7 Narrative Building Systems Descriptions

Attached are Narrative Building Systems Descriptions from the Civil, Structural, Technology and MEPFP consultants. These elements are reflected in the plans, elevations, sections, details, MA-CHPS scorecard and the cost estimates.

PROPOSED SITE UTILITY NARRATIVE
LONGMEADOW HIGH SCHOOL
LONGMEADOW, MASSACHUSETTS
Nitsch Project #7582
January 22, 2010

Nitsch Engineering has reviewed the existing utilities and the conceptual layouts for the Longmeadow High School in Longmeadow, Massachusetts. As indicated in the existing conditions study, the onsite utilities were installed in the 1950s under material specifications and design guidelines that generally do not meet today's standards. The following narrative describes Nitsch Engineering's proposed design conditions and sustainable site recommendations.

STORM DRAINAGE

The proposed stormwater system will be designed to meet the Department of Environmental Protection's Stormwater Standards including water quality treatment, recharge requirements, and mitigation of increased rate of runoff from the proposed increase in impervious area. The proposed design will also attempt to achieve MACHPS credits for stormwater management. The existing vitrified clay pipe will be replaced with corrugated plastic pipe (CPP) or reinforced concrete pipe (RCP) and new catch basins and manholes with deep sumps will be installed. The on site soil is predominately sand indicating a high drainage rate.

Bioretention basins are proposed in the main parking area. These basins will provide stormwater quality treatment, as well as allow for infiltration and groundwater recharge. Stormwater runoff from vehicular pavement areas not collected in the bioretention basins will be treated by water quality structures. Infiltration trenches of perforated CPP pipe and crushed stone is proposed to infiltrate stormwater runoff from the new roof. The water not infiltrated by this trench, in addition to water collected across the site, will be directed into an underground infiltration bed and surface detention basins.

WATER

The existing water line servicing the building is a 6-inch concrete lined cast iron. The existing line will be replaced with a new 8-inch ductile iron line that is looped throughout the site and maintains connections to Grassy Gutter Road and Bliss Road. An additional 8-inch water service is proposed from Williams Street. New hydrants will be installed to adequately service the site.

SEWER

The existing sewer services on site are made from vitrified clay pipe. The services will be replaced and constructed of polyvinyl chloride (PVC) pipe. A grease trap is proposed for treatment of kitchen waste. The proposed sewer service will be connected to the existing sewer main in Williams Street.

STRUCTURAL NARRATIVE

STRUCTURAL – GENERAL (Refer to Schematic Design Structural Drawings)

The proposed, two-story addition will be constructed on a sloping site (generally downwards to the southwest; approximately 7 feet), to the south of the existing 1971 wing. Program elements at the First Floor of the new addition include the Gymnasium, the Auditorium (with Band and Choral rooms), the Kitchen and Café, the Media Center, Administrative Offices and Art and Music Rooms (all in Part B - Auditorium/Gymnasium/Art-Music Wing), as well as classrooms in Part C (Classroom Wing). The Second Floor of the addition (Part C) will primarily be classrooms. An elevator will be provided at the interface of Parts B and C. A partial Basement (Mechanical Room) is planned along the east side of the addition, to the south of the Café. The total area of new construction is approximately 185,000 square feet.

The 1971 wing, approximately 52,000 square feet in area, will be renovated and remain in service. Program elements in the renovated 1971 wing will include the Natatorium, Physical Education Teaching Stations (in the present Media Center space), a reduced Business Technology Center (BTC) and School Department offices at the north end of the wing.

The First Floor elevation of the new addition will be set approximately 3 feet below the floor elevation at the south end of the 1971 wing; a transition zone (with ramps and/or possibly a small lift) will be provided to facilitate the change in elevation.

An outdoor terrace will be constructed along the southeast perimeter of the Part B (adjacent to the Art and Music Rooms); a cantilevered site wall (retaining approximately 7 feet of soil) will be required. A small, basement level Equipment Storage room will be located on the south side of Part B, to the west of the terrace.

The original high school building and the 1958, 1963 and 2000 additions will be demolished and removed from the site to clear the way for a new parking/drop-off area, servicing the new building. Demolition/new construction and renovation work in the 1971 wing will be phased. A temporary exterior wall will be required where the southern section of the original (1958) south wing (expanded in 1963) will be removed in Phase 1, to accommodate the new construction.

The new addition will be steel framed, for reasons of economy, performance, flexibility and speed of construction. A composite structural steel floor system is proposed, as it exhibits superior stiffness, vibrational characteristics, fire resistance and less structural depth, compared to other steel floor framing systems. Floor framing will be wide flange steel beams and girders, acting compositely with cast-in-place concrete floor slabs on steel deck. Shear studs will be field welded to the beam/girder flanges to achieve composite action with the floor slab. The roof will be steel framed as well, with steel roof deck supported by wide flange steel beams and columns (no concrete slab). Longspan steel joists will be used at the Gymnasium and Auditorium roofs to economically achieve the long span, column free spaces. Typical columns will be rectangular hollow steel tube sections. Lateral stability for wind and seismic loads will be provided by steel bracing in each direction. Floor and roof steel framing will be surface prepped and be shop primed, except at areas that will be fire protected.

Foundations are expected to be conventional shallow spread footing construction (per the *Preliminary Foundation Engineering Report* of October 7, 2009, prepared by McPhail Associates, Inc.), with concrete slabs on grade at the Lower First Floor. It is assumed that existing utilities within the footprint of the addition will be removed and relocated to accommodate the new construction. It is not expected that rock will be encountered in the general building excavation.

Exterior wall construction will be a mixture of glazing and steel stud cavity wall construction with a brick veneer. Continuous, galvanized steel relieving angles will be provided at the heads of continuous and/or wide windows to support the brick veneer above. Elsewhere, galvanized steel loose lintels will be provided.

STRUCTURAL - BASIS OF DESIGN

Codes and Design Standards:

Building Code:	Massachusetts State Building Code (780 CMR) - Seventh Edition.
Structural Steel:	AISC "Specification for Structural Steel Buildings" and AISC "Code of Standard Practice".
Concrete:	ACI 318 and ACI 301; latest editions.

Design Loads/Parameters:

Live Loads

Classrooms (with partition allowance):	80 PSF
Corridors:	80 PSF
First Floor Corridors and Open Plan Areas:	100 PSF
Stairs:	100 PSF
Mechanical Areas:	150 PSF

Snow Loads

Basic Ground Snow Load (Longmeadow):	55 PSF

Wind Loads

Wind Speed (Longmeadow):	100 MPH

Seismic Parameters

Short Period Spectral Response Acceleration(S_s):	0.23
1.0 Sec. Spectral Response Acceleration (S_1):	0.065
Seismic Use Group:	II
Seismic Design Category:	C
Site Class:	D (Preliminary)
Structural System:	Building Frame System
Lateral Load Resisting System:	Concentrically Braced Frames (*Not Specifically Detailed for Seismic Resistance)*
Response Modification Factor (R):	3.0
System Overstrength Factor (Ω_0):	3.0
Deflection Amplification Factor (Cd):	3.0

Foundations:

The preliminary foundation design is based on an allowable bearing capacity of 4.0 kips per square foot (2.0 TSF) on natural soils or on compacted structural fill, as recommended in the *Preliminary Foundation Engineering Report* of October 7, 2009, prepared by McPhail Associates, Inc.

Construction Classification:

Part B of the new building (Auditorium/Gymnasium/Art-Music Wing) is expected to be Type 1B Construction (Noncombustible, Protected). Structural steel floor and roof framing, steel bracing and steel roof deck require fire protection to achieve the required rating (2 hours for floors and 1 hour for roofs). Concrete floor slabs on steel deck do not require fire protection. Roof construction at the double-height, Gymnasium and Auditorium spaces will be at least 20 feet above the floor below and will not require protection. Columns which support this framing; however, will require protection (1 hour). A fire wall will be provided, separating this wing from the two-story Classroom Wing (Part C) to the west. The Classroom Wing will be classified at Type 2B Construction (Noncombustible, Unprotected). A fire wall will also be required between the 1971 wing and the new addition. The steel framed, 1971 addition (Part A) is also expected to be classified as Type 2B Construction. All new and existing steel framed construction is considered to be *restrained.*

Sustainable Design Considerations:

Sustainable design considerations will be incorporated into the building design; it is intended that the project will comply with the provisions of the Collaborative for High Performance Schools, *Massachusetts High Performance Green School Guidelines: Criteria.* No green roof areas are proposed.

