BC

Contractor: The George Sollitt Construction Co.
Contact Name: John Pridmore
Address: 790 N. Central Ave.
City/State/Zip: Wood Dale, IL 60191
Phone Number: 630-860-7333
Fax Number: 630-860-7347

TO BE EXECUTED IN DUPLICATE

BOOK 1:

PROJECT INFORMATION, INSTRUCTIONS TO BIDDERS, AND EXECUTION DOCUMENTS

CONTRACT NO. 1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL
4707 W. MARQUETTE ROAD
NEW CONSTRUCTION
PROJECT #05110

PUBLIC BUILDING COMMISSION OF CHICAGO

Mayor Richard M. Daley
Chairman

Erin Lavin Cabonargi
Executive Director

Room 200
Richard J. Daley Center
50 West Washington Street
Chicago, Illinois 60602
312-744-3090
www.pbcchicago.com

Any Contract entered into as a result of this bid process is governed by: Book1 "Project Information, Instructions To Bidders, and Execution Documents;" Book 2 "Standard Terms and Conditions for Construction Contracts" Book 2A "Standard Terms and Conditions Procedures Manual;" and Book 3 "Technical Specifications" and the Drawings.

JUNE 2008 (Rev.1)

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EXHIBITS

1. **Illinois Department of Labor Prevailing Rates of Hourly Wages For Cook County**
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I. INTRODUCTION

Thank you for your interest in bidding on this project, which is being undertaken by the Public Building Commission of Chicago. The Public Building Commission of Chicago (hereafter, the PBC, or Commission) is a municipal corporation with a statutory mandate to procure and award contracts for the construction of public buildings in the City of Chicago, and to oversee the construction of those public buildings until they are turned over to the user agency that will own and operate each new facility.

This is the first page of text of Book 1, which along with Book 2, Book 2A, Book 3, and the project drawings, comprise the PBC's construction contract. The balance of this Book 1 provides a brief description of the project, instructions for completing and submitting your bid, the bid pages, and the forms which must accompany your bid. Book 2 is the Standard Terms and Conditions of the contract. Book 2A is the Standard Terms and Conditions Procedures Manual. Book 3 is the Technical Specifications for the work to be performed on this project. The PBC's architect or engineer for the project will provide the drawings and other documents that may be necessary for you to bid on and/or perform the work. Each of the Books, along with the drawings and any other documents prepared by the PBC, its architect or engineer, are Contract Documents. Collectively, the Contract Documents comprise the Contract. The Contract Documents are defined in Section 1 of Book 2, Standard Terms and Conditions.

II. PROJECT INFORMATION

A. General Information

1. Bids will be received by the Public Building Commission of Chicago for the following Project in accordance with the Contract Documents set forth below:

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL
4707 W. MARQUETTE ROAD
NEW CONSTRUCTION
PROJECT #05110

Bidders must be pre-qualified by the PBC to bid on this Project.

2. General Description of Scope of Work:

   a. As further described in the detailed specifications and drawings, a 104,131 square foot, three story masonry building, serving students from pre-K to 8th grade. Work includes but is not limited to site work, concrete foundations, envelope consisting of unit masonry, aluminum window walls and storefront, roofing (including green roof area); interior consists of gypsum and masonry walls and partitions, resilient, terrazzo and tile floors. Construction to include, but not limited to classrooms, library, gym with stage, warming kitchen and dining facilities, administrative and support area, landscaping, mechanical, electrical, plumbing, and standard elementary school finishes and amenities.

   b. This description of Work is intended to be general in nature and is neither a complete description nor a limitation of the Work to be performed.

3. Construction Budget: $28,000,000.00 (excluding Allowances and Commission's Contingency Funds).

4. User Agency: Chicago Public Schools

5. Project is located in Ward: 13th
6. For purposes of the project community hiring incentive "Residents of the project community" shall mean persons domiciled within the Clearing and West Lawn Community Areas as designated on Exhibit# 3 Community Area Map.
7. Requests for Information: send to Public Building Commission of Chicago, Attn: Janice Meeks, Senior Contract Officer by (email) janicemeeks@cityofchicago.org or (fax) 312-744-3572
8. Documents Available at: Cushing Co, 420 W. Huron Street, Chicago, IL, Attn: Carolyn Clark, 312-266-8228
9. Online Construction Documents Available at: http://dfs.cushingco.com/pbc.htm
10. Pre-Bid Meeting Date, Time, and Location: **Tuesday, January 6, 2009** at 10:00AM in the 2nd Floor Board Room, Richard J. Daley Center, 50 West Washington Street, Chicago, IL 60602
11. *Mandatory Technical Review Meeting for invited Pre-qualified Bidders: **Wednesday, January 14, 2009 at 11:00AM, in room CL115**

    ***NOTE:** Only Pre-qualified Bidders who attend the Technical Review will be eligible to bid.
12. Bid Opening Date and Time: **Friday, January 30, 2009 at 2:00PM**
13. Amount of Bid Deposit: **5% amount of bid**
14. Amount of Commission's Contingency Fund: **$500,000.00**
15. Document Deposit: **N/A**
16. Cost for Additional Documents (per set): At the Contractor's own expense.
17. MBE/WBE Contract Goals: 24% MBE and 4% WBE

B. Time of Completion

Substantial Completion of the Work must be achieved no later than **(465)** Days after the Notice to Proceed.

C. Commission's Contingency Fund

1. The Commission's Contingency Fund for this project is: $500,000.00
2. The Commission has established this Contingency Fund for the exclusive use of the Commission, at the Commission's sole discretion. The Commission's Contingency Fund sum shall be included as an allowance in the Base Bid. In the event that any or all of the Contingency Fund remains unused at the completion of the Work, the Commission will issue a deductive Change Order so that any such unused portion of the Contingency Fund shall remain with the PBC.

D. Copies of Drawings and Specifications Furnished

The Commission will furnish to the Contractor one (1) hard copy set of Drawings and Specifications for the execution of the Work. The Contractor is responsible for obtaining additional copies at its own cost.

E. Liquidated Damages

1. The Contractor agrees that the Work must be executed regularly and diligently to ensure completion within the time specified in Paragraph B above. The

Contractor and the Commission understand and agree that the time for the completion of the Work described herein is reasonable time. If the Contractor neglects, fails or refuses to complete the Work within the time specified, or any proper extension granted by the Commission, then the Contractor and its surety do hereby agree to pay to the Commission the amount of:

Substantial Completion of Phase (s), Milestones, or Project	$5,000 per Day

not as a penalty but as liquidated damages for the breach of contract occurring each and every Day that the Contractor after the time stipulated in the Contract for completing the Work.

2. The Commission may recover liquidated damages by deducting the amount out of any monies due or that may become due the Contractor. Liquidated damages, if any, will be calculated on completion of the Work and submission of the Contractor's final pay request.

3. Substantial Completion of the Work is defined in Book 2, Section 1.01.30.

F. Prevailing Wage Rates

1. Not less than the prevailing rate of wages as determined by the Illinois Department of Labor shall be paid to all laborers, workers and mechanics performing work under this contract. Prevailing wage rates in effect at the time of issuance of these Contract Documents are attached to Book 1 as Exhibit 1. One resource for determining the current prevailing wage rate is the Internet site www.state.il.us/agency/idol/CM/countym.htm maintained by the State of Illinois Department of labor.

III. INSTRUCTIONS FOR BIDDERS

A. Examination of Documents By Bidder

The Bidder shall, before submitting its bid, carefully examine all Contract Documents, including but not limited to, the Project Information, Instructions to Bidders, and Execution Documents (Book 1); Standard Terms and Conditions (Book 2); Standard Terms and Conditions Procedures Manual (Book 2A) Technical Specifications (Book 3); plans; drawings; Addenda (if any); and bonds. The Bidder will be responsible for all errors in its bid resulting from failure or neglect to comply with these instructions.

B. Interpretations of Addenda

The Commission will not furnish oral interpretations of Contract Documents, before or subsequent to the award of a contract. If an interpretation is desired by a prospective Bidder, the interpretation should be requested in a letter addressed to the PBC, attn: Janice Meeks, Senior Contract Officer, email; janicemeeks@cityofchicago.org or by fax 312-744-3572. Every interpretation or revision will be in the form of an addendum to the Contract Documents and, when issued, will be on file in the office of the Commission. Although all addenda will be faxed, e-mailed, or mailed to each Bidder obtaining Contract Documents, it shall be the Bidder's responsibility to inquire as to the addenda issued. All such addenda shall become part of the Contract and attached thereto and all Bidders shall be bound by such addenda, whether or not received by the Bidders.

C. Inspection of Site

Bidder shall inspect the Site to become familiar with the conditions relating to the Work to be performed, the facilities involved, and the difficulties and restrictions attending the performance of this Contract. Failure of the Bidder to visit the Site shall not relieve or alter the Bidder's responsibility for completing the Work as required by the Contract Documents.

D. Pre-Qualification of Bidders

1. Unless otherwise indicated in Part II "Project Information," the Commission has previously issued Request for Qualifications (RFQ) to approve the qualifications of firms to perform work on the Project. Responses to the RFQ were evaluated by the Commission on the basis of the criteria set forth in the RFQ. Notice of pre-qualification has been provided by the Commission to all firms "pre-qualified," and only firms that have received notification of pre-qualification are eligible to bid on this Contract. Pre-qualified firms are eligible to bid either as the entity that was pre-qualified or as a joint venture with another firm, provided that the pre-qualified firm has a controlling interest in the joint venture.

2. The Commission reserves the right to take such steps as it deems necessary to determine the continuing qualifications of the Bidder to adequately perform the requirements of the Contract, and the Bidder shall furnish to the Commission all information and data requested for this purpose. Failure of the Bidder to cooperate with the Commission in its investigation or submit any additional documents requested by the Commission shall be grounds for disqualification.

E. Evidence of Continuing Qualifications of Bidder

1. The Commission reserves the right to refuse to award a Contract to any person, firm, or corporation that is in arrears or is in default to the Commission upon any debt or contract, or that is a defaulter, as surety or otherwise, upon any obligation to the Commission, or had failed to perform faithfully any previous contract with

the Commission, or any of the User Agencies on whose behalf the PBC constructs public buildings.

2. The Bidder, if requested, must present within a reasonable time, as determined by the Commission, evidence satisfactory to the Commission of performance ability and possession of necessary facilities, pecuniary resources, and adequate insurance to comply with the terms of these specifications and Contract Documents.

F. Preparation of Bid

1. Two (2) copies of Project Information, Instructions, and Execution Documents (Book 1) shall be prepared with original signatures and notarizations wherever required.
2. All bids must be prepared on forms supplied by the Commission and shall be subject to all requirements of the Contract Documents. Unless otherwise stated, all blank spaces on the bid page or pages, applicable to the subject specification, should be correctly filled in. All bids must be regular in every respect and no interlineations, excisions or special conditions shall be made by the Bidder.
3. The Bidder's name, address, telephone and fax number should be clearly written on the front cover of each of the copies of Book 1 submitted.
4. When required by the Contract Documents, the Bidder may attach supporting documentation or additional information to the back of the form to which it refers.
5. The Commission may consider as irregular, and at its option reject, any bid on which there is an alteration of or departure from the bid form hereto attached.
6. The Bid Documents shall include the following:
   a. Contractor's Bid Form
   b. Bid Guarantee
   c. Basis of Award (Award Criteria)
   d. Unit Prices
   e. Affidavit of Non-collusion
   f. Schedule B – Joint Venture Affidavit with supporting documentation (if applicable)
   g. Schedule D – Affidavit of General Contractor Regarding MBE/WBE Participation
   h. Schedule E – Request for Waiver from MBE/WBE Participation (if applicable)
   i. Affidavit of Uncompleted Work
7. Current versions of the following documents shall be on file at the Commission at the time of bid opening:
   a. Financial Statement
   b. Disclosure Affidavit
   c. Statement of Bidder's Qualifications
8. The apparent low Bidder is required to submit a fully executed Disclosure of Retained Parties within five (5) days after bid opening.

G. Bid Deposit:

1. The Bid must be accompanied by a "Bid Deposit" in the amount set forth in Part II.A. "General Project Information" to ensure:
   a. Non-withdrawal of the bid after date and time of opening.
   b. The furnishing of the Performance and Payment Bond and evidence of the required insurance coverage by the successful Bidder as required by the Contract Documents.
2. The guarantee shall be made by bid bond, certified check or cashier's check payable to the order of the Public Building Commission of Chicago. No bid will be considered unless it is accompanied by the required guarantee. Cash deposits will not be accepted.
3. The bid bonds, certified checks, or cashier's checks of unsuccessful Bidders will be returned as soon as practicable after the opening of the bids; however, the deposits of the three (3) lowest Bidders shall be retained until the Commission awards the Contract to one of them, or for any reason rejects all bids.

H. Bidder's Execution of Bid

1. The Bidder must execute the Bid in two (2) original counterparts.
2. Bids must be submitted with original signatures in the space provided on the appropriate Part II.B. "Acceptance of the Bid." Bids not properly signed shall be rejected.
3. If Bidder is a corporation, the President and Secretary must execute the bid. In the event that this bid is executed by other than the President, attach hereto a certified copy of that section of the Corporate By-Laws or other authorization by the Corporation that permits the person to execute the offer for said corporation.
4. If Bidder is a partnership, all partners must execute the bid, unless one partner has been authorized to sign for the partnership, in which case, evidence of such authority satisfactory to the Commission must be submitted.
5. If Bidder is a sole proprietorship, the sole proprietor must execute the bid.
6. A "Partnership," "Joint Venture," or "Sole Proprietorship" operating under an Assumed Name must be registered with the Illinois county in which it is located, as provided in 805 ILCS 405 (1992).

I. Affidavit of Non-Collusion

Each Bidder shall fully execute an affidavit, in the form provided, to the effect that the Bidder has not colluded with any other person, firm, or corporation in regard to any bid submitted. Such affidavit shall be attached to the bid.

J. MBE and WBE Commitments

Each Bidder shall submit with its Bid a completed Schedule D-Affidavit of General Contractor regarding M/WBE Participation and Schedule B- Affidavit of Joint Venture (if applicable) as found in Book 2 Section 23.05a (2, 3, 4) describing the extent to which Minority Business Enterprise (MBE) and Women Business Enterprise (WBE) firms will participate in the Contract:

The apparent low bidder must provide complete **Schedule C-** Letter of Intent from M/WBE to Perform as a Subcontractor, Subconsultant, or Material Supplier, including current certification letter for each MBE and WBE firm included in its bid within 5 Days of the date set for bid opening.

K. Affidavit of Uncompleted Work

The Bidder is required to submit a fully executed Affidavit of Uncompleted Work, which declares, among other things, the value and estimated completion date of all uncompleted contracts to be completed with Bidder's own forces and to be subcontracted to others. Such affidavit shall be attached to the bid on the form provided.

L. Bidder's Financial Statement

Each Bidder shall have on file in the office of the Commission at the time of bid opening a financial statement dated not earlier then the end of said Bidder's last fiscal year period. This will be kept on file by the Commission as a representative statement for a period of one year only. If a Bidder does not have such statement on file, it must submit a copy with its bid. Failure to have a current financial statement on file at the Commission at time of bid opening may be cause for the rejection of the Contractor's Bid.

M. Disclosure Affidavit

Each Bidder shall have on file in the office of the Commission at the time of bid opening a fully executed Disclosure Affidavit.

N. Statement of Bidder's Qualifications

Each Bidder shall have on file in the office of the Commission at the time of bid opening a fully executed Statement of Bidder's Qualifications or a Qualification Submittal in response to a Request for Qualifications (RFQ). The Commission reserves the right to request additional information regarding the capability of the Bidder to perform the Contract.

O. Disclosure of Retained Parties

The apparent low Bidder and the apparent 2nd low bidder shall submit a fully-executed Disclosure of Retained Parties pursuant to the instructions on the document within five (5) days of receipt of notice to provide such Disclosure.

P. Submission of Bid

1. Two (2) copies of all bid documents with original signatures shall be enclosed in two (2) envelopes each (outer and inner), both of which shall be sealed and clearly labeled with "BID DOCUMENTS," the Contract number, name of Bidder, and date and time of opening.
2. Bids received prior to the advertised hour of opening will be securely kept by the Commission.
3. Written modifications of bids will be considered only if received prior to the time stated for receipt of Proposals. Such modifications must be submitted in a

sealed envelope and marked in the same manner as a bid. IN ADDITION, the envelope must state "BID MODIFICATIONS TO SEALED PROPOSAL" on the lower left-hand corner of the envelope in which the bid modification is enclosed, so that the modification will be recognized to prevent its being opened prior to scheduled public opening of bids. Telephonic or oral modifications will not be considered. Bidders are cautioned that modifications which are not explicit and which are in any sense subject to misinterpretation shall make the bid so modified or amended subject to rejection.

Q. Withdrawal of Bids before Bid Opening

Any Bidder may withdraw its bid by letter, facsimile, e-mail request, or by personally securing, with proper identification, the submitted bid proposal at any time prior to the time fixed for opening of bids. A telephonic request to withdraw a bid will not be considered.

R. Opening of Bids

At the time and place fixed for the opening of bids, the Commission will cause to be opened and publicly read aloud every bid received within the time set for receiving bids irrespective of any irregularities therein. Bidders and other persons properly interested may be present in person or by representative.

S. Evaluation of Bids

1. The Commission reserves the right to check all calculations and to correct all extensions in case of error in order to determine the correct amount of the Total Base Bid and/or the total amount of any other schedule required.
2. Along with reviewing the calculations of each bid, the Commission will evaluate each Bidder's responsiveness to all Bid requirements and responsibility.
3. The Commission may require that the apparent low bidder and any other bidder submit a breakdown of their bids by CSI Division or other appropriate basis. The Commission may also require the apparent low bidder or any other bidder to attend a pre-award meeting to review their bids in detail.

T. Basis of Award

Award will be made to the responsible Bidder submitting the lowest Award Criteria and otherwise responsive to all the requirements of the Contract Documents.

U. Performance and Payment Bond and Insurance

1. Each Bidder shall furnish proof of its ability to provide the bonds and insurance required by the Contract with its bid. With respect to the payment and performance bonds, a letter from the Bidder's surety affirming the surety's willingness to provide the Bidder's bonds is sufficient. With respect to the insurance, either a letter from the Bidder's insurer, or a certificate showing that the Bidder currently possesses the required coverage, is sufficient.

2. The insurance requirements for this project are as follows: The Contractor must provide and maintain at Contractor's own expense, the minimum insurance coverage and requirements specified below, insuring all operations related to the Contract. The insurance must remain in effect from: the date of the notice to proceed until Substantial Completion of the project, during completion of Punch List, as well as any time Contractor returns to perform additional work regarding warranties or for any other purpose

a) *Insurance To Be Provided By the Contractor*
The insurance requirements are attached as Exhibit 2.

3. Upon approval by the Commission to award, and within five (5) days after being given notice, the successful Bidder must execute and deliver to the Commission the Performance and Payment Bond in the form included in the Contract Documents, and evidence of the required insurance coverage.

4. The Performance and Payment Bond shall be in the form provided herein, in the full amount of the Base Contract Price and shall be security for the faithful performance of the Contract and payment of all persons, firms, or corporations to whom the Contractor may become legally indebted for labor, material, facilities or services of any nature, employed or used by it in performing the Work. The current power of attorney for the persons who sign for any surety company shall be attached to such bond. Such power of attorney shall be sealed and certified with a "first hand signature" by an officer of the surety. A facsimile signature will not be accepted by the Commission. The Commission reserves the right to approve the surety company.

5. The failure of the successful Bidder to supply the required Performance and Payment Bond or evidence of the required insurance coverage within five (5) days of notice, or within such extended period as the Commission may grant based upon reasons determined sufficient by the Commission, shall constitute a default and the Commission may either award the Contract to the next lowest responsible bidder or re-advertise for bids. The difference between the amount of its bid and the amount for which a contract for the work is subsequently executed may be charged against the Bidder, irrespective of whether the amount thus due exceeds the amount of the bid security. If a more favorable bid is received by re-advertising, the defaulting Bidder shall have no claim against the Commission for a refund. Because of the difficulty of ascertaining the damage caused to the Commission, such sum shall be considered liquidated damages and shall not constitute a penalty. The election by the Commission to grant an extension to the period allowed for the bidder to provide an acceptable performance and payment bond and/or evidence of insurance coverage shall not entitle the bidder to an extension of time required to complete the Work.

V. Protests

1. The bidder shall submit any protests or claims regarding this solicitation to the office of the Commission's Executive Director. A pre-bid protest must be filed five (5) days before the bid opening date, a pre-award protest must be filed no later than ten (10) days after the bid opening date, and a post-award protest must be filed no later than ten (10) days after the award of the Contract.

2. All protests or claims must set forth the name and address of the protester, the Contract number, the grounds for the protest or claim, and the course of action that the protesting party desires that the Executive Director take.

W. Licensing

In addition to all other applicable licenses and certifications, the general contractor is required to submit a copy of its (Class A) General Contractor License issued by the Department of Buildings of the City of Chicago.

X. Award Of Contract; Rejection Of Bids

1. The Contract will be awarded to the responsive, responsible Bidder submitting the lowest Award Criteria Figure, as defined herein, complying with all conditions set forth in the Contract Documents.
2. **The Bidder agrees that its bid shall be in effect until midnight, Tuesday, February 17, 2009 and that the bid may not be withdrawn until that time.**
3. The Bidder to whom the award is made will be notified as soon as practicable after the Commission approves award of the Contract. This written notification constitutes the Notice of Award and acceptance of the bid submitted.
4. If written notice of the acceptance of this Bid is mailed, faxed, e-mailed or otherwise delivered to the undersigned within the time noted herein, or at any time thereafter before this Bid is withdrawn, the undersigned agrees to enter into a Contract with the Public Building Commission of Chicago with the Bid as accepted. The undersigned agrees to give a Performance and Payment Bond as specified in the Contract Documents, with good and sufficient surety or sureties, and to furnish the required insurance, all within five (5) days after given Notice of Award.
5. Upon award of Contract, the Commission will process the Contract for final execution.
6. The Commission reserves the right to reject any and all bids and to waive any informality in bids received whenever it determines such rejection or waiver is in its interest.

IV. PROPOSAL AND EXECUTION DOCUMENTS

A. Contractor's Bid

The Contractor hereby acknowledges receipt of the Contract Documents for Contract No. 1478, including, but not limited to, a) Project Information, Instructions to Bidders, and Execution Documents (Book 1), b) Standard Terms and Conditions (Book 2), and Standard Terms and Conditions Procedures Manual (Book 2A) c), Technical Specifications (Book 3) , d), Plans and Drawings, and e). Addenda Nos. (None unless indicated here)

1 and 2

Further, the Contractor, having inspected the Site and become familiar with the conditions affecting the cost of the Work and with the requirements of the Contract, hereby proposes to furnish all labor, necessary tools, materials and other work necessary to perform and complete in a workmanlike manner the TYPE OF WORK for PROJECT located at the Site designated as required by and in strict accordance with the Contract Documents for the Base Contract Price listed on the next page.

The agreement between the parties includes not only this instrument, but also the remaining Contract Documents as described in the Standard Terms and Conditions, and all of which shall be binding on the parties hereto.

Time is of the essence of this Contract. The Contractor agrees that it will commence the performance of the Work on the date set forth in the Notice to Proceed issued by the Commission and that it will complete the Work within the time set forth in Part II "Project Information."

The Base Contract Price listed below, as adjusted from time to time pursuant to the Contract Documents, shall be full compensation to the Contractor for having well and faithfully completed the Work, free and clear of all claims, liens, and charges whatsoever, of any kind or nature, and in full compliance with the Contract.

Payment for the Work will be made in the manner set forth in Book 2 the Standard Terms and Conditions.

The Contractor warrants that it has not employed any person to solicit or secure this Contract upon any agreement for a commission, percentage, brokerage, or contingent fee. Breach of this warranty shall give the Commission the right to terminate the Contract, or, at its discretion, to deduct from the Contract Price or consideration the amount of such commission, percentage, brokerage, or contingent fees. This warranty shall not apply to any commission payable by the Contractor upon contracts or sales secured or made through bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business.

The Contractor, being duly sworn, deposes and says on oath that no disclosures of ownership interests have been withheld; the information provided therein to the best of its knowledge is current; and the undersigned proposes to furnish the insurance and the Performance and Payment Bond required by the Contract Documents.

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

BID FORM

	AMOUNT
Work	$ 21,954,000
Site Work Allowance	$100,000.00
Commission's Contingency Fund	$500,000.00
CCTV	$200,000.00
Data Switch	$175,000.00
TOTAL BASE BID	$ 22,929,000

AWARD CRITERIA FIGURE
(See Section V. Proposal Support Document, line 15 of Award Criteria Figure):

$ 21,931,589

BASE CONTRACT PRICE: $_____

SURETY: Please specify full legal name and address of Surety:

Travelers Casualty and Surety Company of America

215 Shuman Blvd.

Naperville, IL 60563

SITE WORK ALLOWANCE

Item No.	Description of Work	Unit(s)	Unit Price
1	Loading, transportation and disposal of stockpiled contaminated soil	Tons	$35.00
2	Excavation, loading, transportation and disposal of contaminated soil	Tons	$45.00
3	Loading, transportation and disposal of stockpiled un-suitable soil	Tons	$35.00
4	Excavation, loading, transportation and disposal of in-place un-suitable soil	Tons	$45.00
5	Load, place and compact on-site fill material from stockpile	Cubic Yards	$7.00
6	Excavate, load, place and compact on-site fill material	Cubic Yards	$11.00
7	Demolition, removal, transportation and disposal of underground concrete footings and remnants.	Cubic Yards	$30.00
8	UST Removal (Tank < 2000 gal capacity)	Each	$3,000.00
9	UST Removal (Tank 3,000-5,500 gal capacity)	Each	$5,000.00
10	UST Removal (Tank 6,000-10,000 gal capacity)	Each	$8,000.00
11	UST Removal (Tank > 10,000-15,000 gal capacity)	Each	$9,000.00
12	UST Removal (Tank > 15,000 gal capacity)	Each	$12,000.00
13	UST tank sludge removal and disposal (55-gallon drum)	Drums	$300.00
14	Bulk UST pump out (Liquids), including transportation	Gallons	$0.60
15	Waste characterization sample analysis for disposal authorization for soils removed under Allowance Schedule	Sample	$1,500.00
16	Water analysis for full MWRDGC contaminants List	Each	$750.00
17	Obtain MWRDGC discharge permit for Bulk disposal of contaminated liquid	Each	$1,200.00
18	Contaminated water-hauling and disposal of drums	Drums	$200.00
19	Pumping, transportation and disposal of contaminated water - bulk disposal	Gallons	$0.60
20	Pumping, storage and disposal of contaminated water - bulk disposal by MWRDGC Permit	Gallons	$0.10
21	Furnish, place and compact base material CA-1 Stone	Ton	$16.00
22	Load on-site base materials, place and compact CA-1 Stone	Cubic Yards	$8.00
23	Furnish, place and compact aggregate material CA-6	Ton	$16.00
24	Excavate, place and compact on-site aggregate material CA-6	Cubic Yards	$12.00

25	Furnish, place and compact drainage material CA-7	Tons	$16.00
26	Excavate, place and compact on-site drainage material CA-7	Cubic Yards	$12.00
27	Furnish and place geotextile filter fabric	Square Yard	$7.00
28	Site Survey - Survey crew for verification of excavation and backfill quantities	Each	$1,500.00
29	Street restoration per CDOT - 1-1/2 inch Asphalt Binder Coarse and 1-1/2 inch Asphalt Surface Coarse. Less than 100 Square Yards	Square Yard	$165.00
30	Street restoration per CDOT - 9-inch PCC Base Course, 1-1/2 inch Asphalt Binder Coarse and 1-1/2 inch Asphalt Surface Coarse. Less than 100 Square Yards.	Square Yard	$220.00

Total Allowance Fund = $100,000.00

NOTES:

1. All Work associated with the above allowance schedule shall be approved in writing by the Commission Representative prior to proceeding.

2. Authorized additional excavation and replacement material will be paid for in accordance with the above allowance schedule.

3. Authorized additional excavation means excavation below subgrade elevations as shown in the Plans and Specifications due to the presence of unsuitable soil materials as determined by the Commission Representative.

4. The unit prices in this allowance schedule include all overhead and profit.

5. All unused portions of the allowance funds must be returned to the Commission in the form of a deductive change order prior to Final Completion and Acceptance of the Work.

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

B. Acceptance of the Bid

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in two (2) original counterparts the day and year first above written.

PUBLIC BUILDING COMMISSION OF CHICAGO

Secretary

Chairman

CONTRACTING PARTY
(Print or type names underneath all signatures)

The George Sollitt Construction Company
Contractor Name

790 N. Central Ave., Wood Dale, IL 60191
Address

If a Corporation:

By Howard Strong

President
Title of Signatory

ATTEST:
By John Pridmore

Secretary
Title

CORPORATE SEAL

If a Partnership:

Partner — Address

Partner — Address

Partner — Address

If a Sole Proprietorship:

Signature

NOTARY PUBLIC
County of DuPage State of Illinois
Subscribed and sworn to before me on this 30th day of January, 20 09.

Notary Public Signature
Commission Expires: 11/28/09

(SEAL)

OFFICIAL SEAL
NANCY PLANEK
NOTARY PUBLIC - STATE OF ILLINOIS
MY COMMISSION EXPIRES:11/28/09

C. Corporate Resolution (if a Corporation)

I, the undersigned, DO HEREBY CERTIFY that the following is a complete, true and correct copy of certain preambles and resolutions of the board of directors of

The George Sollitt Construction Company ,

a corporation duly organized and existing under the laws of the State of Illinois and authorized to do business in the State of Illinois, which resolutions were duly adopted at a duly called meeting of said board held on May 28, 20 08, a quorum being present, and are set forth in the minutes of said meeting; that I am the keeper of the corporate seal and of the minutes and records of said corporation; and that the said resolutions have not been rescinded or modified:

WHEREAS, this corporation submitted a bid, dated January 30, 20 09 to the Public Building Commission of Chicago, for Contract No. 1478 of said Commission;

NOW, THEREFORE, BE IT RESOLVED: That the president or vice president and the secretary or assistant secretary of this corporation be, and they are hereby, authorized and directed to execute contracts for and on behalf of and under the name and seal of this corporation; and

BE IT FURTHER RESOLVED: That the aforesaid officers of this corporation be, and they are hereby, authorized and directed to execute and deliver to the Commission, for and on behalf of this corporation, such other and all documents as may be necessary or pertinent to a contract, and to do and perform any and all other acts relative thereto.

I FURTHER CERTIFY that the following-named persons are the officers of this corporation duly qualified and now acting as such:

President:	Howard Strong
Vice President:	John Pridmore
Secretary:	John Pridmore
Treasurer:	Daryl Poortinga
Assistant Secretary:	Nancy Planek

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed the seal of said corporation this 30th day of January, 20 09.

Secretary

V. PROPOSAL SUPPORT DOCUMENTS

A. Basis of Award (Award Criteria)

To promote the intended goal of economic opportunity and maximize the use of minority personnel on this project, the Public Building Commission of Chicago has established the Award Criteria formula for the purpose of evaluating proposals and awarding the contract. A contract in the amount of the total Base Bid or Base Contract Price will be awarded to the responsible bidder with the lowest Award Criteria Figure. The Public Building Commission of Chicago reserves the right to check all calculations for accuracy. The fulfillment of the Award Criteria does not abrogate the responsibilities of the Contractor to comply with federal and state requirements under the *Equal Employment Act* and the *Illinois Human Rights Act*.

1. Instructions

The Bidder shall complete the Award Criteria Formula and transfer the final Award Criteria Figure - Line 15 to the space provided on the itemized proposal sheet. Failure to complete the formula may be cause for rejection of the Bidder's proposal. The successful bidder will be held responsible for adhering to the figures submitted in Lines 1, 2, 4, 6, 8, 10 and 12 during construction of the project.

Lines 2, 4 and 6 in the formula shall not be greater than fifty percent (50%) in each category for the sole purpose of determining award of the contract. Similarly, lines 8, 10 and 12 shall not be greater than ten (10%) percent in each category for the purpose of award criteria only. The fifty percent (50%) and ten percent (10%) goals are not intended to restrict the total number of minority and female employees to be used on the project, but only to establish limiting figures for use in the formula. Journeyworker includes journeyworkers from the major trades listed herein, and the teamsters. Watchmen and custodial workers are not creditable in the formula.

2. Award Criteria Formula

Line 1.	Base Bid, in figures	See Total Base Bad On Page 14
Line 2.	Percentage of the Journeyworkers hours that the Contractor proposes to be worked by minority Journeyworkers during construction of the project. (Maximum figure 0.50)	.45
Line 3.	Multiply Line 2 by Line 1 by 0.04	
Line 4.	Percentage of total Apprentice hours that the Contractor proposes to be worked by minority Apprentices during construction of the project. (Maximum figure 0.50)	.50
Line 5.	Multiply Line 4 by Line 1 by 0.03	
Line 6.	Percentage of the total Laborer hours that the Contractor proposes to be worked by minority Laborers during construction of the project. (Maximum figure 0.50)	.50
Line 7.	Multiply Line 6 by Line 1 by 0.01	
Line 8.	Percentage of total Journeyworker hours that the Contractor proposes to be worked by female Journeyworkers during the construction of the project. (Maximum figure 0.10)	.05

Line 9.	Multiply Line 8 by Line 1 by 0.04	
Line 10.	Percentage of total Apprentice hours that the Contractor proposes to be worked by female Apprentices during construction of the project. (Maximum figure 0.10)	.10
Line 11.	Multiply Line 10 by Line 1 by 0.03	
Line 12.	Percentage of the total Laborer hours that the Contractor proposes to be worked by female Laborers during construction of the project. (Maximum figure 0.10)	.05
Line 13.	Multiply Line 12 by Line 1 by 0.01	
Line 14.	Summation of Lines 3, 5, 7, 9, 11, and 13	
Line 15.	Subtract Line 14 from Line 1 (= "Award Criteria Figure")	See Award Criteria Figure

Award Criteria Figure (Insert Line 15 of Award Criteria Formula): $On Page 14

3. Community Hiring Bonuses

In order to encourage maximum employment of interested and available residents of the project community on this project, the following bonus calculations shall apply:

a. In calculating the hours worked by minority and women journeyworkers, apprentices, and laborers under the Award Criteria set out in Part V.A. "Basis of Award (Award Criteria)," all hours worked by minority and women journeyworkers, existing apprentices, and laborers who are residents of the project community shall be multiplied by 1.5.

b. In calculating the hours worked by minority and women apprentices under the Award Criteria set out in Part V "Proposal Support Documents," all hours worked in new apprenticeships by minority and women apprentices who are residents of the project community shall be multiplied by 2.0.

Definitions

"Actual residents of the City of Chicago" shall mean persons domiciled within the City of Chicago. The domicile is an individual's one and only true, fixed, and permanent home and principal establishment.

"Residents of the project community" shall mean persons domiciled within the project area as stated in Section II.A.G., above..

"New Apprenticeship" shall mean an apprenticeship begun for a person who has not held an apprenticeship card within ninety (90) days prior to beginning the project.

4. Liquidated Damages

The Contractor hereby consents and agrees that, in the event that it fails to comply with each of the minimum commitments submitted with this Proposal on Lines 2, 4, 6, 8, 10, and 12 of the Award Criteria Formula, covering minority and female Journeyworkers, apprentices, and laborers respectively, the following shall apply.

If the total hours in any category for which a percentage is assigned in Lines 2, 4, 6, 8, 10, or 12 of the Award Criteria equals zero at the completion of the work,

then a net deficiency of the entire percentage assigned will be deemed to exist. For any net deficiency in each category, the following amounts shall be deducted as liquidated damages from monies due the Contractor and the Contract Sum modified accordingly:

a. For each full one (1%) percent deficiency of minority Journeyworkers not utilized – four cents per each hundred dollars of the base bid calculated as follows:

$$\frac{\text{Line 1 x 04}}{100}$$

Each one (1%) percent deficiency toward the goal for female Journeyworkers (Line 8) shall be calculated in the same way.

b. For each full one (1%) percent deficiency of minority apprentices not utilized – three cents per hundred dollars of the base bid calculated as follows:

$$\frac{\text{Line 1 x 03}}{100}$$

Each one (1%) percent deficiency toward the goal for female apprentices (Line 10) shall be calculated in the same way.

c. For each one (1%) percent deficiency of minority laborers not utilized – one cent per each hundred dollars of the base bid calculated as follows:

$$\frac{\text{Line 1 x 01}}{100}$$

Each one (1%) percent deficiency toward the goal for female laborers (Line 12) shall be calculated in the same way.

d. Liquidated damages, if any, will be calculated for the first pay requests reflecting fifty percent (50%) completion, seventy-five percent (75%) completion, and ninety percent (90%) completion, respectively, based upon the Contractor's pay request together with all attendant certified payrolls and other required documentation of minority and women employment. The accrued liquidated damages and interest will be added to the retention provided elsewhere in this contract. The amount of liquidated damages due to the Commission under this provision will bear compound interest at the rate of 5% per annum, compounded monthly from the date of the Notice to Proceed to the date of approval of a deductive change order for liquidated damages. Should the total amount of liquidated damages due under all provisions of this contract exceed the amount of the Commission's retainage, compound interest on the amount over and above the retainage will continue to accrue until the entire amount of liquidated damages and compound interest is paid to the Commission.

e. The Commission is aware that certain subcontract agreements under this contract may require subcontractors to contribute to payment of liquidated damages assessed under this provision. Should enforcement of subcontract liquidated damages provisions result in an aggregate total of subcontractor liquidated damages greater than the liquidated damages assessed hereunder against Contractor, then Contractor must pay the excess pro rata as a bonus to each subcontractor exceeding its subcontract commitments for minority or women employment, or both.

5. Reporting

In accordance with this commitment, the Contractor must submit both the Contractor's Payroll Record Form and the Contractor's Recapitulation of Minority and Female Worker Hours and Percentages Form on a monthly basis. All Subcontractors shall be listed on the Contractor's Recapitulation Form whether active or not. For the purpose of this report, the following group categories will be used:

a. The classification "White" includes person of Indo-European descent.

b. The classification "Black" or "African-American" includes persons having origins in any of the black racial groups of Africa.

c. The classification "Hispanic" includes persons whose origins are from Mexico, Puerto Rico, Cuba, Central or South America, the Caribbean Islands or other Spanish culture or origin, regardless of race.

d. The classification "Native American" includes persons who are Native Americans by virtue of tribal association.

e. The classification "Asian-Pacific" includes persons whose origins are from East Asia, Southeast Asia, the Pacific Islands or the Indian sub-continent.

f. The classification "Other" includes qualified individuals with disabilities who meet legitimate skill, experience, education or other requirements of employment positions held or sought and who perform the essential function with or without reasonable accommodation and other groups or other individuals found by the Public Building Commission of Chicago to be socially and economically disadvantaged and to have suffered actual racial or ethnic discrimination and decreased opportunities to compete in Chicago area markets.

6. Major Trades

Asbestos Workers
Boiler Makers
Bricklayers
Carpenters
Cement Masons
Electricians
Elevator Construction
Glaziers
Mechanists
Machinery Movers
Ornamental Iron Workers
Lathers
Operating Engineers
Painters
Pile Driver Mechanics
Pipe Fitters/Steam Fitters
Plasterers
Plumbers
Roofers
Sheet Metal Workers
Sprinkler Fitters
Technical Engineers
Tuck Pointers

For approval of other trades for consideration in the Award Criteria Formula, written approval should be requested from the Commission.

7. Trade Participation - For Information Only

The following information must be supplied by the Contractor for the purposes of evaluating figures supplied in the Award Criteria Formula. It is understood that these figures are estimates only and are not to be considered as limiting in any manner actual participation on the project.

Anticipated levels of minority participation, to be expressed as percentages, must be supplied for each trade, whether attributable to the Contractor's work force or any Subcontractor which will be active on this project.

TRADE PARTICIPATION	PERCENT OF MINORITY
Carpenters	50%
Laborers	50%
Bricklayers	33%
Plumbers	33%
Electricians	25%
Sheet Workers	33%
Pipe Fitters	33%
Iron Workers	5%

VI. ADDITIONAL DOCUMENTS TO BE EXECUTED

Affidavit Of Non-collusion

STATE OF ILLINOIS }
} SS
COUNTY OF COOK }

Howard Strong, being first duly sworn, deposes and says that:

(1) He/She is President (Owner, Partner, Officer, Representative or Agent) of The George Sollitt Construction Company the Bidder that has submitted the attached Bid;

(2) That Bidder is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

(3) Such Bid is genuine and is not a collusive or sham bid;

(4) Neither Bidder nor any of its officers, partners, owners, agents, representatives, employees, or parties in interest, including this affiant, has in any way colluded, connived, conspired, or agreed, directly or indirectly, with any other Bidder, firm, or person to submit a collusive or sham bid in connection with the Contract for which the attached bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm, or person to fix the price or prices in the attached bid or in that of any other Bidder, or to fix any overhead, profit, or cost element of the bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Public Building Commission of Chicago or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(6) The Bidder is not barred from bidding as a result of having violated *Illinois Criminal Code*, 720 ILCS 5/33E-3 (Bid-rigging), 720 ILCS 5/33E-4 (Bid rotating) or the *Prevailing Wage Act*, 30 ILCS 570/0.01 through 570/7.

Howard Strong
(Signed)

President
(Title)

Subscribed and sworn to before me this 30th day of January 20 09

Nancy Planek

Office Manager
(Title)

My Commission expires: 11/28/09

OFFICIAL SEAL
NANCY PLANEK
NOTARY PUBLIC - STATE OF ILLINOIS
MY COMMISSION EXPIRES:11/28/09

SCHEDULE B - Joint Venture Affidavit (1 of 3)

This form need not be filled in if all joint venturers are MBE/WBE firms. In such case, however, a written joint venture agreement among the MBE/WBE firms should be submitted. Each MBE/WBE joint venturer must also attach a copy of their current certification letter.

1. Name of joint venture _____

2. Address of joint venture _____
_____

3. Phone number of joint venture _____

4. Identify the firms that comprise the joint venture
_____
_____

   A. Describe the role(s) of the MBE/WBE firm(s) in the joint venture. (Note that a "clearly defined portion of work" must here be shown as under the responsibility of the MBE/WBE firm.)
   _____
   _____
   _____

   B. Describe very briefly the experience and business qualifications of each non-MBE/WBE joint venturer.
   _____
   _____
   _____

5. Nature of joint venture's business
_____
_____

6. Provide a copy of the joint venture agreement.

7. Ownership: What percentage of the joint venture is claimed to be owned by MBE/WBE? _____%

8. Specify as to:

   A. Profit and loss sharing _____%

   B. Capital contributions, including equipment _____%

   C. Other applicable ownership interests, including ownership options or other agreements which restrict ownership or control.
   _____
   _____

   D. Describe any loan agreements between joint venturers, and identify the terms thereof.
   _____
   _____

SCHEDULE B - Joint Venture Affidavit (2 of 3)

9. Control of and participation in this Contract: Identify by name, race, sex, and "firm" those individuals (and their titles) who are responsible for day-to-day management and policy decision making, including, but not limited to, those with prime responsibility for:

   A. Financial decisions

   _____

   B. Management decisions such as:

      1) Estimating

      _____

      2) Marketing and Sales

      _____

      3) Hiring and firing of management personnel

      _____

      4) Other

      _____

   C. Purchasing of major items or supplies

   _____

   D. Supervision of field operations

   _____

   E. Supervision of office personnel

   _____

   F. Describe the financial controls of the joint venture, e.g., will a separate cost center be established; which venturer will be responsible for keeping the books; how will the expense therefor be reimbursed; the authority of each joint venturer to commit or obligate the other. Describe the estimated contract cash flow for each joint venturer.

   _____

   _____

   G. State approximate number of operational personnel, their craft and positions, and whether they will be employees of the majority firm or the joint venture.

   _____

   _____

10. Please state any material facts of additional information pertinent to the control and structure of this joint venture.

    _____

    _____

PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE B - Joint Venture Affidavit (3 of 3)

THE UNDERSIGNED SWEAR THAT THE FOREGOING STATEMENTS ARE CORRECT AND INCLUDE ALL MATERIAL INFORMATION NECESSARY TO IDENTIFY AND EXPLAIN THE TERMS AND OPERATIONS OF OUR JOINT VENTURE AND THE INTENDED PARTICIPATION BY EACH JOINT VENTURER IN THE UNDERTAKING. FURTHER, THE UNDERSIGNED COVENANT AND AGREE TO PROVIDE TO THE PUBLIC BUILDING COMMISSION OF CHICAGO CURRENT, COMPLETE AND ACCURATE INFORMATION REGARDING ACTUAL JOINT VENTURE WORK AND THE PAYMENT THEREFOR AND ANY PROPOSED CHANGES IN ANY OF THE JOINT VENTURE AGREEMENTS AND TO PERMIT THE AUDIT AND EXAMINATION OF THE BOOKS, RECORDS, AND FILES OF THE JOINT VENTURE, OR THOSE OF EACH JOINT VENTURER RELEVANT TO THE JOINT VENTURE, BY AUTHORIZED REPRESENTATIVES OF THE COMMISSION. ANY MATERIAL MISREPRESENTATION WILL BE GROUNDS FOR TERMINATING ANY CONTRACT WHICH MAY BE AWARDED AND FOR INITIATING ACTION UNDER FEDERAL OR STATE LAWS CONCERNING FALSE STATEMENTS.

Note: If, after filing this Schedule B and before the completion of the joint venture's work on this Contract, there is any significant change in the information submitted, the joint venture must inform the Public Building Commission of Chicago, either directly or through the General contractor if the joint venture is a subcontractor.

_____ Name of Joint Venturer	_____ Name of Joint Venturer
_____ Signature	_____ Signature
_____ Name	_____ Name
_____ Title	_____ Title
_____ Date	_____ Date
State of _____ County of _____	State of _____ County of _____
On this _____ day of _____, 20___ before me appeared (Name) _____,	On this ____ day of _____, 20____ before me appeared (Name) _____,
to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of Joint Venture) _____ to execute the affidavit and did so as his or her free act and deed.	to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of Joint Venture) _____ to execute the affidavit and did so as his or her free act and deed.
_____ Notary Public	_____ Notary Public
Commission expires: (SEAL)	Commission expires: (SEAL)

PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (1 of 2)

Name of Project:
Lee Pasteur Hurley Area Elementary School

Project Number: 1478

FROM:

_____ MBE _____ WBE _____
(Name of MBE or WBE)

TO:

_____ and Public Building Commission of Chicago
(Name of General Bidder)

The undersigned intends to perform work in connection with the above-referenced project as (check one):

_____ a Sole Proprietor
_____ a Partnership
_____x_____ a Corporation
_____ a Joint Venture

The MBE/WBE status of the undersigned is confirmed by the attached Letter of Certification, dated _____. In addition, in the case where the undersigned is a Joint Venture with a non-MBE/WBE firm, a Schedule B, Joint Venture Affidavit, is provided.

The undersigned is prepared to provide the following described services or supply the following described goods in connection with the above-named project.

_____
_____
_____
_____
_____

The above-described services or goods are offered for the following price, with terms of payment as stipulated in the Contract Documents.

_____
_____
_____

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (2 of 2)

PARTIAL PAY ITEMS
For any of the above items that are partial pay items, specifically describe the work and subcontract dollar amount:

_____
_____
_____

If more space is needed to fully describe the MBE/WBE firm's proposed scope of work and/or payment schedule, attach additional sheet(s).

SUB-SUBCONTRACTING LEVELS
_____ % of the dollar value of the MBE/WBE subcontract will be sublet to non-MBE/WBE contractors.
_____ % of the dollar value of the MBE/WBE subcontract will be sublet to MBE/WBE contractors.
If MBE/WBE subcontractor will not be sub-subcontracting any of the work described in this Schedule, a zero (0) must be filled in each blank above. If more than 10% percent of the value of the MBE/WBE subcontractor's scope of work will be sublet, a brief explanation and description of the work to be sublet must be provided.
The undersigned will enter into a formal agreement for the above work with the General Bidder, conditioned upon its execution of a contract with the Public Building Commission of Chicago, and will do so within five (5) working days of receipt of a notice of Contract award from the Commission.
By:

Name of MBE/WBE Firm (Print)	Signature
Date	Name (Print)
Phone	

IF APPLICABLE:
By:

Joint Venture Partner (Print)	Signature
Date	Name (Print) MBE ____ WBE ____ Non-MBE/WBE ___
Phone	

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE D - Affidavit of General Contractor Regarding MBE/WBE Participation (1 of 2)

Name of Project:
Lee Pasteur Hurley Area Elementary School

STATE OF ILLINOIS }
} SS
COUNTY OF COOK }

In connection with the above-captioned contract, I HEREBY DECLARE AND AFFIRM that I am the
Vice President
Title and duly authorized representative of

The George Sollitt Construction Company
Name of General Contractor whose address is
790 N. Central Ave., Wood Dale, IL 60191

in the City of Wood Dale, State of Illinois and that I have personally reviewed the material and facts submitted with the attached Schedules of MBE/WBE participation in the above-referenced Contract, including Schedule C and Schedule B (if applicable), and the following is a statement of the extent to which MBE/WBE firms will participate in this Contract if awarded to this firm as the Contractor for the Project.

Name of MBE/WBE Contractor	Type of Work to be Done in Accordance with Schedule C	Dollar Credit Toward MBE/WBE Goals	
		MBE	WBE
Evergreen Supply	Electrical Material	$ ---	$ 340,000
~~Fullerton Supply~~	~~HVAC & Plumbing Supplies~~	$	$
Elmore's HVAC	HVAC	$ 3,180,000	$ ---
Glass Designers	Glass & Windows	$ 1,060,000	$ ---
~~ABL Masonry~~	Masonry	$	$
Anderson Shah	Roofing	$ 760,000	$ ---
~~Chicago United~~	~~Electrical Materials~~	$	$ ---
	Total Net MBE/WBE Credit	$ 5,600,000	$ 940,000
	Percent of Total Base Bid	%	%

The General Contractor may count toward its MBE/WBE goal a portion of the total dollar value of a contract with a joint venture equal to the percentage of the ownership and control of the MBE/WBE partner.

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (1 of 2)

Name of Project:
Lee Pasteur Hurley Area Elementary School

Project Number: 1478

FROM:
Evergreen Supply Co. MBE _____ WBE X
(Name of MBE or WBE)

TO:
The George Sollitt Construction Co. and Public Building Commission of Chicago
(Name of General Bidder)

The undersigned intends to perform work in connection with the above-referenced project as (check one):

_____ a Sole Proprietor x a Corporation
_____ a Partnership _____ a Joint Venture

The MBE/WBE status of the undersigned is confirmed by the attached Letter of Certification, dated March, 2009. In addition, in the case where the undersigned is a Joint Venture with a non-MBE/WBE firm, a Schedule B, Joint Venture Affidavit, is provided.

The undersigned is prepared to provide the following described services or supply the following described goods in connection with the above-named project.

Electrical Material

The above-described services or goods are offered for the following price, with terms of payment as stipulated in the Contract Documents.

$ 340,000 —

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (2 of 2)

PARTIAL PAY ITEMS
For any of the above items that are partial pay items, specifically describe the work and subcontract dollar amount:

If more space is needed to fully describe the MBE/WBE firm's proposed scope of work and/or payment schedule, attach additional sheet(s).

SUB-SUBCONTRACTING LEVELS
0 % of the dollar value of the MBE/WBE subcontract will be sublet to non-MBE/WBE contractors.
0 % of the dollar value of the MBE/WBE subcontract will be sublet to MBE/WBE contractors.
If MBE/WBE subcontractor will not be sub-subcontracting any of the work described in this Schedule, a zero (0) must be filled in each blank above. If more than 10% percent of the value of the MBE/WBE subcontractor's scope of work will be sublet, a brief explanation and description of the work to be sublet must be provided.
The undersigned will enter into a formal agreement for the above work with the General Bidder, conditioned upon its execution of a contract with the Public Building Commission of Chicago, and will do so within five (5) working days of receipt of a notice of Contract award from the Commission.

By:

Evergreen Supply Co. — Name of MBE/WBE Firm (Print)

Signature

2.4.09 — Date

Colleen Kramer — Name (Print)

773.375 4750 — Phone

IF APPLICABLE:
By:

Joint Venture Partner (Print)

Signature

Date

Name (Print)
MBE ____ WBE ____ Non-MBE/WBE ___

Phone

City of Chicago
Richard M. Daley, Mayor

Department of
Procurement Services

Montel M. Gayles
Chief Procurement Officer

City Hall, Room 403
121 North LaSalle Street
Chicago, Illinois 60602
(312) 744-4900
(312) 744-2949 (TTY)
http://www.cityofchicago.org

January 26, 2009

Colleen Kramer
Evergreen Supply Company
9901 S. Torrence Avenue
Chicago, IL 60617

Dear Ms. Kramer:

The City of Chicago Department of Procurement Services ("Department") has undertaken an evaluation of procurement policies and procedures including those utilized within the M/WBE and DBE certification unit. In light of this evaluation and in anticipation of streamlining our procedures, the Department extends your **WBE** certification **until March 1, 2009.**

The Department may request additional information from you prior to the expiration of the courtesy period. This information will assist us in making a determination on the recertification of your company. You will receive additional information from the Department in the coming days.

As you know, your firm's participation on contracts will be credited only toward **WBE** in the following specialty area(s):

Distributor of Electrical Material

If you have any questions, please contact our office at 312-742-0766.

Sincerely,

R Cunniff

for Lori Ann Lypson
Deputy Procurement Officer

LAL/bc

NEIGHBORHOODS Alive!
BUILDING CHICAGO TOGETHER

CHICAGO WORKS TOGETHER

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (1 of 2)

Name of Project:
Lee Pasteur Hurley Area Elementary School

Project Number: 1478

FROM:

Elmore's HVAC,Inc. MBE X WBE _____
(Name of MBE or WBE)

TO:

The George Sollitt Construction Co. and Public Building Commission of Chicago
(Name of General Bidder)

The undersigned intends to perform work in connection with the above-referenced project as (check one):

_____ a Sole Proprietor x a Corporation
_____ a Partnership _____ a Joint Venture

The MBE/WBE status of the undersigned is confirmed by the attached Letter of Certification, dated 10-26-2007. In addition, in the case where the undersigned is a Joint Venture with a non-MBE/WBE firm, a Schedule B, Joint Venture Affidavit, is provided.

The undersigned is prepared to provide the following described services or supply the following described goods in connection with the above-named project.

Heating, ventilation and air conditioning (HVAC)

The above-described services or goods are offered for the following price, with terms of payment as stipulated in the Contract Documents.

$3,180,000.00

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (2 of 2)

PARTIAL PAY ITEMS
For any of the above items that are partial pay items, specifically describe the work and subcontract dollar amount:

_____

_____

_____

If more space is needed to fully describe the MBE/WBE firm's proposed scope of work and/or payment schedule, attach additional sheet(s).

SUB-SUBCONTRACTING LEVELS
30 % of the dollar value of the MBE/WBE subcontract will be sublet to non-MBE/WBE contractors.
_____ % of the dollar value of the MBE/WBE subcontract will be sublet to MBE/WBE contractors.
If MBE/WBE subcontractor will not be sub-subcontracting any of the work described in this Schedule, a zero (0) must be filled in each blank above. If more than 10% percent of the value of the MBE/WBE subcontractor's scope of work will be sublet, a brief explanation and description of the work to be sublet must be provided.
The undersigned will enter into a formal agreement for the above work with the General Bidder, conditioned upon its execution of a contract with the Public Building Commission of Chicago, and will do so within five (5) working days of receipt of a notice of Contract award from the Commission.
By:

Elmore's HVAC, Inc.
Name of MBE/WBE Firm (Print)

Signature

02-02-2009
Date

Harold Harvey
Name (Print)

773-239-5900
Phone

IF APPLICABLE:
By:

_____
Joint Venture Partner (Print)

_____
Signature

_____
Date

_____
Name (Print)
MBE ____ WBE ____ Non-MBE/WBE ___

_____
Phone

City of Chicago
Richard M. Daley, Mayor

Department of
Procurement Services

Barbara A. Lumpkin
Chief Procurement Officer

City Hall, Room 403
121 North LaSalle Street
Chicago, Illinois 60602
(312) 744-4900
(312) 744-2949 (TTY)
http://www.cityofchicago.org

October 26, 2007

Anthony Elmore
Elmore's HVAC, Inc.
3033 West 111th Street
Chicago, Illinois 60655

Annual Certificate Expires: **February 1, 2009**
Vendor Number: **51101021**

Dear Mr. Elmore:

We are pleased to inform you that **Elmore's HVAC, Inc.** has been certified as a **Minority Owned Business Enterprise (MBE)** by the City of Chicago. This **MBE** certification is valid until **February 1, 2013**; however your firm must be re-validated annually. Your firm's next annual validation is required by **February 1, 2009.**

As a condition of continued certification during this five year period, you must file a No-Change Affidavit **within 60 days prior** to the annual expiration. Failure to file this Affidavit will result in the termination of your certification. **Please note that you must include a copy of your most current Federal Corporate Tax Return.** You must also notify the City of Chicago of any changes in ownership or control of your firm or any other matters or facts affecting your firm's eligibility for certification whenever the changes occur.

The City may commence action to remove your firm's eligibility if you fail to notify us of any changes of facts affecting your firm's certification or if your firm otherwise fails to cooperate with the City in any inquiry or investigation. Removal of eligibility procedures may also be commenced if your firm is found to be involved in bidding or contractual irregularities.

Your firm's name will be listed in the City's Directory of Minority Business Enterprises and Women Business Enterprises in the specialty area(s) of:

Installation and Repair of Heating, Ventilating and Air Conditioning (HVAC)

Your firm's participation on City contracts will be credited only toward **MBE** goals in your area(s) of specialty. While your participation on City contracts is not limited to your specialty, credit toward **MBE** goals will be given only for work done in the specialty category.

Thank you for your continued interest in the City's Minority and Women Business Enterprise Programs.

Sincerely,

Lori Ann Lypson
Deputy Procurement Officer

LAL/lac

NEIGHBORHOODS Alive!
BUILDING CHICAGO TOGETHER

CHICAGO WORKS

Vendor Information

CLOSE WINDOW

HELP

Vendor Information

Business Name	**Elmore's HVAC Inc.**
Owner	**Anthony Elmore**
Address > Map This Address	**3033 W. 111th Street Chicago, IL 60655**
Phone	**773-239-5900**
Fax	**773-239-2677**
Email	
Website	

Certification Information

Certifying Agency	**City of Chicago**
Certification Type	**MBE - Minority Business Enterprise**
Certification Date	**10/26/2007**
Renewal Date	**3/1/2009**
Expiration Date	**2/1/2013**
Certified Business Description	**Air Conditioning, Heating and Ventilation;Heating, Ventilating and Air Conditioning (HVAC)**

Commodity Codes

Code	Description
NIGP 55905	Air Conditioning, Heating and Ventilation
NIGP 91450	Heating, Ventilating and Air Conditioning (HVAC)

Print This Page

Customer Service

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (1 of 2)

Name of Project:
Lee Pasteur Hurley Area Elementary School

Project Number: 1478

FROM:

Glass Designers Inc. MBE X WBE _____
(Name of MBE or WBE)

TO:

The George Sollitt Construction Co. and Public Building Commission of Chicago
(Name of General Bidder)

The undersigned intends to perform work in connection with the above-referenced project as (check one):

_____ a Sole Proprietor x a Corporation
_____ a Partnership _____ a Joint Venture

The MBE/WBE status of the undersigned is confirmed by the attached Letter of Certification, dated August 18th 2008. In addition, in the case where the undersigned is a Joint Venture with a non-MBE/WBE firm, a Schedule B, Joint Venture Affidavit, is provided.

The undersigned is prepared to provide the following described services or supply the following described goods in connection with the above-named project.
Alum. Curtainwall, Alum Storefront, Alum. Windows, Glass and Glazing

The above-described services or goods are offered for the following price, with terms of payment as stipulated in the Contract Documents.
1,060,000.00

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (2 of 2)

PARTIAL PAY ITEMS
For any of the above items that are partial pay items, specifically describe the work and subcontract dollar amount:

_____

_____

_____

If more space is needed to fully describe the MBE/WBE firm's proposed scope of work and/or payment schedule, attach additional sheet(s).

SUB-SUBCONTRACTING LEVELS
00 0 % of the dollar value of the MBE/WBE subcontract will be sublet to non-MBE/WBE contractors.
0000 % of the dollar value of the MBE/WBE subcontract will be sublet to MBE/WBE contractors.
If MBE/WBE subcontractor will not be sub-subcontracting any of the work described in this Schedule, a zero (0) must be filled in each blank above. If more than 10% percent of the value of the MBE/WBE subcontractor's scope of work will be sublet, a brief explanation and description of the work to be sublet must be provided.
The undersigned will enter into a formal agreement for the above work with the General Bidder, conditioned upon its execution of a contract with the Public Building Commission of Chicago, and will do so within five (5) working days of receipt of a notice of Contract award from the Commission.
By:

Glass Designers Inc.	
Name of MBE/WBE Firm (Print)	Signature
2/4/09	John Luckett
Date	Name (Print)
773/978-2747	
Phone	

IF APPLICABLE:
By:

Joint Venture Partner (Print)	Signature
Date	Name (Print)
	MBE ____ WBE ____ Non-MBE/WBE ___
Phone	

ty of Chicago
chard M. Daley, Mayor

epartment of
ocurement Services

ontel M. Gayles
ief Procurement Officer

ity Hall, Room 403
21 North LaSalle Street
hicago, Illinois 60602
312) 744-4900
312) 744-2949 (TTY)
ttp://www.cityofchicago.org

August 18, 2008

John Luckett, President
Glass Designers, Inc.
10123 South Torrence Avenue
Chicago, IL 60617

Annual Certificate Expires: **September 1, 2009**
Vendor Number: **1023170**

Dear Mr. Luckett:

Congratulations on your continued eligibility for certification as a MBE by the City of Chicago. This MBE certification is valid until **September 2012;** however your firm must be re-validated annually. Your firm's next annual validation is required by **September 1, 2009.**

As a condition of continued certification during this five year period, you must file a No-Change Affidavit **within 60 days prior** to the date of expiration. Failure to file this Affidavit will result in the termination of your certification. **Please note that you must include a copy of your most current Federal Corporate Tax Return.** You must also notify the City of Chicago of any changes in ownership or control of your firm or any other matters or facts affecting your firm's eligibility for certification.

The City may commence action to remove your firm's eligibility if you fail to notify us of any changes of facts affecting your firm's certification or if your firm otherwise fails to cooperate with the City in any inquiry or investigation. Removal of eligibility procedures may also be commenced if your firm is found to be involved in bidding or contractual irregularities.

Your firm's name will be listed in the City's Directory of Minority Business Enterprises and Women Business Enterprises in the specialty area(s) of:

Glass and Glazing Contractor;
Screen and Storm Window Repair and Installation; Ornamental Iron Work;
Installation of Aluminum Storefronts, Doors, Windows and Curtainwalls

Your firm's participation on City contracts will be credited only toward MBE goals in your area(s) of specialty. While your participation on City contracts is not limited to your specialty, credit toward MBE goals will be given only for work done in the specialty category.

Thank you for your continued interest in the City's Minority and Women Business Enterprise Programs.

Sincerely,

Lori Ann Lyoson
Deputy Procurement Officer

LAL/mck

NEIGHBORHOODS
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CHICAGO WORKS TOGETHER

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (1 of 2)

Name of Project:
Lee Pasteur Hurley Area Elementary School

Project Number: 1478

FROM:

Anderson & Shah Roofing, Inc. MBE X WBE _____
(Name of MBE or WBE)

TO:

The George Sollitt Construction Co. and Public Building Commission of Chicago
(Name of General Bidder)

The undersigned intends to perform work in connection with the above-referenced project as (check one):

_____ a Sole Proprietor x a Corporation
_____ a Partnership _____ a Joint Venture

The MBE/WBE status of the undersigned is confirmed by the attached Letter of Certification, dated _____. In addition, in the case where the undersigned is a Joint Venture with a non-MBE/WBE firm, a Schedule B, Joint Venture Affidavit, is provided.

The undersigned is prepared to provide the following described services or supply the following described goods in connection with the above-named project.

Roofing, Sheet Metal & Garden Roof

The above-described services or goods are offered for the following price, with terms of payment as stipulated in the Contract Documents.

$760,000.00

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (2 of 2)

PARTIAL PAY ITEMS
For any of the above items that are partial pay items, specifically describe the work and subcontract dollar amount:

If more space is needed to fully describe the MBE/WBE firm's proposed scope of work and/or payment schedule, attach additional sheet(s).

SUB-SUBCONTRACTING LEVELS
0 % of the dollar value of the MBE/WBE subcontract will be sublet to non-MBE/WBE contractors.
0 % of the dollar value of the MBE/WBE subcontract will be sublet to MBE/WBE contractors.
If MBE/WBE subcontractor will not be sub-subcontracting any of the work described in this Schedule, a zero (0) must be filled in each blank above. If more than 10% percent of the value of the MBE/WBE subcontractor's scope of work will be sublet, a brief explanation and description of the work to be sublet must be provided.
The undersigned will enter into a formal agreement for the above work with the General Bidder, conditioned upon its execution of a contract with the Public Building Commission of Chicago, and will do so within five (5) working days of receipt of a notice of Contract award from the Commission.

By:

Anderson & Shah Roofing, Inc.
Name of MBE/WBE Firm (Print)

Signature

02/04/09
Date

Paul Shah
Name (Print)

(815) 741-0909
Phone

IF APPLICABLE:
By:

Joint Venture Partner (Print)

Signature

Date

Name (Print)
MBE ____ WBE ____ Non-MBE/WBE ___

Phone

City of Chicago
Richard M. Daley, Mayor

Department of
Procurement Services

Montel M. Gayles
Chief Procurement Officer

City Hall, Room 403
121 North LaSalle Street
Chicago, Illinois 60602
(312) 744-4900
(312) 744-2949 (TTY)
http://www.cityofchicago.org

June 20, 2008

Pravin M. Shah, President
Anderson & Shah Roofing, Inc.
23900 County Farm Road
Joliet, Illinois 60431

Annual Certificate Expires: **October 1, 2009**
Vendor Number: **049370**

Dear Mr. Shah:

We are pleased to inform you that **Anderson & Shah Roofing, Inc.** has been certified as a **Minority Owned Business Enterprise (MBE)** by the City of Chicago. This **MBE** certification is valid until **October 1, 2013**; however your firm must be re-validated annually. Your firm's next annual validation is required by **October 1, 2009.**

As a condition of continued certification during this five year period, you must file a No-Change Affidavit **within 60 days prior** to the annual expiration. Failure to file this Affidavit will result in the termination of your certification. **Please note that you must include a copy of your most current Federal Corporate Tax Return.** You must also notify the City of Chicago of any changes in ownership or control of your firm or any other matters or facts affecting your firm's eligibility for certification whenever the changes occur.

