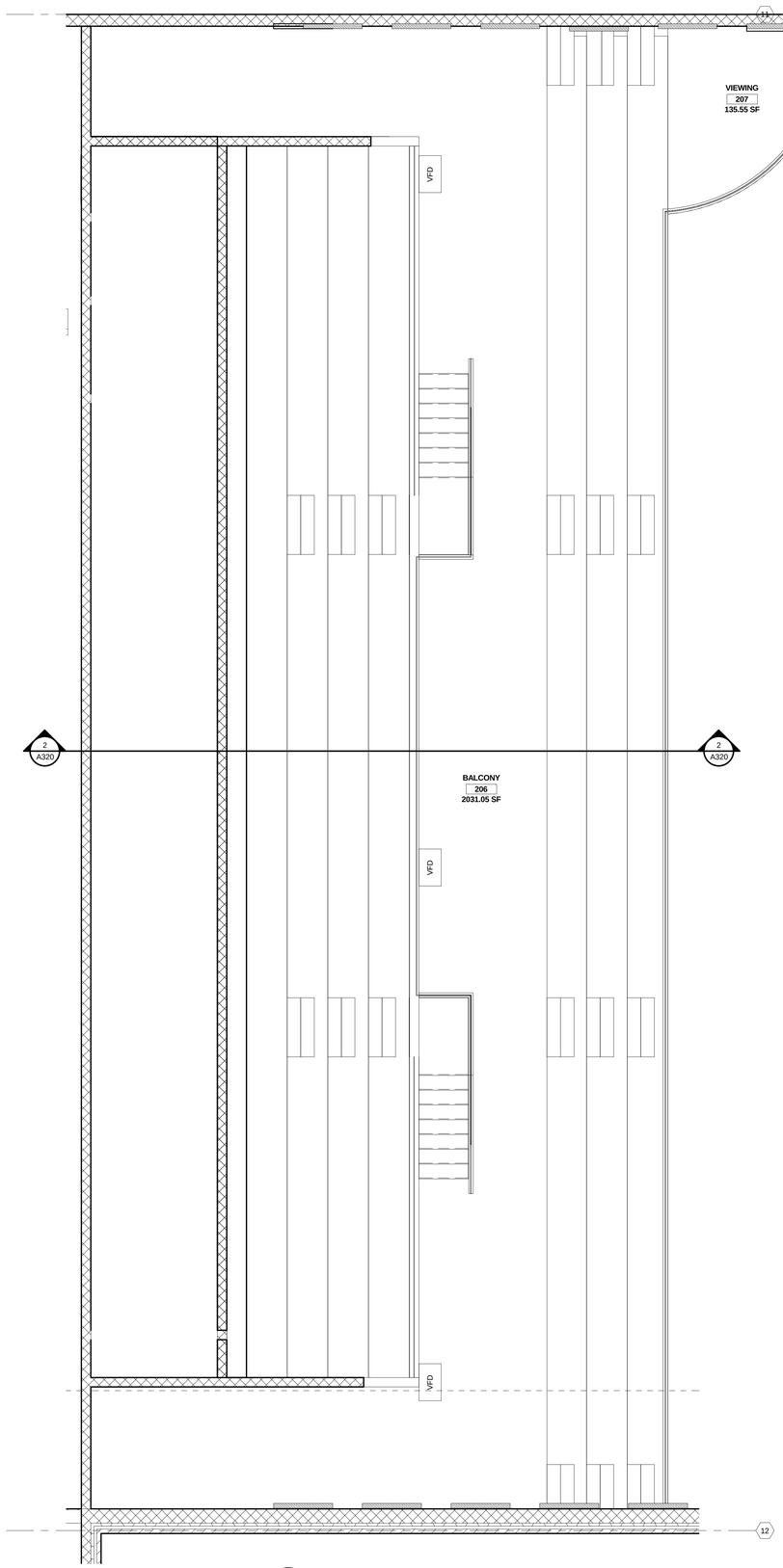
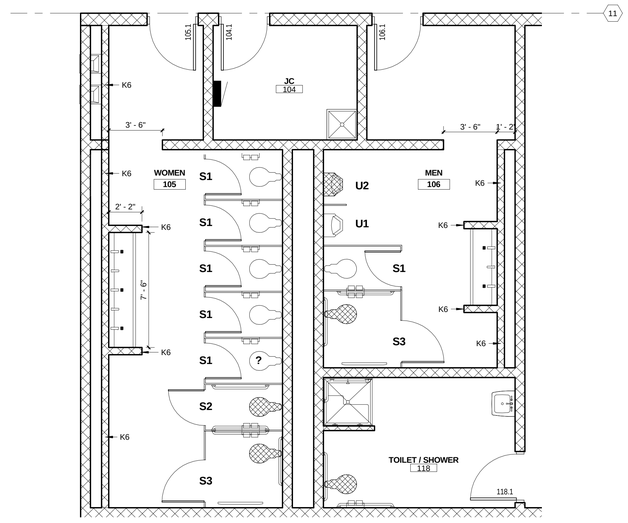
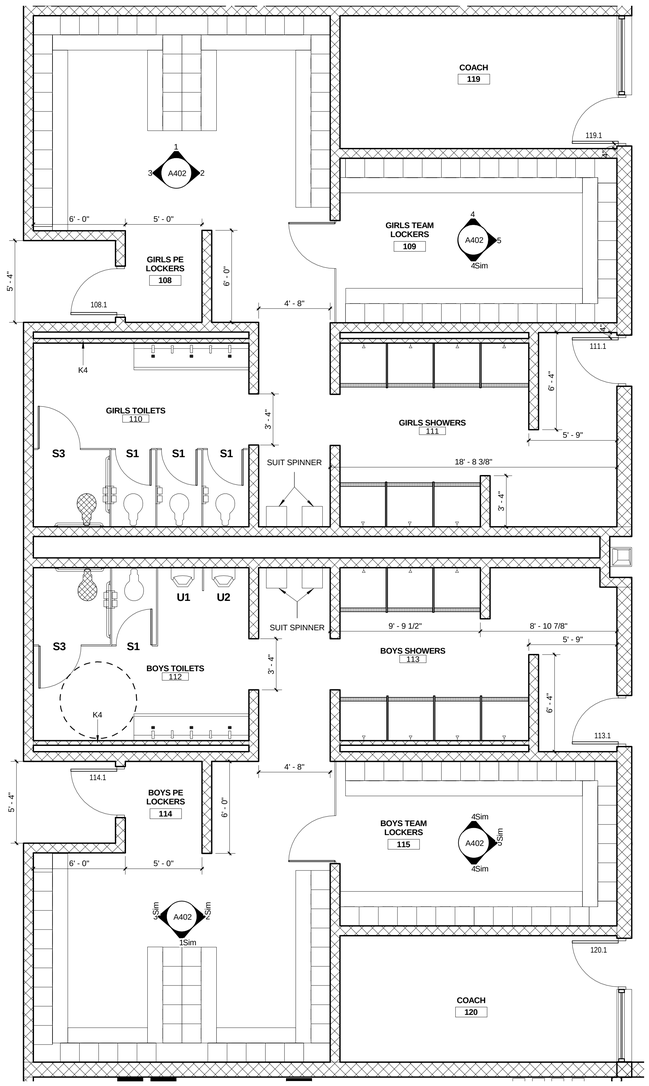
9. REFER TO ROOM FINISH SCHEDULE FOR WALLS TO RECEIVE ABUSE RESISTANT GYPSUM BOARD.
10. PROVIDE FRT PLYWOOD BACKING PANELS IN ALL MDF, IDF, TELECOM, AND ELECTIRCAL ROOMS FROM 1'-0" AFF TO 9'-0" AFF ON ALL WALLS.