GROUP A – SUBSTRUCTURE (Refer to Schematic Design Structural Drawings)

A10 Foundations:

Preliminary borings indicate that subsurface soils are typically sands with a trace of silt. The natural sands are overlain by a layer of fill or subsoil, and topsoil. Foundations for the new addition will consist of individual spread footings (at columns) and continuous strip footings (at walls), similar to the existing foundation construction. All foundation walls and footings will be cast-in-place, reinforced concrete. The preliminary foundation design is based on an allowable bearing capacity of 4.0 kips per square foot (2.0 TSF) on natural soils or on compacted structural fill, as recommended in the *Preliminary Foundation Engineering Report* of October 7, 2009, prepared by McPhail Associates, Inc. Based on the location of the building, the site topography and the expected subsurface soils conditions, it is anticipated that soil cuts of as much as 5 feet in depth and the placement of structural fills as much as 10 feet in thickness will be required.

Exterior grades at the southwest corner of the Classroom Wing (Part C) will be approximately 7 feet below the First Floor level; accordingly, a cantilever foundation wall will be provided to facilitate backfilling below the slab on grade.

Groundwater was encountered at 12 to 22 feet below the ground surface and is not expected to be an issue during construction or in service. Foundation and/or underslab drainage systems will not generally be required, as there are no basement areas. However, perimeter and underslab drainage will be provided at the (partial) Basement Mechanical Room, as recommended in the *Preliminary Foundation Engineering Report.*

Refer to the *Preliminary Foundation Engineering Report* for additional information regarding site conditions, site preparation, foundation construction and drainage issues.

A1010 Standard Foundations:

- Typical perimeter frost wall: *14" thick, with an 8" wide masonry shelf with horizontal and vertical reinforcing each face (4.0+/- psf). The outside surface of perimeter foundation walls should receive a trowelled-on bituminous mastic.*

- Typical perimeter frost wall continuous footing: *2'- 0" wide, by 12" deep, with continuous reinforcing bars, plus dowels to the foundation wall (10.0+/- plf). The bottom of the footing will be placed 4'- 0" minimum below the exterior finish grade for frost protection.*

- Cantilever retaining walls (southwest corner of Part C and Part B exterior Terrace site wall): *14" thick, with horizontal and vertical reinforcing each face (8.0 +/- psf).*

- Cantilever retaining wall continuous footing: *7'-6" wide, by 1'-8" deep, with 8.0 psf reinforcing. The bottom of the footing will be 4'-0" below the exterior finished grade.*

- Typical, average interior column footings: *6'- 6" x 6'- 6" x 1'- 8" deep, with 350 pounds of reinforcing. The bottom of the footing will be approximately 2'- 8" below the First Floor slab on grade.*

- Typical, average perimeter column footings: *5'- 0" x 5'- 0" x 1'- 6" deep, with 165 pounds of reinforcing. The bottom of the footing will be approximately 4'-6" below the exterior finish grade.*

- Piers/pilasters at interior/perimeter columns: *22 inches square, reinforced concrete with 35 plf reinforcing.*

- Anchor Bolts: Anchor bolts at column base plates shall conform to ASTM F1554 – Grade 36 and shall be headed type. Provide a minimum of four (4), ¾" diameter anchor bolts at all columns; additional bolts and/or larger diameter will be required at bracing locations.

A1020 Special Foundations:

- Elevator pits: Elevator pit construction will consist of 12" thick, reinforced concrete walls and an 18" thick, reinforced concrete foundation mat, with a sump pit. Waterstops will be provided at all construction joints and all interior surfaces of the elevator pit will be waterproofed. Elevator shaft walls will be 100% solid grouted, reinforced CMU construction (8" thick).

- Additional special foundation work will be required at the 1971 wing (e.g. underpinning of existing slabs/foundations along the western edge to frost depth, etc.), as described later in this Specification.

A1030 Slabs On Grade:

First Floor Construction will typically be a 5" thick concrete slab on grade, reinforced with welded wire fabric. The slab will be underlain by a vapor barrier, rigid insulation and 6" of compacted gravel fill. Saw cut control joints (1.25" deep) will be provided in each direction on each column line. Full depth isolation joints will be constructed around columns.

The Auditorium floor will be a sloping, concrete slab on grade (low point approximately 3 feet below the First Floor elevation). The Auditorium slab will be reinforced with No. 4 bars at 12" o.c. in each direction. Reinforced concrete retaining walls will be required at the front of the stage and along the sides of the sloping floor slab.

- Welded wire fabric for slabs on grade: *6x6-W2.9xW2.9.*

- Slab On Grade Thermal Insulation: *R=5 extruded polystyrene foamed plastic board.*

- Slab On Grade Vapor Retarder: *ASTM E1745 Standard for Specification for Water Vapor Retarders Used In Contact With Soil or Granular Fill Under Concrete Slabs; Class A.*

A20 Basement Construction:

B2020 Basement Walls:

- Full height basement foundation walls (Mechanical Room and Equipment Storage): *12" thick, with horizontal and vertical reinforcing each face (5.5+/- psf).*

- Typical, basement foundation wall continuous footing: *2'- 0" wide, by 12" deep, with 2 - #5 continuous bars and dowels to the foundation wall. The bottom of the footing will be 2'-0" below the Basement slab on grade.*

- Basement Foundation Wall Dampproofing: *ASTM D1227 Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; Type II , Class I, non-asbestos fibers.*

GROUP B – SHELL (Refer to Schematic Design Structural Drawings)

B10 Superstructure:

Structural Bays/Spans: A 24 foot square planning model has been established for the new building. The typical structural bay size is 24 feet square. Classrooms are generally 24'-0" by 36'-0". In the Classroom Wing (Part C). Interior columns will be located on either side of the east-west corridors, which flank the central (36 foot span), support and breakout spaces. The Gymnasium roof has a clear span of approximately 112 feet. Auditorium roof spans vary (the Auditorium is circular in plan), with a maximum span of approximately 96 feet. Refer to the Schematic Design Structural Drawings for additional information.

Story Heights: The preliminary story height for each level of the Classroom Wing (Part C) has been established at 13'-4", which is compatible with brick coursing. At Part B, roof elevations vary at the Gymnasium, the Auditorium, the Fly space, the Music and Art Rooms and the Entry/Administration area. Refer to the Schematic Design Architectural Drawings for additional information.

Steel Framing Connections: Type 2 simple framing connections (shear only); double clip angles typically.

Columns: Typical columns will be rectangular steel tube (HSS) sections.

Lateral Force Resisting System: Lateral (wind and seismic) forces will be resisted by steel bracing, for reasons of economy, stiffness, reduced structural depth and smaller column sizes. Bracing members will be square or rectangular HSS sections. Brace configurations may include chevrons, inverted chevrons ("V"), or single diagonals in short bays, as required by architectural considerations.

Expansion (Seismic) Joints: A north-south expansion joint will be provided between Part B (Auditorium/Gymnasium/Art-Music Wing) and Part C (Two-story Classroom Wing), to reduce the overall (east-west) length of the addition and to accommodate a fire wall. The new addition (Parts B and C will be separated from the 1971 Wing (Part A) by an expansion joint as well.

Fire Protection: As previously noted, Part B of the new building (Auditorium/Gymnasium/Art-Music Wing) is expected to be Type 1B Construction (Noncombustible, Protected). Structural steel floor and roof framing, steel bracing and steel roof deck require fire protection to achieve the required rating (2 hours for floors and 1 hour for roofs). Concrete floor slabs on steel deck do not require fire protection. Roof construction at the double-height, Gymnasium and spaces will be at least 20 feet above the floor below and will not require protection. Columns which support this framing; however, will require protection (1 hour). A fire wall will be provided, separating this wing from the two-story Classroom Wing (Part C) to the west. The Classroom Wing will be classified at Type 2B

Construction (Noncombustible, Unprotected). A fire wall will also be constructed between the 1971 wing and the new addition. The new addition (Parts B and C) will be fully sprinklered. The steel framed, 1971 addition (Part A) is also expected to be classified as Type 2B Construction. All new and existing steel framed construction is considered to be *restrained.*

B1010 Floor Construction:

Second Floor Construction (Part C): Composite structural steel framing: 4" thick (minimum), normal weight concrete topping slab on a 2" deep, 18 gauge, composite type, galvanized steel floor deck (6" minimum total slab thickness), reinforced with welded wire fabric. Floor framing will consist of composite structural steel members with a typical beam spacing of 8 feet on centers. All composite steel framing will be *unshored.* Composite action will be achieved by field welding ¾" diameter x 4½" long headed shear studs through the deck, to the top flanges of the beams and girders. To avoid compromising composite action, conduit or other, similar embedded items *should not* be placed in the concrete slab on steel deck construction. Slabs on composite steel floor deck will be placed at the required elevation, adding concrete to compensate for the deflection of the (unshored) steel framing (assume an approximate *average* of .75" of additional concrete required over the structural bay). Refer to the Schematic Design Structural Drawings for additional information.