The City may commence action to remove your firm's eligibility if you fail to notify us of any changes of facts affecting your firm's certification or if your firm otherwise fails to cooperate with the City in any inquiry or investigation. Removal of eligibility procedures may also be commenced if your firm is found to be involved in bidding or contractual irregularities.

Your firm's name will be listed in the City's Directory of Minority Business Enterprises and Women Business Enterprises in the specialty area(s) of:

Commercial, Industrial and Institutional Roofing; Sheet Metal Work

Your firm's participation on City contracts will be credited only toward **MBE** goals in your area(s) of specialty. While your participation on City contracts is not limited to your specialty, credit toward **MBE** goals will be given only for work done in the specialty category.

Thank you for your continued interest in the City's Minority and Women Business Enterprise Programs.

Sincerely,

Lori Ann Lypson
Deputy Procurement Officer

LAL/ds

IL UCP HOST: PACE

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PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (1 of 2)

Name of Project:
Lee Pasteur Hurley Area Elementary School

Project Number: 1478

FROM:

TRI-STAR Supply, INC _____ MBE X WBE _____
(Name of MBE or WBE)

TO:

The George Sollitt Construction Co. and Public Building Commission of Chicago
(Name of General Bidder)

The undersigned intends to perform work in connection with the above-referenced project as (check one):

_____ a Sole Proprietor _____x_____ a Corporation
_____ a Partnership _____ a Joint Venture

The MBE/WBE status of the undersigned is confirmed by the attached Letter of Certification, dated APRIL 11, 2008. In addition, in the case where the undersigned is a Joint Venture with a non-MBE/WBE firm, a Schedule B, Joint Venture Affidavit, is provided.

The undersigned is prepared to provide the following described services or supply the following described goods in connection with the above-named project.

Supply ELECTRICAL EQUIPMENT AND SUPPLIES

The above-described services or goods are offered for the following price, with terms of payment as stipulated in the Contract Documents.

$600,000

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (2 of 2)

PARTIAL PAY ITEMS
For any of the above items that are partial pay items, specifically describe the work and subcontract dollar amount:

If more space is needed to fully describe the MBE/WBE firm's proposed scope of work and/or payment schedule, attach additional sheet(s).

SUB-SUBCONTRACTING LEVELS
0 % of the dollar value of the MBE/WBE subcontract will be sublet to non-MBE/WBE contractors.
0 % of the dollar value of the MBE/WBE subcontract will be sublet to MBE/WBE contractors.
If MBE/WBE subcontractor will not be sub-subcontracting any of the work described in this Schedule, a zero (0) must be filled in each blank above. If more than 10% percent of the value of the MBE/WBE subcontractor's scope of work will be sublet, a brief explanation and description of the work to be sublet must be provided.
The undersigned will enter into a formal agreement for the above work with the General Bidder, conditioned upon its execution of a contract with the Public Building Commission of Chicago, and will do so within five (5) working days of receipt of a notice of Contract award from the Commission.
By:

TRI-STAR Supply, INC
Name of MBE/WBE Firm (Print)

M. L. Stephenson, SR.
Signature

FEB. 4, 2009
Date

M. L. STEPHENSON, SR.
Name (Print)

630-629-4440
Phone

IF APPLICABLE:
By:

Joint Venture Partner (Print)

Signature

Date

Name (Print)
MBE ____ WBE ____ Non-MBE/WBE ___

Phone

City of Chicago
Richard M. Daley, Mayor

Department of
Procurement Services

Montel M. Gayles
Chief Procurement Officer

City Hall, Room 403
121 North LaSalle Street
Chicago, Illinois 60602
(312) 744-4900
(312) 744-2949 (TTY)
http://www.cityofchicago.org

April 11, 2008

Martin L. Stephenson, President
Tri-Star Supply, Inc.
1459 Bernard Drive
Addison, IL 60101

Annual Certificate Expires: **July 1, 2009**
Vendor Number: **1021221**

Dear Mr. Stephenson:

We are pleased to inform you that **Tri-Star Supply, Inc.**, has been certified as a **Minority Owned Business Enterprise (MBE)** by the City of Chicago. This **MBE** certification is valid until **July 1, 2013**; however your firm must be re-validated annually. Your firm's next annual validation is required by **July 1, 2009.**

As a condition of continued certification during this five year period, you must file a No-Change Affidavit **within 60 days prior** to the annual expiration. Failure to file this Affidavit will result in the termination of your certification. **Please note that you must include a copy of your most current Federal Corporate Tax Return.** You must also notify the City of Chicago of any changes in ownership or control of your firm or any other matters or facts affecting your firm's eligibility for certification whenever the changes occur.

The City may commence action to remove your firm's eligibility if you fail to notify us of any changes of facts affecting your firm's certification or if your firm otherwise fails to cooperate with the City in any inquiry or investigation. Removal of eligibility procedures may also be commenced if your firm is found to be involved in bidding or contractual irregularities.

Your firm's name will be listed in the City's Directory of Minority Business Enterprises and Women Business Enterprises in the specialty area(s) of:

Supplier and Distributor of Electrical Supplies and Equipment
(Alarms, Ballast, Batteries, Conduit, Cords, Fastners & Fittings, Fuses, Ladders & Scaffolds, Lamps, Light Bulbs, Lighting Fixtures, Meters, Switches, times & Photo Cells, Wire & Cable, Wire Connections)

Your firm's participation on City contracts will be credited only toward **MBE** goals in your area(s) of specialty. While your participation on City contracts is not limited to your specialty, credit toward **MBE** goals will be given only for work done in the specialty category.

Thank you for your continued interest in the City's Minority and Women Business Enterprise Programs.

Sincerely,

Lori Ann Lypson
Deputy Procurement Officer

LAL/ckr

IL UCP Host: IDOT
Revised: Vendor Number

NEIGHBORHOODS Alive!
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CHICAGO WORKS TOGETHER

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (1 of 2)

Name of Project:
Lee Pasteur Hurley Area Elementary School

Project Number: 1478

FROM:

BECKIT, INC. MBE _____ WBE XX
(Name of MBE or WBE)

TO:

The George Sollitt Construction Co. and Public Building Commission of Chicago
(Name of General Bidder)

The undersigned intends to perform work in connection with the above-referenced project as (check one):

_____ a Sole Proprietor x a Corporation
_____ a Partnership _____ a Joint Venture

The MBE/WBE status of the undersigned is confirmed by the attached Letter of Certification, dated SEPTEMBER 18, 2008. In addition, in the case where the undersigned is a Joint Venture with a non-MBE/WBE firm, a Schedule B, Joint Venture Affidavit, is provided.

The undersigned is prepared to provide the following described services or supply the following described goods in connection with the above-named project.
MASONRY MATERIALS

The above-described services or goods are offered for the following price, with terms of payment as stipulated in the Contract Documents.
$600,000.00

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE C - Letter of Intent from MBE/WBE To Perform As Subcontractor, Subconsultant, and/or Material Supplier (2 of 2)

PARTIAL PAY ITEMS
For any of the above items that are partial pay items, specifically describe the work and subcontract dollar amount:
N/A

If more space is needed to fully describe the MBE/WBE firm's proposed scope of work and/or payment schedule, attach additional sheet(s).

SUB-SUBCONTRACTING LEVELS
0 % of the dollar value of the MBE/WBE subcontract will be sublet to non-MBE/WBE contractors.
0 % of the dollar value of the MBE/WBE subcontract will be sublet to MBE/WBE contractors.
If MBE/WBE subcontractor will not be sub-subcontracting any of the work described in this Schedule, a zero (0) must be filled in each blank above. If more than 10% percent of the value of the MBE/WBE subcontractor's scope of work will be sublet, a brief explanation and description of the work to be sublet must be provided.
The undersigned will enter into a formal agreement for the above work with the General Bidder, conditioned upon its execution of a contract with the Public Building Commission of Chicago, and will do so within five (5) working days of receipt of a notice of Contract award from the Commission.

By:

BECKIT, INC.
Name of MBE/WBE Firm (Print)

Rebecca Kress
Signature

FEBRUARY 2, 2009
Date

REBECCA KRESS
Name (Print)

815-385-2904
Phone

IF APPLICABLE:
By:

Joint Venture Partner (Print)

Signature

Date

Name (Print)
MBE ____ WBE ____ Non-MBE/WBE ___

Phone

City of Chicago
Richard M. Daley, Mayor

Department of
Procurement Services

Montel M. Gayles
Chief Procurement Officer

City Hall, Room 403
121 North LaSalle Street
Chicago, Illinois 60602
(312) 744-4900
(312) 744-2949 (TTY)
http://www.cityofchicago.org

September 18, 2008

Rebecca Kress, President
Beckit, Inc.
27992 W. Route 120 Unit #62
Lakemoor, Illinois 60051

Annual Certificate Expires: **October 1, 2009**
Vendor Number: **50678028**

Dear Ms. Kress:

We are pleased to inform you that **Beckit, Inc.** has been certified as a **WBE** by the City of Chicago. This **WBE** certification is valid until **October 1, 2012**; however your firm must be re-validated annually. Your firm's next annual validation is required by **October 1, 2009.**

As a condition of continued certification during this five year period, you must file a No-Change Affidavit **within 60 days prior** to the date of expiration. Failure to file this Affidavit will result in the termination of your certification. **Please note that you must include a copy of your most current Federal Corporate Tax Return.** You must also notify the City of Chicago of any changes in ownership or control of your firm or any other matters or facts affecting your firm's eligibility for certification.

The City may commence action to remove your firm's eligibility if you fail to notify us of any changes of facts affecting your firm's certification or if your firm otherwise fails to cooperate with the City in any inquiry or investigation. Removal of eligibility procedures may also be commenced if your firm is found to be involved in bidding or contractual irregularities.

Your firm's name will be listed in the City's Directory of Minority Business Enterprises and Women Business Enterprises in the specialty area(s) of:

Supplier of Brick, Stone, and Masonry Products and Tools;
Sale of Landscape Products

Your firm's participation on City contracts will be credited only toward **WBE** goals in your area(s) of specialty. While your participation on City contracts is not limited to your specialty, credit toward **WBE** goals will be given only for work done in the specialty category.

Thank you for your continued interest in the City's Minority and Women Business Enterprise Programs.

Sincerely,

Lori Ann Lypson
Deputy Procurement Officer

LAL/emc

Expansion Granted: Sale of Landscape Products

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PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE D - Affidavit of General Contractor Regarding MBE/WBE Participation (1 of 2)

Name of Project:
Lee Pasteur Hurley Area Elementary School

STATE OF ILLINOIS }
} SS
COUNTY OF COOK }

In connection with the above-captioned contract, I HEREBY DECLARE AND AFFIRM that I am the
Vice President
Title and duly authorized representative of

The George Sollitt Construction Company
Name of General Contractor whose address is
790 N. Central Ave., Wood Dale, IL 60191

in the City of Wood Dale, State of Illinois and that I have personally reviewed the material and facts submitted with the attached Schedules of MBE/WBE participation in the above-referenced Contract, including Schedule C and Schedule B (if applicable), and the following is a statement of the extent to which MBE/WBE firms will participate in this Contract if awarded to this firm as the Contractor for the Project.

Name of MBE/WBE Contractor	Type of Work to be Done in Accordance with Schedule C	Dollar Credit Toward MBE/WBE Goals	
		MBE	WBE
Evergreen Supply	Electrical Material	$ ---	$ 340,000
Elmore's HVAC	HVAC	$ 3,180,000	$ ---
Glass Designers	Glass & Windows	$ 1,060,000	$ ---
Anderson Shah	Roofing	$ 760,000	$ ---
Tri-Star Supply	Electrical Materials	$ 600,000	$ ---
Beckit, Inc.	Masonry Materials	$ ---	$ 600,000
		$	$
	Total Net MBE/WBE Credit	$ 5,600,000	$ 940,000
	Percent of Total Base Bid	24.42%	4.10%

The General Contractor may count toward its MBE/WBE goal a portion of the total dollar value of a contract with a joint venture equal to the percentage of the ownership and control of the MBE/WBE partner.

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE D - Affidavit of General Contractor Regarding MBE/WBE Participation (2 of 2)

SUB-SUBCONTRACTING LEVELS

* % of the dollar value of the MBE/WBE subcontract will be sublet to non-MBE/WBE contractors.

* % of the dollar value of the MBE/WBE subcontract will be sublet to MBE/WBE contractors. *See individual Schedule C's attached

If MBE/WBE subcontractor will not be sub-subcontracting any of the work described in this Schedule, a zero (0) must be filled in each blank above.

If more than 10% of the value of the MBE/WBE subcontractor's scope of work will be sublet, a brief explanation and description of the work to be sublet must be provided.

The undersigned will enter into a formal agreement for the above work with the above-referenced MBE/WBE firms, conditioned upon performance as Contractor of a Contract with the Commission, and will do so within five (5) business days of receipt of a notice of Contract award from the Commission.

By:

The George Sollitt Construction Co.
Name of Contractor (Print)

February 5, 2009
Date

630-860-7333
Phone

Signature

John Pridmore
Name (Print)

IF APPLICABLE:

By:

Joint Venture Partner (Print)

Date

Phone/FAX

Signature

Name (Print)

MBE ____ WBE ____ Non-MBE/WBE ___

PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

SCHEDULE E - Request for Waiver from MBE/WBE Participation

Date: _____

Erin Lavin Cabonargi, Executive Director
Public Building Commission of Chicago
Richard J. Daley Center
50 W. Washington Street, Room 200
Chicago, IL 60602

Dear Mrs. Cabonargi:

RE: Contract No._____

Project Title: _____

In accordance with Section 23.01.7, the undersigned hereby requests a waiver/partial waiver from the MBE/WBE provisions. The undersigned certifies that it/we has/have been diligent in our attempt to identify potential subcontractors certified as MBE/WBE to perform work in this project, that such efforts have not been successful, and that it/we cannot meet the Minority/Women Business Enterprise contract goal. These efforts are described below and are consistent with the "Request for Waiver" provisions of the MBE/WBE Program as detailed in Section 23.01.7 as follows:

_____

_____

_____

_____

Documentation attached: yes____ no____

Based on the information provided above, we request consideration of this waiver request.

Sincerely,

_____
Signature

_____
Print Name

_____
Title

_____
Name of Firm

PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

Affidavit Of Uncompleted Work

A. Work Under Contract

List below all work Bidder has under contract as either a general contractor or a subcontractor, including all pending low bids not yet awarded or rejected. In a joint venture, list only that portion of the work that is the responsibility of the Bidder. The uncompleted dollar value is to be based upon the most recent estimate of the owner or engineer, and must include work subcontracted to others. If no work is contracted, indicate NONE.

	1	2	3	4	Awards Pending	TOTALS
Project	TO NUMEROUS TO LIST					
Contract With						
Estimated Completion Date						
Total Contract Price						$257,000,000
Uncompleted Dollar Value if Firm is the GC						$116,096,000
Uncompleted Dollar Value if Firm is a Subcontractor						
			TOTAL VALUE OF ALL WORK			$116,096,000 Uncompleted Work

B. Uncompleted Work to be Completed with the Bidder's own Forces

List below the uncompleted dollar value of work for each contract to be completed with the Bidder's own forces, including all work indicated as awards pending. All work subcontracted to others will be listed on C. of this form. In a joint venture, list only that portion of the work to be done by the Bidder. If no work is contracted, indicate NONE.

	1	2	3	4	Awards Pending	TOTALS
Earthwork	TO NUMEROUS TO LIST					
Demolition						
Sewer and Drain						
Foundation						
Painting						
Struct. Steel (Bldg Const.)						
Ornamental Steel (Bldg Construction)						
Miscellaneous Concrete						
Fireproofing						
Masonry						

PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

	1	2	3	4	Awards Pending	TOTALS
H.V.A.C.						
Mechanical						
Electrical						
Plumbing						
Roofing & Sheet Metal						
Flooring & Tile Work						
Drywall & Plaster Work						
Ceiling Construction						
Hollow Metal & Hardware						
Glazing & Caulking						
Miscellaneous Arch. Work						
Landscaping						
Fencing						
Others (List)						
TOTALS						

C. Work Subcontracted to Others

List below all work, according to each contract on the preceding page, that the Bidder has subcontracted to others. Do NOT include work to be performed by another general contractor in a joint venture. No work may be indicated as subcontracted to others on awards pending. If no work is subcontracted, indicate NONE.

	1	2	3	4	Awards Pending
Subcontractor	TO NUMEROUS TO LIST				
Type of Work					
Subcontract Price					
Amount Uncompleted					
Subcontractor					
Type of Work					
Subcontract Price					
Amount Uncompleted					
Subcontractor					
Type of Work					
Subcontract Price					
Amount Uncompleted					
Subcontractor					
Type of Work					
Subcontract Price					
Amount Uncompleted					
Subcontractor					
Type of Work					
Subcontract Price					
Amount Uncompleted					
Subcontractor					
Type of Work					
Subcontract Price					
Amount Uncompleted					
TOTAL Uncompleted					$95,468,000

PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

Affidavit of Uncompleted Work (continued)

I, being duly sworn, do hereby declare that this affidavit is a true and correct statement relating to ALL uncompleted contracts of the undersigned for Federal, State, County, City, and private work including ALL subcontract work, ALL pending low bids not yet awarded or rejected, and ALL estimated completion dates.

Signature

January 30, 2009
Date

Howard Strong
Name (Type or Print)

President
Title

The George Sollitt Construction Co.
Bidder Name

790 N. Central Ave.
Address

Wood Dale | IL | 60191
City | State | Zip

Subscribed and sworn to before me
this 30th day of January, 20 09

Notary Public (SEAL)

OFFICIAL SEAL
NANCY PLANEK
NOTARY PUBLIC - STATE OF ILLINOIS
MY COMMISSION EXPIRES:11/28/09

Commission expires: 11/28/09

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

Disclosure Of Retained Parties

Pursuant to Resolution No. 5339, as amended by Resolution No. 5371, of the Board of the Public Building Commission of Chicago, the apparent 1st low and the apparent 2nd low Bidder are required to submit a fully executed Disclosure of Retained Parties within five (5) days of their respective receipt of notice that they are the apparent 1st and 2nd low bidders.

A. Definitions and Disclosure Requirements

1. As used herein, "Contractor" means a person or entity that has any contract or lease with the Public Building Commission of Chicago ("Commission").
2. Commission contracts and/or qualification submittals must be accompanied by a disclosure statement providing certain information about any lobbyists whom the Contractor has retained or expects to retain with respect to the contract or lease. In particular, the Contractor must disclose the name of each such person, his or her business address, the name of the relationship, and the amount of fees paid or estimated to be paid. The Contractor is not required to disclose employees who are paid solely through the Contractor's regular payroll.
3. "Lobbyists" means any person a) who for compensation or on behalf of any person other than himself undertakes to influence any legislative or administrative action, or b) any part of whose duties as an employee of another includes undertaking to influence any legislative or administrative action.

B. Certification

Contractor hereby certifies as follows:

1. This Disclosure relates to the following transaction : New Construction

   Description of goods or services to be provided under Contract
   1478 - Lee Pasteur Hurley Area Elementary School

2. Name of Contractor: The George Sollitt Construction Company
3. EACH AND EVERY lobbyist retained or anticipated to be retained by the Contractor with respect to or in connection with the contract or lease is listed below. Attach additional pages if necessary.

   Check here if no such persons have been retained or are anticipated to be retained: _____

PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

Retained Parties:

Name	Business Address	Relationship (Lobbyists, etc.)	Fees (indicate whether paid or estimated)
See Attached			

4. The Contractor understands and agrees as follows:

   a. The information provided herein is a material inducement to the Commission execution of the contract or other action with respect to which this Disclosure of Retained Parties form is being executed, and the Commission may rely on the information provided herein. Furthermore, if the Commission determines that any information provided herein is false, incomplete, or inaccurate, the Commission may terminate the contract or other transaction, terminate the Contractor's participation in the contract or other transactions with the Commission.

   b. If the Contractor is uncertain whether a disclosure is required, the Contractor must either ask the Commission whether disclosure is required or make the disclosure.

   c. This Disclosure of Retained Parties form, some or all of the information provided herein, and any attachments may be made available to the public on the Internet, in response to a Freedom of Information Act request, or otherwise. The Contractor waives and releases any possible rights or claims it may have against the Commission in connection with the public release of information contained in the completed Disclosure of Retained Parties form and any attachments.

Lee Pasteur Hurley Area Elementary School Retained Parties:			
Name	**Business Address**	**Relationship**	**Fees**
Evergreen Supply Company	9901 S. Torrence Ave. Chicago, Illinois 60617	Supplier	$340,000
Elmore's HVAC, Inc.	3033 W. 111th St. Chicago, IL 60655	Subcontractor	$3,180,000
Glass Designers, Inc.	10123 S. Torrence Ave. Chicago, IL 60617	Subcontractor	$1,060,000
Anderson & Shah Roofing, Inc.	23900 County Farm Rd. Joliet, IL 60431	Subcontractor	$760,000
Tri-Star Supply	1459 Bernard Dr. Addison, IL 60101	Supplier	$600,000
Beckit, Inc.	27992 W. Route 20, Unit 13 Lakemoor, IL 60051	Supplier	$600,000

PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

Under penalty of perjury, I certify that I am authorized to execute this Disclosure of Retained Parties on behalf of the Contractor and that the information disclosed herein is true and complete.

Signature — February 4, 2009 (Date)

John Pridmore (Name (Type or Print)) — Executive Vice President (Title)

Subscribed and sworn to before me this 4th day of February, 20 09 (SEAL)

Notary Public

Commission expires: 11/28/09

OFFICIAL SEAL
NANCY PLANEK
NOTARY PUBLIC - STATE OF ILLINOIS
MY COMMISSION EXPIRES:11/28/09

PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

Statement Of Bidder's Qualifications (continued)

The undersigned hereby authorizes any person, firm, or corporation to furnish any information requested by the Public Building Commission of Chicago in verification of this Statement of Bidder's Qualifications.

If submitted by a corporation:

(a) Corporation Name
The George Sollitt Construction Co.

(b) State and City in which incorporated
Illinois, Wood Dale

(c) If incorporated in another state, is firm authorized to do business in the State of Illinois?
Yes _____ No _____

(d) Name and address of registered agent in Illinois

John Pridmore, 790 N. Central Ave., Wood Dale, IL 60191

(e) Names and titles of officers authorized to sign contracts

Howard Strong	President
Name	Title
John Pridmore	Executive Vice President
Name	Title

If submitted by a partnership:

(a) Firm Name

(b) Official Address

(c) Names of all Partners:

If submitted by an individual:

(a) Firm Name

(b) The Owner

(c) Official Address

Signature of Affiant

Subscribed and sworn to before me this 30th day of January 20 09

Notary Public
My Commission expires: 11/28/09

(SEAL) OFFICIAL SEAL
NANCY PLANEK
NOTARY PUBLIC - STATE OF ILLINOIS
MY COMMISSION EXPIRES:11/28/09

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No.1478
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

Disclosure Of Retained Parties

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A. Definitions and Disclosure Requirements

1. As used herein, "Contractor" means a person or entity that has any contract or lease with the Public Building Commission of Chicago ("Commission").
2. Commission contracts and/or qualification submittals must be accompanied by a disclosure statement providing certain information about any lobbyists whom the Contractor has retained or expects to retain with respect to the contract or lease. In particular, the Contractor must disclose the name of each such person, his or her business address, the name of the relationship, and the amount of fees paid or estimated to be paid. The Contractor is not required to disclose employees who are paid solely through the Contractor's regular payroll.
3. "Lobbyists" means any person a) who for compensation or on behalf of any person other than himself undertakes to influence any legislative or administrative action, or b) any part of whose duties as an employee of another includes undertaking to influence any legislative or administrative action.

B. Certification

Contractor hereby certifies as follows:

1. This Disclosure relates to the following transaction
: New Construction

Description of goods or services to be provided under Contract
1478 - Lee Pasteur Hurley Area Elementary School

2. Name of Contractor: The George Sollitt Construction Company
3. EACH AND EVERY lobbyist retained or anticipated to be retained by the Contractor with respect to or in connection with the contract or lease is listed below. Attach additional pages if necessary.

Check here if no such persons have been retained or are anticipated to be retained: _____

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No. 1478

PERFORMANCE AND PAYMENT BOND **Contract No. 1478**

Bond No. 105166759

KNOW ALL MEN BY THESE PRESENTS, that we, The George Sollitt Construction Company, a corporation organized and existing under the laws of the State of Illinois, with offices in the Town of Wood Dale, State of Illinois, as Corporate Principal, and

Travelers Casualty and Surety Company of America
One Tower Square
Hartford, CT 06183-6014

a corporation organized and existing under the laws of the State of CT, with offices in the State of * IL *, as Surety, are held and firmly bound unto the Public Building Commission of Chicago, hereinafter called "Commission", in the penal sum of Twenty-Two Million Nine Hundred Twenty-Nine Thousand Dollars and No Cents ($22,929,000.00) for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

The condition of this obligation is such, that whereas the Principal entered into a certain Contract, hereto attached, with the Commission, dated February 10, 2009, for the fabrication, delivery, performance and installation of

Lee Pasteur Hurley Area Elementary School
4707 W. Marquette Road, Chicago, IL

in the referenced project area and other miscellaneous work collateral thereto.

NOW, THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extension thereof that may be granted by the Commission, with or without notice to the Surety, and during the life of any guarantee required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all authorized modifications of said Contract that may be made; and also if the Principal shall promptly pay all persons, firms, and corporations supplying labor, materials, facilities, or services in the prosecution of the work provided for in the Contract, and any and all duly authorized modifications of said Contract that may be made, notice of which modifications being hereby waived; and also, if the Principal shall fully secure and protect the said Commission, its legal successor and representative, from all liability in the premises and from all loss or expense of any kind, including all costs of court and attorney's fees, made necessary or arising from the failure, refusal, or neglect of the aforesaid Principal to comply with all the obligations

assumed by said Principal or any subcontractors in connection with the performance of said Contract and all such modifications thereof; and also, if the Principal shall deliver all Work called for by said Contract of the Principal with the Commission, free and clear of any and all claims, liens and expenses of any kind or nature whatsoever, and in accordance with the terms and provisions of said Contract, and any and all modifications of said Contract; then, this said Bond shall become null and void; otherwise it shall remain in full force and effect.

The Surety does further hereby consent and yield to the jurisdiction of the State Civil Courts of the County of Cook, City of Chicago, and State of Illinois, and does hereby formally waive any plea of jurisdiction on account of the residence elsewhere of the Surety. The Principal and Surety severally and jointly agree that this Bond, and the undertakings contained herein, are also for the benefit of any and all subcontractors and other persons furnishing materials, labor, facilities, or services to the Principal or for the performance by the Principal of said Contract with the Commission as originally executed by said Principal and the Commission or as thereafter modified, and that any such subcontractor or persons furnishing labor, materials, facilities, or services may bring suit on this Bond, or any undertaking herein contained, in the name of the Commission against the said Principal and Surety or either of them.

It is expressly understood and agreed that this Bond, in the penal sum of Twenty-Two Million Nine Hundred Twenty-Nine Thousand Dollars and No Cents ($22,929,000.00), shall secure the payment of all sums due of and by the Principal under the Contract, and guarantee the faithful performance of the Contract.

No modifications, omissions, or additions, in or to the terms of said Contract, the plans or specifications, or in the manner and mode of payment shall in any manner affect the obligations of the Surety in connection with aforesaid Contract. Notice to the Surety of any and all modifications in said Contract of the Principal with the Commission and of any additions or omissions to or from said Contract are hereby expressly waived by the Surety.

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No. 1478

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this 2/12/2009, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

WITNESS:

_____
Name

_____
Business Address

_____
City State

BY _____ (Seal)
Individual Principal

_____ (Seal)
Individual Principal

CORPORATE SEAL

ATTEST:

BY _____

Secretary _____
Title

790 N. Central Avenue
Wood Dale, IL 60191

BY _____

One Tower Square
Hartford, CT 06183-6014
Business Address & Telephone (630)961-7002

The George Sollitt Construction Company
Corporate Principal

BY _____

President
Title

Travelers Casualty and Surety Company of America
Corporate Surety

Attorney-In-Fact
Title

CORPORATE SEAL

FOR CLAIMS *(Please Print)*:
Contact Name: Todd Baraniak

Business Address: 215 Shuman Blvd., Naperville, IL 60563-8458

Telephone: 630-961-7002 Fax: 866-216-5979

The rate of premium of this Bond is $ 5.80 per thousand. **
Total amount of premium charged is $ 132,988.00 **

* The current power of attorney for the persons who sign for any surety company shall be attached to this Bond. Such power of attorney shall be sealed and certified with a "first-hand signature" by an officer of the surety. The Commission will not accept a facsimile signature.

** Must be filled in by the Corporate Surety.

PUBLIC BUILDING COMMISSION OF CHICAGO
Contract No. 1478

BOND APPROVAL

BY _____
Secretary,
Public Building Commission of Chicago

CERTIFICATE AS TO CORPORATE SEAL

I, John Pridmore, certify that I am the _____ Secretary of The George Sollitt Construction Company, corporation named as Principal in the foregoing performance and payment bond, that Howard Strong who signed on behalf of the Principal was then President of said corporation; that I know this person's signature, and the signature is genuine; and that the Bond was duly signed, sealed, and attested, for and in behalf of said corporation by authority of its governing body.

Dated this 16th day of February 2009.

CORPORATE SEAL

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

TRAVELERS

POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
Seaboard Surety Company
St. Paul Fire and Marine Insurance Company

St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 219810 **Certificate No.** 002289306

KNOW ALL MEN BY THESE PRESENTS: That Seaboard Surety Company is a corporation duly organized under the laws of the State of New York, that St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company and St. Paul Mercury Insurance Company are corporations duly organized under the laws of the State of Minnesota, that Farmington Casualty Company, Travelers Casualty and Surety Company, and Travelers Casualty and Surety Company of America are corporations duly organized under the laws of the State of Connecticut, that United States Fidelity and Guaranty Company is a corporation duly organized under the laws of the State of Maryland, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc. is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Amy E. Callahan, Peter S. Forker of Arlington Heights, Illinois; Becky A. Heaston, Bradley S. Babcock, and Margaret M. Sylvester

of the City of Milwaukee, State of Wisconsin, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 26th day of March, 2008.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
Seaboard Surety Company
St. Paul Fire and Marine Insurance Company

St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

State of Connecticut
City of Hartford ss.

By: George W. Thompson
George W. Thompson, Senior Vice President

On this the 26th day of March, 2008, before me personally appeared George W. Thompson, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2011.

MARIE C. TETREAULT NOTARY PUBLIC CONNECTICUT

Marie C. Tetreault
Marie C. Tetreault, Notary Public

58440-5-07 Printed in U.S.A.

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any power of attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such power of attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, Kori M. Johanson, the undersigned, Assistant Secretary, of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., Seaboard Surety Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 12th day of February, 20 09.

Kori M. Johanson, Assistant Secretary

To verify the authenticity of this Power of Attorney, call 1-800-421-3880 or contact us at www.travelersbond.com. Please refer to the Attorney-In-Fact number, the above-named individuals and the details of the bond to which the power is attached.

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

PUBLIC BUILDING COMMISSION OF CHICAGO

Contract No.1478

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

Document Submittal Checklist

Two originals of the following documents are required at the time of bid opening. Please ensure that you have completed the forms and indicate such by placing an "X" next to each completed item:

1. _____ Contractor's Bid
2. _____ Bid Guarantee
3. _____ Acceptance of the Bid
4. _____ Basis of Award (Award Criteria)
5. _____ Unit Prices (If applicable)
6. _____ Affidavit of Non-Collusion
7. _____ Schedule B – Affidavit of Joint Venture (if applicable)
8. _____ Schedule D – Affidavit of General Contractor Regarding MBE/WBE Participation
9. _____ Schedule E – Request for Waiver from MBE/WBE Participation (if applicable)
10. _____ Affidavit of Uncompleted Work
11. _____ Proof of Ability to Provide Bond
12. _____ Proof of Ability to Provide Insurance
13. _____ General Contractor's License

Current versions of the following documents must be on file with the Commission at the time of bid opening:

1. _____ Financial Statement
2. _____ Disclosure Affidavit
3. _____ Statement of Bidder's Qualifications

If the Contractor is the first or second low bidder, then the Contractor is required to submit the following within five (5) days after bid opening.

_____ **Disclosure of Retained Parties** (The apparent low and the apparent 2nd low bidder must submit a fully executed Disclosure of Retained Parties within 5 days after bid opening).

EXHIBIT #1 Illinois Department of Labor Prevailing Rates of Hourly Wages For Cook County

Cook County Prevailing Wage for December 2008

Trade Name	RG	TYP	C	Base	FRMAN	*M-F>8	OSA	OSH	H/W	Pensn	Vac	Trng
ASBESTOS ABT-GEN		ALL		34.750	35.250	1.5	1.5	2.0	8.830	6.170	0.000	0.270
ASBESTOS ABT-MEC		BLD		29.930	0.000	1.5	1.5	2.0	9.170	9.260	0.000	0.320
BOILERMAKER		BLD		41.230	44.940	2.0	2.0	2.0	6.720	8.940	0.000	0.350
BRICK MASON		BLD		38.030	41.830	1.5	1.5	2.0	8.000	9.970	0.000	0.550
CARPENTER		ALL		39.770	41.770	1.5	1.5	2.0	9.460	7.790	0.000	0.490
CEMENT MASON		ALL		41.850	43.850	2.0	1.5	2.0	7.850	7.410	0.000	0.170
CERAMIC TILE FNSHER		BLD		32.150	0.000	2.0	1.5	2.0	6.150	7.370	0.000	0.380
COMM. ELECT.		BLD		35.440	37.940	1.5	1.5	2.0	7.400	7.660	0.000	0.700
ELECTRIC PWR EQMT OP		ALL		38.600	44.970	1.5	1.5	2.0	9.110	11.34	0.000	0.290
ELECTRIC PWR GRNDMAN		ALL		30.110	44.970	1.5	1.5	2.0	7.120	8.850	0.000	0.230
ELECTRIC PWR LINEMAN		ALL		38.600	44.970	1.5	1.5	2.0	9.110	11.34	0.000	0.290
ELECTRICIAN		ALL		39.400	42.000	1.5	1.5	2.0	10.83	8.740	0.000	0.750
ELEVATOR CONSTRUCTOR		BLD		43.925	49.420	2.0	2.0	2.0	8.775	6.960	2.640	0.000
FENCE ERECTOR		ALL		28.640	30.140	1.5	1.5	2.0	7.750	5.970	0.000	0.350
GLAZIER		BLD		37.000	38.500	1.5	1.5	2.0	7.340	12.05	0.000	0.740
HT/FROST INSULATOR		BLD		39.900	42.400	1.5	1.5	2.0	9.170	10.46	0.000	0.320
IRON WORKER		ALL		40.250	42.250	2.0	2.0	2.0	9.950	14.74	0.000	0.300
LABORER		ALL		34.750	35.500	1.5	1.5	2.0	8.830	6.170	0.000	0.270
LATHER		ALL		39.770	41.770	1.5	1.5	2.0	9.460	7.790	0.000	0.490
MACHINIST		BLD		40.530	42.530	1.5	1.5	2.0	7.000	7.670	0.650	0.000
MARBLE FINISHERS		ALL		28.650	0.000	1.5	1.5	2.0	7.920	9.970	0.000	0.550
MARBLE MASON		BLD		38.030	41.830	1.5	1.5	2.0	8.000	9.970	0.000	0.550
MATERIAL TESTER I		ALL		24.750	0.000	1.5	1.5	2.0	8.830	6.170	0.000	0.270
MATERIALS TESTER II		ALL		29.750	0.000	1.5	1.5	2.0	8.830	6.170	0.000	0.270
MILLWRIGHT		ALL		39.770	41.770	1.5	1.5	2.0	9.460	7.790	0.000	0.490
OPERATING ENGINEER		BLD	1	43.800	47.800	2.0	2.0	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		BLD	2	42.500	47.800	2.0	2.0	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		BLD	3	39.950	47.800	2.0	2.0	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		BLD	4	38.200	47.800	2.0	2.0	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		FLT	1	47.250	47.250	1.5	1.5	2.0	6.850	5.600	1.900	0.000
OPERATING ENGINEER		FLT	2	45.750	47.250	1.5	1.5	2.0	6.850	5.600	1.900	0.000
OPERATING ENGINEER		FLT	3	40.700	47.250	1.5	1.5	2.0	6.850	5.600	1.900	0.000
OPERATING ENGINEER		FLT	4	33.850	47.250	1.5	1.5	2.0	6.850	5.600	1.900	0.000
OPERATING ENGINEER		HWY	1	42.000	46.000	1.5	1.5	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		HWY	2	41.450	46.000	1.5	1.5	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		HWY	3	39.400	46.000	1.5	1.5	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		HWY	4	38.000	46.000	1.5	1.5	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		HWY	5	36.800	46.000	1.5	1.5	2.0	9.600	6.550	1.900	1.000
ORNAMNTL IRON WORKER		ALL		39.050	41.300	2.0	2.0	2.0	7.950	13.19	0.000	0.500
PAINTER		ALL		36.900	41.510	1.5	1.5	1.5	7.350	8.400	0.000	0.470
PAINTER SIGNS		BLD		29.920	33.590	1.5	1.5	1.5	2.600	2.390	0.000	0.000
PILEDRIVER		ALL		39.770	41.770	1.5	1.5	2.0	9.460	7.790	0.000	0.490
PIPEFITTER		BLD		42.050	45.050	1.5	1.5	2.0	7.660	8.550	0.000	1.370
PLASTERER		BLD		38.100	40.390	1.5	1.5	2.0	7.500	8.440	0.000	0.400
PLUMBER		BLD		43.000	45.000	1.5	1.5	2.0	9.110	5.960	0.000	1.030
ROOFER		BLD		35.000	38.000	1.5	1.5	2.0	6.800	3.870	0.000	0.330
SHEETMETAL WORKER		BLD		33.400	36.070	1.5	1.5	2.0	6.460	7.850	0.000	0.590

SIGN HANGER		BLD		26.510	27.360	1.5	1.5	2.0	4.200	2.280	0.000	0.000
SPRINKLER FITTER		BLD		40.500	42.500	1.5	1.5	2.0	8.500	6.850	0.000	0.500
STEEL ERECTOR		ALL		40.250	42.250	2.0	2.0	2.0	9.950	14.74	0.000	0.300
STONE MASON		BLD		38.030	41.830	1.5	1.5	2.0	8.000	9.970	0.000	0.550
TERRAZZO FINISHER		BLD		33.810	0.000	1.5	1.5	2.0	6.150	9.850	0.000	0.310
TERRAZZO MASON		BLD		37.390	40.390	1.5	1.5	2.0	6.150	11.11	0.000	0.350
TILE MASON		BLD		38.630	42.630	2.0	1.5	2.0	6.150	9.010	0.000	0.500
TRAFFIC SAFETY WRKR		HWY		24.300	25.900	1.5	1.5	2.0	3.780	1.875	0.000	0.000
TRUCK DRIVER	E	ALL	1	30.700	31.350	1.5	1.5	2.0	6.750	5.450	0.000	0.150
TRUCK DRIVER	E	ALL	2	30.950	31.350	1.5	1.5	2.0	6.750	5.450	0.000	0.150
TRUCK DRIVER	E	ALL	3	31.150	31.350	1.5	1.5	2.0	6.750	5.450	0.000	0.150
TRUCK DRIVER	E	ALL	4	31.350	31.350	1.5	1.5	2.0	6.750	5.450	0.000	0.150
TRUCK DRIVER	W	ALL	1	32.550	33.100	1.5	1.5	2.0	6.500	4.350	0.000	0.000
TRUCK DRIVER	W	ALL	2	32.700	33.100	1.5	1.5	2.0	6.500	4.350	0.000	0.000
TRUCK DRIVER	W	ALL	3	32.900	33.100	1.5	1.5	2.0	6.500	4.350	0.000	0.000
TRUCK DRIVER	W	ALL	4	33.100	33.100	1.5	1.5	2.0	6.500	4.350	0.000	0.000
TUCKPOINTER		BLD		38.200	39.200	1.5	1.5	2.0	6.580	9.550	0.000	0.280

Legend:

M-F>8 (Overtime is required for any hour greater than 8 worked each day, Monday through Friday.

OSA (Overtime is required for every hour worked on Saturday)

OSH (Overtime is required for every hour worked on Sunday and Holidays)

H/W (Health & Welfare Insurance)

Pensn (Pension)

Vac (Vacation)

Trng (Training)

Explanations

COOK COUNTY

TRUCK DRIVERS (WEST) - That part of the county West of Barrington Road.

The following list is considered as those days for which holiday rates of wages for work performed apply: New Years Day, Memorial/Decoration Day, Fourth of July, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day. Generally, any of these holidays which fall on a Sunday is celebrated on the following Monday. This then makes work performed on that Monday payable at the appropriate overtime rate for holiday pay. Common practice in a given local may alter certain days of celebration such as the day after Thanksgiving for Veterans Day. If in doubt, please check with IDOL.

EXPLANATION OF CLASSES

ASBESTOS - GENERAL - removal of asbestos material/mold and hazardous materials from any place in a building, including mechanical systems where those mechanical systems are to be removed. This includes the removal of asbestos materials/mold and hazardous materials from ductwork or pipes in a building when the building is to be demolished at the time or at some close future date.
ASBESTOS - MECHANICAL - removal of asbestos material from mechanical systems, such as pipes, ducts, and boilers, where the mechanical systems are to remain.

CERAMIC TILE FINISHER

The grouting, cleaning, and polishing of all classes of tile, whether for interior or exterior purposes, all burned, glazed or unglazed products; all composition materials, granite tiles, warning detectable tiles, cement tiles, epoxy composite materials, pavers, glass, mosaics, fiberglass, and all substitute materials, for tile made in tile-like units; all mixtures in tile like form of cement, metals, and other materials that are for and intended for use as a finished floor surface, stair treads, promenade roofs, walks, walls, ceilings, swimming pools, and all other places where tile is to form a finished interior or exterior. The mixing of all setting mortars including but not limited to thin-set mortars, epoxies, wall mud, and any other sand and cement mixtures or adhesives when used in the preparation, installation, repair, or maintenance of tile and/or similar materials. The handling and unloading of all sand, cement, lime, tile, fixtures, equipment, adhesives, or any other materials to be used in the preparation, installation, repair, or maintenance of tile and/or similar materials. Ceramic Tile Finishers shall fill all joints and voids regardless of method on all tile work, particularly and especially after installation of said tile work. Application of any and all protective coverings to all types of tile installations including, but not be limited to, all soap compounds, paper products, tapes, and all polyethylene coverings, plywood, masonite, cardboard, and any new type of products that may be used to protect tile installations, Blastrac equipment, and all floor scarifying equipment used in preparing floors to receive tile. The clean up and removal of all waste and materials. All demolition of existing tile floors and walls to be re-tiled.

COMMUNICATIONS ELECTRICIAN - Installation, operation, inspection, maintenance, repair and service of radio, television, recording, voice sound vision production and reproduction, telephone and telephone interconnect, facsimile, data apparatus, coaxial, fibre optic and wireless equipment, appliances and systems used for the transmission and reception of signals of any nature, business, domestic, commercial, education, entertainment, and residential purposes, including but not limited to, communication and telephone, electronic and sound equipment, fibre optic and data communication systems, and the performance of any task directly related to such installation or service whether at new or existing sites, such tasks to include the placing of wire and cable and electrical power conduit or other raceway work within the equipment room and pulling wire and/or cable

through conduit and the installation of any incidental conduit, such that the employees covered hereby can complete any job in full.

MARBLE FINISHER

Loading and unloading trucks, distribution of all materials (all stone, sand, etc.), stocking of floors with material, performing all rigging for heavy work, the handling of all mateiral that may be needed for the installation of such materials, building of scaffolding, polishing if needed, patching, waxing of material if damaged, pointing up, caulking; grouting and cleaning of marble, holding water on diamond or Carborundum blade or saw for setters cutting, use of tub saw or any other saw needed for preparation of material, drilling of holes for wires that anchor material set by setters, mixing up of molding plaster for installation of material, mixing up thin set for the installation of material, mixing up of sand to cement for the installatin of material and such other work as may be required in helping a Marble Setter in the handling of all material in the erection or installation of interior marble, slate, travertine, art marble, serpentine, alberene stone, blue stone, granite and other stones (meaning as to stone any foreign or domestic materials as are specified and used in building interiors and experiors and customarily known as stone in the trade), carrara, sanionyx, vitrolite and similar opaque glass and the laying of all marble tile, terrazzo tile, slate tile and precast tile, steps, risers treads, base, or any other materials that may be used as substitutes for any of the aforementioned materials and which are used on interior and experior which sare installed in a similar manner.

MATERIAL TESTER I: Hand coring and drilling for testing of materials; field inspection of uncured concrete and asphalt.

MATERIAL TESTER II: Field inspection of welds, structural steel, fireproofing, masonry, soil, facade, reinforcing steel, formwork, cured concrete, and concrete and asphalt batch plants; adjusting proportions of bituminous mixtures.

TERRAZZO FINISHER

The handling of sand, cement, marble chips, and all other materials that may be used by the Mosaic Terrazzo Mechanic, and the mixing, grinding, grouting, cleaning and sealing of all Marble, Mosaic, and Terrazzo work, floors, base, stairs, and wainscoting by hand or machine, and in addition, assisting and aiding Marble, Masonic, and Terrazzo Mechanics.

OPERATING ENGINEERS - BUILDING

Class 1. Mechanic; Asphalt Plant; Asphalt Spreader; Autograde; Backhoes with Caisson attachment; Batch Plant; Benoto; Boiler and Throttle Valve; Caisson Rigs; Central Redi-Mix Plant; Combination Back Hoe Front End-loader Machine; Compressor and Throttle Valve; Concrete Breaker (Truck Mounted); Concrete Conveyor; Concrete Paver; Concrete Placer; Concrete Placing Boom; Concrete Pump (Truck Mounted);

Concrete Tower; Cranes, All; Cranes, Hammerhead; Cranes, (GCI and similar Type); Creter Crane; Crusher, Stone, etc.; Derricks, All; Derricks, Traveling; Formless Curb and Gutter Machine; Grader, Elevating; Grouting Machines; Highlift Shovels or Front Endloader 2-1/4 yd. and over; Hoists, Elevators, outside type rack and pinion and similar machines; Hoists, one, two and three Drum; Hoists, Two Tugger One Floor; Hydraulic Backhoes; Hydraulic Boom Trucks; Hydro Vac (and similar equipment); Locomotives, All; Motor Patrol; Pile Drivers and Skid Rig; Post Hole Digger; Pre-Stress Machine; Pump Cretes Dual Ram; Pump Cretes; Squeeze Cretes-screw Type Pumps; Raised and Blind Hole Drill; Roto Mill Grinder; Scoops - Tractor Drawn; Slip-form Paver; Straddle Buggies; Tournapull; Tractor with Boom and Side Boom; Trenching Machines.

Class 2. Boilers; Broom, All Power Propelled; Bulldozers; Concrete Mixer (Two Bag and Over); Conveyor, Portable; Forklift Trucks; Greaser Engineer; Highlift Shovels or Front Endloaders under 2-1/4 yd.; Hoists, Automatic; Hoists, inside Freight Elevators; Hoists, Sewer Dragging Machine; Hoists, Tugger Single Drum; Laser Screed; Rock Drill self-propelled); Rock Drill (truck mounted); Rollers, All; Steam Generators; Tractors, All; Tractor Drawn Vibratory Roller; Winch Trucks with "A" Frame.

Class 3. Air Compressor; Combination - Small Equipment Operator; Generators; Heaters, Mechanical; Hoists, Inside Elevators - (Rheostat Manual Controlled); Hydraulic Power Units (Pile Driving, Extracting, and Drilling); Pumps, over 3" (1 to 3 not to exceed a total of 300 ft.); Pumps, Well Points; Welding Machines (2 through 5); Winches, 4 small Electric Drill Winches; Bobcat (up to and including 3/4 cu. yd.).

Class 4. Bobcats and/or other Skid Steer Loaders; Oilers; and Brick Forklift.

OPERATING ENGINEERS - FLOATING

Class 1. Craft foreman (Master Mechanic), diver/wet tender, engineer (hydraulic dredge).

Class 2. Crane/backhoe operator, mechanic/welder, assistant engineer (hydraulic dredge), leverman (hydraulic dredge), and diver tender.

Class 3. Deck equipment operator (machineryman), maintenance of crane (over 50 ton capacity) or backhoe (96,000 pounds or more), tug/launch operator, loader, dozer and like equipment on barge, breakwater wall,
slip/dock or scow, deck machinery, etc.

Class 4. Deck equipment operator machineryman/fireman), (4 equipment units or more) and crane maintenance 50 ton capacity and under or backhoe weighing 96,000 pounds or less, assistant tug operator.

OPERATING ENGINEERS - HEAVY AND HIGHWAY CONSTRUCTION

Class 1. Craft Foreman; Asphalt Plant; Asphalt Heater and Planer Combination; Asphalt Heater Scarfire; Asphalt Spreader; Autograder/GOMACO or other similar type machines; ABG Paver; Backhoes with Caisson attachment; Ballast Regulator; Belt Loader; Caisson Rigs; Car Dumper; Central Redi-Mix Plant; Combination Backhoe Front Endloader Machine, (1 cu. yd. Backhoe Bucket or over or with attachments); Concrete Breaker (Truck Mounted): Concrete Conveyor; Concrete Paver over 27E cu. ft.; Concrete Placer; Concrete Tube Float; Cranes, all attachments; Cranes, Hammerhead, Linden, Peco & Machines of a like nature; Crete Crane; Crusher, Stone, etc.; Derricks, All; Derrick Boats; Derricks, Traveling; Dowell machine with Air Compressor; Dredges; Field Mechanic-Welder; Formless Curb and Gutter Machine; Gradall and Machines of a like nature; Grader, Elevating; Grader, Motor Grader, Motor Patrol, Auto Patrol, Form Grader, Pull Grader, Subgrader; Guard Rail Post Driver Mounted; Hoists, One, Two and Three Drum; Hydraulic Backhoes; Backhoes with shear attachments; Mucking Machine; Pile Drivers and Skid Rig; Pre-Stress Machine; Pump Cretes Dual Ram; Rock Drill - Crawler or Skid Rig; Rock Drill - Truck Mounted; Roto Mill Grinder; Slip-Form Paver; Soil Test Drill Rig (Truck Mounted); Straddle Buggies; Hydraulic Telescoping Form (Tunnel); Tractor Drawn Belt Loader (with attached pusher - two engineers); Tractor with Boom; Tractaire with Attachments; Trenching Machine; Truck Mounted Concrete Pump with Boom; Raised or Blind Hole; Drills (Tunnel Shaft); Underground Boring and/or Mining Machines; Wheel Excavator; Widener (APSCO).

Class 2. Batch Plant; Bituminous Mixer; Boiler and Throttle Valve; Bulldozers; Car Loader Trailing Conveyors; Combination Backhoe Front Endloader Machine (less than 1 cu. yd. Backhoe Bucket or over or with attachments); Compressor and Throttle Valve; Compressor, Common Receiver (3); Concrete Breaker or Hydro Hammer; Concrete Grinding Machine; Concrete Mixer or Paver 7S Series to and including 27 cu. ft.; Concrete Spreader; Concrete Curing Machine, Burlap Machine, Belting Machine and Sealing Machine; Concrete Wheel Saw; Conveyor Muck Cars (Haglund or Similar Type); Drills, All; Finishing Machine - Concrete; Greaser Engineer; Highlift Shovels or Front Endloader; Hoist - Sewer Dragging Machine; Hydraulic Boom Trucks (All Attachments); Hydro-Blaster; All Locomotives, Dinky; Pump Cretes; Squeeze Cretes-Screw Type Pumps, Gypsum Bulker and Pump; Roller, Asphalt; Rotory Snow Plows; Rototiller, Seaman, etc., self-propelled; Scoops - Tractor Drawn; Self-Propelled Compactor; Spreader - Chip - Stone, etc.; Scraper; Scraper - Prime Mover in Tandem (Regardless of Size); Tank Car Heater; Tractors, Push, Pulling Sheeps Foot, Disc, Compactor, etc.; Tug Boats.

Class 3. Boilers; Brooms, All Power Propelled; Cement Supply Tender; Compressor, Common Receiver (2); Concrete Mixer (Two Bag and Over); Conveyor, Portable; Farm-Type Tractors Used for Mowing, Seeding, etc.; Fireman on Boilers; Forklift Trucks; Grouting Machine; Hoists, Automatic; Hoists, All Elevators; Hoists, Tugger Single Drum; Jeep Diggers; Pipe Jacking Machines; Post-Hole Digger; Power Saw, Concrete Power Driven; Pug Mills; Rollers, other than asphalt; Seed and Straw Blower; Steam Generators; Stump Machine; Winch Trucks with "A" Frame; Work Boats; Tamper - Form-Motor Driven.

Class 4. Air Compressor; Combination - Small Equipment Operator; Directional Boring Machine; Generators; Heaters, Mechanical; Hydraulic Power Unit (Pile Driving, Extracting, or Drilling); Hydro-Blaster; Light Plants, All (1 through 5); Pumps, over 3" (1 to 3 not to exceed a total of 300 ft.); Pumps, Well Points; Tractaire; Welding Machines (2 through 5); Winches, 4 Small Electric Drill Winches.

Class 5. Bobcats (all); Brick Forklifts, Oilers.

TRAFFIC SAFETY

Work associated with barricades, horses and drums used to reduce lane usage on highway work, the installation and removal of temporary lane markings, and the installation and removal of temporary road signs.

TRUCK DRIVER - BUILDING, HEAVY AND HIGHWAY CONSTRUCTION - EAST & WEST

Class 1. Two or three Axle Trucks. A-frame Truck when used for transportation purposes; Air Compressors and Welding Machines, including those pulled by cars, pick-up trucks and tractors; Ambulances; Batch Gate Lockers; Batch Hopperman; Car and Truck Washers; Carry-alls; Fork Lifts and Hoisters; Helpers; Mechanics Helpers and Greasers; Oil Distributors 2-man operation; Pavement Breakers; Pole Trailer, up to 40 feet; Power Mower Tractors; Self-propelled Chip Spreader; Skipman; Slurry Trucks, 2-man operation; Slurry Truck Conveyor Operation, 2 or 3 man; TEamsters Unskilled dumpman; and Truck Drivers hauling warning lights, barricades, and portable toilets on the job site.

Class 2. Four axle trucks; Dump Crets and Adgetors under 7 yards; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnapulls or Turnatrailers when pulling other than self-loading equipment or similar equipment under 16 cubic yards; Mixer Trucks under 7 yards; Ready-mix Plant Hopper Operator, and Winch Trucks, 2 Axles.

Class 3. Five axle trucks; Dump Crets and Adgetors 7 yards and over; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnatrailers or turnapulls when pulling other than self-loading equipment or similar equipment over 16 cubic yards; Explosives and/or Fission Material Trucks; Mixer Trucks 7 yards or over; Mobile Cranes while in transit; Oil Distributors, 1-man operation; Pole Trailer, over 40 feet; Pole and Expandable Trailers hauling material over 50 feet long; Slurry trucks, 1-man operation; Winch trucks, 3 axles or more; Mechanic--Truck Welder and Truck Painter.

Class 4. Six axle trucks; Dual-purpose vehicles, such as mounted crane trucks with hoist and accessories; Foreman; Master Mechanic; Self-loading equipment like P.B. and trucks with scoops on the front.

Other Classifications of Work:

For definitions of classifications not otherwise set out, the Department generally has on file such definitions which are available. If a task to be performed is not subject to one of the classifications of pay set out, the Department will upon being contacted state which neighboring county has such a classification and provide such rate, such rate being deemed to exist by reference in this document. If no neighboring county rate applies to the task, the Department shall undertake a special determination, such special determination being then deemed to have existed under this determination. If a project requires these, or any classification not listed, please contact IDOL at 618/993-7271 for wage rates or clarifications.

LANDSCAPING

Landscaping work falls under the existing classifications for laborer, operating engineer and truck driver. The work performed by landscape plantsman and landscape laborer is covered by the existing classification of laborer. The work performed by landscape operators (regardless of equipment used or its size) is covered by the classifications of operating engineer. The work performed by landscape truck drivers (regardless of size of truck driven) is covered by the classifications of truck driver.

EXHIBIT #2 INSURANCE REQUIREMENTS

Lee Pasteur Hurley Area Elementary School
Contract Number 1478

The Contractor must provide and maintain at Contractor's own expense, the minimum insurance coverage and requirements specified below, insuring all operations related to the Contract.
The insurance must remain in effect from: the date of the notice to proceed until Substantial Completion of the project, during completion of Punch List, as well as any time Contractor returns to perform additional work regarding warranties or for any other purpose.

INSURANCE TO BE PROVIDED

1) **Workers' Compensation and Employers Liability**

Workers' Compensation Insurance, as prescribed by applicable law covering all employees who are to provide a service under this Contract and Employers Liability coverage with limits of not less than $500,000 each accident, illness or disease.

2) **Commercial General Liability (Primary and Umbrella)**

Commercial General Liability Insurance or equivalent with limits of not less than $5,000,000 per occurrence for bodily injury, personal injury, and property damage liability. Coverage must include the following: All premises and operations, products/completed operations (for minimum of two (2) years following project completion), explosion, collapse, underground, separation of insureds, defense, and contractual liability with no limitation endorsement. The Public Building Commission, Board of Education of the City of Chicago and City of Chicago are to be named as additional insureds on a primary, non-contributory basis for any liability arising directly or indirectly from the work.

Subcontractors performing work for Contractor must maintain limits of not less than $1,000,000 per occurrence with the same terms herein.

3) **Automobile Liability (Primary and Umbrella)**

When any motor vehicles (owned, non-owned and hired) are used in connection with work to be performed, the Contractor must provide Automobile Liability Insurance, with limits of not less than $2,000,000 per occurrence for bodily injury and property damage. The Public Building Commission, Board of Education of the City of Chicago and City of Chicago are to be named as additional insureds on a primary, non-contributory basis.

Subcontractors performing work for Contractor must maintain limits of not less than $1,000,000 per occurrence with the same terms herein.

4) **Contractors Pollution Liability**

When any work is performed which may cause a pollution exposure, Contractors Pollution Liability must be provided covering bodily injury, property damage and other losses caused by pollution conditions that arise from the Contract scope of services with limits of not less than $1,000,000 per occurrence. When policies are renewed or replaced, the policy retroactive date must coincide with or precede, start of work on the Contract. A claims-made policy, which is not renewed or replaced, must have an extended reporting period of two (2) years. The Public Building Commission, Board of

Education of the City of Chicago and City of Chicago are to be named as additional insureds on a primary, non-contributory basis.

5) **Professional Liability**

When any architects, engineers, construction managers or other professional consultants perform work in connection with this Contract, Professional Liability Insurance covering acts, errors, or omissions must be maintained with limits of not less than $1,000,000. When policies are renewed or replaced, the policy retroactive date must coincide with, or precede, start of work on the Contract. A claims-made policy, which is not renewed or replaced, must have an extended reporting period of two (2) years.

6) **Builders Risk**

When Contractor undertakes any construction, including improvements, betterments, and/or repairs, the Contractor must provide All Risk Builders Risk Insurance at replacement cost for materials, supplies, equipment, machinery and fixtures that are or will be part of the permanent facility. Coverage must include but are not limited to the following: right to partial occupancy, collapse, water including overflow, leakage, sewer backup, or seepage, damage to adjoining or existing property, debris removal, scaffolding, false work, fences, and temporary structures, faulty workmanship or materials, and equipment stored off site or in transit. The Public Building Commission, Board of Education of the City of Chicago, and the City of Chicago are to be named as additional insureds and loss payees

The Contractor is responsible for all loss or damage to Public Building Commission, City of Chicago and/or Board property at full replacement cost. The Contractor is responsible for all loss or damage to personal property including but not limited to materials, equipment, tools, and supplies owned, rented, or used by Contractor.

7) **Railroad Protective Liability**

When any work is to be done adjacent to or on railroad or transit property, Architect must provide or cause to be provided, with respect to the operations that Architect or subcontractors perform, Railroad Protective Liability Insurance in the name of railroad or transit entity. The policy must have limits of not less than the requirement of the operating railroad/transit entity for losses arising out of injuries to or death of all persons, and for damage to or destruction of property, including the loss of use thereof.

B. ADDITIONAL REQUIREMENTS

Contractor must furnish the Public Building Commission Procurement Department, Richard J. Daley Center, Room 200, Chicago, IL 60602, original Certificates of Insurance, or such similar evidence, to be in force on the date of this Contract, and Renewal Certificates of Insurance, or such similar evidence, if any insurance policy has an expiration or renewal date occurring during the term of this Contract. The Contractor must submit evidence of insurance to the Public Building Commission prior to Contract award. The receipt of any certificate does not constitute agreement by the Commission that the insurance requirements in the Contract have been fully met or that the insurance policies indicated on the certificate are in compliance with all Contract requirements. The failure of the Commission to obtain certificates or other insurance evidence from Contractor is not a waiver by the Commission of any requirements for the Contractor to obtain and maintain the specified insurance. The Contractor will advise all insurers of the Contract provisions regarding insurance. Non-conforming insurance does not relieve Contractor of the obligation to provide insurance as specified in this contract. Nonfulfillment of the insurance

conditions may constitute a breach of the Contract, and the Commission retains the right to stop work until proper evidence of insurance is provided, or the Contract may be terminated.

The Commission reserves the right to obtain copies of insurance policies and records from the Contractor and/or its subcontractors at any time upon written request.

The insurance must provide for 60 days prior written notice to be given to the Commission in the event coverage is substantially changed, canceled, or non-renewed.

Any deductibles or self-insured retentions on referenced insurance must be borne by Contractor.

The Contractor agrees that insurers waive their rights of subrogation against the Public Building Commission, Board of Education of the City of Chicago, and the City of Chicago, their respective Board members, employees, elected officials, officers, or representatives.

The insurance coverage and limits furnished by Contractor in no way limit the Contractor's liabilities and responsibilities specified within the Contract or by law.

Any insurance or self-insurance programs maintained by the Public Building Commission and the Board of Education of the City of Chicago and the City of Chicago do not contribute with insurance provided by the Contractor under the Contract.

The required insurance to be carried is not limited by any limitations expressed in the indemnification language in this Contract or any limitation placed on the indemnity in this Contract given as a matter of law.

If contractor is a joint venture or limited liability company, the insurance policies must name the joint venture or limited liability company as a named insured.

The Contractor must require all subcontractors to provide the insurance required herein, or Contractor may provide the insurance for subcontractors. All subcontractors are subject to the same insurance requirements of Contractor unless otherwise specified in this Contract.

If Contractor or subcontractor desires additional coverage, the party desiring the additional coverage is responsible for the acquisition and cost

The Public Building Commission maintains the rights to modify, delete, alter or change these requirements.