3 BALCONY SEATING
1/4" = 1'-0" REFERENCED ON **1 / A112**



2 LOBBY TOILET ROOMS
1/4" = 1'-0" REFERENCED ON **A5 / A111**



1 BOYS & GIRLS POOL TOILET & SHOWER ROOMS
1/4" = 1'-0" REFERENCED ON **A5 / A111**

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Portage Public Schools CENTRAL HIGH SCHOOL POOL ADDITION

3135 S WESTNEDGE AVE, PORTAGE, MI 49002

ENLARGED PLANS

REVISIONS

REV	DESCRIPTION	DATE
	100% DESIGN DEVELOPMENT	2016.09.30

SCALE: 1/4" = 1'-0"

PROJ. #: 160018

DATE: 10/12/2016

SHEET

A130

50% CD REVIEW

Schematic Design Narrative

1.0 Chapter X – Mechanical and Plumbing Systems

1.1 GENERAL

This Basis of Design (BOD) document is to provide an overview of the proposed mechanical and plumbing systems, equipment, materials, and associated design criteria for Portage Public Schools new construction of North Middle School.

1.1.1 Codes and Standards

The new mechanical and plumbing systems will be designed based on the following codes and standards:

Michigan Mechanical Code 2015
Michigan Plumbing Code 2015
Michigan Energy Conservation Code 2015
ASHRAE Standard 62.1
ASHRAE Standard 90.1
ASHRAE Standard 55
ASHRAE Standard 15
SMACNA Sheet Metal Construction Standards
NFPA Standard 13
NFPA Standard 14
NFPA Standard 20
NFPA Standard 90A/B

1.1.2 Outdoor Design Conditions

The following outdoor design conditions will be used in sizing the mechanical heating, ventilating, and air conditioning systems. The design temperatures are based on 2013 ASHRAE Fundamentals Handbook, using 0.4% cooling design and 99.6% heating design for Kalamazoo/Battle Creek, Michigan (Latitude 42.24N, Longitude 85.55W, elevation 873 ft ASL)

Summer Outdoor (0.4%)	90.8°F DB | 72.8°F WB
Summer Evaporation (0.4%)	75.9°F WB | 84.6°F DB
Summer Ambient Roof	95°F DB
Winter Outdoor (99.6%)	2.8°F DB
Winter Outdoor Air Intake (for AHU heating coil design)	-10°F DB

1.1.3 Indoor Design Conditions

The following indoor design conditions will be used in sizing the mechanical heating, ventilation, and air conditioning systems:

Room or Area	Summer			Winter	
	DB F	* % RH		DB F	% RH
Offices, Conference & Classrooms	75	50 (+/- 10)		72	-
Computer Labs	75	50 (+/- 10)		72	-
Media Center	75	50 (+/- 10)		72	-
Performance	75	50 (+/- 10)		72	-
Music Suite	75	50 (+/- 10)		72	-
STEAM / Shops	75	50 (+/- 10)		72	-
Commons/Cafeteria	75	50 (+/- 10)		72	-
Kitchen	78	50 (+/- 10)		70	-
Gymnasium	75	50 (+/- 10)		72	-
Athletics / Fitness	75	50 (+/- 10)		72	-
Locker Rooms	78	50 (+/- 10)		72	-
MDF Room	70	50 (+/- 10)		70	30 (+/- 5)
IDF Rooms	70	50 (+/- 10)		70	-
Electrical Equipment Rooms	104 Maximum			50	-
Mechanical Equipment Rooms	Ventilation Only			60	-
Toilets	78			72	-

* Estimated maximum indoor relative humidity during the cooling season. Direct dehumidification control will not be provided.

1.1.4 Building Internal Heat Gain Allowances

The preliminary design shall use the load densities outlined below for sizing the mechanical heating, ventilation and air conditioning systems. The listed lighting densities are the maximum allowable per ASHRAE 90.1-2010.

Internal heat gain diversity at the room level will be 100% for lighting, people, and equipment. Internal heat gain diversity at the system level will be 90% for lighting, 100% for people, and 80% for equipment.

Space Type	Occupant Gains			Lighting	Equipment
	Density	Heat (btu/hr/p)		(W/sqft)	(W/sqft) or W/workstation
	(p/1000 ft²)	Sensible	Latent		
Office, Open	5	250	200	0.98	150 / s
Office, Enclosed	5	250	200	1.11	150 / s
Conference / Meeting	50	245	155	1.23	150 / s
Classrooms / Music	35	250	200	1.24	1.5
Cafeteria (Leisure Dining)	70	250	200	1.31	0.5
Commons	30	250	200	1.2	1.0
Corridor	-	-	-	0.66	-
Kitchen (Food Prep)				0.99	Actual Gain
Stairs	-	-	-	0.69	-
Performance (Stage)	35	305	545	Actual Gain	-
Performance (Seating)	# of Seats	225	105	Actual Gain	-
Gymnasium (Playing Floor)/Fitness	-	710	1090	1.2 / 0.79	-
Gymnasium (Spectator Areas)	150	245	155	1.2	-
Locker Rooms	-	-	-	0.75	-
STEAM / Shop (Lab Classroom)	25	250	200	1.28	1.5
Toilets	-	-	-	0.98	-
Media Center	25	245	155	1.24	1.5
Storage / Equipment	-	-	-	0.95	Actual Gain

*actual occupant loads, based on seating counts, programming documents, or owner provided maximum occupant information may be used where system economies can be realized and professional judgment allows.

1.1.5 Ventilation Rates

Outside air ventilation rates will be in accordance with the Michigan Mechanical Code or ASHRAE 62.1, whichever one is more stringent. Ventilation rates provide the required amount of fresh air to occupied spaces as well as replace air that has been exhausted out of the building. The system will be designed and controlled to provide the required ventilation rates throughout the air handling systems' full operational range.

Outdoor air intake locations are to be located a minimum of 10' from any exhaust fan discharge, plumbing vent, or other pollutant source, except where applicable codes and standards dictate further separation distances.

Locker rooms will have a minimum air change rate of 10 air changes per hour. Toilet rooms will have a minimum air change rate of 10 air changes an hour. Toilets, janitor closets, recycling or trash storage rooms, or other pollutants will be provided with dedicated exhaust systems to ensure the spaces are negatively pressurized relative to adjacent occupied spaces.

A demand controlled ventilation system, utilizing CO_2 monitoring in densely occupied spaces, will be employed to optimize ventilation rates to occupied zones and save energy associated with conditioning outside air. Densely occupied spaces are those spaces which have a design occupant load of 30 people per 1000 ft^2 or greater, or have the potential for highly fluctuating occupant loads.

1.1.6 Indoor Noise and Vibration Criteria

Design sound levels listed shall be based on ASHRAE Applications Handbook – 2015, Chapter 48, Table 1 "Design Guidelines for HVAC-Related Background Sound in Rooms".

Corridors and Commons	NC 40	Conference Rooms	NC 30
Enclosed offices	NC 30	Open Offices	NC 40
Multipurpose Areas	NC 30	Classroom	NC 30
Media Center	NC 30	STEAM	NC 35

*NC level for STEAM is for HVAC system. Machinery within spaces is not included in NC level.

Music rooms and the performance theatre space have unique acoustical requirements. These spaces have more stringent criteria that dictate a highly engineered approach to ensure that each spaces' subtleties are addressed. Devices such as high performance duct sound attenuators, high-blade-count air handling unit fans, duct lagging, and low velocity duct runs are all items that are anticipated to be part of the design solution.

Major rotating loads such as pumps, air handling unit fan assemblies, and large inline fans, shall be provided with vibration isolation devices and mass attenuation (concrete support pads).