- Welded wire fabric for slabs on steel deck: *6x6-W2.9xW2.9.*

- The estimated total weight of structural steel for the Second Floor of the new building (based on 46,000+/- gross square feet of total new framed floor area), including beams, columns, bracing, plates, angles, relieving angles, miscellaneous frames, connections, etc. is ***320+/- Tons.***

- Headed Shear Connectors (shear studs): *Assume 23 shear connectors per 100 square feet of concrete slab on steel deck floor area.*

B1020 Roof Construction:

Typical, flat roof construction for the addition will consist of a 1½" deep, Type WR, 18 gauge galvanized steel roof deck spanning 8 feet (maximum) to wide flange steel beams. Steel beams are typically supported by wide flange steel girders and steel tube columns (HSS).

Three, raised pyramidal roof structures (approximately 42 feet square) with glazed perimeter walls will be constructed at the Classroom Wing (Part C) to introduce natural light to the Second Floor below.

At the Gymnasium, steel roof deck will be the cellular acoustic type (1½" deep, 20/20 gauge), spanning to special, deep longspan, open web steel joists (5'-4" deep), spaced at 5'-6" +/- o.c. and clear spanning the space (112+/- feet). Steel framing for the Gymnasium roof will be Architecturally Exposed Structural Steel (A.E.S.S.). Continuous light monitors are proposed for the Gym roof, along all four perimeter edges of the space. Monitors will be framed with a 1½" deep, 20/20 gauge cellular acoustic steel roof deck supported by light steel HSS frames spaced at 5'-6"+/- feet on centers. In view of the potential for ponded rainwater, either scuppers (extending from the roof area, through the monitors to building exterior) or an independently piped system of overflow roof drains will be required. The sloping roof of the Art and Music Room section of Part B, will be raised above the main roof at the north end and a vertical, glazed exterior wall will be provided to introduce natural light into the space below. Skylights will be provided in the main roof, surrounding the Gymnasium and Auditorium spaces. As the light monitors and skylights will interrupt the steel deck diaphragm, horizontal steel rod bracing will be required at selected locations to interconnect roof planes across the openings.

The Auditorium will be framed in a manner similar to the Gymnasium, with 1½" deep, Type WR, 20 gauge galvanized steel roof deck spanning 6+/- feet to deep longspan, open web steel joists (5'-0" deep maximum). Joists span 96+/- feet maximum and are supported by wide flange steel beams. The fly space at the stage will extend above the Auditorium roof and be framed with steel beams and steel deck.

Wherever practical, roof drainage will be achieved by sloping the steel. Some areas of tapered insulation should be anticipated where it is not practical to slope the steel. Continuous, bent steel plates will be installed around the entire roof perimeter to support the roof edge and blocking.

Rooftop mechanical units (with manufacturer's standard curbs) will be supported directly on the roof structure. There will be no Mechanical Penthouse(s) or equipment screens.

Roofing will be a lightweight, adhered membrane system.

- The estimated total weight of structural steel for the various roof areas of the new building (based on 139,000+/- gross square feet of total new framed roof area), including beams, columns, bracing, plates, angles, relieving angles, miscellaneous frames, connections, etc., but excluding entry canopies is ***755+/- Tons.***

- The estimated weight of longspan steel joists and accessories is ***120+/- Tons***

B20 Exterior Enclosure:

B2010 Exterior Walls:

Exterior walls for new addition will be a mixture of glazing and steel stud/brick veneer cavity wall construction. Continuous, galvanized steel relieving angles will be provided at the heads of continuous and/or long windows below the roof and Second Floor levels, to support the brick veneer above. Elsewhere, galvanized steel loose lintels will be provided.

Vertical steel tubes (approximately 2'-8" high), spaced at 6'-0" o.c. and integrated with the steel stud backup wall, will be bolted to the perimeter frost wall at the First Floor to laterally support the brick veneer below the continuous windows.

The steel stud backup will be 16 gauge minimum, designed for an H/600 deflection limitation. Vertical slip joints will be provided in the metal stud backup system at each level. A sunscreen element, integrated with the window system, may be provided at the south-facing exterior walls of the new building.

STRUCTURAL - SCOPE OF WORK AT EXISTING 1971 WING

The 1971 wing, approximately 52,000 square feet in area, will be renovated and remain in service. Program elements in the renovated 1971 wing will include the Natatorium , Physical Education Teaching Stations (in the present Media Center space) a reduced Business Technology Center (BTC) and the School Department offices at the north end of the wing.

Renovations to the 1971 wing will be subject to provisions of 780 CMR 34.00 (*Existing Structures*) of the Massachusetts State Building Code (7th Edition). Five (5) levels of structural work are defined in the code. More extensive renovations and structural alterations to buildings which have minimal lateral load resistance are classified as higher level renovations and require considerably more structural work/cost. A preliminary review of the 1971 wing and the proposed renovations and alterations suggests that the renovation will be classified as *Level 1.* This conclusion is based on revisions to 780 CMR 34.0 that were approved by the BBRS on August 20, 2009. Special seismic hazards and minimum lateral load resistance requirements are not applicable to *Level 1* renovations.

The scope of structural work in the 1971 wing is expected to be limited in nature. New roof openings and supports for HVAC equipment will be required, as well as minor modifications to existing structural elements to accommodate MEP/FP distribution systems. The preliminary cost estimate should include a line item to cover this work.

Portions of the western edge of the 1971 wing adjoin the original (1954) building and the 1958 additions. As these areas are presently interior conditions, the edge of the slab on grade terminates with a downturned, concrete haunch or a grade beam (bottoms at 2'-0" to 2'-6" below the top of slab). Upon demolition of the adjacent, 1954 and 1958 construction, these sections will become exterior and will be exposed cold temperatures (frost concerns). Accordingly, underpinning of the existing slab/foundations to frost depth or the construction of a new foundation wall with 4'-0" minimum soil cover to the bottom of the footing will be required (approximately 200 linear feet total). New exterior wall construction in these areas (brick veneer with a steel stud backup) will be supported on the modified existing foundations and/or the new foundation walls.

With reference to the August 31, 2009 *Existing Conditions Structural Report*, prepared by FBRA, cracking/deterioration in the veneer of the 1971 addition (possibly moisture related) was observed during our July 30, 2009 visit to the site. Areas steel lintel corrosion, mortar joint deterioration, failed caulking, etc. were also observed. FBRA understands that the adhesive for a replacement Sarnafil roof failed approximately 13 years ago, and that a new, properly adhered Sarnafil roof was subsequently installed. Explorations should be conducted to determine if the veneer ties have been compromised due to moisture infiltration. The preliminary cost estimate should include a line item to cover exterior masonry veneer repair work.

Additional structural/structurally related work in the 1971 Wing is expected to include the following:

- Modification of the existing concrete ramp on grade along the west side of the present Media Center.
- Infill of the central, depressed "pit" area of the existing Media Center (2+/- feet deep), with a new, 5" concrete slab on grade placed on polystyrene voids.
- Various structural modifications/additions in the elevator/stair area to the west of the Business Technology Center (Refer to the Schematic Design Architectural Drawings).

STRUCTURAL - OUTLINE SPECIFICATIONS

Concrete:

- All concrete shall be normal weight, 4,000 psi at 28 days, except foundation walls and footings, which shall be normal weight, 3,000 psi and exterior (exposed) concrete (paving) which shall be normal weight, 4,500 psi.
- Portland Cement: ASTM C150, Type I or II.
- Fly Ash: ASTM C618, Class F. Replacement of cement content with fly ash is limited to 20% (by weight). Fly ash is not permitted in exterior, exposed concrete.
- All concrete shall be proportioned with 3/4" maximum aggregate, ASTM C 33, except 3/8" maximum aggregate shall be used at toppings less than 2" thick (e.g. metal pan stairs).
- All reinforcing shall be ASTM A 615 deformed bars, Grade 60.
- All welded wire fabric shall conform to ASTM A 185.

- Reinforcing bars, steel wire, welded wire fabric, and miscellaneous steel accessories shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Submittal Requirements.

- Concrete products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements.

- Cure all concrete by moisture retention methods, approved by Architect; curing compounds shall not be used.

Reinforced Concrete Masonry (Elevator Shaft):

- Masonry construction (elevator shaft) shall conform to ACI 530/ASCE 5/TMS 402 “Building Code Requirements for Masonry Structures”, latest edition.