C1478 - LEE PASTEUR HURLEY

ACORD CERTIFICATE OF LIABILITY INSURANCE

OP ID DC GEORG-3 | DATE (MM/DD/YYYY) 02/11/09

PRODUCER

Weible & Cahill
2300 Cabot Drive, Suite 100
Lisle IL 60532
Phone: 630-245-4600 Fax: 630-245-4601

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED

George Sollitt Construction Co
790 N. Central Avenue
Wood Dale IL 60191

INSURERS AFFORDING COVERAGE		NAIC #
INSURER A:	Zurich American Insurance Co	
INSURER B:	Amer. Guarantee & Liability	
INSURER C:	Lexington Insurance Company	
INSURER D:	Steadfast Insurance Company	
INSURER E:		

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	X	GENERAL LIABILITY [X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [X] PRO-JECT [ ] LOC	GLO937891904	06/30/08	06/30/09	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 100,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
A	X	AUTOMOBILE LIABILITY [X] ANY AUTO [ ] ALL OWNED AUTOS [ ] SCHEDULED AUTOS [X] HIRED AUTOS [X] NON-OWNED AUTOS	BAP937891804	06/30/08	06/30/09	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
		GARAGE LIABILITY [ ] ANY AUTO				AUTO ONLY - EA ACCIDENT OTHER THAN AUTO ONLY: EA ACC AGG	$ $ $
B		EXCESS/UMBRELLA LIABILITY [X] OCCUR [ ] CLAIMS MADE [ ] DEDUCTIBLE [X] RETENTION $ 0	AUC937890104	06/30/08	06/30/09	EACH OCCURRENCE AGGREGATE	$ 4,000,000 $ 4,000,000
A		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below	WC937892005	06/30/08	06/30/09	[X] WC STATU-TORY LIMITS [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 500,000 $ 500,000 $ 500,000
C		OTHER POLLUTION LIAB	CPO1957615	06/30/08	06/30/10	2,000,000	LIAB LIMIT
D		PROFESSIONAL LIAB	EOC596289801	11/14/08	11/14/09	3,000,000	LIAB LIMIT

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

RE: Contract Number 1478, Lee Pasteur Hurley Elementary School
Primary/Noncontributory Additional Insured on General Liability, Automobile Liability, & Pollution and Waiver of Subrogation on General Liability, Automobile & Workers' Compensation in favor of The Public Building Commission, Board of Education of City of Chicago and City of Chicago

CERTIFICATE HOLDER

PUBLI-2

Public Building Commission
of Chicago
Richard J. Daley Center
Room 200
Chicago IL 60602

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

Deborah A. Campbell

EXHIBIT # 3 COMMUNITY AREA MAP

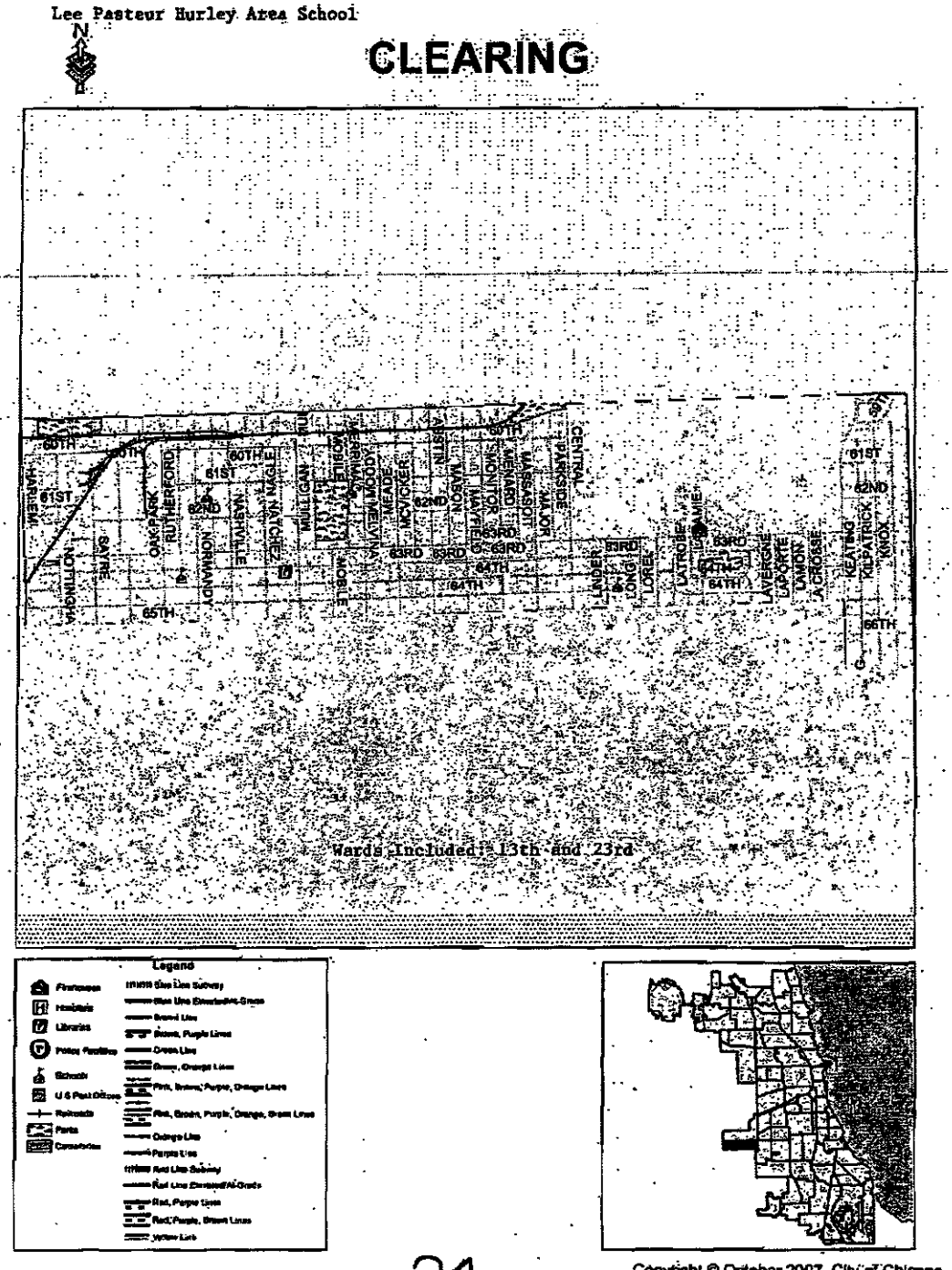
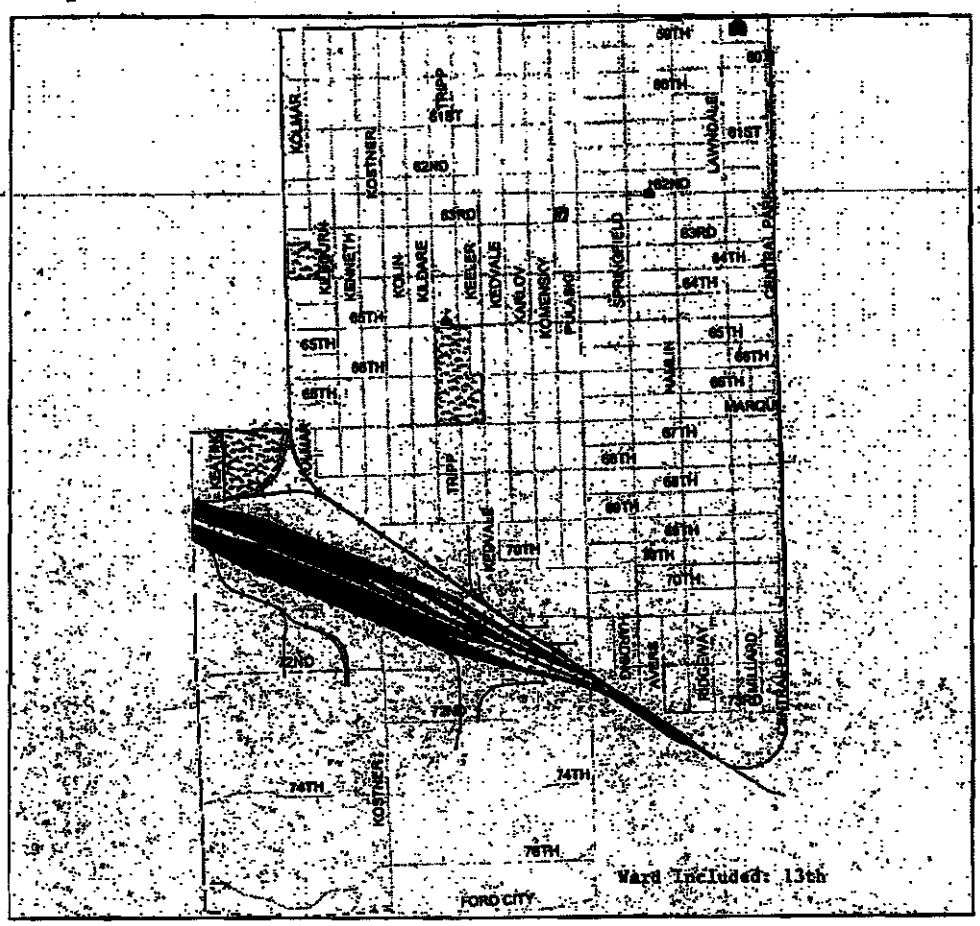
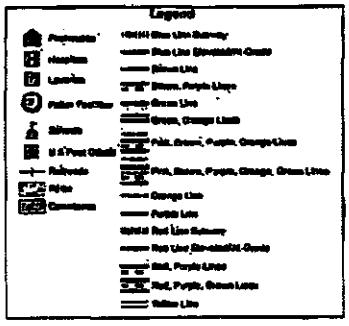


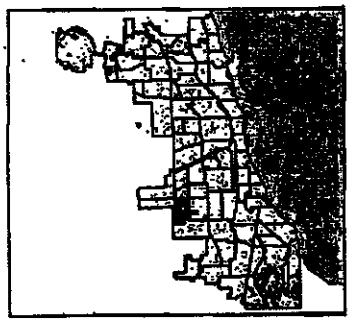
EXHIBIT # 3 COMMUNITY AREA MAP-CONTINUED

Lee Pasteur Hurley Area School

WEST LAWN







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PUBLIC BUILDING COMMISSION OF CHICAGO

ADDENDUM NO. 1 TO CONTRACT NO. 1478
FOR

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL
FOR
NEW CONSTRUCTION

DATE: January 23, 2009

NOTICE OF CHANGES IN CONTRACT DOCUMENTS

The following changes are hereby made in the Contract Documents.

CHANGES TO BOOK 3 - TECHNICAL SPECIFICATIONS:

Change 1: Table of Contents

a. Page 1, Division 01 – Project Requirements, **ADD** a line reading, "Report of Subsurface Exploration and Engineering Services....39."
b. Page 1, Division 01 – Project Requirements, **ADD** a line reading, "Supplemental Report of Subsurface Exploration and Engineering Services....23."
c. Page 1, Division 01 – Project Requirements, **ADD** a line reading, "Geophysical Survey....11."
d. Page 3, Division 11 – Equipment, **ADD** a line reading, "11062 Stage Rigging....14."
e. Page 5, Division 16 – Electrical, **ADD** a line reading, "16555 Stage Lighting....19."

Change 2: **ADD** Report of Subsurface Exploration and Engineering Services, per attached report.

Change 3: **ADD** Supplemental Report of Subsurface Exploration and Engineering Services, per attached report.

Change 4: **ADD** Geophysical Survey, per attached report.

Change 5: Section 04200 – Unit Masonry

a. Page 04200-13, Article 3.3 – Installation, Paragraph F, **REVISE** Sub-Paragraph 6 to read, "Install cavity drainage material ***full height of wall, as indicated on the drawings.*** Provide units the full width of the cavity..."

Change 6: **ADD** Section 11062 – Stage Rigging, per attached specification section.

Change 7: **DELETE** Section 15950 as included in Book 3, Volume 1 of the Project Manual and **REPLACE** with Section 15950 – Building Automation System (BAS) General, per attached specification section.

Change 8: **DELETE** Section 15951 as included in Book 3, Volume 1 of the Project Manual and **REPLACE** with Section 15951 – BAS Basic Materials, Interface Devices, and Sensors, per attached specification section.

Change 9: **DELETE** Section 15952 as included in Book 3, Volume 1 of the Project Manual and **REPLACE** with Section 15952 – BAS Operator Interfaces, per attached specification section.

Change 10: **DELETE** Section 15953 as included in Book 3, Volume 1 of the Project Manual and **REPLACE** with Section 15953 – BAS Field Panels, per attached specification section.

Change 11: **DELETE** Section 15955 as included in Book 3, Volume 1 of the Project Manual and **REPLACE** with Section 15955 – BAS Software and Programming, per attached specification section.

Change 12: Section 15958 – Sequence of Operations

a. Page 15958-27, Article 3.11 – Exhaust Fans (BAS-EF-01), **REVISE** Paragraph A to read, "Toilet and General Exhaust Fans ***EF 1-3***: BAS shall control..."
b. Page 15958-27, Article 3.11 – Exhaust Fans (BAS-EF-01), **REVISE** Paragraph B to read, "T-Stat controlled exhaust fans ***EF-10*** and heater shall be controlled...Thermostat shall also operate unit heater ***UH-B1*** to maintain a minimum temperature..."
c. Page 15958-27, Article 3.11 – Exhaust Fans (BAS-EF-01), **REVISE** Paragraph C to read, "Exhaust Fans ***EF 4-6, 9***: Shall be controlled by a thermostat..."

Change 13: Section 16781 – CCTV System and Components

a. Page 16781-1, Article 1.2 – Summary, Paragraph A, **REVISE** Sub-Paragraph 3 to read, "CCTV Remote Enclosures (Provided and installed by Contractor)."
b. Page 16781-1, Article 1.2 – Summary, Paragraph A, **REVISE** Sub-Paragraph 4 to read, "Power Supply & Control Insertion Devices for UTP System (Provided and installed by Contractor)."
c. Page 16781-1, Article 1.2 – Summary, Paragraph A, **REVISE** Sub-Paragraph 8 to read, "Multiplexers (Provided and installed by Contractor)."

Change 14: **ADD** Section 16555 – Stage Lighting, per attached specification section.

CHANGES TO DRAWINGS:

Change 15: Drawing AS.1, titled, "Architectural Site Plan"

a. **DELETE** note along the west side of the site reading, "Extent of Work."
b. **DELETE** note at the south side of the site reading, "Note: Refer to sheet AS.7 for layout of all ballfields, including but not limited to infield and outfield dimensions; fence, backstop, and dugout dimensions; and bench and bleacher details."

Change 16: Drawing AS.2, titled, "Enlarged Site Plan"

a. **DELETE** note along the west side of the site reading, "Note: Refer to sheet AS.1 for layout of all ball fields."
b. **DELETE** designation for all fences south of the Work Limit Line.

Change 17: Drawing TL1.01, titled, "Theatre Lighting Panel Plans & Sections"

a. At C1/TL1.01 – Theatre Lighting Panels – Centerline Section, **DELETE** note reading, "Quartz house light assembly."
b. At A4/TL1.01 – Theatre Lighting Panels – Reflected Ceiling Plan, **DELETE** (16) plug

boxes PB-B-5 through PB-B-20 over the gym floor.

Change 18: Drawing TL1.02, titled, "Theatre Lighting – Power and Lighting Plans"

a. At A4/TL1.02 – Theatre Lighting – Reflected Ceiling Plan, **DELETE** (16) Type TM-2 fixtures and associated plug boxes.

Change 19: Drawing TL2.01, titled, "Theatre Lighting Riser Diagram & Schedules"

a. At D1/TL2.01 – Distribution Schedule, **DELETE** (16) plug boxes PB-B-5 through PB-B-20.

b. At B5/TL2.01 – Dimmer Rack EDR-1 Schedule, **CONNECT** (4) circuits from light fixture Type F34 indicated on Drawing E2.2A to circuits 97 through 100 in the Emergency Dimmer Rack.

Change 20: Drawing S0.1, titled, "General Structural Notes"

a. **DELETE** Excavation & Foundation Note 7 reading, "Within the building area, remove all topsoil, miscellaneous fill materials and the buried topsoil under the fill materials to a depth of approximately 7.5' to 8.0' below grade – Replace with engineered fill up to the design elevation" in its entirety.

Change 21: **DELETE** Civil (Site Prep) - "For Reference Only" Drawings C0.0, C1.0, C2.0, C3.0, C4.0, C5.0 and C5.1 in their entirety, and **REPLACE** with Drawings C0.0, C1.0, C2.0, C3.0, C4.0, C5.0 and C5.1, attached.

QUESTIONS & ANSWERS:

Q1. Can you please tell me what the extent of demolition is for this project? Also, are there any square footages available?

A1. All of the existing structures (concessions stand, garage, scoreboards, fences, etc.) and trees indicated on the existing site survey (Drawings C0.01 and C0.02) within the project work limits have already been removed by the JOC Contractor. These items are shown on Site Preparation Drawing C1.0 – Existing Conditions and Demolition included ***for reference only*** at the end of the Bidding Documents. Items remaining to be removed (curbs, pavement, etc.) are indicated on Drawing C1.0 – Demolition Plan of the civil drawings.

Q2. Fencing is only indicated on 3 sides of the planters (L2.1) in front of the building. Is this correct?

A2. This is correct.

Q3. Drawing AS.1 shows the exterior of work at the property lines leading one to believe that the ball fields are in the scope of work. Drawing L1 and some of the C drawings show the work limits in close proximity to the school building itself. Which is correct?

A3. Drawing AS.1 of the Bidding Documents contains a note along the west side of the site referencing the property line reading, "Extent of Work". This note is in error and has been eliminated per Change No. 15, above. The Work Limit Line shown on Drawings AS.1 and AS.2 corresponds to that indicated on the civil and landscaping drawings. No work is to be completed under this contract south of the Work Limit Line.

Q4. Specifications for the Stage Rigging are missing. Will they be issued with addenda?

A4. Section 11062 – Stage Rigging has been added per Change 6, above.

Q5. Can you clarify if the striping in the crosswalks is thermal plastic or just paint?
A5. Striping in the crosswalks shall be thermal plastic.

Q6. The site survey that was required by the previous contractor (Item 1); is a copy available?
A6. The original site survey was included in the Bidding Documents (Drawings C0.01 and C0.02). The General Contractor's bid documents include site prep drawings, as part of this addendum. These drawings reflect the extent of the excavation and backfill scope. Upon completion of the site prep work, an as-built survey will be provided.

Q7. Can we obtain a soils report for the undisturbed areas?
A7. Report of Subsurface Exploration and Engineering Service, Supplemental Report of Subsurface Exploration and Engineering Service, and Geophysical Survey have been added per Changes 2, 3 and 4, above.

Q8. Will any of the adjacent areas to the south of the school site be available for staging areas?
A8. Staging will require coordination. The General Contractor shall submit its proposed site utilization/mobilization plan to the commission for review and approval.

Q9. Sheet AS.1 refers to Sheet AS.7. Our bid set did not include AS.7 (or AS.8).
A9. Drawings AS.7 and AS.8 are not intended to be part of the Bidding Documents for the Lee Pasteur Hurley Area Elementary School. References to AS.7 have been eliminated from Drawing AS.1 per Change 15, above.

Q10. Sheet S0.1 Excavation and Foundation Note 7. Will the 7.5' to 8.0' undercut and replacement work to be completed by the separate contractor that is completing the grading work? If not, does the 7.5' to 8.0' "below grade" meet 7.5' to 8.0' below finished floor grade? If not, please define "grade" in this note.
A10. The excavation work described in Excavation & Foundation Note 7 on Drawing S0.1 is to be completed by the JOC Contractor under separate contract. Note 7 has been eliminated from the Excavation & Foundation notes per Change 20, above.

Q11. Will a field office be required to be provided for the PBC? If so, please provide specifications for this field office.
A11. Specification Section 01510 – Temporary Offices is currently in Book 3, Volume 1 of the Project Manual.

Q12. What type of replacement fill material will the JOC contractor use for the undercut at the building?
A12. CA-6 is the primary fill material to be used by the JOC Contractor at the undercut areas within the building footprint. The extent of excavation and backfill scope is included in the site prep drawings as part of this addendum.

Q13. Can we assume the following conditions at the conclusion of the JOC contractor's work: a) Building pad area will be left at slab subgrade elevation? b) Pavement areas will be left at pavement subgrade elevations? c) Green areas will be left at topsoil subgrade

elevations?

A13. These assumptions are correct. New information has been added to the "for reference only" site prep drawings and the latest package is being re-issued in this Addendum 1 ***for reference only***. See Change 21, above.

Q14. Specification Section 01500 makes mention of a field office for Commission Representative's use. It does not indicate any furniture, equipment or fixtures that need to be included within the field office. Are we required to provide FF&E for the field office?

A14. As indicated in Q/A 11, Specification Section 01510 – Temporary Offices is currently in Book 3, Volume 1 of the Project Manual. Section 01510 indicates all furniture, equipment, fixtures, etc. that the General Contractor is required to provide.

Q15. Book 2A, Section 01400, 3.4 – Settlement Monitoring, please clarify when settlement monitoring can stop: Is it after the foundation work is substantially complete? Or is it when the entire project is substantially complete?

A15. As indicated in Book 2A, Section 1400, Part 3, 3.4 – Settlement Monitoring, settlement monitoring shall continue "until the Work is substantially complete." As defined in Book 2, Article 1, Section 1.01 – Definitions, Paragraph 33, "'Work' means the obligations of the Contractor under the Contract Documents..."

Q16. Book 1, Article 6, how much time should the general contractor allocate to permitting from the 465 days? The general contractor does not have control over when the permit will be issued.

A16. The General Contractor is responsible for obtaining all required permits and complete all Work within 465 Calendar Days of the issue of Notice to Proceed. Refer to Book 2, Article 6 – Permits and Licenses; and Article 10 – Schedule.

Q17. Can the mechanical/electrical contractor also serve as the project superintendent or project manager?

A17. No. Refer to Book 2, Article 9, Section 9.05.

Q18. What is the status of the building permit? When we checked the DCAP website for street address of 4707 W. Marquette Road, we could not find the project.

A18. The permit is in progress.

Q19. The bid form contains a $200,000 allowance labeled "CCTV". Is this allowance to cover all costs for Section 16781 CCTV System and Components? Does this allowance cover any portion of the work described in Section 16781?

A19. The CCTV allowance will be used to purchase all CCTV items designated as "Furnished by Owner", as indicated in Section 16781 – CCTV System and Components, Article 1.2 – Summary, Paragraph A, and as amended in Change 13, above. Material and labor costs for all CCTV items designated as "Provided and installed by Contractor" shall be included in the Contractor's base bid, and all labor costs for CCTV items designated as "Installed by Contractor" shall be included in the contractors' base bid.

Q20. Regarding CCTV: Panasonic #WV-GSS6Y refers to a number that is an indoor PTZ. The drawings show no indoor PTZ cameras. All are shown as fixed cameras. Please confirm

there are no indoor pan tilt zooms.

A20. All interior cameras are fixed cameras. PTZ cameras are only for exterior cameras. Additionally, CCTV cameras and housings are to be furnished by Owner (installed by Contractor), as indicated in Section 16781 – CCTV System and Components, Article 1.2 – Summary, Paragraph A, and amended in Change 13, above.

Q21. Regarding CCTV: The following are no longer available: Pelco Monitors #PMC21A, Ainixter Part # CMM-Y-CCTR and CMBP-Y_CCTP. What should be used for pricing?

A21. Monitors are to be furnished by Owner (installed by Contractor), as indicated in Section 16781 – CCTV System and Components, Article 1.2 – Summary, Paragraph A, and amended in Change 13, above.

Q22. Regarding CCTV: Regarding the DVR equipment – how many frames per second are required? How many days of storage for the DVR are required?

A22. Digital video recorders are to be furnished by Owner (installed by Contractor), as indicated in Section 16781 – CCTV System and Components, Article 1.2 – Summary, Paragraph A, and amended in Change 13, above.

Q23. Is the CCTV allowance to cover all work in that Division?

A23. See the response to Question 19, above.

Q24. Not used.

A24. Not used.

Q25. Not used.

A25. Not used.

Q26. Is flush out required for the substantial completion? Does furniture have same low V.O.C. requirements as GCs work?

A26. Flush out is part of the commissioning that is required for acceptance at substantial completion. This would be done prior to the inclusion of furniture by CPS.

Q27. Please explain the concurrency of the Park District work versus the PBC School work.

A27. The Park District work will be done by The Gordian Group. Finish site work within the contract limit lines of the school will be done by the GC.

Q28. What specifically are the limits of The Gordian Group's work?

A28. Limits and extent of work are given in the site prep drawings issued "for reference only" in the bidding documents. New information has been added to the "for reference only" site prep drawings and the latest package is being re-issued in this Addendum 1 ***for reference only***. See Change 21, above.

Q29. Regarding site access through the parking lot – this will not allow a marshalling area for GC on site. Where is this to take place?

A29. Refer to the response to Question 8.

Q30. Will The Gordian Group perform the work required in the site prep package?

A30. Yes, the Gordian Group will be performing the work indicated on the "for reference only"

site prep drawings. New information has been added to the "for reference only" site prep drawings and the latest package is being re-issued in this Addendum 1 ***for reference only***. See Change 21, above.

Q31. Are the classroom corridors heated and cooled?
A31. The corridors are heated and cooled primarily by transfer from the classrooms. Additional heating and cooling is provided at the corridor and lobby window locations.

Q32. Will ComEd provide underground conduit to the building on the project site (within the property line)?
A32. As indicated on Drawing E1.0 – Electrical Site Plan, primary feeds from the ComEd pole to the transformer (conduits only, with pull strings)shall be provided and installed by the Electrical Contractor. Conductors shall be by ComEd.

Q33. Will the remediation take into account the planting depths?
A33. Soil Remediation work indicated on the "for reference only" site prep drawings take into account planting depths at areas where the existing soils exceeded EPA TACO Tier 1 SRO's. New information has been added to the "for reference only" site prep drawings and the latest package is being re-issued in this Addendum 1 ***for reference only***. See Change 21, above.

ATTACHMENTS:

Book 3, V1	Report of Subsurface Exploration and Engineering Services (39 pages)
Book 3, V1	Supplemental Report of Subsurface Exploration and Engineering Services (23 pages)
Book 3, V1	Geophysical Survey (11 pages)
Book 3, V1	11062 Stage Rigging (14 pages)
Book 3, V2	15950 Building Automation System (BAS) General (29 pages)
Book 3, V2	15951 BAS Basic Materials, Interface Devices, and Sensors (30 pages)
Book 3, V2	15952 BAS Operator Interfaces (4 pages)
Book 3, V2	15953 BAS Field Panels (14 pages)
Book 3, V2	15955 BAS Software and Programming (39 pages)
Book 3, V2	16555 Stage Lighting (19 pages)
Drawings	Site Prep C0.0 (For Reference Only), dated 01.20.09 (1 page, 30" x 42" format)
Drawings	Site Prep C1.0 (For Reference Only), dated 01.20.09 (1 page, 30" x 42" format)
Drawings	Site Prep C2.0 (For Reference Only), dated 01.20.09 (1 page, 30" x 42" format)
Drawings	Site Prep C3.0 (For Reference Only), dated 01.20.09 (1 page, 30" x 42" format)
Drawings	Site Prep C4.0 (For Reference Only), dated 01.20.09 (1 page, 30" x 42" format)
Drawings	Site Prep C5.0 (For Reference Only), dated 01.20.09 (1 page, 30" x 42" format)
Drawings	Site Prep C5.1 (For Reference Only), dated 01.20.09 (1 page, 30" x 42" format)

END OF ADDENDUM NO.1

REPORT OF

SUBSURFACE EXPLORATION AND ENGINEERING SERVICES

LEE PASTEUR/HURLEY AREA ELEMENTARY SCHOOL
67TH STREET AND CICERO AVENUE
CHICAGO, ILLINOIS

FOR

LEGAT ARCHITECT
CHICAGO, ILLINOIS

MAY 28, 2008

ECS ILLINOIS, LLC
Geotechnical • Construction Materials • Environmental

May 28, 2008

Mr. Tom Kitka
Legat Architects
651 West Washington
Suite 1
Chicago, IL 60661

ECS Job No. 16:7126

Reference: ***Report of Subsurface Exploration and Engineering Services, Proposed LEE Pasteur/Hurley Area Elementary School, 67th Street and Cicero Avenue, Chicago, Illinois***

Dear Mr. Kitka:

ECS Illinois, LLC has completed the subsurface exploration and geotechnical engineering analyses for the proposed LEE Pasteur/Hurley Area Elementary School to be located at 67th Street and Cicero Avenue, in Chicago, Illinois. This report describes the subsurface exploration procedures, laboratory testing, and geotechnical recommendations for project construction. A Boring Location Plan is included in the Appendix of this report along with the Boring Logs performed for the exploration.

We appreciate this opportunity to be of service to Legat Architects during the design phase of this project. If you have any questions with regard to the information and recommendations presented in this report, or if we can be of further assistance to you in any way during the planning or construction of this project, please do not hesitate to contact us.

Respectfully,

ECS ILLINOIS, LLC

Teddy Ngoy / For
Teddy K. Ngoy
Assistant Project Engineer

Kiran Adhikary
Kiran Adhikary, P.E.
Manager, Geotechnical Services

KIRAN ADHIKARY
062-056547
LICENSED
PROFESSIONAL
ENGINEER
STATE OF ILLINOIS

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REPORT

PROJECT

SUBSURFACE EXPLORATION AND ENGINEERING SERVICES

LEE PASTEUR/HURLEY AREA ELEMENTARY SCHOOL
67TH STREET AND CICERO AVENUE
CHICAGO, ILLINOIS

CLIENT

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PROJECT #16: 7126

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LEE Pasteur/Hurley Area Elementary School
Chicago, Illinois

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EXECUTIVE SUMMARY

The subsurface conditions encountered during our exploration and ECS' conclusions and recommendations are summarized below. This summary should not be considered apart from the entire text of the report with all the qualifications and considerations mentioned herein. Details of our conclusions and recommendations are discussed in the following sections and in the Appendix of this report.

The site for proposed LEE Pasteur/Hurley Area Elementary School was located at 67th Street and Cicero Avenue, in Chicago, Illinois. At the time of our field exploration, the site was occupied by baseball fields. The ground was mostly covered with grass/gravel. Scattered trees were present across the extent of LEE Pasteur/Hurley Area Elementary School site. The topography across the site was observed to be generally flat. We estimate less than 1 to 2 feet of vertical difference was present across the extent of LEE Pasteur/Hurley Area Elementary School site.

Soil borings typically encountered topsoil/gravel/crushed stone/fill material at the ground surface. In 5 of the borings, B-3, B-4, B-10, B-12, and B-14, approximately 8 to 12 inches of topsoil was encountered at the ground surface; in 4 of the borings, B-1, B-2, B-6, and B-13, about 3 to 7 inches of crushed stone was encountered at the ground surface followed by about 2 to 5 inches of recycled asphalt; and in borings, B-5, B-7, B-8, and B-11, approximately 4 to 11 inches of gravel was encountered at the ground surface. At the ground surface of boring B-9 and below the surface materials in the remaining borings, fill material mainly consisting of brown and black silty clay and/or silty clay mixed with cinders, brick, and gravel was encountered and extended to a depth of about 1½ to 5½ feet below the existing grade. The fill material encountered in boring B-2 at a depth of about 3 to 5½ feet consisted of black silty sand. In 6 of the borings, B-1, B-2, B-6, B-8, B-9, and B-14, **buried topsoil** was encountered underneath the fill material and extended to a depth of about 2½ to 5½ feet below grade. Underneath the fill material/buried topsoil in the borings, apparently natural brown and/or brown and gray silty clay was encountered extending to a depth of about 7 to 12 feet below grade followed by gray silty clay extending to the explored depth of 10 to 20 feet below grade.

Initial subgrade preparation should consist of complete stripping/removal of topsoil/buried topsoil, vegetation, old pavement, rootmat, and any other soft or unsuitable/deleterious materials from the location of the proposed building as well as pavement areas. In the slab and pavement areas where no buried topsoil was encountered, one of the following subgrade preparation options can be selected based on the level of risk that can be accepted by the owner, **but the topsoil/buried topsoil should be removed and replaced**. (1) The existing fill material may remain in place below the slab and the pavement provided that the exposed subgrade of existing fill passes a proofroll and the owner is willing to accept some risk of slab/pavement movement/deterioration and long term maintenance issues. (2) The existing fill material within 2 feet below the bottom of the slab/pavement section can be removed and replaced with engineered fill provided that the exposed subgrade passes a proofroll and the owner is willing to accept slight risk of slab/pavement movement/deterioration and long term maintenance issues. (3) The existing fill should be entirely removed from slab/pavement areas and replaced with engineered fill to construct a stable subgrade.

In building foundation areas, the existing fill material and **buried topsoil** similar to those encountered in the borings extending to a depth of about 2½ to 5½ feet below the existing grade and soft silty clay similar to that encountered in boring B-7 at a depth of about 5½ to 7½ feet below grade, and other areas if encountered during construction should be entirely removed from the building foundation areas and replaced with engineered fill. For footings bearing at depths of at least 3½ feet below grade on natural stiff to hard silty clay or new properly compacted engineered fill, we recommend a maximum net allowable soil bearing pressure of 3,000 psf be used to proportion the footings.

We recommend that the excavation of building foundations be monitored full-time by an ECS geotechnical engineer or his representative to verify that the exposed subgrade materials and the soil bearing pressure will be suitable for the proposed structure and is consistent with the boring log information obtained during the geotechnical exploration.

Report Prepared By:

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PROJECT OVERVIEW

Introduction

This report presents the results of our subsurface exploration and engineering services for the proposed LEE Pasteur/Hurley Area Elementary School in Chicago, Illinois. A General Location Plan included in the Appendix of this report, shows the approximate location of this project.

Project Description

Based on the information provided to ECS, the proposed project will consist of a construction of a 2 to 3-story masonry building with associated parking and drive areas. The school building is planned to be located in the area currently occupied with the existing northwest ball field at the front side of the Adler Park School building. The building will be of slab and grade construction. No basement or below grade spaces will be included in the facility.

Scope of Work

The conclusions and recommendations contained in this report are based on the soil borings performed in the vicinity of the proposed 2 to 3-story masonry building and pavement areas, and associated laboratory testing of selected soil samples.

A total of fourteen (14) soil borings, B-1 through B-14, extended to depths of approximately 10 to 20 feet were located in the vicinity of the proposed building and pavement areas. The results of the soil borings, along with a Boring Location Plan showing the approximate locations where the borings were performed, are included in the Appendix of this report.

This report also presents our recommendations for foundation design, subgrade preparation and pavement design for the project. In addition, the report provides construction considerations based upon the results of the soil borings and our previous experience.

Purposes of Exploration

The purposes of this exploration were to explore the soil and groundwater conditions at the site and to develop engineering recommendations to guide design and construction of the project. We accomplished these purposes by:

1. drilling fourteen (14) soil borings to depths of approximately 10 to 20 feet below the existing ground surface in the vicinity of the proposed structures to explore the subsurface soil and groundwater conditions,

2. performing laboratory tests on selected representative soil samples from the borings to evaluate pertinent engineering properties, and,

3. analyzing the field and laboratory data to develop appropriate engineering recommendations.

EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil borings were located in the field by an ECS Field Engineer based on the proposed boring site plan provided to ECS by Legat Architects. As required by the State of Illinois, the driller notified Chicago Utility Alert, DIGGER, to verify underground utilities in the vicinity of the project site prior to drilling operations.

The soil borings were performed with a truck-mounted rotary-type auger drill rig, which utilized continuous hollow stem augers to advance the boreholes. Representative soil samples were obtained at 2½ foot intervals for the first 10 feet and 5 foot intervals thereafter by means of conventional split-barrel sampling procedures. In this procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval, after initial setting of 6 inches, is termed the Standard Penetration Test (SPT) or N-value and is indicated for each sample on the boring logs. The SPT value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the standard penetration resistance value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies. The drill rig utilized an automatic trip hammer to drive the sampler. Consideration of the effect of the automatic hammer's efficiency was included in the interpretation of subsurface information for the analyses prepared for this report.

The drill crew maintained a field log of the soils encountered in the borings. After recovery, each geotechnical soil sample was removed from the sampler and visually classified. Representative portions of each soil sample were then sealed in jars and brought to our laboratory in Buffalo Grove, Illinois for further visual examination and laboratory testing. After completion of the drilling operations, the boreholes were backfilled with auger cuttings to the existing ground surface.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications and unconfined compressive strength and moisture content determinations.

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. A brief

explanation of the Unified System is included with this report. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual.

Unconfined compressive strength tests were performed on cohesive soil samples with the use of a calibrated hand penetrometer. In the hand penetrometer test, the unconfined compressive strength of a soil sample is estimated, to a maximum of 4½ tons per square foot (tsf) by measuring the resistance of a soil sample to penetration of a small, calibrated spring-loaded cylinder.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposal.

EXPLORATION RESULTS

Site Conditions

The site for proposed LEE Pasteur/Hurley Area Elementary School was located at 67th Street and Cicero Avenue, in Chicago, Illinois. At the time of our field exploration, the site was occupied by baseball fields. The ground was mostly covered with grass/gravel. Scattered trees were present across the extent of LEE Pasteur/Hurley Area Elementary School site. The topography across the site was observed to be generally flat. We estimate less than 1 to 2 feet of vertical difference was present across the extent of LEE Pasteur/Hurley Area Elementary School site.

Soil Conditions

A total of fourteen (14) borings, B-1 through B-14 were performed for this project. The subsurface conditions encountered at the borings performed at the site can be summarized as follows.

Soil borings typically encountered topsoil/gravel/crushed stone/fill material at the ground surface. In 5 of the borings, B-3, B-4, B-10, B-12, and B-14, approximately 8 to 12 inches of topsoil was encountered at the ground surface; in 4 of the borings, B-1, B-2, B-6, and B-13, about 3 to 7 inches of crushed stone was encountered at the ground surface followed by about 2 to 5 inches of recycled asphalt; and in borings, B-5, B-7, B-8, and B-11, approximately 4 to 11 inches of gravel was encountered at the ground surface. At the ground surface of boring B-9 and below the surface materials in the remaining borings, fill material mainly consisting of brown and black silty clay and/or silty clay mixed with cinders, brick, and gravel was encountered and extended to a depth of about 1½ to 5½ feet below the existing grade. The fill material encountered in boring B-2 at a depth of about 3 to 5½ feet consisted of black silty sand. In 6 of the borings, B-1, B-2, B-6, B-8, B-9, and B-14, **buried topsoil** was encountered underneath the fill material and extended to a depth of about 2½ to 5½ feet below grade. Underneath the fill material/buried topsoil in the borings, apparently natural brown and/or brown and gray silty clay was encountered extending to a depth of about 7 to 12 feet below grade followed by gray silty clay extending to the maximum explored depth of 20 feet below grade.

The silty clays (fill and natural) were firm to very stiff in consistency with unconfined compressive strengths in the range of ¼ to greater than 4½ tsf and moisture contents between 14 and 28 percent. The soft silty clay was encountered in boring B-7 at a depth of about 5½ to 7½ feet below grade. The silty sand fill encountered in soil boring B-12 was loose in relative density with SPT N-values of about 5 blows per foot (bpf).

The specific soil types observed at the borings are noted on the boring logs, enclosed in the Appendix.

Groundwater Observations

Observations for groundwater were made during sampling and upon completion of the drilling operations at the boring locations. In auger drilling operations, water is not introduced into the boreholes, and the groundwater position can often be obtained by observing water flowing into or out of the boreholes. Furthermore, visual observation of the soil samples retrieved during the auger drilling exploration can often be used in evaluating the groundwater conditions.

Groundwater seepage was encountered in 7 of the borings, B-6 through B-10, B-12, and B-13 at depths between 3 and 17 feet during drilling and sampling operations and at depths between about 1½ and 18½ feet after the borings were completed. Groundwater was not encountered in the other borings. Glacial till soils in the Midwest frequently oxidize from gray to brown above the level at which the soil remains saturated. The long-term groundwater level is often interpreted to be near this zone of color change. Based on the results of this exploration, the long-term groundwater level may be located at a depth about 7 to 12 feet below current grade.

It should be noted that the groundwater level can vary based on precipitation, evaporation, surface run-off and other factors not immediately apparent at the time of this exploration. Surface water runoff will be a factor during general construction, and steps should be taken during construction to control surface water runoff and to remove any water that may accumulate in the proposed excavations as well as floor slab and pavement areas.

ANALYSIS AND RECOMMENDATIONS

Overview

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, ECS Illinois, LLC should be consulted so that the recommendations of this report can be reviewed.

Subgrade Preparation and Engineered Fill

Subgrade Preparation

Initial subgrade preparation should consist of complete stripping/removal of topsoil/buried topsoil, vegetation, old pavement, rootmat, and any other soft or unsuitable/deleterious materials from the location of the proposed building as well as pavement areas. Unsuitable materials, such as topsoil/buried topsoil or organic soils, should either be stockpiled for later use in landscaping fills or placed in approved disposal areas either on-site or off-site. We recommend that the project geotechnical engineer or his representative should be on site to monitor stripping and site preparation operations and observe that unsuitable soils have been satisfactorily removed and to observe proofrolling. We recommend earthwork clearing be extended a minimum of 10 feet beyond the building and pavement limits. Stripping limits should be extended an additional 1 foot for each foot of fill required at the building's exterior edge.

As mentioned earlier, fill material mainly consisting of brown and black silty clay, silty sand. and/or silty clay mixed with cinders, brick, and gravel was encountered in the borings and extended to a depth of about 1½ to 5½ feet below the existing grade. In 6 of the borings, B-1, B-2, B-6, B-8, B-9, and B-14, **buried topsoil** was encountered underneath the fill material and extended to a depth of about 2½ to 5½ feet below grade. As the buried topsoil was encountered in 6 locations it may be prevalent in other areas. We recommend that buried topsoil should be completely removed from building foundations, slab on grade and pavement areas and replaced with engineered fill. We suggest test pits be excavated on the site prior to construction to determine the extent of buried topsoil.

In the slab and pavement areas where no buried topsoil was encountered, one of the following subgrade preparation options can be selected based on the level of risk that can be accepted by the owner, **but the topsoil/buried topsoil should be removed and replaced**. (1) The existing fill material may remain in place below the slab and the pavement provided that the exposed subgrade of existing fill passes a proofroll and the owner is willing to accept some risk of slab/pavement movement/deterioration and long term maintenance issues. (2) The existing fill material within 2 feet below the bottom of the slab/pavement section can be removed and replaced with engineered fill provided that the exposed subgrade passes a proofroll and the owner is willing to accept slight risk of slab/pavement movement/deterioration and long term

maintenance issues. (3) The existing fill should be entirely removed from slab/pavement areas and replaced with engineered fill to construct a stable subgrade.

In building foundation areas, the existing fill material and buried topsoil similar to those encountered in the borings extending to a depth of about 2½ to 5½ feet below the existing grade and soft silty clay similar to that encountered in boring B-7 at a depth of about 5½ to 7½ feet below grade, and other areas if encountered during construction should be entirely removed from the building foundation areas and replaced with engineered fill.

After removal of unsuitable/deleterious materials and stripping to the desired grade, and prior to fill placement, we recommend the stripped/exposed subgrades be observed by an experienced geotechnical engineer or his authorized representative at the time of construction in order to aid in identifying localized soft/loose or unsuitable materials which should be removed. Proofrolling using a loaded dump truck having an axle weight of at least 10 tons, may be used at this time to aid in identifying localized soft or unsuitable material which should be removed. Any soft or unsuitable materials encountered during proofrolling should be compacted in place or removed and replaced with an approved backfill compacted to the criteria given below.

If exposed, the silty clay soils similar to those encountered in the borings could exhibit susceptibility to strength loss due to construction traffic. **These soils could be sensitive to disturbance from construction activity, particularly if wetted further by rainfall or seepage.** These soils could exhibit a relatively firm/stable condition upon initial exposure at the subgrade level. However, repetitive construction traffic and/or wetting of the soils will deteriorate the soil strength and likely result in rutting and instability. Construction traffic over subgrade should be minimized, especially after rain events; otherwise extensive removal and replacement will be required.

In general, scarifying, drying and recompacting moderately unstable soil areas is expected to be the most economical means of improving the soils prior to final preparation of pavement and building subgrades.

During final preparation of subgrades, a smooth drum roller is often used to provide a flat surface and provide for better drainage to reduce the negative impact of rain events. We recommend crowning the subgrade to provide positive drainage off the building pad and parking lot subgrades.

Engineered Fill

Where new fill material is required for backfill or to otherwise reach the design subgrade elevation beneath slabs-on-grade and pavements, we recommend that engineered fill be used. Any soil placed as engineered fill should be an approved material, free of organic matter or debris, be a non-frost susceptible soil, and have a liquid limit and plasticity index less than 40 and 15, respectively. The project geotechnical engineer should be consulted to determine the suitability of off-site/on-site materials for use as engineered fill, prior to use or placement. The

natural silty clay is suitable to be used as engineered fill. **We do not recommend the use of 3-inch stone or pea-gravel as engineered fill to backfill undercuts, particularly under floor slabs and foundations.** Due to the large diameter and absence of fines, the 3-inch rock exhibits large voids. Fill materials containing large voids are more susceptible to future movement that may become unstable resulting in excessive and variable settlement.

Fill should be placed in lifts not exceeding 8 inches in loose thickness, moisture conditioned to within 2 percent of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density obtained in accordance with ASTM Specification D 1557, Modified Proctor Method. Fill placed below footing base elevations should be compacted to at least 95 percent of the material's modified Proctor maximum dry density (ASTM D 1557). Engineered fill placed to support foundations should extend 1 foot beyond the outside edges of the footings and from that point outward laterally 1 foot for every 2 feet of fill thickness below the footings. Laboratory proctor tests should be performed on fill materials to determine the maximum dry density and optimum moisture content.

We recommend suitable silty clays used to raise the grade or backfill undercuts should be compacted with sheepsfoot roller. Granular engineered fill should be compacted with smooth drum roller or adequate heavy vibratory plate. Moisture control during earthwork operations, including the use of disking or appropriate drying equipment and techniques, should be expected.

In-place density tests should be performed with a minimum of 1 test per 2,000 square feet of fill area for each lift of fill placed. We recommend that the placement of engineered fill be monitored full-time by ECS representative and in-place density tests should be performed to verify the adequacy of the compaction for each lift of fill placed.

Footing Foundations

Based on the anticipated structural loading and subsurface conditions, conventional shallow foundation systems consisting of spread and/or continuous footings bearing on the natural very stiff to hard silty clay or properly compacted new engineered fill is considered feasible and appropriate to support the proposed structure. In building foundation areas, the existing fill material and buried topsoil similar to those encountered in the borings extending to a depth of about 2½ to 5½ feet below the existing grade and soft silty clay similar to that encountered in boring B-7 at a depth of about 5½ to 7½ feet below grade, and other areas if encountered during construction should be entirely removed from the building foundation areas and replaced with engineered fill. For footings bearing at depths of at least 3½ feet below grade on natural stiff to hard silty clay or new properly compacted engineered fill, we recommend a maximum net allowable soil bearing pressure of 3,000 psf be used to proportion the footings. The net allowable soil bearing pressure refers to that pressure which may be transmitted to the foundation bearing soils in excess of the final minimum surrounding overburden pressure.

Since localized areas of soft/unsuitable material may be present below the bearing elevation of foundations, we recommend that hand auger probes with in-situ vane shear testing and/or DCP testing be performed to at least ½ B, or a minimum of 3 feet below each isolated column footing and to at least 2 feet below continuous footings. Hand auger probes with in-situ vane shear testing and/or DCP tests should be performed at each column footing and at approximately 20-foot intervals along continuous footings to verify the suitability of the soils to support the recommended maximum net allowable bearing pressure.

If soft/loose/unsuitable soils are encountered during foundation construction, the footings should be extended until suitable bearing soils are encountered or the unsuitable soils should be removed beneath the base of the footing and replaced with compacted engineered fill or lean concrete. Engineered fill should be compacted to a minimum of 95% of the maximum dry density as discussed in the Subgrade Preparation and engineered fill section. The zone of the engineered fill placed below the foundations should extend 1 foot beyond the outside edges of the footings and from that point, outward laterally 1 foot for every 2 feet of fill thickness below the footing. If lean concrete is used to replace weaker/low bearing soils or unsuitable soils, no lateral overexcavation will be necessary, but the excavation should be 1 foot wider than the footing (6 inches on each side).

We recommend that the excavation/backfill of building foundations be monitored full-time by an ECS Geotechnical Engineer or his representative to verify that the soil bearing pressure are consistent with the boring log information obtained during the geotechnical exploration.

To reduce the potential for foundation bearing failure and excessive settlement due to local shear or "punching" action, we recommend that continuous footings have a minimum width of 18 inches and that isolated column footings have a minimum lateral dimension of 30 inches. In addition, footings should be placed at a depth to provide adequate frost cover protection. For this region, we recommend the exterior footings and footings beneath unheated areas be placed at a minimum depth of 3½ feet below finished grade. Interior footings can bear at a depth of 2 feet below the top of slab, provided suitable bearing materials are encountered.

Settlement of individual footings, designed in accordance with our recommendations presented in this report, is expected to be small and within tolerable limits for the proposed building. For footings placed on natural suitable silty clay or properly compacted engineered fill, maximum total settlement is expected to be in the range of 1 inch or less. Maximum differential settlement between adjacent columns is expected to be half the total settlement. These settlement values are based on our engineering experience with the soil and the anticipated structural loading, and are to guide the structural engineer with his design.

Floor Slab Design

For the design and construction of the new building slabs-on-grade for the proposed building, we recommend that all existing vegetation, topsoil, old pavement, rootmat, and any unsuitable/deleterious materials should be removed and replaced with compacted engineered fill as discussed in the **Site Preparation and Engineered Fill** section.

In the slab on grade areas where no buried topsoil was encountered, one of the following subgrade preparation options can be selected based on the level of risk that can be accepted by the owner, **but the topsoil/buried topsoil should be removed and replaced**. (1) The existing fill material may remain in place below the slab provided that the exposed subgrade of existing fill passes a proofroll and the owner is willing to accept some risk of slab movement and long term maintenance issues. (2) The existing fill material within 2 feet below the bottom of the slab can be removed and replaced with engineered fill provided that the exposed subgrade passes a proofroll and the owner is willing to accept slight risk of slab movement and long term maintenance issues. (3) The existing fill should be entirely removed from slab/pavement areas and replaced with engineered fill to construct a stable subgrade.

We recommend that floor slabs be underlain by a minimum of 6 inches of granular material having a maximum aggregate size of 1½ inches and no more than 2 percent of fines. Prior to placing the granular material, the floor subgrade soil should be properly compacted, proofrolled, and free of standing water, mud, and frozen soil. For design of Portland cement concrete slabs-on-grade, a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci) can be used for slabs constructed on subgrade prepared as discussed herein.

A properly designed and constructed capillary break layer can often mitigate the need for a moisture retarder and can assist in more uniform curing of concrete. If a vapor retarder is considered to provide additional moisture protection, special attention should be given to the surface curing of the slabs to reduce uneven drying of the slabs and associated cracking and/or slab curling. The use of a blotter or cushion layer above the vapor retarder can also be considered for project specific reasons. Please refer to ACI 302.1R96 *Guide for Concrete Floor and Slab Construction* and ASTM E 1643 *Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs* for additional guidance on this issue. Based on the results of the borings, for slabs located at 3 to 5 feet below current grades, groundwater infiltration beneath the slab is anticipated to be relatively small if stormwater is properly prevented from permeating the granular base course. Based on the results of the borings, it is the opinion of ECS that a subsoil drainage system will be unnecessary.

We recommend that the floor slab be isolated from the foundation footings so differential settlement of the structure will not induce shear stresses on the floor slab. Also, in order to reduce the crack width of any shrinkage cracks that may develop near the surface of the slab, we recommend mesh reinforcement as a minimum be included in the design of the floor slab. Temperature and shrinkage reinforcements in slabs on ground should be positioned in the upper third of the slab thickness. The Wire Reinforcement Institute recommends the mesh

reinforcement be placed 2 inches below the slab surface or upper one-third of slab thickness, whichever is closer to the surface. Adequate construction joints, contraction joints and isolation joints should also be provided in the slab to reduce the impacts of cracking and shrinkage. Please refer to ACI 302.1R96 *Guide for Concrete Floor and Slab Construction* for additional information regarding concrete slab joint design.

Pavements

For the design and construction of exterior pavements, we recommend that topsoil/buried topsoil, vegetation, old pavement, and otherwise unsuitable soils be removed before construction of new pavements as discussed in the subgrade preparation and engineered fill section.

In the pavement areas where no buried topsoil was encountered, one of the following subgrade preparation options can be selected based on the level of risk that can be accepted by the owner, **but the topsoil/buried topsoil should be removed and replaced**. (1) The existing fill material may remain in place below the pavement provided that the exposed subgrade of existing fill passes a proofroll and the owner is willing to accept some risk of pavement deterioration and long term maintenance issues. (2) The existing fill material within 2 feet below the bottom of the pavement section can be removed and replaced with engineered fill provided that the exposed subgrade passes a proofroll and the owner is willing to accept slight risk of pavement deterioration and long term maintenance issues. (3) The existing fill should be entirely removed from pavement areas and replaced with engineered fill to construct a stable subgrade.

We anticipate the new pavement will be of asphaltic concrete or Portland cement concrete. We expect that the proposed parking lot will generally be utilized for light duty traffic, and the driveways and loading and unloading areas be utilized for light to medium duty traffic. Heavy traffic loads would be anticipated for areas near any dumpsters where garbage trucks would often cross. We recommend the pavement subjected to light duty traffic be underlain by a minimum of 8 inches of base course granular material, similar to Illinois Department of Transportation (IDOT) gradation CA-6 and 12 inches of granular base for pavements subject to medium to heavy duty traffic.

For the anticipated light duty requirements for the parking lot, we recommend a minimum pavement section consisting of 1½ inches of wearing course (surface course) and 2 inches of leveling course (binder course) over at least 8 inches of granular base course. For drive and turnaround areas anticipated to be subjected to frequent medium or occasional medium to heavy duty traffic, we recommend consideration be given to a minimum pavement section consisting of 1½ inches of wearing course (surface course) and 3 inches of leveling course (binder course) over 12 inches of granular base course. The granular base course should be compacted to at least 95 percent of the maximum dry density obtained in accordance with ASTM Specification D 1557 Modified Proctor Method. During asphalt pavement construction, the wearing and leveling course should be compacted to a minimum of 93 percent of the theoretical density value. Prior to

placing the granular material, the pavement subgrade soil should be properly compacted, proofrolled, and free of standing water, mud, and frozen soil.

Alternately, 6 inches and 5 inches of Portland Cement Concrete pavement over 12 inches and 8 inches of IDOT CA-6 granular base course could be used for design of medium to heavy and light duty pavements, respectively.

General Construction Considerations

Prior to construction, we recommend all utilities in the proposed construction areas be positively identified and marked. Those utilities that can be relocated should be relocated to the extent practical and backfilled with compacted/densified engineered fill. **Abandoned utilities should be removed or grouted full with lean concrete. Active utilities to remain in the construction areas should be exposed and protected during construction to reduce the potential for damage or interruption of service.**

We recommend that the subgrade preparation, installation of the foundations, and construction of slabs-on-grade be monitored by an ECS geotechnical engineer or his representative. We recommend that excavations of new foundations be monitored on a full-time basis by an ECS geotechnical engineer or his representative to verify that the soil bearing pressure and the exposed subgrade materials will be suitable for the proposed building and are consistent with the boring log information obtained during this geotechnical exploration. We would be pleased to provide these services.

As the buried topsoil was encountered in 6 locations it may be prevalent in other areas. We recommend that test pits be excavated on the site prior to construction to determine the extent of buried topsoil.

If loose/unsuitable soils are encountered during the construction, the footings should be extended until suitable bearing soils are encountered or the unsuitable soils should be removed beneath the base of the footing and replaced with compacted engineered fill or lean concrete.

All loose or soft soils in the subgrade or foundation excavation areas should be densified or removed before placing any concrete or fill. Accumulated water or runoff water at the base of the foundation excavations should also be promptly removed. Groundwater seepage is anticipated not to be a major factor during foundation excavations or undercutting. If encountered, we believe sump and pump system should be adequate to remove accumulated seepage from the bottom of excavations prior to placement of concrete or crushed stone. Concrete should not be placed in water. To reduce the potential for frost heave related problems; forms should be used prior to the placement of foundation concrete.

Exposure to the environment may weaken the soils at the foundations bearing level if the excavations remain open for too long a time. Therefore, foundation concrete should be placed

the same day that excavations are opened, when possible. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the immediately prior to placement of concrete.

We recommend adequate surface and subsurface drainage be considered in the design and construction of floor slabs and pavements. Where standing water develops, either on slab or pavement surfaces or within the base course layer, softening of the subgrade and other problems related to the deterioration of the floor slabs and pavements can be expected. Adequate drainage should reduce the possibility of the subgrade materials becoming saturated over a long period of time. To reduce water infiltration to the pavement section and within the base course layer resulting in softening of the subgrade and deterioration of the slabs and pavements, we recommend the timely repair or sealing of joints and cracks in slabs and pavement.

All unsuitable materials should be removed and replaced with environmentally clean, inorganic fill and free of debris or harmful matter. Unsuitable materials removed from the project site should be disposed of in accordance with all applicable federal, state, and local regulations.

The contractor should avoid stockpiling excavated materials immediately adjacent to the excavation walls. We recommend that stockpile materials be kept back from the excavation a minimum distance equal to the excavation depth to avoid surcharging the excavation walls. If this is impractical due to space constraints, the excavation walls should be retained with bracing designed for the anticipated surcharge loading.

Excavations should comply with the requirements of OSHA 29CFR, Part 1926, Subpart P, "Excavations" and its appendices, as well as other applicable codes. This document states that the contractor is solely responsible for the design and construction of stable, temporary excavations. The excavations should not only be in accordance with current OSHA excavation and trench safety standards but also with applicable local, state, and federal regulations. The contractor should shore, slope or bench the excavation sides when appropriate. Site safety is the sole responsibility of the contractor, who shall also be responsible for the means, methods and sequencing of construction operations.

Closing

We recommend that the construction activities be monitored by ECS Illinois, LLC to provide the necessary overview and to check the suitability of the subgrade soils for supporting the foundations. Once final loads become available, ECS should be contacted to review the recommendations presented herein.

This report has been prepared in order to aid in the evaluation of this property and to assist the architect and/or engineer in the design of this project. The scope is limited to the specific project and locations described herein and our description of the project represents our understanding of the significant aspects relative to soil and foundation characteristics. In the event that any change

in the nature or location of the proposed construction outlined in this report are planned, we should be informed so that the changes can be reviewed and the conclusions of this report modified or approved in writing by the geotechnical engineer. It is recommended that all construction operations dealing with earthwork and foundations be reviewed by an experienced geotechnical engineer to provide information on which to base a decision as to whether the design requirements are fulfilled in the actual construction. If you wish, we would welcome the opportunity to provide field construction services for you during construction.

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings and tests performed at the locations as indicated on the Boring Location Plan and other information referenced in this report. This report does not reflect any variations, which may occur between the borings. In the performance of the subsurface exploration, specific information is obtained at specific locations at specific times. However, it is a well known fact that variations in soil conditions exist on most sites between boring locations and also such situations as groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear evident, after performing on-site observations during the construction period and noting characteristics and variations, a reevaluation of the recommendations for this report will be necessary.

APPENDIX

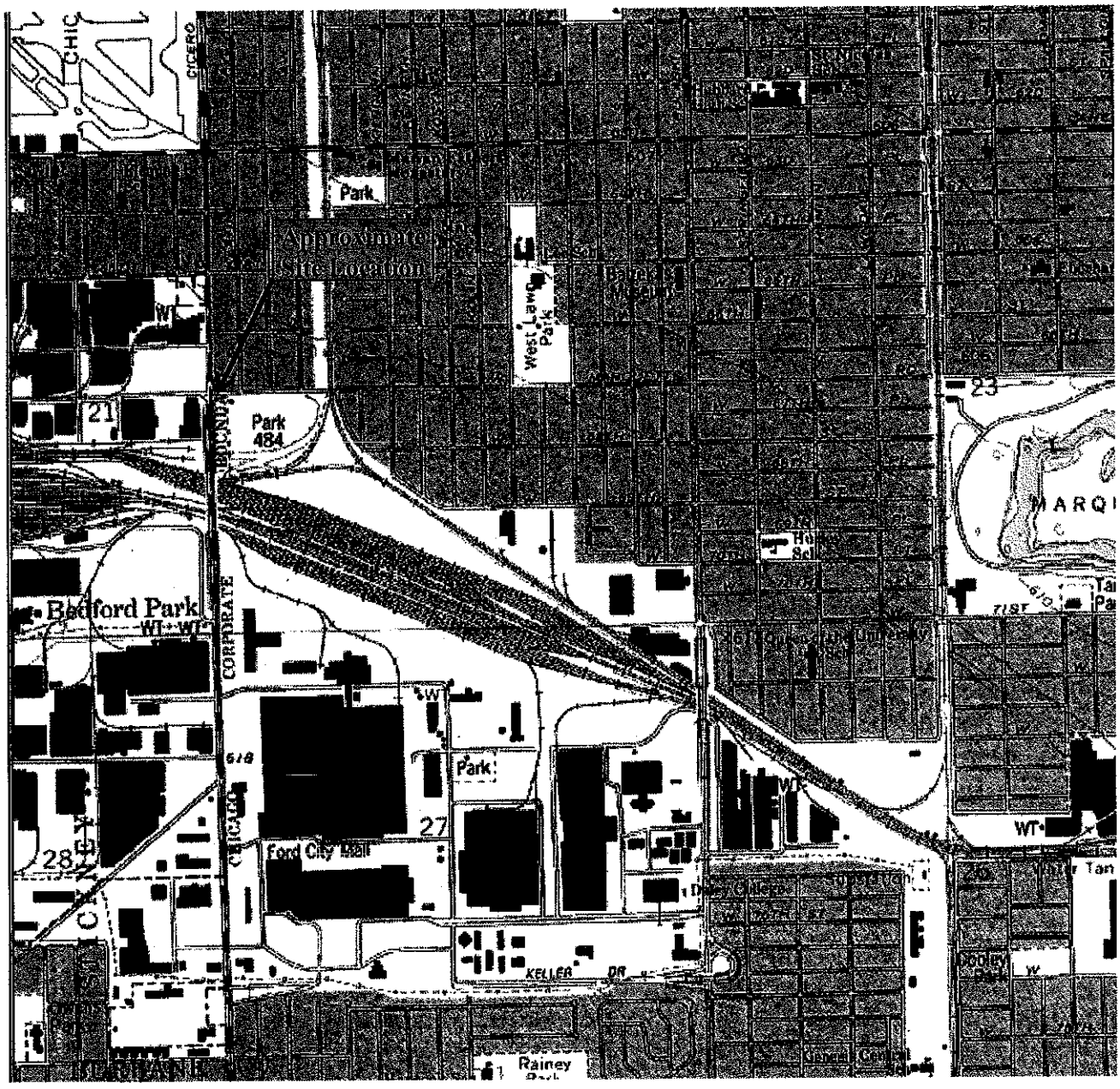
General Location Map

Boring Location Plan

Boring Logs

Unified Soil Classification System

Reference Notes For Boring Logs

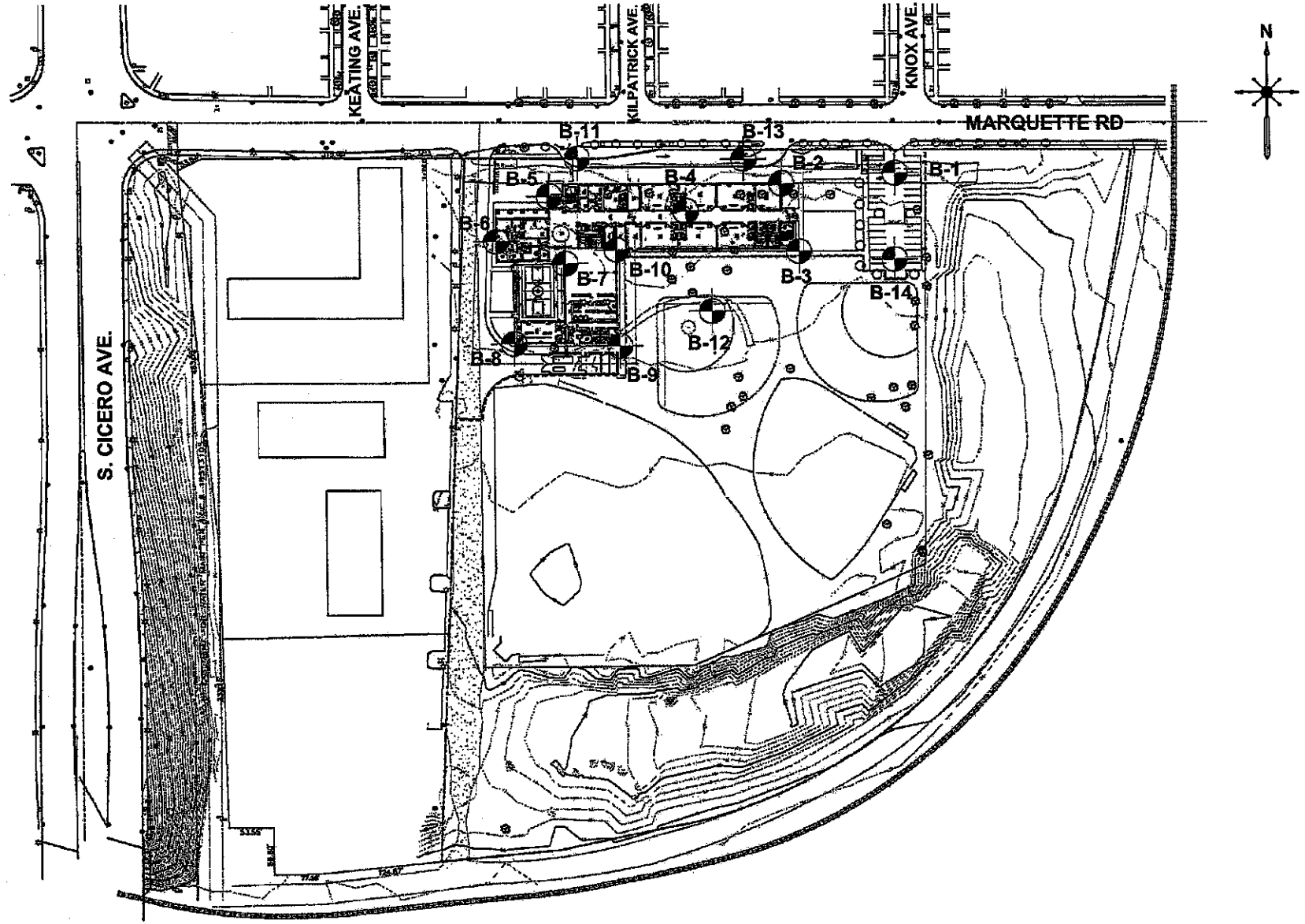


ECS LLC ILLINOIS

GENERAL LOCATION PLAN
USGS Topographic Map

N

ECS PROJECT NO. 16:7129
LEE Pasteur/Hurley Area
Elementary School
67th Street and Cicero Avenue
Chicago, Illinois



◆ APPROX. SOIL BORING LOCATION

ECS LLC ILLINOIS

BORING LOCATION PLAN

LEE Pasteur/Hurley Area Elementary School

Legat Architects

ENGINEER TKN	SCALE NTS
DRAFTING LGM	PROJECT NO. 7126
REVISIONS	SHEET FIGURE 2
	DATE 5/05/08

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-1	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur/Hurley Area Elementary School

ARCHITECT-ENGINEER:

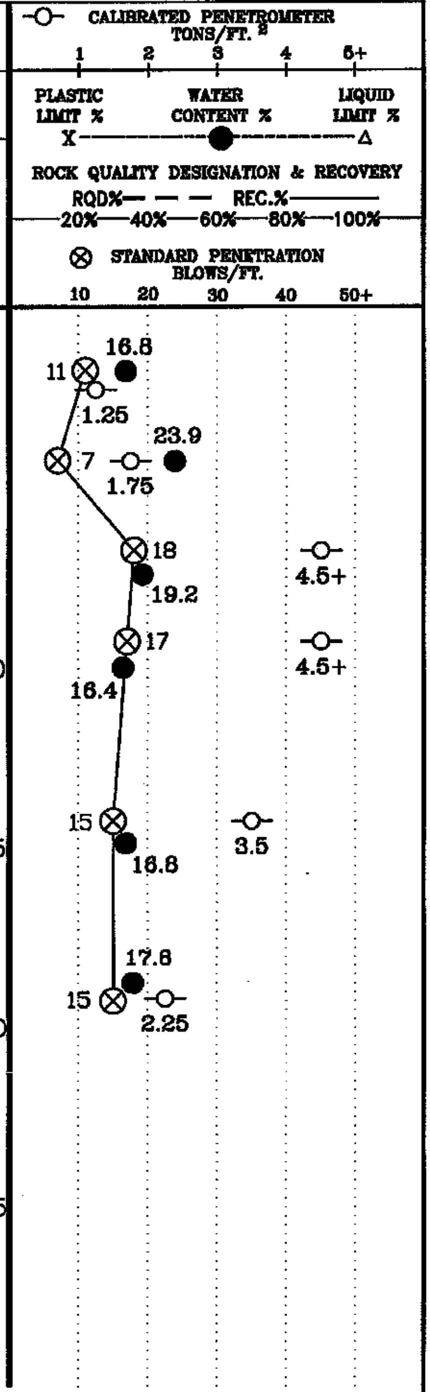
SITE LOCATION: Cicero & Marquette, Chicago, IL

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION: 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
0					Crushed Stone Depth 4"	
	1	SS	18	18	Recycled Asphalt 2"	
	2	SS	18	18	Silty CLAY, Trace Sand, Gravel, and Cinders, Dark Gray and Black, Stiff, (CL-FILL)	
5					Buried TOPSOIL, Black, (OL)	-5
	3	SS	18	18	Silty CLAY, Trace Sand and Gravel, Brown and Gray, Stiff to Hard, (CL)	
	4	SS	18	18		
10					Silty CLAY, Trace Sand and Gravel, Gray, Very Stiff to Hard, (CL)	-10
	5	SS	18	18		
15						-15
	6	SS	18	18		
20					END OF BORING @ 20'	-20
25						-25
30						



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL.