All ducts and pipes within mechanical rooms or in music and performance spaces will be provided with vibration isolation hangers.

1.1.7 Duct Sizing Criteria

VAV Supply Air Ducts (upstream of VAV box)	1,500 FPM maximum velocity 0.2"/100 ft. maximum air pressure drop
VAV Supply Air Ducts (downstream of VAV box)	800 FPM maximum velocity 0.08"/100 ft. maximum air pressure drop
VAV & CV Supply Air Ducts (within music suite)	800 FPM maximum velocity 0.08"/100 ft. maximum air pressure drop
CV Supply Air Ducts	1200 FPM maximum velocity 0.08"/100 ft. maximum air pressure drop
Supply Air Outlets	425 FPM maximum velocity 250 FPM maximum velocity within music suite

Return Air Ducts	1,500 FPM maximum velocity 0.10"/100 ft. maximum air pressure drop
Return Air Ducts (within music suite)	800 FPM maximum velocity 0.08"/100 ft. maximum air pressure drop
Return Air openings	500 FPM maximum velocity 200 FPM maximum velocity within music suite
General Exhaust Air Ducts	1,000 FPM maximum velocity 0.10"/100 ft. maximum air pressure drop
Outside air intake openings	500 FPM maximum

1.1.8 Duct Materials and Pressure Class

VAV Supply Air Ducts (upstream of VAV box)	Galvanized steel (G90), unlined +6" W.G.
VAV Supply Air Ducts (downstream of VAV box)	Galvanized steel (G90), lined +2" W.G.
Return Air Ducts	Galvanized steel (G90), unlined -4" W.G.
General Exhaust Air Ducts	Galvanized steel (G90), unlined +/- 2" W.G.
STEAM Exhaust	PVC Coated Galvanized steel (G90)or stainless steel, (based on application), unlined +/- 2" W.G.
Intake/Relief Ducts	Galvanized steel (G90), unlined +/- 6" W.G.

Some extent of supply and return main ductwork could be lagged or lined based on application or instruction from the acoustical consultant.

All sheet gauges, joint construction, and reinforcement method shall be per SMACNA "HVAC Duct Construction Standards", latest edition.

All air handling systems which contain automatically closing dampers shall be provided with positive or negative pressure relief doors of a quantity and size to prevent ductwork collapse or rupture.

Any duct located below 8' AFF in mechanical rooms shall be provided with PVC jacket.

1.1.9 Pipe Sizing Criteria

HVAC Piping, < 2-1/2"	4 FPS max. velocity 4.0 ft /100 ft equivalent length max. pressure drop
HVAC piping 3" through 12" size	8 FPS max. velocity 4.0 ft / 100 ft equivalent length max. pressure drop
Domestic Water Piping	5 FPS max. velocity 3 psi /100 ft equivalent length max. pressure drop
Gravity Drainage and Vent Systems	Sized per Michigan Plumbing Code and ASPE methods

1.1.10 Pipe Materials and Joining Methods

System	Material	Joining Method
Hydronic piping (2" and smaller)	Copper, Hard Drawn Type L	Soldered
Hydronic piping (2 ½" and larger)	Steel, Schedule 40	Welded
Air conditioning condensate piping	Copper, Type L	Soldered
Fire protection piping – wet (2" and smaller)	Steel, Schedule 40	Screwed or flanged
Fire protection piping – wet (2 1/2" and larger)	Steel, Schedule 40	Screwed, flanged, or grooved
Aboveground Natural Gas (1" and smaller)	Black Steel, Schedule 40	Threaded
Aboveground Natural Gas (1 1/2" and larger)	Black Steel, Schedule 40	Welded
Belowground Natural Gas	Black Steel, Schedule 40 or soft annealed copper	With containment piping and vent.
Underground sanitary	PVC, Schedule 40	Solvent Weld
Underground storm	PVC, Schedule 40	Solvent Weld
Aboveground sanitary, waste, and vent	PVC, Schedule 40	Solvent Weld
Aboveground primary and secondary roof drainage	PVC, Schedule 40	Solvent Weld

Domestic water, 2" and smaller	Copper, Type L	Soldered
Domestic water, 2 1/2" and larger	Copper, Type L	Wrought Soldered

Any outdoor piping requiring insulation shall be provided with a protective, embossed aluminum jacketing system.

Any piping located in mechanical rooms at an elevation lower than 8' AFF shall be provided with a protective PVC jacket.

1.2 FIRE PROTECTION SYSTEMS – GENERAL

A fire sprinkler system will be served from a new site water supply system which will be a combined 8" domestic and fire water service and split inside the building. The fire service connection is estimated at 8-inch and will connect to a new listed backflow preventer. The system will be provided in accordance with most recent editions of NFPA 13.

All areas of the new building will be provided with fire sprinkler protection in accordance with NFPA 13, the Michigan Building Code and the requirements of the local fire marshal. Fire sprinkler systems will be zoned by floor. The athletic wing will be zoned separately. Each zoned area will be provided with individual floor control assemblies consisting of control valves, water flow switches, and test and drain assemblies.

Standpipes with hose connections, located in located at all stairwells where the floor level of the highest story is 30 feet above the lowest level of the fire department vehicle access. Each will be provided with fire rated hose cabinets. These standpipes will be provided with 1 ½" hose connections.

A fire pump is anticipated pending results from the flow test. A fire department connection and fire pump test header will be located on an exterior wall. The fire pump will be located in a mechanical room on the first level.

A dry fire protection system is not anticipated. Freeze-proof heads will be located in areas anticipated to have frost concerns such as electrical rooms.

Fire Pump System

- Horizontal split case or inline fire pump complete with pressure maintenance pump.
- Manufacturers: A-C Fire Pump (basis of design), Patterson Pump Company, Peerless Pump, Pentair Pump Group

Sprinkler Heads

- Rooms without ceilings: Upright sprinklers.
- Rooms with suspended ceilings: Concealed sprinklers.
- Wall mounting: Sidewall sprinklers.

- Spaces subject to freezing: Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as required.
- Special applications: Extended-coverage, flow-control, and quick-response sprinklers as required.
- Manufacturers: Reliable Automatic Sprinkler Co., Tyco Fire & Building Products, Victaulic Company, Viking Corporation

1.3 PLUMBING SYSTEMS – GENERAL

In general, new sanitary, waste, sanitary vent, grease waste, domestic water, storm water drainage, foundation drainage and natural gas systems will be provided in all new areas of construction.

1.3.1 Sanitary, Waste, and Vent Piping Systems

New gravity sanitary waste and vent piping will be provided throughout the building in accordance with the Michigan Plumbing Code. The new system will connect to new or existing site sanitary mains, depending on size, location, and invert elevation.

Elevator shafts shall be equipped with a sump and any hydraulic elevators or dock levelers shall be equipped with oil separation.

Sump Pumps
- Duplex, submersible, quick disconnect complete with controller and sump cover. Poured in place concrete or pre-cast sump.
- Manufacturer: Bell & Gossett, Weil

Grease Waste
A 75 GPM, 150 pound grease capacity grease interceptor will be provided for each grease laden fixtures in the kitchen. The grease interceptor will be mounted below floor level or below grade adjacent to the kitchen exterior wall and will route to the nearest 4" sanitary line from the outlet.

Dressing rooms near performance and STEAM room sinks will be provided with plaster traps.

Science classrooms are not intended for chemical use and are anticipated to be connected to the sanitary system.

1.3.2 Storm Water Piping Systems

All new building areas will be provided with a new primary and secondary storm drainage system. Primary roof drains and piping will route horizontally and vertically through the building as required and will connect to new site underground storm mains. Secondary roof drainage systems will also route similarly to the primary piping system and will spill to grade at exterior locations with bronze downspout covers.