- Masonry strength, f’m shall not be less than 1350 psi.

- Requirements for load bearing block strength shall be as required for specified masonry strength (f’m) but shall not be less than 2000 psi on the net area of the block.

- Grout shall conform to ASTM C476, Type Fine, and shall be of strength required for specified masonry strength (F’m) but not less than 3000 psi.

- Mortar for reinforced masonry shall conform to ASTM C 270 Type S and shall be of strength required for specified masonry strength (f’m) but not less than 1800 psi.

- Reinforcing bars shall conform to ASTM A 615 Grade 60 deformed bars. Lap all continuous bars 48 diameters.

- Joint reinforcing shall be 9 gauge ladder type conforming to ASTM A 82. Provide prefabricated corners and tees. Walls shall be reinforced horizontally with joint reinforcing at 16 inches on centers unless otherwise noted.

- Reinforcing bar, steel wire, welded wire fabric, and miscellaneous steel accessories shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Submittal Requirements.

- Masonry products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements.

- Elevator shaft walls shall be 100% solid grouted (all cores).

Structural Steel:

- Structural steel shapes shall conform to ASTM A 992, Fy = 50 ksi.

- Steel tubes (HSS) shall conform to ASTM A 500, Grade B, Fy=46 ksi.

- Structural steel plates and bars shall conform to ASTM A 36, Fy = 36 ksi.

- Steel members shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the Submittal Requirements.

- Steel manufactured within 500 miles (by air) of the project site shall be documented in accordance with the Submittal Requirements.

- Anchor Bolts: Anchor bolts at column base plates shall conform to ASTM F1554 – Grade 36 and shall be headed type. Provide a minimum of four (4), ¾" diameter anchor bolts at all columns; additional bolts and/or larger diameter will be required at bracing locations.

- Bolted connections shall be ASTM A 325, Type N (bearing) bolts, except slip-critical bolts shall be used at lateral brace beam connections.

- Shop and field welding shall be AWS D1.1 E70XX electrodes.

- Shear connectors shall be ¾" diameter, 4½" long, headed Nelson studs conforming to ASTM A 108.

- Surface treatment for typical structural steel: SSPC Surface Preparation No. 3 (Power Tool Cleaning). Structural steel shall receive one (1) shop coat of rust inhibitive primer, except those areas to be fireproofed and surfaces to receive field welded shear connectors.

- Structural steel for the Gymnasium Roof shall be Architecturally Exposed Structural Steel (A.E.S.S.) and shall meet the requirements of Section 10 of the AISC manual.

- Surface treatment for Architecturally Exposed Structural Steel: SSPC Surface Preparation No. 6 (Commercial Blast Cleaning). Exposed structural steel shall be primed with a premium architectural primer.

- All exterior, exposed structural steel shall be hot-dip galvanized (e.g. brick relieving angles).

Steel Joists:

- All deep Longspan Steel Joists, joist accessories and workmanship shall be in accordance with Steel Joist Institute (SJI) standards.

- Longspan steel joists shall be shop primed with a primer that is compatible with the finish paint.

Steel Deck:

- Typical steel roof deck shall be 1½" deep, 18 Gauge, Type WR, conforming to ASTM A 653, Grade 33 (minimum), galvanized in accordance with ASTM A 653, coating class G-60. Exposed steel roof deck above the Gymnasium shall be cellular acoustic deck and shall have a factory applied primer on the exposed bottom surface.

- Steel floor deck shall be 2" deep, 18 Gauge, composite type, conforming to ASTM A 653, Grade 33, galvanized in accordance with ASTM A 653, coating class G-60.

- All steel floor deck and roof deck accessories (pour stops, finish strips, closures, etc.) shall be the same finish as the deck; 18 gauge minimum.

- Steel deck shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the Submittal Requirements.

- Steel deck manufactured within 500 miles (by air) of the project site shall be documented in accordance with the Submittal Requirements.

- Provide 14 gauge sump pans at roof drains.

Longmeadow High School
Longmeadow, MA
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HVAC SYSTEMS

NARRATIVE REPORT

The following is the HVAC system narrative, which defines the scope of work and capacities of the HVAC system as well as the Basis of Design.

1. CODES

All work installed under Division D30 shall comply with the Longmeadow Building Code and all state, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

The work of Division D30 is shown on the drawings and specifications. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Heating, Ventilating and Air Conditioning work and all items incidental thereto, including commissioning and testing.

3. BASIS OF DESIGN: (MASS CODE)

Massachusetts Code values are listed herein based on Hampden County values as determined from table 1305.1 chapter 13.

Outside: Winter -1°F, Summer 86°F DB 73°F WB

Inside: 72° for heating 75°F (50% RH) for cooling. Unoccupied temperature setback will be provided.

Generally outside air is provided at the rate of 15 cfm/person in all classrooms and large group spaces, and 15 cfm/person for the combination auditorium, gymnasium and cafeteria. In all cases ASHRAE guide 62.1-2004 and the International Mechanical Code will be met as a minimum. All occupied areas will be designed to maintain 1,000 PPM carbon dioxide maximum.

4. SYSTEM DESCRIPTION

A. Central Heating Plant:
Heating for the entire building will be through the use of (2) gas-fired boilers at approximately 1,800,000 BTUH output operating at a maximum supply water temperature of 180°. The boiler plant shall consist of (1) high efficiency condensing boiler and (1) high efficiency non condensing boiler. [Add Alternate: The non-condensing high efficiency boiler will be provided with dual-fired burner, and a fuel oil tank, piping and specialties will be provided.] The system will supply hot water to all heating apparatus throughout the entire building (including the existing 1971 addition) through a two-pipe fiberglass insulated schedule 40 black steel piping system. The supply water temperature will be adjusted downward based on outside temperature to improve overall operating efficiency of the powerplant. Primary and standby end suction base mounted pumps at 360 GPM each with a variable frequency drive will be provided for overall water system distribution. Combustion air for each boiler will be distributed directly at each boiler through a ducted distribution system from a central roof mounted gas-fired make up air unit. Breeching from each boiler shall be through separate double wall stainless steel design chimneys each discharging approximately 12 feet above the roof level.

B. Central Cooling Plant:

A chilled water powerplant will be provided which will include a single roof mounted outside air cooled liquid chiller of approximately 60 tons capacity. It is proposed that the chiller will be of the high-efficiency design and will distribute between 44° and 54° chilled water to all areas of the building provided with chilled beam distribution systems i.e. Band and Music Area, Cafeteria, Library and Media Center, Administration areas. The chilled water distribution piping will be of the fiberglass insulated schedule 40 type and will be completely separate from the hot water distribution piping system. Primary and standby end suction base mounted pumps at 145 GPM each with a variable frequency drive (which will control down to maintain a minimum flow to the chiller) will be provided for overall water system distribution.

C. Classroom Heating: (Refer to note 1 at end of System Description)

It is proposed that a continuous length of fin tube radiation will be installed along the entire length of the exterior wall in each classroom. The fin tube radiation in each classroom will be controlled by a space mounted thermostat to maintain overall space temperature control.

D. Classroom Wing Ventilation: (Refer to note 1 at end of System Description)

Each classroom will be provided with two individual wall mounted displacement diffusing units between 200 and 300 CFM each (depending on room size). Exhaust air at the same rate as supply air to the space will be returned from each classroom at the center through a central return air system back to the main distribution air handling unit where it will pass through an energy recovery coil.

E. Classroom Wing Ventilation Equipment: (Refer to note 1 at end of System Description)

The primary mechanical ventilation system for the classroom wing will include three roof mounted air handling units of the 100% outside air design. Two (2) units will have a capacity of 10,000 CFM, 35 Tons and 400 MBH heating and one (1) unit will have a capacity of 000 CFM, 30 tons, and 350 MBH heating. The units will include a supply fan, gas fired furnace with modulating gas valve, MERV 13 filtration, air cooled condensing section with evaporator coil for cooling with hot gas reheat for dehumidification and control of supply air temperature, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each classroom which will satisfy building code requirements at a fixed temperature of 68° year-round.

F. Gymnasium:

The main gymnasium will be provided with two roof mounted air handling units of the recirculation design. Each unit will be approximately 12,500 CFM and will include a supply fan, 750 MBH gas fired furnace with modulating gas valve, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed maintaining a maximum of 1000 PPM. Supply air ventilation will be provided to the space through a single galvanized round supply duct which will travel the length of the gymnasium over each court and will be provided with a series of duct mounted supply registers. As levels of carbon dioxide drop generally relating to a reduction in population a variable frequency drive located in each rooftop unit will modulate to reduce air flow and ventilation while always maintaining a maximum of 1000 ppm. Return air will be drawn back to each rooftop unit by a low wall return air registers.