WL Dry — WS OR WD	BORING STARTED 5/20/08	
WL(BCR) — WL(ACR) Dry	BORING COMPLETED 5/20/08	CAVE IN DEPTH
WL	RIG — FOREMAN i.e.x.	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-2	1 OF 1
PROJECT NAME	ARCHITECT-ENGINEER		
LEE Pasteur/Hurley Area Elementary School			

ECS LLC ILLINOIS

SITE LOCATION
Cicero & Marquette, Chicago, IL

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)
PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ
ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% (20%, 40%, 60%, 80%, 100%)
STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING ▶ — LOSS OF CIRCULATION 100%
SURFACE ELEVATION 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.	WATER CONTENT %	CALIBRATED PENETROMETER TONS/FT.^{2}
0					Crushed Stone Depth 3"					
	1	SS	18	18	Recycled Asphalt 2"			8	18.0	1.25
					Silty CLAY, Trace Sand, Gravel and Cinders, Dark Gray and Black, Stiff, (CL-FILL)					
5	2	SS	18	18			-5	8	28.1	1.5
					Buried TOPSOIL, Black, (OL)					
	3	SS	18	18	Silty CLAY, Trace Sand and Gravel, Brown and Gray, Stiff to Very Stiff, (CL)			11	21.3	3.5
	4	SS	18	18			-10	17	16.7	4.5+
10					Silty CLAY, Trace Sand and Gravel, Gray, Very Stiff to Hard, (CL)					
	5	SS	18	18			-15	14	16.3	3.5
15										
	6	SS	18	18			-20	14	16.7	3.5
20					END OF BORING @ 20'					
25							-25			
30										

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL Dry	WS OR ⓓ	BORING STARTED 5/20/08	
▽WL(BCR)	▽WL(ACR) Dry	BORING COMPLETED 5/20/08	CAVE IN DEPTH ●
▽WL		RIG FOREMAN j.e.x.	DRILLING METHOD HSA

(05-28-08) (05-28-08) (05-28-08)

bgw(05/27/2008)

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-3	1 OF 1
PROJECT NAME	ARCHITECT-ENGINEER		
LEE Pasteur/Hurley Area Elementary School			
SITE LOCATION			
Cicero & Marquette, Chicago, IL			

ECS LLC ILLINOIS

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)

PLASTIC LIMIT % (X) — WATER CONTENT % (●) — LIQUID LIMIT % (Δ)

ROCK QUALITY DESIGNATION & RECOVERY
RQD% — — — REC.%
20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. (⊗) (10, 20, 30, 40, 50+)

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING ▶ — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.	CALIBRATED PENETROMETER TONS/FT.^{2}	WATER CONTENT %	PLASTIC LIMIT %	LIQUID LIMIT %
0					Topsoil Depth 9"						
	1	SS	18	18	Silty CLAY, Trace Sand and Gravel, Dark Gray, Stiff, (CL-FILL)		9	1.0	25.5		
	2	SS	18	18	Silty CLAY, Trace Sand and Gravel, Brown and Gray, Stiff to Hard, (CL)	-5	7	1.5	23.9		
	3	SS	18	18			16	4.5	18.8		
	4	SS	18	18	Silty CLAY, Trace Sand and Gravel, Gray, Very Stiff to Hard, (CL)	-10	14	4.5+	16.5		
	5	SS	18	18		-15	12	3.75	16.2		
	6	SS	18	18		-20	13	4.25	16.5		
					END OF BORING @ 20'						

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL Dry WS OR WD	BORING STARTED 5/20/08	
▽WL(BCR) ▽WL(ACR) Dry	BORING COMPLETED 5/20/08	CAVE IN DEPTH ●
▽WL	RIG FOREMAN j.e.x.	DRILLING METHOD HSA

(05-23-08) (05-23-08) (05-23-08) (05-23-08)

bspk(05/22/2008)

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-4	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur/Hurley Area Elementary School

ARCHITECT-ENGINEER:

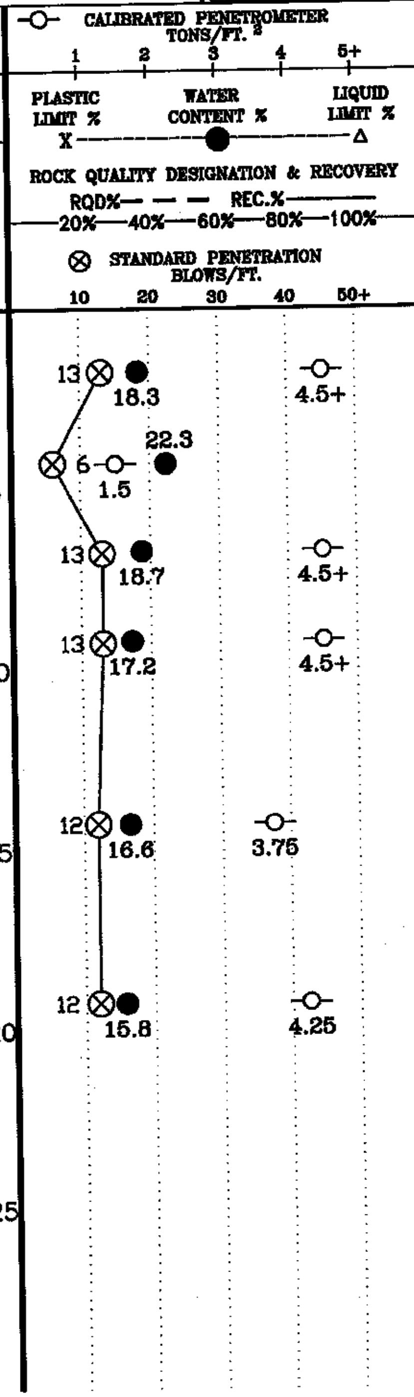
SITE LOCATION: Cicero & Marquette, Chicago, IL

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
0					Topsoil Depth 9"	
	1	SS	18	18	Silty CLAY, Trace Sand and Gravel, Dark Brown and Black, Hard, (CL-FILL)	
	2	SS	18	18	Silty CLAY, Trace Sand and Gravel, Brown and Gray, Stiff to Hard, (CL)	-5
5						
	3	SS	18	18		
	4	SS	18	18	Silty CLAY, Trace Sand, Gravel, Gray, Very Stiff to Hard, (CL)	
10						-10
	5	SS	18	18		
15						-15
	6	SS	18	18		
20					END OF BORING @ 20'	-20
25						-25
30						



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL Dry WS OR WD	BORING STARTED 5/20/08	
▽WL(BCR) ▽WL(ACR) Dry	BORING COMPLETED 5/20/08	CAVE IN DEPTH @
▽WL	RIG FOREMAN l.e.x.	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-5	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur/Hurley Area Elementary School

ARCHITECT-ENGINEER:

SITE LOCATION: Cicero & Marquette, Chicago, IL

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 0

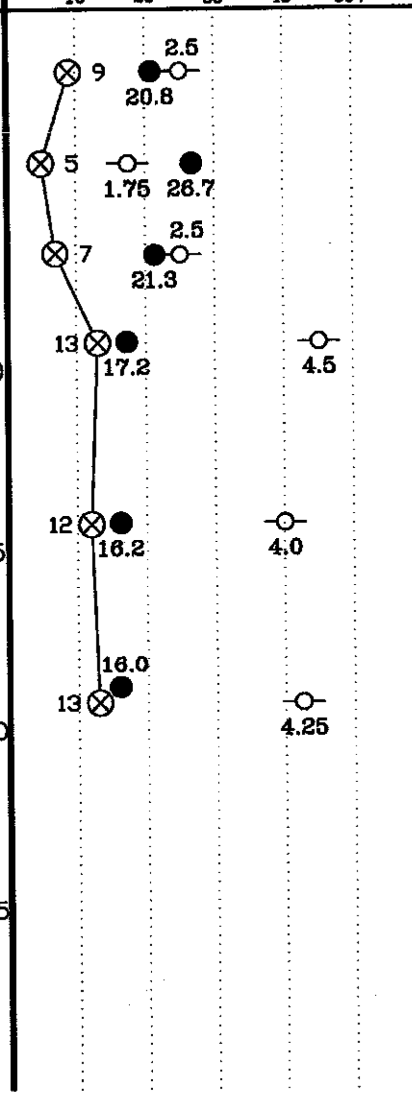
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
0					Crushed Gravel 8"	
	1	SS	18	18	Silty CLAY, Trace Sand and Gravel, Dark Gray and Black, Very Stiff, (CL-FILL)	
5	2	SS	18	18	Silty CLAY, Trace Sand and Gravel, Brown and Gray, Stiff to Very Stiff, (CL)	-5
	3	SS	18	18		
10	4	SS	18	18	Silty CLAY, Trace Sand and Gravel, Gray, Hard, (CL)	-10
15	5	SS	18	18		-15
20	6	SS	18	18		-20
					END OF BORING @ 20'	
25						-25
30						

-O- CALIBRATED PENETROMETER TONS/FT.² 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% —— 20% 40% 60% 80% 100%

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL Dry	WS OR BD	BORING STARTED	5/20/08	
WL(BCR)	WL(ACR) Dry	BORING COMPLETED	5/20/08	CAVE IN DEPTH ●
WL		RIG	FOREMAN i.e.x.	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-6	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur/Hurley Area Elementary School

ARCHITECT-ENGINEER:

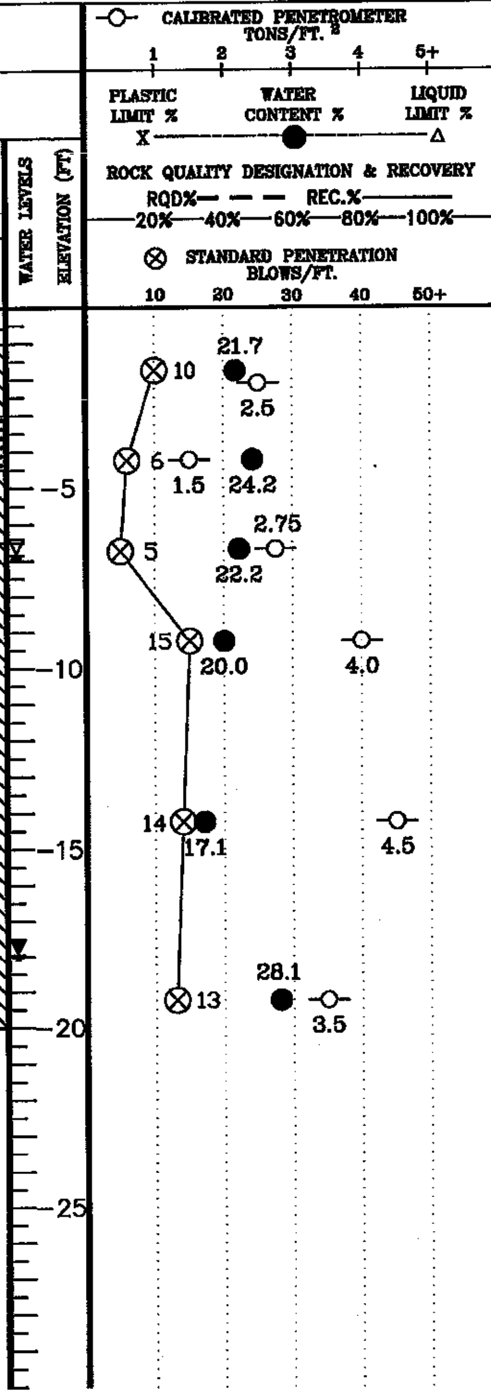
SITE LOCATION: Cicero & Marquette, Chicago, IL

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION: 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL
0					Crushed Limestone Depth 7"
	1	SS	18	18	Recycled Asphalt 5"
	2	SS	18	18	Silty CLAY, Trace Sand, Gravel, Cinders, Brick, Dark Gray and Black, Very Stiff, (CL-FILL)
5					Buried Topsoil, Black, (OL)
	3	SS	18	18	Silty CLAY, Trace Sand and Gravel, Brown and Gray, Very Stiff to Hard, (CL)
	4	SS	18	18	
10					Silty CLAY, Trace Sand and Gravel, Gray, Very Stiff to Hard, (CL)
15	5	SS	18	18	
	6	SS	18	18	
20					END OF BORING @ 20'



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL 6.8' WS OR (D)	BORING STARTED 5/20/08	
▼WL(BCR) ▼WL(ACR) 17.9'	BORING COMPLETED 5/20/08	CAVE IN DEPTH @
▽WL	RIG FOREMAN i.e.x.	DRILLING METHOD HSA

(05-28-08) (05-28-08) (05-28-08)

topo(05/27/2008)

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-7	1 OF 1
PROJECT NAME	ARCHITECT-ENGINEER		
LEE Pasteur/Hurley Area Elementary School			

SITE LOCATION: Cicero & Marquette, Chicago, IL

ECS LLC ILLINOIS

CALIBRATED PENETROMETER TONS/FT.² — 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% — 20% 40% 60% 80% 100%

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING ▶ — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL
0					Crushed Gravel Depth 7"
	1	SS	18	18	Silty CLAY, With Cinders and Gravel, Dark Brown and Black, (FILL)
	2	SS	18	18	Silty CLAY, Trace Sand and Gravel, Yellowish Brown and Gray to Brown and Gray, Soft to Hard, (CL)
5	3	SS	18	18	
	4	SS	18	18	
10					Silty CLAY, Trace Sand and Gravel, Gray, Very Stiff, (CL)
	5	SS	18	18	
15					
	6	SS	18	18	
20					END OF BORING @ 20'
25					
30					

WATER LEVELS ELEVATION (FT): -5, -10, -15, -20, -25

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL			
▽WL 17' WS OR ⓓ	BORING STARTED 5/20/08		
▽WL(BCR) ▽WL(ACR) 16.9'	BORING COMPLETED 5/20/08	CAVE IN DEPTH ● 18.5'	
▽WL	RIG FOREMAN i.e.x.	DRILLING METHOD HSA	

(05-29-08) (05-29-08) (05-29-08)

logs(05/22/2008)

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-8	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur/Hurley Area Elementary School

ARCHITECT-ENGINEER:

SITE LOCATION: Cicero & Marquette, Chicago, IL

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION (100%)

SURFACE ELEVATION: 0

-O- CALIBRATED PENETROMETER TONS/FT.² (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% —— (20% — 40% — 60% — 80% — 100%)

⊗ STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

Sample No.	Sample Type	Sample Dist. (in)	Recovery (in)	Standard Penetration (blows/ft)	Water Content %	Calibrated Penetrometer (tons/ft²)
1	SS	18	18	12	16.4	4.5
2	SS	18	18	9	24.1	2.5
3	SS	18	18	7	24.2	2.0
4	SS	18	18	14	18.9	4.5+
5	SS	18	18	16	18.2	3.5
6	SS	18	18	21	14.6	4.5+

Description of material (from top, depth 0 ft / elevation 0):

- Crushed Concrete Depth 11"
- Silty CLAY, With Cinders and Gravel, Brown and Black, (FILL)
- Buried TOPSOIL, Black and Some Gray, (OL)
- Silty CLAY, Trace Sand and Gravel, Dark Gray, Very Stiff, (CL)
- Silty CLAY, Trace Sand and Gravel, Yellowish Brown and Gray to Brown, Gray, Very Stiff to Hard, (CL)
- Silty CLAY, Trace Sand and Gravel, Gray, Very Stiff to Hard, (CL)

END OF BORING @ 20'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 17.5' WS OR (WD)	BORING STARTED 5/14/08	
WL(BCR) WL(ACR) 18.5'	BORING COMPLETED 5/14/08	CAVE IN DEPTH ●
WL	RIG FOREMAN i.e.x.	DRILLING METHOD HSA

(05-28-08) (05-28-08) (05-28-08)

tngo(05/27/2008)

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-9	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur/Hurley Area Elementary School

ARCHITECT-ENGINEER:

SITE LOCATION: Cicero & Marquette, Chicago, IL

-O- CALIBRATED PENETROMETER TONS/FT.^{2}: 1, 2, 3, 4, 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

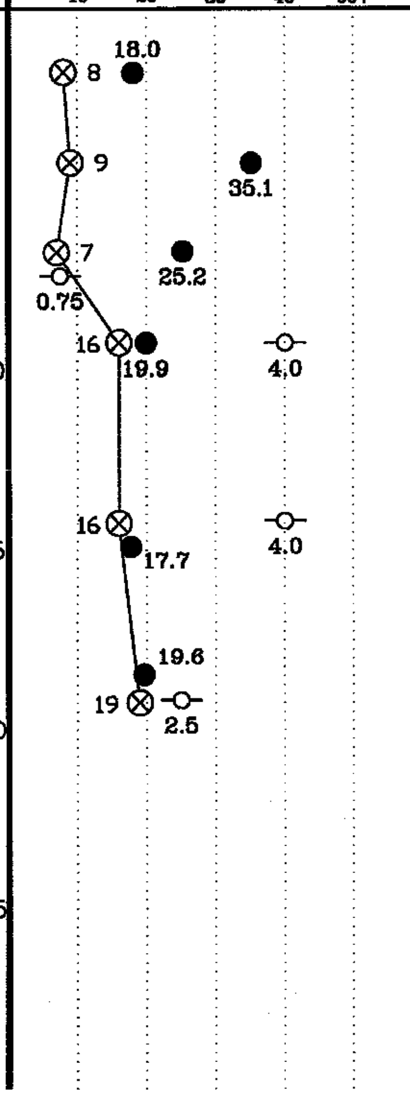
⊗ STANDARD PENETRATION BLOWS/FT.: 10, 20, 30, 40, 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING ▶ LOSS OF CIRCULATION [100%]

SURFACE ELEVATION: 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
0	1	SS	18	18	Silty CLAY to Clayey SAND, Trace Sand, Gravel, Brick and Cinders, Brown and Black, (FILL)	
5	2	SS	18	18	Buried Topsoil, Black, (OL)	-5
	3	SS	18	18	Silty CLAY, Trace Sand and Gravel, Yellowish Brown and Gray to Brown and Gray, Firm to Hard, (CL)	
10	4	SS	18	18		-10
15	5	SS	18	18	Silty CLAY, Trace Sand and Gravel, Gray, Very Stiff to Hard, (CL)	-15
20	6	SS	18	18		-20
25					END OF BORING @ 20'	-25
30						



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL 3' WS OR (WD)	BORING STARTED 5/14/08		
▼WL(BCR) ▼WL(ACR) 10.3'	BORING COMPLETED 5/14/08	CAVE IN DEPTH @ 18.2'	
▽WL	RIG FOREMAN i.e.x.	DRILLING METHOD HSA	

CLIENT: Legat Architects

JOB #: 7126 | **BORING #:** B-10 | **SHEET:** 1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur/Hurley Area Elementary School

ARCHITECT-ENGINEER:

SITE LOCATION: Cicero & Marquette, Chicago, IL

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION: 0

Legend: -O- CALIBRATED PENETROMETER TONS/FT.² (1, 2, 3, 4, 5+); PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ; ROCK QUALITY DESIGNATION & RECOVERY: RQD% — REC.% (20%, 40%, 60%, 80%, 100%); ⊗ STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

Depth (ft)	Sample No.	Sample Type	Sample Dist. (in)	Recovery (in)	Description of Material	Standard Penetration (blows/ft)	Water Content %	Calibrated Penetrometer (tons/ft²)
0–1					Topsoil Depth 12"			
1–4	1	SS	18	18	Silty CLAY, Trace Sand, Gravel and Cinders, Brown, Very Stiff, (CL-FILL)	7	18.4	3.25
4–9	2	SS	18	18	Silty CLAY, Trace Sand and Gravel, Yellowish Brown and Gray to Brown and Gray, Stiff to Hard, (CL)	7	23.4	1.5
	3	SS	18	18		8	20.4	4.25
9–20	4	SS	18	18	Silty CLAY, Trace Sand and Gravel, Gray, Very Stiff to Hard, (CL)	19	17.5	4.5
	5	SS	18	18		16	15.2	4.5+
	6	SS	18	18		17	16.6	2.75

END OF BORING @ 20'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 16.5' WS OR BD	BORING STARTED 5/14/08	
WL(BCR) WL(ACR) 18.2'	BORING COMPLETED 5/14/08	CAVE IN DEPTH
WL	RIG FOREMAN i.e.x.	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-11	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur/Hurley Area Elementary School

ARCHITECT-ENGINEER:

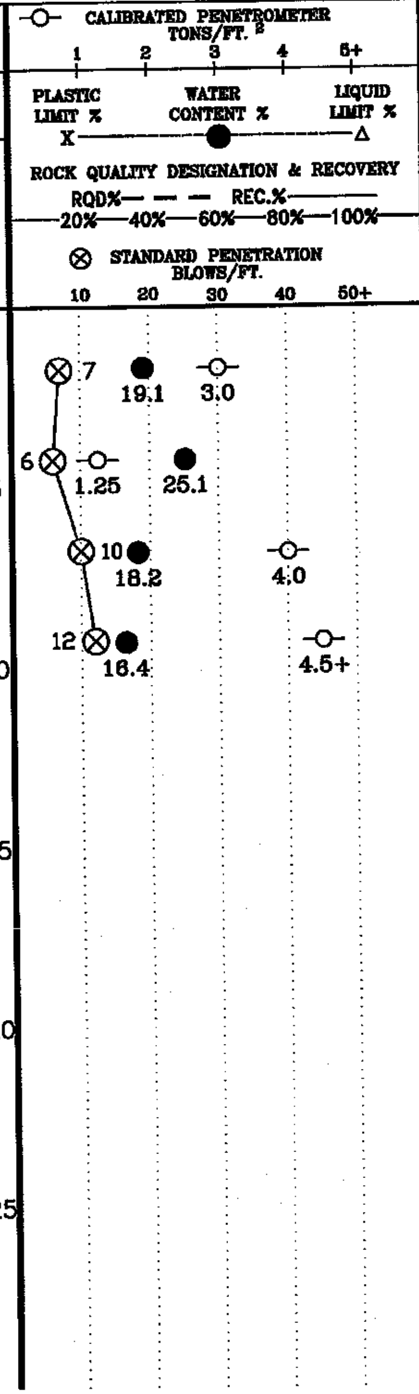
SITE LOCATION: Cicero & Marquette, Chicago, IL

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	SPT BLOWS/FT.	WATER CONTENT %	CALIBRATED PENETROMETER TONS/FT.²
0					Gravel Depth 4"	0			
	1	SS	18	18	Silty CLAY, With Cinders and Sand, Black to Brown, Very Stiff, (CL-FILL)		7	19.1	3.0
	2	SS	18	18	Silty CLAY, Trace Sand and Gravel, Brown and Gray, Stiff to Hard, (CL)	-5	6	25.1	1.25
	3	SS	18	18			10	18.2	4.0
	4	SS	18	18	Silty CLAY, Trace Sand and Gravel, Gray, Hard, (CL)		12	16.4	4.5+
10					END OF BORING @ 10'	-10			



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 3.5' WS OR WD	BORING STARTED 5/14/08	
WL(BCR) WL(ACR) 8.5'	BORING COMPLETED 5/14/08	CAVE IN DEPTH ●
WL	RIG FOREMAN i.e.x.	DRILLING METHOD HSA

(05-28-08) (05-28-08) (05-28-08) (05-28-08) (05-28-08)

topo(05/27/2008)

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-12	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur/Hurley Area Elementary School

ARCHITECT-ENGINEER:

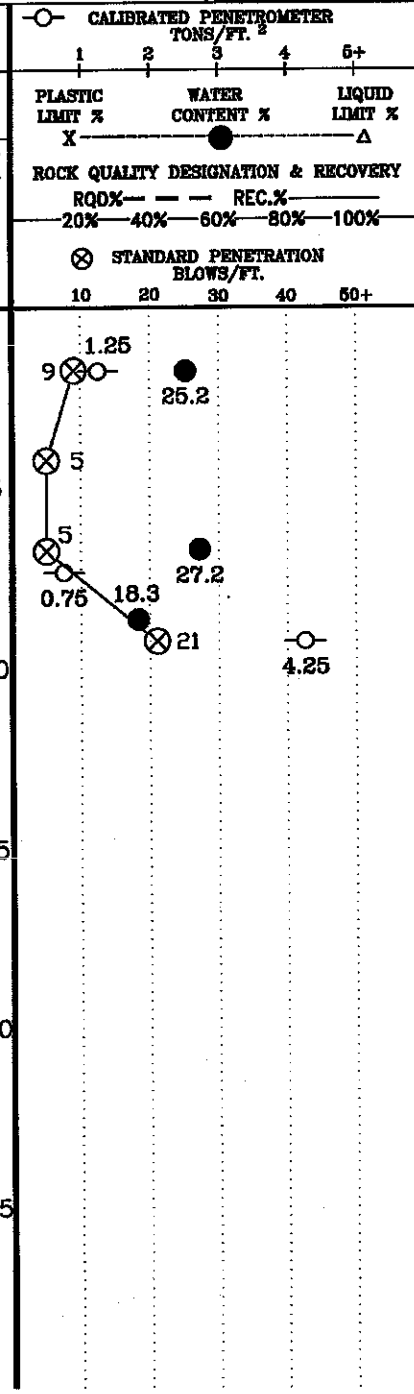
SITE LOCATION: Cicero & Marquette, Chicago, IL

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION [100%]

SURFACE ELEVATION: 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
0					Topsoil Depth 8"	0
	1	SS	18	18	Silty CLAY, With Gravel, Brick and Cinders, Brown and Black, (FILL)	
5	2	SS	18	18	Silty SAND, Trace Gravel, Black, Wet, Loose, (SM-FILL)	-5
	3	SS	18	18	Silty CLAY, Trace Sand and Gravel, Yellowish Brown and Gray to Brown and Gray, Firm to Hard, (CL)	
10	4	SS	18	18		-10
					END OF BORING @ 10'	
15						-15
20						-20
25						-25
30						



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 3'	WS OR (BD)	BORING STARTED 5/14/08	
WL(BCR)	WL(ACR) 1.4'	BORING COMPLETED 5/14/08	CAVE IN DEPTH ● 7.2'
WL		RIG FOREMAN i.e.x.	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-13	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur/Hurley Area Elementary School

ARCHITECT-ENGINEER:

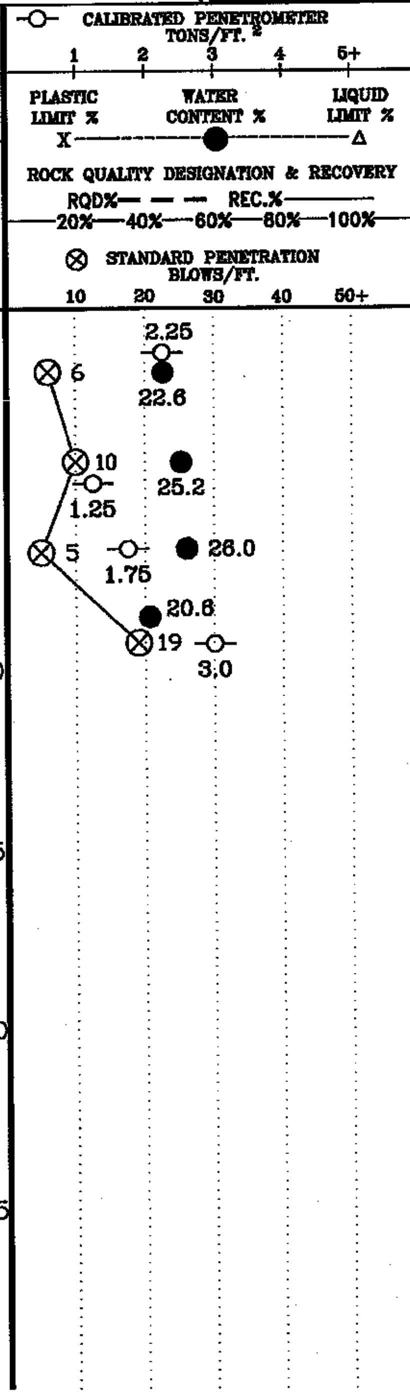
SITE LOCATION: Cicero & Marquette, Chicago, IL

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)
0					Gravel Depth 5"		
	1	SS	18	18	Recycled Asphalt 5"		
					Silty CLAY, Trace Sand, Gravel, Brick and Cinders, (FILL)		
5	2	SS	18	18			-5
					Silty CLAY, With Topsoil, Trace Sand and Gravel, Dark Gray, Stiff, (CL-FILL)		
	3	SS	18	18			
					Silty CLAY, Trace Sand and Gravel, Brown and Gray, Stiff to Very Stiff, (CL)	▼	
	4	SS	18	18			
10					END OF BORING @ 10'		-10
15							-15
20							-20
25							-25
30							



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 8' WS OR BD	BORING STARTED 5/14/08		
WL(BCR) WL(ACR) 8.4'	BORING COMPLETED 5/14/08	CAVE IN DEPTH ●	
WL	RIG FOREMAN i.e.x.	DRILLING METHOD HSA	

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126	B-14	1 OF 1
PROJECT NAME	**ARCHITECT-ENGINEER**		
LEE Pasteur/Hurley Area Elementary School			

ECS LLC ILLINOIS

SITE LOCATION
Cicero & Marquette, Chicago, IL

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY
RQD% — — — REC.% ——
20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. ⊗
10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING ▶ — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 0

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT. ⊗	CALIBRATED PENETROMETER TONS/FT.^{2} ●	ROCK QUALITY DESIGNATION & RECOVERY RQD% ○ REC.% ○
0					Topsoil Depth 8"				
	1	SS	18	18	Silty CLAY and SAND, With Brick, Trace Wood and Roots, Black, (FILL)		5	19.1	
	2	SS	18	18	Silty CLAY, Trace Sand and Gravel, Brown and Gray, Stiff, (CL-FILL)	-5	12	23.4	4.25
5	3	SS	18	18	Buried TOPSOIL, Black, (OL)		6	26.2	1.0
	4	SS	18	18	Silty CLAY, Trace Sand and Gravel, Dark Gray, Stiff, (CL)		15	19.0	4.5+
10					Silty CLAY, Trace Sand and Gravel, Brown and Gray, Stiff to Hard, (CL)	-10			
					END OF BORING @ 10'				
15						-15			
20						-20			
25						-25			
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL.

▽WL Dry	WS OR ▽	BORING STARTED 5/14/08	
▽WL(BCR)	▽WL(ACR) Dry	BORING COMPLETED 5/14/08	CAVE IN DEPTH ●
▽WL		RIG FOREMAN j.e.x.	DRILLING METHOD HSA

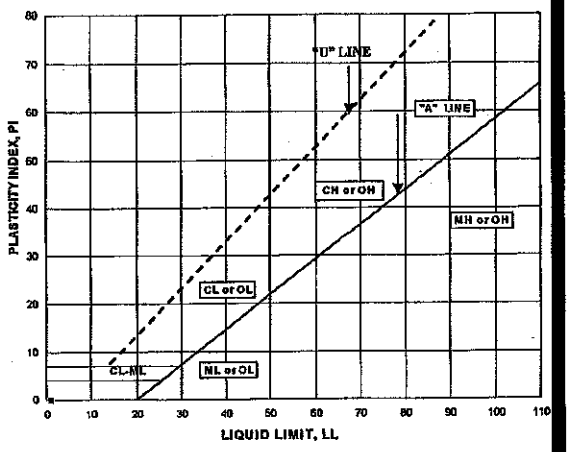
(05-29-08) (05-29-08) (05-29-08)

tmpl(05/12/2008)

Unified Soil Classification System
(ASTM Designation D-2487)

Major Division		Group Symbol	Typical Names	Classification on basis of percentage of fines	Classification Criteria
Coarse-grained soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Less than 5% Pass No. 200 sieve: GW, GP, SW, SP	$C_u = D_{60}/D_{10}$ Greater than 4 $C_z = (D_{30})^2/(D_{10}xD_{60})$ Between 1 and 3
		GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW
		GM	Silty gravels, gravel-sand-silt mixtures	More than 12% Pass No. 200 sieve: GM, GC, SM, SC	Atterberg limits plot below "A" line or plasticity index less than 4
		GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits plot above "A" line and plasticity index greater than 7
	Sands: More than 50% of coarse fraction passes No. 4 sieve	SW	Well-graded sands and gravelly sands, little or no fines	5% to 12% Pass No. 200 sieve: Borderline classification requiring use of dual symbol	$C_u = D_{60}/D_{10}$ Greater than 6 $C_z = (D_{30})^2/(D_{10}xD_{60})$ Between 1 and 3
		SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW
		SM	Silty sands, sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4
		SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above "A" line and plasticity index greater than 7
Fine-grained soils: 50% or more passing No. 200 sieve	Silts and Clays: Liquid limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands		
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
		OL	Organic silts and organic silty clays of low plasticity		
	Silts and Clays: Liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts		
		CH	Inorganic clays of high plasticitiy, fat clays		
		OH	Organic clays of medium to high plasticity		
Highly organic soils		Pt	Peat, muck and other highly organic soils		Fibrous organic matter; will char, burn, or glow

Note: U-line represents approximate upper limit of LL and PI combinations for natural soils (empircally determined). ASTM-D2487.



Plasticity chart for the classification of fine-grained soils. Tests made on fraction finer than No. 40 sieve

Boderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder

ECS LLC ILLINOIS

UNIFIED SOIL CLASSIFICATION SYSTEM

REFERENCE NOTES FOR BORING LOGS

I. Drilling and Sampling Symbols:

SS – Split Spoon Sampler
ST – Shelby Tube Sampler
RC – Rock Core: NX, BX, AX
PM – Pressuremeter
DC – Dutch Cone Penetrometer

RB – Rock Bit Drilling
BS – Bulk Sample of Drilling
PA – Power Auger (no sample)
HSA – Hollow Stem Auger
WS – Wash Sample

Standard Penetration (Blows/Ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2 inch O.D. split spoon sampler, as specified in ASTM D-1586. The blow count is commonly referred to as the N-value.

II. Correlation of Penetration Resistances to Soil Properties:

Relative Density-Sands, Silts

SPT – N	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
50 – 80	Very Dense

Consistency of Cohesive Soils

Unconfined Compressive Strength, Qp, tsf	Consistency
under 0.25	Very Soft
0.25 – 0.49	Soft
0.50 – 0.99	Firm
1.00 – 1.99	Stiff
2.00 – 3.99	Very Stiff
4.00 – 8.00	Hard
over 8.00	Very Hard

III Unified Soil Classification Symbols:

GP – Poorly Graded Gravel
GW – Well Graded Gravel
GM – Silty Gravel
GC – Clayey Gravel
SP – Poorly Graded Sand
SW – Well Graded Sand
SM – Silty Sand
SC – Clayey Sand

ML – Low Plasticity Silt
MH – High Plasticity Silt
CL – Low Plasticity Clay
CH – High Plasticity Clay
OL – Low Plasticity Organic
OH – High Plasticity Organic
CL-ML – Dual Classification (Typical)

IV. Water Level Measurement Symbol:

WL – Water Level
WS – While Sampling
WD – While Drilling

BCR – Before Casing Removal
ACR – After Casing Removal
WCI – Wet Cave In
DCI – Dry Cave In

The water levels are those water levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clays and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

SUPPLEMENTAL REPORT OF

SUBSURFACE EXPLORATION AND ENGINEERING SERVICES

BASEBALL FIELD AND ADDITIONAL TESTING
LEE PASTEUR ELEMENTARY SCHOOL
67TH STREET AND CICERO AVENUE
CHICAGO, ILLINOIS

FOR

LEGAT ARCHITECTS

AUGUST 29, 2008

ECS ILLINOIS, LLC
Geotechnical • Construction Materials • Environmental

August 29, 2008

Mr. Tom Kikta
Legat Architects
651 West Washington
Chicago, Illinois 60661

ECS Job No. 16:7126-A

Reference: ***Supplemental Report of Subsurface Exploration and Engineering Services, Proposed Lee Pasteur Elementary School Baseball Field and Additional Testing, 67th Street and Cicero Avenue, Chicago, Illinois***

Dear Mr. Kikta:

ECS Illinois, LLC has completed the supplemental subsurface exploration and geotechnical engineering analyses for the proposed Lee Pasteur Elementary School Baseball Field and Additional Testing to be located at 67th Street and Cicero Avenue, in Chicago, Illinois. This report describes the subsurface exploration procedures, laboratory testing, and geotechnical recommendations for project construction. A Boring Location Plan is included in the Appendix of this report along with the Boring Logs performed for the exploration.

We appreciate this opportunity to be of service to Legat Architects during the design phase of this project. If you have any questions with regard to the information and recommendations presented in this report, or if we can be of further assistance to you in any way during the planning or construction of this project, please do not hesitate to contact us.

Respectfully,

ECS ILLINOIS, LLC

Lito Santos, E.I.T.
Assistant Project Engineer

Kiran Adhikary

Kiran Adhikary, P.E.
Manager, Geotechnical Services

KIRAN ADHIKARY
062-056547
LICENSED
PROFESSIONAL
ENGINEER
STATE OF ILLINOIS

Renews 11/30/09

3pc: Encl.

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REPORT

PROJECT

SUBSURFACE EXPLORATION AND ENGINEERING SERVICES

Baseball Field and Additional Testing
Lee Pasteur Elementary School
67th Street and Cicero Avenue
Chicago, Illinois

CLIENT

Mr. Tom Kikta
Legat Architects
651 West Washington
Chicago, Illinois 60661

SUBMITTED BY

ECS Illinois, LLC
1575 Barclay Boulevard
Buffalo Grove, Illinois 60089

Illinois Professional Design Firm
No. 184-004247

PROJECT #16:7126-A

DATE August 29, 2008

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ECS Project No. 16:7126-A
Lee Pasteur Elementary School Baseball Field and Additional Testing
Chicago, Illinois

EXECUTIVE SUMMARY

The subsurface conditions encountered during our exploration and ECS' conclusions and recommendations are summarized below. This summary should not be considered apart from the entire text of the report with all the qualifications and considerations mentioned herein. Details of our conclusions and recommendations are discussed in the following sections and in the Appendix of this report.

The project site is located at 67th Street and Cicero Avenue in Chicago, Illinois. A total of two (2) exploratory borings, B-101 through B-101, were performed for this project. The soil conditions encountered at the borings performed at the site are summarized as follows.

In boring, B-102, dark brown Sand and Gravel Fill (SP-GP-FILL) was encountered at the ground surface and extended to approximately 5½ feet below grade. At the ground surface in boring, B-101 and below the Sand and Gravel Fill in boring, B-102, dark brown Silty Clay Fill (CL-FILL) was encountered and extended to about 6½ to 8 feet below grade. Below the fill material in the borings, black Organic Clay (OL) was encountered and extended to a depth of approximately 8½ to 9 feet below current grade. The Organic Clay was underlain by apparently natural brown and gray to brownish gray Silty Clay (CL) to a depth of about 17 feet below grade followed by gray Silty Clay (CL) to the maximum explored depth of 20 feet below current grade.

Based on the information provided to ECS, the proposed project will consist of a new baseball field to be constructed on the eastern portion of the site, immediately west of the existing railroad tracks. The existing grade of the site varies from an elevation of 42 to an elevation of 43 feet. The design grade of the new baseball field is anticipated to be about 38 to 39 feet, approximately 4 to 5 feet below current grade. Therefore, the baseball field area will have a cut extended to a depth of about 4 to 5 feet.

As mentioned earlier, **black Organic Clay** was encountered in the borings below at depths between 6½ and 9 feet below current grade, which indicates that unsuitable **Organic Clays** will be located within 2 to 3 feet of the finished grade. The existing **Organic Clay** similar to that encountered in the borings and extended to an elevation of about 34 to 33½ feet, **and in other areas if encountered during construction should be completely removed from the baseball field areas and replaced with engineered fill**.

If permeable topsoil is considered to be used as the surface for the baseball field, we recommend a perimeter and underdrainage system. This system may consist of free draining granular material and drain tiles located under the topsoil and around the perimeter of the athletic area. The drain tiles should be surrounded by a minimum of 6 inches of free draining granular filter material. The underdrainage blanket and drain tiles should be connected to a storm sewer.

We recommend that the project geotechnical engineer or his representative should be on site to monitor stripping and site preparation operations and observe that unsuitable soils have been satisfactorily removed and to observe proofrolling.

Report Prepared By:

Lito Santos, E.I.T.
Assistant Project Engineer

Report Reviewed By:

Kiran Adhikary, P.E.
Manager, Geotechnical Services

PROJECT OVERVIEW

Introduction

This supplemental report presents the results of our subsurface exploration and engineering services for the proposed Lee Pasteur Elementary School Baseball Field in Chicago, Illinois. A General Location Plan included in the Appendix of this report, shows the approximate location of this project.

Project Description

Based on the information provided to ECS, the proposed project will consist of the construction of a new baseball field to be located on the eastern portion of the site, immediately west of the existing railroad tracks. The soil borings were located on an existing berm with an elevation of 42 to 43 feet. Based on the information provided to ECS, the area will be cut to a depth of about 5 feet to construct a baseball field. The final grade of the baseball field is anticipated to have an elevation of about 38 to 39 feet.

Scope of Work

The conclusions and recommendations contained in this report are based on the soil borings performed in the vicinity of the proposed baseball field and associated laboratory testing of selected soil samples. ECS has previously performed a subsurface exploration for this project and a geotechnical report dated May 28, 2008 (ECS Project No. 16:7126) was submitted.

A total of two (2) supplemental soil borings, B-101 through B-102, extended to a depth of approximately 20 feet below grade were located in the vicinity of the proposed baseball field. The results of the soil borings, along with a Boring Location Plan showing the approximate locations where the borings were performed, are included in the Appendix of this report.

This report also presents our recommendations for subgrade preparation for the project. In addition, the report provides construction considerations based upon the results of the soil borings and our previous experience.

Purposes of Exploration

The purposes of this exploration were to explore the soil and groundwater conditions at the site and to develop engineering recommendations to guide design and construction of the project. We accomplished these purposes by:

1. drilling two (2) soil borings to a depth of approximately 20 feet below the existing ground surface in the vicinity of the proposed structures to explore the subsurface soil and groundwater conditions,

2. performing laboratory tests on selected representative soil samples from the borings to evaluate pertinent engineering properties, and,

3. analyzing the field and laboratory data to develop appropriate engineering recommendations.

EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil borings were located in the field by an ECS Field Engineer based on the proposed boring site plan provided to ECS by Legat Architects. As required by the State of Illinois, the driller notified the Chicago Utility Alert, DIGGER, to verify underground utilities in the vicinity of the project site prior to drilling operations.

The soil borings were performed with a truck-mounted rotary-type auger drill rig, which utilized continuous hollow stem augers to advance the boreholes. Representative soil samples were obtained at 2½ foot intervals for the first 10 feet and 5 foot intervals thereafter by means of conventional split-barrel sampling procedures. In this procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval, after initial setting of 6 inches, is termed the Standard Penetration Test (SPT) or N-value and is indicated for each sample on the boring logs. The SPT value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the standard penetration resistance value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies. The drill rig utilized an automatic trip hammer to drive the sampler. Consideration of the effect of the automatic hammer's efficiency was included in the interpretation of subsurface information for the analyses prepared for this report.

The drill crew maintained a field log of the soils encountered in the borings. After recovery, each geotechnical soil sample was removed from the sampler and visually classified. Representative portions of each soil sample were then sealed in jars and brought to our laboratory in Buffalo Grove, Illinois for further visual examination and laboratory testing. After completion of the drilling operations, the boreholes were backfilled with auger cuttings to the existing ground surface.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications and unconfined compressive strength and moisture content determinations.

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. A brief

explanation of the Unified System is included with this report. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual.

Unconfined compressive strength tests were performed on cohesive soil samples with the use of a calibrated hand penetrometer. In the hand penetrometer test, the unconfined compressive strength of a soil sample is estimated, to a maximum of 4½ tons per square foot (tsf) by measuring the resistance of a soil sample to penetration of a small, calibrated spring-loaded cylinder.

Undrained shear strength tests were also performed in soft to firm Silty Clay soils using a torvane shear tester. The torvane is a small, hand-held, spring-loaded device that is pressed into the sample and turned. A scale on the calibrated dial indicates the approximate ultimate shear strength of the sample.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposal.

EXPLORATION RESULTS

Site Conditions

The proposed Lee Pasteur Elementary School Baseball Field will be located at 67th Street and Cicero Avenue, in Chicago, Illinois. The field will be located on the eastern portion of the property, immediately west of existing railroad tracks. At the time of our field exploration, the site consisted of an elevated berm. The topography across the site was observed to have an approximately 4 to 5 foot drop in elevation from the top of the berm to the level of the nearby existing baseball fields.

Soil Conditions

A total of two (2) borings, B-101 through B-102 were performed for this project. The subsurface conditions encountered at the borings performed at the site can be summarized as follows.

In boring, B-102, dark brown Sand and Gravel Fill (SP-GP-FILL) was encountered at the ground surface and extended to approximately 5½ feet below grade. At the ground surface in boring, B-101 and below the Sand and Gravel Fill in boring, B-102, dark brown Silty Clay Fill (CL-FILL) was encountered and extended to about 6½ to 8 feet below grade. Below the fill material in the borings, black Organic Clay (OL) was encountered and extended to a depth of approximately 8½ to 9 feet below current grade. The Organic Clay was underlain by apparently natural brown and gray to brownish gray Silty Clay (CL) to a depth of about 17 feet below grade followed by gray Silty Clay (CL) to the maximum explored depth of 20 feet below current grade.

In general, the Sand and Gravel Fill encountered in boring, B-102 was medium dense in relative density with blow counts ranging from 17 to 19 blows per foot. The (fill and natural) Silty Clays (fill and natural) were stiff to hard in consistency and exhibited unconfined compressive strength estimates of about 1¼ to greater than 4½ tsf and moisture contents ranging from 14 to 27 percent. The black Organic Clay encountered in the borings exhibited an undrained shear strength/hand penetrometer reading of about 0.20 tsf (400 psf) to 1½ tsf and moisture contents of about 27 to 42 percent.

The specific soil types observed at the borings are noted on the boring logs, enclosed in the Appendix.

Groundwater Observations

Observations for groundwater were made during sampling and upon completion of the drilling operations at the boring locations. In auger drilling operations, water is not introduced into the boreholes, and the groundwater position can often be obtained by observing water flowing into or

out of the boreholes. Furthermore, visual observation of the soil samples retrieved during the auger drilling exploration can often be used in evaluating the groundwater conditions.

Groundwater seepage was encountered in boring, B-102 at a depth of approximately 8½ feet below grade during drilling and sampling operations and at a depth of about 9½ feet below grade after the boring was completed. Groundwater was not encountered in boring, B-101. Glacial till soils in the Midwest frequently oxidize from gray to brown above the level at which the soil remains saturated. The long-term groundwater level is often interpreted to be near this zone of color change. Based on the results of this exploration, the long-term groundwater level may be located at a depth of about 17 feet below current grade.

It should be noted that the groundwater level can vary based on precipitation, evaporation, surface run-off and other factors not immediately apparent at the time of this exploration. Surface water runoff will be a factor during general construction, and steps should be taken during construction to control surface water runoff and to remove any water that may accumulate in the proposed excavations.

ANALYSIS AND RECOMMENDATIONS

Overview

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, ECS Illinois, LLC should be consulted so that the recommendations of this report can be reviewed.

Subgrade Preparation and Engineered Fill

Based on the information provided to ECS, the proposed project will consist of a new baseball field to be constructed on the eastern portion of the site, immediately west of the existing railroad tracks. The existing grade of the site varies from an elevation of 42 to an elevation of 43 feet. The design grade of the new baseball field is anticipated to be about 38 to 39 feet, approximately 4 to 5 feet below current grade. Therefore, the baseball field area will have a cut extended to a depth of about 4 to 5 feet.

The area within the limits of earthwork should be stripped of all old pavement (if any), topsoil/buried topsoil, vegetation (if any), and any deleterious/unsuitable materials, and site grading should be performed to design subgrade elevation. We recommend that the project geotechnical engineer or his representative should be on site during embankment/backfilling operations and the entire earthwork operation to monitor and ensure adequate and proper placement and compaction of engineered fill are attained.

As mentioned earlier, **black Organic Clay** was encountered in the borings below at depths between 6½ and 9 feet below current grade, which indicates that unsuitable **Organic Clays** will be located within 2 to 3 feet of the finished grade. The existing **Organic Clay** similar to that encountered in the borings and extended to an elevation of about 34 to 33½ feet, **and in other areas if encountered during construction should be completely removed from the baseball field areas and replaced with engineered fill**.

We recommend that the project geotechnical engineer or his representative should be on site to monitor stripping and site preparation operations and observe that unsuitable soils have been satisfactorily removed and to observe proofrolling.

After removal of unsuitable/deleterious materials and stripping to the desired grade, and prior to fill placement, we recommend the stripped/exposed subgrades be observed by an experienced geotechnical engineer or his authorized representative at the time of construction in order to aid in identifying localized soft/loose or unsuitable materials which should be removed. Proofrolling using a loaded dump truck having an axle weight of at least 10 tons, may be used at this time to aid in identifying localized soft or unsuitable material which should be removed. Any soft or

unsuitable materials encountered during proofrolling should be compacted in place or removed and replaced with an approved backfill compacted to the criteria given below.

These soils could be sensitive to disturbance from construction activity, particularly if wetted further by rainfall or seepage, and/or if a shallow groundwater level is present. These soils could exhibit a relatively firm/stable condition upon initial exposure at the subgrade level. However, repetitive construction traffic and/or wetting of the soils will deteriorate the soil strength and likely result in rutting and instability. Construction traffic over unstable areas should be avoided. We also recommend crowning/sloping the subgrade to provide positive drainage off the athletic field subgrades.

If permeable topsoil is considered to be used as the surface for the baseball field, we recommend a perimeter and underdrainage system. This system may consist of free draining granular material and drain tiles located under the topsoil and around the perimeter of the athletic area. The drain tiles should be surrounded by a minimum of 6 inches of free draining granular filter material. The underdrainage blanket and drain tiles should be connected to a storm sewer.

Any soil placed as engineered fill and base material should be an approved material. New fill and base material should be placed in lifts not exceeding 8 inches in loose thickness, moisture conditioned to within 2 percent of the optimum moisture content, and compacted to at least 90 percent of the maximum dry density obtained in accordance with ASTM Specification D 1557, Modified Proctor Method. Fine grained engineered fill should be compacted with a sheepsfoot roller while the granular engineered fill should be compacted with smooth drum roller or adequate heavy vibratory plate. Steps should be taken by the contractor to control surface water runoff and to remove any water from precipitation that may accumulate in the subgrade areas, especially during the wet season. When wet and subjected to construction traffic, softening and disturbance of the exposed clayey subgrade may occur. Construction traffic should be limited when the subgrade is wet.

Soil Permeability

A total of six (6) permeameter tests were performed to evaluate the infiltration rate of the onsite soils by using a Guelph Permeameter. Guelph permeameter measures the hydraulic conductivity of in-situ soils immediately below the testing device. Permeameter tests were performed at the locations indicated on the Boring Location Plan, P-1 through P-4, and in borings, B-101 and B-102.

The permeameter test results are as shown below:

Boring Number	Depth (ft)	Elevation (ft)	Material	Hydaulic Conductivity, k (cm/sec)
P-1	7	31	Silty Clay	4.07×10^{-7}
P-2	7	30	Silty Clay	5.43×10^{-7}
P-3	4	32	Silty Clay	6.88×10^{-7}
P-4	4	33	Silty Clay	8.28×10^{-7}
B-101	8	34	Silty Clay	5.01×10^{-7}
B-102	6	37	Silty Clay Fill	5.68×10^{-7}

The permeability of site soils will vary based on soil composition, in-place condition, and others. Soils identified as having a medium to high degree of permeability are generally considered pervious. The following table is used as a general guideline for evaluation the site soils.

Degree of Permeability	Permeability (k), cm/sec
High	Over 10^{-1}
Medium	10^{-1} to 10^{-3}
Low	10^{-3} to 10^{-5}
Very Low	10^{-5} to 10^{-7}
Practically Impermeable	Less Than 10^{-7}

General Construction Considerations

We recommend that the subgrade preparation, installation of the new baseball field be monitored by an ECS geotechnical engineer or his representative. Methods of verification and identification such as proofrolling and hand auger probe holes will be necessary to further evaluate the subgrade soils and identify unsuitable soils. We recommend that site development activities be monitored on a full-time basis by an ECS geotechnical engineer or his representative to verify that the exposed subgrade materials will be suitable for the proposed baseball field and are consistent with the boring log information obtained during this geotechnical exploration. We would be pleased to provide these services.

We recommend adequate surface and subsurface drainage be considered in the design and construction of the new baseball field. Where standing water develops on surfaces or within the drainage layer of the new artificial surface, softening of the subgrade and other problems related to the deterioration of the subgrade of the field can be expected. Adequate drainage should reduce the possibility of the subgrade materials becoming saturated over a long period of time.

To reduce water infiltration to the pavement section and within the base course layer resulting in softening of the subgrade and deterioration of the artificial surface.

All unsuitable materials should be removed and replaced with environmentally clean, inorganic fill and free of debris or harmful matter. Unsuitable materials removed from the project site should be disposed of in accordance with all applicable federal, state, and local regulations.

The contractor should avoid stockpiling excavated materials immediately adjacent to the excavation walls.

Excavations should comply with the requirements of OSHA 29CFR, Part 1926, Subpart P, "Excavations" and its appendices, as well as other applicable codes. This document states that the contractor is solely responsible for the design and construction of stable, temporary excavations. The excavations should not only be in accordance with current OSHA excavation and trench safety standards but also with applicable local, state, and federal regulations. The contractor should shore, slope or bench the excavation sides when appropriate. Site safety is the sole responsibility of the contractor, who shall also be responsible for the means, methods and sequencing of construction operations.

Closing

We recommend that the construction activities be monitored by ECS Illinois, LLC to provide the necessary overview and to check the suitability of the subgrade soils for supporting the new athletic field.

This report has been prepared in order to aid in the evaluation of this property and to assist the architect and/or engineer in the design of this project. The scope is limited to the specific project and locations described herein and our description of the project represents our understanding of the significant aspects relative to soil characteristics. In the event that any change in the nature or location of the proposed construction outlined in this report are planned, we should be informed so that the changes can be reviewed and the conclusions of this report modified or approved in writing by the geotechnical engineer. It is recommended that all construction operations dealing with earthwork be reviewed by an experienced geotechnical engineer to provide information on which to base a decision as to whether the design requirements are fulfilled in the actual construction. If you wish, we would welcome the opportunity to provide field construction services for you during construction.

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings and tests performed at the locations as indicated on the Boring Location Plan and other information referenced in this report. This report does not reflect any variations, which may occur between the borings. In the performance of the subsurface exploration, specific information is obtained at specific locations at specific times. However, it is a well known fact that variations in soil conditions exist on most sites between boring locations and also such

situations as groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear evident, after performing on-site observations during the construction period and noting characteristics and variations, a reevaluation of the recommendations for this report will be necessary.

APPENDIX

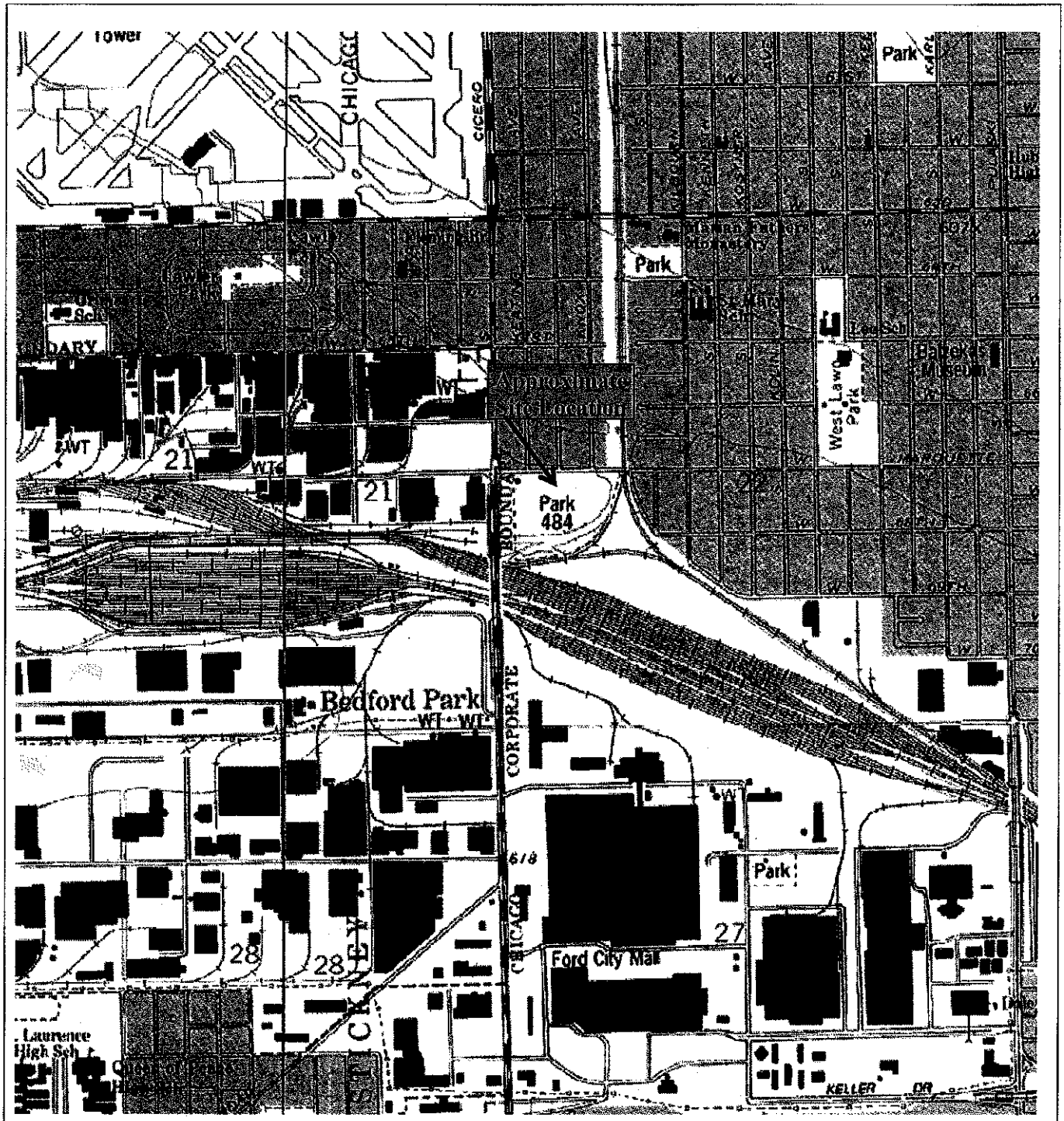
General Location Map

Boring Location Plan

Boring Logs

Unified Soil Classification System

Reference Notes For Boring Logs

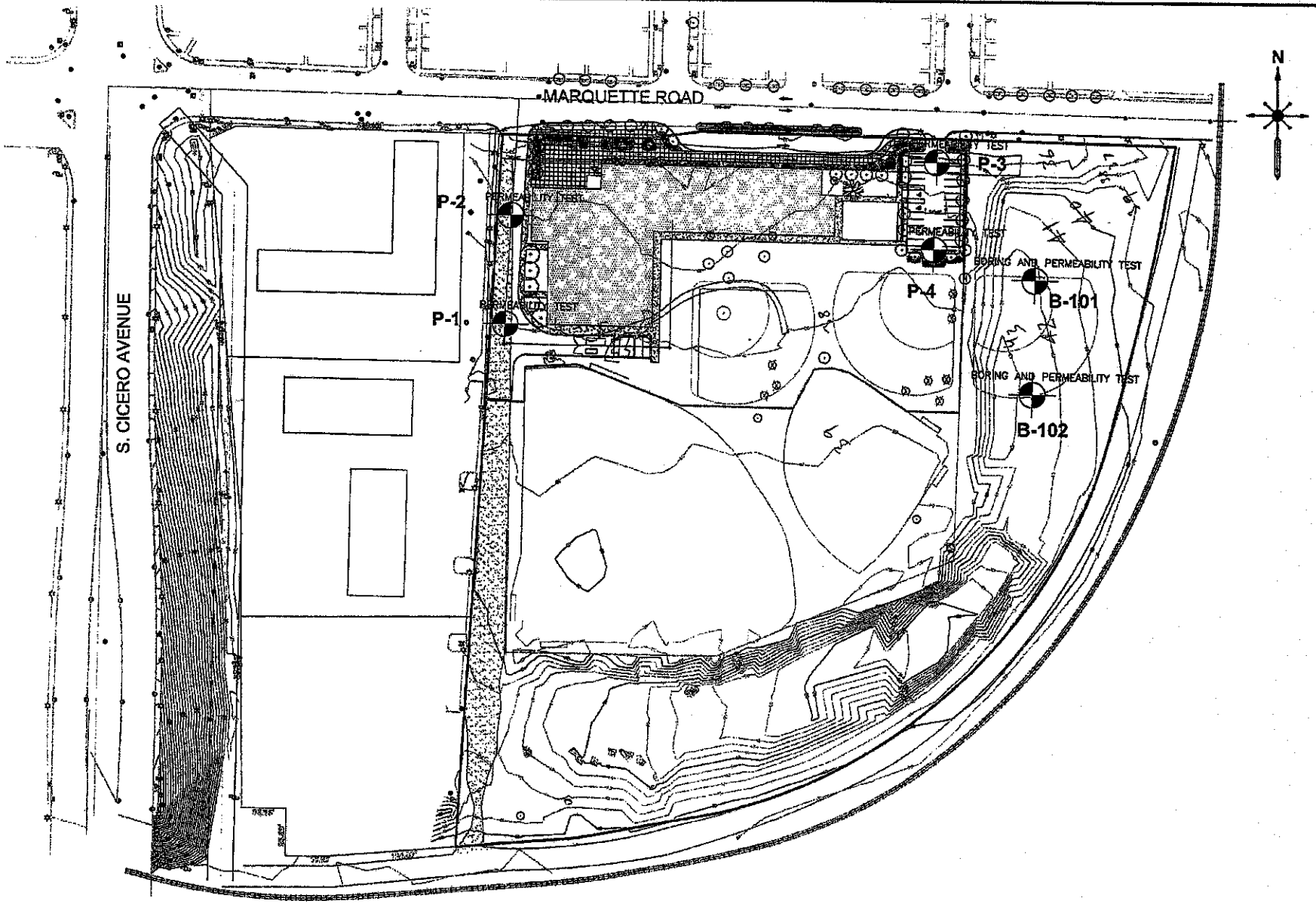


ECS LLC
ILLINOIS

GENERAL LOCATION PLAN
USGS Topographic Map

N

ECS PROJECT NO. 16:7126-A
Baseball Field and Additional Testing
Lee Pasteur Elementary School
67th Street and Cicero Avenue
Chicago, Illinois



BORING LOCATION PLAN

LEE Pasteur Elementary School–Baseball Field

Legat Architects

ECS LLC ILLINOIS

ENGINEER: LAS	SCALE: NTS
DRAFTING: LGM	PROJECT NO.: 7126-A
REVISIONS:	SHEET: FIGURE 2
	DATE: 8/20/08

⊕ APPROX. SOIL BORING LOCATION

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126-A	B-101	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur Elementary School-Baseball Field

ARCHITECT-ENGINEER:

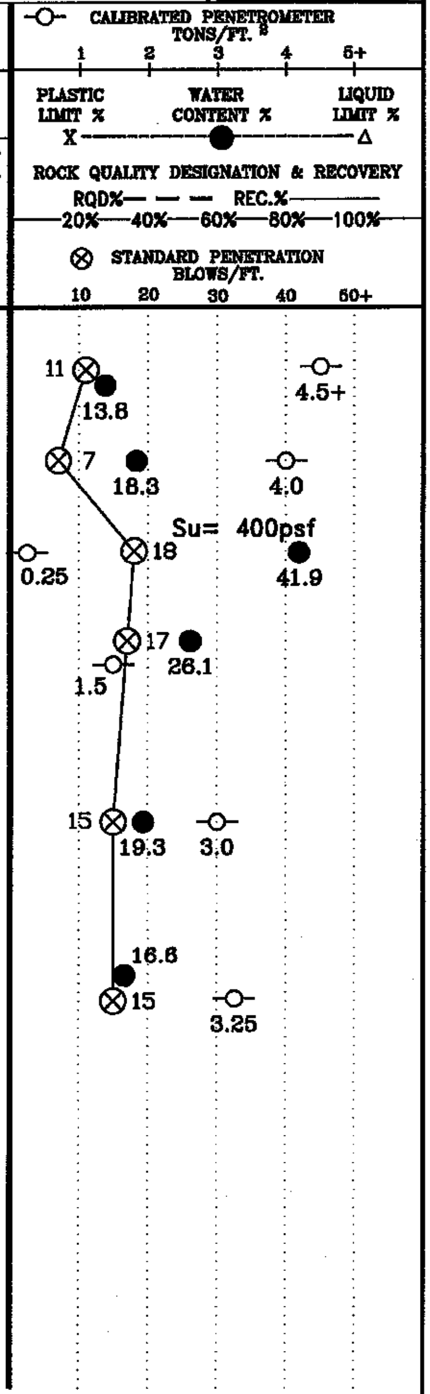
SITE LOCATION: 67th Street & Cicero Avenue, Chicago, IL

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 42

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
0					Silty Clay FILL, Trace Cinders, Sand and Gravel, Dark Brown, Hard, (CL-FILL)	42
	1	SS	18	18		40
5	2	SS	18	18		
	3	SS	18	18	Organic CLAY, Trace Sand and Gravel, Black, Soft, (OL)	35
10	4	SS	18	18	Silty CLAY, Trace Sand and Gravel, Brown and Gray to Brownish Gray, Stiff to Very Stiff, (CL)	30
15	5	SS	18	18		
					Silty CLAY, Trace Sand and Gravel, Gray, Very Stiff, (CL)	25
20	6	SS	18	18		
					END OF BORING @ 20'	20
25						15
30						



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL Dry	WS OR WD	BORING STARTED 5/20/08	
WL(BCR)	WL(ACR) Dry	BORING COMPLETED 5/20/08	CAVE IN DEPTH ●
WL		RIG — FOREMAN i.e.x.	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Legat Architects	7126-A	B-102	1 OF 1

ECS LLC ILLINOIS

PROJECT NAME: LEE Pasteur Elementary School-Baseball Field

ARCHITECT-ENGINEER:

SITE LOCATION: 67th Street & Cicero Avenue, Chicago, IL

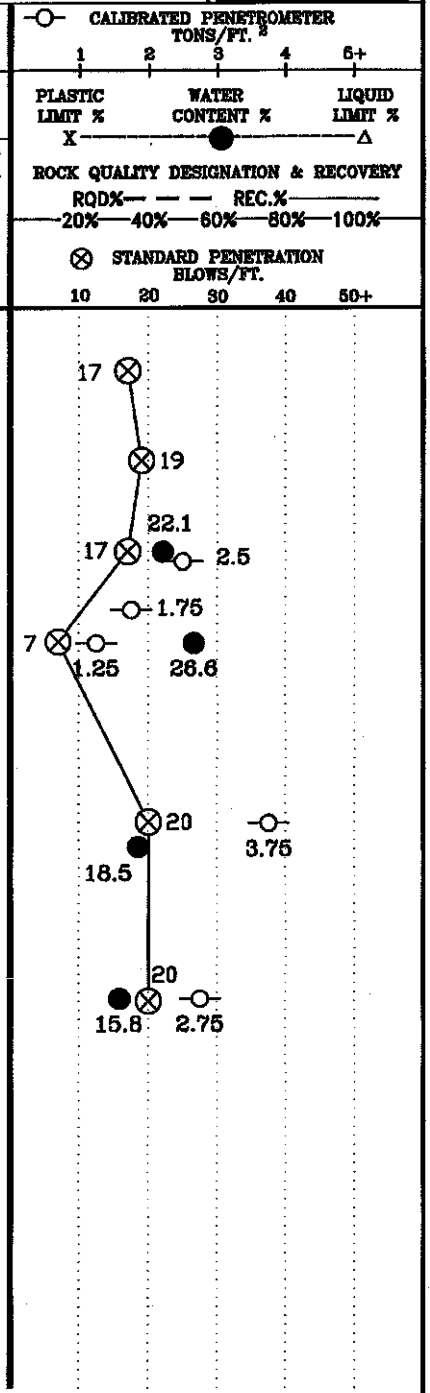
DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 43

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL
0	1	SS	18	18	Sand and Gravel FILL, Trace Silty Clay, Dark Brown, Medium Dense, (SP-GP-FILL)
5	2	SS	18.	18	
	3	SS	18	18	Silty Clay FILL, Trace Cinders, Sand and Gravel, Dark Brown, Very Stiff, (CL-FILL)
10	4	SS	18	18	Organic CLAY, Trace Sand and Gravel, Black, Stiff, (OL)
					Silty CLAY, Trace Sand and Gravel, Brown and Gray to Brownish Gray, Stiff to Very Stiff, (CL)
15	5	SS	18	18	
					Silty CLAY, Trace Sand and Gravel, Gray, Very Stiff, (CL)
20	6	SS	18	18	
					END OF BORING @ 20'
25					
30					

WATER LEVELS / ELEVATION (FT): 40, 35, 30, 25, 20, 15



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

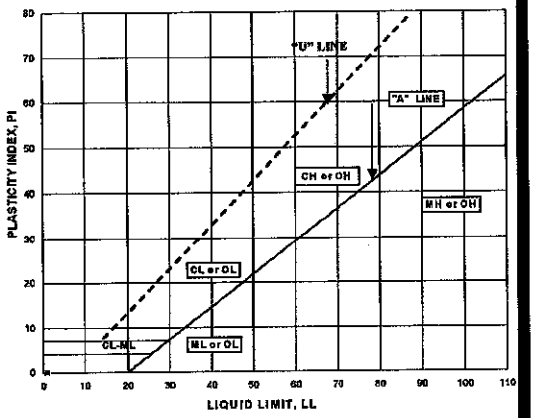
WL 8.5' WS OR WD	BORING STARTED 8/15/08		
WL(BCR) WL(ACR) 9.4'	BORING COMPLETED 8/15/08	CAVE IN DEPTH ●	
WL	RIG FOREMAN i.e.x.	DRILLING METHOD HSA	

Unified Soil Classification System
(ASTM Designation D-2487)

Major Division		Group Symbol	Typical Names	Classification Criteria
Coarse-grained soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	$C_u = D_{60}/D_{10}$ Greater than 4 $C_z = (D_{30})^2/(D_{10}xD_{60})$ Between 1 and 3
		GP	Poorly graded gravels and gravel-sand mixtures, little or no fines	Not meeting both criteria for GW
		GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limits plot below "A" line or plasticity index less than 4
		GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits plot above "A" line and plasticity index greater than 7
	Sands: More than 50% of coarse fraction passes No. 4 sieve	SW	Well-graded sands and gravelly sands, little or no fines	$C_u = D_{60}/D_{10}$ Greater than 6 $C_z = (D_{30})^2/(D_{10}xD_{60})$ Between 1 and 3
		SP	Poorly graded sands and gravelly sands, little or no fines	Not meeting both criteria for SW
		SM	Silty sands, sand-silt mixtures	Atterberg limits plot below "A" line or plasticity index less than 4
		SC	Clayey sands, sand-clay mixtures	Atterberg limits plot above "A" line and plasticity index greater than 7
Fine-grained soils: 50% or more passing No. 200 sieve	Silts and Clays: Liquid limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		OL	Organic silts and organic silty clays of low plasticity	
	Silts and Clays: Liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
		CH	Inorganic clays of high plasticitiy, fat clays	
		OH	Organic clays of medium to high plasticity	
Highly organic soils		Pt	Peat, muck and other highly organic soils	Fibrous organic matter; will char, burn, or glow

Classification on basis of percentage of fines:
- Less than 5% Pass No. 200 sieve: GW, GP, SW, SP
- More than 12% Pass No. 200 sieve: GM, GC, SM, SC
- 5% to 12% Pass No. 200 sieve: Borderline classification requiring use of dual symbol

Note: U-line represents approximate upper limit of LL and PI combinations for natural soils (empirically determined). ASTM-D2487.



