

**COMMISSIONING AGENT SERVICES AGREEMENT BETWEEN THE DOVER SCHOOL DISTRICT
AND HORIZON ENGINEERING ASSOCIATES LLP.**

This Agreement is by and between THE DOVER HIGH SCHOOL AND CAREER TECHNICAL CENTER JOINT BUILDING COMMITTEE, by and through THE DOVER SCHOOL DISTRICT, a municipal corporation, with principal office at 61 Locust Street, Dover, NH hereinafter collectively called “District” and HORIZON ENGINEERING ASSOCIATES, LLP with principal office at 480 Neponset Street, Unit 11A, Canton, MA 02021, hereinafter called “Contractor” and collectively called “Parties.”

This Agreement hereby incorporates all of the items set forth in the Request for Proposal (RFP) to provide commissioning agent services for Dover High School and Career Technical Center, dated February 5, 2016, and the Contractor’s bid as it is specifically stated herein. Where there is a conflict between the RFP and this Agreement, this Agreement shall be construed as a modification to the RFP and this Agreement shall control.

ARTICLE 1. PURPOSE

- 1.1 This agreement refers to and incorporates the provisions of a Request for Proposal for Commissioning Agent issued by HMFH Architects in conjunction with the Joint Building Committee of the Dover High School and Career Technical Center. The commissioning activities shall include, but not be limited to, the following integrated building systems.
- Building thermal envelopes and all materials and components forming a part of these systems including, but not limited to, walls, windows, doors, louvers, vents, grilles and sun screens.
 - Roofing systems and all materials and components forming a part of these systems including parapets and roof openings (e.g., skylights, monitors, pipe chases, ducts, penetrations),
 - HVAC Systems: Heating, ventilating and air conditioning systems, and all mechanical equipment forming a part of these systems including, but not limited to, all boilers, chillers, direct expansion refrigeration equipment, fuel storage and handling systems, pumps, piping, air handler systems, terminal equipment, fans, exhaust systems, ventilation systems, variable frequency drives, heat recovery systems, thermal solar systems, and automated temperature controls and energy management systems.
 - Plumbing Systems and all equipment forming a part of these systems including, but not limited to, potable and non-potable water systems, water pressure booster systems, service water heating systems, sanitary waste and vent systems, grey water systems, laboratory waste and acid neutralization systems, storm water systems including rain water reclamation systems, natural gas systems, and compressed air systems.
 - Electrical Power Systems and all equipment forming a part of these systems including, but not limited to, electrical supply and distribution systems, emergency and standby power systems including automatic transfer switching systems, lighting and lighting control systems, low voltage systems, grounding and bonding systems, audio visual systems, photovoltaic systems, wind power systems and interfaces to automated temperature/building automation control systems.
 - Life Safety Systems and all equipment forming a part of these systems including, but not limited to, security and surveillance systems, fire alarm systems, fire protection and suppression systems, fire pump systems, egress lighting, and egress pressurization.
 - Building Automation and Controls and all equipment forming a part of these systems including, but not limited to, the interface of these systems with HVAC systems, fire alarm and security systems.

ARTICLE 2. AGREEMENT DOCUMENTS AND RELATED INFORMATION

- 2.1 The agreement shall include and consist of the following documents (the “Agreement Documents”).
- Agreement (5 pages).
 - RFP and Scope of Services for Commissioning Agent Issued by HMFH Architects in conjunction with the Joint Building Committee of the Dover High School and Career Technical Center dated February 5, 2016.

- Response of the Contractor dated February 23, 2016.
- 2.2 The District shall retain ownership of the documents and designs, if any, prepared for the District by the Contractor pursuant to the provisions of this Agreement to the extent the Contractor has been paid for the services to prepare the documents and designs.
- 2.3 The Contractor hereby grants the District an irrevocable non-exclusive license to copy and otherwise use in connection with the Project all documents, including electronic media, prepared by the Contractor, hereunder, except that if the Agreement vests ownership and/or copyright in the District, the terms of such agreement shall apply.

ARTICLE 3. SCOPE OF SERVICES

- 3.1 The Contractor shall perform all work specified and required by the Agreement Documents listed in Article 2. Should there be inconsistencies between the terms of any of the Agreement Documents, precedence shall be as follows: (1) the Agreement, (2) the terms of the RFP for Commissioning Agent for Dover High School and Career Technical Center and (3) response of the Contractor.
- 3.2 Any changes to the cost of the work and the Scope of Services shall be made in writing by mutual agreement prior to the performance of work.
- 3.3 The Contractor shall at its own expense provide all personnel necessary to perform the work under this Agreement. The Contractor warrants that all personnel shall be qualified to perform the work under the Scope of Services and shall be properly licensed and otherwise authorized to do so under all applicable laws.

ARTICLE 4. INDEPENDENT CONTRACTOR

- 4.1 The Contractor shall perform services as an independent contractor, and shall have and maintain complete control over all of its employees, agents, and operations. Neither the Contractor nor anyone employed by it shall be, represent, act, purport to act or be deemed to be the agent, representative, employee or servant of the District. The Contractor selected by this Request for Proposal will be working as an independent contractor and will be required to take out and keep in force all permits, licenses, certifications, other approvals, and or insurance that may be required by the District, any local or regional governmental agency, the State of New Hampshire, or the federal government. Failure to comply with any of these items would be grounds for immediate cancellation of the contract.
- 4.2 The Contractor shall perform the services contemplated without interfering in any way with the activities of the District's faculty, students, staff or visitors. The District shall have no responsibility for the loss, theft, and damage to vehicles, equipment, tools, materials, supplies, and other property of the Contractor and/or its employees or agents.

ARTICLE 5. TERM

- 5.1 The Contractor shall commence work upon the execution of this Agreement and issuance of a purchase order by the District. All services to be performed under this Agreement shall become effective upon the date of this Agreement. Agreement shall end upon the completion of all work required under the Scope of Services, which is anticipated to be in August 2018.

ARTICLE 6. COST AND PAYMENT

- 6.1 The District shall pay the Contractor an amount not to exceed \$171,630.00 for services within the Scope of Services. The District shall pay the Contractor within thirty (30) days upon performance and presentation of an invoiced supplied by the Contractor detailing the work performed.
- 6.2 Compensation for additional services shall be subject to approval by the District and include the following hourly rates:
- Partner in Charge: \$225.00.
 - Project Manager: \$225.00.
 - Mechanical/Plumbing Engineer: \$120.00.
 - Electrical Engineer: \$150.00.
 - BMS/Controls Engineer: \$175.00.
 - Building Envelope Associate: \$150.00.
 - Field Engineer: \$95.00.
 - Project Coordinator: \$65.00.

ARTICLE 7. TERMINATION

- 7.1 If either Party materially breaches any of the covenants or duties imposed upon it by this Agreement, such breach shall entitle the other Party to terminate this Agreement in accordance with the following procedure: The non-defaulting Party shall give the offending Party written notice of the breach with the opportunity to cure within 14 days. If at the end of such 14 day cure period, the Party notified has not remedied the breach, the non-defaulting Party may terminate this Agreement as follows: Within fourteen (14) business days following the last day of the cure period, the non-defaulting Party shall give the defaulting Party not less than thirty (30) days' notice of termination. If the non-defaulting Party does not provide the notice of termination within fourteen (14) days, the non-defaulting Party shall have waived its right to terminate this Agreement based on the breach cited in the written notice of default.
- 7.2 In addition to any other rights the District may have, the District shall have the right to declare the Contractor in breach of this Agreement if (a) the Contractor becomes insolvent; (b) the Contractor makes an assignment for the benefits of the creditors; (c) a voluntary or involuntary petition in bankruptcy is filed by or against the Contractor.
- 7.3 In the event that this Agreement is terminated by the District for cause, the District reserves the right to contract with another Contractor to complete the term of this Agreement and hold the Contractor responsible for any extra or additional expense or damages suffered by the District.

ARTICLE 8. INDEMNIFICATION

- 8.1 The Contractor agrees to indemnify, hold harmless and defend District, its governing board, officers, employees and agents from and against every claim or demand which may be made by any person, firm or corporation, or any other entity arising from or caused by any act of neglect, default or omission of Contractor in the performance of this Agreement, except to the extent that such claim or demand arises from or is caused by the negligence or willful misconduct of the District, its agents or employees.

ARTICLE 9. INSURANCE

- 9.1 Insurance coverage provided in this section shall be limited to those claims arising under the scope of the Agreement between the District and the Contractor.
- 9.2 The Contractor shall secure and maintain for the duration of this Agreement a Professional Liability Insurance policy or policies, and a General Liability Insurance policy or policies, at no cost to the District. The coverage of both the Professional Liability and General Liability insurance policies shall be in an

amount of not less than One Million Dollars (\$1,000,000) per occurrence and Two Million Dollars (\$2,000,000) in the aggregate. An insurance certificate shall be supplied to the District by the Contractor at the time the contract is executed and thereafter by each August 1st during the contract term. The District shall be named as an additional insured on the Contractor's policies. A condition of the insurance coverage shall be thirty (30) days' notice to the District upon cancellation of the policies, which condition may be waived in the District's sole discretion. The Contractor shall also provide the District certificates of renewal of any applicable insurance policies no later than ten (10) business days prior to the expiration of said policy.

- 9.3 The Contractor agrees, certifies, and warrants that it is in compliance with, or exempt from, the requirements of New Hampshire RSA Chapter 281-A, regarding workers' compensation insurance. The Contractor shall maintain statutory workers' compensation insurance coverage for all of its employees as required by said law.

ARTICLE 10. DISPUTE RESOLUTION

- 10.1 Any dispute between the Parties arising out of or relating to this Agreement shall be resolved in accordance with this paragraph. Either Party shall give written notice of a dispute arising out of or related to this Agreement to the other Party in person or by certified mail, return receipt requested. The Parties shall attempt to resolve the matter through informal communication or negotiation for a period of thirty (30) days from the date of receipt of notice by the noticed Party. If the dispute has not been resolved within thirty (30) days, either Party may serve written notice on the other Party of a request for mediation. The mediation shall be conducted in New Hampshire by a mediator mutually agreeable to the Parties, shall not exceed one full day or two half days in length, and shall be completed within ninety (90) days from the date of receipt of notice of a request for mediation. If the Parties cannot agree on a mediator, each Party shall select a temporary mediator and those mediators shall jointly select the permanent mediator. The Parties shall share the cost of the mediator, but each shall bear its own costs related to mediation. If the Parties are unable to resolve the dispute through mediation, then each retains all rights and legal and equitable remedies provided by law, including the right to initiate and pursue arbitration, or litigation in the courts of the State of New Hampshire.

ARTICLE 11. MISCELLANEOUS

- 11.1 This Agreement shall be interpreted, governed, construed and enforced in accordance with the laws of the State of New Hampshire, without regard to any of its conflict of laws principles.
- 11.2 This Agreement, containing the Agreement Documents as defined in section 2.1 herein, contains the entire agreement between the Parties in relation to its subject matter, and there are no other agreements or understandings, oral or otherwise, between the Parties at the time of execution of this Agreement.
- 11.3 This Agreement may only be modified by a written instrument, signed by both Parties.
- 11.4 The headings of the sections and paragraphs of this Agreement are inserted for convenience of reference only and shall not control or affect the meaning or construction of any of the agreements, terms, covenants and conditions of this Agreement in any manner.
- 11.5 If any provision(s) of this Agreement is determined to be invalid or unenforceable in whole or in part for any reason, the remaining provisions of this Agreement shall be unaffected and shall remain in full force and effect.
- 11.6 This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which, taken together, shall constitute one and the same Agreement.

11.7 Each Party represents that its signatories to this Agreement are duly authorized by that Party to execute this Agreement and in so doing to bind that Party to its terms.

11.8 Any notice by a party hereto to the other party to this Agreement shall be provided as follows:

To District

DHS-CTC JBC/Dover School District
61 Locust Street, Suite 409
Dover, NH 03820

To Contractor

Horizon Engineering Associates, LLP
480 Neponset Street, Unit 11A
Canton, MA 02021

IN WITNESS WHEREOF, this Agreement has been signed and executed in duplicate on behalf of all Parties hereto by persons duly authorized on the day and year first written above.

DOVER SCHOOL DISTRICT

By: _____

Title: _____

Date: _____

HORIZON ENGINEERING ASSOCIATES, LLC

By: _____

Title: _____

Date: _____

HMFH Architects, Inc.

130 Bishop Allen Drive
Cambridge, MA 02139
t 617 492 2200
f 617 876 9775
www.hmfh.com

February 5, 2016

Horizon Engineering Associates,
480 Neponset Street Unit 11A
Canton, MA 02021

Attn: Michael English

Re: Request for Proposal for Commissioning Agent
Dover High School and Career Tech Center

Dear Mr. English:

HMFH Architects in conjunction with the Joint Building Committee of the Dover High School and Career Technical Center is soliciting proposals for building commissioning services. The scope of services is described in the attached Scope of Services for Commissioning Agent.