G. Locker Rooms:

The locker rooms will be provided with two roof mounted air handling units of the 100% outside air design. Each unit will be approximately 2500 CFM and will include a supply fan, 150 MBH gas fired furnace with modulating gas valve, MERV 13 filtration, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space through a galvanized supply duct which will travel throughout each locker room area to a series of ceiling mounted supply registers. As levels drop generally relating to a reduction in population a variable frequency drive located in each rooftop unit will modulate to reduce air flow and ventilation while always maintaining a maximum of 1000 ppm.

H. Cafeteria:

The Cafeteria, adjacent Lobby and communicating Corridor will be provided with one roof mounted air handling units of the 100% outside air design. The unit will be approximately 4000 CFM and will include a supply fan, 300 MBH gas fired furnace with modulating gas valve, MERV 13 filtration, 12.5 ton air cooled condensing section with evaporator coil for cooling with hot gas reheat for dehumidification and control of supply air temperature, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space which will satisfy building code requirements based on population. It is proposed that spatial heating and air-conditioning will utilize "active chilled beam technology" (ceiling mounted induction units) which will receive primary ventilation air from the associated rooftop ventilation unit, with hot water and chilled water for the induction system provided by the individual hot water and chilled water central recirculation piping system communicating with the boiler and chilled water power plants.

I. Kitchen:

The kitchen will be provided with one roof mounted Make-up air handling unit of the 100% outside air design. The unit will be approximately 4,000 CFM capacity and will include a supply fan, 600 MBH output gas fired furnace with minimum 4 stage gas valve. Make-up supply air will be provided to the kitchen through galvanized supply duct which will travel above the ceiling to a series of ceiling mounted supply registers located adjacent to the kitchen exhaust hood.

A kitchen exhaust fan with a capacity of approximately 4000 cfm will be provided to serve the kitchen exhaust hood. Exhaust air ductwork constructed of black steel will be provided which will be routed above the ceiling to the kitchen exhaust hood .

A variable volume kitchen exhaust hood control system consisting of kitchen exhaust stack temperature and smoke density sensors, supply and exhaust fan variable speed drives and associated controller will be provided by the kitchen equipment vendor. This system installation shall be field installed and coordinated with the ATC and Electrical contractors.

J. Auditorium:

The auditorium will be provided with one roof mounted HVAC air handling units of the recirculation design. The unit will be approximately 12,500 CFM and 35 tons refrigeration capacity and will include a supply fan, 550 MBH output gas fired furnace with modulating gas valve, MERV 13 filtration, direct expansion cooling with self-contained condensing section. Supply air will be provided to the space through a single galvanized round supply duct which will travel above the ceiling to a series of duct mounted supply registers located above the acoustical clouds. In addition, carbon dioxide controls will be installed which will monitor the overall level of carbon dioxide at a threshold level of 1000 ppm. As levels drop generally relating to a reduction in population a variable frequency drive located in the rooftop unit will modulate to reduce air flow and outside air ventilation while always maintaining a maximum of 1000 ppm. Return air will be drawn back to the rooftop unit by low wall return air registers.

K. Stage:

The stage will be provided with one roof mounted HVAC air handling units of the recirculation design. The unit will be approximately 4000 CFM and 15 tons refrigeration capacity and will include a supply fan, 175 MBH output gas fired furnace with modulating gas valve, MERV 13 filtration, direct expansion cooling with self-contained condensing section. Supply air will be provided to the space through a single galvanized supply duct which will travel above the structural framework supporting stage apparatus to a series of duct mounted supply registers. In addition, carbon dioxide controls will be installed which will monitor the overall level of carbon dioxide at a threshold level of 1000 ppm. As levels drop generally relating to a reduction in population a variable frequency drive located in the rooftop unit will modulate to reduce air flow and outside air ventilation while always maintaining a maximum of 1000 ppm. Return air will be drawn back to the rooftop unit by low wall return air registers.

L. Band and Music Area:

The band and music area will be provided with one roof mounted air handling units of the 100% outside air design. The unit will be approximately 3000 CFM and will include a supply fan, 200 MBH output gas fired furnace with modulating gas valve, MERV 13 filtration, 12.5 ton air cooled condensing section with evaporator coil for cooling with hot gas reheat for dehumidification and control of supply air temperature, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space which will satisfy building code requirements based on population. It is proposed that spatial heating and air-conditioning will utilize "active chilled beam technology" (ceiling mounted induction units) which will receive primary ventilation air from the associated rooftop ventilation unit, with hot water and chilled water for the induction system provided by the individual hot water and chilled water central recirculation piping system communicating with the boiler and chilled water power plants.

M. Administration Area

The Administration area offices will be provided with one roof mounted air handling units of the 100% outside air design. The unit will be approximately 3000 CFM and will include a supply fan, 200 MBH gas fired furnace with modulating gas valve, MERV 13 filtration, 10 ton air cooled condensing section with evaporator coil for cooling with hot gas reheat for dehumidification and control of supply air temperature, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space which will satisfy building code requirements based on population. It is proposed that spatial heating and air-conditioning will utilize "active chilled beam technology" (ceiling mounted induction units) which will receive primary ventilation air from the associated rooftop ventilation unit, with hot water and chilled water for the induction system provided by the individual hot water and chilled water central recirculation piping system communicating with the boiler and chilled water power plants.

N. Media Center

The Media Center and adjacent seminar and teacher rooms will be provided with one roof mounted air handling units of the 100% outside air design. The unit will be approximately 3000 CFM and will include a supply fan, 200 MBH gas fired furnace with modulating gas valve, MERV 13 filtration, 10 ton air cooled condensing section with evaporator coil for cooling with hot gas reheat for dehumidification and control of supply air temperature, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space which will satisfy building code requirements based on population. It is proposed that spatial heating and air-conditioning will utilize "active chilled beam technology" (ceiling mounted induction units) which will receive primary ventilation air from the associated rooftop ventilation unit, with hot water and chilled water for the induction system provided by the individual hot water and chilled water central recirculation piping system communicating with the boiler and chilled water power plants.

O. Alternative HVAC systems Options

As part of an engineering life cycle cost analysis the following HVAC systems have been studied in addition to the systems described above: (1) Classrooms served by unit ventilators with heating, cooling and CO2 demand control ventilation, and (2) Classrooms served by fan coil unit system with heating and cooling and central ventilation system with energy recovery. The following central cooling plant options have also been studied in comparison to the cooling plant system described above: (1) Central high efficiency water cooled chiller with cooling tower, and (2) Geothermal heat pump chiller plant.

P. 1971 Building

School Department Offices, Business Training Center & PE Teaching:

Ventilation:

The three existing air handling units that currently serve the 1971 Building will be converted from constant volume, multi-zone and single-zone units to variable air volume (VAV) units. It is proposed that the existing units are cleaned, steam heating coils are converted to hot water heating coils with face & bypass dampers, and new inverted duty rated fan motors, VFD drives and ATC controls are installed as part of the unit retrofit. The existing ductwork for two of the air handling units shall be re-configured to convert the systems from multi-zone to VAV operation. New VAV terminal boxes with reheat coils will be installed to replace the multi-zone dampers and new room thermostats will be provided. The existing ductwork for all three units shall be re-configured as required to suit the new architectural renovations. New DDC type automatic temperature controls shall be provided for the ventilation systems.

Heating:

The existing steam boiler, accessories, steam to hot water heat exchanger, related controls and existing steam condensate return piping shall be demolished and removed. A new gas-fired condensing boiler, circulator pump, controls and hydronic accessories will be installed to replace the existing steam boiler. The existing low pressure steam supply lines shall be converted for heating hot water supply duty. A new heating hot water return piping main and heating hot water supply branch piping distribution systems will be installed to serve the air handling unit hot water coils, VAV reheat coil and radiation heating equipment. In addition, new hot water supply and return lines from the new addition central hot water boiler plant will be provided to serve as a back-up heating source for the 1971 building heating and ventilation systems

Supplemental heating for the area will be provided by the existing terminal radiation units supplied by the central hot water heating plant. It is proposed that the majority of existing hot water piping that currently serves the 1971 building's radiation heating system is re-used after being cleaned and tested. New hot water supply and return lines from the new central hot water boiler plant will be provided to serve the 1971 building heating and ventilation systems. New DDC type automatic temperature controls shall be provided for the heating unit.