Plasticity chart for the classification of fine-grained soils. Tests made on fraction finer than No. 40 sieve

Boderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder

ECS LLC ILLINOIS

UNIFIED SOIL CLASSIFICATION SYSTEM

REFERENCE NOTES FOR BORING LOGS

I. Drilling and Sampling Symbols:

SS – Split Spoon Sampler
ST – Shelby Tube Sampler
RC – Rock Core: NX, BX, AX
PM – Pressuremeter
DC – Dutch Cone Penetrometer

RB – Rock Bit Drilling
BS – Bulk Sample of Drilling
PA – Power Auger (no sample)
HSA – Hollow Stem Auger
WS – Wash Sample

Standard Penetration (Blows/Ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2 inch O.D. split spoon sampler, as specified in ASTM D-1586. The blow count is commonly referred to as the N-value.

II. Correlation of Penetration Resistances to Soil Properties:

Relative Density-Sands, Silts

SPT – N	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
50 – 80	Very Dense

Consistency of Cohesive Soils

Unconfined Compressive Strength, Qp, tsf	Consistency
under 0.25	Very Soft
0.25 – 0.49	Soft
0.50 – 0.99	Firm
1.00 – 1.99	Stiff
2.00 – 3.99	Very Stiff
4.00 – 8.00	Hard
over 8.00	Very Hard

III Unified Soil Classification Symbols:

GP – Poorly Graded Gravel
GW – Well Graded Gravel
GM – Silty Gravel
GC – Clayey Gravel
SP – Poorly Graded Sand
SW – Well Graded Sand
SM – Silty Sand
SC – Clayey Sand

ML – Low Plasticity Silt
MH – High Plasticity Silt
CL – Low Plasticity Clay
CH – High Plasticity Clay
OL – Low Plasticity Organic
OH – High Plasticity Organic
CL-ML – Dual Classification (Typical)

IV. Water Level Measurement Symbol:

WL – Water Level
WS – While Sampling
WD – While Drilling

BCR – Before Casing Removal
ACR – After Casing Removal
WCI – Wet Cave In
DCI – Dry Cave In

The water levels are those water levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clays and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

ENVIRONMENTAL PROTECTION INDUSTRIES

September 18, 2008

Mr. Joe McEvoy
FHP SNN
8725 W. Higgins Road, Suite 200
Chicago, Illinois 60631

RE: Geophysical Survey
Lee Pasteur Elementary Replacement School (5 acres)
67th and Cicero, Chicago, Illinois
EPI Project #081187

Dear Mr. McEvoy:

Thank you for the opportunity to work with you on this project. Environmental Protection Industries (EPI) was retained by FHP/SNN to perform a Geophysical Survey of the above referenced 5-acre site to locate significant metallic anomalies indicative of suspect buried tanks and/or structures. The survey was performed on September 10, 2008, and this letter summarizes the findings of the investigation.

The survey identified no anomalies where significant metallic targets exist (Map 3). Numerous metallic objects were noted, but no individual significant anomalies indicative of a buried structure or tank were identified and mapped. The distribution and type of anomalies are characteristic of a fill site or former dump.

Please note that the area surveyed was much larger than the intended survey area of 5 acres. All of the ball fields were surveyed. This was due to a miscommunication of the site boundaries on the day of the survey and the access to the locked areas of the site. There was an equipment failure during the survey of the middle of the site. This area will be redone and submitted when the equipment is repaired.

Should you have any questions concerning the information presented in this Report, please do not hesitate to contact us at any time.

Sincerely,
Environmental Protection Industries

Robert L. Mankowski
Vice President

Enclosures

Site Location Topographic Map
GPS Detail Site Map
Geophysical Report

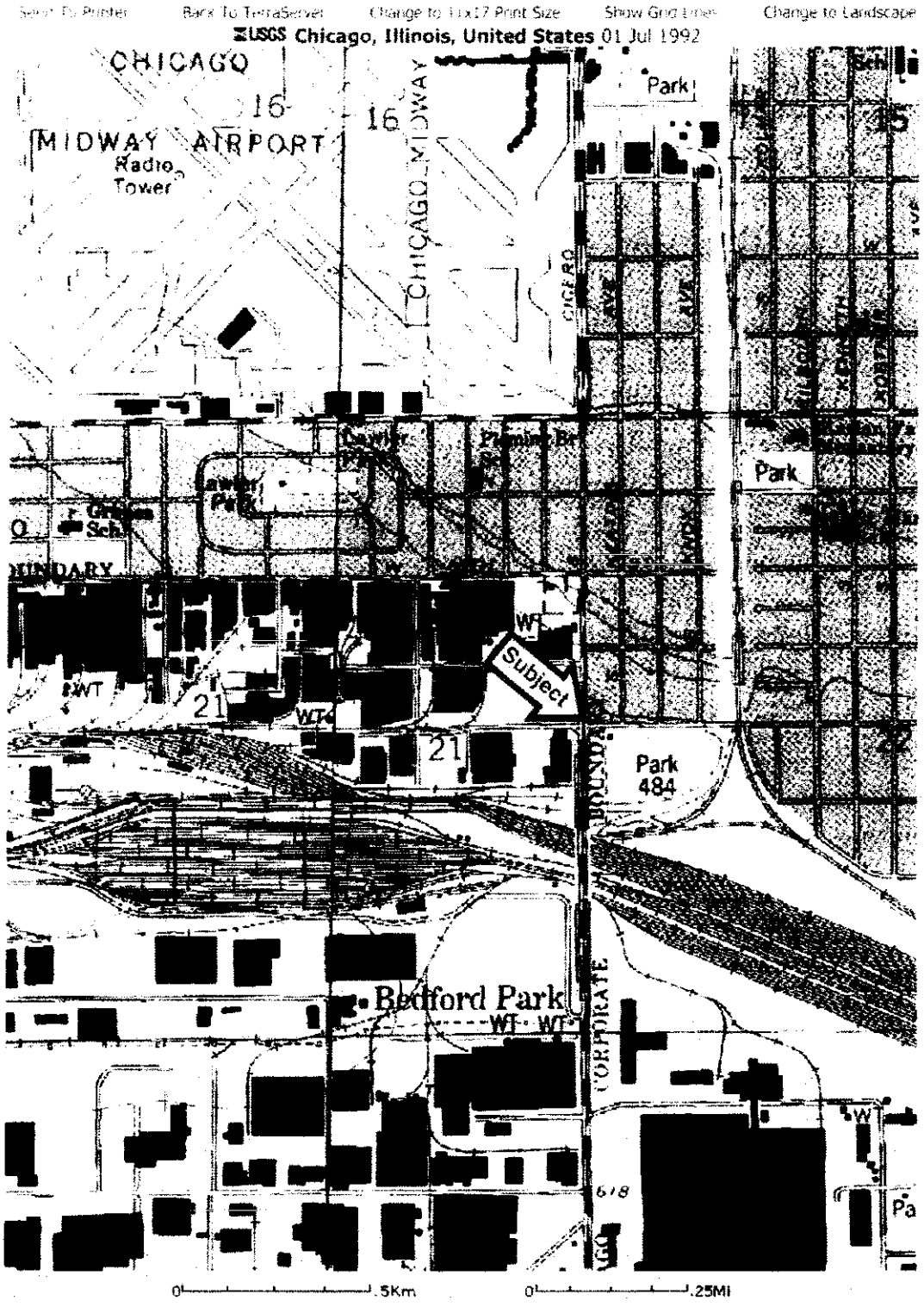


Image courtesy of the U.S. Geological Survey

LEE PASTEUR HURLEY AREA
ELEMENTARY SCHOOL

TIME DOMAIN ELECTROMAGNETIC SURVEY EM61-MK2

Lee Pasteur Hurley Area Elementary
Replacement School
4707 West Marquette Road
Chicago, IL

Prepared by

MIDWEST GEOMAR GEOPHYSICS, Inc
429 Elm Street
Frankfort, Illinois 60423
Tel: (815) 464-6205

Prepared for

Environmental Protection Industries
South Holland, IL

TABLE OF CONTENTS

1. Introduction

MidWest Geomar Geophysics, Inc employed the Geonics EM61-MK2 electromagnetic instrument to perform detailed measurements with the aim of mapping buried metallic objects. This survey was conducted on Sept 10, 2008 at the 4707 West Marquette Road, Chicago, IL.

2. Objective

The electromagnetic investigation at the site was carried out with the following specific objectives

- To map the location of buried metallic objects "Possible Buried UST's and related piping"

3. The Electromagnetic Time Domain Method

In the electromagnetic method two coils (antennas), which serve as a transmitter and a receiver, are situated on or near the earth surface. A steady voltage is applied to the transmitter coil for a sufficiently long time to allow turn-on transients in the ground to dissipate. The current supplied to the transmitter (bipolar rectangular current) is sharply terminated at each cycle. A rapid reduction of the transmitter current, and thus of the associated transmitter primary magnetic field, induces an electromotive force in nearby conductors. This electromotive force causes electrical eddy currents to flow in conductors with a decay, which is a function of the conductivity, size, and shape of the conductor. The decaying currents generate a secondary magnetic field, which is detected and measured by a receiver coil. The measured quantity is usually the response of the instrument to metallic objects or the apparent conductivity of the material

4. Instrumentation:

The Geonics EM61-MK2 is a high sensitivity high-resolution 4 channel time-domain metal detector, which is used to detect both ferrous and nonferrous metallic objects. It consists of a powerful transmitter that a pulsed primary magnetic field, which induces eddy currents in nearby metallic objects. Two receiver coils mounted on the coil assembly measure the decay of these currents. The responses are recorded and displayed by an integrated digital data logger with real time numerical and graphic display. Two ports on the logger allow simultaneous collection of EM and GPS data. For further processing and interpretation data can be transferred to the PC type of computer

The EM61-MK2 detects a single 200-liter (55 gal) drum at a depth of over 3 meters beneath the instrument, yet is relatively insensitive to interference from nearby surface metal such as fences, buildings, cars, etc. By making the measurement at a relatively long time after termination of the primary pulse, the response is practically independent of the electrical conductivity of the ground.

Due to its unique coil arrangements, the response curve is a single well defined positive peak, greatly facilitating quick and accurate location of the target, the depth of which can usually be

estimated from the width of the response and/or from relative response from each of the two receiver coils

5. Field Procedures

The survey was conducted with the EM61-MK2, taking nine (9) readings of four (4) time gates per second. The survey was conducted on approximately four (4) foot line spacing, utilizing a marking paint for control. The southwest corner of the surveyed area was deemed reference point 0/0. This investigative technique results in excellent resolution on the computer generated maps.

6. Data Processing

The electromagnetic information stored in the Allegro Juniper System digital data logger and was downloaded to laptop computer. Geonics (DAT61Win) was used for data interpretation. Geosoft Mapping System Software was used to process the data points in the production of the final color contour maps, utilizing the Geomar DIGGI mapping system.

7. Results

The electromagnetic results for this site are presented on the following three maps:

Map 1 - EM61-MK2 Channel 3 Response map.

Map 2 - EM61-MK2 Differential Channel (Removed Response from Near Surface Objects) map

Map 3 - Map of Located Anomalies (depicts results of interpretation).

Anomalies on this map are divided in to five groups:

Magenta zones- indicate presence of substantial buried metallic objects.

Pink zones - indicate groups of small metallic objects, or other interferences.

Red lines - indicate location of linear anomalies that may indicate buried pipes or other linear features.

Red circles - indicates location of buried metallic objects.

Yellow circles - indicates location of shallow or on ground metallic objects

The EM61-MK2 survey revealed extremely complicated nature of EM61-MK2 response within the site. The appearance of the amount of small anomalies would indicate a lot of debris was dumped on this site, spread and covered.

Anomalous zones are marked on interpretation map (Map 3) by magenta and pink shaded zones. Pink shaded zones may indicate groups of several various metallic objects. All pink zones are extremely complicated, large number of mostly small anomalies. There is nothing that can be said making one much different from another. They are all of the same nature with huge number of anomalies. Red and yellow circles were marked, however many more could be marked, so only more distinguishable small anomalies were noted and are marked.

Magenta zones indicate possible large metallic object. There is nothing to tell more about one or another, they are about the same and differ mainly in size.

Three relatively well delineated linear anomalies were detected and marked by solid red lines. These may represent a section of buried pipe, series of aligned objects, or in the case of the "L" shaped anomaly in the south west area may be a portion of a foundation wall.

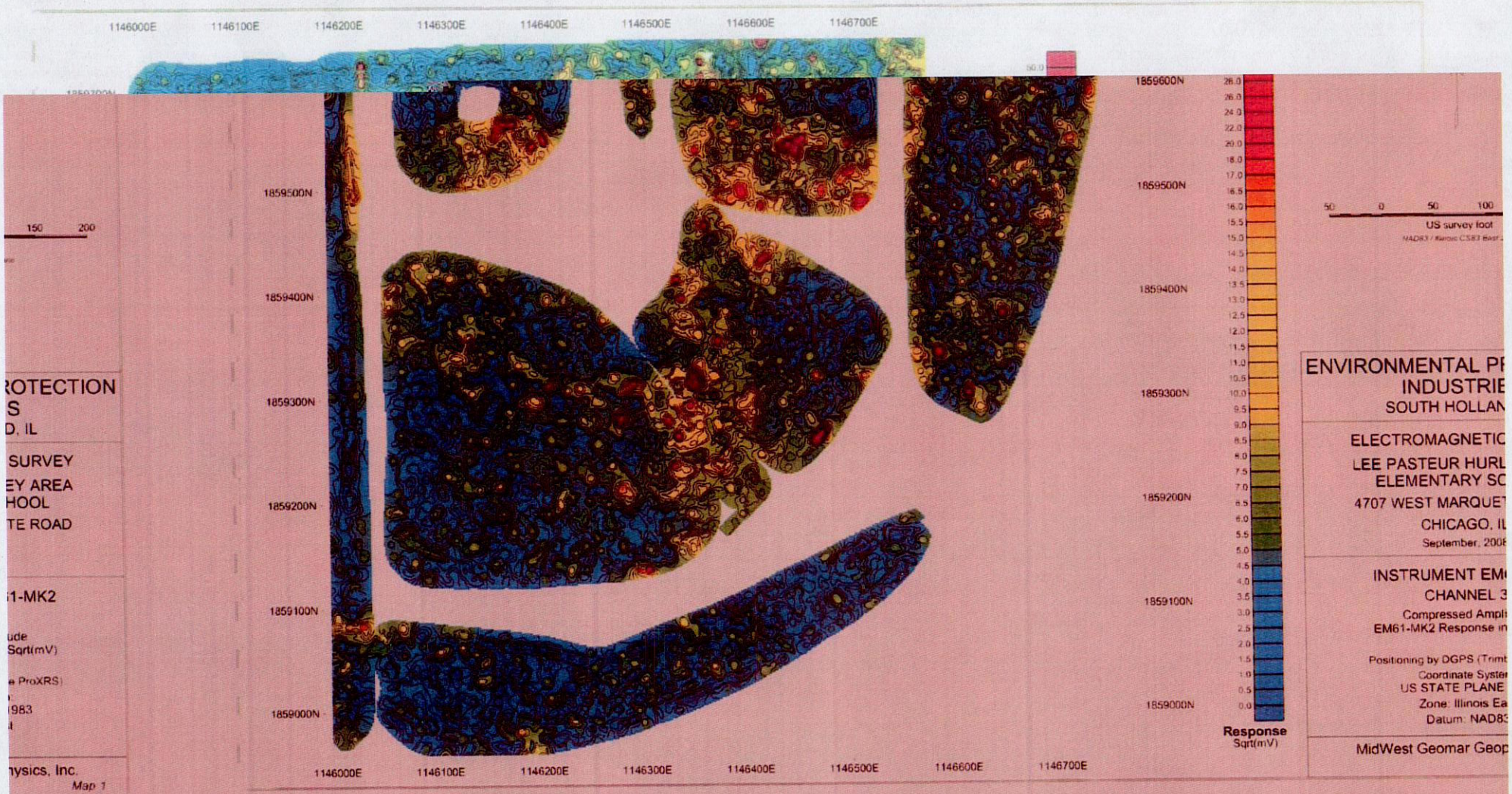
Remaining linear anomaly marked by dashed red line is poorly delineated, it should be treated only as a potential location of linear features. It may be also associated with aligned anomalies representing small metallic objects.

END

Sincerely,

Ron C. Reed

MidWest Geomar Geophysics, Inc
By: Ron C. Reed, President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1146100E
1146200E
1146300E
1146400E
1146500E
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1146700E
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1859300N
1859200N
1859100N
1859000N
Response
Sqrt(mV)
US survey foot
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INDUSTRIE
SOUTH HOLLAN
ELECTROMAGNETIC
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ELEMENTARY SC
4707 WEST MARQUET
CHICAGO, IL
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INSTRUMENT EM
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EM61-MK2 Response in
Positioning by DGPS (Trimb
Coordinate Syste
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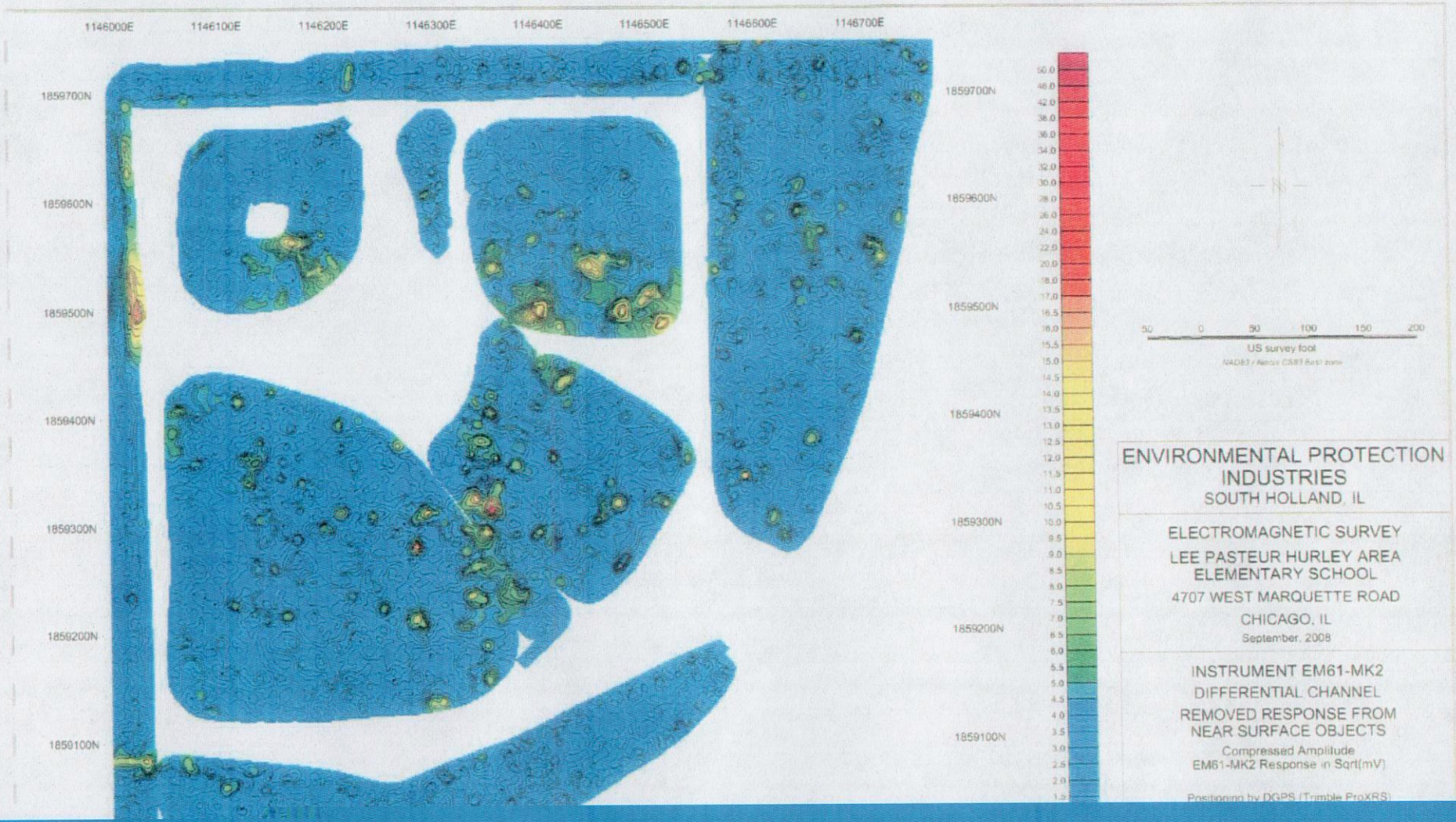
Map 1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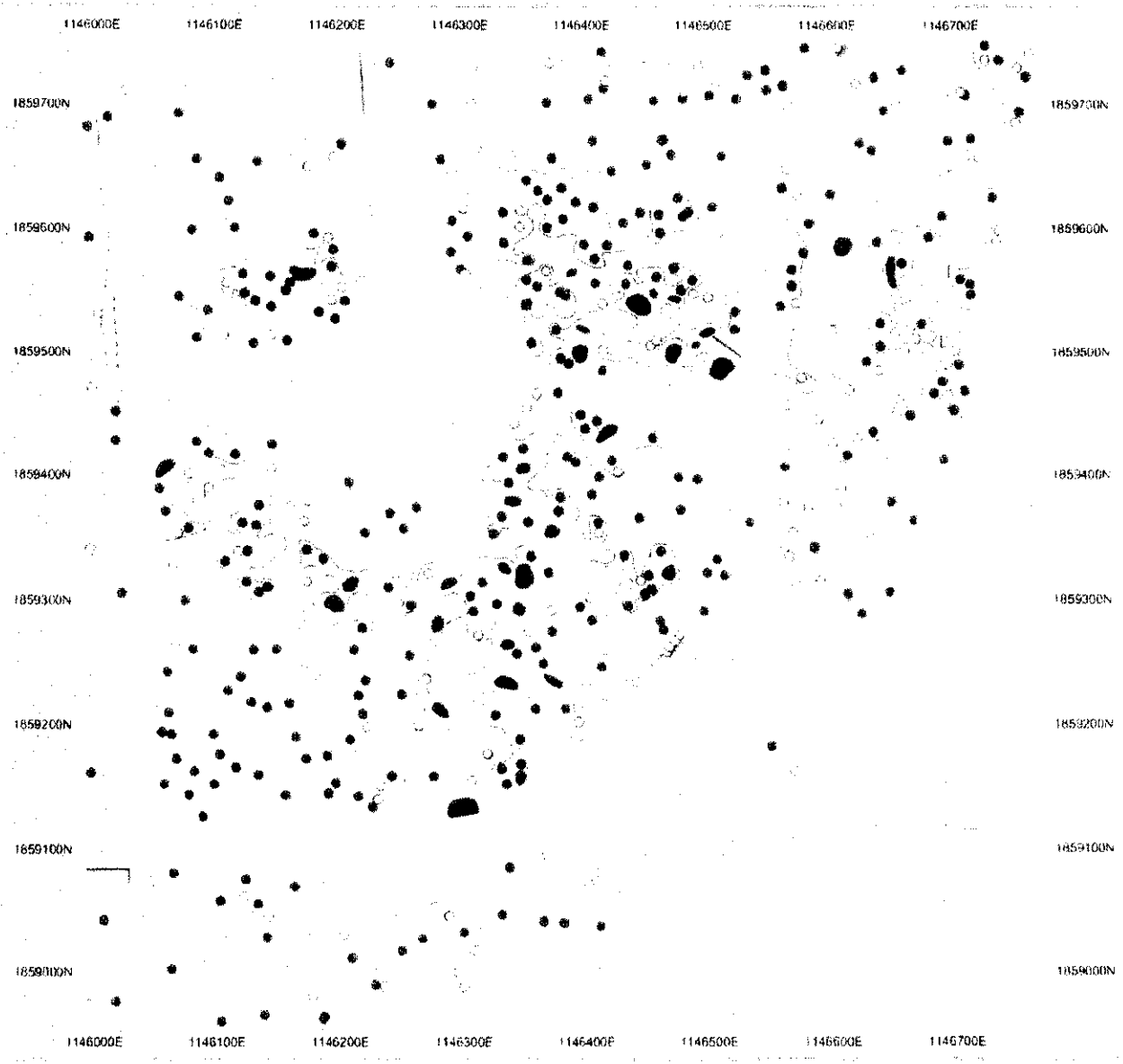
50 0 50 100 150 200
US survey foot
NAD83 / Illinois CS83 East zone
ENVIRONMENTAL PROTECTION INDUSTRIES
SOUTH HOLLAND, IL
ELECTROMAGNETIC SURVEY
LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL
4707 WEST MARQUETTE ROAD
CHICAGO, IL
September, 2008
INSTRUMENT EM61-MK2
DIFFERENTIAL CHANNEL
REMOVED RESPONSE FROM NEAR SURFACE OBJECTS
Compressed Amplitude
EM61-MK2 Response in Sqrt(mV)
Positioning by DGPS (Trimble ProXRS)



50 0 50 100 150 200

US survey foot

ENVIRONMENTAL PROTECTION INDUSTRIES

SOUTH HOLLAND, IL

ELECTROMAGNETIC SURVEY

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL

4707 WEST MARQUETTE ROAD

CHICAGO, IL

September, 2008

MAP OF LOCATED ANOMALIES

INSTRUMENT EM61-MK2

LEGEND

- Anomalous Zone Indicating Possible Large Buried Metallic Objects
- Anomalous Zones of Possible Groups of Small Metallic Objects or Interferences
- Linear Anomalies Possible Pipes, or Other Linear Objects
- Anomalies Indicating Metallic Objects
- Anomalies Indicating Shallow Metallic Objects

Positioning by DGPS (Trimble ProXRS)

Coordinate System:
US STATE PLANE 1983
Zone: Illinois East
Datum: NAD83

MidWest Geomar Geophysics, Inc.

Map 3

SECTION 11062

STAGE RIGGING

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Contractor provide on Stage:
   1. Stage rigging
   2. Drapery
   3. Track Systems

B. Related Sections include the following:
   1. Section 16555 Theatre Lighting Systems
   2. Division 05 Sections for supplementary metal members supporting stage-curtain systems to structure.

1.02 SYSTEM DESCRIPTION

A. Stage Rigging Contractor shall provide all items and work necessary for complete, safe, fully functional systems as described herein, including:
   1. Shipment of equipment to job site and the secured storage of all non-fixed equipment.
   2. Installation and completion, in accordance with Specifications, related Drawings, and Equipment.

B. Work includes items necessary for a complete installation including:
   1. Curtains, tracks, battens and lighting cages.

1.03 PERFORMANCE REQUIREMENTS

A. Systems shall conform to all applicable code requirements and shall conform to industry standards of operation and practices.

B. Materials, arrangements, and procedures shall comply with applicable code requirements, allowing the end user to arrange and operate a safe assembly and working environment for audience and user's personnel.

C. In the absence of more stringent requirements, Stage Rigging Contractor shall maintain sufficient injury and property liability insurance coverage throughout the project's scheduled timetable, including workmen's compensation coverage for Stage Rigging Contractor's employees.

D. Errors, omissions, or ambiguities found in these documents do not relieve Stage Rigging Contractor of the responsibility of providing items necessary for complete, safe, fully functional systems. Errors, omissions, or ambiguities shall be brought to the attention of the Architect, General Contractor, Owner and/or Consultant for clarification.

1.04 SUBMITTALS

A. Within 60 business days after receiving a notice to proceed, submit proposed schedule and predecessor requirements.

B. Within 60 business days of award, submit component and installation drawings and schedules showing all information necessary to fully explain the design features, appearance, function, fabrication, installation, and use of system components in all phases of operation.
   1. Drawings shall be no less detailed than as provided in the contract documents.
   2. Submittals including shop drawings, related data, and samples must be submitted complete and at one time as much as possible within the constraints of the schedule imposed on this specific project.
   3. Submittal drawings in ledger format are preferred.

C. Review submittals for conformance to design intent by the Architect before beginning fabrication, installation, or erection.
   1. Review of shop drawings and samples is for quality and design. Such review does not change the requirements of contract drawings or specifications, does not change the requirement to install all products according to manufacturer's recommendations, nor reduce quality or quantity or size of items to be supplied, unless so stated in writing.
   2. Review does not relieve the Stage Rigging Contractor of the responsibility of providing complete and safe systems and equipment in accordance with the intent of specifications and Drawings.

D. In lieu of Drawings, Stage Rigging Contractor may submit catalog cuts for standard equipment items.
   1. Catalog cuts must contain full information on dimensions, construction, applications, etc. to permit proper evaluation.
   2. Properly identify catalog cuts for their intended use.

E. Clearly indicate variations from the design and arrangements indicated in contract drawings and specifications on Submittals.

F. Prepare submittals under the supervision of a Registered Design Professional licensed in the state where this facility is located.
   1. Shop drawings shall be Sealed by Registered Design Professional.
   2. Registered Design Professional's responsibility shall include all elements related to overhead lifting, support of elements provided by the Stage Rigging Contractor, and all overhead suspended elements.

G. Submit the following samples:
   1. Curtain fabric color swatches for color selection.
   2. Samples of equipment component requested by the Architect.

H. Final submittal. Within thirty (30) days of final tests, and as a condition for final review, the Stage Rigging Contractor shall submit to the Architect:
   1. Receipts for delivery of all turn-over items, i.e., all items designated, "deliver to Owner."
   2. Three (3) sets of "As built and approved" drawings and wiring diagrams showing all systems and components as installed, including all field modifications.
   3. Three (3) sets of operation and service manuals, schematics, and parts lists for each unit of equipment installed or provided.

4. Three (3) sets of flame retardant test certificates for each type of soft goods.
5. Certificates of warranty, as set forth below.
6. A rigging log book with forms for recording inspections and tests, modifications to the system, and out-of-the-ordinary rigging system incidents.

I. Prepare and submit complete record drawings and operational and maintenance data and certificates.

1.05 QUALITY ASSURANCE

A. Contractor Qualifications:
1. Stage Rigging Contractor:
   a. Approved rigging manufacturer or an authorized representative or dealer of an approved manufacturer.
   b. The contractor shall have been in business and installing stage rigging systems for a period of ten years or more, and shall have completed at least ten installations of this type and scope.
   c. Architect shall be the final judge of the suitability of experience.
2. Member in good standing of the Entertainment Services and Technology Association (ESTA) and maintain qualifying membership for the duration of the project.
3. A qualified and experienced supervisor for the Stage Rigging Contractor and employed full time by the Stage Rigging Contractor for not less than 3 years shall be at the site during the entire installation period and shall actively direct and supervise the work. The supervisor shall be an ETCP Certified Rigger - Theatre.
4. Stage Rigging Contractor shall be one of the following accepted firms:
   a. Chicago Flyhouse, Chicago, Illinois (773) 728-8455
   b. Chicago Spotlight, Chicago, Illinois (312) 455-1171
   c. Grand Stage, Chicago Illinois (312) 332-5611
   d. SECOA, Champlin Minnesota (800) 328-5519
   e. Texas Scenic, San Antonio, Texas (800) 292-7490
   f. Mainstage Theatrical (800) 236-0878

B. Accepted firms are not relieved of any other bid submission, requirements of the general conditions, or other requirements of the contract documents for this project.

C. Other contractors seeking acceptance for Stage Rigging Contractor must submit the following information at least 10 business days prior to the bid opening date. Acceptance of contractors will be by addenda:
1. A written list of five equivalent installations including:
   a. Name, address and telephone number of Owner.
   b. Name, address and telephone number of Architect.
   c. A brief written description of the scope of work with approximate value.
2. A brief written description of the contractor's operation including facilities, financial capabilities, and experience of key personnel.
3. A statement from a bonding company agreeing to provide the required bonds in the amount required for the project.

D. Contractors not having a qualified and experienced sewing room as an integral part of their operation shall employ the services of a qualified and experienced Sewing Sub-contractor for the fabrication of stage curtains.

1. Sewing Sub-contractor shall have at least 10 years experience in the fabrication of curtains for professional theatres.
2. If requested, the Stage Rigging Contractor shall submit a representative list of projects performed by the Sewing Sub-contractor during the above period.
3. Subject to requirements, work performed under this Section may be by one of the following Sewing Sub-contractors:
   a. Rose Brand, New York, New York, 800-223-1624
   b. Stage Decoration and Supplies, Greensboro, NC, 888-220-3174
   c. Syracuse Scenery & Stage Lighting, Liverpool, New York, 800-453-7775
   d. I. Weiss & Sons, Long Island City, New York, 888-325-7192

E. Other contractors seeking acceptance for Sewing Sub-contractor must submit the following information at least 10 business days prior to the bid opening date (acceptance of contractors will be by addenda):
1. A written list of five equivalent installations including:
   a. Name, address and telephone number of Owner.
   b. Name, address and telephone number of Architect.
   c. A brief written description of the scope of work with approximate value.
2. A brief written description of the contractor's operation including facilities, financial capabilities, and experience of key personnel.

1.06 COORDINATION

A. Verify dimensions and conditions at the job site.

B. Coordinate the design, planning, and scheduling of the work of this section with the work of all other trades.
1. Notify Architect of difficulties in coordinating work with other contractors.
2. Failure to do so shall constitute acceptance of construction as suitable in all ways to receive the work of this section.

1.07 WARRANTY AND ONE YEAR INSPECTION

A. The Stage Rigging Contractor shall provide a three year written guarantee against defects in materials or workmanship starting from the date of acceptance of equipment by the Owner's representative.
1. Parts replacement and system repair and site visits by factory representative, including time and travel expenses, shall be included.
2. Guarantee shall not cover damage due to normal wear and tear, acts of God, neglect, or improper use of equipment.
3. Required maintenance or replacement shall be provided by the Stage Rigging Contractor within thirty days of notification by the Owner except for safety related items, which shall be corrected within 48 hours of notification.
4. Coordinate with Owner's requirements for facility use.
5. Subsequent to the expiration of the guarantee period the Stage Rigging Contractor agrees to furnish repair and maintenance service, at the Owner's expense, within thirty days of request for such service.
6. Three signed copies of the above are required as a condition for final approval of the work.

B. At one year after the date of final acceptance, provide a comprehensive inspection of all installed systems and components. Make adjustments as may be required by normal wear and tear. Schedule inspection directly with the Owner at the Owner's convenience.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials shall conform to the following ASTM and ANSI standard specifications:
1. 36/A 36 M B – Standard Specification for Carbon Structural Steel.
2. 47/A 47/M B – Standard Specification for Ferritic Malleable Iron Castings.
3. 48/A 48/M B – Standard Specification for Gray Iron Castings.
4. A/120 B – Standard Specification for Black and Hot-dipped Zinc-coated Galvanized Steel Pipe for Ordinary Use.
5. F606-06 B18.2.1 and 2 - Standard Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets.

B. In order to establish minimum standards of safety, the following factors shall be used:
1. Cables and Fittings: 8:1 Design factor
2. Wire Rope Bending Ratio: Sheave tread diameter minimum 30 times that of the wire rope diameter
3. Textile Fabric Rope: Sheave tread diameter shall minimum 15 times the textile rope diameter.
4. Maximum Tread Pressures:
   a. 500 lb for cast iron.
   b. 900 lb for Nylatron or Polyamide Nylon (PA6-G).
   c. 1,000 lb for steel.
5. Maximum Fleet Angle: 1-1/2 degrees
6. Steel: 1/5 of yield
7. Bearings: Two times required load at full speed for 2000 hours
8. Bolts Minimum: SAE J429 Grade 5 (ISO R898 Class 8.8) Zinc plated
9. Motors: 1.25 Service Factor
10. Gearboxes: 1.25 Mechanical Strength Service Factor

C. Provide products that are new, unused, and of the latest design. Refurbished and obsolete materials are not permitted except where specifically required.

D. Machinery and Component Parts: Comply with applicable trade practice, industry standards, and code requirements and bear appropriate labels of conformity and acceptability.

E. Sheaves:
1. ASTM A 48 Class gray iron castings
2. Nylatron or Polyamide Nylon (PA6-G)
3. Steel
4. Groove Depth sufficient to fully encompass the cables and ropes. Grooves shall have sloped sides (8 degree minimum) and conform to rope and cable manufacturers' standards for groove shape and tolerance.
5. Sheaves for Lines of Varying Diameters: Grooved so all lines will have equal pitch diameters.

F. Support sheaves with bearings and machined steel shafts.

G. Key shafts side plate to prevent rotation.

H. Proper adjustment of the bearing shall be accomplished by means of a fine thread, self-locking nut on the opposite end of the shaft.
   1. Factory adjust shaft nut to bearing manufacturer's specifications.
   2. Each sheave shall run plumb and true without rubbing its side plates when rotated.
   3. Unless otherwise noted, pre-lubricate and seal bearings for life.
      a. For bearing types that cannot be sealed for life, provide easy means for periodic lubrications via standard and common fittings.
      b. Such lubrication shall not require the disassembly of blocks or other extraordinary means.

I. The mechanical fabrication and workmanship shall incorporate best practices for good fit and finish.
   1. There shall be no burrs or sharp edges to cause a hazard nor any sharp corners accessible to personnel.

J. Moving parts shall have specified tolerances. Sheaves shall run plumb and true and shall not scrape housings.

K. Build and install equipment to facilitate future maintenance and replacement.

L. Finishes:
   1. Paint equipment matte black except where noted.
   2. Do not paint aluminum guide tracks.
   3. Plate or paint turnbuckles, clips, tracks, chains, and incidental hardware items.

M. Materials and components required by the contract documents or by regulatory agencies to be flameproofed shall bear pertinent flameproofing certificates or UL labels.

N. Components shall bear labels identifying the manufacturer, model number, and serial number. Permanently attach labels and certificates in a conspicuous location.

O. Provide items necessary for a complete, operational, and safe system, including bolts, nuts, washers, fittings, anchors, supports, hinges, and other items as specified. Where not specified elsewhere in this Section, provide Grade 5 or better bolts.

2.02 MANUFACTURERS

A. Approved Equipment Manufacturers: Due to the highly specialized nature of theatrical rigging and related equipment, and safety requirements of equipment, fabricated theatrical rigging equipment, curtain tracks, stage draperies, and other components shall be manufactured and supplied by one or more of the following approved manufacturers:
   1. Stage Rigging Equipment:
      a. J. R. Clancy, Inc., Syracuse, New York 800-836-1885
      b. SECOA, Champlin, Minnesota 800-328-5519
      c. Texas Scenic, San Antonio, Texas 800-292-7490
      d. H & H Specialties Inc., South El Monte, California 818-575-0776
   2. Stage Curtain Tracks:

a. Automatic Devices Company, Allentown, PA 800-360-2321
b. H & H Specialties Inc., South El Monte, California 818-575-0776
c. Triple E Ltd., Kent TN., 16 3BW UK +44(0) 1959 570 333

3. Curtain Fabric:
a. Gerriets International, Allentown, NJ 800-369-3695
b. JB Martin Ltd.,Saint-Jean-Sur-Richeau, Quebec 800-363-9275
c. KM Fabrics, Greenville, SC 864-295-2550

2.03 BLOCKS

A. Loft Blocks:
1. Sheave: 8-1/2 inch outside diameter.
a. Equip sheave with a minimum 5/8 inch diameter machined steel shaft and two sealed, precision ball bearings.
2. Base Angles: Minimum 1-1/2 x 1-1/2 x 3/16 inch angle and of sufficient length to extend over and clip to the long side flange.
3. Block:
a. Furnish ach block with two appropriately sized steel angles or heavy duty clips (min 3/8 inch thick) installed to allow for the flange thickness of the supporting beams.
b. Clip angle or clip held in place by two minimum 1/2 inch diameter bolts and lock nuts.
4. Side Plates:
a. Minimum of 12-gauge steel, and shall fully enclose the sheave.
b. Bolt side plates to base angles.
c. Minimum seven 1/4 inch bolts with spacers between the side plates, four of which prevent cables from escaping the sheave grooves.
d. Spacers shall retain the sheave within the block in the event of shaft failure.
5. Block and associated mounting hardware shall have a recommended working load of at least 500 lbs.

B. Groove loft blocks for the number lift line or lines as required.

2.04 LABELS AND SIGNAGE

A. Signage and labels shall be pre-printed or machine lettered. Hand or "stick on" lettering is not permitted unless otherwise noted. Lettering shall be in a font without serifs.

B. Furnish and install a permanent sign in a conspicuous location visible from the lock rail or operating position stating "Stage Rigging Operation by Authorized Personnel Only" in minimum 1-1/2 inch high lettering.

C. Furnish and install system informational signs in conspicuous locations. The sign shall describe the following:
1. Rigging system safe working loads.
2. Name, address, and phone number of the Stage Rigging Contractor.
3. Name, address, and phone number of the counterweight rigging equipment manufacturer if different from the Stage Rigging Contractor.
4. Date of installation (month and year).
5. Notice regarding the necessity of periodic inspections.
6. Name of theater consultant.

2.05 WIRE ROPE

A. Wire rope shall be of domestic manufacture or of foreign manufacture with certifications that it meets all applicable US standards. Wire rope shall be impregnated with a dry lubricant. Secure rope ends to the standing line with heat shrink tube.

B. Do not use damaged or deformed cable. Install wire rope rigging to prevent abrasion of the wire rope against any part of the building construction or other equipment.

C. Lift lines shall be 7 x 19 preformed galvanized aircraft cable of right regular lay.

D. Employ thimbles of the proper size and compressed malleable copper oval sleeve fittings for wire rope connections as manufactured by National Telephone ("Nicopress").
   1. Select and install connections to develop the full tensile strength of the cable.
   2. Stage Rigging Contractor shall maintain and inspect all swaging equipment on a daily basis to ensure the integrity of swaged fittings.

E. Clips:
   1. Drop forged steel cable clips may be used only in specific locations as directed by this Specification, or in locations approved in writing.
   2. Clips shall meet or exceed Federal Specification FF-C-450 and shall produce a termination equal to at least 80 percent of the breaking strength of the wire rope.
   3. Saddles of the clips shall be in contact with the load end of the rope.
      a. One clip shall be tight against the thimble to retain the cable in the thimble.
      b. Quantity and separation of the clips shall be per the manufacturer's recommendation.

2.06 TRIM CHAINS

A. Trim chains for dead hung suspension shall be minimum 1/4 inch Grade 43 chain.

B. Shackle shall be screw pin type drop forged type, proof tested to not less than 2,000 lbs

C. One end of each chain shall be attached and captive to the stage end termination of each lift line.

D. Wrap chains one and one half turns around the batten and attach back to the thimble at the end of the lift line with a shackle. Mouse screw pins after installation with cable ties.

2.07 BATTENS

A. Pipe Battens:
   1. ASTM A53/A black steel pipe of weight and nominal diameter as indicated on the drawings.
   2. Clean and paint batten with at least one coat of black primer and one coat of flat black paint.
   3. Cover each end with a bright yellow, closed end, soft vinyl safety cap at least 4 inches in length.

B. Splices:
   1. Close fitting internal steel sleeves with a wall thickness of not less than 0.1875 inch, and min. 24 inches long.

2. One side of the splice shall be held in place with a minimum of two (2) plug welds or two (2) 5/16 inch bolts and lock nuts; bolts shall be placed at right angles.
3. Other side shall be held with a minimum of two (2) 5/16 inch bolts and lock nuts; bolts shall be placed at right angles.

2.08 STAGE LIGHTING PROTECTIVE CAGE

A. Cage shall be of size and form indicated on the drawings and shall be of a design and of sufficient size to permit use of lighting equipment specified elsewhere.

B. Cage shall be primed and painted to match ceiling beams or as directed by architect.

C. Cage shall be "Spotlight Cage" by SSRC, SECOA, or Chicago Spotlight or approved equal.

2.09 PIPE CLAMPS

A. Connect curtain tracks to the battens by "clamshell" type pipe clamps.

B. Pipe clamps shall be made of two strips of 12 Ga. by 2 inch hot rolled steel which are formed so that when installed they encompass and clamp the pipe batten to prevent rotation of the batten.

C. A 5/8 inch hole in the top of each clamp half allows the attachment of cable, chain, or other fittings.

D. Corners shall be rounded.

E. There shall be a 3/8 x 1 inch hex bolt with lock washer and hex nut above and below the batten to allow for easy demounting of the track from the batten.

2.10 BOX TRACK:

A. Heavy duty enclosed type, approximately 1 3/4 x 2 inch, 16-gauge steel formed to provide parallel double tracks for carrier wheels and totally enclosed except for bottom carrier slot.

B. Traveler track assemblies shall be free of burrs, dents and irregularities.

C. Each section of track less than 20 feet shall be in one continuous piece.

D. Splice clamps shall be permitted for section lengths over 20 feet.

E. Splice clamps shall provide positive alignment of sections with at least 2 lap clamps to join halves where required.

F. Single carriers to have two polyurethane wheels with ball bearings.

G. Single carriers to have single-plated swivels with 3 to 6 inch trim chains and rubber spacers.

H. Provide 5 percent spare single carriers.

I. Housings shall be firmly bolted to the track; pressure fitting not acceptable.

J. All track, carriers, clamps, ropes, chains, hangers, etc. except operating surfaces of pulleys and wheels shall be black.

K. Galvanized surfaces shall be degreased, pickled, and primed prior to painting.

L. The complete track assembly with all necessary parts shall be ADC 283R custom with painted steel track or Atlas Silk 418PB or Triple E Limited Unitrack.

2.11 BEAM TRACK

A. Track shall be extruded 7 gauge aluminum open "I" beam track with two intermediate flanges, approximately 3-1/4" high by 1-5/8" wide, for walk-along operation, finished anodized matte black.

B. End-stop by bolt through tracks with rubber or neoprene bumper sleeves each side of track. Furnish and install fittings and clamps for attachment to pipe batten spaced not more than 5 feet 0 inches on center.

C. Provide special lateral bracing for curved track sections to prevent sway when moving curtains.

D. Verify and indicate in shop drawings the stacking space requirements and weights of all curtains.

E. Carriers shall be U-shaped steel carrier; two nylon wheels with ball bearings; rubber bumpers.

F. Plated swivel for curtain snap-hooks.

G. Provide sufficient carriers for curtains on sets plus 5 percent spares. All carriers finished black except wearing surfaces on wheels and axles.

2.12 STAGE CURTAINS

A. Materials shall be treated to be flame retardant or shall be inherently flame retardant and shall be tested in accordance with NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films 2004 Edition.
   1. Certification label shall be sewn on back of each curtain at bottom of stage hem, off stage or, for side masking, upstage.
   2. Provide certificates as required under submittals.

B. Produce fabrics from one dye lot per color. Color quality shall be consistent throughout, with no visible streaking, striping, or spotting.

C. Attach by sewing at webbing to rear of each piece sufficient material samples for a minimum of four tests per 2004 NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

D. Velour Drapery.
   1. Curtains shall be of quantities, sizes, fullness, and side hems per the schedule and drawings. Sizes are nominal maximums.
   2. All pile fabrics shall have pile running up. All fabric shall run full height with no horizontal seams. Thread colors shall match face colors. Thread shall conform to

shrinkage characteristics and composition of fabric. Reinforce top hems with 3-1/2" jute or nylon webbing. Install black grommets on webbing at pleats and at ends of all curtain pieces. Provide 6" double-turned hem at bottom with separate heavy canvas chain sleeve with galvanized or plated No. 6 jack chain in separate sleeve and held 4" above bottom of curtain on all velour drapery.

E. Drapery shall be fabricated of 24.1 oz 100 percent Polyester IFR Velour in standard color, KM Prestige or equal.

2.13 SKY DROP

A. Furnish and install skydrops per schedule. Material shall be Procyc Opera by Gerriets or Twin White by Rosco. All seams shall be ultrasonically welded flat, without wrinkles or stress lines for a seamless appearance. Top finish shall be 2-½" wide webbing with grommets ultrasonically welded on 12" centers. Side finish shall be reinforced with 2-½" webbing welded to screen surface with grommets ultrasonically welded on 12" centers. Bottom finish shall accommodate a 1" steel pipe batten with a 9" skirt welded onto face of drop. Provide pipe in pocket. Provide batten with sleeved joints. Drop must appear seamless, uniform in color, and free of wrinkles or seam lines.

2.14 FABRICATION

A. This Stage Rigging Contractor is responsible for becoming familiar with and verifying all pertinent dimensions and conditions, both in the Drawings and in the field, before proceeding with any work.

B. All electrical components shall be fully assembled and internally wired, with terminals of the proper rating and clearly labeled, provided for external feeder and control wiring.

C. All metal fabricated items shall be given at least one coat of primer and one coat of finish paint. Color: Flat black.

D. Where not specifically called out in the drawings and specifications, tracks and fittings shall be painted or anodized black.

E. Fabricate and install equipment to facilitate maintenance and future replacement.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Provide notification to Architect/Engineer of any conditions, measurements, quantities, or other data, required for proper execution, fit and completion of all work, and for safe and proper operating clearances.

3.02 INSTALLATION

A. Examine existing conditions at the jobsite prior to beginning installation.

B. Provide protection for all stage flooring, regardless of whether flooring has been stained or sealed. Flooring shall be protected from both structural damage and cosmetic damage.

C. The Stage Rigging Contractor shall be responsible for storage of stage equipment, tools, and equipment during the period of the installation.

D. Specified equipment shall be installed by fully trained superintendents and workmen.
   1. A change of supervisor shall not be acceptable unless by written authorization of the Architect.
   2. Equipment shall be installed in a workmanlike manner, per plans and specifications and per the manufacturer's recommendations.
   3. Equipment shall be aligned, adjusted, and trimmed for the most efficient operation, the greatest safety and for the best visual appearance.

E. Installation practices shall be in accordance with OSHA Safety and Health Standards and all local codes. All welding must be performed in full compliance with the latest edition of the Structural Welding Code (ANSI/AWS D1.1).

F. Coordinate installation with all other trades doing adjoining work. Advise and provide coordination as required in the installation of other electrical equipment related to the work of this section.

G. Provide and install supplementary structural support as required for the installation and safe operation of equipment and materials supplied under this section.

H. Do required cutting, drilling, tapping, and welding necessary for proper installation. Cut no structural members unless specifically shown in the drawings or indicated in the contractor's shop drawings, or unless written approval is obtained from the Architect.

I. Turnbuckles and screw pin shackles shall be wired shut after adjustment.

J. Do not install curtains until construction and painting are complete and the building has been cleaned. Store curtains delivered to the job site prior to their installation in a clean area in dustproof bags.

K. Where equipment bears the label of a nationally recognized testing laboratory (e.g.: UL) such labels shall be visible and unpainted.

L. Mule blocks, cable rollers and guides shall be installed, as required, to provide proper alignment, to maintain specified fleet angles, and to prevent contact with other surfaces.

M. Securely attach equipment to the building structure.

N. Fabricate and install operating equipment to minimize operating noise levels for live performances.

O. Finishes:
   1. Touch up welds to match disturbed finishes.
   2. Finishes which are disturbed during shipping and installation shall be touched up to match the original.
   3. Hand-touchable and people-level items shall be smooth without sharp corners or edges.

3.03 CLEAN UP

A. The Stage Rigging Contractor shall be responsible for clean up, including removal of packing materials etc. and the protection of surfaces or equipment provided by other contractors.

3.04 INSPECTION AND TESTING

A. During the installation of equipment the Stage Rigging Contractor shall arrange for access as necessary for inspection of equipment by the Architect or their consultants.

B. On completion of installation and testing the Stage Rigging Contractor shall conduct a complete pre-test of the system to ensure it is working properly and in conformance with this specification. This shall include a complete test of all electrical systems and components. All tests shall be conducted as if the Architect or Consultant were present and appropriate corrections made before the final inspection.

C. If specifications, the Architect's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Stage Rigging Contractor shall give the Architect timely notice of its readiness for inspection, and of dates of inspections to be made by other authorities.

D. Any equipment, which is not in conformance with the plans and specifications, shall be repaired or replaced with suitable equipment. Should deficiencies due to faulty equipment or installation require a second review; such second review will be scheduled under the same conditions as previously specified. All additional expenses resulting from a second review, including time and travel of the Architect and their consultants shall be the paid by the Stage Rigging Contractor.

E. Upon completion of all installation work, the Stage Rigging Contractor shall notify the Architect that the work is complete and ready for final review.
   1. Final inspection shall be conducted by the Stage Rigging Contractor's ETCP Certified Rigger, in the presence of the Architect or their consultant and shall include the following:
      a. At the time of the review, the Stage Rigging Contractor shall furnish sufficient workers to operate all equipment and to perform such adjustments and tests as may be required by the Architect or their consultant.
      b. The Stage Rigging Contractor's ETCP Certified Rigger shall be present for this review. At the time of these inspections, no other work shall be performed in the auditorium and stage areas.
      c. Remove temporary bracing, scaffolding, etc. to permit full operation of, and access to, all equipment.
      d. Final acceptance will be withheld until all systems have been thoroughly tested and found to be in first class operating condition in every particular.

3.05 DEMONSTRATION AND SAFETY CLASS

A. Stage Rigging Contractor's representative shall provide a rigging operation and safety class to instruct Owner's designated staff or representatives in the safe operation, and maintenance of all items, including the storage and cleaning of all fabrics, and recommended practice for the rigging logs. Class shall be of sufficient time to adequately cover the work. While it may be possible to schedule the class to coincide with the system checkout, such coincidence should not be assumed.

END OF SECTION

SECTION 15950

BUILDING AUTOMATION SYSTEM (BAS) GENERAL

PART 1. PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General Requirements

B. Description of Work

C. Quality Assurance

D. System Architecture

E. Distributed Processing Units/Quantity and Location

F. Demolition and Reuse of Existing Materials and Equipment

G. Sequence of Work

1.2 RELATED DOCUMENTS

A. Division 1

B. Division 15

C. Division 16

1.3 DESCRIPTION OF WORK

A. The distributed digital control (DDC) and building automation system (BAS) defined in this specification shall furnish and install a complete LONMARK® OR Native BACnet®Building Automation System (BAS) for all mechanical systems and other facility systems as included in the project documents. The contractor shall provide a complete and operational system to perform all sequences of operations stated in the Sequence of Operation Section or shown on the control drawings.

B. The BAS shall utilize electronic sensing, microprocessor-based digital control, and electronic actuation of dampers and valves to perform control sequences and functions specified. The BAS for this project will generally consist of monitoring and control of systems listed below. Also reference the control drawings, the sequences of operation, and the points list.

C. The BAS system will include a webserver (control system server CSS), a separate operator work station (OWS), a laptop (portable operator terminal POT), all the software tools required to maintain or configure the server, OWS and any local devices.

D. This Section defines the manner and method by which these controls function.

E. All interlock wiring for mechanical system equipment shall be by this contractor unless specifically stated otherwise. This shall include (but not be limited to) items such as thermostats for unit heaters, interlock wiring to central boiler control panels, chiller flow switches, duct smoke detectors etc.

1.4 APPLICATION OF OPEN PROTOCOLS

A. Subject to the detailed requirements provided throughout the specifications, the BAS and digital control and communications components installed, as work of this contract shall be an integrated distributed processing system utilizing the following standards:

B. BACnet: System components shall communicate using native BACnet in accordance with ASHRAE Standard 135 and current addenda and annexes, including all workstations, all BACnet building controllers (B-BC), advanced application controllers (B-AAC) and all application specific controllers (B-ASC). Gateways to other communication protocols are not acceptable. All controllers must be BACnet Testing Labs listed for their required profile (B-BC, B-AAC or B-ASC) .

OR

C. LonTalk: Provide control products and systems that comply with the latest version of the ANSI/EIA standard 709.1 and the LonTalk protocol of the Interoperability Standards as published by the LONMARK™ Association. All architectures involving tunneling the LonTalk protocol across an IP network must incorporate ISO Layer 3 transparent routing.

D. Throughout these specifications, there are parallel requirements for BACnet or LonWorks systems. Such requirements shall be interpreted in light of whether the contractor is installing a BACnet, LonWorks, or hybrid system.

1.5 QUALITY ASSURANCE

A. **Contractor Qualifications**: The following contractors have been ratified in previous Board of Education's qualification processes and have been active as part of those qualification. Inclusion on this list does not guarantee acceptance of products or installation. Control systems shall comply with the terms of this specification. All the BAS system provided by the Contractor shall be web based and shall meet all the requirements stated in the specifications

- Automatic Building Control, Inc
  1580 N. Northwest Highway
  Park Ridge, IL 60068
  Contact: Mark Bevil
  (847)-296-4000
  Vendor # 22627

- Control Engineering Corp.
  2000 York Rd, Ste 102
  Oakbrook, IL 60523
  Contact: Dave G. Dickerson

(630)-954-1300
Vendor #23101

- Environmental Systems, Inc.
  W223 N603 Saratoga Drive.
  Waukesha, WI 53186
  Contact: Paul Oswald
  (262) 544-8860
  Vendor #95503

- Johnson Controls, Inc..
  3007 Malmo Drive
  Arlington Heights, IL 60005
  Contact: Nick Hecimovich
  (847)-364-1500
  Vendor #11409

- Siemens Building Technologies Inc.
  1000 Deerfield Parkway
  Buffalo Grove, IL 60089
  Contact: Mark Sheehan
  (847)-493-7863
  Vendor #14664

- Automated Logic
  811 Ogden Ave.
  Lisle, IL 60
  Contact: George Biskup
  (630) 852-1700
  Vendor #35461

1.6 CODES AND STANDARDS

A. The following codes and standard intended to apply as applicable as not all will apply to all installations

B. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standards:

1. 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings
2. 62.1 Ventilation for Acceptable Indoor Air Quality
3. 135: BACnet - A Data Communication Protocol for Building Automation and Control Networks. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. current version including all annexes and addenda.
4. 55 Thermal Environmental Conditions for Human Occupancy

C. Electronics Industries Alliance

1. EIA-709.1-A-99: Control Network Protocol Specification
2. EIA-709.3-99: Free-Topology Twisted-Pair Channel Specification
3. EIA-232: Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange.
4. EIA-458: Standard Optical Fiber Material Classes and Preferred Sizes
5. EIA-485: Standard for Electrical Characteristics of Generator and Receivers for use in Balanced Digital Multipoint Systems.
6. EIA-472: General and Sectional Specifications for Fiber Optic Cable
7. EIA-475: Generic and Sectional Specifications for Fiber Optic Connectors and all Sectional Specifications
8. EIA-573: Generic and Sectional Specifications for Field Portable Polishing Device for Preparation Optical Fiber and all Sectional Specifications
9. EIA-590: Standard for Physical Location and Protection of Below-Ground Fiber Optic Cable Plant and all Sectional Specifications
10. EIA-852: Tunneling of Component Network Data over IP Channels

D. Underwriters Laboratories

1. UL 916: Energy Management Systems.

E. NEMA Compliance

1. NEMA 250: Enclosure for Electrical Equipment
2. NEMA ICS 1: General Standards for Industrial Controls.

F. NFPA Compliance

1. NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.
2. NFPA 70 National Electrical Code (NEC)

G. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE 142: Recommended Practice for Grounding of Industrial and Commercial Power Systems
2. IEEE 802.3: CSMA/CD (Ethernet – Based) LAN
3. IEEE 802.4: Token Bus Working Group (ARCNET – Based) LAN

1.7 DEFINITIONS

A. **Acknowledged**: The data is broadcast repeatedly until an acknowledgement is received. This type of service should be used for critical data using one to one bindings only. This type of service shall not be used for one to many bindings.

B. **Adjustable (Adj):** A characteristic of a control logic parameter such that it can be varied by the operator without downloading the program. See also initial value.

C. **Analog Calibration Offsets**: For all analog input measured variables with the exception of velocity pressure, there is a requirement to adjust the value measured by the hardware based analog input point to match the value reported by a certified test instrument. An analog calibration offset is a parameter that can be added or subtracted from the raw value measured by the sensor to produce a calibrated value

that will be use by the control logic and reported to the operator workstations. The initial value of this parameter is set at zero and it is adjusted when the calibration process is executed. This adjustment is referred to as a single point calibration. These parameters are mandatory for all analog inputs except velocity pressure sensors (requirements for velocity pressure sensors are presented elsewhere). These offset values are configuration parameters and as such shall be written to EEPROM. It shall be possible to change the value of these parameters from a graphic page.

D. **Advanced Application Controller (AAC):** A device with limited resources relative to the Building Controller (BC). It may support a level of programming and may also be intended for application specific applications. A fully programmable control module. This control module may be capable of some of the advanced features found in Building Controllers (storing trends, initiating read and write requests, etc.) but it does not serve as a master controller. Advanced Application Controllers may reside on either the Ethernet/IP backbone or on a subnet. A BACnet device to be used as an AAC will meet the requirements of ASHRAE 135 Annex L and will be listed as an AAC by BACnet Testing LABs. A BTL listed device will carry the BTL Mark

E. **Application Programming Tool**: A vendor unique software tool used to create applications for programmable controllers.

F. **Application Protocol Data Unit (APDU)**:A unit of data specified in an application protocol and consisting of application protocol control information and possible application user data (ISO 9545).

G. **Application Specific Controller (ASC):** A device with limited resources relative to the Advanced Application Controller (AAC). It may support a level of programming and may also be intended for application-specific applications. An ACS is a pre-programmed control module, which is intended for use in a specific application. ASCs may be configurable, in that the user can choose between various pre-programmed options, but it does not support full custom programming. ASCs are often used on terminal equipment such as VAV boxes or fan coil units. In many vendors' architectures ASCs do not store trends or schedules but instead rely upon a Building Controller to provide those functions. A BACnet device to be used as an ASC will meet the requirements of ASHRAE 135 Annex L and will be listed as an ASC by BACnet Testing LABs. A BTL listed device will carry the BTL Mark.

H. **BACnet/BACnet Standard**: BACnet communication requirements as defined by ASHRAE/ANSI 135 current version including all annexes and addenda.

I. **Bandwidth Utilization**: The average utilization of the network capacity. . Network loading is controlled by the use of event driven broadcast based data propagation and the use of appropriate binding services.