The Project:

HMFH is currently designing a combined and integrated new Dover High School and Career Tech Center to replace the existing High School and Tech Center. The new facility will be constructed adjacent to the existing facility. Upon completion of the new facility the existing facility will be demolished. The new facility will be 305,000 square feet inclusive of a standalone animal science classroom facility and barns. Schematic level floor plans, site plan and HVAC narrative are attached. The building will primarily be slab on grade with slab on grade and a steel frame.

The Schedule:

Design Development Submission	March 15, 2016
Early Bid Package Foundations and Steel	June 15, 2016
Construction Documents Complete	August 15, 2016
Complete New Facility	August 1, 2018

Fee Submission Schedule and Requirements:

Fee proposals will be due on February 22, 2016. Any questions regarding this RFP should be addressed in writing to Laura Wernick lwernick@hmfh by February 17th. The goal is to have the Commissioning Agent contracted and available to begin working to review the Design Development set by March 15th.

The proposal should include a fee proposal with the following information

- Overall fee
- Fee for building envelope commissioning including roofs and items penetrating envelope
- Fee for HVAC, plumbing systems, electrical systems, life safety systems and building automation control systems



George R. Metzger, AIA
Laura A. Wernick, FAIA

Lori Cowles, AIA
Philip S. Lewis, AIA
C. Julia Nugent, AIA

Deborah A. Collins, AIA
Arthur S. Duffy, AIA
Matthew LaRue, AIA
Chin Lin, AIA
Christina Stanislawski, AIA
Vassilios Valaes, AIA

Devin E. Canton, AIA
Colin R. Dockrill, AIA
Melissa A. Greene, AIA
Erica Metzger
Margaret M. Munroe
Robert P. Williams, AIA

Stephen Friedlaender, FAIA
John F. Miller, FAIA
Mario J. Torroella, FAIA

The proposal should also include the following:

- Overview of the firm and description of appropriateness for this project.
- Names and resumes of individuals responsible for envelop commissioning
- Names and resumes of individuals responsible for HVAC, Plumbing and Electrical commissioning
- List of the 8 most recent public school commissioning projects with dates location, size, reference contact and description of commissioning services provided
- List of 3 project public school projects of comparable size and complexity.

If a consultant will be providing a portion of the commissioning services than the proposal should include information from each firm in response to the items above.

Very truly yours,

HMFH Architects, Inc.

A handwritten signature in blue ink, reading "Laura Wernick". The signature is fluid and cursive, with the first name "Laura" and last name "Wernick" clearly distinguishable.

Laura Wernick, FAIA

cc: Melissa Glidden, Tina Stanislaski

SCOPE of Services for Commissioning Agent

Commissioning Activities: Commissioning activities shall include the following integrated building systems:

- Building thermal envelopes and all materials and components forming a part of these systems including, but not limited to, walls, windows, doors, louvers, vents, grilles and sun screens.
- Roofing systems and all materials and components forming a part of these systems including parapets and roof openings (e.g., skylights, monitors, pipe chases, ducts, penetrations),
- HVAC Systems: Heating, ventilating and air conditioning systems, and all mechanical equipment forming a part of these systems including, but not limited to, all boilers, chillers, direct expansion refrigeration equipment, fuel storage and handling systems, pumps, piping, air handler systems, terminal equipment, fans, exhaust systems, ventilation systems, variable frequency drives, heat recovery systems, thermal solar systems, and automated temperature controls and energy management systems.
- Plumbing Systems and all equipment forming a part of these systems including, but not limited to, potable and non-potable water systems, water pressure booster systems, service water heating systems, sanitary waste and vent systems, grey water systems, laboratory waste and acid neutralization systems, storm water systems including rain water reclamation systems, natural gas systems, and compressed air systems.
- Electrical Power Systems and all equipment forming a part of these systems including, but not limited to, electrical supply and distribution systems, emergency and standby power systems including automatic transfer switching systems, lighting and lighting control systems, low voltage systems, grounding and bonding systems, audio visual systems, photovoltaic systems, wind power systems and interfaces to automated temperature/building automation control systems.
- Life Safety Systems and all equipment forming a part of these systems including, but not limited to, security and surveillance systems, fire alarm systems, fire protection and suppression systems, fire pump systems, egress lighting, and egress pressurization.
- Building Automation and Controls and all equipment forming a part of these systems including, but not limited to, the interface of these systems with HVAC systems, fire alarm and security systems.

Project Phases: Commissioning services for individual projects are anticipated to be provided starting from the Design Development Phase and continue through preparation of construction documents, bidding, construction, close-out of the new construction and building occupancy.

- A. **Design Development and Construction Documents Phases** Within 15 days of contract signing, the Contractor shall prepare and submit to the Design Team a Design Phase Commissioning Plan which shall include:
1. Commissioning Task Matrix. A matrix or narrative describing major commissioning activities and the commissioning team member(s) designated to lead and assist with fulfilling those objectives;
 2. Commissioning Scope of Work. A detailed scope of work highlighting the systems that will be commissioned, and what commissioning tasks will need to occur over the design process.
 3. Commissioning Schedule. A preliminary commissioning schedule which is cross-referenced with the Project's schedule highlighting dates when key commissioning activities need to be completed.

- B. Contractor shall perform a thorough review of all drawings and specifications. These reviews shall occur at the following mileposts: 100% complete Design Development, 60% complete Construction Documents and 90% complete Construction Documents, and shall review and comment on their completeness, coordination among design disciplines, and adherence to the Design Team. Such review shall include each of the following issues:
1. Review and provide input as to how to facilitate effective commissioning (including sufficient accessibility, test ports, monitoring points and related features).
 2. Review for adequacy of the energy efficiency and efficiency of system types and components for building shell, HVAC systems and lighting systems.
 3. Review envelope design and assemblies for thermal and water integrity, moisture vapor control and assembly life.
 4. Review HVAC, lighting, fire control, emergency power, security control system, strategies and sequences of operation for adequacy and efficiency.
 5. Review commissioned systems layout and their impact on other systems and the facility as a whole toward facilitating operations and maintenance (including equipment accessibility and system control).
 6. Review the mechanical concepts/design and recommend enhancements for operational or efficiency improvements.
 7. Review the electrical concepts/systems and recommend enhancements for operational or efficiency improvements.
 8. Review the Construction Documents, including the drawings and specifications prepared for each subcontractor, to assess their completeness and coordination among the various disciplines, to assess provisions for construction sequencing, materials and equipment delivery and storage, site and building access, testing requirements, and training requirements.
- C. Contractor shall participate in design review meetings on an as-needed basis, which meetings shall be coordinated by the Design Team and be held monthly, March through July.
- D. Contractor shall develop commissioning specifications (the "Cx Specifications") for inclusion in the Construction Documents. Schedule for completion of the Cx Specifications shall be commensurate with the overall Project schedule. The Cx Specifications shall, at a minimum, define the commissioning requirements for each specification section, for a special commissioning specification division, and for each of the systems and equipment to be commissioned as identified in the Work Order, and shall be coordinated for format and content with the project manual developed by the Design Team.
1. The Cx Specifications shall include, but shall not be limited to, requirements for commissioning submittals, startup and checkout test plans, functional test development support, pre-functional checklists and functional test execution, training plan development and execution, operations and maintenance manuals, as-built drawings and coordination among subtrades.
 2. The Cx Specification shall specifically include specifications for the start-up protocols, including an identification of any and all equipment or instrumentation needed for measurements during pre-functional testing and functional performance testing, so that these requirements and any specialized equipment or instrumentation will be clearly delineated and provided for in the Construction Documents. These procedures shall also be included in the Design Team's pertinent bid specifications for relevant subcontractors.

- E. Building upon the responsibilities defined in the Design Phase Commissioning Plan and the Cx Specifications, prior to the Project being put out to bid, Contractor shall develop the Construction Phase Commissioning Plan (the "Cx Plan"), including all documentation identifying and describing all required functional performance tests and defining clear procedures for the commissioning process. The Cx Plan shall be provided to the Design Team for review, approval and incorporation into the Construction Documents. At a minimum, the Cx Plan shall include the following:
1. Commissioning Task Matrix. A matrix or narrative describing major commissioning activities and the commissioning team member(s) designated to lead and assist with fulfilling those objectives
 2. Commissioning Scope of Work. Description of all systems scheduled for commissioning, including the nature of the testing to be performed for each piece of equipment, for each sub-system and for each system.
 3. Deliverables: Clearly define the deliverables to be produced from the commissioning process and the deadlines for such deliverables, and identify parties responsible for producing them. Deliverables shall include, but not be limited to, schedules, test plans, test reports, training plans and final report. Identify required format for deliverables and include sample documents as appropriate.
 4. Schedule: Prepare a schedule of commissioning activities. The commissioning schedule shall be coordinated with the overall Project schedule as established by the OPM.
 5. Checkout, Startup & Pre-functional Testing: Define the processes and procedures to be used for the installation review, startup and pre-functional testing process and required integration between these activities for each piece of equipment, sub-system and system.
 6. Functional Performance Testing: Describe the functional performance testing process, including prerequisites and any special equipment or instrumentation needed to obtain necessary measurements during performance testing. Include requirements for deferred seasonal functional performance testing as appropriate.
 7. Test Guidelines: Include requirements for review, approval and documentation practices and test acceptance criteria.
 8. Training & Turnover: Identify training requirements, and responsibilities for development of the training plan and participation by the Commissioning Team members in the training process. The training program shall assure that the Owner's building operation personnel receive adequate training for the proper operation of the new facility systems. Define required O&M, as-built and commissioning deliverables and the deliverables turnover procedures, with references to the construction specifications as appropriate, to ensure that the school district receives all necessary documentation from the
 9. Define a procedure for the turn-over of all required tools, lubricants, spare parts and miscellaneous start-up consumables required to be provided by the CM including requirements for documentation and acceptance.
 10. Other commissioning-related correspondence, checklists, test forms, and documentation.
 11. Upon OPM's receipt of 100% complete Construction Documents, Contractor shall provide to the Design Team three (3) electronic copies (DOC and PDF formats) on compact disk or flash drive of the Commissioning Plan, specifications and graphic materials.
- F. Bidding Phase
1. Contractor shall attend and participate in the pre-bid meeting defining, to those in attendance, what is involved in the commissioning process, reviewing the sequence and schedule of the commissioning phase, and explaining its importance to the Project.
 2. Contractor shall assist the Design Team and the CM in responding to requests from prospective bidders for information or clarification relating to commissioning.

G. Construction Phase

1. Contractor shall coordinate the commissioning work with the CM and the Design Team and assess whether the commissioning activities are properly accounted for in the master Project schedule.
2. When equipment to be commissioned is about to be installed and during the installation of such equipment, Contractor shall track the progress and quality of the work being performed. To that end, Contractor shall visit the site at such intervals as are appropriate to the stage of construction; and whenever a significant amount of work in a specific discipline is being installed or constructed, Contractor shall bring to the site visits the specific members of Contractor's core team with expertise in such disciplines. Contractor shall advise the CM & the Design Team on any issues related to these matters. Contractor, however, shall not be required to make exhaustive or continuous on-site inspection to check the quality or quantity of the work.
3. The Contractor shall, through the CM, plan and conduct periodic commissioning team meetings, which shall include, at a minimum, the CM, sub-contractors responsible for the installation of systems to be commissioned, the Design Team, and the facility's operations personnel. These meetings should occur regularly during most of the Construction Phase and more frequently during the three months prior to the commencement of the Acceptance Phase. Contractor shall prepare commissioning meeting minutes and distribute them to the OPM and all attendees.
4. Contractor shall prepare Pre-Functional Checklists and Functional Test Procedures for commissioned equipment and systems and in the process shall:
 - i. Review CM and subcontractor submittals applicable to systems being commissioned concurrently with review by the Design Team to obtain equipment and system information and verify compliance with commissioning needs and requirements; advise the CM and Design Team of any deficiencies noted that may impact the commissioning execution or intended system performance; review the Design Team's submittal documentation and comments, and assist in resolving any discrepancies.
 - ii. Request and review additional manufacturers' or CM's information as required to develop the test procedures, including operations and maintenance materials, contractor start-up plans and component test procedures. Contractor shall request and review all Requests for Information (RFI), change directives and construction contract Change Orders (CO) for any changes that would affect the systems to be commissioned.
 - iii. Before startup, gather and review the approved control sequences of operation and interlocks, and work with the CM appropriate subcontractors and appropriate members of the design team until sufficient clarity has been obtained, in writing, to be able to write detailed functional performance test procedures.
 - iv. The functional performance test procedures shall be developed from industry performance testing standards and supplemented by information contained in approved shop drawings and submittals and shall include requirements for operating each system and its components through each of the written sequences of operation and other significant modes and sequences, including startup, shutdown, unoccupied mode, manual mode, staging, miscellaneous

alarms, power failure, security alarm when impacted and interlocks with other systems or equipment.