Cooling: The existing 100 Ton water cooled chiller that currently serves the 1971 Building shall be re-used to serve the 1971 building Renovation area. A new roof mounted cooling tower will be required to serve the chilled water plant. New backup chilled water and condenser water pumps and chemical treatment system will also be provided. The majority of the existing chilled water and condenser water lines will be re-used. New piping insulation for the chilled water lines shall be provided after any existing asbestos has been abated. New DDC type automatic temperature controls shall be provided for the chiller plant.

Natatorium: The Natatorium will be provided with a new air handling unit of the 100% outside air design. The unit will include a supply fan, gas fired furnace with modulating gas valve, MERV 13 filtration, energy recovery and dehumidification section for control of supply air temperature, and exhaust air energy recovery wheel. Supplemental heating for the area will be provided by terminal radiation units supplied by the central hot water heating plant.

Locker Rooms: The existing Locker Room areas will be provided with two (2) new air handling unit of the 100% outside air design. The unit will include a supply fan, gas fired furnace with modulating gas valve, MERV 13 filtration, and exhaust air energy recovery wheel. Supplemental heating for the area will be provided by terminal radiation units supplied by the central hot water heating plant.

Note 1:

The proposed displacement ventilation system for the classroom wing is intended to provide a maximum cooling temperature during peak cooling periods of approximately 80°, however, the ventilation air provided will be extremely dry which will be the result of utilizing refrigeration equipment and hot gas reheat to reduce vapor pressure to an extremely low condition of approximately 40 grains of moisture per pound of air and reheating the air to a supply temperature of approximately 68° which will be distributed to each space. The extremely dry condition of the supply air provides the perception of a condition which is cooler than is actually occurring due to the evaporation of moisture to the adjacent air from the occupants of the space.
Considering maximum cooling requirements occur primarily during the months of July and August when the majority of the academic areas are not in use, it would suggest maintaining slightly higher temperatures may not present a discomfit, however, will relate to a substantial operating cost savings and a reduced installation cost which should be considered.

An additional major benefit of utilizing dry air within the building will be the overall reduction of vapor pressure typically present in outside ventilation air during summer months. This reduction in vapor pressure will dramatically reduce the amount of moisture entering the building and the potential of condensation resulting in moisture, and a direct relationship with the formation of mold.

If it is the desire of the client to provide complete air-conditioning for all academic areas and a requirement to maintain a constant 75° space temperature, will result in the deletion of the indicated displacement ventilation system and the application of ceiling mounted induction units a similar to that described for the administration area, library and multipurpose space, and band music area. The air handling units described for the classrooms above will remain of the same design and capacity; however, additional chilling capacity will be required through a secondary chiller. It is proposed that the chiller will be of the high-efficiency design and will distribute between 44° and 54° chilled water to all classroom areas. The chilled water distribution piping will be of the fiberglass insulated schedule 40 type and will be completely separate from the hot water distribution piping system. Primary and standby end suction base mounted pumps with a variable frequency drive (which will control down to maintain a minimum flow to the chiller) will be provided for overall water system distribution.

The results of this option will provide a constant 75° cooling setpoint for all classrooms, along with low stable vapor pressure conditions as described above. Providing full air conditioning in the Classroom areas will increase overall yearly operating costs and will result in an increase in installed costs. Both of these costs have been identified in the Engineering Economic Analysis report.

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ELECTRICAL SYSTEMS

NARRATIVE REPORT

The following is the Electrical system narrative, which defines the scope of work and capacities of the Power and Lighting system as well as the Basis of Design. The electrical systems shall be designed and constructed for ***MA-CHPS*** where indicated on this narrative.

1. CODES

   All work installed under Division D50 shall comply with the Massachusetts State Building Code and all local, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

   The work of Division D50 is as described in this Narrative. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Electrical work and all items incidental thereto, including commissioning and testing.

3. SEQUENCE OF OPERATIONS AND INTERACTIONS

   A. Classroom and corridor lighting will be controlled via “smart panels”, which is achieved through programming self-contained solenoid operated circuit breakers. The control of the circuit breakers shall be by automatic means such as an occupancy sensor in each classroom. The system will be interfaced with the DDC control system for schedule functions. The controllability shall be in conformance with credit ***MA-CHPS credit IEQC 4.2.***

   B. Exterior lighting will be controlled by photocell “on” and “smart panel” for “off” operation. The parking area lighting will be controlled by “zones”.

   C. Emergency and exit lighting will be run through life safety panels to be on during normal power conditions as well as power outage conditions. The emergency lighting system will have time control so that lights are “on” only when building is occupied.

4. DESCRIPTION OF THE SYSTEMS

   A. Electrical Distribution System:

      1. New construction service ratings are designed for a demand load of 10 watts/s.f. The service capacity will be sized for 3000 amperes with 100% rating at 277/480 volt, 3∅, 4wire. New lighting and power panels will be provided to accommodate respective loads. The equipment will be located in dedicated rooms or closets.

   B. Interior Lighting System:

      1. Classroom lighting fixtures consist of pendant mounted direct/indirect fluorescent luminaries with T5HO lamps and electronic ballasts. The fixtures will be pre-wired for dimming control where natural daylight is available and also for multi-level switching. Two daylight zones will be provided in each classroom.

2. Office lighting fixtures will consist of pendant mounted direct/indirect fluorescent luminaries with T5HO lamps and electronic ballasts. Offices on the perimeter with windows shall have daylight dimming controls similar to classrooms.

   In general lighting power density will be 30-40% less than IECC 2006. The power density reduction relates to ***MA-CHPS credit EC1.***

3. Lighting levels will be approximately 30 foot candles in classrooms and offices. The daylight dimming footcandle level will be in compliance with ***MA-CHPS credit IEQC 1.2.***

4. Gymnasium lighting will be comprised of direct fluorescent fixtures with slots for an up light component with T5H0 lamps and electronic ballasts. The fixtures will be provided with protective wire guards. The light level will be designed for approximately 30 foot candles.
   Daylight dimming will be provided within 15 feet of skylights or glazing. Daylight dimming controls will be similar in operation to classrooms.

5. Corridor lighting will be comprised of concealed cove mounted indirect lighting using T5HO lamps and electronic ballasts. The corridor light level will be designed for approximately 20 foot candles. Corridor lighting will be on time clock control and only “ON” during occupied hours. The corridor lighting will have step dimming ballasts controlled by schedule on DDC system.

6. Cafetorium lighting will be pendant direct/indirect fluorescent fixtures with electronic ballasts. The light levels will be designed for approximately 30 foot candles. Daylighting controls will be provided on perimeter light fixtures with 15 feet of glazing

7. Theatrical lights with a dimming system will be provided for performances. Lighting located where daylighting can be accomplished shall be provided with dimming ballast and dimming controls. House lighting in auditorium shall be dimmable fluorescent and controlled by theatrical dimming system.

8. Kitchen and servery lighting will consist of recessed 2’x4’ acrylic lensed gasketed troffers with aluminum frame doors with (3) T5 lamps and electronic ballasts. Light levels will be approximately 50 foot candles.
9. Library lighting will consist of indirect fluorescent fixtures with T5HO lamps and electronic ballasts. Light levels will be approximately 30 foot candles.

10. Each area will be locally switched and designed for multi-level controls. Each classroom, office space and toilet rooms will have an occupancy sensor to turn lights off when unoccupied. Daylight sensors will be installed in each room where natural light is available for dimming of light fixtures. The control system shall be in accordance with ***MA-CHPS credit IEQC 4.2.***

11. The entire school will be controlled with an automatic lighting control system using the DDC control system for programming lights on & off.

C. Emergency Lighting System:

1. An exterior 275 kw natural gas emergency generator with sound attenuated enclosure will be provided. Light fixtures and LED exit signs will be installed to serve all egress areas such as corridors, intervening spaces, toilets, stairs and exit discharge exterior doors. The administration area lighting will be connected to the emergency generator.

2. The generator will be sized to include fire safety systems, boilers and circulating pumps, refrigeration equipment, communications systems, etc.

D. Site Lighting System ***MA-CHPS Credit SC5-2***

1. Fixtures for area lighting will be pole mounted cut-off 'LED' luminaries in the parking area and roadways. Pole heights will be 20 feet. The exterior lighting will be connected to the automatic lighting control system for photocell on and timed off operation. The site lighting fixtures will be dark sky compliant. The illumination level is 0.5fc minimum for parking areas in accordance with Illuminating Engineering Society.