Storm piping in canopies or other areas subject to freeze conditions will be provided with self-regulating electric heat trace with master shutdown connectivity from the building management system.

Any area of the building with gutters and downspouts will be provided with self-regulating electric heat trace.

1.3.3 Domestic Water Systems

New distribution piping shall be sized and based on ASPE and the Michigan Plumbing Code. Isolation valves and drains will be provided per floor. Room isolation valves will be provided where required.

A new 6" water main extending from the combined domestic and fire protection site main shall be provided and sized accordingly. A new meter and duplex backflow preventer assembly shall be provided.

No water softening of domestic systems is anticipated at this time.

The new system will provide a minimum of 35 PSI water pressure at the most remote system point to satisfy the demand for domestic hot and cold water.

A booster pump is anticipated pending results from the water flow test. The booster system will be a duplex skid mounted packaged system in which each pump is capable of 100% load with the second pump being redundant as backup. Each pump will be controlled via VFD. The booster system will also include a hydropneumatic tank with a pressure control sensor.

1.3.4 Domestic Water Heaters

Domestic Hot Water Heaters

- Condensing, High Efficiency
- Manufacturers: Aerco, Lochinvar, Rheem

Three new 199,999 Btu/hr gas-fired, high efficiency condensing, storage type water heaters will serve the building excluding the kitchen. The water heaters will generate water at 140°F. The hot water will be mixed with a master mixing valve down to 130°F and distributed to fixtures. Point of use mixing valves will be provided for hand washing fixtures. Hot water recirculation shall be provided on all branches over 25 feet from the main or as needed. The hot water will return at approximately 120°F.

A dedicated 199,999 Btu/hr gas fired, high efficiency condensing, storage type water heater and separate 200 gallon storage tank will serve the kitchen fixtures. The water heaters will generate water at 140°F. The hot water will be mixed with a master mixing valve down to 130°F and distributed to hand washing sinks and lavatories. The remaining fixtures will be distributed at 140°F water. Point of use mixing valves will be provided for hand washing fixtures. Hot water recirculation shall be provided on all branches over 25 feet from the main or as needed. The hot water will return at approximately 120°F.

Domestic Hot Water Circulation Pump
- Inline, close coupled pump. All bronze NSF rated construction.
- Manufacturers: Armstrong, Bell & Gossett (basis of design), Peerless, or Taco

Mixing Valves
- Master mixing valve: ASSE 1017 lead free, rough bronze, thermostatic mixing valve.
- Point of use: ASSE 1070 under counter, chrome plated, lead free, thermostatic mixing valve.
- Emergency combination eyewash showers: ASSE 1071 lead free, rough bronze, thermostatic mixing valve at mechanical rooms and STEAM room.

1.3.5 Plumbing Fixtures

The plumbing fixtures will be selected to be water efficient and low maintenance. The fixtures will meet minimum ADA standards where required. The mechanical rooms will have a wall hydrant and/or service sink. Janitor's closets will be provided with a cast iron floor mounted mop receptor and extra hot and cold water connections with vacuum breakers for connecting floor scrubbing equipment.

Exterior hose bibbs will be located around the perimeter of the new addition at a spacing of approximately 100'.

Manufacturers:
- China – American Standard, Crane
- Flush valves - Kohler, American Standard
- Stainless steel sinks - Elkay or Just Manufacturing
- Lavatory and sink faucets - Chicago Faucet, Kohler, T&S Brass, American Standard

Water Closets
- Wall mounted, top spud, siphon jet with elongated bowl
- White, open front seat with check hinge.
- Sensor operated, hard wired (1.6 gpf) flush valve

Urinals
- Wall mounted, top spud, siphon jet type with integral side panels.
- Sensor operated, hard wired (1.0 gpf) flush valve

Lavatories – Public Restrooms
- Wall mounted multiple station wash-fountains.
- Sensor operated, hard wired (0.5 gpm) faucets

Lavatories – Single Toilet
- Vitreous china lavatory with grid drain
- Sensor operated, hard wired (0.5 gpm) faucet

Mop Sink
- Floor mounted 24"x24" cast-iron
- Wall mounted 8" body with vacuum breaker faucet
- 3' high splash panels and hose and bracket on wall

- Mechanical room will be provided with a wall mounted cast iron sink.

Hose Bibbs
- Mechanical spaces-non-freeze with dual check valve and T-handle key

Wall Hydrants
- Freezeless backflow protected with loose key and cover

Trap Primers
- Electronic manifold type

Electric Water Coolers
- Stainless steel, vandal-resistant, bi-level with bottle filling station
- Manufacturers: Acorn, Elkay, Halsey-Taylor

1.4 BUILDING HVAC SYSTEMS – GENERAL

New HVAC equipment, distribution systems, and controls will be provided for all new construction.

1.4.1 Heating Generation Systems

3 new 3,000 MBH high efficiency heating hot water boilers will be provided in a new mechanical room in the mechanical penthouse above the third level. The boilers will serve all building heating requirements. New distribution pumps, air separator, expansion tank and chemical feeder will also be provided. New distribution piping will be routed throughout the building. Mechanical penthouse will have elevator access sized for hydronic equipment.

1.4.2 Hydronic Heating Distribution Systems

The heating system will be piped in a primary secondary piping arrangement. Each boiler will be provided with a constant flow primary pump. Three variable speed, secondary heating hot water pumps, each sized for 50% of the heating requirement of the school will be provided. System shall rotate one pump as being the lag pump. The pump speed and staging will be controlled by two differential pressure devices (east side & west side) to maintain required system flow.

The heating system supply temperature will reset from 160 degrees F to 120 degrees based on outside air temperature.

The secondary pumping loop would include two way valves at all coils with a two-way minimum flow bypass valve and a magnetic flow meter to ensure any pump is running above its minimum speed during low load conditions. The heating system piping will be divided into several regional loops on each floor to maximize variable flow pump efficiency.

Supplemental perimeter heating will be provided for each perimeter zone. Radiant wall panel and/or fin tube radiation will be utilized in all occupied perimeter zones. Fin tube radiation will be utilized in any perimeter utility or storage rooms without and exit door. Entrances shall be provided with cabinet unit heaters or concealed fan coils. Mechanical spaces shall be provided with hot water propeller unit heaters.

1.4.3 Cooling Generation Systems

2 new 250 ton Air cooled chillers will be provided and located on the roof near the central mechanical penthouse. The chillers will serve all building cooling requirements. New distribution pumps, air separator, expansion tank and chemical feeder will also be provided and located within the central mechanical penthouse. New distribution piping will be routed horizontally throughout the building and vertically within chases down to lower levels.

1.4.4 Stand-alone Cooling Systems

Stand-alone split system air conditioning units shall be provided for the elevator machine room, and IDF rooms. A specialized computer room unit with humidity control will be provided for the MDF room. Remote condensing units for each of these systems shall be located on the roof.

1.5 AIR DISTRIBUTION SYSTEMS – GENERAL

All new spaces will be served by central station energy recovery air handling units (AHU) with overhead supply air and overhead return/exhaust air ductwork. Supply and return/exhaust systems will be a fully ducted galvanized (G90) steel, or PVC coated or stainless steel (STEAM exhaust) sheet metal distribution system. Ductwork in spaces without ceilings shall be round spiral duct, or fabric ductwork.

All air handling units will be provided with supply and return/exhaust fan arrays (multiple direct drive plenum fans), economizer/mixing box section, cartridge filters, hot water preheat coil (with dedicated circulation pump per coil), and chilled water cooling coils. Enthalpy energy recovery with bypass for freeze protection will be provided in all air handling units. Heat pipe heat transfer will be used for dehumidification during summer months. Indoor units shall be mounted on 6" base rails, and 6" concrete housekeeping pads. Air handling units will also include perforated noise attenuating sections up and downstream of fans.