- v. Submit completed pre-functional checklists and functional performance test procedures and distribute to the CM Design Team, and equipment vendors for review as required and to assure understanding prior to execution.
- 1. Contractor shall review and comment on the CM's systems start-up plans and checkout plans, equipment and component test procedures, and shall coordinate these plans and procedures with the Design Team and through the Design Team, shall facilitate CM compliance with the requirements of the Cx Plan and Construction Documents.
- 2. Contractor shall review the testing, adjusting and balancing (TAB) execution plan before TAB is executed, and shall monitor functional testing of the control system, and, through the Design Team, recommend and coordinate such retesting of the control system as may be necessary until, in the opinion of the Contractor, it's ready for use for TAB. In connection with the TAB, Contractor shall review air and water systems balancing by spot testing, by reviewing completed reports, and by selected site observation.
- 3. Contractor shall review and comment on the Training Plan developed by the CM. Review the plan for compliance with training requirements of the facility's operations staff and obtain documentation from the Owner attesting to the adequacy and acceptance of the Training Plan.

H. Acceptance Phase

- 1. Contractor shall plan, organize, schedule and coordinate all commissioning and other work activities including pre-functional testing and functional performance testing during this phase of the Project, shall coordinate such activities with the OPM and the CM/GC, and shall lead all commissioning team meetings.
- 2. Contractor shall review pre-functional checklist execution by site observation and spot checks, shall review all completed pre-functional checklists, shall review the deficiency and resolution log, balancing reports, approved shop drawings, open RFI's and manufacturers' start-up sheets and comment on the readiness for functional performance testing.
- 3. Contractor shall review the calibration status of sensors and actuators reported during pre-functional check by the installing contractors and shall spot check the same during functional testing.
- 4. Working with the CM, equipment vendors and appropriate subcontractors, Contractor shall execute, coordinate, witness and assess the functional performance tests for each sub-system and system as established by the Cx Plan, and shall coordinate retesting as necessary until satisfactory performance is achieved. Services shall include:
 - (i) Coordination, witnessing and assessing performance tests of building envelope components.
 - (ii) Execution of tests on HVAC equipment during both the heating and cooling season. Tests shall be conducted with the systems utilizing permanent electrical power and, to the extent possible, under full load conditions, though, some overriding of control values to simulate conditions may be allowed, if used judiciously.
 - (iii) Execution of tests using conventional methods, control system trend logs or stand-alone data loggers, to provide a high level of confidence in proper system function.

- (iv) Analyze functional performance trend logs and monitoring data to assess performance.
- (v) Maintain a master deficiency and resolution log, which shall become part of the Issues Log, and a separate testing record, provide periodic, written progress reports to the OPM and the Design Team which include test results with recommended actions, coordinate resolution of any deficiencies with the CM and appropriate subcontractors, and witness and document repeat testing, as necessary to indicate whether all deficiencies are corrected.
- (vi) Witness all tests of commissioned equipment and systems which the Owner may contract for or which may be performed by manufacturer's personnel over whom the Contractor may not have direct control, review and comment on the accuracy of the test reports and the conformance of the test results with the Contract Documents, and document and include the test data and reports of such tests in the commissioning record and in the operations and maintenance manuals.
- (vii) Contractor shall coordinate and participate in the training of the facility's operations and maintenance staff in accordance with the requirements of the training plan, which shall include participation of appropriate systems and equipment vendors and contractors. Contractor shall provide documentation to the Design Team that this has been satisfactorily completed.
- (viii) Contractor shall review completed as-built drawings and records, including operation and maintenance manuals prepared by equipment manufacturers, fabricators or installers.
- (ix) The Contractor, with the assistance of the Design Team and GC shall develop a Systems Manual that provides the information needed to understand, operate, and maintain the building's systems and assemblies. Systems Manual shall be developed in accordance with ASHRAE 202-2013.
- (x) Contractor shall participate in meetings and other Project activities relating to system start-up and after Substantial Completion shall participate in the review of the building operations.
- (xi) Contractor shall assess and report to the OPM, Design Team and CM whether all equipment and systems are working in conformance with the requirements of the Construction Documents, and shall make recommendations for modification or adjustment as necessary.
- (xii) Contractor shall review all equipment warranties and advise the OPM, and Design Team of compliance with the Construction Documents.
- (xiii) Contractor shall review all testing, adjusting and balancing with respect to each piece of equipment to be commissioned, for each system and combination of systems, and for the facility as a whole; shall assess the adequacy, accuracy and completeness of all final testing, adjusting, and balancing reports; and shall advise the OPM and MSBA of any necessary corrections.
- (xiv) Contractor shall observe all environmental performance testing, and testing of environmental monitoring systems or tests by manufacturers' personnel over whom Contractor may not have direct control, shall review and comment on the accuracy of the test reports and the conformance of the test results with the Contract Documents, and all permits and other applicable requirements, and shall document and include the results of these tests in the Final Commissioning Report.
- (xv) Contractor shall monitor the continuing adjustment, optimization, and modification of all systems to assess whether they meet operating and performance requirements

specified in the Contract Documents, and shall advise the OPM on a regular basis on the status of this process.

- (xvi) Contractor shall coordinate with the OPM to review and recommend appropriate action with respect to the operator training program required by the CM.
- (xvii) Contractor shall comment on documentation provided by the CM regarding the provision of all required tools, lubricants, spare parts and miscellaneous start-up consumables required to be provided by the CM/GC.
- (xviii) Contractor may be requested to provide on-going support to the OPM, and the Owner during the first full year of operation on an as-needed basis as a reimbursable service.
- (xix) Contractor shall accompany the OPM and Design Team on a walk-through site visit upon completion of punch list by the CM, review the deficiency and resolution log and report to the OPM on the installation completeness and functionality of all commissioned systems; and shall advise the OPM of any necessary corrections.
- (xx) Contractor shall provide the OPM, and Design Team with prompt written notice if Contractor becomes aware of any fault or defect or noncompliance with the Construction Documents as they may affect the systems to be commissioned.

I. Project Closeout Phase

1. Contractor shall provide a Final Commissioning Report. The report shall include an executive summary, list of participants and the role of each participant, brief building and systems descriptions, an overview of the scope of commissioning and testing, and a general description of testing and verification methods.
2. For each piece of commissioned equipment, the report shall address the adequacy of the equipment, documentation and training, in satisfying the requirements of the Contract Documents in each of the following areas:
 - i. Equipment/system specifications and design intent
 - ii. Equipment/system installation
 - iii. System functional performance and efficiency
 - iv. Description of the verification method used (manual testing, trend logs, data loggers, or other as appropriate) and observations and conclusions from the testing
 - v. Non-compliance issues referenced to the specific functional test, inspection, trend log, and other records where the deficiency is documented
 - vii. Equipment/system operations and maintenance
 - viii. Record documentation
 - ix. Operator and maintenance training.
3. All outstanding non-compliance items shall be specifically listed in the report, and recommendations for improvement to equipment or operations, future actions, commissioning process changes, and other appropriate matters shall also be listed.
 - i. Appendices shall contain all acquired sequence documentation, Issues Log, meeting minutes, progress reports, deficiency lists, site visit reports, findings, unresolved issues, communications, and all other relevant information.
 - ii. Pre-functional checklists and functional performance tests and monitoring data and analyses shall be provided in a separate labeled binder.

Scope of Services for Commissioning Agent

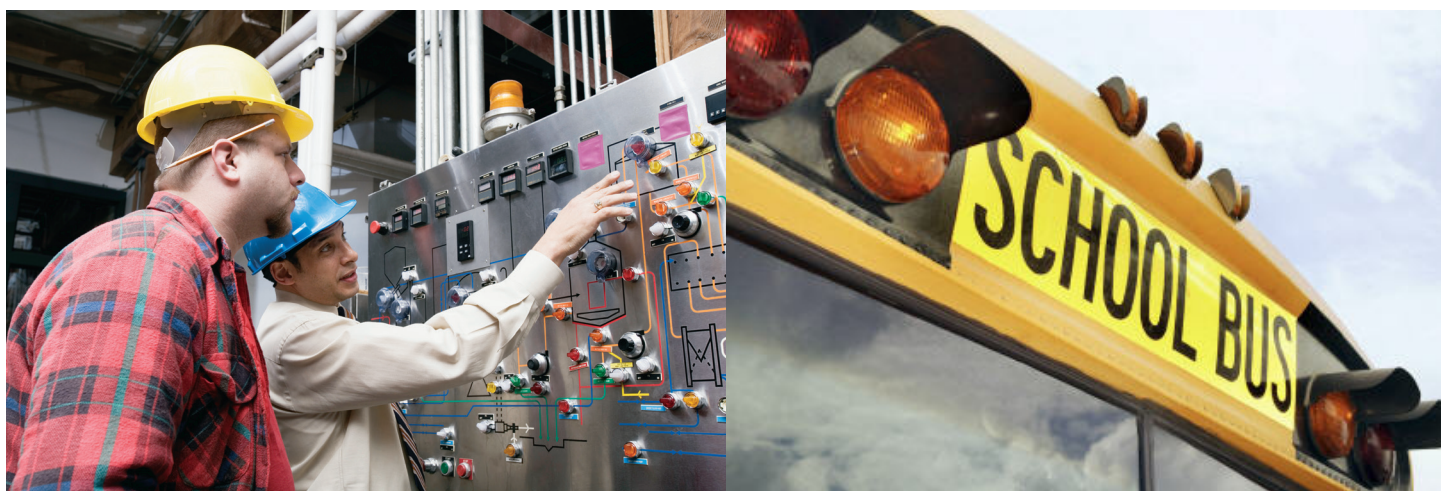
j. Post Occupancy

1. Contractor shall, through the OPM, plan, organize, schedule and coordinate required seasonal or deferred testing and deficiency corrections.
2. Contractor shall provide the final testing documentation for the commissioning record and operations and maintenance manuals.
3. Ten months after Substantial Completion of the Project and after one complete heating and cooling season, Contractor shall return to the Project site and review with the building operations and maintenance staff including the status of outstanding issues related to the original and seasonal commissioning, shall interview facility staff and identify problems and any concerns they may have with the operation and maintenance of the facility as originally intended, shall make suggestions for improvements and for recording any proposed changes in the operations and maintenance manuals, shall identify to the facility staff those issues whose correction may be covered by equipment and system warranties or by the original construction contract, and shall assist the facility staff in developing reports and documents and requests for services to remedy outstanding problems. Once deficiencies have been corrected, Contractor may be requested to provide oversight on any final testing required, and document the results in the Commissioning Record as a reimbursable service.



Horizon Engineering
Associates LLP

Demand a Higher StandardSM



Proposal
to

HMFH Architects, Inc.
Cambridge, MA

for

Dover High School and Career Technical Center
Commissioning Agent

February 23, 2016



Horizon Engineering

Associates LLP

Demand a Higher StandardSM

February 23, 2016

Ms. Laura Wernick, FAIA

HMFH Architects, Inc.

130 Bishop Allen Drive

Cambridge, MA 02139

Transmitted via e-mail: lwernick@hmfh.com

RE: Proposal to Provide Commissioning Agent Services for Dover High School and Career Technical Center

Dear Ms. Wernick:

Horizon Engineering Associates, LLP (HEA) is pleased to offer the following proposal to provide commissioning agent services for the Dover High School and Career Technical Center project. HEA provides commissioning and professional consulting services to help ensure your building systems are fully functional and optimized for both new construction and existing buildings. **Expertise, respect, teamwork, innovation, quality and sustainability are just some of the values HEA will bring to your project.**

Why Choose HEA to Provide Commissioning Services for Your Project?

HEA has provided successful commissioning services for more than 150 K-12 school projects nationwide. We understand the commissioning of K-12 schools takes on added importance due to the nature of occupancy. Unlike commercial or residential buildings, where occupancy may take place in a gradual fashion over the course of weeks, months and even years, schools must be ready to accept students on a specific date for spring, fall and even summer semesters. Our firm is mindful of phasing and staging requirements to avoid disruption to ongoing operations. Our large number of repeat clients attest to the quality, timely and cost-effective service HEA offers to our academic clients. Some of the factors that differentiate our firm from other providers include:

- **Dedicated Service** – Commissioning represents 90% of our business, and is not an “add-on” service like it may be at design-oriented MEP firms. Commissioning is not merely part of what we do; it is what we do. Our operational experience and dedication to independent commissioning produces proactive solutions that result in functional, reliable and energy-efficient systems installed and operated in accordance with the design intent.
- **Previous Experience with HMFH Architects and GGD Consulting Engineers** – HEA has previous experience working with HMFH Architects and GGD Consulting Engineers on the Hanover High School and Carlisle K-8 School projects. HEA has also worked with GGD on other K-12 projects such as Sharon Middle School in Sharon, MA.

- **Certified Professionals** – We are one of the nation's premier commissioning providers, having served as commissioning authority on projects comprising of more than 125 million sf and \$25 billion in construction cost. With 10 offices across the country, we have one of the largest and most respected staffs of Certified Commissioning Professionals, Professional Engineers and LEED Accredited Professionals in the nation.