J. **Binding Services**: When the network management tool within Niagara or Plexus is used to establish a binding, the programmer selects one of three types of binding services:

a) Unacknowledged: The data being broadcast is sent one time and an acknowledgement of receipt is not required. This type of service shall be used for non-critical data where there is no significant impact should the receiving device have to wait for the next broadcast.

b) Unacknowledged Repeated: The data being broadcast is sent three times and an acknowledgement of receipt is not required. This type of service shall be used for most process control related data requiring timely receipt of the data.

c) Acknowledged: The data is broadcast repeatedly until an acknowledgement is received. This type of service should be used for critical data using one to one bindings only. This type of service shall not be used for one to many bindings.

K. **Binding**: The concept of associating an output network variable from one device to the input network variable of a second device. There are three types of bindings:

a) One to One: A single output network variable is bound to a single input network variable

b) One to Many: A single output network variable is bound to input network variables on multiple devices.

c) Many to One: Output network variables from multiple devices are bound to a single input network variable on a different device.

L. **Broadcasting**: The propagation of data from a device to the control network. Software objects that broadcast data to the network shall include the following parameters:

M. **Building Automation System (BAS)**: The entire integrated energy management and control system

N. **Building Controller (BC)**: A fully programmable control module which is capable of storing trends and schedules, serving as a router to devices on a subnet, and initiating read and write requests to other controllers. Typically this controller is located on the Ethernet/IP backbone of the BAS. In many vendors' architectures a Building Controller will serve as a master controller, storing schedules and trends for controllers on a subnet underneath the Building Controller. A BACnet device to be used as a BC will meet the requirements of ASHRAE 135 Annex L and will be listed as a BC by BACnet Testing LABs. A BTL listed device will carry the BTL Mark

O. **Bus Topology**: A term used to describe the sequential connection of devices on a LON segment. The communication cable runs from device to device with no tees or stubs from the main communication cable to a device.

P. **Change of Value (COV)**: An event that occurs when a measured or calculated analog value changes by a predefined amount (ASHRAE/ANSI 135-1995).

Q. **Channel**: A LON network consisting of two segments connected by a physical layer repeater or router configured as a repeater. Each segment can support a theoretical limit of 64 connections.

R. **Client:** A device that is the requestor of services from a server. A client device makes requests of and receives responses from a server device.

S. **Configuration Parameter**: An input network variable to a controller (nci) that is written to the EEPROM. Configuration parameters can be changed periodically from the HMI but are not changed routinely as a function of control logic.

T. **Connection**: A connection is made when a device is physically connected to the FTT-10 communication cable. Devices that count against the number of connections limit include LON Talk Adapters (PCLTA, PCC 10 etc.), any sensor, actuator or controller with a FTT-10 transceiver and Neuron chip and a router or repeater. Terminators are not considered to be a connection.

U. **Continuous Monitoring**: A sampling and recording of a variable based on time or change of state (e.g. trending an analog value, monitoring a binary change of state)

V. **Control System Server,Web Server (WS)**: A device that is provides access to the control system. This device will allow access to the control system with a web browser over the CPS WAN. As the BAS network devices are stand-alone, the CSS is not required for communications to occur. The webserver will have two NIC cards so that is functions as the bridge between the local supervisory LAN and the CPS LAN.

W. **Controller or Control Unit (CU)**: Intelligent stand-alone control panel. Controller is a generic reference and is a PCU.

X. **CPS WAN:** Reference to Chicago Public Schools Information Technology network, used for normal business-related e-mail and Internet communication.

Y. **Direct Digital Control (DDC)**: Microprocessor-based control including Analog/Digital conversion and program logic

Z. **Enumerated SNVT**: An enumerated SNVT defines the format of a single piece of data using a state description concept. The data will consist of a series of integers and each integer shall convey a defined condition or state. The list of available enumerated SNVT types is defined in the LonMark Standard Enumeration Master List, dated May 2002. This document is available on the Echelon.com web site.

AA. **Error Rate**: A measurement of communication quality that assesses the number of defective data packets as a percentage of the total number of data packets. Defective data packets are generally the result of poor installation practices or improper cable selection.

BB. **Event Driven Communication**: A term used to describe the propagation of data from a device to the network based on broadcasting rather than polling. The send on delta parameter is used to define the event and the data propagation is further controlled by the minimum and maximum send time parameters.

CC. **Free Topology**: A data wiring topology that allows for loops, tees, y-connections etc. When this topology is used only one terminator of a specific design is required and allowable cable lengths are significantly reduced.

DD. **Functional Profile:** A collection of variables required to define a the key parameters for a standard application. As this applies to the HVAC industry, this would include applications like VAV terminal, fan coil units, and the like.

EE. **Gateway (GTWY)**: A device, which contains two or more dissimilar networks/protocols, permitting information exchange between them (ASHRAE/ANSI 135-1995).

FF. **Hand Held Device (HHD)**: Manufacturer's microprocessor based device for direct connection to a Controller.

GG. **Host-Based Controller**: A term applicable only to Lon-based controllers where the on-board Neuron chip is used solely as the Communications Interface and a processor independent from the Neuron chip to is used to execute Application control and I/O processes.

HH. **JACE**: Java Control Engine. A term used within the Niagara Framework to describe a component that serves several key functions:

- Serve as the LANID
- Collection of data from a FTT-10 LonTalk channel
- Transmission of data to operator workstations on the TCP/IP network
- Location for time schedules to support all of the devices on the LonTalk channel
- Support for 1 LonTalk channel (two segments, 40 nodes each)
- Location for trend logs for all data to be trended from the devices on the LonTalk channel
- Location for alarm handling software. The JACE shall process event broadcasted data from the devices (alarm indication) and enter the appropriate alarm information in the alarm reporting system at the TCP/IP level.

II. **Local Supervisory LAN Interface Device (LANID)**: Device used to facilitate communication and sharing of data throughout the BAS and CPS WAN

JJ. **LonMark Profile**: To enhance interchangeability of control components at the sensor, actuator, terminal unit controller and package equipment controller level, the LonMark Association has created profiles that define the network image for these devices. These profiles define mandatory input and output variables and configuration parameters and a required format for each. Conformance to a LonMark profile provides to the facility owner the opportunity to replace a control component manufactured by one vendor with a similar component manufactured by a different vendor provided the embedded application of the replacement controller meets the sequence of control requirements.

KK. **Media Access Control address (MAC)** , a hardware address that uniquely identifies each node of a network.. Each different type of network medium requires a different MAC layer.

LL. **Managed Communication**: The transmission of data from a controller to a data manager, which in turn re-broadcasts the data to a second controller. In some systems the data manager is referred to a Network Controller.

MM. **Manual Control**: A concept where the operator from the operator workstation takes control of an end device and forces a specific position or state. From a software perspective, the value produced by the control logic is not allowed to affect the position or state of the end device. The manual mode and the desired manual position or states are parameters that are set by the operator.

NN. **Many to One**: Output network variables from multiple devices are bound to a single input network variable on a different device.

OO. **Maximum Send Time Parameter**: A parameter used to ensure the periodic update of network data. If a time period equal to the value of this parameter has expired without a broadcast of the variable, a re-broadcast of the current value shall be executed. See also send on delta and maximum send time parameter definitions.

PP. **Maximum Send Time**: An adjustable parameter that defines the maximum time period between broadcasts of a software object's data to the network. Should the value of a software object remain constant over an extended period of time, the value will be rebroadcast once every maximum time period.

QQ. **Minimum Send Time Parameter**: A parameter used to control unnecessary broadcasting of data onto the network. A broadcast of an updated value shall not occur unless a time period equal to the value of this parameter has expired. The expiration of the time period does not mandate a re-broadcast. See also send on delta and maximum send time parameter definitions.

RR. **Minimum Send Time**: An adjustable parameter that defines a mandatory time period during which no broadcasting of data will occur. Once this time period has been exceeded without a broadcast, the send on delta parameter or the maximum send time parameter shall determine when a broadcast is initiated.

SS. **Multiple Controller Integrated Control (MCIC)**: A concept where multiple controllers with I/O are used to control a single mechanical system such as an air handling unit. Under this concept the mechanical system is sub-divided into a collection of processes to be controlled such as the fan start stop circuit, the fan variable speed drive, the mixed air section, the cooling coil section etc. With this concept all primary measured variables and the end device associated with a single process along with the primary control logic for the process shall be contained within a single controller. Secondary data from one process that affects the control of another process may be sent from one controller to the primary controller controlling the process. When data is sent from one controller to another controller, broadcasting concepts as defined above must be used. If the data being received over the network only affects the general thermodynamic or psychometric performance of the process but does not have a significant affect on safety or equipment protection then unacknowledged repeated binding services shall be used. If the data being received over the network does have a safety or equipment protection impact, then acknowledged repeated binding services shall be used. In both cases peer to peer communication is mandatory. All of the controllers must be on the same channel. Managed communication shall not be used to move data between the multiple controllers.

TT. **One to Many**: A single output network variable is bound to input network variables on multiple devices.

UU. **One to One**: A single output network variable is bound to a single input network variable

VV. **Open Database Connectivity (ODBC)**: An open standard application-programming interface (API) for accessing a database developed. ODBC compliant systems make

it possible to access any data from any application, regardless of which database management system (DBMS) is handling the data.

WW. **Operator Interface (OI)**: A device used by the operator to manage the BAS including OWSs, and POTs,.

XX. **Operator Workstation (OWS)**: The user's interface with the BAS system via the internet or the Local Supervisory LAN. As the BAS network devices are stand-alone, the OWS is not required for communications to occur.

YY. **Peer to Peer Communication**: Data is broadcast from its origin and is received by the final device requiring the data without being received and retransmitted by a third device.

ZZ. **Polling Communication**: The concept of a control device requesting a network variable from a second control device at a specified interval. Polling communication is typically used to populate dynamic data on an active graphic page and for temporary or short term trending of data where the trend data is not stored at the controller level.

AAA. **Portable Operators Terminal (POT):** Laptop PC used both for direct connection to a controller and for remote dial up connection.

BBB. **Primary Control Unit (PCU)**: A fully programmable device capable of carrying out a number of tasks including control and monitoring via direct digital control (DDC) of specific systems.

CCC. **PICS - Protocol Implementation Conformance Statement (PICS):** A written document, created by the manufacturer of a device, which identifies the particular options specified by BACnet that are implemented in the device.

DDD. **Repeater**: A physical device used to connect two segments. A repeater does not filter any message traffic. A repeater does isolate physical problems such as short circuits to a single segment and is typically required to allow the use of additional devices or additional cable length.

EEE. **Router**: A device that connects two or more networks at the network layer.

FFF. **Segment**: A single section of a LON network that contains no routers or repeaters.

GGG. **Send on Delta Parameter**: A parameter used to control unnecessary broadcasting of data onto the network. A broadcast of an output variable shall not occur unless the output variable has changed by an amount equal to or greater than the value of this parameter and the minimum send time has expired since the last broadcast. See also minimum send time and maximum send time parameter definitions. For binary data the send on delta parameter is assumed to be a change of state. Logic to support the send on delta concept may be imbedded in the configurable structure of an output point or programmed as part of the logic.

HHH. **Send on Delta**: An adjustable parameter that defines a requirement to broadcast when the data generated by the software object changes by an amount that exceeds this parameter's value. For binary data this parameters defaults to a change of state.

The broadcast of data is initiated when this criteria and the minimum send time requirement have been met.

III. **Simple SNVT**: A simple SNVT defines the format of a single piece of data. The definition of a simple SNVT in the master list of SNVTs will include the type of variable being measured (temperature, electric current, power etc.), the data type (signed integer, unsigned integer, floating point etc.), the data range, the resolution of the data and the engineering units.

JJJ. **Smart Device**: A control I/O device such as a smart sensor (SS) or smart actuator (SA) that can directly communicate with the controller network to which it is connected rather than through a binary or analog signal. This differs from an PCU in that it typically deals only with one variable.

KKK. **SNVT**: An acronym for STANDARD NETWORK VARIABLE TYPE. A SNVT is a data format statement for implicit (open) communication on a LonTalk network. The current master list of SNVTs is available from Echelon.com in a document defined as SNVT Master List, Version 11, Revision 2, dated May 2002.

LLL. **SQL**: Standardized Query Language, a standardized means for requesting information from a database.

MMM. **Stand-Alone Controller**: A stand alone controller has provisions for all of the physical inputs and physical outputs associated with a single mechanical component such as a terminal unit, air handling unit, chiller or boiler. The controller shall also have embedded in it all of the control logic that associated the physical inputs to the physical outputs. A stand-alone controller may rely on other networked devices for time schedule inputs and trend data storage.

NNN. **Structured SNVT**: A structured SNVT defines the format of a network variable that contains several different data elements. A simple SNVT or an enumerated SNVT may define each data element within a structured SNVT.

OOO. **Supervisory Logic**: The concept of gathering performance data from multiple terminal units to determine if a specific condition exists within the family of terminal devices. Examples: Are any of the VAV terminals supported by a particular AHU operating the reheat processes? Is there an indication from any of the control zones that an occupant has requested the temporary operation of the air delivery system?

PPP. **Terminator**: An electronic component that consists of a resistive and capacitive circuit specifically designed to enhance the quality of communications on a segment. On a bus topology, a terminator is connected to each end of a segment. For a channel consisting of two bus topology segments, a total of 4 terminators are required, one at each end of each segment.

QQQ. **Test Mode**: A concept where the operator from the operator work-station can interrupt the flow of data from a sensor to the control logic and insert a mandatory test value or test state to be used by the control logic. The test mode and the desired test value or states are parameters that are set by the operator.

RRR. **Unacknowledged Repeated**: The data being broadcast is sent three times and an acknowledgement of receipt is not required. This type of service shall be used for most process control related data requiring timely receipt of the data.

SSS. **Unacknowledged**: The data being broadcast is sent one time and an acknowledgement of receipt is not required. This type of service shall be used for non-critical data where there is no significant impact should the receiving device have to wait for the next broadcast.

TTT. **Web Server** See Control System Server

UUU. **XIF File**: A file indicating the interface specifications for LonMark devices.

VVV. **XML (Extensible Markup Language)**: A specification developed by the World Wide Web Consortium. XML is a pared-down version of SGML, designed especially for Web documents. It allows designers to create their own customized tags, enabling the definition, transmission, validation, and interpretation of data between applications and between organizations.

1.8 FUNCTIONAL INTENT

A. Throughout Division 15 Sections detailed requirements are specified, some of which indicate a means, method or configuration acceptable to meet that requirement. Contractor may submit products that utilize alternate means, methods, and configurations that meet the functional intent. However these products must be submitted and approved by CPS in accordance with Division 1..

1.9 SUBMITTALS

A. Submit under provisions of Conditions of the Contract and Division 1 Specification Sections.

B. **Electronic Submittals**: While all requirements for hard copy submittal apply, control submittals and O&M information shall also be provided in electronic format as follows.

1. **Drawings and Diagrams**: Shop drawings shall be provided on electronic media as an AutoCAD 2000 or later version drawing file and/or Adobe Portable Document Format file. All 'x reference' and font files must be provided with AutoCAD files.
2. **Other Submittals**: All other submittals shall be provided in Adobe Portable Document Format. There are a few documents including the Cheat Sheets, Trouble Shooting Guide and Sequence of operation that will also be submitted in rich text format or MS Word.

C. **Product Line Demonstrated History**: The product line being proposed for the project must have an installed history of demonstrated satisfactory operation for a length of 1 year since date of final completion in at least 10 installations of comparative size and complexity. Submittals shall document this requirement with references.

D. **Qualifications**: Manufacturer, Contractor and Key personnel qualifications as indicated for the appropriate item above.

E. **Product Data**: Submit manufacturer's technical product data for each control device, panel, and accessory furnished, indicating dimensions, capacities,

performance and electrical characteristics, and material finishes. Also include installation and start-up instructions. When manufacturer's cutsheets apply to a product series rather than a specific product, clearly indicate applicable data by highlighting or by other meansGeneral catalogs shall not be accepted as cutsheets to fulfill submittal requirements.

F. **Shop Drawings:** Submit shop drawings for each control system, including a complete drawing for each air handling unit, system, pump, device, etc. with all point descriptors, addresses and point names indicated. Each shop drawing shall contain the following information:

1. System Architecture and System Layout:
   a) One-line diagram indicating schematic locations of all control units, workstations, LAN interface devices, gateways, etc. Indicate network number, device ID, address, device instance, MAC address, drawing reference number, and controller type for each control unit. Indicate media, protocol, baud rate, and type of each LAN. For LonTalk systems indicate all LonTalk nodes, including Neuron ID and domain, sub-network and channel addresses. Indicate media, protocol, baud rate, and type of each LAN. All optical isolators, repeaters, end-of-line resistors, junctions, terminators, ground locations etc. shall be located on the diagram.
   b) Provide floor plans locating all control units, workstations, servers, LAN interface devices, gateways, etc. Include all WAN and LAN communication wiring routing, power wiring, power originating sources, and low voltage power wiring. Indicate network number, device ID, address, device instance, MAC address, drawing reference number, and controller type for each control unit. Indicate media, protocol, baud rate, and type of each LAN. For LonTalk systems provide as-built network architecture drawings showing all LonTalk nodes, including Neuron ID and domain, sub-network and channel addresses. All optical isolators, repeaters, end-of-line resistors, junctions, ground locations etc. shall be located on the floor plans. Wiring routing as-built conditions shall be maintained accurately throughout the construction period and the drawing shall be updated to accurately reflect accurate, actual installed conditions.
2. Schematic flow diagram of each air and water system showing fans, coils, dampers, valves, pumps, heat exchange equipment and control devices. Include contractor written description of sequence of operation.
3. All physical points on the schematic flow diagram shall be indicated with names, descriptors, and point addresses identified as listed in the point summary table.
4. With each schematic, provide a point summary table listing building number and abbreviation, system type, equipment type, full point name, point description, Ethernet backbone network number, network number, device ID, object ID (object type, instance number). See Division 15 Section BAS Software and Programing - Part III for additional requirements.
5. Label each control device with setting.
6. Label each input and output with the appropriate range.
7. Provide a Bill of Materials with each schematic. Indicate device identification to match schematic and actual field labeling, quantity, actual product ordering

number, manufacturer, description, size, voltage range, pressure range, temperature range, etc. as applicable. Also identify the spec section and spec reference.

8. Provide a valve or damper and the associated actuator information including size, Cv, design flow, design pressure drop, manufacturer, model number, close off rating, etc. Indicate normal (fail) positions of spring return valves and dampers. This is the valve or damper position with no power to the actuator.
9. Indicate all required electrical wiring. Electrical wiring diagrams shall include both ladder logic type diagram for motor starter, boiler burner, chiller, RTU, control, and safety circuits and detailed digital interface panel point termination diagrams with all wire numbers and terminal block numbers identified. Provide panel termination drawings on separate drawings. Ladder diagrams shall appear on system schematic. Clearly differentiate between portions of wiring, which are existing, factory-installed and portions to be field-installed. For all devices with safety circuits, incuding burners and chillers, field wiring will be labeled and all added devices will be properly mounted. Any internal wiring changes shall be approved by the manuafacturer in writing. If for example a gas booster needs to be tied into the burner circuit the manaufacturer shall identify the terminal points and provide an updated control diagram.
10. Sample Operator Interface Graphic Screens for each unique type of system, with final screens to be received 60 days prior to system startup.
11. Details of control panels, including controls, instruments, and labeling shown in plan or elevation indicating the installed locations.
12. Sheets shall be consecutively numbered.
13. Each sheet shall have a title indicating the type of information included and the HVAC system controlled.
14. Table of Contents listing sheet titles and sheet numbers.
15. Legend and list of abbreviations.
16. Provide an operating schedule for review. The schedule will have a schedule for each AHU/RTU and the associated equipment. Terminal units serving the principals office and associated administrative areas will have a separate schedule from the classrooms.

G. Checkout and Testing Forms

Submit a blank copy of the forms that will be used during Point-to-Point Checkout, Prefunctional Checkout, and Functional Performance Testing as outlined in Division 15 Section BAS Commissioning. Those forms should be structured to capture the following information at a minimum during each particular testing phase:

1. Point-to-Point Checkout Form contain the following information
   a) Each point is addressed, labeled and that proper communication exists between the controller and the field device.
   b) Documents that installed condition match the control drawings and that any changes or differences are noted on the drawings.
2. Prefunctional Checkout Forms contain the following information

a) Documents correct voltage and or current present as well as verifying circuits are free from grounds or faults for each control device.

b) Obtain and Record Test and Balance settings and incorporate into the BAS. The information from the TAB contractor includes:

1) Water and air system differential pressure and flow settings

2) AHU minimum outside air control point or damper setting.

c) As left calibration data for all sensing and actuating devices recording final measured and displayed value. For analog inputs an independent meter will determine the measured value. Record the type and model of the meter.

d) For analog outputs record both the displayed output as well state of the receiving device.

e) For digital input/outputs record the signal at the controller and the state of the sensing/control device.

f) For actuators:

1) Check to insure that actuated device moves smoothly and results are repeatable thru full range and seals tightly when the appropriate signal is applied to the operator.

2) Check for appropriate fail position, and that the stroke and range is as required.

3) For sequenced electronic actuators, calibrate per manufacturer's instructions to required ranges. Record final settings

g) For all valves and actuators, verify the actual position against the Operator Interface readout. Set pumps to normal operating mode. Command valve closed, verify that valve is closed, and adjust output zero signal as required. Command valve open, verify position is full open and adjust output signal as required. Command the valve to a few intermediate positions. If actual valve position doesn't reasonably correspond, replace actuator.

h) Valve leak check: Verify proper close-off of the valves. Ensure the valve seats properly by simulating the maximum anticipated pressure difference across the circuit.

i) For air and water flow measuring stations the data recorded will include the independent flow measurement, area and the independently measured output of the flow station. The BAS input from the flow station and any factors used to calculate the flow including area and any constants used in the calculation of flow. There will be two sets of data collected. The first at design flow and the second at 50% of design flow. It is not acceptable to simply add a correction factor to address differences between the flow station and the independent reading.

j) For Operator Interfaces and Web accessible display:

1) Verify that all elements on the graphics are functional and are properly bound to physical devices and/or virtual points, and that hot links or page jumps are functional and logical.

2) Output all specified BAS reports for review and approval.

3) Verify that the alarm pop ups, printing and logging is functional and per requirements.

4) Verify that all points are trended and are archiving to disk and provide a sample to the Commissioning Authority and CPS for review.

5) Verify that paging/dial-out alarm annunciation is functional.

6) Verify the functionality of remote Operator Interfaces and that a robust connection can be established consistently.

7) Verify that required third party software applications required with the bid are installed and are functional.

k) For all actuating devices record final settings for device. For example the setpoint and reset values for differential pressure switches.

l) Document verification of point to graphics binding for all points displayed on the workstation and that webserver display have been mapped correctly, and display the correct information.

m) Document that the webserver is on the CPS LAN and can be viewed from off site (another school) and that the modem is connected and the BAS is accessible via modem by the contractor.

3. Functional Performance Forms contain:

a) List of all sequences, modes of operation and setpoint that initiates each sequence and/or mode. For each confirm that proper sequence of operation. Document any variance between designed sequence and actual condition.

b) Record tuning parameters and response time for each control loop.

c) Document all alarm and safeties test and final results.

d) Results of trends including controlled points, setpoints, actual readings and other point defined by the Boards Authorized Representative.

H. The Testing Plan

1. Contractor is to submit their plan for executing all phases of testing and completion of checkout forms. This included the following: manufacturers' normal testing, point-to-point testing, pre-functional testing, and functional performance testing. "The Testing Plan" will show the overall milestones of the controls work and testing of the controls system.
2. Provide the schedule for completing each phase of testing for each system or set of equipment: air handlers, chillers, boilers, unit-vents, vav boxes, network wiring, operators workstation, etc. Schedules are to have no dates at this point, but should show the time frame needed to complete the tasks.
3. The testing plan shall identify other trade milestones that impact the successful completion of during each phase of testing.

4. This plan is not meant to take precedence over any other plan but is intended to provide coordination assistance to all trades as the project is scheduled.

I. **Open Protocol Information**

1. General
   a) Provide all of the information necessary for review of the proposed system such that it can be determined that the product chosen for implementation meets all of the protocol standards within this specification and as determined by the authority maintaining the protocol standard.
2. LonWorks Systems:
   a) Binding table indicating all Network Variables used in the project, Neuron ID and domain, subnet and channel address, and associated bound variables. Clearly indicate which parameters of a functional profile are bound and can be overridden.
   b) A point binding diagram shall be provided with each control schematic depicting all bound network variables along with the associated functional profiles.
   c) LonMark functional profile certifications.
   d) For Host-Based Controllers: Controller programming and configuration tool and or plug in required for all controllers with a minimum of 3 licenses as applicable.
   e) For non-host Controllers: LonTalk Neuron C source code and/or Neuron C application programming interface tool (3 licenses) and associated files required for all controllers.
   f) Backup of systems configuration database on CD. This shall be provided at preliminary acceptance and at the end of the warranty period.
   g) Documentation of all explicit messaging.
   h) XIF files for all LonMark components.
3. BACnet Systems:
   a) BACnet object description, object ID, and device ID, for each I/O point.
   b) Documentation for any non-standard BACnet objects, properties, or enumerations used detailing their structure, data types, and any associated lists of enumerated values.
   c) Submit PICS indicating the standardized BACnet device profile, functionality and configuration of each controller along with proof of BTL listing.

J. **Framed Control Drawings**: After completion of installation and check out, but prior to training, laminated control drawings including system control schematics, sequences of operation and panel termination drawings, shall be provided in panels for major pieces of equipment. Terminal unit drawings shall be located in the central plant equipment panel or mechanical room panel.

K. **Control Logic Documentation** (All documentation to be received and updated prior to training)

1. Submit control logic program listings (for graphical programming) and logic flow charts illustrating (for line type programs) to document the control software of all control units.
2. Control logic shall be annotated to describe how it accomplishes the sequence of operation. Annotations shall be sufficient to allow an operator to relate each program component (block or line) to corresponding portions of the specified Sequence of Operation.
3. Include written description of each control sequence.
4. Include control response, settings, setpoints, throttling ranges, gains, reset schedules, adjustable parameters and limits.
5. Sheets shall be consecutively numbered.
6. Each sheet shall have a title indicating the controller designations and the HVAC system controlled.
7. Include Table of Contents listing sheet titles and sheet numbers
8. Submit one complete set of programming and operating manuals for all digital controllers concurrently with control logic documentation. This set will count toward the required number of Operation and Maintenance materials specified below.

L. Training Plan;

1. Training shall be structured as follows: Format shall be an outline broken up into eight 4 hour sessions. The training plan for the Opposite Season or Refresher training will not be provided.
2. The material to be covered shall then be further sub divided into descriptions of the material to be covered in every 15 minutes. See Division 15 *BAS SYSTEM COMMISSIONING* for specific items to be addressed.
3. The descriptions shall include not only the material to be covered but also its location in the Operation and Maintenance Manual or the Training Manual including section and page number.

M. Operation and Maintenance Manual: (All documentation to be received and updated prior to training)

1. Submit under provisions of Conditions of the Contract and Division 1 Specification Sections. One copy of the materials shall be delivered directly to Chicago Publics School's (CPS) operation staff, in addition to the copies required by other Sections.
2. Submit maintenance instructions and spare parts lists for each type of control device, control unit, and accessory.
3. Submit BAS User's Guides (Operating Manuals) for each controller type and for all workstation hardware and software and workstation peripherals.
4. Submit BAS advanced Programming Manuals for each controller type and for all workstation software.
5. Include all as built submittals (product data, shop drawings, control logic documentation, hardware manuals, software manuals, installation guides or manuals, maintenance instructions and spare parts lists) in maintenance manual; in accordance with requirements of Division 1.

N. TRAINING MANUAL:

Submit training manual electronically for review. Once accepted, provide three hard copies and one electronic copy of the training manual shall be provided at the start of training and shall contain the following. Note only the initial 8 hours of training which include the Cheat Sheets will occur before the demonstration is completed.

1. Cheat Sheets or quick reference section with step-by-step guidance with a level of detail that will allow someone with no experience with the control system to follow the instructions. The quick reference guidance can be provided one of two ways. Screen prints with bubbled text describing the navigation required or written description of the steps to be taken with screen prints provided to facilitate the written explanation. In either case the document will be provided in rtf or doc format (see Exhibit A for a sample). The required cheat sheets include:
   a) Login and logoff to control system as well as Microsoft XP login;
   b) Adjust Setpoints and restore setpoints
   c) Overrides and releasing overrides as well as running a report to list all points currently overriden.
   d) Start, group, plot and export Trends
   e) Adjust schedules and add holidays
   f) Processing of alarms including acknowledgement, review of alarm report and clearing of alarm history.
   g) Backup and restoration of system data
   h) Demonstrate how to clear/reset all field devices that may require manual intervention. For example if a building controller is not responding show how to reset/reboot the controller or the manual operation of a damper or valve actuator. (see Exhibit F for a sample)
   i) Demonstrate how to reset motor starter and the significance of Hand-Off-Auto switch position on motor starters. (see Exhibit F for a sample)
   j) Demonstration of each input and output device. Provide a picture of each input or output device with a brief narrative on its operation. For example while displaying a picture of a modulating and 2-position damper actuator describe how to tell the difference and who fast it takes to go full stroke. (see Exhibit F for a sample)
   k) Demonstrate how to place the boiler, or chiller system in manual control and boiler control and how to restore the system to BAS control. (see Exhibit F for a sample)
2. Operating instructions including system startup & shutdown, seasonal and emergency instruction (see Exhibit B for a sample).
3. Trouble Shooting Guide. The guide will address actions to be taken to trouble shoot problems with the OWS, PCU's CSS and local control devices (see Exhibit E for a sample)
4. Setpoint Table (see Exhibit C for a sample).
5. Preventative maintenance instructions (see Exhibit D for a sample).

6. Color print of each unique screen.
7. Final Sequence of Operations. This document shall be printed but shall also be provided electronically in rich text format (rtf). The sequence shall provide not only the original design sequence from the specifications and drawings but also the any changes to the sequence.
8. Complete set of the design control drawings (provided by the AOR on 11"X17" sheets. The manual will have a TAB for these drawings. The printed drawings will come from the AOR/EOR.
9. List of all alarm points and alarm priority

O. Video Training: The following training shall be recorded on a CD using screen capture software. Any files required to run the CD will be provided along with a file with the instruction on how to view the CD. The cadence of the video training shall be such that an inexperienced person can listen to the narrative and execute those steps on controls system while watching the the CD. The training recording must include a screen view recording the actual video feed to the monitor for the work station penetration while narrating the associated steps.

1. Quick reference procedures. The taping of these procedures must include both a screen view preferably recording the actual video feed to the monitor while narrating the associated steps.
   a) Login and logoff to control system as well as Microsoft XP login;
   b) Adjust Setpoints and restore setpoints
   c) Overrides and releasing overrides as well as running a report to list all points currently overriden.
   d) Start, group, plot and export Trends
   e) Adjust schedules and add holidays
   f) Processing of alarms including acknowledgement, review of alarm report and clearing of alarm history.
   g) Backup and restoration of system data
   h) Demonstrate workstation menu penetration and broad overview of the various workstation features
   i) Demonstrate all operations and functions that can be performed at the supervisory or local controllers as well as system display artifacts such as the indication that a point has failed or lost communication.

P. Demonstration of portable operator interface device display capabilities

Q. Manufacturers Certificates: For all listed and/or labeled products, provide certificate of conformance. Include all LonMark functional profiles certifications for systems used on this project.

R. Product Warranty Certificates: submit manufacturers product warranty certificates covering the hardware provided.

1.10 PROJECT RECORD DOCUMENTS

The Project Record documents that have not already been submitted as part of the Operating and Maintenance Manual or Training Manual are to be submitted with the Record Documents. Any documents in the Operating and Maintenance Manual or Training Manual that have changed since they were submitted will need to be re-submitted as part of the Project record documents. All of these documents maybe submitted electronically.

A. Submit under provisions of Conditions of the Contract and Division 1 Specification Sections.

B. Record copies of product data and control shop drawings updated to reflect the final installed condition.

C. Record copies of approved control logic programming and database on CD's. The CD's will contain all information required to reinstall the control system program. It will include actual setpoints and settings of controls, final sequence of operation, including changes to programs made after submission and approval of shop drawings and including changes to programs made during specified testing. One set of CD's will be stored at the school in the main control panel and the second set will be provided to CPS Operations.

D. Record copies of approved project specific graphic software on CDs.

E. For LonTalk systems provide as-built network architecture drawings showing all LonTalk nodes, including Neuron ID and domain, sub-network and channel addresses. For BACnet systems provide as-built network architecture drawings showing all BACnet nodes including a description field with specific controller identification, description and location information.

F. Record copies shall include individual floor plans with controller locations with all interconnecting wiring routing including space sensors, LAN wiring, power wiring, low voltage power wiring. Indicate device instance, MAC address and drawing reference number.

G. Provide record riser diagram showing the location of all controllers.

H. Maintain project record documents throughout the warranty period and submit final documents at the end of the warranty period

1.11 BUILDING AUTOMATION SYSTEM OPERATOR INTERFACE (OI)

A. The Operator Interface shall provide for overall system supervision, graphical user interface, management report generation, alarm annunciation, remote monitoring, and trend reporting. . Refer to Section 15952 – BAS Operator Interfaces.

1.12 SYSTEM ARCHITECTURE

A. Application of Open Protocols

1. Subject to the detailed requirements provided throughout the specifications, the BAS and digital control and communications components installed, as work of this contract shall be an integrated distributed processing system utilizing the following standards:

   a) LonTalk: Provide control products and systems that comply with the latest version of the ANSI/EIA standard 709.1 and the LonTalk protocol of the Interoperability Standards as published by the LONMARK™ Association. All architectures involving tunneling the LonTalk protocol across an IP network must incorporate ISO Layer 3 transparent routing.

   b) BACnet or hybrid system: The system architecture shall consist of a BACnet IP Router, a single Local Area Network (LAN) or two-level LANs that support BCs, AACs, ASCs, Operator Workstations (OWS), Smart Devices (SD), and Remote Communication Devices (RCDs) as applicable. In no event shall there be more than two levels of LAN topology within the system, excluding wiring to sensors with no control intelligence.

B. The system provided shall incorporate hardware resources sufficient to meet the functional requirements of these Specifications. The Contractor shall include all items not specifically itemized in these Specifications that are necessary to implement, maintain, and operate the system in compliance with the functional intent of these Specifications.

C. The system shall be configured as a distributed processing network(s) capable of expansion as specified below. Refer to the network architecture on the BAS drawings for other requirements and details.

D. The system architecture shall consist of an Ethernet-based, wide area network (WAN), a single Local Area Network (LAN) or multi-leveled LANs that support PCU's, Operator Workstations (OWS), and Remote Communication Devices (RCDs) as applicable. The following indicates a functional description of the BAS structure.

1. **CPS WAN**: Intranet-based network connecting multiple facilities with a central data warehouse and server, accessible via standard web-browser. This is an existing infrastructure and contractor is not required to configure any components of this WAN.

2. **Local BAS Supervisory LAN**: The Local BAS Supervisory LAN shall be an Ethernet-based, 100 Mbps LAN connecting Primary Control LANs and OWSs. The LAN serves as the inter-PCU gateway and OWS-to-PCU gateway and communications path and as the connection point for the CPS WAN. LAN shall be IEEE 802.3 Ethernet over Fiber or Category 5 cable with switches and routers that support 100 Mbps throughput. Power-line carrier communication shall not be acceptable for communications. The higher level layers of this network shall be the following:

1) LonWorks Supervisory LAN: Individual Primary Control LonTalk Networks routed over IP using LonTalk to IP routers.

2) BACnet Local Supervisory LAN: BACnet/IP as defined in Addendum A (Annex J) of the BACnet standard, and shall share a common network number for the Ethernet backbone, as defined in BACnet. .

3. **Primary Controller LAN ('Primary LAN')**: High-speed, peer-to-peer communicating LAN used to connect and Primary Control (PCUs) and communicate exclusively control information. Acceptable technologies include:

a) LonTalk: The LonTalk standalone BAS shall be comprised of a network of PCU's supporting LonTalk protocol (EIA 709.1) and twisted pair, bus topology transceivers (EIA 709.3). The network shall communicate at 78 kbps. The network shall be installed utilizing the Bus Topology. The network shall consist of a single channel with 2 segments. Each segment shall be limited to a maximum of 40 nodes or as required to meet performance and standalone requirements, and to meet the requirements for response time, trending and bandwidth utilization as specified elsewhere in the specifications. A terminator shall be installed at both ends of each segment.

b) BACnet: Network used to connect AACs, ASCs or SDs. These can be Master Slave/ Token Passing or polling, or ARCnet in accordance with IEEE 802.4, in addition to those allowed for Primary Controller LANs. Network speed vs. the number of controllers on the LAN shall be dictated by the response time and trending requirements. The primary network shall communicate at a minimum of 38 kbps. Each secondary network may support up to 32 communicating devices without segmentation or repeaters subject to the requirements for response time, trending and bandwidth utilization.

E. **Dynamic Data Access**: Any data throughout any level of the network shall be available to and accessible by all other devices, Controllers and OWS, whether directly connected or connected remotely.

F. **Remote Data Access**: The system shall support the following methods of remote access to the building data.

1. Dial-in via minimum of a 56k modem. The purpose of the remote access via phone is to allow for the contractor to access the control system. Dial-in connection shall allow access to all control system facilities and graphics with appropriate password. Chicago Public Schools shall provide and pay for the voice grade phone line to support this remote connection.

a) Browser-based access: A remote user, connecting via the CPS WAN and using a standard browser shall be able access all control system facilities and graphics with proper password. The remote access user will not need to load Java or other applications to view the web pages.

G. **Network Performance**: The communication speed between the controllers, control LAN interface devices, and operator interface devices shall be sufficient to ensure fast system response time under any loading condition. Contractor shall submit guaranteed response times with shop drawings including calculations to support the

guarantee. In no case shall delay times between an event, request, or command initiation and its completion be greater than those listed herein. Contractor shall reconfigure LAN as necessary to accomplish these performance requirements. The performance will also include the trending of all AI, AO and DI points at 15 minute intervals. Generally requirements do not apply when a remote connection must be established via modem:

1. 5 seconds between a Level 1 (critical) alarm occurrence and enunciation at operator workstation.
2. 10 seconds between a Level 2 alarm occurrence and enunciation at operator workstation.
3. 20 seconds between and a Level 3-5 alarm occurrence and enunciation at operator workstation.
4. 10 seconds between an operator command via the operator interface to change a setpoint and the subsequent change in the controller.
5. 5 seconds between an operator command via the operator interface to start/stop a device and the subsequent command to be received at the controller.
6. 10 seconds between a change of value or state of an input and it being updated on the operator interface.
7. Graphic Display, 10 seconds between an operator selection of a graphic and it completely painting the screen and updating all points.
8. Graphic Refresh, every 15 seconds the graphic shall automatically refresh all graphic data.

H. **Control Systems Server (CSS) and Operator Work Station (OWS):** These are two separate computers that maintain the systems configuration and programming database and is the operating platform for the operator interface (OI). It shall hold the backup files of the information downloaded into the individual controllers and as such support uploading and downloading that information directly to/from the controllers. It shall be located within each facility. It shall also act as a control information server to non-control system based programs. It shall allow secure multiple-access to the control information. Refer to Division 15 Section BAS Operator Interfaces for its requirements.

I. The PCU's, shall monitor, control, and provide the field interface for all points specified. Each PCU shall be capable of performing all specified energy management functions, and all DDC functions, independent of other PCU's and operator interface devices as more fully specified in Division 15 Section - BAS Field Panels.

J. **Systems Configuration Database:** The system architecture shall support maintaining the systems configuration database on a server or workstation on the Local Supervisory LAN. User tools provided to Chicago Public Schools shall allow configuring, updating, maintaining, etc. current configurations and settings whether they are initiated at the server or the end device.

1. Database Schema shall be published and provided to Chicago Public Schools to facilitate easy access to the data.
2. Database shall be ODBC compliant or a data access driver shall be provided to act as an ODBC or OLE DB data provider.

3. For a LON system: The SCD and associated network services shall be Echelon LonWorks Network Services (LNS) (latest version) compliant, no exceptions allowed. The Network Management Application shall be LonMaker™ for Windows (latest released version) service tool (including hardware, software and any peripheral devices required) and is to be used for commissioning and management of the LonTalk control architecture, no exceptions allowed. The network management service tool shall remain on the project as the property of Chicago Public Schools. A copy of the LonTalk network database shall be archived on the service tool and the operator interface, documenting system bindings and node addressing. In addition all system variables shall have a plain English language description for each variable. This service tool shall be used for all system maintenance and expansion, so that the network database backup remains current

K. Interruptions or fault at any point on any Primary Controller LAN shall not interrupt communications between other nodes on the network. If a LAN is severed, two separate networks shall be formed and communications within each network shall continue uninterrupted.

L. All line drivers, repeaters, terminators, signal boosters, signal conditioners etc. shall be provided as necessary for proper data communication.

M. Anytime any controller's database or program is changed in the field, the controller shall be capable of automatically uploading the new data to the OWS and CSS.

1.13 WARRANTY MAINTENANCE

A. Contractor shall warrant all products and labor for a period of one (1) year after Final Acceptance.

B. Chicago Public Schools reserves the right to make changes to the BAS during the warranty period. Such changes do not constitute a waiver of warranty. The Contractor shall warrant parts and installation work regardless of any such changes made by CPS, unless the Contractor provides clear and convincing evidence that a specific problem is the result of such changes to the BAS. Any disagreement between CPS and the Contractor on such matters shall be subject to resolution through the contract 'Disputes' clause.

C. At no cost to CPS, during the warranty period, the Contractor shall provide maintenance services for software and hardware components as specified below:

1. Maintenance services shall be provided for all devices and hardware specified in Division 15 BAS sections. Service all equipment per the manufacturer's recommendations. All devices shall be calibrated within the last month of the warranty period.
2. Emergency Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would result in property damage or loss of comfort control shall be corrected and repaired following telephonic notification by CPS to the Contractor.
   a) Response by telephone to any request for service shall be provided within two (2) hours of CPS's initial telephone request for service.

b) In the event that the malfunction, failure, or defect is not corrected through the telephonic communication, at least one (1) hardware and software technician, trained in the system to be serviced, shall be dispatched to the site within eight (8) hours of the CPS's initial telephone request for such services, as specified.

c) Emergency service shall be available on a 24-hour, 7-day-a-week basis.

3. Normal Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would not result in property damage or loss of comfort control shall be corrected and repaired following telephonic notification by CPS to the Contractor.

a) Response by telephone to any request for service shall be provided within eight (8) working hours (contractor specified 40 hr per week normal working period) of CPS's initial telephone request for service.

b) In the event that the malfunction, failure, or defect is not corrected through the telephonic communication, at least one (1) hardware and software technician, trained in the system to be serviced, shall be dispatched to the site within three (3) working days of the initial telephone request for such services, as specified.

4. CPS's Telephonic Request for Service: Contractor shall specify a maximum of three telephone numbers for CPS to call in the event of a need for service. At least one of the lines shall be attended at any given time at all times. Alternatively, pagers can be used for technicians trained in system to be serviced. One of the three paged technicians shall respond to every call within 15 minutes.

5. Technical Support: Contractor shall provide technical support by telephone throughout the warranty period.

6. Preventive maintenance shall be provided throughout the warranty period in accordance with the hardware component manufacturer's requirements.

1.14 DELIVERY, STORAGE, AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons during shipping, storage and handling as required to prevent equipment damage, and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protect from weather.

1.15 LISTING AND LABELING

A. The BAS and components shall be listed by Underwriters Laboratories (UL 916) as an Energy Management System.

B. BACnet controllers, B-BC, B-AAC, B-ASC etc will carry the BTL Mark for their device profile.

PART 2. PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials shall be new, the best of their respective kinds without imperfections or blemishes and shall not be damaged in any way. Used equipment shall not used in any way for the permanent installation except where drawings or specs specifically allow existing materials to remain in place.

2.2 UNIFORMITY

A. To the extent practical, all equipment of the same type serving the same function shall be identical and from the same manufacturer.

PART 3. PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to contractor.

3.2 INSTALLATION OF CONTROL SYSTEMS

A. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings.

B. Refer to additional requirements in other sections of this specification.

3.3 DIGITAL CONTROL STATIONS, CONTROLLER QUANTITY AND LOCATION

A. Individual Digital Control Stations (DCS) are referenced to indicate allocation of points to each DCS and DCS location. Digital control stations shall consist of one or multiple controllers to meet requirements of this specification.

B. Where a DCS is referenced, Contractor shall provide at least one (1) controller, and additional controllers as required, in sufficient quantity to meet the requirements of this Specification. Restrictions in applying controllers are specified in Division 15 : BAS Field Panels. This Contractor shall extend power to the DCS from an acceptable power panel. If the contractor wishes to further distribute panels to other locations, contractor is responsible for extending power to that location also. Furthermore, contractor is responsible for ensuring adequate locations for the panels that do not interfere with other requirements of the project and maintain adequate clearance for maintenance access.

C. Contractor shall locate DCSs as referenced. It is the Contractor's responsibility to provide enough controllers to ensure a completely functioning system, according to the point list, trending requirements and sequence of operations.

D. Contractor shall provide a minimum of the following:

1. One DCS (including at least one controller) in each heating water and chilled water plant mechanical room
2. One DCS (including at least one controller) for each air handler located in an applicable mechanical room
3. One controller shall be provided for each terminal unit unless indicated otherwise

3.4 SURGE PROTECTION

A. The Contractor shall furnish and install any power supply surge protection, filters, etc. as necessary for proper operation and protection of all PCU's, operator interfaces, printers, routers, gateways and other hardware and interface devices. All equipment shall be capable of handling voltage variations 10% above or below measured nominal value, with no affect on hardware, software, communications, and data storage.

3.5 CONTROL POWER SOURCE AND SUPPLY

A. Contractor shall extend all power source wiring required for operation of all equipment and devices provided under Division 15 BAS Sections and Sequences of Operation.

1. Control panels will not share a power circuit. Power supplied to the panels will have dedicated circuits and the circuit location will be documented in the panel.

3.6 BAS START UP, COMMISSIONING AND TRAINING

A. Refer to Division 15 BAS Commissioning

3.7 SEQUENCE OF OPERATION

A. Refer to Division 15 - Sequences of Operation

3.8 IDENTIFICATION STANDARDS

A. Controller Identification. All controllers shall be identified by a plastic engraved nameplate securely fastened to the outside of the controller enclosure.

B. Panel Identification. All local control panels shall be identified by a plastic engraved nameplate securely fastened to the outside of the controller enclosure.

C. Field Devices. All field devices shall be identified by a typed (not handwritten) securely attached tag label.

D. Panel Devices. All panel devices shall be identified by a typed label securely fastened to the backplane of the local control panel.

E. Raceway Identification. All the covers to junction and pull boxes of the control system raceways shall be painted blue or have identification labels stating "Control System Wiring" affixed to the covers. Labels shall be typed, not hand written.

F. Wire Identification. All low and line voltage control wiring shall be identified by a number, as referenced to the associated control diagram, at each end of the conductor or cable. Identification number shall be permanently secured to the conductor or cable and shall be typed

3.9 EXHIBITS

A. Exhibits A through E attached

END OF SECTION 15950

SECTION 15951

BAS BASIC MATERIALS, INTERFACE DEVICES, AND SENSORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pneumatic Tubing

B. Wiring

C. Control Valves and Actuators

D. Control Dampers and Actuators

E. BAS Field Panels

F. Sensors

G. Flow Meter

H. Pneumatic Control Components (Gauges, switches, relays, etc.)

I. Electric Control Components (Switches, EP Valves, Thermostats, Relays, Smoke Detectors, etc.)

J. Transducers

K. Air Flow Measuring Stations

L. Current Switches

M. Nameplates

N. Testing Equipment

1.2 RELATED DOCUMENTS

A. Division 1

B. Division 15

C. Division 16

1.3 DESCRIPTION OF WORK

A. Refer to Division 15 Building Automation System General for general requirements.

B. Refer to other Division-15 sections for installation of instrument wells, valve bodies, and dampers in mechanical systems; not work of this section.

C. Provide the following electrical work as work of this section, complying with requirements of Division-16 sections:

1. Control wiring between field-installed controls, indicating devices, and unit control panels.
2. Interlock wiring between electrically interlocked devices, sensors, and between a hand or auto position of motor starters as indicated for all mechanical and controls.
3. Wiring associated with indicating and alarm panels (remote alarm panels) and connections to their associated field devices.

4. All other necessary wiring for fully complete and functional control system as specified.
5. Power wiring from spare circuits in electrical panels to BAS Field Panels. WORK BY OTHERS

D. Control Valves furnished under this section shall be installed under the applicable piping section under the direction of Section 15951 Contractor who will be fully responsible for the proper operation of the valve.

E. Control Dampers furnished under this section shall be installed under the applicable air distribution or air handling equipment section under the direction of Section 15951 Contractor who will be fully responsible for the proper operation of the damper

F. Water Pressure Taps, Thermal Wells, Flow Switches, Flow Meters, etc. that will have wet surfaces, shall be installed under the applicable piping Section under the direction of Section 15951 Contractor who will be fully responsible for the proper installation and application.

G. Controlled Equipment Power Wiring shall be furnished and installed under Division 16. Where control involves 120V control devices controlling 120V equipment, Division 16 Contractor shall extend power wiring to the equipment. Section 15951 Contractor shall extend it from the equipment to the control device.

PART 2. PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. General: Provide electronic control products in sizes and capacities indicated, consisting of valves, dampers, thermostats, clocks, controllers, sensors, and other components as required for complete installation. Except as otherwise indicated, provide manufacturer's standard materials and components as published in their product information; designed and constructed as recommended by manufacturer, and as required for application indicated.

B. Instrument Pipe and Tube

1. Hydronic and Instruments
   a) **Connection To Main Piping**: Provide ½ inch minimum size threadolet, ½" x 2 inch brass nipple, and ½" ball valve for connection to welded steel piping. Provide tee fitting for other types of piping.
   b) **Remote Instruments**: Adapt from ball valve to specified tubing and extend to remote instruments. Provide a union or otherwise removable fitting at ball valve so that connection to main can be cleaned with straight rod. Where manifolds with test ports are not provided for instrument, provide tees with ¼" FPT branch with plug for use as test port. Adapt from tubing size to instrument connection.
   c) **Line Mounted Instruments**: Extend rigid piping from ball valve to instrument. Do not use close or running thread nipples. Adapt from ball valve

outlet to instrument connection size. Provide a plugged tee if pipe makes 90 degree bend at outlet of valve to allow cleaning of connection to main with straight rod without removing instrument.

d) **Instrument Tubing**: Seamless copper tubing, Type K or L, ASTM B 88; with cast-bronze solder joint fittings, ANSI B1.18; or wrought-copper solder-joint fittings, ANSI B16.22; or brass compression-type fittings. Solder shall be 95/5 tin antimony, or other suitable lead free composition solder. Tubing OD size shall be not less than the larger of ¼" or the instrument connection size.

e) **Rigid Piping For Line Mounted Instruments**: Schedule 40 threaded brass, with threaded brass fittings.

2. Low Pressure Air Instrument Sensing Lines

a) **Connections**: Use suitable bulkhead type fitting and static sensing tip for static pressure connections. Adapt tubing to instrument connection.

b) **Tubing**: Virgin polyethylene non-metallic tubing type FR, ASTM D 2737, and with flame-retardant harness for multiple tubing. Use compression or push-on brass fittings.

C. **Communication Wiring**: All wiring shall be in accordance with National Electrical Codes and Division 16 of this specification.

1. Contractor shall supply all communication wiring between Building Controllers (BC), Routers, Gateways, Advanced Application Controllers (AAC), Application Specific Controllers (ASC) and local and remote peripherals (e.g., operator workstations, printers, and modems).

2. **Local Supervisory LAN**: For any portions of this network required under this section of the specification, contractor shall use Fiber or Category 5 of standard TIA/EIA 68 (10BaseT). Network shall be run with no splices and separate from any wiring over thirty (30) volts.

3. **Primary and Secondary Controller LANs**: Communication wiring shall be individually 100% shielded pairs per manufacturers recommendations for distances installed, with overall PVC cover, Class 2, plenum-rated run with no splices and separate from any wiring over thirty (30) volts. Shield shall be terminated and wiring shall be grounded as recommended by BC manufacturer.

D. **Signal Wiring**: Contractor shall run all signal wiring in accordance with National Electric Codes and Division 16 of this Specification.

1. Signal wiring to all field devices, including, but not limited to, all sensors, transducers, transmitters, switches, etc. shall be twisted, 100% shielded pair, minimum 18-gauge wire, with PVC cover. Signal wiring shall be run with no splices and separate from any wiring above thirty (30) volts.

2. Signal wiring shield shall be grounded at controller end only unless otherwise recommended by the controller manufacturer.

E. **Low Voltage Analog Output Wiring**: Contractor shall run all low voltage control wiring in accordance with National Electric Codes and Division 16 of this Specification.

1. Low voltage control wiring shall be minimum 16-gauge, twisted pair, 100% shielded, with PVC cover, Class 2 plenum-rated. Low voltage control wiring shall be run with no splices separate from any wiring above thirty (30) volts.

F. **Control Panels**: Provide control panels with suitable brackets for wall mounting for each control system. Locate panel adjacent to systems served.

1. Fabricate panels of 16-gage furniture-grade steel, or 6063-T5 extruded aluminum alloy, totally enclosed on four sides, with hinged door and keyed lock, with manufacturer's standard shop- painted finish and color.
2. Provide UL-listed cabinets for use with line voltage devices.
3. All gauges and control components shall be identified by means of nameplates.
4. All control tubing and wiring shall be run neatly and orderly in open slot wiring duct with cover.
5. Complete wiring and tubing termination drawings shall be mounted in or adjacent to panel.

2.2 CONTROL VALVES

A. **General**: Provide factory fabricated control valves of type, body material and pressure class indicated. Where type or body material is not indicated, provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature in piping system. Provide valve size in accordance with scheduled or specified maximum pressure drop across control valve. Control valves shall be equipped with heavy-duty actuators, and with proper close-off rating for each individual application. Minimum close-off rating shall be as scheduled and adequate for each application, and shall generally be considered at dead head rating of the pump.

B. **Plug-Type Globe Pattern for Water Service**:

1. **Valve Sizing**: Where not specifically indicated on the control drawings, modulating valves shall be sized for maximum full flow pressure drop between 50% and 100% of the branch circuit it is controlling unless scheduled otherwise. Two-position valves shall be same size as connecting piping.
2. **Single Seated (Two-way) Valves**: Valves shall have equal-percentage characteristic for typical heat exchanger service and linear characteristic for building loop connections to campus systems unless otherwise scheduled on the drawings. Valves shall have cage-type trim, providing seating and guiding surfaces for plug on 'top-and-bottom' guided plugs.
3. **Double Seated (Three-way) Valves**: Valves shall have linear characteristic. Valves shall be balanced-plug type, with cage-type trim providing seating and guiding surfaces on 'top-and-bottom' guided plugs.
4. **Temperature Rating**: 25°F minimum, 250°F maximum
5. **Body**: Bronze, screwed, 250 psi maximum working pressure for 1/2" to 2"; Cast Iron, flanged, 125 psi maximum working pressure for 2-1/2" and larger.
6. **Valve Trim**: Bronze; Stem: Polished stainless steel.
7. **Packing**: Spring Loaded Teflon or Synthetic Elastomer U-cups, self-adjusting.
8. **Plug**: Brass, bronze or stainless steel, Seat: Brass
9. **Disc**: Replaceable Composition or Stainless Steel Filled PTFE.
10. **Ambient Operating Temperature Limits**: -10 to 150°F
11. **Acceptable Manufacturers**: Subject to compliance with requirements approved manufacturers are as follows:

a) Johnson Controls

b) Invensys

c) Warren

d) Delta

e) Belimo

C. **Plug-Type Globe Pattern for Steam Service:**

1. **Valve Sizing**: Where valve size is not specifically indicated on the drawings, size modulating valves for applications of 15 psig or less for 80% of inlet gage pressure unless scheduled otherwise. Modulating valves for applications of greater than 15 psig shall be sized for 42% of inlet absolute pressure unless scheduled otherwise. Two-position valves shall be same size as connecting piping.
2. **Characteristics**: Modified equal-percentage characteristics. Cage-type trim, providing seating and guiding surfaces for plug on "top and bottom" guided plugs.
   a) Working Temperature: 250°F minimum for saturated steam applications of 15 psig or less; 366°F minimum for saturated steam applications of greater than 15 psig up to 150 psig.
3. **Body**: Bronze, screwed, 250 psig steam working pressure for 1/2" to 2"; Cast Iron, flanged, 100 psig steam working pressure for 2-1/2" and larger for applications of 50 psig or less.
4. Valve Trim, Plug, Seat and Stem: Polished stainless steel.
5. **Packing**: Spring Loaded Teflon.
6. **Disc**: Replaceable Composition or Stainless Steel Filled PTFE.
7. **Acceptable Manufacturers**: Subject to compliance with requirements approved manufacturers are as follows:
   a) Johnson Controls
   b) Invensys
   c) Warren
   d) Delta
   e) Belimo

D. **Butterfly Type:** Valve will be sized for 50 to 100% of branch pressure drop. For valves sized at 3way less than 90 degree position for pressure drop are to have the linkage for full closed when the open port is at the design point.

1. **Body**: Extended neck epoxy coated cast or ductile iron with full lug pattern, ANSI Class 125 or 250 bolt pattern to match specified flanges.
2. **Seat**: EPDM, except in loop bypass applications where seat shall be metal to metal
3. **Disc**: Bronze or stainless steel, pinned or mechanically locked to shaft
4. **Bearings**: Bronze or stainless steel
5. **Shaft**: 416 stainless steel
6. **Cold Service Pressure**: 175 psi

7. **Close Off**: Bubble-tight shutoff to 150 psi
8. **Operation**: Valve and actuator operation shall be smooth both seating and unseating. Should more that 2 psi deadband be required to seat/unseat the valve, valve shall be replaced at no cost to the Government.
9. **Acceptable Manufacturers**: Subject to compliance with requirements approved manufacturers are as follows:
   a) Jamesbury WS815
   b) Bray Series 31
   c) Belimo

E. Ball Type: Valve will be sized for 50 to 100% of branch pressure drop.

1. **Body**: Brass or bronze; one-, two-, or three-piece design; threaded ends.
2. **Seat**: Reinforced Teflon
3. **Ball**: Stainless steel.
4. **Port**: Standard or 'V' style.
5. **Stem**: Stainless steel, blow-out proof design, extended to match thickness of insulation.
6. **Cold Service Pressure**: 600 psi WOG
7. **Steam working Pressure**: 150 psi
8. **Acceptable Manufacturers**: Subject to compliance with requirements approved manufacturers are as follows:
   a) Belimo
   b) Jamesbury
   c) Delta

F. Segmented or Characterized Ball Type

1. **Body**: Carbon Steel (ASTM 216), one-piece design with wafer style ends.
2. **Seat**: Reinforced Teflon (PTFE).
3. **Ball**: Stainless steel ASTM A351
4. **Port**: Segmented design with equal-percentage characteristic.
5. **Stem**: Stainless steel.
6. **Cold Service Pressure**: 200 psi WOG
7. **Cavitation Trim**: Provide cavitation trim where indicated and/or required, designed to eliminate cavitation and noise while maintaining an equal percentage characteristic. Trim shall be a series of plates with orifices to break the pressure drop into multi-stages.
8. **Acceptable Manufacturers**: Subject to compliance with requirements approved manufacturers are as follows:
   a) Jamesbury R-Series
   b) Fisher
   c) Belimo

2.3 CONTROL DAMPERS

A. **General**: Provide factory fabricated automatic control dampers of sizes, velocity and pressure classes as required for smooth, stable, and controllable air flow. Provide parallel or opposed blade dampers as recommended by manufacturers sizing techniques. Provide parallel blade dampers for dampers providing two-position control (for multi zone dampers a parallel blade application with lower torque requirements should be submitted as an alternate). For dampers located near fan outlets, provide dampers rated for fan outlet velocity and close-off pressure, and recommended by damper manufacturer for fan discharge damper service.

B. For zone dampers and other applications with duct or opening areas less that 5 square feet that do not provide isolation to out doors and function in a general isolation and modulating control service in rectangular ducts at velocities not greater than 1500 fpm , differential pressure not greater than 2.5" w.c. :

1. **Performance**: Test in accordance with AMCA 500.
2. **Frames**: Galvanized steel, 16-gauge minimum thickness, welded or riveted with corner reinforcement.
3. **Blades**: Stainless steel in lab exhausts and galvanized steel elsewhere, maximum blade size 8 inches wide by 48 inches long, attached to minimum 1/2 inch shafts with set screws, 16 gauge minimum thickness.
4. **Blade Seals**: Synthetic elastomer, mechanically attached, field replaceable.
5. **Jamb Seals**: None.
6. **Shaft Bearings**: Oil impregnated sintered bronze, graphite impregnated nylon sleeve or other molded synthetic sleeve, with thrust washers at bearings.
7. **Linkage**: Concealed in frame if parallel.
8. **Linkage Bearings**: Oil impregnated sintered bronze or graphite impregnated nylon.
9. **Leakage**: Less than one percent based on approach velocity of 1500 ft./min. and 1 inches wg. .
10. **Maximum Pressure Differential**: 2.5 inches wg.
11. **Temperature Limits**: -40 to 200 °F .
12. Where two dampers are to be mechanically interlocked such as a face and bypass arrangement, the manufacturer will provide required torque values for the combined damper assembly.
13. **Acceptable Manufacturers**: Subject to compliance with requirements approved manufacturers are as follows:
    a) Johnson Controls D-1100
    b) Ruskin CD36
    c) Vent Products 5800

C. For applications with duct or opening areas greater than 5 square feet that do not provide isolation to out doors and function in a general isolation and modulating control

service in rectangular ducts at velocities exceeding 1500 fpm , differential pressure greater than 2.5" w.c. :

1. **Performance**: Test in accordance with AMCA 500.
2. **Frames**: Galvanized steel, 16-gauge minimum thickness, welded or riveted with corner reinforcement.
3. **Blades**: Galvanized steel or extruded aluminum hollow airfoil shape, maximum blade size 8 inches wide by 48 inches long, attached to minimum 1/2 inch shafts, 14 gauge minimum extrusion thickness.
4. **Blade Seals**: Synthetic elastomeric, mechanically attached, field replaceable.
5. **Jamb Seals**: Stainless steel.
6. **Shaft Bearings**: Oil impregnated sintered bronze sleeve, graphite impregnated nylon sleeve, molded synthetic sleeve, or stainless steel sleeve, with thrust washers at bearings.
7. **Linkage**: Concealed in frame if parallel.
8. **Linkage Bearings**: Oil impregnated sintered bronze or graphite impregnated nylon.
9. **Leakage**: Less than 0.1 percent based on approach velocity of 4000 ft./min. and 1 inches wg. .
10. **Maximum Pressure Differential**: 6 inches wg.
11. **Temperature Limits**: -40 to 200 °F .
12. Where opening size is larger than 48 inches wide, or 72 inches high, provide dampers in multiple sections, with appropriately intermediate frames, and jackshafts. For multiple dampers driven by a jackshaft the shaft will rigid in torsion and driven by at least two actuators located at either end of the shaft.
13. **Acceptable Manufacturers**: Subject to compliance with requirements approved manufacturers are as follows:
    a) TAMCO 1000
    b) Ruskin CD60
    c) CESCO Products AGA or AGB

D. For all outside air intake or exhaust control dampers that provide isolation to out doors or otherwise need to provide thermal isolation:

1. **Performance**: Test in accordance with AMCA 500.
2. **Frames**: Galvanized steel, 16-gauge minimum thickness, welded or riveted with corner reinforcement.
3. **Blades**: Extruded aluminum hollow airfoil shape, maximum blade size 8 inches wide by 48 inches long, attached to minimum 1/2 inch shafts, 14 gauge minimum extrusion thickness.
4. **Blade Seals**: Synthetic elastomeric, mechanically attached, field replaceable.
5. **Jamb Seals**: Non-metallic seal.
6. **Shaft Bearings**: Oil impregnated sintered bronze sleeve, graphite impregnated nylon sleeve, molded synthetic sleeve, or stainless steel sleeve, with thrust washers at bearings.

7. **Linkage**: Concealed in frame if parallel.
8. **Linkage Bearings**: Oil impregnated sintered bronze or graphite impregnated nylon.
9. **Leakage**: Less than 0.1 percent based on approach velocity of 4000 ft./min. and 1 inches wg. .
10. **Maximum Pressure Differential**: 6 inches wg.
11. **Temperature Limits**: -40 to 200 °F .
12. Where opening size is larger than 48 inches wide, or 72 inches high, provide dampers in multiple sections, with appropriately intermediate frames, and jackshafts. For multiple dampers driven by a jackshaft the shaft will rigid in torsion and driven by at least two actuators located at either end of the shaft.
13. **Acceptable Manufacturers**: Subject to compliance with requirements approved manufacturers are as follows:
    a) TAMCO 9000
    b) Ruskin CDTI50

E. For general isolation and modulating control service in round ducts up to 40 inches in size at velocities not greater than 2500 fpm , differential pressure not greater than 4" w.c. :

1. **Performance**: Test in accordance with AMCA 500.
2. **Frames**: rolled 12 gauge steel strip for sizes 6 inch and smaller, rolled 14 gauge steel channel for larger sizes, galvanized or aluminum finish.
3. **Blades**: Steel construction, 12 gauge minimum thickness for dampers less than 18 inches in size, 10 gauge minimum thickness for larger dampers.
4. **Blade Seals**: Full circumference neoprene.
5. **Shaft**: ½ inch diameter zinc or cadmium plated steel.
6. **Shaft Bearings**: Oil impregnated sintered bronze or stainless steel, pressed into frame, with thrust washers at bearings.
7. **Leakage**: Less than 0.2 percent based on approach velocity of 4000 ft./min. and 1 inches wg. differential pressure.
8. **Maximum Pressure Differential**: 4 inches wg.
9. **Temperature Limits**: -40 to 300 °F .

F. For general isolation and modulating control service in round ducts up to 60 inches in size at velocities not greater than 4000 fpm (20.3 m/s), differential pressure not greater than 6" w.c. (1492 Pa):

1. **Performance**: Test in accordance with AMCA 500.
2. **Frames**: rolled 10-gauge steel channel for sizes 48 inch and smaller, rolled 3/16 inch thick steel channel for larger sizes, galvanized or aluminum finish.
3. **Blades**: Steel construction, 10-gauge minimum thickness for dampers not greater than 48 inches in size, ¼ inch minimum thickness for larger dampers.
4. **Blade stops**: ½ inch x ¼ inch full circumference steel bar.
5. **Blade Seals**: Full circumference neoprene.
6. **Shaft**: zinc or cadmium plated steel, angle reinforcing as necessary.