In general, diffusers located within 2'x2' acoustical ceiling tile systems will be based on the SPD model by Price, with spaces employing hard or specialty ceiling systems utilizing modular linear diffusers (SDS, JSP, ASP models by Price). Diffusers located within hard ceilings will be provided with remotely actuated manual balancing dampers (Metropolitan Air Products) for test and balance purposes.

Fire or fire/smoke dampers will be provided at all locations where ducts penetrate shafts or other rated assemblies.

1.5.1 Administration

The first level administration area will be served by a dedicated enthalpy wheel heat exchanger energy recovery AHU located in the east mechanical room on the third level. VAV boxes with hot water reheat coils will be located above ceilings with accessibility in mind, and utilized to section off zones within the space. Supply ductwork will be routed overhead above ceilings with ceiling mounted supply outlets. Return duct will be extended to the above ceiling plenum and ceiling mounted transfer grilles will be periodically located drawing air to the plenum.

1.5.2 Media Center

The second level administration area will be served by a dedicated enthalpy wheel heat exchanger energy recovery AHU located in the east mechanical room on the third level. VAV boxes with hot water reheat coils will be located above ceilings with accessibility in mind, and utilized to section off zones within the space. Supply ductwork will be routed overhead above ceilings with ceiling mounted supply outlets. Return duct will be extended to the above ceiling plenum and ceiling mounted transfer grilles will be periodically located drawing air to the plenum.

1.5.3 Athletic Multi-Purpose

The first level Multi-Purpose area will be served by a dedicated flat plate heat exchanger energy recovery AHU located in the east mechanical room on the third level. VAV boxes with hot water reheat coils will be located above corridor ceilings with accessibility in mind, and utilized to section off zones within the space. Supply and return ductwork will be routed overhead above ceilings within the corridor and exposed throughout the multipurpose and fitness spaces.

1.5.4 Athletic Lockers

The first level Lockers area will be served by a dedicated flat plate heat exchanger energy recovery AHU located in the east mechanical room on the third level. VAV boxes with hot water reheat coils will be located above corridor ceilings with accessibility in mind, and utilized to section off zones within the space. Supply and return/exhaust ductwork will be routed overhead above ceilings with ceiling mounted supply outlets and return/exhaust inlets.

1.5.5 Gymnasium

The second level gymnasium will be served by a dedicated enthalpy wheel heat exchanger energy recovery AHU located in the east mechanical room on the third level. Supply ductwork will be routed to the space and continue as spiral and/or fabric duct upon entrance to the gymnasium. Return duct will be routed to the space and down at multiple points to low return inlets.

1.5.6 Commons

The first level cafeteria, and first, second and third level central common areas will be served by a dedicated enthalpy wheel heat exchanger energy recovery AHU located in the central mechanical penthouse above the third level. VAV boxes with hot water reheat coils will be located above corridor ceilings with accessibility in mind, and utilized to section off zones on each floor. Supply ductwork will be routed overhead above ceilings with ceiling mounted supply outlets on each level. Return duct will be routed to the space and down at multiple points to low return inlets.

1.5.7 STEAM Labs

The second level labs/shop area will be served by a dedicated flat plate heat exchanger energy recovery AHU located in the central mechanical penthouse above the third level. VAV boxes with hot water reheat coils will be located above ceilings with accessibility in mind, and utilized to section off zones within the space. Supply and return/exhaust ductwork will be routed overhead above ceilings with ceiling mounted supply outlets and return/exhaust inlets. There will be dedicated exhaust fans to serve any specialty hoods within these spaces.

1.5.8 Kitchen

The first level kitchen/food prep area will be served by a dedicated flat plate heat exchanger energy recovery AHU located in the central mechanical penthouse above the third level. Supply and return/exhaust ductwork will be routed overhead above ceilings with ceiling mounted supply outlets and return/exhaust inlets. There will be dedicated exhaust fans to serve any cooking hoods within these spaces.

1.5.9 Music Suite

The first level music suite area will be served by a dedicated enthalpy wheel heat exchanger energy recovery AHU located in the central mechanical penthouse above the third level. VAV boxes with hot water reheat coils will be located above ceilings with accessibility in mind, and utilized to section off zones within the space. A low velocity supply and return duct distribution system with sound attenuators and duct lagging will be utilized for these sound sensitive spaces. High supply outlets and low return inlets will be utilized for optimum airflow.

1.5.10 Performance

The first level performance area will be served by a dedicated enthalpy wheel heat exchanger energy recovery AHU located in the central mechanical penthouse above the third level. A low velocity supply and return duct distribution system with sound attenuators and duct lagging will be utilized for these sound sensitive spaces. High supply outlets and low return inlets will be utilized for optimum airflow.

1.5.11 Classrooms

The first, second, and third level classroom areas will be served by a dedicated enthalpy wheel heat exchanger energy recovery AHU in the central mechanical penthouse above the third level. VAV boxes with hot water reheat coils will be located above ceilings with accessibility in mind, and utilized to section off zones within the space. Supply ductwork will be routed overhead above ceilings with ceiling mounted supply outlets. Return duct will be extended to the above ceiling plenum and ceiling mounted transfer grilles will be periodically located drawing air to the plenum.

1.6 BUILDING ENERGY MANAGEMENT AND CONTROL SYSTEMS

All new HVAC equipment will be provided with Direct Digital Controls (DDC) with all new points and graphics mapped to the new front-end system at the school and will be web based for connection to the District-wide control system.

Electric actuation will be provided for valves and dampers. A combination of control and monitoring points will be provided for each piece of equipment. Each device will utilize energy saving algorithms, such as duct static pressure reset, supply air temperature reset, heating hot water temperature reset, heating hot water pressure reset, hot water pump speed optimization and differential pressure reset. CO_2 monitoring will be provided in all densely occupied spaces and a demand controlled ventilation reset scheme will be employed for all systems served by variable air volume air handling units.

Interface to third party equipment controllers, such as lighting control systems, variable frequency drives, generators, or utility meters will be accomplished via a networked BACnet interface, hardwire points, or a combination of both.

Standby power is not planned for the building's control hardware.

1.0 Chapter 7 – Electrical Systems

1.1 ELECTRICAL PROJECT DESCRIPTION

This section of the Schematic Design Narrative provides an overview of the proposed electrical system, equipment, materials, and associated design criteria for the Portage Public Schools.

1.2 CODES AND STANDARDS

The electrical system will comply with the following Codes and Standards:

- Michigan Building Code 2012
- 2014 Michigan Part 8 Electrical Code (National Electrical Code 2014 adopted by reference)
- NFPA 101 Life Safety Code 1997
- NFPA 72 2010
- Michigan School, College and University Fire Safety Rules
- Michigan Uniform Energy Code (ASHRAE 90.1-2007 adopted by reference)
- Illuminating Engineering Society of North America (IESNA) – Tenth Edition

1.3 BUILDING ELECTRICAL SERVICE

The Portage Public School District is a primary service customer.

Each new Middle School will be served from three (3) pad-mounted transformers located in an exterior enclosure adjacent to the building: (1)1000 kVA transformer with 480Y/277V secondary voltage, (1)112.5 kVA transformer with 480Y/277V secondary voltage for the building fire pump, and (1) 750 kVA transformer with for 208Y/120V secondary voltage.

New medium-voltage transformers will be less-flammable liquid-filled, dead-front type, with distribution-class surge arrestors.

The pad-mounted transformers will be served from new PPS medium-voltage (8.32KV) campus primary service equipment. New medium voltage switches and distribution will be provided.