HEA represents the owner, with an unbiased focus on building performance. Our role is to use a quality process to document and verify that facility performance meets clearly defined objectives and criteria based on the needs of the facility users, owners and operators. The following is a selection of why HEA should be selected for your project:

- 20+ years of experience providing dedicated commissioning services.
- Extensive K-12 facility experience.
- 90% of our business is commissioning and retro-commissioning.
- Key staff certified by BCA, AEE, USGBC and other related organizations.
- Independent commissioning firm.
- Develop and execute customized checklists and system test procedures.
- Hands-on approach.
- Proven success with complex projects.
- Accountability for ensuring operational understanding of the facility.

HEA performs our commissioning services from the perspective of an owner and operator; yielding long-term success stories that go beyond the design phase. We commission for system performance, bridging the gap between construction and long-term building operations. Our commissioning philosophy designates that we treat each facility as if we were going to operate it for the next twenty years. This enhances the quality of the project, which is reflected by improved performance in systems, sufficient access to equipment, better operational characteristics and improved training of personnel.

Please do not hesitate to contact me should any questions arise at (518) 444-4672 or jfriedman@horizon-engineering.com. We look forward to working with the entire project team on this important project.

Sincerely,

A handwritten signature in black ink that reads "Jon Friedman". The signature is written in a cursive, flowing style.

Jonathan Friedman, PE, CCP, LEED AP
Regional Director
Horizon Engineering Associates, LLP (HEA)



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HEA Firm Values:

Quality: demand a higher standard

Expertise: lead with knowledge

Respect: show consideration across all lines

Teamwork: promote unity and collaboration

Innovation: encourage new ideas

Sustainability: maintain needs of clients, employees & industry





Firm Overview

HEA is dedicated to sustainable design and construction practices. We are the commissioning authority for over 450 LEED certified or registered buildings nationwide.

Horizon Engineering Associates, LLP (HEA)

As one of the nation's leading providers of commissioning and sustainable consulting for building systems, **HEA has a simple goal: getting building systems to work as they were intended.** It's not too much for owners and developers to ask. However, it doesn't happen through typical industry engineering and construction practices. Today's fast-paced and complex building process, equipment, and expectations – demand a more rigorous standard.

HEA has served as commissioning authority and sustainability consultant for an extensive range of projects nationwide. We play a principal role in helping establish standards through leadership in national commissioning and green building organizations.

From initial design concepts to beyond building turnover and ongoing operational performance, HEA is a team player. We offer solutions for improvement, identify issues early to reduce changes, and educate the team on how best to make certain that building systems realize their full capabilities. **Throughout the process, we guide, advise, define, document, verify and test. We do everything it takes to demand a higher standard for your project.**

HEA was founded in 1995 to help owners improve the operation and performance of their buildings. HEA has grown in size and offerings, but our core service remains the same: building commissioning for new construction and existing buildings. With 10 offices across the country, we are one of the largest firms dedicated to commissioning services and remain committed to our original goal: **getting building systems to work as intended.**

HEA promotes a team approach to motivate project members to work towards the same goal. We stay visible and engaged throughout the project and help drive the commissioning process through open communication. We bring value to projects, owners and occupants by identifying issues early, offering solutions for improvement and educating the building operators to



ensure that optimal building systems performance is maintained once the project is complete.

For over 20 years, HEA has been committed to preserving commissioning as a part of the sustainable building process. Our engineers have held leadership roles with the Building Commissioning Association (BCA) and United States Green Building Council (USGBC), on national and regional levels. HEA's Founder and Senior Partner, Michael C. English, PE, CCP, LEED AP, plays a principal role in establishing industry standards through leadership in:

- BCA National President, 2005 – 2006
- Developed Standards and Certification for Building Commissioning:
 - BCA's Certified Commissioning Professional (CCP) program, 2002
 - National Institute of Building Sciences (NIBS) new program, 2014
- Helped Write Commissioning Guidelines for:
 - Long Island Power Authority, Commercial Energy Efficiency Program, 2003
 - USGBC LEED-NC Version 2.2, 2003
 - New York City's Mayor's Office, PlaNYC Local Law 87 Retro-Commissioning Guidelines, 2008 – 2012
- Participated in research study on Building Commissioning for Navigant Research and named Key Industry Player in their findings, 2012

The Thompson & Lichtner Company, Inc. (T&L)

The Thompson & Lichtner Company, Inc. (T&L), a Veteran Owned Small Business, is an engineering, testing and consulting firm performing a broad range of engineering, testing, quality control, advisory and forensic services to the construction industry. Their staff of professional engineers, materials specialists, laboratory technicians and construction inspectors is supported by a full laboratory facility located in Canton, Massachusetts. T&L's goal is to help their clients achieve professional, objective engineering and testing solutions to construction problems and assure independent, effective quality control during the construction or repair of new and renovated buildings and facilities.

T&L has maintained its reputation for excellence and quality of service since the formation of the original partnership of Sanford E. Thompson & Frederick W. Taylor in 1896. They have a diverse client base which includes financial institutions, insurance companies, real estate firms, attorneys, architects, engineers, building contractors, manufacturers, government agencies, schools, colleges and other commercial and industrial organizations of all sizes.



They provide a full range of services relating to the weatherproofing of new, existing and historic building envelopes. They have extensive experience in determining the many unique sources and paths of moisture penetration of all types of facades and roofs. Their experience has been gained in hundreds of investigations of water leakage involving extensive field testing, opening up of walls and roofs, and sampling and laboratory testing of the components of facades and roofs. They have examined high-rise office towers, apartment buildings, condominium buildings, commercial and industrial buildings, hotels, schools, colleges, hospitals, government buildings, residences and many other structures.

T&L has provided quality control construction materials testing and inspection services to thousands of projects for over sixty years. Their laboratory is located in a 10,000 square foot facility in Canton and has been recognized by the American Society of Testing and Materials (ASTM) and the American Concrete Institute (ACI) for its membership and contributions to both organizations for over seventy years. The firm also is well-known and highly regarded for its pioneering contributions to the development of ready-mix concrete in the early 1900's. Engineers and field inspectors have completed training in the safety and functioning of aerial work platforms, and understand the proper usage and safety procedures.

T&L's services are best described in the following three categories and are offered separately or in combination, depending on the needs of our clients.

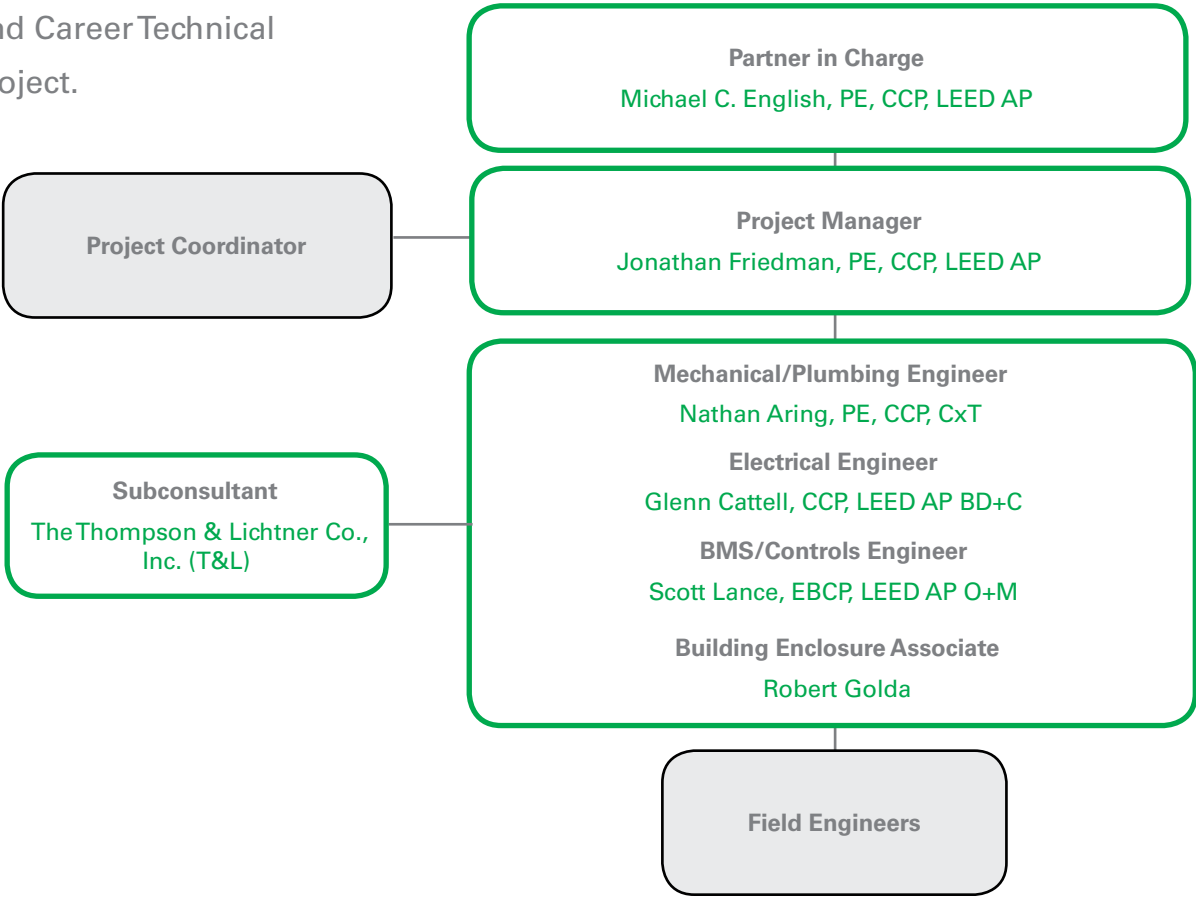
- **Weatherproofing Services** to investigate the causes of, and to recommend solutions to, water leakage and air infiltration problems in structures and to advise on and inspect the materials of weatherproofing during construction and installation.
- **Laboratory Testing and Inspection Services** to provide quality control inspection and testing services during new construction and construction repair programs, to analyze and research the products and materials of new and existing construction and to provide consultation relative to these services.
- **Engineering Services** to examine the condition of old and new structures, to investigate the causes of structural and materials failures, to recommend repair solutions, and to specify and oversee the implementation of repairs.



Key Personnel

HEA employs over 70+ full-time commissioning professionals and support staff. All members of the proposed project team are readily available to begin working on the Dover High School and Career Technical Center project.

The proposed project team for the Dover High School and Career Technical Center project will be led by Senior Partner, Michael C. English, PE, CCP, LEED AP. Mr. English will be responsible for general oversight of the commissioning team's progress. Jonathan Friedman, PE, CCP, LEED AP, Senior Engineer/Project Manager, will be responsible for technical direction, quality assurance and control and commitment of resources. Mr. Friedman will serve as the primary, day-to-day point of contact for this project and all team members throughout the duration of the project. The organizational chart below demonstrates clear and effective lines of communication.



Key Personnel Responsibilities

Names of individuals responsible for building envelope commissioning:

- Robert Golda
- Peter Dalton
- Donald Arpin

Names of individuals responsible for HVAC, Plumbing and Electrical commissioning:

- Jonathan Friedman, PE, CCP, LEED AP
- Nathan Aring, PE, CCP, CxT
- Glenn Cattell, CCP, LEED AP BD+C
- Scott Lance, EBCP, LEED AP O+M

Detailed resumes are provided on the following pages.

Michael C. English, PE, CCP, LEED AP

Partner in Charge



Founder and Senior Partner of HEA, with over 20 years of extensive experience in the leadership and performance of building commissioning and energy efficiency services for educational, cultural, healthcare, commercial and residential facilities. Mr. English served as National Board President and Vice President of the Building Commissioning Association and spearheaded the organization's Certified Commissioning Professional (CCP) program.