7. **Shaft Bearings**: Oil impregnated sintered bronze or stainless steel, pressed into frame, with thrust washers at bearings.
8. **Leakage**: Less than 0.4 percent based on approach velocity of 4000 ft./min. and 1 inches wg. differential pressure.
9. **Maximum Pressure Differential**: 6 inches wg.
10. **Temperature Limits**: -40 to 250 °F .

2.4 ACTUATORS

A. **General**: Size actuators and linkages to operate their appropriate dampers or valves with sufficient reserve torque or force to provide smooth modulating action or 2-position action as specified. Select spring-return actuators with manual override to provide positive shut-off of devices as they are applied.

B. Damper Actuators

1. Ambient Operating Temperature Limits: -10 to 122°F
2. **Two Position Electric Actuators**: Line voltage with spring return
3. **Electronic Actuators**: Provide actuators with spring return for two-position (24v), 0-5 Vdc, 0-10 Vdc, 2-10Vdc, 4-20 mA, as required. Actuators shall travel full stroke in less than 90 seconds, unless prior approval is obtained. Actuators shall be designed for a minimum of 60,000 full cycles at full torque and be UL 873 listed. Provide stroke indicator. Actuators shall have positive positioning circuit. Where two actuators are required in parallel, or in sequence, provide an auxiliary actuator driver. Actuators shall have current limiting motor protection. Actuators shall have manual override . Modulating actuators for valves shall have minimum rangeability of 40 to 1.
   a) **Close-Off Pressure**: Provide the minimum torque required, and spring return for fail positioning (unless otherwise specifically indicated) sized for required close-off pressure. Required close-off rating of air damper applications shall be shutoff pressure of associated fan, plus 10 percent. When shutoff does not apply the actuator will be sized based on the manufactures required torque plus 30%.
   b) **Acceptable Manufacturers**: Subject to compliance with requirements approved manufacturers are as follows:
      1) Belimo
      2) Delta
      3) Invensys

C. Quarter-Turn Actuators (for ball and butterfly valves):

1. **Electric**
   a) **Motor**: Suitable for 120 or 240 Volt single-phase power supply. Insulation shall be NEMA Class F or better. Motor shall be rated for 100 percent duty cycle. Motors shall have inherent overload protection.
   b) **Gear Train**. Motor output shall be directed to a self locking gear drive mechanism. Gears shall be rated for torque input exceeding motor locked rotor torque.

c) **Wiring**: Power and control wiring shall be wired to a terminal strip in the actuator enclosure

d) **Failsafe Positioning**: Actuators shall be spring return type for failsafe positioning.

e) **Enclosure**: Actuator enclosure shall be NEMA-4 rated, and shall have a minimum of two threaded conduit entries. Provide an enclosure heater for actuators located outside of buildings.

f) **Limit Switches**: Travel limit switches shall be UL and CSA approved. Switches shall limit actuator in both open and closed positions.

g) **Mechanical Travel Stops**: The actuator shall include mechanical travel stops of stainless steel construction to limit actuator to specific degrees of rotation.

h) **Manual Override**: Actuators shall have manual actuator override to allow operation of the valve when power is off. For valves 4 inches and smaller the override may be a removable wrench or lever or geared handwheel type. For larger valves, the override shall be a fixed geared handwheel type. An automatic power cut-off switch shall be provided to disconnect power from the motor when the handwheel is engaged for manual operation.

i) **Valve Position Indicator**: A valve position indicator with arrow and open and closed position marks shall be provided to indicate valve position.

j) **Torque Limit Switches**: Provide torque limit switches to interrupt motor power when torque limit is exceeded in either direction of rotation.

k) **Position Controller**: For valves used for modulating control, provide an electronic positioner capable of accepting 4-20 mA, 0-10 Vdc, 2-10 Vdc, and 135 Ohm potentiometer.

l) **Ambient Conditions**: Actuator shall be designed for operation from –10 to 150 °F ambient temperature with 0 to 100 percent relative humidity.

2.5 GENERAL FIELD DEVICES

A. Provide field devices for input and output of digital (binary) and analog signals into controllers (BCs, AACs, ASCs). Provide signal conditioning for all field devices as recommended by field device manufacturers, and as required for proper operation in the system.

B. It shall be the Contractor's responsibility to assure that all field devices are compatible with controller hardware and software.

C. Field devices specified herein are generally 'two-wire' type transmitters, with power for the device to be supplied from the respective controller. If the controller provided is not equipped to provide this power, or is not designed to work with 'two-wire' type transmitters, or if field device is to serve as input to more than one controller, or where the length of wire to the controller will unacceptably affect the accuracy, the Contractor shall provide 'four-wire' type equal transmitter and necessary regulated DC power supply or 120 VAC power supply, as required.

D. For field devices specified hereinafter that require signal conditioners, signal boosters, signal repeaters, or other devices for proper interface to controllers, Contractor shall

furnish and install proper device, including 120V power as required. Such devices shall have accuracy equal to, or better than, the accuracy listed for respective field devices.

E. **Accuracy**: As stated in this Section, accuracy shall include combined effects of nonlinearity, nonrepeatability and hysteresis.

2.6 TEMPERATURE SENSORS (TS)

A. **Sensor range**: When matched with A/D converter of BC, AAC/ASC, or Smart Sensor (SS), sensor range shall provide a resolution of no worse than 0.3°F (unless noted otherwise). Where thermistors are used, the stability shall be better than 0.25°F over 5 years.

B. **Matched Sensors**: The following applications shall require matched sensors:

1. **Building Loop Connections**: Provide matched loop and building supply sensors where control sequence requires controlling to a temperature rise (differential).
2. **Hydronic Temperature Difference Calculations**: Provide matched supply and return temperature sensors where the pair is used for calculating temperature difference for use in load calculations or sequencing such as across chillers and plants.
3. **Air Handling Unit Sequencing:** Provide matched pair for the cooling and heating coil leaving sensors where the sequence includes calculating an offset from the supply air setpoint to maintain a leaving heating coil temperature.

C. **Room Temperature Sensor:** Shall be an a stainless steel wall plate sensor. An electronic thermostat with manual override will be provided in the principal and main office areas and in select administrative areas as approved by CPS. Provide ¼" medical grade closed cell foam insulating material. The following sensing elements are acceptable:

1. Sensing element shall be platinum RTD, thermistor, or integrated circuit, +/- 0.3°F accuracy at calibration point.

D. **Single-Point Duct Temperature Sensor:** Shall consist of sensing element, junction box for wiring connections and gasket to prevent air leakage or vibration noise. Temperature range as required for resolution indicated in paragraph A. Sensor probe shall be 316 stainless steel.

1. Sensing element shall be platinum RTD, thermistor, or integrated circuit, +/- 0.3°F accuracy at calibration point

E. **Averaging Duct Temperature Sensor**: Shall consist of an averaging element, junction box for wiring connections and gasket to prevent air leakage. Provide sensor lengths and quantities to result in one lineal foot of sensing element for each three square feet of cooling coil/duct face area. Temperature range as required for resolution indicated in paragraph A.

1. Sensing element shall be platinum RTD, or thermistor, +/- 0.3°F accuracy at calibration point.

F. **Liquid immersion temperature sensor** shall include thermowell, sensor and connection head for wiring connections. Provide thermally conductive paste in well to ensure good contact with the well. Temperature range shall be as required for resolution of 0.15°F.

1. Sensing element (chilled water/glycol systems) shall be platinum RTD +/- 0.2°F accuracy at calibration point. Temperature range shall be as required for resolution of 0.15°F.
2. Sensing element (other systems) shall be platinum RTD, thermistor, or integrated circuit, +/- 0.4°F accuracy at calibration point. Temperature range shall be as required for resolution of 0.3°F.

G. **Pipe Surface-Mount Temperature Sensor**: Sensor are only for use in applications specifically identified on the drawings. Normally only used on condensate return piping for steam systems. Shall include metal junction box and clamps and shall be suitable for sensing pipe surface temperature and installation under insulation. Provide thermally conductive paste at pipe contact point. Temperature range shall be as required for resolution indicated in paragraph A.

1. Sensing element shall be platinum RTD, thermistor, or integrated circuit, +/- 0.4°F accuracy at calibration point.

H. **Outside air sensors** shall consist of a sensor, an aspirated enclosure, utility box, and watertight gasket to prevent water seepage. Temperature range shall be as required for resolution indicated in Paragraph A

1. Sensing element shall be platinum RTD, thermistor, or integrated circuit, +/- 0.4°F accuracy at calibration point.

2. **Acceptable Manufacturers**: Kele A21 or equal

2.7 TEMPERATURE TRANSMITTERS

A. Where required by Controller, or where wiring runs are over 50 feet, sensors as specified above may be matched with transmitters outputting 4-20 mA linearly across the specified temperature range. Transmitters shall have zero and span adjustments, an accuracy of 0.1°F when applied to the sensor range.

2.8 HUMIDITY TRANSMITTERS

A. Units shall be suitable for duct, wall (room) or outdoor mounting. Unit shall be two-wire transmitter utilizing bulk polymer resistance change or thin film capacitance change humidity sensor. Unit shall produce linear continuous output of 4-20 mA for percent relative humidity (% RH). A combination temperature and humidity sensor may be used for zone level monitoring. Sensors shall have the following minimum performance and application criteria:

1. Input Range: 0 to 100% RH.
2. Accuracy(% RH): +/- 2% (when used for enthalpy calculation, dewpoint calculation or humidifier control) or +/- 3% (monitoring only) between 20-90% RH at 77°F, including hysteresis, linearity, and repeatability.
3. Sensor Operating Range: As required by application
4. Long Term Stability: Less than 1% drift per year.

B. **Acceptable Manufacturers**: Units shall be Vaisala HM Series, General Eastern, Microline, or Hy-Cal HT Series, Kele H_20K.

2.9 PRESSURE AND DIFFERENTIAL PRESSURE TRANSMITTERS (DP)

A. **General Purpose - Water**: Two-wire transmitter, 4-20 mA output with zero and span adjustments. Plus or minus 0.5% overall accuracy, 450 psig maximum static pressure rating, 200 psid maximum overpressure rating for 6 through 60 psid range, 450 psid for 100 through 300 psid range.

1. Acceptable units shall be Kele & Associates Model 360 C

B. **Liquid, Steam and Gas**:

1. **General**: Two-wire smart DP cell type transmitter, 4-20 mA or 1-5 Vdc user-selectable linear or square root output, adjustable span and zero, stainless steel wetted parts.
2. **Environmental limits**: –40 to 250 °F , 0 to 100% RH..
3. **Accuracy**: less than 0.1 percent of span.
4. **Output Damping**: Time constant user selectable from 0 to 36 seconds.
5. **Vibration Effect**: Less than ±0.1% of upper range limit from 15 to 2000 Hz in any axis relative to pipe mounted process conditions.
6. **Electrical Enclosure**: NEMA-4, -4X, -7, -9.
7. **Approvals**: FM, CSA.
8. **Acceptable Manufacturers**: Rosemount Inc. 3051 Series, Foxboro, Johnson-Yokagawa, Setra, or Mamac.

C. **General Purpose Low Pressure Air**: Generally for use in static measurement of duct pressure or constant volume air velocity pressure measurement where the range is applicable.

1. **General**: Loop powered two-wire differential capacitance cell-type transmitter.
2. **Output**: two wire 4-20 mA output with zero adjustment.
3. **Overall Accuracy**: Plus or minus 1% of reading.
4. **Minimum Range**: 0.1 in. w.c.
5. **Maximum Range**: 10 inches w.c.
6. **Housing**: Polymer housing suitable for surface mounting.
7. **Acceptable Manufacturers**: Modus T30.
8. **Static Sensing Element**: Pitot-type static pressure sensing tips similar to Dwyer model A-301 and connecting tubing.
9. **Range**: Select for specified setpoint to be between 25% and 75% full-scale.

D. **General Purpose Low Pressure/Low Differential Air**: Generally for use in static measurement of space pressure or constant volume air velocity pressure measurement where the range is applicable.

1. **General**: Loop powered, two-wire differential capacitance cell type transmitter.
2. **Output**: Two-wire 4-20 mA output with zero adjustment.
3. **Overall Accuracy**: Plus or minus 1% of reading.
4. **Minimum Range**: 0 in. w.c.
5. **Maximum Range**: 0.1, 0.25, or 0.5 inches w.c.
6. **Housing**: Polymer housing suitable for surface mounting.
7. **Acceptable Manufacturers**: Modus T30 or Setra.

8. **Static Sensing Element**: Pitot-type static pressure sensing tips similar to Dwyer model A-301 and connecting tubing.
9. **Range**: Select for specified setpoint to be between 25% and 75% full-scale.

E. **Velocity Pressure**: Generally for use in air velocity pressure measurement where the range is applicable.

1. **General**: Loop powered two-wire differential capacitance cell type transmitter.
2. **Output**: Two-wire, 4-20 mA output with zero adjustment.
3. **Overall Accuracy**: Plus or minus 0.25%
4. **Minimum Range**: 0 in. w.c.
5. **Maximum Range**: 1 inch w.c.
6. **Housing**: Polymer housing suitable for surface mounting.
7. **Acceptable Manufacturers**: Setra 264 with optional FS accuracy above or equal. .
8. **Range**: Select for minimum range that will accept the maximum velocity pressure expected.

2.10 VALVE BYPASS FOR DIFFERENTIAL PRESSURE SENSORS

A. Provide a five valve bypass kit for protection of DP sensors where the static on the pipe can cause on over pressure when connected to one port with the other at atmospheric pressure. Kit shall include high and low pressure isolation valves, high and low pressure vent valves, and a bypass valve contained in a NEMA-1 enclosure.

2.11 DIFFERENTIAL PRESSURE SWITCHES (DPS)

A. **General Service - Air**: Diaphragm with adjustable setpoint and differential and snap acting form C contacts rated for the application. Provide manufacturer's recommended static pressure sensing tips and connecting tubing

B. **General Service - Water**: Diaphragm with adjustable setpoint, 2 psig or adjustable differential, and snap-acting Form C contacts rated for the application. 60 psid minimum pressure differential range. 0°F to 160°F operating temperature range.

2.12 PRESSURE SWITCHES (PS)

A. Diaphragm or bourdon tube with adjustable setpoint and differential and snap-acting Form C contacts rated for the application. Pressure switches shall be capable of withstanding 150% of rated pressure.

B. **Acceptable Manufacturers**: Square D, ITT Neo-Dyn, ASCO, Penn, Honeywell, and Johnson Controls.

2.13 TRANSDUCERS

A. **Standard Capacity Electronic-to-Pneumatic (E-P) Transducers**: E-P transducers shall be Voltage-to-Pneumatic (V-P) type, Current-to-Pneumatic (I-P) type,:

1. **Electrical Power Supply**: 24 Vac or 24 Vdc.
2. **Pneumatic Air Supply**: 30 psig (2.07 bar) maximum.
3. **Air Capacity**: 1100 scim @ 20 psig (300 cm^3/sec @ 1.4 bar).

4. **Air Consumption**: Zero at steady state.
5. **Output Span**: 0-20 psig (0-1.4 bar).
6. **Input**: 4-20 mA, 0-5 Vdc, 1-5 Vdc, 0-10 Vdc, 2-10 Vdc, 0-15 Vdc, or 3-15 Vdc input.
7. **Enclosure**: Polymer designed for surface or panel mount.
8. **Air Connections**: ¼" (6.35 mm) barbed.
9. **Failure Mode on Power Loss**: Non-failsafe transducers shall have no output air loss. Failsafe transducers shall exhaust output upon power loss.
10. **Acceptable Manufacturers**: RE Technologies Model UCP-522.

B. **Binary to Analog Transducers or Tri-State-to-Voltage or -Current**:

1. Adjustable zero and span.
2. **Failure Mode on Power Loss**: Shall be provided with memory feature to allow the transducer to return to last value on power failure.
3. **Accuracy**: ± 1% of span
4. **Output Span**: 4-20 mA, 0-5 Vdc, 1-5 Vdc, 0-10Vdc, 2-10Vdc, 0-15Vdc, 3-15Vdc
5. **Input**: 4-20 mA, pulse width modulated or tri-state input.
6. **Tri-state Input Time Base:** Dip switch selectable.
7. **Enclosure**: Polymer designed for surface or panel mount.
8. **Failure Mode on Power Loss**: Non-failsafe transducers shall have no output air loss. Failsafe transducers shall exhaust output upon power loss.
9. **Acceptable Manufacturers**: RE Technologies Model PWA Series.

C. **Electronic-to Electronic (Voltage or Current to Current or Voltage):**

1. Adjustable zero and span.
2. **Failure Mode on Power Loss**: Memory feature to allow the transducer to return to last value on power failure.
3. **Accuracy**: ± 1% of span.
4. **Output Span**: 4-20 mA, 0-5 Vdc, 1-5 Vdc, 0-10 Vdc, 2-10 Vdc, 0-15 Vdc, 3-15 Vdc.
5. **Input**: 0-20 Vdc, 0-20 ma, 0-10 kOhm.
6. **Enclosure**: Polymer enclosure designed for surface or panel mount.
7. **Acceptable Manufacturers**: RE Technologies Model PWA Series.

2.14 CURRENT SWITCHES (CS)

A. **Clamp-On or Solid-Core Design Current Operated Switch** (for Constant Speed Motor Status Indication)

1. **Range**: 1.5 to 150 amps.
2. **Trip Point**: Adjustable.
3. **Switch**: Solid state, normally open, 1 to 135 Vac or Vdc, 0.3 Amps. Zero off state leakage.
4. **Lower Frequency Limit**: 6 Hz.
5. **Trip Indication**: LED
6. **Approvals**: UL, CSA

7. **Max. Cable Size**: 350 MCM
8. **Acceptable Manufacturers**: Veris Industries H-708/908; Inc., RE Technologies SCS1150A-LED.

B. **Clamp-on or Solid-Core Wire Through Current Switch (CS/CR) (for Constant Speed Motors)**: Same as CS with 24v command relay rated at 5A @ 240 Vac resistive, 3A @ 240 Vac inductive, load control contact power shall be induced from monitored conductor (minimum conductor current required to energize relay 5A, max. rating of 135A). Acceptable Manufacturers shall be Veris Industries, Inc., Model # H938/735; or RE Technologies RCS 1150.

1. Where used for single-phase devices, provide the CS/CR in a self-contained unit in a housing similar with override switch to Kele RIBX.

C. **Clamp-On Design Current Operated Switch for Variable Speed Motor Status Indication**

1. **Range**: 1.5 to 135 Amps.
2. **Trip Point**: Self-calibrating based on VA memory associated with frequency to detect loss of belt with subsequent increase of control output to 60 Hz.
3. **Switch**: Solid state, normally open, 1 to 135 Vac or Vdc, 0.3 Amps. Zero off state leakage.
4. **Frequency Range**: 5-75 Hz
5. **Trip Indication**: LED
6. **Approvals**: UL, CSA
7. **Max. Cable Size**: 350 MCM
8. Acceptable Manufacturers: Veris Industries, Inc. H-904.

D. **Clamp-On Wire Through Current Switch (CS/CR) (for Variable Speed Motors)**: Same as CS with 24v command relay rated at 5A @ 240 Vac resistive, 3A @ 240 Vac inductive, load control contact power shall be induced from monitored conductor (minimum conductor current required to energize relay 5A, max. rating of 135A). Acceptable manufacturer shall be Veris Industries, Inc., Model # H934.

E. **Variable Speed Status**: Where current switches are used to sense the status for variable speed devices, the CT shall include on-board VA/Hz memory to allow distinction between a belt break and subsequent ramp up to 60 Hz, versus operation at low speed. The belt break scenario shall be indicated as a loss of status and the operation at low speed shall indicate normal status.

2.15 CURRENT TRANSFORMERS (CT)

A. **Clamp-On Design Current Transformer (for Motor Current Sensing)**

1. **Range**: 1-10 amps minimum, 20-200 amps maximum
2. **Trip Point**: Adjustable
3. **Output**: 0-5 VDC.
4. **Accuracy**: ±0.2% from 20 to 100 Hz.
5. **Acceptable Manufacturers**: KELE SA100, Veris Hawkeye 720.

2.16 OUTDOOR AIR STATIC PRESSURE SENSING TIP

A. **Pressure sensor**: Pressure sensing tip shall be designed to minimize the effects of wind and resulting velocity pressure up to 80 mph. Acceptable manufacturers shall be Dwyer A-306.

B. **Low Air Pressure Surge Dampener**: 30-second time constant. Acceptable manufacturer shall be Modus SD030.

2.17 CONTINUOUS LEVEL TRANSMITTERS

A. Capacitance Type

1. Provide a loop powered, continuous capacitance type level transmitter with adjustable span and zero.
2. **Output**: 4-20 mA.
3. **Probe**: Fluoropolymer coated stainless steel rod or cable. Provide cable probe with end attachment hardware or weight.
4. **Electrical Enclosure**: NEMA-4, -7.
5. **Approvals**: UL or CSA.
6. **Accuracy**: ±1% of calibrated span.
7. **Process Connection**: MPT or ANSI Flange as required.
8. **Acceptable Manufacturers**: Drexelbrook, Endress & Hauser.

B. Hydrostatic Pressure

1. Two wire smart d/p cell type transmitter
2. 4-20 mA or 1 to 5 volt user selectable linear or square root output
3. Adjustable span and zero
4. Stainless steel wetted parts
5. Environmental limits: –40 to 250 °F (-40 to 121°C), 0 to 100% RH
6. Accuracy: less than 0.1 percent of span
7. Output Damping: time constant user selectable from 0 to 36 seconds
8. Vibration Effect: Less than ±0.1% of upper range limit from 15 to 2000 Hz in any axis relative to pipe mounted process conditions.
9. Electrical Enclosure: NEMA 4, 4X, 7, 9
10. Approvals: FM, CSA
11. **Acceptable Manufacturers**: Rosemount Inc. 3051 Series, Foxboro, and Johnson-Yokagawa.

2.18 INSERTION TYPE TURBINE METER FOR WATER SERVICE

2.19 VORTEX SHEDDING FLOW METER FOR STEAM AND GAS SERVICE:

A. **Output**: Pulse output, field selectable pulse per units selected

B. **Maximum Fluid Temperature**: 800 °F

C. **Wetted Parts**: Stainless Steel

D. **Housing**: NEMA 4X

E. **Turndown**: 10:1 minimum.

F. **Accuracy**: 0.5% of calibrated span for liquids, 1% of calibrated span for steam and gases.

G. **Body**: Wafer style or ANSI flanged to match piping specification.

H. **Acceptable Manufacturers**: Foxboro 83 series, Johnson-Yokagawa, and Rosemount.

2.20 VENTURI FLOW METER FOR WATER SERVICE

A. **Flow Sensing Element**: Differential-pressure Venturi-type designed for installation in piping.

B. **Construction**: Bronze or cadmium plated steel with brass quick connect fittings and attached tag with flow conversion data and rated flow. Ends shall be threaded for 2" and smaller and flanged or welded for larger than 2".

C. Accuracy: Differential transmitter shall be dual range industrial grade as specified above.

1. Under the reference conditions of a 68 °F media temperature, a 68 °F ambient temperature, a +/- 1% nominal power supply voltage, 10 diameters up stream and 5 down of straight piping and a fully developed flow profile; the meter must meet the following requirements:
2. +/- 0.8% of reading accuracy in the flow range of 1.65 - 33 ft/sec +/- (0.66/Velocity actual ft/s +0.4)% of reading accuracy in the flow range of 0-1.65 ft/sec.
3. Meter repeatability shall be +/- 0.1% of rate at velocities > 1.65 ft/sec.

D. Connect differential pressure to venturi and repipe quick connect fittings for measurement. Provide ball valves to isolate quick connects and differential pressure transmitter.

E. Apply Venturi-type flow meters where minimum flow range is no less than 40% of maximum flow.

2.21 AIRFLOW MEASURING STATIONS (AFMS)

A. General Requirements

1. **Sensor Accuracy**: ±1.5%
2. **Electronics Accuracy**: ±0.5%
3. **Range**: Select minimum range to accommodate the expected flow range of the project
4. **Temperature Limits**: 20-140°F
5. **Velocity Range**: 750 to 9000 fpm
6. **Operating Range**: Select minimum range to accommodate the expected flow range of the project

B. **Pitot Tube Grids**: Provide an array of velocity pressure sensing elements with averaging manifolds and air straightening vanes packaged in a sheet metal casing. Distribute sensing elements in accordance with ASHRAE for traversing ducts. Provide

taps to connect tubing from instrumentation. Label AFM with drawing number designation, design flow, velocity pressure, and pressure drop. Application of pitot grids shall be allowed only where minimum expected flow is greater than 30% of maximum flow and greater than manufacturer's minimum flow to achieve accuracy.

1. **Acceptable Manufacturer**:
   a) Tek-Air TFP-5000
   b) Kele KMS-DS flow station

C. **Hot Wire Grid**: Provide an array of hot wire anemometer with air straightening package in a sheet metal casing. Provide averaging circuitry and transmitter to transmit a linear signal proportional to airflow.

1. **Acceptable Manufacturer**:
   a) Ebtron
   b) Dybek
   c) Kurtz

D. **Vortex Shedding Grid**: Provide an array of vortex shedding elements designed to produce stable 'Karmen Vortices' that are linear with air velocity. Provide the electronics to totalize the pulses and output average velocity proportional to an output signal of 4-20ma.

1. **Acceptable Manufacturer**: Tek-Air Systems Inc. 'Vortek' Model.

E. **Fan Inlet**: Provide multi-sensor probes which are installed in the inlet of the fan. Individual sensors on the probe provide direct proportional and linear signals to airflow velocity.

1. **Acceptable Manufacturer**: Tek-Air Systems Inc. 'Vortek' Model 7000, 8000, or Approved Equal.

2.22 AIR VELOCITY PRESSURE SENSORS (INSERTION TYPE)

A. **Single or Multi-Point Averaging** (as indicated): Sensing tip shall be for insertion into duct with mounting flange and push on tube connections. Material shall be suitable to the application.

2.23 CO_2 SENSORS/TRANSMITTERS (CARBON DIOXIDE)

A. CO_2 sensors shall use silicon based, diffusion aspirated, infrared single beam, dual-wavelength sensor.

B. **Range**: 0-2000 ppm

C. **Accuracy**: ±36ppm at 800 ppm and 68°F.

D. **Stability**: 5% over 5 years.

E. **Output**: 4-20 mA, 0-10 Vdc or relay.

F. **Mounting**: Duct as indicated

G. **Acceptable Manufacturer**: Vaisala, Inc. GMD20 (duct) or GMW20 (wall), MSA, Inc, Kele 8000 series.

2.24 CO SENSORS/TRANSMITTERS (CARBON MONOXIDE)

A. CO sensors shall use electrochemical sensor.

B. **Accuracy**: 3% at 0-250 ppm

C. **Display & Horn**: Progressive or digital display and audible alarm, 65dBA @ 3'.

D. **Output**: 4-20 mA, 0-10 Vdc .

E. **Mounting**: Wall mounted between 3' and 5' above the floor in the boiler room.

F. **Acceptable Manufacturer**: Kele GMT-CO-S1A, MSA, Inc.

2.25 PNEUMATIC CONTROL COMPONENTS

A. **Analog Pressure Gauges**: Gauges shall be pneumatic type, minimum 1-1/2" in (38 mm) diameter, with white face and black numerals. Surface-mounted gauges shall have chrome plated trim and be a minimum of 2-1/2" in (64 mm) diameter.

B. **Pneumatic Actuated Pressure Switches (PE)** (for 30 psig max pressure control systems): Pressure ranges and sensitivity of PEs shall match control system sequence of operation. Switch operation shall be externally adjustable over the operating pressure range (nominal 0-20 psig, 0 to 138 KPa). PE switches shall be SPDT type, rated for the particular application, and shall be UL listed. PE shall be as manufactured by Penn. Substitutions shall be allowed as per Division 1

C. **Pilot Positioners**: Operating span adjustment range is from 3 to 13 psi (21 to 91 kPa). Positioner shall be furnished with a mounting bracket for attachment directly to the actuator.

2.26 ELECTRIC CONTROL COMPONENTS

A. **Limit Switches (LS):** Limit switches shall be UL listed, SPDT or DPDT type, with adjustable trim arm. Limit switches shall be as manufactured by Square D, Allen Bradley.

B. **Electric Solenoid-Operated Pneumatic Valves (EP)**: EP valves shall be rated for a minimum of 1.5 times their maximum operating static and differential pressure.. Valves shall be ported 2-way, 3-way, or 4-way and shall be normally closed or open as required by the application. EPs shall be sized for minimum pressure drop, and shall be UL and CSA listed. Furnish and install gauges on all inputs of EPs. Furnish an adjustable air pressure regulator on input side of solenoid valves serving actuators operating at greater than 30 psig.

1. **Coil Enclosure**: Indoors shall be NEMA-1, Outdoors and NEMA-3, 4, 7, 9.
2. **Fluid Temperature Rating**: Valves for compressed air and cold water service shall have 150 °F (66 °C) minimum rating. Valves for hot water or steam service shall have fluid temperature rating higher than the maximum expected fluid temperature.
3. **Acceptable Manufacturers**: EP valves shall be as manufactured by ASCO or Parker.
4. **Coil Rating**: EP valves shall have appropriate voltage coil rated for the application (i.e., 24 VAC, 120 VAC, 24 VDC, etc.).

C. **Low Temperature Detector ('Freezestat') (FZ):** Low temperature detector shall consist of a 'cold spot' element which responds only to the lowest temperature along any one foot of entire element, minimum bulb size of 1/8" x 20', junction box for wiring connections and gasket to prevent air leakage or vibration noise, DPST (4 wire, 2 circuit) with manual reset. Temperature range 15 to 55°F , factory set at 38°F.

D. **High Temperature Detectors ('Firestat') (FS):** High temperature detector shall consist of 3-pole contacts, a single point sensor, junction box for wiring connections and gasket to prevent air leakage of vibration noise, triple-pole, with manual reset. Temperature range 25 to 215°F.

E. **Surface-Mounted Thermostat:** Surface-mounted thermostat shall consist of SPDT contacts, operating temperature range of 50 to 150°F , and a minimum 10°F fixed setpoint differential.

F. **Low Voltage Wall Thermostat:** Wall-mounted thermostat shall consist of SPDT sealed mercury contacts, operating temperature range of 50 to 90°F , switch rating of 24 Vac (30 Vac max.), and both manual and automatic fan operation in both the heat and cool modes.

G. **Control Relays:** All control relays shall be UL listed, with contacts rated for the application, and mounted in minimum NEMA-1 enclosure for indoor locations, NEMA-4 for outdoor locations.

1. Control relays for use on electrical systems of 120 volts or less shall have, as a minimum, the following:
   a) AC coil pull-in voltage range of +10%, -15% or nominal voltage.
   b) Coil sealed volt-amperes (VA) not greater than four (4) VA.
   c) Silver cadmium Form C (SPDT) contacts in a dustproof enclosure, with 8 or 11 pin type plug.
   d) Pilot light indication of power-to-coil and coil retainer clips.
   e) Coil rated for 50 and 60 Hz service.
   f) **Acceptable Manufacturers:** Relays shall be Potter Brumfield, Model KRPA.
2. Relays used for across-the-line control (start/stop) of 120V motors, 1/4 HP, and 1/3 HP, shall be rated to break minimum 10 Amps inductive load. Relays shall be IDEC.
3. Relays used for stop/start control shall have low voltage coils (30 VAC or less), and shall be provided with transient and surge suppression devices at the controller interface.

H. **General Purpose Power Contactors:** NEMA ICS 2, AC general-purpose magnetic contactor. ANSI/NEMA ICS 6, NEMA type 1enclosure. Manufacturer shall be Square 'D', Cutler-Hammer or Westinghouse.

I. **Control Transformers:** Furnish and install control transformers as required. Control transformers shall be machine tool type, and shall be US and CSA listed. Primary and secondary sides shall be fused in accordance with the NEC. Transformer shall be proper size for application, and mounted in minimum NEMA-1 enclosure.

1. Transformers shall be manufactured by Westinghouse, Square 'D', or Jefferson.

J. **Time Delay Relays (TDR)**: TDRs shall be capable of on or off delayed functions, with adjustable timing periods, and cycle timing light. Contacts shall be rated for the application with a minimum of two (2) sets of Form C contacts, enclosed in a dustproof enclosure.

1. TDRs shall have silver cadmium contacts with a minimum life span rating of one million operations. TDRs shall have solid state, plug-in type coils with transient suppression devices.
2. TDRs shall be UL and CSA listed, Crouzet type.

K. **Electric Push Button Switch**: Switch shall be momentary contact, oil tight, push button, with number of N.O. and/or N.C. contacts as required. Contacts shall be snap-action type, and rated for minimum 120 Vac operation. Switch shall be 800T type, as manufactured by Allen Bradley.

L. **Pilot Light**: Panel-mounted pilot light shall be NEMA ICS 2 oil tight, transformer type, with screw terminals, push-to-test unit, LED type, rated for 120 VAC. Unit shall be 800T type, as manufactured by Allen-Bradley.

M. **Alarm Horn**: Panel-mounted audible alarm horn shall be continuous tone, 120 Vac Sonalert solid-state electronic signal, as manufactured by Mallory.

N. **Electric Selector Switch (SS)**: Switch shall be maintained contact, NEMA ICS 2, oil-tight selector switch with contact arrangement, as required. Contacts shall be rated for minimum 120 Vac operation. Switch shall be 800T type, as manufactured by Allen-Bradley.

2.27 DUCT SMOKE DETECTOR

A. Photoelectric detector with sampling tube that spans the entire width of duct. .

B. **Velocity Rating** : 100 to 4000 fpm or 500 to 4000fpm depending on the minimum velocity in the duct. Provide the 100 to 4000 fpm detector if the min duct velocity is below 550 fpm.

C. **Output Contact**: . Alarm, two sets form "C" rated at 10amps 115V resistive. One set of alarm contacts for BAS monitoring and fan shutdown. Trouble, one set of contacts.

D. **Temperature & RH limits:** 32 to 120°F and 10 to 85% relative humidity..

E. **Acceptable Manufacturer**:

1. Invensys FIREX model 2650
2. Sensor Systems DH100ACDCLP
3. Air Products and Controls SL-2000

2.28 ELECTRICAL SUBMETERING

A. The submetering device will monitor current and voltage on all three phases and provide a pulse output..

B. Accuracy: ±1% from 7% to 100% of rated current (temperature range 0-60C)

C. Transducer : Conform to ANSI C12.1 metering accuracy standards.

D. Output: Pulse with field selectable pulse per kWh.

E. Mounting: In panel or as indicated on the drawing

F. Acceptable Manufacturer: Veris. H8053 for 3 phase loads and Veris H8051 for 1 phase loads.

2.29 REFRIGERANT MONITOR

A. **General**: Contractor shall provide a refrigerant sensitive infrared-based stationary refrigerant gas leak monitor system designed to continuously measure refrigerants. Refrigerant monitor shall be coordinated to detect refrigerants used in chiller or other refrigeration equipment. The alarm system shall comply with ANSI/ASHRAE 15-1994 and local code requirements.

B. The refrigerant monitor shall be capable of monitoring multiple refrigerant gas compounds at multiple locations in concentrations of 0 PPM to a minimum of 1000 PPM. The Monitor shall have a low range resolution of 1 PPM in the range of 1 PPM through 100 PPM. Readings above 100 PPM must be accurate to within ±5% of reading. Accuracy shall be maintained within ambient environmental ranges of 0°C. through 50°C., (32°F. through 122°F.) and 5% through 90% relative humidity, non-condensing.

C. The refrigerant monitor shall automatically and continuously monitor the areas through a sample draw type tubular pick up system with an internal pump and filter. The installation of the monitoring control and the tubing shall be in strict accordance with the manufactures instructions. The location, routing, and final position of the sample tubes shall be submitted to the engineer with all necessary shop drawings and monitor specifications and installation instructions. Tubing size, tubing material, and tube length limitations shall be within the specifications of the monitor manufacture. The location and method of tube support and hangers must be identified on the shop drawings. Each of the sampling tubes shall have end of line filters.

D. The analyzer will be based on infrared detection technology, and will be factory tested and calibrated for the specified refrigerant or refrigerants. Factory certification of the calibrations shall be provided with the O&M manuals. . The analyzer shall provide a menu driven or automatic method of checking both zero, span calibration for each sensor, and allow for adjustment.

E. The monitor shall be equipped with 4 outputs. Three relays shall energize at an adjustable user defined set point based on refrigerant concentration levels. The relay threshold adjustment shall be protected by keyed or password access controls. Adjustments and observations shall be made at the front panel operator interface. The relay threshold values can be viewed without a password. The digital display will continuously display the refrigerant concentration level and alarm status. The fourth output shall indicate a monitor malfunction alarm. The monitor shall also have an analog output that will provide a liner scaled reference to the refrigerant concentration in parts per million. The analog output signal shall be an industry standard DC voltage, or mA current signal.

F. The monitor shall have a NEMA-4 moisture resistant enclosure with a gasketed, hinged front cover. Conduits and tube connections shall be located on the bottom of the enclosure. The enclosure shall have a rust and corrosion resistant finish.

G. The following alarm modes will be provided by the refrigerant monitor:

1. An audible alarm shall be placed directly outside the machinery room.

2. A visual alarm, a flashing yellow light, shall be placed directly over the above the door or doors to the machinery room.
3. A sign, with 2" high letters, shall shall be provided at each door that states

DANGER
DO NOT ENTER WHEN LIGHT IS FLASHING
PELIGRO
NO ENTRAR CUANDO LA LUZ ESTE

4. ALARM LEVEL ONE – Low level of refrigerant concentration at one of the sampling points has detected the presence of a possible refrigerant leak. The initial alarm threshold shall be set to 5 PPM (adj.) and increased if there are nuisance alarms. This alarm level shall be displayed on the refrigerant monitor interface panel, indicating which sensor has triggered the alarm, and the associated concentration of refrigerant in PPM. This event will also send an Alarm Level One signal to the BAS through a digital output from the monitor relay. This alarm will remain active until the refrigerant concentration is reduced below set point.
5. ALARM LEVEL TWO – This alarm shall indicate that one of the sensors has detected a refrigerant concentration that is approaching dangerous levels in the area being monitored. This alarm shall be set to 25% below the maximum calculated refrigerant level specified in ANSI/ASHRAE 15-1994 and ASHRAE 34-1992. This alarm will be displayed on the monitor interface, and will indicate which of the sensors has caused the alarm, and the highest concentration in PPM. This event will also activate the beacon and audible alarm mounted on the refrigerant monitoring enclosure. This alarm will also be sent to the BAS through the digital output of the relay. In this mode the audible alarm can be silenced, but the beacon shall remain active until the fault is cleared
6. ALARM LEVEL THREE – This alarm shall be set at the maximum calculated refrigerant level specified in ANSI/ASHRAE 15-1994 and ASHRAE 34-1992 whichever is the lowest concentration. The refrigerant monitor interface will display which sensor has caused the alarm, and the associated concentration in PPM. This event will also activate the beacon and audible alarm mounted on the refrigerant monitoring enclosure. If the audible alarm had been silenced by an earlier alarm, the activation of this level three alarm will cause the audible alarm to be activated again. The relay in the refrigerant monitoring panel shall activate the space ventilation system, and will disable all combustion or flame-producing equipment via hardwired control interlocks. In addition, this event and will de-energize the energy source for any hot surface (850°F or 454°C) located in the space. Interlocks must also be provided to close any normally open doors or openings to the space for proper ventilation and isolation during this alarm condition. This alarm level will also signal the BAS through the digital output through the same relay. In this mode, the audible alarm can be silenced, but the beacon shall remain active until the fault is cleared.

H. All alarm conditions shall be report to the BAS system as follows:

1. ALARM LEVEL ONE - The lowest refrigerant alarm level shall detect the presence of refrigerant in low concentrations and energize a relay to signal a low level alarm to the BAS operator terminal(s). The alarm shall display an alarm message stating that there is a potential refrigerant leak in the designated area.
2. ALARM LEVEL TWO - The second refrigerant level alarm shall be a high refrigerant alarm alert. This alarm shall energize a relay to signal the BAS system

indicating a high level alarm on the BAS operator terminal(s). This BAS alarm shall state that high levels of refrigerant have been detected in the designated area.

3. FAULT ALARM – Reports a high level alarm to the BAS operator terminal(s) that there is a fault in the refrigerant monitoring alarm system.

2.30 NAMEPLATES

A. Provide engraved phenolic or micarta nameplates for all equipment, components, and field devices furnished. Nameplates shall be 1/8 thick, black, with white center core, and shall be minimum 1" x 3", with minimum 1/4" high block lettering. Nameplates for devices smaller than 1" x 3" shall be attached to adjacent surface.

B. Each nameplate shall identify the function for each device.

2.31 TESTING EQUIPMENT

A. Contractor shall test and calibrate all signaling circuits of all field devices to ascertain that required digital and accurate analog signals are transmitted, received, and displayed at system operator terminals, and make all repairs and recalibrations required to complete test. Contractor shall be responsible for test equipment required to perform these tests and calibrations. Test equipment used for testing and calibration of field devices shall be at least twice as accurate as respective field device (e.g., if field device is +/-0.5% accurate, test equipment shall be +/-0.25% accurate over same range).

PART 3. EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.

3.2 INSTALLATION OF CONTROL SYSTEMS

A. **General**: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings. Install electrical components and use electrical products complying with requirements of National Electric Code and all local codes.

B. **Main Control Air Piping**: All main air piping between the compressors and the control panels shall be copper, run per ASTM B88

C. **Branch Control Air Piping**: Accessible tubing is defined as that tubing run in mechanical equipment rooms; inside mechanical equipment enclosures, such as heating and cooling units, instrument panels; across roofs, in pipe chases, etc. Inaccessible tubing is defined as that tubing run in concrete slabs; furred walls; or ceilings with no access.

1. Provide copper tubing with maximum unsupported length of 3'-0", for accessible tubing run exposed to view. Polyethylene tubing may be used in lieu of above, when run within adequately supported, rigid enclosure, such as metallic raceways,

or EMT. Terminal single-line connections less than 18 in length may be copper tubing, or polyethylene tubing run inside flexible steel protection. Accessible tubing run in concealed locations, such as pipe chases, suspended ceilings with easy access, etc. may be copper or polyethylene bundled and sheathed tubing.

2. Provide copper or polyethylene tubing for inaccessible tubing, other than in concrete pour. If polyethylene tubing is used, install in EMT or vinyl-jacketed polyethylene tubing.
3. Polyethylene piping may be used above suspended ceiling without conduit provided it is run in a neat and orderly fashion, bundled where applicable, and completely suspended (strapped to rigid elements or routed through wiring rings) away from areas of normal access. Tubing shall not be laid on the ceiling or duct.
4. Pressure test control air piping at 30 psi (207 kPa) for 24 hours. Test fails if more than 2 psi loss occurs.
5. Fasten flexible connections bridging cabinets and doors, neatly along hinge side, and protect against abrasion. Tie and support tubing neatly.
6. Number-code or color-code tubing, except local individual room control tubing, for future identification and servicing of control system. Code shall be as indicated on approved installation drawings.

D. **Control Wiring**: The term "control wiring" is defined to include providing of wire, conduit and miscellaneous materials as required for mounting and connection of electric control devices.

1. **Wiring System**: Install complete wiring system for electric control systems. Install all control wiring external to panels in electric metallic tubing or raceway. On Renovation projects, wiring in finished areas shall be routed in wire mold. The routing of wiring in finished areas must be specifically approved by the AOR/EOR. Installation of wiring shall generally follow building lines. Install in accordance with National Electrical Code and Division 16 of this Specification. Fasten flexible conductors bridging cabinets and doors, neatly along hinge side, and protect against abrasion. Tie and support conductors neatly.
2. **Control Wiring Conductors**: Install control wiring conductors, without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code and Division 16 of this Specification.
3. Communication wiring, signal wiring and low voltage control wiring shall be installed separate from any wiring over thirty (30) volts. Signal wiring shield shall be grounded at controller end only, unless otherwise recommended by the controller manufacturer.
4. All WAN and LAN Communication wiring shield shall be terminated as recommended by controller manufacturer. All WAN and LAN Communication wiring shall be labeled with a network number, device ID at each termination and shall correspond with the WAN and LAN system architecture and floor plan submittals. All WAN and LAN cabling shall comply with applicable Division 16 requirements.
5. Number-code or color-code conductors appropriately for future identification and servicing of control system. Code shall be as indicated on approved installation drawings.

E. **Control Valves**: Install so that actuators, wiring, and tubing connections are accessible for maintenance. Where possible, install with valve stem axis vertical, with operator side up. Where vertical stem position is not possible, or would result in poor access, valves may be installed with stem horizontal. Do not install valves with stem below horizontal, or down.

F. **Freezestats**: Install freezestats in a serpentine fashion where shown on drawing. Provide one foot of element for each square foot of coil face area. The length of element not just down stream of the coil will not be included in the coverage calculation. Where coil face area exceeds required length of element, provide multiple devices, wired in parallel for normally open close on trip application, wired in series for normally closed, open on trip application. Adequately support with coil clips such that sensor is not in direct contact with equipment. Coordinate the location of the switch such that it is normally accessible.

G. **Room Temperature Sensors**: Install sensors as shown on the drawings. Provide approved security screws for mounting, matching those installed in other areas of the project. Provide 3 tools to the Owner for installation and removal of the security screws. Seal conduit penetrations at the wall box airtight. Install batt insulation in the wall box to completely fill the box. Electrical connections shall be made using a twist-on sealant filled connectors suitable for the installation.

H. **Averaging Temperature Sensors**: Cover no more than three square feet per linear foot of sensor length except where indicated. Generally the sensor will be located where flow is sufficiently homogeneous/adequately mixed , consult AE for requirements.

I. **Airflow Measuring Stations**: Install per manufacturer's recommendations in an unobstructed straight length of duct (except those installations specifically designed for installation in fan inlet). For installations in fan inlets, provide on both inlets of double inlet fans and provide inlet cone adapter as recommended by AFM station manufacturer.

J. **Fluid Flow Sensors**: Install per manufacturer's recommendations in an unobstructed straight length of pipe.

K. **Relative Humidity Sensors**: Provide element guard as recommended by manufacturer for high velocity installations. For high limit sensors, position remote enough to allow full moisture absorption into the air stream before reaching the sensor.

L. **Differential Pressure Transmitters**: Provide valve bypass arrangement to protect against over pressure damaging the transmitter.

M. **Flow Switches**: Where possible, install in a straight run of pipe at least 15 diameters in length to minimize false indications.

N. **Current Switches for Motor Status Monitoring**: Adjust so that setpoint is below minimum operating current and above motor no load current.

O. **Supply Duct Pressure Transmitters**:

1. **General**: Install pressure tips with at least 4 'round equivalent' duct diameters of straight duct with no takeoffs upstream. Install pressure tips securely fastened with tip facing upstream in accordance with manufacturer's installation instructions. Locate the transmitter at an accessible location to facilitate calibration.
2. **VAV System 'Down-Duct' Transmitters**: Locate pressure tips approximately 2/3 of the hydraulic distance to the most remote terminal in the air system.

P. **Cutting and Patching Insulation**: Repair insulation to maintain integrity of insulation and vapor barrier jacket. Use hydraulic insulating cement to fill voids and finish with material matching or compatible with adjacent jacket material.

3.3 REFRIGERANT MONITOR

A. Install in accordance with the manufacturer's instructions. Place sensing tips in locations to maximize effectiveness.

B. Hard wire interlocks to the emergency ventilation and shutdown of combustion devices.

END OF SECTION 15951

SECTION 15952 - BAS OPERATOR INTERFACES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Site Control System Server (CSS)/ Operator Workstation (OWS)

B. Portable Operator Terminal (POT)

C. Printers

1.2 RELATED DOCUMENTS

A. Division 1

B. Division 15

C. Division 16

1.3 DESCRIPTION OF WORK

A. Furnish and install all Operator Interfaces and Control System Servers as required for the BAS functions specified. All computers shall be warranted by the manufacturer for a period of one year after final acceptance. The CPS strategic supplier of Microsoft based computers is Dell so all OWS and POT computers will be Dell. CSS computers will also be Dell unless the BAS system manufacturer manufactures the computer.

B. All computers shall meet the requirements of Chicago Public School's Office of Technology Services as published in the "Minimum Hardware, Software, and Network Standards". The most current document can be found at the following website, www.cps.k12.il.us/Network_Standards.pdf.

C. Refer to Division 15 Section "Building Automation System (BAS) General", for general requirements.

PART 2 - PRODUCTS

1.4 SITE WEB SERVER, CONTROL SYSTEM SERVER (CSS)/

A. The CSS web server shall support browser access via Microsoft Internet Explorer 5.0 (or higher), or Navigator Netscape 6.0 (or higher).

B. The server will have two, (2), LAN network cards compatible with the CPS WAN and BAS LAN systems or as shown on the BAS control riser diagram. The server computer will not function as the workstation. The web server will provide the link between the CPS WAN and BAS LAN.

C. All information exchanged over Internet shall be optionally encrypted and secure via SSL.

D. E-mail – The system will be able to generate e-mails automatically for alarming using a "MS – Outlook" or similar platform that meets the requirements of Chicago Public School's Office of Technology Services as published in the "Minimum Hardware,

Software, and Network Standards". The most current document can be found at the following website, www.cps.k12.il.us/Network_Standards.pdf.

E. The web server licensing options will allow concurrent access by an unlimited number of browser connections.

F. Provide software registration cards to CPS for all included software.

G. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable. For example, a webserver that requires a Java script to load would not be acceptable nor would the use of an alternate to a webserver such as Microsoft Terminal Services.

H. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMS, shall not be acceptable.

I. The Web server shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

J. Provide all software, cables, peripherals etc. for a complete system.

K. Provide network configuration tool, all programming applications, graphic creation tools and all other software required to configure and operate the system.

L. For CSSs that provide web services for presentation of data across the Internet, all Web components and services shall be installed with required licensing. CSS shall be configured to secure it to the extent practical inside the Local Supervisory LAN. CSS shall always function from behind a firewall provided either by the CPS network administrators in the case where they provide the LAN infrastructure, or by this contractor where the LAN is provided under this Division of the specifications.

M. Provide network card approved by BAS manufacturer to support Supervisory LAN communications (100 Mbps Ethernet TCP/IP)

N. Control System Server shall be placed as indicated on the drawings or as directed by CPS.

O. The CSS will meet or exceed the requirements for the OWS hardware.

1.5 OPERATOR WORKSTATION (OWS)

A. The computer hardware will meet Chicago Public School's Office of Technology Services requirements for as published in the "Minimum Hardware, Software, and Network Standards". The most current document can be found at the following website, www.cps.k12.il.us/Network_Standards.pdf. The computer will be a Dell computer "CPS Ready" with the current CPS image.

B. Provide software registration cards to CPS for all included software.

C. Provide (as a minimum) a personal computer (PC) with Intel Pentium 4 processor operating at 3.0GHz minimum speed. Include 2 GB RAM and minimum of two (2) 160GB, 7,200 RPM hard disk drives. These drives will operate as a set of mirrored RAID 1 hard drives with the associated software and/or hardware provided. These drives and the associated controllers supplied and warranted by Dell. Provide a 128 MB graphics card, four USB ports, 10/100 Base-T network card, 48x/24x/48x\16x CD-RW/DVD ROM Combo Drive.

D. Provide 17 in flat panel Monitor.

E. Provide detachable keyboard with standard typewriter layout, function keys, and separate numeric keypad. Provide an optical mouse and mouse pad with the system. Provide one open serial port after configuration of the workstation to meet the requirements of the rest of these specifications.

F. Workstation PC shall have the capability of changing serial port interrupt vectors and IOBASE addresses through software.

G. Provide an uninterruptible power supply system providing battery backup for the operator workstation and peripheral devices, excluding the printer.. UPS shall protect against blackouts, brownouts, surges and noise. UPS shall include LAN port and modem line surge protection. UPS shall be sized for a 4-minute full load runtime, 12-minute ½ load runtime, with a typical runtime of up to 30 minutes. Transfer time shall be 2-4 milliseconds. UPS shall provide a 480-joule suppression rating and current suppression protection for 36,000 amps and provide 90% recharge capability in 2-4 hours. Suppression response time shall be instantaneous. UPS low voltage switching shall occur when supply voltage is less than 94 volts. UPS shall be provided with phone and datasurge suppression and LAN port connections. Provide all software, cables, peripherals etc. for a complete system including software to automatically shutdown the computer .

H. Operating system for operator workstation shall be Microsoft Windows 2000 Professional or Office XP. Provide Microsoft Office 2000 Professional or Office XP Professional Software. All software shall be at least the latest version available as of the date of contract completion.

I. Provide network configuration tool, all programming applications, graphic creation tools and all other software required to configure and operate the system.

J. Provide network card approved by BAS manufacturer to support Supervisory LAN communications (100 Mbps Ethernet TCP/IP)

K. Provide additional hardware, video drivers, etc., to facilitate all control functions and software requirements specified for the BAS.

L. OWS shall be placed as indicated on the drawings or as directed by CPS.

1.6 PORTABLE OPERATORS TERMINAL (POT) / REMOTE WORKSTATION

A. Portable Operators Terminal shall support system management by connection to the controllers, by connection via the Internet, and by dial-up communications while serving as the remote workstation. The computer will be a Dell computer "CPS Ready" with the current CPS image.

B. Provide (as a minimum) one notebook personal computer (PC) with Intel 4 processor, 2.66GHz, 14.1 XGA display, Include 1GB RAM and one 60GB/7200 RPM hard disk

drive. Provide 32 MB graphics card, , Two USB ports, 10/100 Base-T network card and 24X/24X/24X/8X CD-RW/DVD ROM Combo Drive.

C. Provide a 10/100 LAN+56K CardBus Type III PC Card

D. Provide minimum 14.1" XGA active matrix display.

E. Provide carrying case and extra battery.

F. Operating system for operator workstation shall be Microsoft Windows 2000 Professional. Provide Microsoft Office 2000 Professional or Office XP Professional Software.

G. Provide software, graphics and programming as specified in Division 15 Section "BAS Software and Programming".

H. Provide additional hardware, video drivers, serial ports, etc., to facilitate all control functions and software requirements specified for the building automation system.

I. Provide all controller configuration and interface software and/or plug ins for all devices applicable. All shall be loaded and functional. Provide all required interface cables required to connect to all networks, routers, controllers, SDs etc.

1.7 PRINTERS

Provide the following Printer:

A. 1200x1200 dpi, min 15pages per minute color, 21 pages per minute black. 8-1/2" x 11" paper tray. HP Deskjet 5650 or equal

PART 2 - EXECUTION

2.1 INSTALLATION

A. Set up the workstations and printers as indicated. Install all software and verify that the systems are fully operational. Ensure licensing is provided for all software.

B. No license, software component, key, etc or any piece of information required to install, configure, operate, diagnose and maintain the system shall be withheld from CPS.

C. Install electronic control system Operation and Maintenance Manuals, programming guides, network configuration tools, control shop drawings etc on each OWS and CSS. Provide interface or shortcuts to guide user to the appropriate information.

D. Set up portable operator terminal and configure it as the remote workstation. Install all software and verify that the system is fully operational.

E. Install systems and materials in accordance with manufacturer's instructions.

END OF SECTION 15952

SECTION 15953

BAS FIELD PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Building Controllers (BC)

B. Application Specific Controllers (ASC)

C. Advanced Application Controllers (AAC)

1.2 RELATED DOCUMENTS

A. Division 1

B. Division 15

C. Division 16

1.3 DESCRIPTION OF WORK:

A. Furnish and install DDC Control units and/or Smart Devices required to support specified building automation system functions.

B. Refer to Division 15 Section "Building Automation (BAS) General" for general requirements.

PART 2 - PRODUCTS

2.1 STAND-ALONE FUNCTIONALITY

A. **General**: These requirements clarify the requirement for stand-alone functionality relative to packaging I/O devices with a controller. Stand-alone functionality is specified with the controller and for each Application Category specified in Part 3. This item refers to acceptable paradigms for associating the points with the processor.

B. **Functional Boundary**: Provide controllers so that all points associated with and common to one unit or other complete system/equipment shall reside within a single control unit. The boundaries of a standalone system shall be as dictated in the contract documents. Generally systems specified for the Application Category will dictate the boundary of the standalone control functionality. See related restrictions below. When referring to the controller as pertains to the standalone functionality, reference is specifically made to the processor. One processor shall execute all the related I/O control logic via one operating system that uses a common programming and configuration tool.

C. The following configurations are considered acceptable with reference to a controller's standalone functionality:

1. Points packaged as integral to the controller such that the point configuration is listed as an essential piece of information for ordering the controller (having a unique ordering number).
2. Controllers with processors and modular back planes that allow plug in point modules as an integral part of the controller.
3. I/O point expander boards, plugged directly into the main controller board to expand the point capacity of the controller.
4. I/O point expansion devices connected to the main controller board via wiring and as such shall be remote from the controller and that communicate via a sub LAN protocol. These arrangements to be considered standalone shall have a sub LAN that is dedicated to that controller and include no other controller devices. All wiring to interconnect the I/O expander board shall be:
   a) Contained in the control panel enclosure;
   b) Or run in conduit. Wiring shall only be accessible at the terminations.
5. General purpose LonMark I/O devices or Smart Devices racked with a processor module in the same contiguous physical enclosure. The controller shall also include its own dedicated processor module and bridge or router making the controllers LAN communication a subnet or LAN segment dedicated to that controller as specified under Application Categories below. The following are additional requirements of this configuration:
   a) Configuration must meet the requirements for battery back up.
   b) If processor fails, the I/O devices shall go to their fail condition.
   c) Contractor shall provide a network bandwidth analysis of the controller segment or subnet. The analysis shall document network bandwidth utilization does not exceed 30% for a continuous one hour period.
   d) Logic must provide for orderly sequencing of I/O during a power interruption and restart of program logic upon restoration of power.
   e) Programming must facilitate a robust uploading scheme using LONMark File Transfer Protocol and limit available bandwidth during upload.
   f) Trending shallshall be buffered in the processor or dedicated data logging module and uploaded to the Tridium JACE, or buffered in the Tridium JACE.

2.2 BUILDING CONTROLLER (BC)

A. General Requirements:

1. The BC(s) shall provide fully distributed control independent of the operational status of the OWSs and CSS. All necessary calculations required to achieve control shall be executed within the BC independent of any other device. All control strategies performed by the BC(s) shall be both operator definable and modifiable through the Operator Interfaces.
2. BCs shall perform overall system coordination, accept control programs, perform automated HVAC functions, control peripheral devices and perform all necessary mathematical and logical functions. BCs shall share information with the entire network of BCs and AACs/ASCs for full global control. Each controller shall permit multi-user operation from multiple workstations and portable operator terminals connected either locally or over the Primary Controller LAN. Each unit

shall have its own internal RAM, non-volatile memory, microprocessor, battery backup, regulated power supply, power conditioning equipment, ports for connection of operating interface devices, and control enclosure. BCs shall be programmable from an operator workstation, portable operator's terminal, or hand held operating device. BC shall contain sufficient memory for all specified global control strategies, user defined reports and trending, communication programs, and central alarming.

3. BCs shall be connected to a controller network that qualifies as a Primary Controlling LAN.
4. All BCs shall be protected from any memory loss due to a loss of power by one or a combination of the following:
   a) Volatile RAM shall have a battery backup using a lithium battery with a rated service life of fifty (50) hours, and a rated shelf life of at least five years. Self-diagnostic routine shall report an alarm for a low battery condition.
   b) EEPROM, EPROM, or NOVROM non-volatile memory
5. In addition BCs shall provide intelligent, standalone control of HVAC functions. Each BC shall be capable of standalone direct digital operation utilizing its own processor, non-volatile memory, input/output, wiring terminal strips, A/D converters, real-time clock/calendar and voltage transient and lightning protection devices. Refer to standalone functionality specified above.
6. The BC shall provide for point mix flexibility and expandability. This requirement shall be met via either a family of expander boards, modular input/output configuration, or a combination thereof. Refer to stand alone functionality specified above.
7. All BC point data, algorithms and application software shall be modifiable from the Operator Workstation.
8. Each BC shall execute application programs, calculations, and commands via a microprocessor resident in the BC. The database and all application programs for each BC shall be stored in non-volatile or battery backed volatile memory within the BC and will be able to upload/download to/from the OWS and/or CSS.
9. BC shall provide buffer for holding alarms, messages, trends etc.
10. Each BC shall include self-test diagnostics, which allow the BC to automatically alarm any malfunctions, or alarm conditions that exceed desired parameters as determined by programming input.
11. Each BC shall contain software to perform full DDC/PID control loops.
12. For systems requiring end-of-line resistors those resistors shall be located in the BC, if it has I/O capability.
13. Input-Output Processing
    a) Digital Outputs (DO): Outputs shall be rated for a minimum 24 Vac or Vdc, 1 amp maximum current. Each shall be configurable as normally open or normally closed. Each output shall have an LED to indicate the operating mode of the output and Each DO shall be discrete outputs from the BC's board (multiplexing to a separate manufacturer's board is unacceptable). Provide suppression to limit transients to acceptable levels.
    b) Analog Inputs (AI): AI shall be O-5 Vdc, 0-10 Vdc, 0-20 Vdc, and 0-20 mA. Provide signal conditioning, and zero and span calibration for each input.

Each input shall be a discrete input to the BC's board (multiplexing to a separate manufacturers board is unacceptable unless specifically indicated otherwise). A/D converters shall have a minimum resolution of 12 bits.

c) Digital Inputs (DI): Monitor dry contact closures. Accept pulsed inputs of at least one per second. Source voltage for sensing shall be supplied by the BC and shall be isolated from the main board. Software multiplexing of an AI and resistors shall only be done in non-critical applications and only with prior approval of Architect/Engineer.

d) Universal Inputs (UI-AI or DI): To serve as either AI or DI as specified above.

e) Electronic Analog Outputs (AO): Voltage mode: 0-5 Vdc and 0-10 Vdc; Current mode: 4-20 mA. Provide zero and span calibration and circuit protection. Pulse Width Modulated (PWM) analog via a DO and transducer is acceptable only with Chicago Public Schools (CPS) approval (PWM will not be allowed on loops with a short time constant such as discharge temperature loops, economizer loops, pressure control loops and the like. They are generally acceptable for standard room temperature control loops). Where these are allowed, transducer/actuator shall be programmable for normally open, normally closed, or hold last position and shall allow adjustable timing. PWM controlled devices will have an automatically initiated function that resets the device position tracking on a scheduled basis. The controllers shall initially be set up to perform this function once every 24 hours. The purpose of this required function is to recalibrate the position tracking to assure the device will open and close completely when commanded. Each AO shall be discrete outputs from the PCU's board (multiplexing to a separate manufacturers board is unacceptable). D/A converters shall have a minimum resolution of 10 bits.

f) Analog Output Pneumatic (AOP), 0-20 psi: Pneumatic outputs via an I/P transducer, or digital to pneumatic transducer are acceptable. Multiplexed digital to pneumatic transducers are acceptable provided they are supplied as a standard product and part of the BC and provide individual feedback. Multiplexed pneumatic outputs of a separate manufacturer are unacceptable.

g) Pulsed Inputs: Capable of counting up to 8 pulses per second with buffer to accumulate pulse count. Pulses shall be counted at all times.

14. A communication port for operator interface through a terminal shall be provided in each BC. It shall be possible to perform all program and database back-up, system monitoring, control functions, and BC diagnostics through this port. Standalone BC panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers, or workstations.
15. Each BC shall be equipped with loop tuning algorithm for precise proportional, integral, derivative (PID) control. Loop tuning tools provided with the Operator Workstation software is acceptable. In any case, tools to support loop tuning must be provided such that P, I, and D gains are automatically calculated.
16. Slope intercepts and gain adjustments shall be available on a per-point basis.
17. BC Power Loss:

a) Upon a loss of power to any BC, the other units on the primary controlling network shall not in any way be affected.

b) Upon a loss of power to any BC, the battery backup shall ensure that the energy management control software, the Direct Digital Control software, the database parameters, and all other programs and data stored in the RAM are retained for a minimum of fifty (50) hours.

c) Upon restoration of power within the specified battery backup period, the BC shall resume full operation without operator intervention. The BC shall automatically reset its clock such that proper operation of any time dependent function is possible without manual reset of the clock. All monitored functions shall be updated.

d) Should the duration of a loss of power exceed the specified battery back-up period or BC panel memory be lost for any reason, the panel shall automatically report the condition (upon resumption of power) and be capable of receiving a download via the network, and connected computer. In addition, the owner shall be able to upload the most current versions of all energy management control programs, Direct Digital Control programs, database parameters, and all other data and programs in the memory of each BC to the operator workstation via the local area network, or via the telephone line dial-up modem where applicable, or to the laptop PC via the local RS-232C port.

18. BC Failure:

a) Building Controller LAN Data Transmission Failure: BC shall continue to operate in stand-alone mode. BC shall store loss of communication alarm along with the time of the event. All control functions shall continue with the global values programmable to either last value or a specified value. Peer BCs shall recognize the loss, report alarm and reconfigure the LAN.

b) BC Hardware Failure: BC shall cease operation and terminate communication with other devices.

19. Each BC shall be equipped with firmware resident self-diagnostics for sensors and be capable of assessing an open or shorted sensor circuit and taking an appropriate control action (close valve, damper, etc.).

20. BCs shall include LAN communications interface functions for controlling secondary controlling LANs Refer to Section 15954 - BAS System Communications Devices for requirements if this function is packaged with the BC.

21. A minimum of four levels of password protection shall be provided at each BC.

22. BCs shall be mounted on equipment, in packaged equipment enclosures, or locking wall mounted in a NEMA 1 enclosure.

B. **BACnet Building Controller Requirements**:

1. The BC(s) shall support all BIBBs defined in the BACnet Building Controller (B-BC) device profile as defined in the BACnet standard.