1.4 LOW-VOLTAGE POWER DISTRIBUTION (600V AND LESS) – NORMAL POWER SYSTEM

Each Main Electrical room will be constructed on the 1st level. This room will house two new (2) service-entrance rated main circuit breaker switchboards, each with an integral customer meter (monitored by the building management system) and with integral surge suppression. The first switchboard, at 480Y/277V, will have a 1600AF/1600AT 80% rated main circuit breaker with ground fault protection. The second switchboard, at 208Y/120V, will have a 2500AF/2500AT 80% rated main circuit breaker with ground fault protection. Each main circuit breaker will be solid-state type with long-time and short-time adjustability.

For preliminary design purposes, the following densities will be used (all load densities are based on the 161,000 gross square footage per middle school, including the future classroom addition (15,000 sq. ft. per middle school).

New 480Y/277V Loads (1000 kVA Transformer)	
Mechanical Equipment	5.0 VA per square foot
General Lighting (Building Average)	1.0 VA per square foot
Subtotal (480Y/277V)	6.0 VA per square foot
	966 kVA
	1162 Amps (at 480Y/277V)

New 480Y/277V Loads (112.5 kVA Transformer)	
Building Fire Pump 75HP	80 kVA
	96 Amps (at 480Y/277V)

New 208Y/120V Loads (750 kVA Transformer)	
Receptacles	3.5 VA per square foot
Small Mechanical & Misc.	0.5 VA per square foot
Subtotal (208Y/120V)	4.0 VA per square foot
	644 kVA
	1788 Amps at 208Y/120V

The above preliminary electrical loads will be verified and optimized during the forthcoming design phases to reflect the actual loading values.

Distribution and branch circuit panelboards will be provided in electrical rooms. Feeders and panel buses will be copper, and will include 20% (minimum) spare capacity for future loads. Feeder neutral conductors will be sized at 200% of the panel ampacity where a majority of non-linear loads are served.

All new switchboards, distribution panels and branch panelboards will be by Square D or Eaton Electrical Inc. (Cutler Hammer products).

208Y/120V branch circuit panelboards will be designed with integral surge suppression and 20A minimum circuit breakers.

Where variable frequency drives are furnished with the equipment, circuit breakers will be mounted in distribution panels.

Horizontal and vertical bus bars in panelboards will be copper.

Panelboard buses will be sized in accordance with the following:

Minimum Bus Sizes:

Panel Type	**Minimum Feeder Size**
480Y/277V Distribution panels	200A
208Y/120V Distribution panels	400A
208Y/120V General branch panels	60A

Voltage drop calculations will be completed as the project design develops. Feeders and branch circuit conductors will be sized to minimize voltage drop and losses throughout the building.

Short circuit calculations will be completed as the project design is developed based on estimated feeder lengths. The results of the calculations will be used to determine the short circuit ratings for the electrical equipment. The equipment will be fully rated for the available fault current at each location.

Design voltages will be as follows:

Motors 1/2 HP and larger	460V, 3-phase, 3-wire
Motors smaller than 1/2 HP	120V or 208V, 1-phase
Lighting, interior general	277V, 1-phase
Lighting, exterior	277V, 1-phase

1.5 LOW-VOLTAGE POWER DISTRIBUTION (600V AND LESS) – EMERGENCY POWER SYSTEMS

A new 100 kW/125 kVA 480Y/277V, 3 phase, 4 wire, natural gas generator will be provided for each middle school. The generator will serve life safety loads, such as emergency lighting, and will also serve standby loads such as the battery-backed fire alarm system, kitchen freezers, refrigerators and technology equipment racks. The generator will be located in an exterior screen wall enclosure and it will be specified with a Level II sound-attenuating weatherproof housing. Separate transfer switches will serve the life safety and standby loads per code.

1.6 RACEWAYS, BOXES AND CONDUCTORS

Branch and feeder conductors will be Type THHN/THWN or XHHW stranded copper in conduit with a minimum size of #12 AWG for power and lighting. Threaded plastic or nylon insulated wire nuts will be used for conductors #10 AWG or smaller. Pre-insulated mechanical connectors will be used for conductors larger than #10 AWG.

The minimum conduit size will be 1/2". Rigid, galvanized, threaded conduit will be used for main building feeders and where subject to physical damage, such as in storage rooms below 8'-0" AFF. Electrical metallic tubing (EMT) with set-screw fittings will be used in interior partitions and above suspended ceilings. For branch circuits, MC Cable will be used above lay-in ceilings for final connections to light fixtures, and concealed within walls for final connections to receptacles, 8-foot maximum length, as permitted by Portage Public School District standards.

A dedicated neutral conductor will be provided for each new 277V and 120V phase conductor.

Connections to vibrating equipment will be made with liquid-tight flexible metallic conduit.

Large, flexible spaces will be provided with floor boxes for power and communications as required.

1.7 GROUNDING

All equipment and non-current carrying metal parts of the electrical system will be grounded in accordance with the NEC. An equipment grounding conductor will be routed with the circuit conductors for all feeders and branch circuits.

1.8 WIRING DEVICES

New receptacles will be 20 ampere, 125 volt, NEMA 5-20R configuration, back wired specification-grade type with brushed stainless steel cover plates.

Ground Fault Circuit Interrupter (GFCI) receptacles will be used outdoors, in toilet and locker rooms, within 6 feet of sinks and other water sources, and at other locations as required by the NEC.

Electric water coolers and vending machines will be connected to GFCI circuit breakers for ease of test/reset.

Exterior receptacles will be weather resistant-type (labeled "WR") and will be provided with While-In-Use cast aluminum wet location covers.

1.9 POWER STUDIES AND TESTING

The contractor will be required to hire a qualified electrical testing agency to prepare a Fault-Current and Overcurrent Protective Device Coordination Study for review and approval. The study will not include Arc Flash Hazard analysis.

Third-party testing, including thermographic scanning, will be required for all electrical distribution equipment.

1.1 LIGHTING SYSTEMS

The lighting load density for the North and Central Middle Schools will be designed in accordance with ASHRAE 90.1-2007.

Interior spaces in the building will be provided with lighting fixtures designed to enhance the aesthetics of the architectural design and to provide adequate illumination levels. The primary fixture types will utilize LED light sources.

LED fixtures will utilize 80+ CRI LEDs and electronic drivers. Dimming LED drivers will be 0-10V type with a minimum dimming level of 10% light output, except where lower minimum dimming levels are required.

General classroom lighting will consist of linear recessed fixtures, to provide glare-free illumination. The general classroom lighting design will complement the architectural daylighting design by providing IES recommended light levels, of 30-50 foot candles. Light fixtures will be arranged in rows and zoned appropriately to match the needs of individual classrooms. Additionally, 0-10V dimming will be provided for LED classroom lighting, pending owner approval.

Lab style classroom lighting will consist of linear pendant fixtures with an uplight component. Lighting design in science and art classrooms will be designed to meet higher IES recommended light level requirements of up to 50 foot candles. Light fixtures will be arranged in long rows, to span the length of the classroom. Track lighting will be provided for display walls for exhibition of artwork or projects, where needed. These fixtures will be switched independently from general lighting. 0-10V dimming will be provided for general and display lighting.

Corridor lighting will consist of linear recessed linear fixtures. In areas with ceilings that are open to structure, a pendant-hung fixture will be used. Lighting will be designed to provide 15-20 foot candles. Recessed round downlights will be used in soffits or any areas where there is little room for linear fixtures, and/or more lighting is required.