EDUCATION

Bachelor of Engineering, SUNY Maritime College, Nuclear Power Option (1990)

PROFESSIONAL LICENSES & CERTIFICATIONS

Professional Engineer: CT (2011), NC (2006), NY (1998), PA (2003), MD (2006), VA (2006), SC (2006), IN (2007), NJ (2007), FL (2009), MA (2009), UT (2010), KY (2010), GA (2009), MS (2009), OH (2010), RI (2011), DE (2013)

Certified Commissioning Professional, Building Commissioning Association (2004)

LEED Accredited Professional, U.S. Green Building Council (2001)

RELEVANT EXPERIENCE

Commissioning

- Leominster High School, Leominster, MA / 295,589 sf / \$33 million
- Sharon Middle School, Sharon, MA / 170,750 sf / \$50.5 million
- Hanover High School, Hanover, MA / 156,000 sf / \$42 million
- Minnechaug High School, Wilbraham, MA / 231,467 sf / \$66.5 million
- Wellesley Fiske and Schofield Schools, Wellesley, MA
- Baypath Regional Vocational School, Charlton, MA
- Grafton High School, Grafton, MA / 186,351 sf / \$57 million
- Mount Greylock High School, Williamstown, MA / 180,000 sf / \$965,000
- Bedford High School, Bedford, MA / 220,000 sf / \$51 million
- Auburn Middle School Boiler Replacement, MA
- Park Avenue Elementary School, Danbury, CT / 39,920 sf
- East Hampton High School, East Hampton, CT / 124,700 sf / \$51 million
- Kennedy High School, Waterbury, CT / 48,200 sf / \$25 million
- Gaffney Elementary Magnet School, New Britain, CT / 80,000 sf / \$30 million
- Vernon Cleaves Regional Vocational Agricultural Center, Wallingford, CT / 70,000 sf / \$29 million
- North Branford Intermediate School, North Branford, CT / 115,700 sf / \$36 million
- Allen Park Public Schools, Six Schools, Allen Park, MI / 700,000 sf / \$76 million
- Henry Ford High School, Detroit, MI
- Oakland Schools, Oakland County, MI
- Trey Whitfield School, Brooklyn, NY
- Roosevelt High School, Roosevelt, NY / 225,000 sf
- Allentown School District, Allentown, PA
- Woodgrove High School, Purcellville, VA / 262,000 sf / \$50 million
- Tuscarora High School, Leesburg, VA / 270,000 sf / \$55 million
- Thoreau Middle School, Vienna, VA / 170,000 sf / \$39 million



Jonathan Friedman, PE, CCP, LEED AP

Project Manager



Mr. Friedman has 20 years of industry experience commissioning and designing building systems. He has directed commissioning projects for higher-education, K-12, healthcare and commercial facilities. This includes managing and participating in design reviews, pre-functional and functional testing and post-occupancy consulting services. He has authored commissioning specifications, testing procedures, operating manuals and energy savings reports.

RELEVANT EXPERIENCE

Commissioning

- Carlisle K-8 School, Carlisle, MA / 139,337 sf / \$20 million
- Leominster High School, Leominster, MA / 295,589 sf / \$32.8 million
- Sharon Middle School, Sharon, MA / 170,750 sf / \$50.5 million
- Hanover High School, Hanover, MA / 156,000 sf / \$42 million
- Minnechaug High School, Wilbraham, MA / 231,467 sf / \$66.5 million
- Somerset Berkley Regional High School, Somerset, MA / 222,826 sf / \$66.8 million
- Wellesley Fiske and Schofield Schools, Wellesley, MA
- Grafton High School, Grafton, MA / 186,351 sf / \$57 million
- Rochester Memorial Elementary School, Rochester, MA / 105,023 sf / \$26.5 million
- Mount Greylock High School, Williamstown, MA / 180,000 sf / \$965,000
- Bedford High School, Bedford, MA / 220,000 sf / \$51 million
- Park Avenue Elementary School, Danbury, CT / 39,920 sf
- East Hampton High School, East Hampton, CT / 124,700 sf / \$51 million
- Kennedy High School, Waterbury, CT / 48,200 sf / \$25 million
- Gaffney Elementary Magnet School, New Britain, CT / 80,000 sf / \$30 million
- North Branford Intermediate School, North Branford, CT / 115,700 sf / \$36 million
- Vernon E Cleaves Regional Vocational Agricultural Center, Wallingford, CT / 70,000 sf / \$28.8 million
- Whitmore Lake High School, Whitmore Lake, MI / 150,900 sf / \$38 million
- Allen Park Public Schools, Six Schools, Allen Park, MI / 700,000 sf / \$76 million
- Skyline High School, Ann Arbor, MI / 374,000 sf / \$84 million
- Salem High School, Canton, MI
- Oakland Schools, Oakland County, MI
- Birmingham Schools, Birmingham, MI

EDUCATION

Bachelor of Engineering,
SUNY Maritime College,
Marine Engineering (1993)

OSHA Certified (2010)

PROFESSIONAL LICENSES & CERTIFICATIONS

Professional Engineer: NY
(2012)

LEED Accredited Professional,
U.S. Green Building Council
(2009)

Certified Commissioning
Professional, Building
Commissioning Association
(2005)



Nathan Aring, PE, CCP, CxT

Mechanical/Plumbing Engineer



Nathan Aring is an accomplished and certified Field Engineer with over 5 years of industry experience in the commissioning, operations and assessment of building systems. He has served as project manager of multiple, concurrent jobs including commercial, K-12, fire stations and multiple LEED certified facilities. Mr. Aring has successfully applied the commissioning process from beginning to end and specializes in communication with all team members involved to meet project needs while maintaining the target budget.

RELEVANT EXPERIENCE

Commissioning

- Somerset Berkley Regional High School, Somerset, MA / 222,826 sf / \$66.8 million
- Westfield Elementary School, Westfield, MA / 95,573 sf / \$28.1 million
- Springfield Central High School Science Lab, Springfield, MA / 265,783 sf / \$32 million
- Greater Lowell Technical High School, Lowell, MA / \$53.1 million
- North Middlesex High School, Townsend, MA / 180,530 sf / \$69.2 million
- Wellesley Fiske and Schofield Schools, Wellesley, MA
- Auburn Middle School Boiler Replacement, MA
- Abington Middle School and High School, MA / 253,370 / \$77.2 million
- Massport Terminal B, Massachusetts
- University of Massachusetts, Amherst Champions Center, Amherst, MA / 50,000 sf / \$22 million
- Shrewsbury Public Library, Shrewsbury, MA / 34,000 sf / \$17 million
- Park Avenue Elementary School, Danbury, CT / 39,920 sf
- East Hampton High School, East Hampton, CT / 124,700 sf / \$51 million
- Kennedy High School, Waterbury, CT / 48,200 sf / \$25 million
- Gaffney Elementary Magnet School, New Britain, CT / 80,000 sf / \$30 million
- East Hampton High School, East Hampton, CT / 124,700 sf / \$51 million
- University of Michigan Dearborn Modular Research Lab, Ann Arbor, MI
- University of Michigan School of Nursing New Building, Ann Arbor, MI / 78,000 sf / \$33.9 million
- University of Michigan Munger Graduate Residences, Ann Arbor, MI / 380,000 sf / \$155 million
- William Paterson University Hunziker Wing and Hall, Wayne, NJ
- Culinary Institute of America Student Recreation Expansion, Hyde Park, NY / 52,000 sf

EDUCATION

Bachelor of Engineering,
University of Toledo,
Mechanical Engineering (2009)

PROFESSIONAL LICENSES & CERTIFICATIONS

Certified Commissioning
Professional, Building
Commissioning Association
(2015)

AABC Commissioning Group,
Certified Commissioning
Technician (2010)

Professional Engineer: MA
(2016)



Glenn Cattell, CCP, LEED AP BD +C

Electrical Engineer



Glenn Cattell is a licensed Master Electrician with over 20 years of experience with controls and high voltage, including electrical construction. Mr. Cattell has worked on a variety of projects, including hospitals, data centers, higher education, laboratories and industrial manufacturing facilities. Mr. Cattell also has a vast amount of experience with automated redundant medium voltage utility power systems and medium voltage emergency power systems.

RELEVANT EXPERIENCE

Commissioning

- Sharon Middle School, Sharon, MA / 170,750 sf / \$50.5 million
- Minnechaug High School, Wilbraham, MA / 231,467 sf / \$66.5 million
- Rochester Memorial Elementary School, Rochester, MA / 105,023 sf / \$26.5 million
- Burgess Elementary School, Sturbridge, MA / 129,300 sf / \$36.5 million
- Plymouth Canton New Middle School, Plymouth, MI
- Salem High School, Canton, MI
- Skyline High School, Ann Arbor, MI / 374,000 sf / \$84 million
- Cass High School, Detroit, MI
- Centerburg Middle/High School, Centerburg, OH
- Columbus City Schools, CPS Kingswood Data Center, Columbus, OH / 43,985 sf
- Columbus City Schools, Columbus, OH / 140,000 sf
- University of Utah, LS Skaggs Pharmacy Research Building, Salt Lake City, UT / 150,439 sf / \$53.8 million
- State University of New York at Buffalo, Science Complex, Buffalo, NY / 115,000 sf / \$40 million
- University of Kentucky, Patient Care Facility, Lexington, KY / 1,096,000 sf / \$450 million
- Duke University, Fitzpatrick Data Center Phase I and II, Durham, NC / 7,300 sf / \$8 million
- Cornell University, Martha Van Rensselaer 1933 Building, Ithaca, NY / 125,000 sf / \$28 million
- Ohio State University, Student Academic Services Building, Columbus, OH / 127,000 sf / \$22 million
- Wayne County Community College, Northwest Campus, Detroit, MI / 100,000 sf / \$32 million
- University of Massachusetts, Amherst Champions Center, Amherst, MA / 50,000 sf / \$22 million
- Emory University, Oxford Science Building, Atlanta, GA / 55,000 sf / \$28.9 million

EDUCATION

Washtenaw Community College,
Electrical Studies (1996)

Northwestern Community
College, PLC Class (2001)

10-Hour OSHA Trained (2010)

PROFESSIONAL LICENSES & CERTIFICATIONS

LEED Accredited Professional
Building Design + Construction,
U.S. Green Building Council
(2008)

Master Electrician, State of
Michigan (2000)

Certified Commissioning
Professional (2010)



Scott Lance, EBCP, LEED AP O+M

BMS/Controls Engineer



Scott Lance is a Senior Project Engineer with over 15 years of hands-on experience in project management and systems engineering; including 10 years of controls experience with Siemens. He has a proven ability to successfully organize critical business requirements and identify deficiencies. Mr. Lance is experienced with all aspects of building automation and controls systems including conceptual design, engineering, installation, start-up, commissioning, O&Ms and customer training. In addition to lab and cleanrooms, Mr. Lance has experience commissioning education, commercial and healthcare facilities.

RELEVANT EXPERIENCE

Commissioning

- Hanover High School, Hanover, MA / 156,000 sf / \$42 million
- Sharon Middle School, Sharon, MA / 170,750 sf / \$50.5 million
- University of Rochester Medical Center, Golisano Children's Hospital, Rochester, NY / 245,000 sf / \$145 million
- State University of New York at Cortland, Dragon Hall, Cortland, NY / 60,000 sf / \$22 million
- State University of New York at Buffalo, Buffalo State Science Building 3 Retro-Commissioning, Buffalo, NY
- NYS College of Human Ecology, Cornell University, North Martha Van Rensselaer Hall Replacement, Ithaca, NY / 87,000 sf / \$77 million
- Cornell University, Rice and Fernow Hall Renovations, Ithaca, NY
- Cornell University, Plantations Welcome Center and Botanical Gardens, Ithaca, NY / 6,000 sf
- Cornell University, School of Hotel Administration, Ithaca, NY
- Cornell University, Stocking Hall, Ithaca, NY / 160,000 sf / \$100.5 million
- SUNY College at Cortland, Casey/Smith Towers, Cortland, NY / 34,300 sf / \$4.5 million
- University of Rochester Middle Campus, Rochester, NY
- Rochester-Genesee Regional Transportation Authority, Renaissance Square Transit Center, Rochester, NY / 87,000 sf / \$50 million
- University Hospitals, Ahuja Medical Center, Beachwood, OH / 432,000 sf / \$260 million
- Corning, Inc., Alternative School of Math and Science, Corning, NY / 60,000 sf / \$17 million
- Corning, Inc., H Class Building, Corning, NY
- Corning Inc., Big Flats Warehouse Process Area, Corning, NY / 20,000 sf
- Corning, Inc., South Side Powerhouse Boiler Plant, Corning, NY / 16,700 sf
- Corning, Inc., ZV Building, Corning, NY / 350,000 sf
- Corning, Inc., Glass Market Cafe, Corning, NY / 20,000 sf

EDUCATION

Associate Degree, State
University of New York College
of Technology, Applied Science
(1999)

OSHA 30-Hour Trained

PROFESSIONAL LICENSES & CERTIFICATIONS

Existing Building
Commissioning Professional
(2014)

LEED Accredited Professional
Operations + Maintenance,
U.S. Green Building Council
(2012)

EPA Universal Refrigeration
Certificate (1999)

Six Sigma Yellow Belt



Robert Golda

Building Envelope Associate



Robert Golda has over 10 years of international experience with the design, engineering, fabrication and installation of building enclosure systems. Mr. Golda leads the Building Envelope team, where he focuses on the Building Envelope Commissioning process, as well as provides Exterior Enclosure Consulting Services. He has presented at several building envelope related conferences and has also published research related to the Integrated Design Process. Robert received a Presidential Citation at the 2012 AIA National Convention for his team's involvement in the rebuilding of the World Trade Center Site.