2. Building perimeter fixtures will be 'LED' wall mounted cut-off over exterior doors for exit discharge.

E. Wiring Devices:

1. Each classroom will have a minimum of (2) duplex receptacles per teaching wall and (2) double duplex receptacles on dedicated circuits at classroom computer workstations. The teacher's workstation will have a double duplex receptacle also on a dedicated circuit. Refer to drawings.

2. Office areas will generally have (1) duplex outlet per wall. At each workstation a double duplex receptacle will be provided.

3. Corridors will have a cleaning receptacle at approximately 25 foot intervals.
4. Exterior weatherproof receptacles with lockable enclosures will be installed at exterior doors.

5. A system of computer grade panelboards with double neutrals and transient voltage surge suppressors will be provided for receptacle circuits.

F. Fire Alarm System:

1. A fire alarm and detection system will be provided with battery back-up. The system will be of the addressable type where each device will be identified at the control panel and remote annunciator by device type and location to facilitate search for origin of alarms.

2. Smoke detectors will be provided in open areas, corridors, stairwells and other egress ways.

3. The sprinkler system will be supervised for water flow and tampering with valves.

4. Speaker/strobes will be provided in egress ways, classrooms, assembly spaces, open areas and other large spaces. Strobe only units will be provided in single toilets and conference rooms.

5. Manual pull stations will be provided at exit discharge doors and at each egress stairwell not located at grade level.

6. The system will be remotely connected to automatically report alarms to fire department via an approved method by the fire department.

G. Uninterruptible Power Supply (UPS):

1. Two (2) 12kw, three (3) phase centralized UPS systems will be provided with battery back-up.

2. The system will provide conditioned power to sensitive electronic loads, telecommunication systems, bridge over power interruptions of short duration and allow an orderly shutdown of servers, communication systems, etc. during a prolonged power outage.

3. The UPS systems will also be connected to the stand by generator.

H. Lightning Protection System:

1. A system of lightning protection devices will be provided.

2. The lightning protection equipment will include air terminals, conductors, conduits, fasteners, connectors, ground rods, etc.

5. TESTING REQUIREMENTS

The Electrical Contractor shall provide testing of the following systems with the Owner and Owner's representative present:

- Lighting and power panels for correct phase balance.
- Emergency generator.
- Lighting control system (interior and exterior).
- Fire alarm system.
- Security system.
- Lightning protection system.

Testing reports shall be submitted to the engineer for review and approval before providing to the Owner.

6. OPERATION MANUALS AND MAINTENANCE MANUALS:

When the project is completed, the Electrical Contractor shall provide operation and maintenance manuals to the Owner.

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7. RECORD DRAWINGS AND CONTROL DOCUMENTS:

When the project is completed, an as-built set of drawings, showing all lighting and power requirements from contract and addendum items, will be provided to the Owner.

8. COMMISSIONING

The project shall be commissioned per Section 18000 of the specifications.

9. CCTV

A Closed Circuit TV system will consist of computer servers with image software, computer monitors and IP based closed circuit TV cameras. The head end server will be located in the head end MDF room and will be rack mounted. The system can be accessed from any PC within the facility or externally via an IP address. Each camera can be viewed independently. The network video recorders NVR's will record all cameras and store this information for 21days at 15 images per second (virtual real time).

The location of the cameras is generally in corridors and exterior building perimeter. The exterior cameras are pan-tilt-zoom type.

The system will fully integrate with the access control system to allow viewing of events from a single alarm viewer. Camera images and recorded video will be linked to the access system to allow retrieval of video that is associated with an event.

10. INTRUSION SYSTEM

An intrusion system will consists of security panel, keypads, motion detectors and door contacts. The system is addressable which means that each device will be identified when an alarm occurs. The system is designed so that each perimeter classroom with grade access will have dual tech sensors along the exterior wall and corridors, door contacts at each exterior door.

The system can be partitioned into several zones. Therefore, it is possible to use the Gym area while the remainder of the school remains alarmed.

The system will include a digital transmitter to summons the local police department in the event of an alarm condition

The intrusion system will be connected to the automated lighting control system to automatically turn on lighting upon an alarm.

11. CARD ACCESS

A card access system includes a card access controller, door controllers and proximity readers/keypads. Proximity readers will be located at various locations. Each proximity reader will have a distinctive code to identify the user and a log will be kept in memory. The log within the panel can be accessed through a computer.

The alarm condition will also initiate real time recording on the integrated CCTV System. The system may be programmed with graphic maps allowing the end-user to quickly identify alarm conditions and lock/unlock doors.

The system is modular and may be easily expanded to accommodate any additional devices.

12. PHASING

The Work will be conducted in phases to provide the least possible interference to the activities of the High School.

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PLUMBING SYSTEMS

NARRATIVE REPORT

The following is the Plumbing system narrative, which defines the scope of work and capacities of the Plumbing system as well as the Basis of Design. The Plumbing systems shall be designed and constructed for ***MA-CHPS*** where indicated on this narrative.

1. CODES

   A. All work installed under Section D20 shall comply with the MA Building Code, MA Plumbing Code and all state, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

   A. The work of Section D20 is shown on the drawings and specifications. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Plumbing work and all items incidental thereto, including commissioning and testing.

3. GENERAL

   A. The Plumbing Systems that will serve the project are cold water, sanitary waste and vent system, grease waste system, special waste system, storm drain system, and natural gas.

   B. The Building will be serviced by Municipal water, municipal sewer and storm drainage and natural gas.

   C. All Plumbing in the building will conform to Accessibility Codes and to Water Conserving sections of the Plumbing Code.

4. DRAINAGE SYSTEM

   A. Soil, Waste, and Vent piping system is provided to connect to all fixtures and equipment. System runs from 10 feet outside building and terminates with stack vents through the roof.

   B. A separate Grease Waste System starting with connection to an exterior concrete grease interceptor running thru the kitchen and servery area fixtures and terminating with a vent terminal through the roof. The grease interceptor is provided under Division 2 scope.

   C. Storm Drainage system is provided to drain all flat roofs with roof drains piped through the building to a point 10 feet outside the building.

   D. Drainage system piping will be service weight cast iron piping; hub and spigot with gaskets for below grade; no hub with gaskets, bands and damps for above grade 2” and larger. Waste and vent piping 1-1/2“ and smaller will be type ‘L’ copper.

E. A separate Special Waste System shall be provided starting from a point 10 feet outside the building running thru the science classroom fixtures and terminating with a vent terminal through the roof. Special Waste and Vent piping will be Schedule 40 electric heat fused polypropylene piping, fittings & traps, flame retardant above grade and non-flame retardant below ground.

5. WATER SYSTEM

A. New 4" domestic water service from the yard water system will be provided into a dedicated water service room in the basement of Building B. A meter and backflow preventer will be provided.

B. Cold water distribution main is provided. Non-freeze wall hydrants with integral back flow preventers are provided along the exterior of the building.

C. Hot water temperature will be 140° to serve the kitchen and 120° to serve general use fixtures.

D. Non-potable hot and cold water will be provided to the science classrooms off of the domestic water systems and protected with reduced pressure backflow preventers.

E. Water piping will be type 'L' copper with wrot copper sweat fittings, silver solder. All piping will be insulated with 1" thick high density fiberglass.

6. GAS SYSTEM

A. Natural gas service will be provided for the building and will serve the boilers, domestic water heater, kitchen and roof top equipment.

B. Gas piping will be Schedule 40 black steel pipe with threaded gas pattern malleable fittings for 2" and under and butt welded fittings for 2½" and larger.

7. FIXTURES ***CHPS Credit WC1.1/P&OC5***

A. Furnish and install all fixtures, including supports, connections, fittings, and any incidentals to make a complete installation.

B. Fixtures shall be the manufacturer's guaranteed label trademark indicating first quality. All acid resisting enameled ware shall bear the manufacturer's symbol signifying acid resisting material.

C. Vitreous china and acid resisting enameled fixtures, including stops, supplies and traps shall be of one manufacturer by Kohler, American Standard, or Toto. Supports shall be Zurn, Smith or Josam. All fixtures shall be white. Faucets shall be Speakman, Chicago or Toto.

D. Fixtures shall be as scheduled on drawings.

1. Water Closet: Toto high efficiency toilet, 1.28 gallon per flush, wall hung, vitreous china, siphon jet. Toto EcoPower sensor oprated 1.28 gallon per flush-flush valve.