Break out spaces and collaboration zones, housed within corridors and between classrooms, will consist of linear pendant lighting in open structure ceilings that transition into the general corridor lighting. Floating cloud ceilings will have a combination of decorative lighting and recessed round downlighting to maintain higher light levels more appropriate for complex tasks. The lighting levels in these areas may range from 25-50 foot candles, depending on tasks. Additional and localized lighting controls will be provided in these spaces to help maintain the necessary lighting levels.

Media Center lighting design will consist of linear pendant fixtures with an uplight component. Lighting will be designed to meet IES recommended light levels of 40-50 foot candles, and daylighting will be taken into consideration. Specialty spaces within the Media Center will have lighting that varies from the rest of the space, and will be designed with higher light levels necessary for more complex tasks.

Performance Area lighting will consist of recessed and pendant hung linear light fixtures to provide general ambient illumination. The current scope does not include specialty lighting or theatrical lighting for the performance area.

Office, conference and administrative spaces will consist of linear and square recessed fixtures, to provide glare free illumination. Lighting levels will be designed to meet IES recommended levels of 30-50 foot candles. Accent lighting, in the form of recessed wall wash fixtures and/ or track lighting, will be utilized in administrative areas where suitable.

Gymnasium lighting design will consist of pendant hung fixtures. Light fixtures in the Gymnasium will have diffusion lenses to help control glare and reflection of light on the wood floor surface. All fixtures in the Gymnasium will be protected with a cage or wire guard, to help prolong the life of the fixtures. Lighting will be designed to meet IES recommended light levels of 50 foot candles. Locker rooms will be designed with standard linear fixtures to meet IES recommended lighting levels of 20-25 foot candles.

Cafeteria lighting design will consist of pendant hung fixtures, and lighting levels will be designed to 25-40 foot candles. Adjacent kitchen lighting will consist of recessed lensed fixtures to meet various light level recommendations, up to 50 foot candles.

The lighting design for Toilet Rooms will consist of recessed downlight fixtures for general walkway illumination and accent fixtures over mirrors for additional vertical lighting. Lighting levels will be designed to 15-25 foot candles.

Mechanical and electrical rooms will utilize chain-hung lensed LED strip fixtures. These will be of rugged quality.

Specialty lighting will be provided in entranceways, vestibules, the Commons, and in areas with wood ceilings. Lighting will consist of pendant hung decorative, perimeter and accent fixtures, in correlation with general lighting, to maintain required lighting levels.

All interior light sources will have a color temperature of 3500 Kelvin. All light fixtures will be independently supported from structure. Fixtures will be of specification grade with a minimum 5 year warranty. Maintenance needs will be taken into consideration with all pendant and recessed fixtures.

All exit signs will be LED type, AC only, with die-cast housings.

Exterior lighting will consist of wall mounted fixtures and recessed soffit fixtures with LED light sources. Area lighting may consist of pedestrian scale lights with LED light sources. All exterior light sources will have a color temperature of 4000 Kelvin.

Pole heights for parking lot and site lighting will be designed per the local ordinance.

1.2 EMERGENCY LIGHTING

Emergency lighting will be powered from a new on-site natural gas generator. LED light fixtures will be utilized for egress lighting. Generator-backed night lights will be provided in the corridors to provide minimal lighting when general lighting in the corridor is in the "Off" position. Emergency lighting will be provided in the following areas:

- All paths of egress
- Performance Area
- Athletics Area
- Gymnasium
- Cafeteria
- Commons
- Media Center
- Conference rooms
- Toilet rooms
- Locker rooms
- Mechanical and electrical rooms
- Enclosed multi-occupancy offices
- Laboratory spaces
- Windowless classrooms
- Any student occupied rooms over 1000 ft²
- Outside legally-required egress doors

Maintained emergency lighting levels will not be less than 1 foot-candle average. The minimum emergency lighting level will be 0.1 foot-candle, and the maximum-to-minimum foot-candle ratio will not exceed 40:1.

Emergency lighting transfer devices will be required (one per switchleg), to turn generator-backed emergency lights on in the event of utility power failure.

1.3 LIGHTING CONTROL SYSTEMS

In corridors, large gathering spaces and other paths of egress, unswitched night lighting will be provided to maintain a minimum lighting level of 1 footcandle 24 hours per day. The remaining lights in these spaces will be controlled through the lighting relay panel and the Building Management System (BMS).

Classroom lighting control will consist of dimmable switching, with the front row of lights being zoned independently from the rest of the classroom. This will offer faculty the opportunity to control the lighting closest to the teaching wall separately from the remaining rows.

Occupancy sensors will be used as required to meet the requirements of ASHRAE in classrooms and other smaller discreet rooms, except in Mechanical and Electrical rooms. Small spaces will use wall mounted occupancy sensor switches. Larger spaces will use ceiling-mounted sensors. Occupants in each space will have the ability to control their own lighting with localized switching. These switches will vary from room to room, but in general, every classroom space will have at least (2) zones of independent control. The lighting and occupancy sensors in these rooms will not be connected to a lighting control panel.

Corridor lights will be controlled by the building automation system through the lighting control system. Additional collaboration zones within corridors will have localized switching for additional and/or specialty lighting. Occupancy sensors will not be used in corridors.

Daylight harvesting, via photocell sensors and the lighting control system, will be provided where feasible.

Night lighting will be strategically located at stairway entrances, stairways, vestibules and areas that require security cameras, as required for proper camera operation.

Exterior lighting will be controlled through the building automation system with a photocell.

Occupancy sensors and other automated lighting control systems will not be used in potentially hazardous spaces, such as electrical rooms, mechanical rooms, and elevator control and maintenance areas.

Classrooms, offices, conference rooms and other smaller spaces with dimmable LED lighting will have manual 0-10V dimming control switches for a 10% minimum dimming level. Larger gathering spaces with dimmable lighting will have low-voltage touch screen, pre-set or fader stations for manual dimming control.

1.4 FIRE ALARM SYSTEM

A new addressable fire alarm system with voice evacuation capability will be provided per NFPA requirements. Notification will be by speaker/strobes and strobes. The Fire Alarm Control Panel will be provided with network interface and with an auto dialer connected to dedicated phone lines for remote notification.

The main fire alarm panel will be located in the main office and a remote annunciator panel will be located at the fire department point of entry.

System programming will be such that dirty smoke detectors will generate a trouble signal in lieu of an alarm condition.

The FA system will interface with the BMS system to indicate position of dampers.

Throughout each building, addressable pull stations, strobes and speakers/strobes will be provided.

Photoelectric smoke detectors will be provided in electrical rooms, telecommunications rooms, and storage areas. Heat detectors will be provided in mechanical rooms.

Duct smoke detectors will be installed in mechanical air handling units and in all ducts with smoke dampers.

Fire protection system tamper and flow switches will be monitored by the fire alarm system.

Fire alarm wiring will be installed in conduit, except that plenum-rated fire alarm cabling may be routed in j-hooks above accessible ceilings. Fire alarm wiring will be red in color.