EDUCATION

Bachelor of Architecture, New Jersey Institute of Technology (2008)

SPECIALITY SKILLS

Facade Assessment
Forensic Investigation
Roof Asset Management
Evaluation
Inspection/Evaluation of Existing Buildings
Construction Management/ Administration
Value Engineering
Exterior Enclosure System Development and Design
High Performance Facade Systems
Structural Glass
Performance Mock-up Testing
Field Testing
Bid Negotiation and Procurement
Material Research and Development
Curtain Wall Refurbishment and Renovation

RELEVANT EXPERIENCE

Envelope Commissioning

- George Mason University, Academic and Research Facility for Health Sciences, Fairfax, VA / 160,000 sf / \$73 million
- Erickson Retirement Communities, Lantern Hill BECx, New Providence, NJ / 300,000 sf

Previous Experience

- Senior Architectural Professional, Building Enclosure Specialist, New York, NY / Skidmore Owings & Merrill / Duties: led the technical design and review for the enclosure systems of many of the firm's major projects throughout the world. / Experience: Citi Group Repositioning, New York, NY; 34 E 51st Street, New York, NY; All Aboard Florida, Miami Central Station, Miami, FL; UCONN Integrated Science Building, Storrs, CT; National Cancer Center Institute, Cairo, Egypt; OH-1, Office Building in Tokyo, Japan; Esentai Mall Upgrades, Almaty, Kazakhstan; Pertamina Tower, Jakarta, Indonesia*
- Associate, Curtain Wall Consultant Quality Control Manager, New York, NY / Heintges & Associates / Duties: consulted at this building envelope and curtain wall consulting firm in New York, where he contributed to numerous groundbreaking, large scale civic, institutional, and commercial projects. / Experience: New United States Embassy, Mexico City, Mexico; The Tower at PNC Plaza, Pittsburgh, PA; Vassar Science Project, Poughkeepsie, NY; Jacob Javits Center Renovation & Expansion, New York, NY; National Museum of African American History and Culture, Washington, DC; Millstein Heart Center New York Presbyterian Hospital, New York, NY; AMNH, Rose Center for Earth and Space, New York, NY; Weill Cornell Medical College Belfur Research Building, New York, NY*

*Prior to HEA





PETER DALTON

Senior Weatherproofing Consultant

EDUCATION

Hyde Park High School,
Hyde Park, MA
Wentworth Institute of
Technology

MEMBERSHIPS

Boston Society of Architects
Building Enclosure Council
Member
Air Barrier Association of
America
New England Chapter of
RCI, Inc.

CERTIFICATES

Aerial Lift Training course
AGC Massachusetts, OSHA
CETCO certified inspector
OSHA 10-Hour
Construction Health &
Safety Course
Suspended Scaffold
Training course

PROFESSIONAL EXPERIENCE

Peter Dalton joined T&L in 2007 as a senior weatherproofing consultant. He is involved in the evaluation of building enclosures, including roofing and below grade waterproofing; and the field inspection of all components of the exterior façade, including all weatherproofing components of existing and new buildings under construction, from the weatherproofing and flashing installations of back-up walls at masonry/stone veneer constructions to field-installed EIFS systems.

Peter has over 40 years of experience in the waterproofing industry. Prior to joining T&L, Peter was a project manager for both a restoration company and a masonry and waterproofing company. Peter was responsible for as many as 20 projects at one time, of both new and restoration construction, with contract values up to \$1 million. He was responsible for the day-to-day operations of individual projects, including material acquisition and interpretation of contract documents. His project manager responsibilities included estimating new construction and restoration projects and ongoing project management. As field coordinator, he was responsible for all field management operations for as many as 20 concurrent projects with individual contract values of up to \$3 million and for daily site supervision of up to 170 field personnel. He evaluated conditions of buildings in preparation for labor and material cost estimates and worked with architects and engineers to prepare mock-ups used in evaluation of waterproofing procedures.

RECENT T&L PROJECTS

Quincy House, Harvard University, Cambridge, MA
Fogg Museum, Harvard, Cambridge, MA
Malkin Athletic Center, Harvard, Cambridge, MA
Minnechaug Regional High School, Springfield, MA
Grafton Senior High School, Grafton, MA
Four Seasons Hotel, Boston, MA

PAST PROJECTS

New Construction

Post Office Square, Boston, MA
International Place, Boston, MA
Hynes Auditorium, Boston, MA
Marriott Hotel, Boston, MA
Westin Hotel, Boston, MA

Restoration Projects

Harvard University (Austin Hall, Claverly Hall, Dunster House, Eliot House, and Memorial Hall), Cambridge, MA
Museum of Fine Arts, Boston, MA
Landmark Building, 140 Federal Street, Boston, MA
South Station, Boston, MA



DONALD H. ARPIN

Senior Weatherproofing Consultant

EDUCATION

Lowell (MA) High School,
Concentration in General
Business (1970)

CERTIFICATIONS

OSHA 10-Hour Construction
Health & Safety Course

Aerial Lift Training course

Suspended Scaffold Training
course

CETCO certified inspector

TRADE EXPERIENCE

Construction Supervisor
License #CS-078946 (1992-
2012)

PROFESSIONAL EXPERIENCE

Mr. Arpin joined T&L in 2002, after working as a construction supervisor for fifteen years. Prior to joining T&L, Mr. Arpin worked on the construction of eleven multi-story buildings ranging in size from 150,000 to 300,000 square feet with one- to four-level parking garages, providing him with familiarity with a variety of facade components and weatherproofing materials.

Since joining T&L, Mr. Arpin has worked in our weatherproofing department, inspecting both new construction and restoration projects. His experience includes the installation of foundation waterproofing systems, air barrier systems, flashing systems, windows, doors, curtain walls, skylights, and joint sealants. He has also participated in field air infiltration and water penetration tests of windows, curtain walls, and skylights.

RECENT T&L PROJECTS

Franklin Park Apartments, Roxbury, Massachusetts (11 Buildings). Inspection of the restoration of brick masonry walls and application of waterproof coating and caulking

Essex County Public Safety Building, Lewis, New York. Inspection of foundation waterproofing.

Library Addition, Newton Country Day School, Newton, Massachusetts. Inspection of the installation of air barrier and flashing on back-up wall, EPDM and slate roofing, windows, doors, skylight, and caulking

Fenway Park, Boston, Massachusetts. Inspection of waterproofing membranes and expansion join in new box areas (2005 / 2006)

Liberty Mutual Dover, New Hampshire. Inspection of the installation of air barrier and flashing on back-up walls, TPO roofing, windows, curtainwalls, and caulking



Project Experience

HEA has provided commissioning, engineering and consulting services to a number of owners and clients nationwide, including public agencies, private institutions and organizations and professional firms.

"HEA worked closely with my team and the Construction Manager to ensure that project requirements were met and that a functioning facility was turned over to the school district. They were very effective in helping to drive schedules, resolve issues quickly and effectively and provided a very detail oriented approach to project management and deliverables."

David Helmke, Senior Project Manager, Loudoun County Public Schools. HEA served as commissioning authority.

Pages 15 - 18 contain a list of HEA's eight (8) most recent K-12 public school commissioning projects.

Pages 19 - 21 demonstrate three (3) commissioning projects of similar size and scope as the Dover High School and Career Technical Center project.

The Thompson & Lichtner Company, Inc. (T&L) has provided subconsultant services on the following projects:

- Springfield Central High School Science Lab
- Somerset Berkley Regional High School
- Wellesley Fiske and Schofield School
- Minnechaug High School
- Leominster High School
- Gaffney Elementary School
- Hanover High School
- Carlisle K-8 School
- Sharon Middle School
- Grafton High School



PROJECT 1

Gaffney Elementary School

New Britain, CT / 80,000 sf / \$30 million

Project Duration: March 2014 - September 2015

Client Reference: Joseph DeSanti, Senior Project Manager
Downes Construction Company

T: (860) 229-3755 / **E:** jdesanti@downesco.com



HEA was hired by the New Britain Board of Education to provide commissioning services for the complete renovation of the Gaffney Elementary School. The renovation included adding 15,000 sf, bringing the facility to 80,712 sf. The project includes additional office space, two preschool classrooms and one KEY room, which is used for special education autistic students. In total, there are 27 classrooms. This project was completed under budget and in time for the start of the 2015-16 school year.

Scope of work included: air handling units and their associated heating and cooling coils, exhaust fans, return fans, variable air volume terminal units and associated reheat coils, boiler and all associated pumps, tanks, condensate pumps, hot water heating system, computer room air conditioning units and associated split system condensers, unit heaters, cabinet heaters, building automation system, Direct Digital Controls, fire protection systems and equipment, fire alarm system interfaces with HVAC systems and security and telecommunications systems.

Deficiencies found include:

- Gymnasium return/supply ducting outlets/inlets are located high in space. This can lead to stratification issues when units are in operation.
- The CO2 sensor for a conference room read over 1,200 ppm even though the room has been empty for hours.
- Hot water bypass valve wiring does not appear to be correct. When commanded open, the valve remains shut.

PROJECT 2

Lowell Technical High School

Lowell, MA / 504,692 sf / \$53.1 million

Project Duration: March 2013 - October 2015

Client Reference: Mike Williams, Project Manager
KBA Architects

T: (617) 241-2807 / **E:** Not Available



The Massachusetts School Building Authority (MSBA) contracted Horizon Engineering Associates, LLP (HEA) to provide commissioning services for Greater Lowell Technical High School project in Lowell, MA. Commissioning services included participating in design, construction and post occupancy (warranty period) phases. The commissioning scope included the mechanical, electrical, communication, fire protection, plumbing and building envelope systems. The purpose of the commissioning process was to ensure that the design, installation and functionality of the building systems met the design intent and Owner's requirements. HEA participated in the design review process, which included multiple reviews of the design documents. During construction tasks performed included reviews of major equipment submittals, verification of equipment/system installation, equipment start-ups, air and water balancing and functional testing.



PROJECT 3 **Somerset Berkley Regional High School**

Somerset, MA / 222,826 sf / \$66.8 million

Project Duration: December 2011 - June 2014

Client Reference: Mike Morrison, Assistant Program Manager

Skanska USA Building, Inc.

T: (617) 279-3474 / **E:** Not Available



Under a term contract with Massachusetts School Building Authority, HEA was hired to provide commissioning services for the construction of the new regional high school. The new construction project replaced the existing Somerset High School. The new facility is a 222,826 sf academic high school capable of holding 1,000 students, Grades 9 through 12. The school houses the following departments: Art, Business Technology, English Language Arts and Reading, Engineering Technology, Foreign Languages, Health, Family & Consumer Sciences, Mathematics, Music, Physical Education, Science, Social Studies and Special Education.

HEA's scope of work included full building commissioning services for the building envelope, roofing, HVAC, plumbing, electrical power, voice, data, video, life safety and building automation/controls systems. This project is registered to achieve LEED Certification.

PROJECT 4 **Minnechaug High School**

Wilbraham, MA / 231,467 sf / \$66.5 million

Project Duration: March 2010 - September 2013

Client Reference: Melissa Frydlo, Project Engineer
ARCADIS US, Inc.

T: (413) 788-6256 / **E:** melissa.frydlo@arcadis-us.com



HEA was hired by the Massachusetts School Building Authority and has provided commissioning services for this new high school facility. The project included construction of a completely new school building on the site of the existing school. In addition to the state-of-the-art classrooms in the new school, the building also features an impressive auditorium, a large media center and a new swimming pool. The building includes many sustainable features and is seeking certification under the Massachusetts Collaborative for High Performing Schools (MA-CHPS) Program.

HEA's scope of work included all mechanical, electrical, fire protection, BMS/controls, plumbing, roofing, data and solar panel systems. The school Superintendent has reported that the project had very few change orders, with construction costs not exceeding the budget which was allocated.



PROJECT 5

Leominster High School

Leominster, MA / 296,000 sf total / \$46 million

Project Duration: September 2010 - December 2013

Client Reference: Anthony Sciabarrasi, Facility Director
Leominster Public Schools

T: (978) 534-7700 ext 332 /

E: anthony.sciabarrasi@leominster.mec.edu



Leominster High School's renovation goals included replacing the building systems that were well past their life expectancy. This project also included the construction of a 13,500 sf addition that will house the science department. This addition created eight new classrooms in the science wing. The renovation project replaced the windows, doors, cooling and heating systems, installing sprinklers, electrical and plumbing as well as upgraded to handicapped accessibility.

HEA provided commissioning services for all HVAC, plumbing, electrical, life safety, roofing, building envelope, voice, data, video and building automation and controls systems. One of the greatest challenges was to make sure that work is completed with hundreds of students, administrators, teachers, and visitors walking through the halls on a daily basis. Some of the students attended classes in leased modular classrooms. The project was broken out into eight phases, to allow construction to take place throughout the school year.

PROJECT 6

Sharon Middle School

Sharon, MA / 170,705 sf / \$35.8 million

Project Duration: May 2010 - February 2013

Client Reference: Michael Dupuis, Senior Project Manager
Consigli Construction Company

T: (508) 458-0377 / **E:** mdupuis@consigli.com



HEA provided commissioning services to an addition and renovation of the Sharon Middle School. The completed building is a 170,750 sf facility for 845 students, grades six through eight. The renovation includes science classrooms/labs, kitchen, cafeteria, server areas and accessibility and M/E/P upgrades. The addition links three wings of the existing building while housing a new main entrance, library, classrooms, addition to gymnasium and early childhood development center.