2. Urinal: Eco-Tech waterless urinal, wall hung, vitreous china.

3. Lavatory: Toto wall hung/countertop ADA lavatory. Toto EcoPower infra-red, sensor mixing faucet.

4. Sink: Elkay ADA stainless steel countertop sink with Chicago 201A faucet.

5. Drinking Fountain: Halsey Taylor hi-low wall mounted electric water cooler, stainless steel basin.

6. Janitor Sink: 24 x 24 x 10 Terrazo mop receptor Stern-Williams or equal.

8. DRAINS

A. Drains are cast iron, caulked outlets, nickaloy strainers, and in waterproofed areas and roofs shall have galvanized iron clamping rings with 6 lb. lead flashings to bond 9" in all directions. Drains shall be Smith, Zurn or Josam.

9. VALVES

A. Locate all valves so as to isolate all parts of the system. Shutoff valves 3" and smaller shall be ball valves, solder end or screwed, Apollo, or equal.

10. INSULATION

A. All water piping shall be insulated with snap-on fiberglass insulation Type ASJ-SSL, equal to Certainteed 850 System.

11. CLEANOUTS

A. Cleanouts shall be full size up to 4" threaded bronze plugs located as indicated on the drawings and/or where required in soil and waste pipes.

B. Cleanouts for Special Waste System shall be Zurn #Z9A-C04 polypropylene cleanout plug with Zurn #ZANB-1463-VP nickel bronze scoriated floor access cover.

12. ACCESS DOORS

A. Furnish access doors for access to all concealed parts of the plumbing system that require accessibility. Co-ordinate types and locations with the Architect.

13. WATER HEATER ***CHPS Credit EC1***

A. Two gas fired, high efficiency, condensing, sealed combustion unit 9 with storage tank and a thermostatically controlled mixing device to control water temperature to the fixtures.

Longmeadow High School
Longmeadow, MA
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FIRE PROTECTION SYSTEMS

NARRATIVE REPORT

The following is the Fire Protection system narrative, which defines the scope of work and capacities of the Fire Protection system as well as the Basis of Design.

1. CODES

   A. All work installed under Section D40 shall comply with the MA Building Code and all state, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

   A. The work of Section D40 is shown on the drawings and specifications. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Plumbing work and all items incidental thereto, including commissioning and testing.

3. GENERAL

   A. In accordance with the provisions of the Massachusetts Building Code 748 CMR, a school building of greater than 12,000s.f. must be protected with an automatic sprinkler system.

4. DESCRIPTION

   A. System will include a new fire service, double check valve assembly, wet alarm valve complete with electric ball, and a fire department connection meeting local thread standards. Service will be located in the basement of Building B.

   B. System will be a combined standpipe/sprinkler system with control valve assemblies to limit the sprinkler area controlled to less than 52,000 s.f. as required by NFPA 13-2007. Control valve assemblies shall consist of a supervised shutoff valve, check valve, flow switch and test connection with drain. Standpipes shall be provided in the Stage.

   C. All areas of the building including all finished and unfinished spaces, combustible concealed spaces, all electrical rooms and closets will be sprinklered.

   D. All sprinkler heads will be quick response, pendent in hung ceiling areas and upright in unfinished areas.

   E. Fire department valves including 50 foot hose racks and cabinets will be provided on each side of the stage.

5. BASIS OF DESIGN

   A. The mechanical rooms, kitchen, science classrooms, and storage rooms are considered Ordinary Hazard Group 1; library stack areas and stage are considered Ordinary Hazard Group 2; all other areas are considered light hazard.

B. Required Design Densities:

Light Hazard Areas	0.10 GPM over 1,500 s.f.
Ordinary Hazard Group 1	0.15 GPM over 1,500 s.f.
Ordinary Hazard Group 2	0.20 GPM over 1,500 s.f.

C. Sprinkler spacing (max.):

Light Hazard Areas:	225 s.f.
Ordinary Hazard Areas:	130 s.f.

6. PIPING

A. Sprinkler piping 1-1/2" and smaller shall be ASTM A-53, Schedule 40 black steel pipe. Sprinkler piping 2” and larger shall be ASTM A-135, Schedule 10 black steel pipe.

7. FITTINGS

A. Fittings on fire service piping, 2" and larger, shall be Victaulic Fire Lock Ductile Iron Fittings conforming to ASTM A-536 with integral grooved shoulder and back stop lugs and grooved ends for use with Style 009-EZ or Style 005 couplings. Branch line fittings shall be welded or shall be Victaulic 920/920N Mechanical Tees. Schedule 10 pipe shall be roll grooved. Schedule 40 pipe, where used with mechanical couplings, shall be roll grooved and shall be threaded where used with screwed fittings. Fittings for threaded piping shall be malleable iron screwed sprinkler fittings.

8. JOINTS

A. Threaded pipe joints shall have an approved thread compound applied on male threads only. Teflon tape shall be used for threads on sprinkler heads. Joints on piping, 2" and larger, shall be made up with Victaulic, or equal, Fire Lock Style 005, rigid coupling of ductile iron and pressure responsive gasket system for wet sprinkler system as recommended by manufacturer.

LONGMEADOW HIGH SCHOOL TECHNOLOGY SYSTEMS NARRATIVE

UTILITY FEEDS

The required new utility feeds include a cable company feed, telephone company feed, and possible other carriers. Sufficient conduit will be provided to the building to support future carrier connections.

TECHNOLOGY EQUIPMENT ROOMS AND CABLING INFRASTRUCTURE

- The utility company will bring the service feed cables into the building. The utility feeds will terminate in the termination/demarcation space that will be allocated for the utilities, within the Main Distribution Frame room ("MDF");
- Fiber optic distribution cables will run from the main equipment room to each of the technology wiring rooms;
- Multi pair copper backbone cable will be run from the MDF to each of the wiring rooms ("IDFs") to support miscellaneous communications circuits;
- The station cables shall terminate sequentially on patch panels in each wiring room;
- Generator power circuits and plywood wall boards will be provided for the core equipment (such as security). This will ensure that they operate correctly in emergency situations;
- All MDF and IDF rooms will have dedicated HVAC along with security.
- Copper station cable, Category 6, will be run from the serving/wiring room to each outlet. The same Category 6 cable will be installed for each type of outlet: voice, data, and wireless;

CLASSROOMS

- Wireless network connectivity will be provided throughout the facilities. The typical classroom will have wired cabling for teachers' computers with three (3) data drops terminated and working in the front/teacher area. The wireless access points and associated hardware will be provided in the FF&E phase of the project;
- Each classroom will have one (1) teacher's notebook and a mix of students' notebook and/or desktop working stations. The outlets will be provided as required;
- Laptop carts will be provided to supplement classroom and lab computers;
- Speech amplifications systems are to be installed in each classroom and in each teaching area. These systems will support speech amplification and program audio within the spaces. The systems will be the Extron Voice Lift speech amplification system;
- The classrooms will not have electronic boards. Mimio interactive technology or the projector based interactive technology will be used;

COMMON PRINTING/SCANNING

- There will be one printing/scanning area per department. Some head office will have printers provided as required for information privacy.

CAFETERIA

- Kitchen and cafeteria will have wired point of sale stations. The outlets will be provided as required. Wireless connectivity will be provided as well.

MUSIC

- There will be a midi lab in the music area. There will be fifteen (15) work stations provided in this area.
- Recording and playback systems will be provided in choral and band rooms.

PUBLIC ADDRESS AND MASTER CLOCK

- Public address system is to be provided throughout the facility. Speakers will be provided for selected outdoor locations. Offices will be equipped with volume controls. The systems will be accessible throughout the school;
- A master clock system with automated time correction will be provided, supporting IP wireless clocks throughout the school.

TELEPHONE SYSTEM

A new telephone system will be installed with the capacity to support a telephone in every room and at each office work location. A fully featured voice mail system with automated notification capability will be installed. The telephone system will be linked to the intercom and public address system so that the instruments provide more than one function and eliminate the need for separate intercom switches and devices. The telephone system will be an expansion of the district Cisco Voice over Internet Protocol system, with a call manager installed at the school.

AUDIOVISUAL SYSTEMS

Audiovisual systems will be provided for the larger spaces including the gym, cafeteria, media center and spaces identified during the design. These systems will support excellent audio and projection where appropriate. The systems will be designed to allow easy use with limited training or support. System controls and inputs will industry standard and support current technologies including laptops and iPods. The systems will support the multiple uses of each space, ranging from traditional teaching/learning activities through collaboration, presentation and competition.

SECURITY SYSTEMS

Security systems will be provided throughout the facilities. Access control systems will be designed to control access to the building and the ability to alarm portions of the building while keeping other areas accessible. Intrusion detection will detect unauthorized access to the building and/or specific spaces. CCTV and associated monitoring will be required to provide the supervisory monitoring of areas where people and/or things need to be protected. The systems will be integrated and configured in a manner that allows authorized monitoring by administrators and public safety officials.