1.5 COMMUNICATIONS AND AUXILIARY SYSTEMS

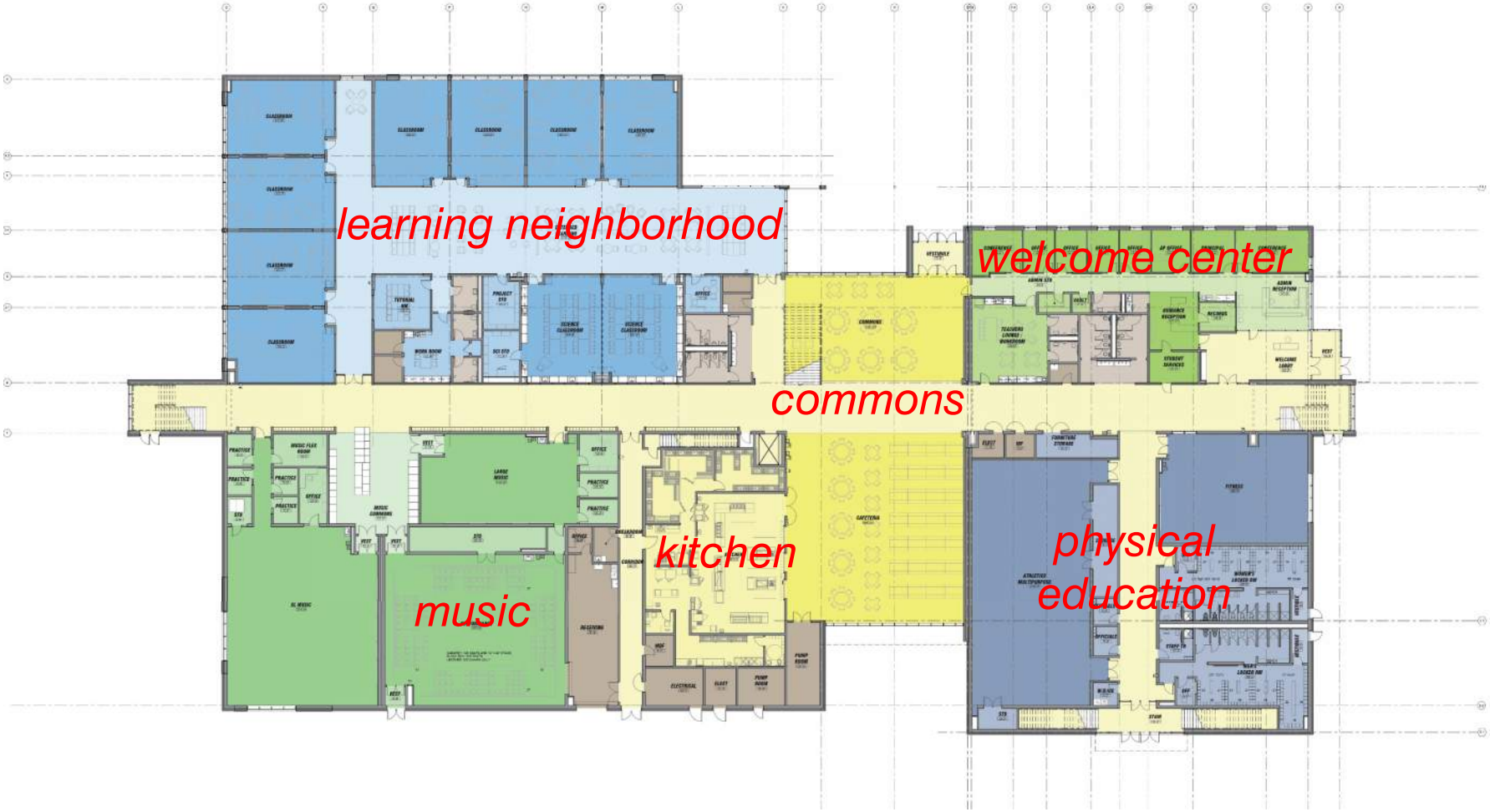
Raceways and boxes will be provided for the following communications and auxiliary systems:

- Fiber optics, interior and exterior
- Structured cabling
- Audio-visual systems
- Digital signage
- PA/Clock/Bell systems
- Access control
- Video surveillance systems

The minimum conduit size for communications systems will be 1-inch.

1.6 LIGHTNING PROTECTION

A lightning protection system will not be provided.



Level 01

Portage Public Schools
THE FUTURE LEARNS HERE

Owen Ames Kimball
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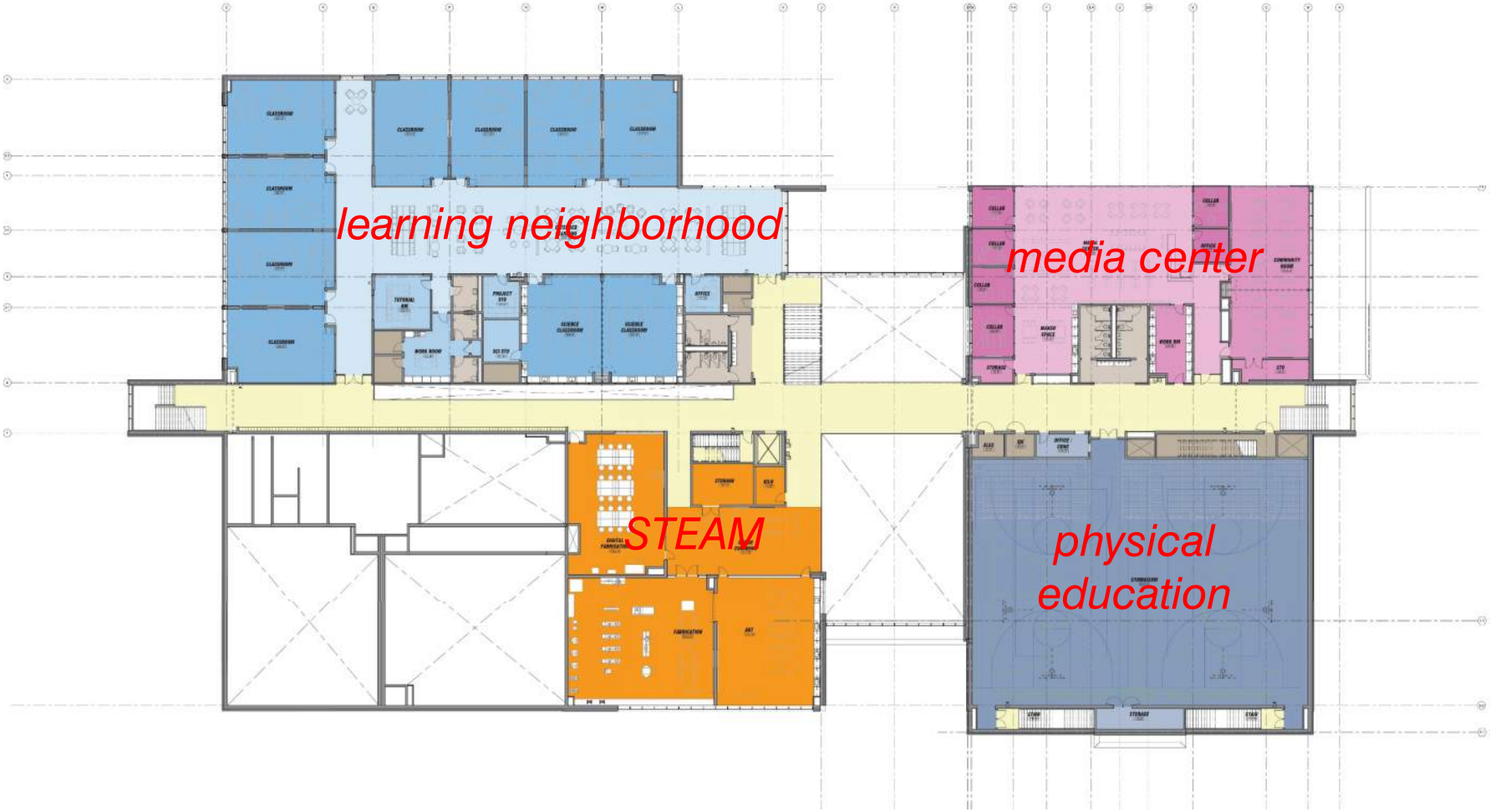
Stantec



Level 02

Portage Public Schools
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Level 03

Portage Public Schools
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Central Campus looking West from High School

Central Campus looking South East from Westnedge

Central Campus looking North East from fields