HEA's scope of work included all building envelope, roofing, mechanical, electrical, plumbing, life safety, BMS, and video systems in the school. HEA participated in deficiency resolution meetings and retested equipment/systems to ensure proper operation. Overall, the commissioning process proved to be a success due to approximately 200 deficiency issues being successfully addressed.



PROJECT 7

Wellesley Fiske & Schofield School

Wellesley, MA / 80,000 sf

Project Duration: June 2014 - August 2015

Client Reference: Rick Reuter, Senior Project Manager
Agostini Bacon Construction Companies

T: (401) 431-1200, ext 225 /

E: rickr@baconconstruction.com



The Consolidated School District of Wellesley contracted Horizon Engineering Associates, LLP (HEA) to provide commissioning services for the Fiske and Schofield Elementary School projects in Wellesley, MA. Commissioning services included participating in design, construction and then post occupancy (warranty period) phases. The commissioning scope included the mechanical, automation, and window testing. The purpose of the commissioning process was to ensure that the design, installation and functionality of the building systems met the design intent and Owner's requirements.

HEA participated in the design review process, which included multiple reviews of the design documents. During construction tasks performed included reviews of major equipment submittals, verification of equipment/system installation, equipment start-ups, and functional testing. In addition a review of the operation & maintenance manuals was conducted, a Systems Manual was developed and the Owner training process was coordinated. Various testing methods were used to verify operation such as manual testing, building automation system adjustments, manufacturer / contractor demonstration, seasonal checks and log in to the building automation system.

PROJECT 8

Springfield Central High School, Science Lab

Springfield, MA / 265,753 sf / \$32 million

Project Duration: March 2013 - March 2015

Client Reference: Anthony Leone, Owner Project Manager
Leftfield

T: (617) 737-6400 / **E:** aleone@leftfieldpm.com



The Massachusetts School Building Authority (MSBA) contracted Horizon Engineering Associates, LLP (HEA) to provide commissioning services at the Springfield Central High School Science Lab Initiative project in Springfield, MA. Commissioning services included participating in design, construction and then post occupancy (warranty period) phases. The commissioning scope included the mechanical, electrical, communication, fire protection, plumbing and building envelope systems. The purpose of the commissioning process was to ensure that the design, installation and functionality of the building systems met the design intent and Owner's requirements. HEA participated in the design review process, which included multiple reviews of the design documents. During construction tasks performed included reviews of major equipment submittals, verification of equipment/system installation, equipment start-ups, air and water balancing and functional testing. In addition, a review of the operation & maintenance manuals was conducted and the Owner training process was coordinated. Various testing methods were used to verify operation such as manual testing, building automation system adjustments, manufacturer / contractor demonstration, seasonal checks and remote log in to the building automation system.



PROJECT 1

The Hanover Public School District decided that a new high school was needed instead of renovations. HEA was hired to provide commissioning services for the new Hanover High School (HHS), encompassing grades 9-12. The building, surrounded by a new field and athletic facilities, is an environmentally friendly, flexible learning center that can accommodate approximately 800 students. The design has an open cafeteria/commons space that is the hub of the school and is designed with a sense of community. HHS received the Massachusetts Collaborative for High Performance School (MA-CHPS) distinction.

HEA's commissioning scope of work includes all mechanical, electrical, plumbing, data, fire safety, audiovisual, security and BMS systems within the school. The building maintains a variety of helpful systems that assist energy efficiency such as: a photovoltaic system installed on the roof for generating electricity; a state-of-the-art building automation control system allowing the facility manager to operate the building's HVAC system based on the building's needs; and a dedicated outdoor air system (DOAS) which uses less energy for space heating and cooling than a traditional VAV system.

Examples of deficiencies HEA identified and oversaw the correction of include:

- Economizer modes and energy wheels not functioning properly.
- Outside air dampers modulating to 100% open when the heat is on.
- Hot gas reheat solenoid wired wrong.
- Induction unit hot water heating valves programmed incorrectly.

HHS has kept HEA onboard to provide continuous commissioning services.



Hanover High School

Hanover, MA / 156,000 sf / \$42 million

Client Reference: Robert F. Murray, Facilities Engineering
Manager, Town of Hanover, MA

T: (781) 826-3189 ext. 214 / **E:** engineer@hanover-ma.gov



PROJECT 2

Massachusetts School Building Authority (MSBA) contracted HEA to provide commissioning services for the renovation and addition to the existing Carlisle K-8 school. The building will include 110,337 sf of renovation and a 29,000 sf addition for 700 students, grades Pre-K through 8.

The addition and renovations link the core public spaces with the academic building and provide a clear new entrance to the K-8 school. The two-story facility includes new PK-2 classrooms to bring the school's youngest learners together, administration and special education offices, and an entrance lobby.

HEA's scope of work, which was completed while the school was occupied, included: building envelope, roofing, HVAC, plumbing, electrical power, voice, data, video, life safety and building automation and controls.



Carlisle K-8 School

Carlisle, MA / 139,337 sf / \$20 million

Client Reference: Arthur Duffy, Senior Associate, HMFH Architects, Inc.

T: (617) 492-2200 / **E:** aduffy@hmfh.com



PROJECT 3

In 2008-2009, Grafton Memorial Senior High School had a total enrollment of 681 students, 20% over its stated design capacity. Overcrowding impacted all curriculum areas and limited specialized program offerings. Science laboratories were undersized, guidance offices were small and lacked conference space. Core spaces were also lacking with limited library and computer space, and gym classes were conducted in hallways due to overflow. Throughout the building, hallways and stairwells were not wide enough to accommodate the volume of students during class transitions, making for unsafe and inefficient student passing. After analyzing several options, the school district decided to construct a new high school on the existing site.

HEA provided commissioning services for the new Grafton Memorial Senior High School facility. The building is a new, 186,351 sf high school for 900 students, grades 9 through 12. The new school eliminated district-wide overcrowding. HEA's scope of work included commissioning all building envelope, roofing, mechanical, electrical, plumbing, BMS, life safety, voice, data, and video systems within the school. HEA also conducted infrared survey resulting in identification of 34 roof leaks.



Grafton Memorial Senior High School

Grafton, MA / 186,351 sf / \$57.4 million

Client Reference: Chris Hakenson, Head of Facilities,
Grafton High School

T: (757) 898-0530 / **E:** hakensonc@grafton.k12.ma.us





Scope of Work

MECHANICAL, ELECTRICAL AND PLUMBING SCOPE OF WORK

The commissioning services required to meet the scope of work noted in the RFP includes but is not limited to the following details noted below. The following systems are included in the commissioning scope:

- Heating, ventilation and air conditioning systems.
- Plumbing systems.
- Electrical power systems.
- Life safety systems.
- Building automation and controls.
- Building thermal envelopes (see detailed building envelope scope of work narrative).
- Roofing systems (see detailed building envelope scope of work narrative).

DESIGN DEVELOPMENT AND CONSTRUCTION DOCUMENTS PHASES

Owner's Project Requirements (OPR) and the Basis of Design (BoD)

Coordination. HEA will review the OPR and the BoD with the project team. HEA will assist with the development and comment as appropriate on the OPR as it pertains to the overall design. Also included, are focused reviews of the project documents (drawings and specifications) during the design phase. Reviews will take place at the design development, 60% and 90% construction document phases of design.

- Reviews will consist of the following:
 - o Confirm that the documents conform to the OPR and BoD. The review will include functionality, efficiency, performance, maintainability and environmental or indoor air quality impacts.
 - o Verify that the systems include all necessary components required for proper maintenance, accessibility and functionality.
 - o Development of recommendations regarding improvements of design strategy, material selection, and detailing that may maximize and improve long-term performance.
 - o Verify that performance information is identified, complete and correct.
 - o Review accessibility of all necessary components.
 - o Review project specifications as it pertains to the construction requirements. Confirm that commissioning work required by all participating parties in the project is accurately reflected in the contract documents.



- o Develop recommendations regarding improvements, refinements or operational procedures that may maximize and improve long-term operational performance.
- Provide a report identifying issues including discrepancies, omissions and clarifications.
- Meet with the design team to gain an understanding of the design to discuss the review comments and recommendations brought up by HEA. Up to five (5) design phase meetings are included.
- Coordinate a controls integration meeting with the design team and a follow up meeting with the controls contractor when they are brought onboard.
- Coordinate building envelope testing requirements for inclusion into the bid specifications with the architect.
- Upon issuance of the final construction documents, HEA will back check to ensure the comments were addressed.
- The building envelope systems review will include roofing, waterproofing, and exterior windows, doors and wall assemblies.

Develop Commissioning Specification. HEA will establish the specification to be included with the contract documents. It will outline roles and responsibilities of the contractors, vendors, owner and commissioning authority throughout the commissioning process.

Commissioning Plan. HEA will develop the commissioning plan for the commissioning process. The plan will include the development of the pre-functional and functional checklists. It will also include a timeline, coordinated with the construction team, delineating when and how specific tests will occur. This document will be updated as construction progresses.

Training and Turnover. Requirements pertaining to the training plan will be outlined in both the commissioning specification and commissioning plan. Information associated with equipment/system training sessions, design team participation, durations, multiple sessions for complex systems such as building automation and documentation including operation & maintenance manuals will be detailed.

BIDDING AND CONSTRUCTION PHASES

Bid. Participate in pre-bid meetings to review the commissioning process and to answer any questions from prospective bidders.

Commissioning Meeting(s). HEA will lead and conduct all commissioning meeting(s). Meeting(s) will be held during the construction process and will increase in frequency as the project moves forward. The commissioning meeting(s) will provide information in order to coordinate controls integration early in construction, review balancing procedures, discuss



equipment / system high performance activities, identify testing schedules, resolve conflicts and discuss deficiency resolution. The meeting minutes will be distributed by HEA to the commissioning team for review and comment.

Shop Drawing and Submittal Review. HEA will review the select shop drawings and submittals from an operational standpoint, in addition to determining the most feasible way to install the equipment for both performance and serviceability. Upon completion of our review, HEA will coordinate with the design engineer to collaborate on creating one unified comment for the contractors. HEA will concentrate on reviewing the shop drawings and submittals and compare to the project requirements. This detailed review includes building envelope submittals, mechanical, electrical and controls software along with the sequences of operation.

Test Forms and Scripts. HEA will develop construction checklists and pre-functional and functional testing forms. These forms may include:

- Pre-functional test requirements.
 - o Installation criteria.
 - o Nameplate verification.
 - o Equipment start-up requirements such as rotation, lubrication, actuator operation, etc.
 - o Sign-off requirement for the responsible installing contractors.
- Functional test requirements.
 - o Step-by-step test procedures for the individual component and corresponding systems.
 - o Performance criteria for passing tests, such as capacity, voltage, amperage, load conditions, etc.
 - o Interaction and integration with other systems.
 - o Each functional test procedure will have a detailed script to be executed by the sub-contractors.

Systems Installation Inspection. During construction, HEA will be present on a regular basis to evaluate the installation process. As construction progresses, the frequency of site visits will increase. This includes inspections of equipment/system installations to ensure that they are installed in accordance with the manufacturer's standards, design documents and the local code having jurisdiction over this project. Site reports will be completed and submitted after each visit. Some of the procedures that HEA will perform during this phase are as follows:

- Observe that equipment is installed to design specifications, via site visits and field observation reports.
- Attend construction meetings as required.
- Document construction process through the field observation reports and issues log.



- Develop an Owner training outline to be used for building turn over.
- Witness a portion of the hydrostatic tests, duct leakage tests or any other testing as required in specification.

ACCEPTANCE PHASE

Systems Performance Assessment. During the system performance assessment of the commissioning process, verification; functional performance testing; standard testing, adjusting and balancing (TAB); deficiency resolution and other acceptance procedures will take place. HEA personnel will assist with all pre-functional testing. During the pre-functional and functional stages, site visits will be conducted and field observation reports will be completed and submitted to the project team.

- *Verification.* This comprises a full range of checks and tests to determine that all components, equipment, systems and interfaces between systems operate in accordance with the contract documents. This includes all operating modes, interlocks, control responses and all specified responses to abnormal or emergency conditions. All verification procedures will be directed and witnessed by HEA. Any operating deficiencies will be documented and corrected by the responsible party concurrently and re-tested until accepted.
- *System Start-Up.* HEA will work with the project team to coordinate the commissioning activities into the project schedule early on in construction. Start-up and checkout plans issued by the contractors will be reviewed. HEA will witness major equipment / system start-ups and will review start-up reports to ensure all project requirements were achieved.
- *Functional Performance Testing (FPT).* Functional performance testing should progress from tests of individual components of the central equipment to tests of the overall systems that contain these pieces of equipment. HEA will verify that all equipment / systems function properly.
- *Testing, Adjusting and Balancing (TAB).* A pre-balancing meeting will be conducted in order to allow for an efficient TAB process. HEA will be onsite periodically to witness the TAB readings and progress (minimum of 10% verification). Upon completion of the TAB effort, HEA will review / comment on the TAB report.
- *Issues.* HEA will document all issues identified in the required systems during the verification process and report them to the construction team. HEA and the responsible contractor(s) will schedule re-testing of these items. HEA will also manage and administer any and all issues for the duration of the project. An onsite issue log will be present at all times. HEA will also report the issues in a report format during (or sooner as required) commissioning meetings with the trades.



System and Energy Management Manual. This manual will be developed in accordance with the ASHRAE 202-2013 requirements. The purpose is to have a guide that will help the building Owner operate the building systems as efficiently and effectively as possible. It will cover the operation of the commissioned systems and the facility staff will be trained in the use of the manual.

Maintenance Planning and Operations Training. The operating training program shall furnish a thorough understanding of all equipment, components, systems and their operation. We will review the operation and maintenance (O&M) manuals and participate in the Owner training program. Training items shall include the following:

- OPR/BoD review.
- System descriptions, capabilities and limitations.
- System operational procedures, for all modes of operation.
- Acceptable tolerances for system adjustments.
- Procedures for dealing with abnormal conditions and emergency situations.
- Use of O&M manuals.

PROJECT CLOSEOUT PHASE **Commissioning Report and Logs.** HEA will furnish a commissioning report that will include the following:

- Evaluation of the operating condition of the facility.
- Log deficiencies that were discovered and measures taken for correction.
- Log of uncorrected deficiencies that were accepted by the owner.
- Functional test and procedure results.
- Reports that document all field commissioning activities as they progress.
- A schedule of all deferred testing.
- Final version of the owner's requirements and design basis narratives, including brief descriptions of each building system.

POST OCCUPANCY PHASE **Warranty Period.** HEA will manage the warranty period to ensure that equipment / systems are operating properly after the building comes online. HEA will document any warranty issues, as they arise and set forth the necessary plan of action to rectify the warranty situation. Any and all seasonal testing will be completed at this point. Multiple site visits will be conducted during the warranty period to monitor the equipment and to review building operation with the facility department. Trend data will be reviewed to confirm operation. HEA will also establish a final site visit, with the appropriate project team members, to take place during the 10th month of the warranty period. The walkthrough will include a survey with the facility staff to identify



any issues associated with commissioned systems. Issues will be investigated by HEA. All commissioned systems will be reviewed with the facility staff. A warranty field report including recommendations will be issued by HEA.

BUILDING ENVELOPE SCOPE OF WORK

HEA will provide the Commissioning for the complete building enclosure with respect to the moisture, air, vapor, and thermal control layers. This encompasses the subgrade waterproofing at the foundation systems, the exterior walls and roof systems to form a complete building envelope.

The systems which are anticipated to be commissioned include:

- Air barriers, thermal barriers, vapor barriers and moisture barriers integral to the exterior envelope.
- Roofing systems with associated flashing and trims.
- Below grade and above grade waterproofing system, including any slab on grade conditions with associated flashing and trims.
- Fenestration systems including curtain walls, windows, storefronts and glazed openings.
- Exterior wall cladding systems, inclusive of cladding materials with associated insulation, support systems and air and vapor barriers.
- Exterior louvers included in the exterior envelope.
- Sealant joints, expansion joints and control joints related to the exterior envelope.

Our building envelope commissioning (BECx) services are modeled on the guidelines set forth by the National Institute of Building Science (NIBS) Guideline 3 in conjunction with ASTM E2813: Standard Practice for Building Enclosure Commissioning (BECx). The BECx services provided will fulfill the LEED requirements for Enhanced Commissioning, to ensure that all LEED Credits for the project are fulfilled.

HEA will work together with the Design Team and Building Owner to ensure that all of the systems which form the comprehensive Building Envelope as outlined above, meet and exceed the project requirements for both performance and longevity of materials. This will be accomplished by integrating ourselves into the team, and by providing the services listed herein throughout the various phases of the project.

Technical Design Reviews. HEA will perform a technical review of documents prepared by the A/E team, including drawings and specifications,

**DESIGN DEVELOPMENT
AND CONSTRUCTION
DOCUMENT PHASE
SERVICES**

at three (3) intervals during the design phases which includes the following milestones:

- 100% DD Documents.
- 60% CD Documents.
- 90% CD Documents.

HEA will furnish a Technical Peer Review Report to the owner and A/E team for review and use in future design issuances and meetings. HEA includes three (3) design review meetings with the Owner, A/E team, Construction Manager and Sub-contractors at the conclusion of each document milestone review.

Develop Envelope Commissioning Specification. HEA will establish the enclosure commissioning specification to be included with the contract documents. It will outline roles and responsibilities of the contractors, vendors, owner and commissioning authority throughout the commissioning process.

Building Envelope Commissioning Plan and Testing Matrix. HEA, in conjunction with the BECx Specifications, develop a commissioning plan. Which identifies and outlines the following minimum requirements.

- Requirements for laboratory testing and mock-ups.
- Requirements for field testing.
- Related Construction Phase and Post-Construction/Occupancy Phase requirements and activities.
- Development of Construction Checklists.
- Development of preliminary testing schedule.

Building Envelope Systems Manual. HEA will develop a Building Envelope Systems Manual, in conjunction with the Design and Construction teams.

Bid Negotiation Phases. HEA will attend a maximum of three (3) pre-bid conference meeting to review the BECx specification requirements with the selected exterior enclosure subcontractors. HEA will review Bidders requests, and provide recommendations to the Owner, A/E Team and CM as required.

**BID NEGOTIATION
AND AWARD PHASE
SERVICES**

**CONSTRUCTION
PHASE SERVICES**

Pre-Construction/Pre-Installation Meetings. HEA will participate in the pre-construction kickoff meeting and pre-installation meetings with the various enclosure trades. These meetings will be to coordinate the work of the trades responsible for installing the various enclosure systems, to identify gaps or overlaps in scope, and to discuss the integration of the various trades' work to establish continuity in the environmental control layers of the enclosure. HEA's fee has included for one (1) pre-construction meeting.



Review of Project Submittals. HEA will review and comment on submittals pertaining to the exterior envelope including but not limited to the following items:

- Shop drawings and associated structural calculations.
- Quality control and quality assurance submittals.
- Product data and material samples.
- Test reports.
- Mock-up submittals.
- Review construction schedule.

Commissioning Meetings. HEA will lead and conduct all enclosure commissioning meetings. Meetings will be held during the construction process and will increase in frequency as the project moves forward. The commissioning meetings will identify testing schedules, resolve conflicts and discuss deficiency resolution. The meeting minutes will be distributed by HEA to the commissioning team for review and comment.

Systems Installation Observation. During construction, HEA will be present to evaluate the installation process at the beginning of all critical enclosure component installations and at appropriate, regular intervals. This will include observation of installed systems to ensure they are installed in accordance with the manufacturers' standards and contract documents. Site reports will be completed and submitted after each visit. HEA's fee has included for monthly site visits during an anticipated duration of twelve (12) months for the exterior enclosure installation, for a total of twelve (12) site visits. In the event construction schedules are extended, HEA reserves the right to provide additional site visits as an additional service.

Some of the tasks that HEA will perform during this phase are as follows:

- Development of installation and performance checklists and testing forms with the installing contractor.
- Observation that enclosure systems are installed to design specifications, via site visits and field reports. HEA recommends and includes twelve (12) site visits to provide comprehensive building enclosure commissioning. In the event the construction duration is extended, additional site visits will be provided as an additional service to the building owner.
- Conductance of enclosure commissioning meetings – HEA recommends and includes six (6) for this phase and will coordinate these with the construction schedule.
- Documentation of the construction process, including verification that construction checklists are being utilized and are properly completed.

- Witnessing and perform onsite testing of enclosure related testing as required in the enclosure commissioning and exterior wall specification sections.
- Develop and maintain a construction open items log for items related to the exterior enclosure. Log to be submitted as part of the final BECx report.
- Maintenance of exterior envelope testing matrix as required.

Systems Performance Assessment. During the systems performance assessment portion of the commissioning process, performance testing and the ongoing identification of deficiencies will take place. HEA personnel will witness performance testing by others, after each of which a report will be completed and submitted to the owner. All onsite testing is to be performed by others, cost of testing is not included herein. In the event an offsite laboratory performance mock-up is pursued, additional fee will be required to inspect and witness the testing of the mock-up specimen.

- *Performance Testing.* Performance testing should progress from tests of individual enclosure components to tests of component assemblies and their various interfaces to tests of the entire enclosure. HEA will ensure that correct procedures are implemented and will work to assist the contractor(s) in achieving the proper function of all enclosure systems.
- *Identification of Deficiencies.* HEA will document all issues identified with the enclosure systems during performance testing and report them to the construction team. HEA and the responsible contractor(s) will schedule re-testing of these items. We will also manage and administer any and all issues for the duration of the project. An issues log will be made available and updated regularly. We will also document the issues in a report format during regular commissioning meetings with the trades or sooner as required.

PROJECT CLOSE OUT AND POST OCCUPANCY PHASE

Commissioning Report and Logs. HEA will furnish an enclosure commissioning report that will include the following:

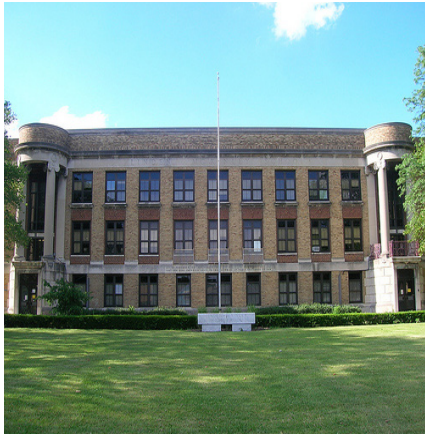
- Final version of the owner's requirements and design basis narratives, including brief descriptions of each enclosure system.
- Evaluation of the performance capacity of the enclosure.
- Log of deficiencies that were discovered and measures taken for correction.
- Log of uncorrected deficiencies that were accepted by the owner.
- Performance testing procedures and results.
- Reports that document all field commissioning activities as they progressed.
- A schedule of any deferred testing.



- Plans for continuous commissioning or recommended frequency for re-commissioning by enclosure system type.
- Maintenance manual for exterior enclosure systems.

Pre-occupancy/Lessons Learned Meeting. HEA to attend a pre-occupancy meeting with the building's facilities personnel to review maintenance procedures and review the status of the open items log.

Warranty Period. HEA will manage the warranty period as required within the specifications forwarded to our office. We will document any warranty issues if they arise and set forth the necessary plan of action to rectify the warranty situation. We will also establish a walk through with the appropriate trades and building personnel two (2) months, ten (10) months post occupancy and prior to the end of the first warranty year of the warranty period.



Fee Proposal

Our proposed fee for the Dover High School and Career Technical Center project will be as follows:

Task	Fee
Building Envelope Commissioning Services	\$15,490.00
Commissioning Services	\$156,140.00
Overall Fee:	\$171,630.00

EXCLUSIONS

Our fee is based on the RFP supplied to HEA dated February 5, 2016. The fee is based on an August 2018 completion date. If services are extended beyond this date, additional services may be required for meetings and on-site presence and will be deemed as not in contract. In addition, any increases in scope, square footage and/or quantity of systems will be treated as *not in contract*. Items deemed *not in contract* will be billed separately in accordance with our rate structure listed under “Terms” below.

TERMS

Acceptance. If you would like to proceed with this work, please address your order to Horizon Engineering Associates, LLP, 800 Veterans Memorial Highway, Suite 301, Hauppauge, NY 11788.

Payments. Invoices for basic services, reimbursable expenses and additional services shall be submitted monthly on our normal monthly billing cycle. Unless otherwise stipulated, invoices will be submitted electronically. Payments are due and payable thirty (30) days from the date of the invoice. If we are not paid within sixty (60) days of the invoice, we have the right to stop work without notice or liability.

Expenses. Reimbursable expenses are included in our fee breakout table on the previous page. Reimbursable expenses will include:

- All reproduction costs for plotting, prints and specifications, as well as creating the required drawings.
- All final reports will be submitted on a CD unless requested by the client. Any production cost associated with the report will be billed to the client.
- Mailing express delivery, courier service, messenger services and other communication expenses incurred in connection with the project.
- Test equipment rentals that are required to satisfy project requirements.
- Any expenses associated with transportation incurred by the engineer due to travel.
- Fees paid for expediting and securing approvals of authorities having jurisdiction over the project.
- Re-calibration of required test equipment associated with the project when necessary.

Compensation for Additional Services. It is understood that, where there are approved changes to work already completed or additional services required not specifically outlined in the scope-of-work, HEA shall be paid additional compensation, equal to the following hourly billing rates:

Partner in Charge - Michael C. English, PE	\$225.00
Project Manager - Jonathan Friedman, PE	\$225.00
Mechanical/Plumbing Engineer - Nathan Aring, PE	\$120.00
Electrical Engineer - Glenn Cattell	\$150.00
BMS/Controls Engineer - Scott Lance	\$175.00
Building Envelope Associate - Robert Golda	\$150.00
Field Engineer	\$ 95.00
Project Coordinator	\$ 65.00

Validity. This quotation is valid for sixty (60) days for work commencing within six (6) months.



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