2. BCs shall communicate over the BACnet Building Controller LAN.

3. Each BC shall be connected to the BACnet Building Controller LAN communicating to/from other BCs.

C. **LonTalk Building Controller Requirements**:

1. All products shall be LonMark certified, and shall be designed according to the LonMark Interoperability Guidelines. Product documentation and devices shall display the LonMark symbol, indicating conformance to the LonMark Interoperability Standards.
   a) In those instances in which LonMark devices are not available, the Network Integrator shall provide LonWorks devices with application source code, device resource files, and external interface definitions. The software tools required to install and commission the device shall be provided for non-LonMark devices.
2. All products shall support and be certified to an appropriate LonMark functional profile. Where published profiles do not exist, use draft profile standards or submit a proposed draft as part of the submittal package. All drafts shall also be submitted simultaneously to the LonMark Interoperability Association for certification.
3. An external interface file (*.XIF) shall be provided for each LonTalk device describing network variables, configuration parameters and other parameters supported.
4. All products shall utilize standard configuration parameter types for all product configuration parameters. Do not use network variables for this purpose.
5. The use of manufacturer-defined network variables and configuration parameters shall be limited to factory-configured parameters. All data and configuration parameters that shall be required for field installation, service and maintenance shall be represented using standard LonMark network variables and configuration parameters. Modification of LonMark certified network variables and configuration parameters is unacceptable.
6. Provide LonTalk bridge or routers and repeaters as required to combine different secondary (TP/FT-10) networks onto the primary Ethernet/IP network, or as required to segment groups of LonTalk devices to meet minimum throughput requirements.
7. Provide all necessary bridge or routers and gateways in order to connect TP/FT-10 devices to the primary network, and to connect the primary network to the GEMnet.
8. The network services for the BAS shall be the latest version of LonWorks Network Services (LNS).
9. Device to device communication shall be event driven and peer to peer.
10. Propagation of data from a PCU to a Router for the execution of supervisory control logic shall be event driven at the device and not based on polling from the Router.
11. Propagation of data from a PCU to a Router to support non-alarm dynamic data display or for trending purposes shall be based on polling from the Router.
12. Propagation of data from a PCU to a Router to support the reporting of alarm conditions shall be event driven at the device and not based on polling from the Router.
13. The programming of all output network variables shall include the send on delta concept; minimum send time and maximum send time parameters.
    a) Send on delta parameters shall be non-zero values selected to ensure efficient use of the available bandwidth but not exceeding the following:

1) Temperatures: 0.36 Degrees Fahrenheit
2) Pressures In Air Systems: 0.025 Inches Of Water
3) Building Static Pressure: 0.0125 Inches Of Water
4) Flow: Approximately 10 Cfm or 2% of the system operating range
5) Relative Humidity: 3%
6) Analog Position: 2%
7) Enthalpy: Approximately 0.2 Btu Per Lb
8) Binary Alarm Data: Change of State

b) If the minimum send time parameters can be set on a point by point basis, they shall not exceed the following:
1) Alarms: 1 second
2) Temperatures at Zone Level: 60 seconds
3) Temperatures at Central Station Level: 10 seconds for data reporting, 5 seconds for control purposes
4) Pressures: 5 seconds for data reporting, 1 second for control purposes.

c) If the minimum send time parameters can only be set on a controller basis, set the parameter at a value of 5 seconds.

14. The error rate for each channel shall be verified by a one hour test using the network analysis tool. The error rate shall not exceed 1%.
15. The bandwidth utilization for each channel shall be verified by a one hour test using the network analysis tool. The utilization shall not exceed 30%.
16. All products shall be LonMark certified, and shall be designed according to the LonMark Interoperability Guidelines. Product documentation and devices shall display the LonMark symbol, indicating conformance to the LonMark Interoperability Standards.
    a) In those instances in which LonMark devices are not available, the Network Integrator shall provide LonWorks devices with application source code, device resource files, and external interface definitions. The software tools required to install and commission the device shall be provided for non-LonMark devices.
17. All products shall support and be certified to an appropriate LonMark functional profile. Where published profiles do not exist, use draft profile standards or submit a proposed draft as part of the submittal package. All drafts shall also be submitted simultaneously to the LonMark Interoperability Association for certification.
18. An external interface file (*.XIF) shall be provided for each LonTalk device describing network variables, configuration parameters and other parameters supported.
19. All products shall utilize standard configuration parameter types for all product configuration parameters. Do not use network variables for this purpose.
20. The use of manufacturer-defined network variables and configuration parameters shall be limited to factory-configured parameters. All data and configuration

parameters that shall be required for field installation, service and maintenance shall be represented using standard LonMark network variables and configuration parameters. Modification of LonMark certified network variables and configuration parameters is unacceptable.

21. Provide LonTalk bridge or routers and repeaters as required to combine different secondary (TP/FT-10) networks onto the primary Ethernet/IP network, or as required to segment groups of LonTalk devices to meet minimum throughput requirements.
22. Provide all necessary bridge or routers and gateways in order to connect TP/FT-10 devices to the primary network, and to connect the primary network to the GEMnet WAN.
23. The network services for the BAS shall be the latest version of LonWorks Network Services (LNS), no exceptions allowed.
24. The Network Management Application shall be LonMaker™ for Windows (Latest Released Version) service tool (including hardware, software and any peripheral devices required) and is to be used for commissioning and management of the LonTalk control architecture, no exceptions allowed. The network management service tool shall remain on the project as the property of GSA. A copy of the LonTalk Network Database Shall Be Archived on the service tool and Site Control System Server (CSS)/ Operator Workstation (OWS), documenting system bindings and node addressing. In addition all system variables shall have a plain English language description for each variable. This service tool shall be used for all system maintenance and expansion, so that the network database backup remains current.

2.3 ADVANCED APPLICATION SPECIFIC CONTROLLER (AAC) AND APPLICATION SPECIFIC CONTROLLER (ASC)

A. **General Requirements**:

1. AACs and ASCs shall provide intelligent, standalone control of HVAC equipment. Each unit shall have its own internal RAM, non-volatile memory and will continue to operate all local control functions in the event of a loss of communications on the ASC LAN or sub-LAN. Refer to standalone requirements by application specified in Part 3 of this section. In addition, it shall be able to share information with every other BC and AAC /ASC on the entire network.
2. Each AAC and ASC shall include self-test diagnostics that allow the AAC /ASC to automatically relay to the BC, LAN Interface Device or workstation, any malfunctions or abnormal conditions within the AAC /ASC or alarm conditions of inputs that exceed desired parameters as determined by programming input.
3. AACs and ASCs shall include sufficient memory to perform the specific control functions required for its application and to communicate with other devices.
4. Each AAC and ASC must be capable of stand-alone direct digital operation utilizing its own processor, non-volatile memory, input/output, minimum 8 bit A to D conversion, voltage transient and lightning protection devices. All volatile memory shall have a battery backup of at least fifty- (50) hrs with a battery life of five years.
5. All point data; algorithms and application software within an AAC /ASC shall be modifiable from the Operator Workstation.

6. AAC and ASC Input-Output Processing

   a) Digital Outputs (DO): Outputs shall be rated for a minimum 24 VAC or VDC, 1 amp maximum current. Each shall be configurable as normally open or normally closed. Each output shall have an LED to indicate the operating mode of the output and Each DO shall be discrete outputs from the AAC/ASC's board (multiplexing to a separate manufacturer's board is unacceptable). Provide suppression to limit transients to acceptable levels.

   b) Analog Inputs (AI): AI shall be 0-5 Vdc, 0-10Vdc, 0-20Vdc, and 0-20 mA. Provide signal conditioning, and zero and span calibration for each input. Each input shall be a discrete input to the BC's board (multiplexing to a separate manufacturers board is unacceptable unless specifically indicated otherwise). A/D converters shall have a minimum resolution of 8-10 bits depending on application.

   c) Digital Inputs (DI): Monitor dry contact closures. Accept pulsed inputs of at least one per second. Source voltage for sensing shall be supplied by the BC and shall be isolated from the main board. Software multiplex

2. AAC(s) and ASC(s) shall communicate over the BACnet Building Controller LAN or the ASC LAN or sub-LAN.
3. Each BC shall be connected to the BACnet Building Controller LAN communicating to/from other BCs.

C. **LonTalk AAC(s) and ASC(s) Requirements**:

1. Refer to LonWorks requirements under BC. All apply also to the AACs and ASCs.

D. **Terminal Box Controllers**:

1. Terminal box controllers controlling damper positions to maintain a quantity of supply or exhaust air serving a space shall have an automatically initiated function that resets the volume regulator damper to the fully closed position on a scheduled basis. The controllers shall initially be set up to perform this function once every 24 hours. The purpose of this required function is to reset and synchronize the actual damper position with the calculated damper position and to assure the damper will completely close when commanded. The software shall select scheduled boxes randomly and shall not allow more than 5% of the total quantity of controllers in a building to perform this function at the same time. When possible the controllers shall perform this function when the supply or exhaust air system is not operating or is unoccupied.

PART 3 EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.

3.2 SYSTEM ACCESS:

A. Provide an Ethernet connection and 5 port hub at each panel housing a controller or controllers, that provides access to the Local Supervisory LAN and to the Control System Server for all Controllers, other than an Application Category 1 Controllers. The user shall be able to access each controller on the system using this connection via the Control System Server database for graphics, schedules, programming, controller configuration etc.

3.3 INSTALLATION OF CONTROL SYSTEMS:

A. General: Install systems and materials in accordance with manufacturer's instructions, specifications roughing-in drawings and details shown on drawings. Contractor shall install all controllers in accordance with manufacturer's installation procedures and practices.

3.4 HARDWARE APPLICATION REQUIREMENTS

A. **General**: The functional intent of this specification is to allow cost effective application of manufacturers standard products while maintain the integrity and reliability of the control functions. Specific requirements indicated below are required

for the respective application. Manufacturer shall apply the most cost-effective unit that meets the requirement of that application.

B. **Standalone Capability**: Each Control Unit shall be capable of performing the required sequence of operation for the associated equipment. All physical point data and calculated values required to accomplish the sequence of operation shall originate within the associated CU with only the exceptions enumerated below. Refer to Item 2.01 above for physical limitations of standalone functionality. Listed below are functional point data and calculated values that shall be allowed to be obtained from or stored by other CUs or SDs via LAN.

C. Where associated control functions involve functions from different categories identified below, the requirements for the most restrictive category shall be met.

D. **Application Category Type 0** (Distributed monitoring)

1. Applications in this category include the following:
   a) Monitoring of variables that are not used in a control loop, sequence logic, or safety.
2. Points on BCs, AACs, and ASCs may be used in these applications as well as Ds and/or general-purpose I/O modules.
3. Where these points are trended, contractor shall verify and document that the network bandwidth is acceptable for such trends and is still capable of acceptable and timely control function.
4. **LAN Restrictions**: These points may reside on any controller

E. **Application Category Type 1**

1. Applications in this category include the following:
   a) Fan Coil Units
   b) Airflow Control Boxes (VAV and Constant Volume Terminal Units)
   c) Terminal Control Dampers/Reheat Vales
   d) Unitary equipment <15 tons (Package Terminal AC Units, Package Terminal Heat Pumps, Split-System AC Units, Split-System Heat Pumps, and Water-Source Heat Pumps)
   e) Induction Units
2. **Standalone Capability**: Provide capability to execute control functions for the application for a given setpoint or mode, which shall generally be occupied mode control. Only the following data (as applicable) may be acquired from other controllers via LANs. In the event of a loss of communications with any other controller, or any fault in any system hardware that interrupts the acquisition of any of these values, the ASC shall use the last value obtained before the fault occurred. If such fault has not been corrected after the specified default delay time, specified default value(s) shall then be substituted until such fault has been corrected.

Physical/Virtual Point	Default Value
Scheduling Period	Normal
Morning Warm-Up	Off (cold discharge air)
Load Shed	Off (no shedding)
Summer/Winter	Winter

Trend Data	N/A

3. **Mounting**:
   a) ASCs that control equipment located above accessible ceilings shall be mounted on the equipment in an accessible enclosure and shall be rated for plenum use.
   b) ASCs that control equipment mounted in a mechanical room shall either be mounted in, on the equipment, or on the wall of the mechanical room at an adjacent, accessible location.
   c) ASCs that control equipment mounted outside or in occupied spaces shall either be located in the unit or in a proximate mechanical/utility space.
   d) Section 15953 contractor may furnish ASCs to the terminal unit manufacturer for factory mounting.
4. **LAN Segment Restrictions**:
   a) LonTalk systems: Limit the number of nodes servicing any one of these applications on the LAN Segment to 40. VAV terminals or zone dampers/reheat coils served by a single air handler are to be located on the same segment of the LAN with the AHU. Multiple AHU's may reside on a LAN segment if all the associated/served terminal boxes and zone dampers/reheat coils are located on the same LAN segment. If more than 40 VAV terminals or zone dampers/reheat coils are served by a single air handler, then one LAN segment shall be fully populated with the parent air handler and terminal unit Nodes with the balance of the served terminal units Nodes located on the other segment located on the single channel JACE.
   b) BACnet Systems: Limit the number of AAC's/ASC's servicing any one of these applications on the LAN Segment to 32.

F. Application Category Type 2

1. Applications in this category include the following:
   a) Constant Volume Air Handlers
   b) Unitary Equipment >= 15 tons (Air Conditioners, Heat Pumps, Packaged Heating/Cooling Units, and the like)
   c) Constant Volume Pump Start/Stop
   d) Misc. Equipment (Exhaust Fan) Start/Stop
   e) Misc. Monitoring (not directly associated with a control sequence and where trending is not critical)
   f) Variable Speed Drive (VSD) controllers not requiring safety shutdowns of the controlled device
   g) Multizone Air handlers with fewer than 5 zones
2. **Standalone Capability**: Only the following data (as applicable) may be acquired from other AACs via LANs. In the event of a loss of communications with any other AACs, or any fault in any system hardware that interrupts the acquisition of any of these values, the AAC shall use the last value obtained before the fault occurred. If such fault has not been corrected after the specified default delay

time, specified default value(s) shall then be substituted until such fault has been corrected.

Physical/Virtual Point	Default Delay Time	Default Value
Outside Air Temperature	3 minutes	80°F
Outside Air Humidity	3 minutes	60%RH
Outside Air Enthalpy	3 minutes	30 Btu/lb
Trend Data		N/A
Cooling/Heating Requests	3 minutes	None

3. **Mounting:**
   a) AACs that control equipment located above accessible ceilings shall be mounted on the equipment in an accessible enclosure and shall be rated for plenum use.
   b) AACs that control equipment mounted in a mechanical room may either be mounted in, on the equipment, or on the wall of the mechanical room at an adjacent, accessible location.
   c) AACs that control equipment mounted outside or in occupied spaces shall either be located in the unit or in a proximate mechanical/utility space.
4. **LAN Segment Restrictions:**
   a) LonTalk systems: Limit the number of nodes servicing any one of these applications on the LAN Segment to 40.
   b) BACnet Systems: Limit the number of AAC's servicing any one of these applications on the LAN Segment to 32.

G. Application Category Type 3

1. Applications in this category include the following:
   a) VAV Air Handlers
   b) Dual Duct Air Handlers
   c) Multizone Air Handlers with 5 or more zones
   d) Self Contained VAV Units
   e) Central Cooling Plant
   f) Central Heating Plant
   g) Cooling Towers
   h) Sequenced or Variable Speed Pump Control
   i) Local Chiller Control (unit specific)
   j) Local Free Cooling Heat Exchanger Control
2. **LAN Segment Restrictions:**
   a) LonTalk systems: Limit the number of PCU's servicing any one of these applications on the LAN Segment to 20. Only PCU's associated with equipment for the applications in this category shall reside on the LAN segment of this application category type, with the exception of Application Category Type 0 points.

3. BACnet Systems: BCs shall be used in these applications.

3.5 CONTROL UNIT REQUIREMENTS

A. Refer to Division 15 Building Automation System for requirements pertaining to control unit quantity and location.

END OF SECTION 15953

SECTION 15955

BAS SOFTWARE AND PROGRAMMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. System Software

B. Programming Description

C. Control Algorithms

D. Energy Management Applications

E. Password Protection

F. Alarm Reporting

G. Trending

H. Data Acquisition and Storage

I. Point Structuring

J. Dynamic Color Graphics

1.2 RELATED DOCUMENTS

A. Division 1

B. Division 15

C. Division 16

1.3 DESCRIPTION OF WORK:

A. Fully configure systems and furnish and install all software, programming and dynamic color graphics for a complete and fully functioning system as specified.

B. Refer to Division 15 - *Building Automation System (BAS)* for general requirements.

C. Refer to Division 15 - *Sequence of Operation* for specific sequences of operation for controlled equipment.

1.4 LICENSING

A. Include licensing for all software packages at all required Control System Server (CSS Operator Work Stations (OWS) and Portable Operator Terminal (POT).

B. Any operator interface, programming environment, networking, database management and any other software used by the Contractor to install the system or needed to operate the system to its full capabilities shall be licensed and provided to Chicago Public Schools (CPS).

C. Include licensing for all software packages at all required Web Server and OWS's and POT's. Licensing shall allow access to all aspects of the system including system access, workstations, points, programming, database management, graphics etc. No restrictions shall be placed on the licensing. All operator interfaces, programming environment, networking, database management and any other software used by the Contractor to install the system or needed to operate the system to its full capabilities shall be licensed and provided to Chicago Public Schools (CPS).

D. All software should be available on all Web Servers and OWS's provided, and on all Portable Operator Terminals. Hardware and software keys to provide all rights shall be installed on all workstations. At least 2 sets of CDs shall be provided with backup software for all software provided, so that CPS may reinstall any software as necessary. Include all licensing for workstation operating systems, and all required third-party software licenses. These backup disks will include a backup of all program data files, graphics etc. and shall allow the owner to completely restore the system in the case of a computer malfunction

E. Provide evidence of licensing including version and original software copies for each WEB Server OWS's and POT's. Licenses shall allow for access to any site device and shall not be restricted to accessing, database management, configuring, etc. the LANs included in this project. The licensing and registration proof will be provided when the system is installed on site.

F. Upgrade all software packages to the release (version) in effect at the end of the Warranty Period and provide a letter indicating the current release/version date at the end of the warrenty.

G. Refer to Division 15 - *Building Automation System (BAS) General* for further requirements.

PART 2 - PRODUCTS

2.1 SYSTEM SOFTWARE-GENERAL

A. **Functionality and Completeness**: The Contractor shall furnish and install all software and programming necessary to provide a complete and functioning system as specified. The Contractor shall include all software and programming not specifically itemized in these Specifications, which is necessary to implement, maintain, operate, and diagnose the system in compliance with these Specifications.

2.2 CONTROLLER SOFTWARE

A. All bindings, SNVT's, configuration values, addresses, calibration values, parameters, variables, tuning values, gains, test values, etc. for all software, programs, network configurations etc. shall be exposed and be available for setup, manipulation, adjustment, calibration, testing, etc. at all workstations, CSS's/OWS's, POT's for use as allowed via applicable password protection for all controllers and devices throughout all networks and the entire BAS.

B. **Building Controller (BC) Software Residency**: Each BC as defined below shall be capable of control and monitoring of all points physically connected to it. All software including the following shall reside and execute at the BC:

1. Real-Time Operating System software
2. Real-Time Clock/Calendar and network time synchronization
3. BC diagnostic software
4. LAN Communication software/firmware
5. Direct Digital Control software
6. Alarm Processing and Buffering software
7. Energy Management software
8. Data Trending, Reporting, and Buffering software
9. I/O (physical and virtual) database
10. Remote Communication software

C. **Advanced Aplication Controller (AAC) Application Specific Controller (ASC) Software Residency**: Each AAC/ASC as defined below shall be capable of control and monitoring of all points physically connected to it. As a minimum, software including the following shall reside and execute at the AAC/ASC. Other software to support other required functions of the AAC/ASC may reside at the BC or LAN interface device (specified in Section 15954) with the restrictions/exceptions per application provided in Section 15953:

1. Real-Time Operating System software
2. AAC/ASC diagnostic software
3. LAN Communication software
4. Control software applicable to the unit it serves that will support a single mode of operation
5. I/O (physical and virtual) database to support one mode of operation

D. **Stand Alone Capability**: BC shall continue to perform all functions independent of a failure in other BC/AAC/ASC or other communication links to other BCs/AACs/ASCs. Trends and runtime totalization shall be retained in memory. Runtime totalization shall be available on all digital input points that monitor electric motor status. Refer also to Section 15953 for other aspects of stand alone functionality..

E. **Operating System**: Controllers shall include a real-time operating system resident in ROM. This software shall execute independently from any other devices in the system. It shall support all specified functions. It shall provide a command prioritization scheme to allow functional override of control functions. Refer also to Section 15953 for other aspects of the controller's operating system.

F. **Network Communications**: Each controller shall include software/firmware that supports the networking of CUs on a common communications trunk that forms the respective LAN. Network support shall include the following:

1. Controller communication software shall include error detection, correction, and re-transmission to ensure data integrity.
2. LonTalk - Provide a network bandwidth analysis tool. The tool for determining bandwidth utilization shall be the LoyTech protocol analyzer LPA-IP network

analysis tool, no exceptions allowed. Turn the tool over to CPS as part of the Project Closeout requirements.

3. Operator/System communication software shall facilitate communications between other BCs, all subordinate AACs/ASCs, Gateways and LAN Interface Devices or Operator Workstations. Gateways and LAN Interface Devices or CSS's/OWS's. Software shall allow point interrogation, adjustment, addition/deletion, and programming while the controller is on line and functioning without disruption to unaffected points. The software architecture shall allow networked controllers to share selected physical and virtual point information throughout the entire system.

G. **Point Database/Summary Table**: All points included in the typical equipment point list must be represented in a common, open protocol format. Naming conventions for these points and network addressing are discussed in Part III of this section. Point/system database creation and modification shall be via a user-friendly, menu-driven program. System software shall support virtual or logic point (points not representing a physical I/O) creation. Software shall support virtual points with all services specified herein. Database software shall support definition of all parameters specified in Part III of this section for a given point type. If database does not support all these parameters, software module shall be created and attached to the points which accomplish the respective function.

H. **Diagnostic Software**: Controller software shall include diagnostic software that checks memory and communications and reports any malfunctions

I. **Alarm/Messaging Software**: Controller software shall support alarm/message processing and buffering software as more fully specified below.

J. **Application Programs**: CUs shall support and execute application programs as more fully specified below:

1. All Direct Digital Control software, Energy Management Control software, and functional block application programming software templates shall be provided in a 'ready-to-use' state, and shall not require (but shall allow) CPS programming.
2. Line programs shall supply preprogrammed functions to support these energy management and functional block application algorithms. All functions shall be provided with printed narratives and/or flow diagrams to document algorithms and how to modify and use them.

K. **Security**: Controller software shall support multiple level password access restriction as more fully specified below.

L. **Direct Digital Control**: Controller shall support application of Direct Digital Control Logic. All logic modules shall be provided pre-programmed with written documentation to support their application. Provide the following logic modules as a minimum:

1. Proportional-Integral-Derivative (PID) control with analog, PWM and floating output
2. Two Position control (Hi or Low crossing with deadband)
3. Single-Pole Double-Throw relay
4. Delay Timer (delay-on-make, delay-on-break, and interval)
5. Hi/Low Selection

6. Reset or Scaling Module
7. Logical Operators (And, Or, Not, Xor)

M. **Psychrometric Parameters**: Controller software shall provide preprogrammed functions to calculated and present psychrometric parameters (given temperature and relative humidity) including the following as a minimum: Enthalpy, Wet Bulb Temperature.

N. **Updating/Storing Application Data**: Site-specific programming residing in volatile memory shall be uploadable/downloadable from an OWS or CSS connected locally, to the Primary LAN, to the Local Supervisory LAN and remotely via the internet and modem and telephone lines as applicable but all must be available. Initiation of an upload or download shall include all of the following methods; Manually, Scheduled, and Automatically upon detection of a loss or change.

O. **Restart**: System software shall provide for orderly shutdown upon loss of power and automatic restart upon power restoration. Volatile memory shall be retained; outputs shall go to programmed fail (open, closed, or last) position. Equipment restart shall include a user definable time delay on each piece of equipment to stagger the restart. Loss of power shall be alarmed at operator interface indicating date and time.

P. **Time Synchronization**: Operators shall be able to set the time and date in any device on the network that supports time-of-day functionality. The operator shall be able to select to set the time and date for an individual device, devices on a single network, or all devices simultaneously. Automatic time synchronization shall be provided.

Q. **Misc. Calculations**: System software shall automate calculation of psychometric functions, calendar functions, kWh/kW, and flow determination and totalization from pulsed or analog inputs, curve-fitting, look-up table, input/output scaling, time averaging of inputs and A/D conversion coefficients.

2.3 APPLICATION PROGRAMMING DESCRIPTION

A. The application software shall be user programmable.

B. This specification generally requires a programming convention that is logical, easy to learn, use, and diagnose. General approaches to application programming shall be provided by one, or a combination, of the following conventions:

1. **Point Definition**: provide templates customized for point type, to support input of individual point information. For LON systems use standard LonWorks SNVTs.
2. **Graphical Block Programming**: Manipulation of graphic icon 'blocks', each of which represents a subroutine, in a functional/logical manner forming a control logic diagram. Blocks shall allow entry of adjustable settings and parameters via pop-up windows. Provide a utility that shall allow the graphic logic diagrams to be directly compiled into application programs. Logic diagrams shall be viewable either off-line, or on-line with real-time block output values.
3. **Functional Application Programming**: Pre-programmed application specific programs that allow/require limited customization via 'fill-in-the-blanks' edit fields. Typical values would be setpoints gains, associated point names, alarm limits, etc.
4. **Line Programming**: Textual syntax-based programming in a language similar to BASIC designed specifically for HVAC control. Subroutines or functions for

energy management applications, setpoints, and adjustable parameters shall be customizable, but shall be provided preprogrammed and documented.

C. Provide a means for testing and/or debugging the control programs both off-line and on-line.

2.4 ENERGY MANAGEMENT APPLICATIONS

A. System shall have the ability to perform all of the following energy management routines via preprogrammed function blocks or template programs. As a minimum provide the following whether or not required in the software:

1. Time-of-Day Scheduling
2. Calendar-Based Scheduling
3. Holiday Scheduling
4. Temporary Schedule Overrides
5. Optimal Start/Optimal Stop-based on space temperature offset, outdoor air temperature, and building heating and cooling capacitance factors as a minimum
6. Night Setback and Morning Recovery Control, with ventilation only during occupancy
7. Economizer Control (enthalpy or dry-bulb)
8. Peak Demand Limiting and Load Shedding. The demand limiting function will use demand data as the basis for the function and the load shedding program will use space temperature adjustment or means acceptable to CPS to provide load shedding response. The function selected for a given school will be made by CPS.
9. Dead Band Control

B. All programs shall be executed automatically without the need for operator intervention, and shall be flexible enough to allow operator customization. For exmaple the load shedding program will allow the operator to determine the spaces to be included in the load shed as well as the duration of the event. Programs shall be applied to building equipment as described in the Section 15958 entitled *'Sequence of Operation'*.

2.5 PASSWORD PROTECTION

A. Multiple-level password access protection shall be provided to allow the CPS's authorized BAS Administrator to limit workstation control, display and database manipulation capabilities as deemed appropriate for each user, based upon an assigned user name with a unique password.

B. All passwords for the system shall be provided to CPS including administrator, dealer, or factory level passwords for the systems provided under this project.

C. Passwords shall restrict access to all Control Units.

D. Each user name shall be assigned to a discrete access level. A minimum of five levels of access shall be supported. Alternately, a comprehensive list of accessibility/functionality items shall be provided, to be enabled or disabled for each user.

E. A minimum of 20 user names shall be supported and programmed per CPS's direction. Provide abilty to deactivate passwords without removal of the login and password. CPS

will be provided with the highest level login and password so that CPS controls the administrative passwords.

F. Operators shall be able to perform only those commands available for the access level assigned to their user name.

G. User-definable, automatic log-off timers of from 1 to 60 minutes shall be provided to prevent operators from inadvertently leaving interface device software on-line. This timer will not be the windows system screen saver feature.

2.6 ALARM AND EVENT MANAGEMENT REPORTING

A. Alarm management shall be provided to monitor, buffer, and direct alarms and messages to operator devices and memory files. Each BC shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms from being lost. At no time shall a BC's ability to report alarms be affected by either operator activity at an Operator Workstation or local handheld device, or by communications with other panels on the network.

1. **Alarm Descriptor**: Each alarm or point change shall include that point's English language description, and the time and date of occurrence. In addition to the alarm's descriptor and the time and date, the user shall be able to print, display and store an alarm message to more fully describe the alarm condition or direct operator response.
2. **Alarm Prioritization**: The software shall allow users to define the handling and routing of each alarm by their assignment to discrete priority levels. A minimum of ten priority levels shall be provided. For each priority level, users shall have the ability to enable or disable an audible tone whenever an alarm is reported and whenever an alarm returns to normal condition. Users shall have the ability to manually inhibit alarm reporting for each individual alarm and for each priority level. Contractor shall coordinate with CPS on establishing alarm priority definitions.
3. **Alarm Report Routing**: Each alarm priority level shall be associated with a unique user-defined list of operator devices including any combination of local or remote workstations, printers and workstation disk files. All alarms associated with a given priority level shall be routed to all operator devices on the user-defined list associated with that priority level. For each priority level, alarms shall be automatically routed to a default operator device in the event that alarms are unable to be routed to any operator device assigned to the priority level.
4. **Auto-Dial Alarm Routing**: For alarm priority levels that include a remote workstation (accessed by modem) as one of the listed reporting destinations, the BC shall initiate a call to report the alarm, and shall terminate the call after alarm reporting is complete. System shall be capable of multiple retries and buffer alarms until a connection is made. If no connection is made, system shall attempt connection to an alternate dial-up workstation. System shall also be able to dial multiple pagers upon alarm activation.
5. **Alarm Acknowledgment**: For alarm priority levels that are directed to a workstation screen, an indication of alarm receipt shall be displayed immediately regardless of the application in use at the workstation, and shall remain on the screen until acknowledged by a user having a password that allows alarm

acknowledgment. Upon acknowledgment, the complete alarm message string (including date, time, and user name of acknowledging operator) shall be stored in a selected file on the workstation hard disk.

6. **Alarm Display**: All alarms will popup as described in Alarm Acknowledgement. The owner will have the option to limit the pop up alarms based on alarm priority.

B. It shall be possible for any operator to receive a summary of all alarms, regardless of acknowledgement status; for which a particular recipient is enrolled for notification; based on current event state; based on the particular event algorithm (e.g., change of value, change of state, out of range, and so on); alarm priority; and notification class.

C. **Alarm Historical Database**: The database shall store all alarms and events object occurrences in an ODBC or an OLE database-compliant relational database. Provide a commercially available ODBC driver or OLE database data provider, which would allow applications to access the data using standard Microsoft Windows Data Services.

2.7 TRENDING

A. The software shall display historical data in both a tabular and graphical format. The requirements of this trending shall include the following:

1. Trends may be buffered in the BC as long as the trend data in the BC and the historical data stored on hard disk is displayed seamlessly.
2. Provide trends for all physical points, virtual points and calculated variables.
3. Trend data shall be stored in relational database format as specified in herein under Data Acquisition and Storage.
4. In the graphical format, the trend shall plot at least 4 different values for a given time period superimposed on the same graph. The 4 values shall be distinguishable by using unique colors. In printed form the 4 lines shall be distinguishable by different line symbology. Displayed trend graphs shall indicate the engineering units for each trended value.
5. The sample rate and data selection shall be selectable by the operator.
6. The trended value range shall be selectable by the operator.
7. Where trended values on one table/graph are COV, software shall automatically fill the trend samples between COV entries.

B. **Control Loop Performance Trends**: Controllers incorporating PID control loops shall also provide high resolution sampling in less than six second increments for verification of control loop performance.

C. **Data Buffering and Archiving**: Trend data may be buffered at the BC, and uploaded to hard disk storage for archiving as needed based on the BC's memory constraints. All archived trends shall be transmitted to the on-site OWS as applicable. Uploads shall occur based upon a user-defined interval, manual command, or automatically when the trend buffers become full.

D. **Time Synchronization**: Provide a time master that is installed and configured to synchronize the clocks of all devices supporting time synchronization. Synchronization shall be done using Coordinated Universal Time (UTC). All trend sample times shall be able to be synchronized. The frequency of time synchronization message transmission shall be selectable by the operator.

2.8 DYNAMIC PLOTTING

A. Provide a utility to dynamically plot in real-time at least 4 values on a given 2-dimensional dynamic plot/graph with at least two Y-axes. At least 5 dynamic plots shall be allowed simultaneously.

2.9 DATA ACQUISITION AND STORAGE

A. All points included in the typical equipment point list must be represented in a common, open or accessible format. Naming conventions for these points and network addressing are discussed in the 'Point Naming Conventions' paragraph below.

B. Data from the BAS shall be stored in relational database format. The format and the naming convention used for storing the database files shall remain consistent across the database and across time. The relational structure shall allow for storage of any additional data points, which are added to the BAS in future. The metadata/schema or formal descriptions of the tables, columns, domains, and constraints shall be provided for each database.

C. The database shall allow applications to access the data while the database is running. The database shall not require shutting down in order to provide read-write access to the data. Data shall be able to be read from the database without interrupting the continuous storage of trend data being carried by the BAS.

D. The database shall be ODBC or OLE database compliant. Provide a commercially-available ODBC driver or OLE database data provider, which would allow applications to access the data via Microsoft Windows standard data access services.

2.10 TOTALIZATION

A. The software shall support totalizing analog, digital, and pulsed inputs and be capable of accumulating, storing, and converting these totals to engineering units used in the documents. These values shall generally be accessible to the Operator Interfaces to support management-reporting functions.

B. Totalization of electricity use/demand shall allow application of totals to different rate periods, which shall be user definable.

C. When specified to provide electrical or utility Use/Demand, the Contractor shall obtain from the local utility all information required to obtain meter data, including k factors, conversion constants, and the like.

2.11 EQUIPMENT SCHEDULING

A. Provide a graphic utility for user-friendly operator interface to adjust equipment-operating schedules.

B. Scheduling feature shall include multiple seven-day master schedules, plus holiday schedule, each with start time and stop time. Master schedules shall be individually editable for each day and holiday.

C. Scheduling feature shall allow for each individual equipment unit to be assigned to one of the master schedules.

D. Timed override feature shall allow an operator to temporarily change the state of scheduled equipment. An override command shall be selectable to apply to an individual unit, all units assigned to a given master schedule, or to all units in a building. Timed override shall terminate at the end of an operator selectable time, or at the end of the scheduled occupied/unoccupied period, whichever comes first. A password level that does not allow assignment of master schedules shall allow a timed override feature.

E. A yearly calendar feature shall allow assignment of holidays, and automatic reset of system real time clocks for transitions between daylight savings time and standard time.

2.12 POINT STRUCTURING AND NAMING

A. **General**: The intent of this section is to require a consistent means of naming points across the CPS Enterprise. Contractor shall configure the systems from the perspective of the Enterprise, not solely the local project. The following requirement establishes a standard for naming points and addressing Buildings, Networks, Devices, Instances, and the like. The interface shall always use this naming convention. The naming convention shall be implemented as much as practical, and any deviations from this naming convention shall be approved by CPS.

B. **Point Summary Table**

1. The term 'Point' is a generic description for the class of object represented by analog and binary inputs, outputs, and values.
2. With each schematic, Contractor shall provide a Point Summary Table listing:
   a) Building number and abbreviation
   b) System type
   c) Equipment type
   d) Point suffix
   e) Full point name (see Point Naming Convention paragraph)
   f) English language point description
   g) Ethernet backbone network number,
   h) Network number
   i) Device ID
   j) Device MAC address
   k) Engineering units
3. Point Summary Table shall be provided in both hard copy and in electronic format (ODBC-compliant).
4. Point Summary Table shall also illustrate Network Variables/LonWorks Bindings.
5. The Contractor shall coordinate with the CPS's representative and compile and submit a proposed Point Summary Table for review prior to any object programming or project startup.
6. The Point Summary Table shall be kept current throughout the duration of the project by the Contractor as the Master List of all points for the project. Project

closeout documents shall include an up-to-date accurate Point Summary Table. The Contractor shall deliver to CPS the final Point Summary Table prior to final acceptance of the system. The Point Summary Table shall be used as a reference and guide during the commissioning process.

7. The Point Summary Table shall contain all data fields on a single row per point. The Point Summary Table is to have a single master source for all point information in the building that is easily sorted and kept up-to-date. Although a relational database of Device ID-to-point information would be more efficient, the single line format is required as a single master table that will reflect all point information for the building. The point description shall be an easily understandable English-language description of the point.
8. Point Summary Table shall also illustrate Network Variables/BACnet Data Links/LonWorks Bindings.

Point Summary Table Example

Row Headers and Examples

(Transpose for a single point per row format)

Building Number	0006 (CPS 4 digit Building Code)
System Type	Cooling
Equipment Type	Chiller
Point Suffix	CHLR1KW
*Point Name (Object Name)	0006.COOLING.CHILLER.CHLR1KW
*Point Description (Object Description)	Chiller 1 kW
Ethernet Network Number	600
Network Number	610
Device ID	1024006
Device MAC address	24
Point Type	AI
Instance Number	4
Engineering Units	KW
Network Variable?	True
Server Device	1024006
Client Devices	1028006

* Represents information that shall reside in the property for the point

C. **Point Naming Convention**

1. All point names shall adhere to the format as established below. Said objects shall include all physical I/O points, calculated points used for standard reports, and all application program parameters. For each BAS point, a specific and unique name shall be required.
2. For each point, four (4) distinct descriptors shall be linked to form each unique object name: Building, System, Equipment, and Point. All keyboard characters except a space are allowable. Each of the four descriptors must be bound by a

period to form the entire object name. Reference the paragraphs below for an example of these descriptors.

3. CPS shall designate the *Building* descriptor. The *System* descriptor shall further define the object in terms of air handling, cooling, heating, or other system. The *Equipment* descriptor shall define the equipment category; e.g., Chiller, Air Handler, or other equipment. The *Point* descriptor shall define the hardware or software type or function associated with the equipment; e.g., supply temperature, water pressure, alarm, mixed air temperature setpoint, etc. and shall contain any numbering conventions for multiples of equipment; e.g., CHLR1KW, CHLR2KW, BLR2AL (Boiler 2 Alarm), HWP1ST (Hot Water Pump 1 Status).
4. A consistent object (point) naming convention shall be utilized to facilitate familiarity and operational ease across the CPS WAN. Inter-facility consistency shall be maintained to ensure transparent operability to the greatest degree possible. The table below details the object naming convention and general format of the descriptor string.

Point Name Requirements

Descriptors		**Comment**
Building Number	0006	The Master Building List also has the correct number for each building.
System	AIRHANDLING EXHAUST HEATING COOLING UTILITY ENDUSE MISC	 Boilers and ancillary equipment Chillers and ancillary equipment Main electrical and gas meters Specific building loads by type
Equipment	AHU-1 BOILERS CHILLERS FACILITY TOWERS WEATHER	 Non-specific boiler system points Non-specific chiller system points
Point Suffix	See Input/Output point summary table for conventions	

5. **Examples**: Within each point name, the descriptors shall be bound by a period. Within each descriptor, words shall not be separated by dashes, spaces, or other separators as follows:
   a) 0006.COOLING.CHILLERS.CHWP1ST
   b) 0006.HEATING.BOILERS.BLR1CFH

D. **Device Addressing Convention:**

1. Lontalk - Network numbers and SNVT's shall be unique throughout the network.
2. BACnet - Network numbers and Device Object IDs shall be unique throughout the network.

3. BACnet - For each BAS object, a specific and unique BACnet object name shall be required.
4. All assignment of network numbers and Device Object IDs shall be coordinated with CPS.
5. Each Network number shall be unique throughout all facilities and shall be assigned in the following manner unless specified otherwise:
   BBBFF, where: BBB = 1-655 assigned to each building, FF = 00 for building backbone network, 1-35 indicating floors or separate systems in the building.
6. Each Device Identifier property shall be unique throughout the system and shall be assigned in the following manner unless specified otherwise:
   XXFFBBB, where: XX = number 0 to 40, FF = 00 for building backbone network, 1-35 indicating floors or separate systems in the building. BBB = 1-655 assigned to each building.
7. The Contractor shall coordinate with CPS or a designated representative to ensure that no duplicate Device Object IDs occur.
8. Alternative Device ID schemes or cross project Device ID duplication if allowed shall be approved before project commencement by CPS.

2.13 OPERATOR INTERFACE GRAPHIC SOFTWARE

A. Graphic software shall facilitate user-friendly interface to all aspects of the System Software specified above. The intent of this specification is to require a graphic package that provides for intuitive operation of the systems without extensive training and experience. It shall facilitate logical and simple system interrogation, modification, configuration, and diagnosis.

B. Graphic software shall support multiple simultaneous screens to be displayed and resizable in a 'Windows'-like environment. All functions excepting text entry functions shall be executable with a mouse.

C. Graphic software shall provide for multitasking such that third-party programs can be used while the OWS software is on line. Software shall provide the ability to alarm graphically even when operator is in another software package.

D. Operating system software shall be Microsoft Windows 2000 Professional or Microsoft Windows XP Professional.

E. The software shall allow for CPS creation of user-defined, color graphic displays of geographic maps, building plans, floor plans, and mechanical and electrical system schematics. These graphics shall be capable of displaying all point information from the database including any attributes associated with each point (i.e., engineering units, etc.). In addition, operators shall be able to command equipment or change setpoints from a graphic through the use of the mouse.

F. **Screen Penetration**: The operator interface shall allow users to access the various system graphic screens via a graphical penetration scheme by using the mouse to select from menus or 'button' icons. All screens will be accessible out the use of outline type selection screens. Each graphic screen shall be capable of having a unique list of other graphic screens that are directly linked through the selection of a menu item or button icon.

G. **Dynamic Data Displays**: Dynamic physical point values shall automatically updated at a minimum frequency of 6 updates per minute without operator intervention. Point

value fields shall be displayed with a color code depicting normal, abnormal, override and alarm conditions.

H. **Point Override Feature**: Provide the following:

1. An Operator from a work-station shall have the capability to place an end device under manual control, which shall prevent the control logic from making changes to the end device status, and provide the operator with the ability to position the end device. It must be possible to put a point under manual control and command the point to a specific state or value from a graphic page. Once under manual control the point will be able to be realeased to automatice operation from the same graphics page. See the definition of Manual Control in the definition of terms section.
2. An Operator from the operator work-station shall have the capability to place a sensor input into test mode. When in test mode, any changes from the physical sensor will no longer be recognized and the value reported to control logic shall take a value that is assigned to it by the operator from the operator work-station. It must be possible to put a point in test and assign a test value from a graphic page. See the definition of Test Mode in the definition of terms section.
3. Points that are overridden shall be reported as an alarm, and shall be displayed in a coded color. The alarm message shall include the operator's user name. A list of points that are currently in an override state shall be available through menu selection. Such overrides or changes shall occur in the control unit, not just in the workstation software. The graphic point override feature shall be subject to password level protection.

I. **Dynamic Symbols**: Provide a selection of standard symbols that change in appearance based on the value of an associated point.

1. Analog symbol: Provide a symbol that represents the value of an analog point as the length of a line or linear bar.
2. Digital symbol: Provide symbols such as switches, pilot lights, rotating fan wheels, etc. to represent the value of digital input and output points.
3. Point Status Color: Graphic presentations shall indicate different colors for different point statuses. (For instance, green = normal, red = alarm, gray (or '???') for non-response.

J. **Graphics Development Package**: Graphic development and generation software shall be provided to allow the user to add, modify, or delete system graphic displays. The application of the graphic editing will be controlled by password level at the programmer level or higher.

1. The Contractor shall provide libraries of pre-engineered screens and symbols depicting standard air handling unit components (e.g. fans, cooling coils, filters, dampers, etc.), mechanical system components (e.g., pumps, chillers, cooling towers, boilers, etc.), complete mechanical systems (e.g. constant volume-terminal reheat, VAV, etc.) and electrical symbols.
2. The Graphic Development Package shall use a mouse or similar pointing device to allow the user to perform the following:
   a) Define symbols
   b) Position items on graphic screens
   c) Attach physical or virtual points to a graphic

d) Define background screens

e) Define connecting lines and curves

f) Locate, orient and size descriptive text

g) Define and display colors for all elements

h) Establish correlation between symbols or text and associated system points or other displays.

i) Create hot spots or link triggers to other graphic displays or other functions in the software.

PART 3 - EXECUTION

3.1 SYSTEM CONFIGURATION

A. Contractor shall thoroughly and completely configure the BAS software, supplemental software, network communications, CSS, OWS, printer, and remote communications for a fully complete operational system.

3.2 SITE-SPECIFIC APPLICATION PROGRAMMING

A. Provide all database creation and site-specific application control programming as required by these Specifications, national and local standards and for a fully functioning system. Contractor shall provide all initial site-specific application programming and thoroughly document programming. Generally meet the intent of the written sequences of operation. If a sequence is not clear, in the contractors opinion, it is the Contractor's responsibility to request clarification..

B. All site-specific programming shall be fully documented and submitted for review and approval, both prior to downloading into the panel, at the completion of functional performance testing, and at the end of the warranty period.

All programming, graphics and data files must be maintained in a logical system of directories with self-explanatory file names. All files developed for the project will be the property of CPS and shall remain on the workstation(s)/server(s) at the completion of the project.

3.3 PASSWORD SETUP

A. Set up the following password levels to include the specified capabilities:

1. Level 1: (CPS's BAS Administrator)
   a) Level 2 capabilities
   b) View, add, change and delete user names, passwords, password levels
   c) All unrestricted system capabilities including all network management functions.
2. Level 2: (Programmer)
   a) Level 3 capabilities
   b) Configure system software
   c) Modify control unit programs

d) Modify graphic software

e) Essentially unrestricted except for viewing or modifying user names, passwords, password levels

3. Level 3: (Chief Engineer)
   a) Level 4 capabilities
   b) Override output points
   c) Change all setpoints and reset schedules.
   d) Exit BAS software to use third party programs
4. Level 4: (Assitant)
   a) Level 5 capabilities
   b) Acknowledge alarms
   c) Change equipment schedules
   d) Change room temperature setpoints
5. Level 5: (Veiw only Access)
   a) Display all graphic data
   b) Trend point data
   c) Unless otherwise directed the Login will the school name and the password will be "cpswebaccess".

B. Contractor shall assist CPS's operators with assigning user names, passwords and password levels. There may be multiple login name and passwords for a given password level. The contractor will be responsible for changing BAS administrator and Programmer level passwords if those are accidentally provided to other contractors or the school engineer.

3.4 POINT PARAMETERS

A. Provide the following minimum programming for each analog input:

1. Name
2. Address
3. Scanning frequency or COV threshold
4. Engineering units
5. Offset calibration and scaling factor for engineering units
6. High and low alarm values and alarm differentials for return to normal condition
7. High and low value reporting limits (reasonableness values), which shall prevent control logic from using shorted or open circuit values.
8. Default value to be used when the actual measured value is not reporting. This is required only for points that are transferred across the primary and/or secondary controlling networks and used in control programs residing in control units other than the one in which the point resides. Events causing the default value to be used shall include failure of the control unit in which the point resides, or failure

of any network over which the point value is transferred. All default values will be provided in list format for evaluation by CPS.

9. Selectable averaging function that shall average the measured value over a user selected number of scans for reporting.

B. Provide the following minimum programming for each analog output:

1. Name
2. Address
3. Output updating frequency
4. Engineering units
5. Offset calibration and scaling factor for engineering units
6. Output Range
7. Default value to be used when the normal controlling value is not reporting.

C. Provide the following minimum programming for each digital input:

1. Name
2. Address
3. Engineering units (on/off, open/closed, freeze/normal, etc.)
4. Debounce time delay
5. Message and alarm reporting as specified
6. Reporting of each change of state, and memory storage of the time of the last change of state
7. Totalization of on-time (for all motorized equipment status points), and accumulated number of off-to-on transitions.

D. Provide the following minimum programming for each digital output:

1. Name
2. Address
3. Output updating frequency
4. Engineering units (on/off, open/closed, freeze/normal, etc.)
5. Direct or Reverse action selection
6. Minimum on-time
7. Minimum off-time
8. Status association with a DI and failure alarming (as applicable)
9. Reporting of each change of state, and memory storage of the time of the last change of state.
10. Totalization of on-time (for all motorized equipment status points), and accumulated number of off-to-on transitions.
11. Default value to be used when the normal controlling value is not reporting.

3.5 TRENDS

A. Contractor shall establish and store trend logs. Trend logs shall be prepared for each physical input and output point. All dynamic virtual points such as setpoints subject to a reset schedule, intermediate setpoint values for cascaded control loops, and the like will be trended as directed by the CPS.

B. CPS will analyze trend logs of the system operating parameters to evaluate normal system functionality. Contractor shall establish these trends and ensure they are being stored properly.

1. Data shall include a single row of field headings and the data thereafter shall be contiguous. Each record shall include a date and time field or single date stamp. Recorded parameters for a given piece of equipment or component shall be trended at the same intervals and be presented in a maximum of two separate 2-dimensional formats with time being the row heading and field name being the column heading.

C. Sample times indicated as COV (±) or change-of-value mean that the changed parameter only needs to be recorded after the value changes by the amount listed. When outputting to the trending file, the latest recorded value shall be listed with any given time increment record. The samples shall be filled with the latest values also if the points include different time intervals. If the BAS does not have the capability to record based on COV, the parameter shall be recorded based on the interval common to the unit.

D. Trending intervals or COV thresholds shall be dictated by CPS, or their representative, upon system start-up.

E. The Contractor shall demonstrate functional trends as specified for a period of 30 days after successful system demonstration before final acceptance of the system. The trend limit is 1 year from demonstration for LEED projects that require trend data for M&V purposes. The limit on the length of trend data will be a function of the storage capacity of the computer.

3.6 TREND GRAPHS

A. Prepare controller and workstation software to display graphical format trends. Trended values and intervals shall be the same as those specified

B. Lines shall be labeled and shall be distinguishable from each other by using either different line types, or different line colors.

C. Provide a legend identifying the line color and symbol along side the point noun name for each point in the trend. Aslo, indicate engineering units of the y-axis values; e.g. degrees F., inches w.g., Btu/lb, percent open, etc.

D. The y-axis scales shall be chosen so that all trended values are in a readable range. Do not mix trended values on one graph if their unit ranges are incompatible.

E. Trend outside air temperature, humidity, and enthalpy during each period in which any other points are trended except for control loop performance trends.

F. Allow point groups to be saved for future trends. For example HW supply and return temperatures along with HX stm valve position and pump status.

3.7 ALARMS

A. **Override Alarms**: Any point that is overridden through the override feature of the graphic workstation software shall be reported as a Level 3 alarm.

B. **Analog Input Alarms**: For each analog input, program an alarm message for reporting whenever the analog value is outside of the programmed alarm limits. Report a 'Return-to-Normal' message after the analog value returns to the normal range, using a programmed alarm differential. The alarm limits shall be individually selected by the Contractor based on the following criteria:

1. Space temperature, except as otherwise stated in sequence of operation: Level 3
   a) Low alarm: 64°F
   b) Low return-to-normal: 68°F
   c) High alarm: 85°F
   d) High return-to-normal: 80°F
2. Controlled media temperature other than space temperature (e.g. AHU discharge air temperature, steam converter leaving water temperature, condenser water supply, chilled water supply, etc.): Level 3 (If controlled media temperature setpoint is reset, alarm setpoints shall be programmed to follow setpoint)
   a) Low alarm: 3°F below setpoint
   b) Low return-to-normal: 2°F below setpoint
   c) High alarm: 3°F above setpoint
   d) High return-to-normal: 2°F above setpoint.
3. AHU mixed air temperature: Level 4
   a) Low alarm: 45°F
   b) Low return-to-normal: 46°F
   c) High alarm: 90°F
   d) High return-to-normal: 89°F
4. Duct Pressure:
   a) Low alarm: 0.5"w.g. below setpoint
   b) Low return-to-normal: 0.25"w.g. below setpoint
   c) High alarm: 0.5"w.g. above setpoint
   d) High return-to-normal: 0.25"w.g. above setpoint
5. Space humidity:
   a) Low alarm: 35%
   b) Low return-to-normal: 40%
   c) High alarm: 75%
   d) High return-to-normal: 70%

C. **Status versus Command Alarms**: The Sequences of Operation are based on the presumption that motor starter Hand-Off-Auto (HOA) switches are in the 'Auto' position. BAS shall enunciate the following Level 5 alarm message if status indicates a unit is operational when the run command is not present or vice versa:

1. *DEVICE XXXX* FAILURE: Status is indicated on *{the device}* even though it has been commanded to stop. Check the HOA switch, control relay, status sensing device, contactors, and other components involved in starting the unit. Acknowledge this alarm when the problem has been corrected.

D. **Maintenance Alarms**: Enunciate Level 5 alarms when runtime accumulation exceeds a value specified by the operator.

1. *DEVICE XXXX REQUIRES MAINTENANCE.* Runtime has exceeded specified value since last reset.

E. See requirements for additional equipment-specific alarms specified in *Section 15958 - Sequences of Operation.*

3.8 GRAPHIC SCREENS

A. **Main Screen:** The Main screen will be the first screen displayed after login, no navigation required to get to the main screen (see Exhibit A for sample screens). This screen will have the following features:

1. CPS will have the option of providing a picture of the school as background.
2. There will be a link button to the floor plans, Summary screen, and system schematic screens. In the event that there are more 10 to 15 AHU, Boiler and Chiller screens a button to groups of AHU's will be provided.
3. Manufacturer/Installer Logo or information is not to be included in the screen.
4. Provide a global command to open heating or cooling valves to facilitate Test Adjust and Balance. The command will be grouped so that an AHU can be balanced as well as total system balancing. The same function will apply for VAV AHU's were all the boxes can be set at minimum or maximum flow.

B. **Floor Plan Screens**: The contract document drawings will be made available to the Contractor in AutoCAD format upon request. These drawings may be used only for developing backgrounds for specified graphic screens; however CPS does not guarantee the suitability of these drawings for the Contractor's purpose (see Exhibit B for sample screens). .

1. Provide graphic floor plan screens for each floor and/or wing of the building. Indicate the location of all equipment that is not located on the equipment room screens.
   a) Indicate the location of temperature sensors associated with each temperature-controlled zone (i.e., VAV terminals, fan-coils, single-zone AHUs, etc.) on the floor plan screens.
   b) Display the space temperature point adjacent to each temperature sensor symbol along with the room set point. Use a distinct line symbol to demarcate each terminal unit zone boundary. Use distinct background colors for each zone to demarcate the air-handling unit to which it is associated.
   c) Indicate room numbers as provided by CPS. Verify final room number/name assignments, as these are often different than initially assigned room numbers on the contract drawings.
   d) Provide a drawing link from each space temperature sensor symbol and equipment symbol shown on the graphic floor plan screens to each corresponding zone equipment schematic graphic screen. Because the area

available for the floor plans varies from system to system, the size of text used to display data such as room number and temperature will be at least 1/8" high on the screen when the entire floor plan section is displayed.

e) The floor plan graphics will also indicate the location of control panels. For control devices such as duct smoke detectors, system pressure or differential pressure sensors (water or air), airflow stations that are located outside the equipment rooms. All of these devices will be linked to the associated system graphic. For terminal units the link to the associated system graphic is sufficient and the associated unit control devices do not need to be located on the floor plan.

2. Provide graphic floor plan screens for each mechanical equipment room and a plan screen of the roof. Indicate the location of each item of mechanical equipment. Provide a drawing link from each equipment symbol shown on the graphic plan view screen to each corresponding mechanical system schematic graphic screen.
3. Provide a graphic building key plan that will allow navigation at a floor level or from floor to floor. Use elevation views and/or plan views as necessary to graphically indicate the location of all of the larger scale floor plans. Link graphic building key plan to larger scale partial floor plans. Provide links from each larger scale graphic floor plan screen to the building key plan and to each of the other graphic floor plan screens.
4. When there is more than one building, provide a graphic site plan with links to and from each building plan.

C. **System Schematic Screens**: Provide graphic system schematic screen for each HVAC subsystem (AHU) controlled with each I/O point in the project appearing on at least one graphic screen. System graphics shall be have the same look as the submittal diagrams (do not use three dimensional graphics) with status, setpoints, current analog input and output values, operator commands, etc. as applicable. Input/output devices shall be shown in their schematically correct locations with the associated value, noun name and engineering units. The position of valves or dampers will be % OPEN. For three way valves it will be %OPEN to the device. The noun name (English language descriptors) shall be included for each point on all graphics; this may be accomplished by the use of a pop-up window accessed by selecting the displayed point with the mouse. Indicate all adjustable setpoints on the applicable system schematic graphic screen or, if space does not allow, on a supplemental linked-setpoint screen. Similar AHU's will have the same organization of information. For example a single zone AHU will not put all the set points across the top and multizone put them on the side or bottom (see Exhibit C for sample screens).

1. Provide graphic screens for each air handling system. Indicate outside air temperature and enthalpy, and mode of operation as applicable (i.e., occupancy mode and heating, cooling, economizer etc based on the sequence of operations). Link screens for air handlers to the heating system and cooling system graphics. Link screens for supply and exhaust systems if they are not combined onto one screen.
2. Provide a graphic screen for each zone with the associated control devices or terminal unit with a link to the associated system schematic screen of the air handling unit that serves the zone.

3. Provide a cooling system graphic screen showing all points associated with the chillers, cooling towers and pumps. Indicate outside air dry-bulb temperature and calculated wet-bulb temperature. Link the chilled water and condenser water systems screens if they cannot fit onto one cooling plant graphic screen.
4. Link the heating and cooling system graphics to utility history reports showing current and monthly electric uses, demands, peak values, and other pertinent values.
5. For each system schematic screen, including AHU, Boiler, Chiller and terminal unit screen, provide a button linked to a text version of the sequence of operation for the device or system. The sequence will be updated with the as-built sequence following completion of the demonstration.

D. **System Summary Screens**: On each graphic System Screen, provide drawing links to the graphic air handling unit schematic screens (see Exhibit D for sample screens).

1. Provide a chilled water valve screen showing the analog output signal of all chilled water valves with signals expressed as percentage of fully open valve (percentage of full cooling). Indicate the discharge air temperature and setpoint of each air handling unit, cooling system chilled water supply and return temperatures and the outside air temperature and humidity on this graphic. Provide drawing links between the graphic cooling plant screen and this graphic screen.
2. Provide a heating water valve screen showing the analog output signal of all air handling unit heating water valves with signals expressed as percentage of fully open valve (percentage of full heating). Indicate the temperature of the controlled medium (such as AHU discharge air temperature or zone hot water supply temperature) and the associated setpoint and the outside air temperature and humidity.
3. When there are more than four AHU's on the system provide a summary screen with the following type of information for each AHU, each fan command, status, alarms (smoke, freeze, duct static), DAT and duct pressure if applicable. For the heating system provide status and supply water temp or steam pressure and for the chiller provide status and chilled water supply temperature.
4. Provide a BAS system summary screen using the control system riser diagram to show the communication status of all controllers (BC, AAC and ASC's) on the BAS as well as all interface devices such as VFD's, chillers and boiler panels etcetera. Use green board concept, green means communicating, red is not communicating.
5. Provide a terminal unit summary screen grouped by floor or AHU. If the summary is grouped by floor then the AHU will be shown for each terminal unit and vice versa. The points shown will depend on the type of terminal unit and will include room name, floor or AHU, room set point and temperature, DAT, valve position, command status, alarm and occupancy state.
6. Exhaust fans will be show in a table format showing the command signal, the status, the alarm condition, and the occupancy state.

E. **Alarms**: Each programmed alarm shall appear on at least one graphic screen. In general, alarms shall be displayed on the graphic system schematic screen for the system that the alarm is associated with (for example, chiller alarm shall be shown on graphic cooling system schematic screen). For all graphic screens, display analog values that are in a 'high alarm' condition in a red color, 'low alarm' condition in a

blue color. Indicate digital values that are in alarm condition in a red color. When an alarm first occurs it shall "popup" over the current screen so that the operator is imediatedly aware of an alarm.

1. Maintenance Alarms
   a) Runtime alarm screen will list all equipment with a BAS status. For each piece of equipment the screen will display the current run time (since the last reset), the runtime alarm limit (adj.), its alarm status (red / green) and the total accumulated runtime. The total accumulated runtime would only be zeroed out if the equipment were replaced. For equipment with internal runtime meters ensure that the total accumulative runtime is synchronized.

F. **Utility Metering**: Provide a graphic for the gas, electric and water utility data required in the sequence of operations. This may entail multiple screens if submetering of the gas or electric usage is included in the project.

END OF SECTION

SPECIFICATION 15955
EXHIBITS

The following graphic screens are provided as examples that incorporate most of the requirements of Specification 15955. While few graphic screens meet all the requirements they are illustrative of the quality of graphic screen that CPS expects on projects executed under this specification.

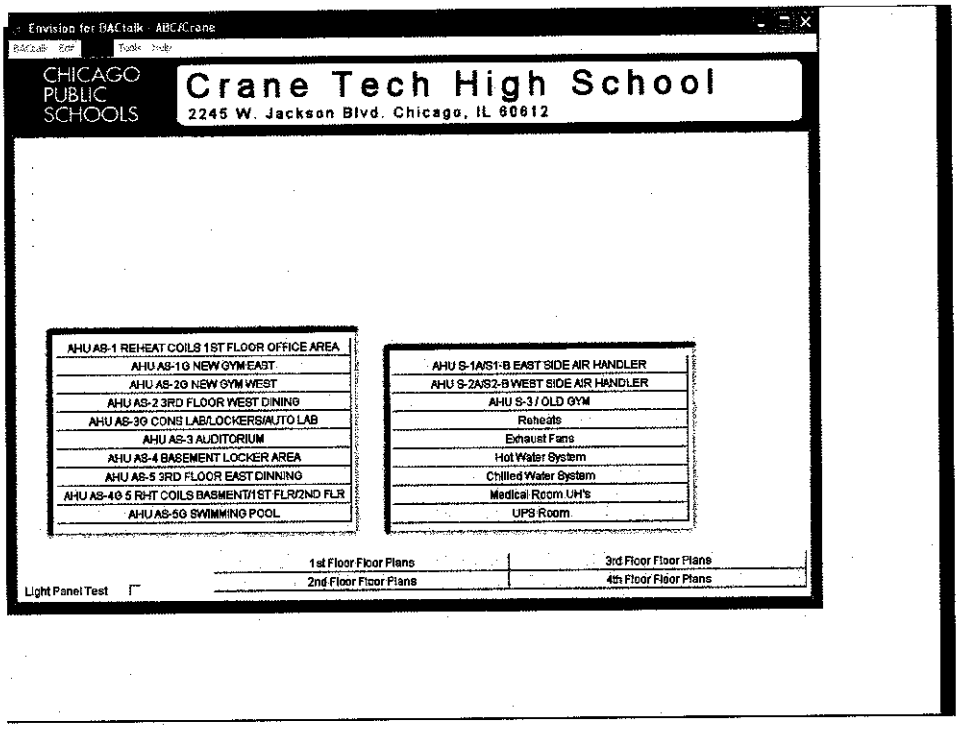
EXHIBIT A **Main Screen Example Graphics**

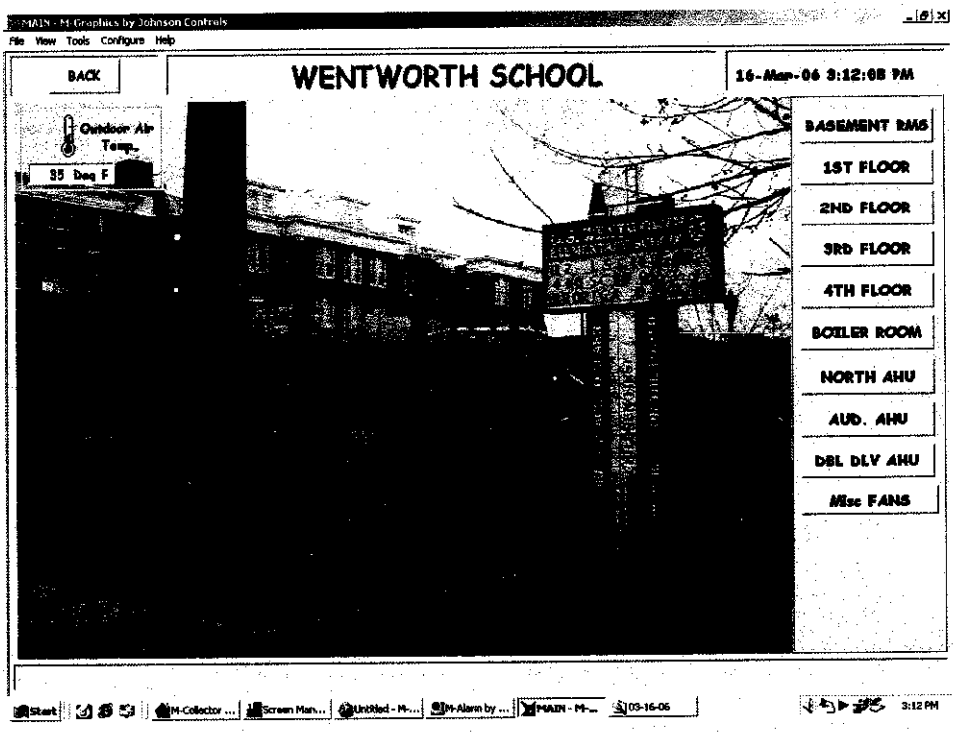
EXHIBIT B **Floor Plan Example Graphics**

EXHIBIT C **System Schematic Example Graphics**

EXHIBIT D **System Summary Example Graphics**

EXHIBIT A Main Screen Example Graphics





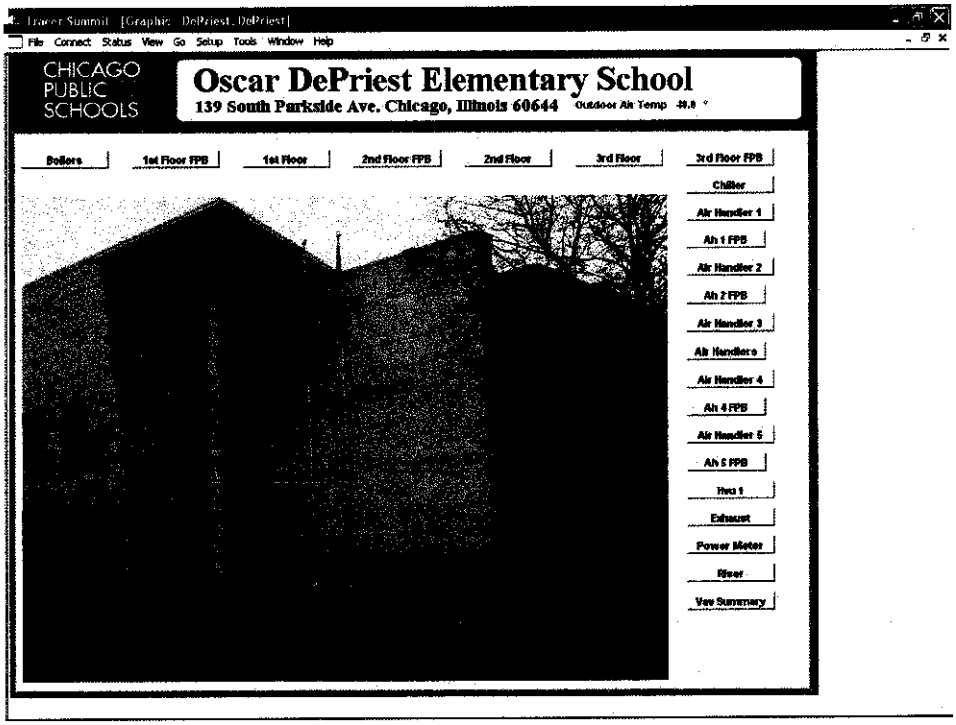
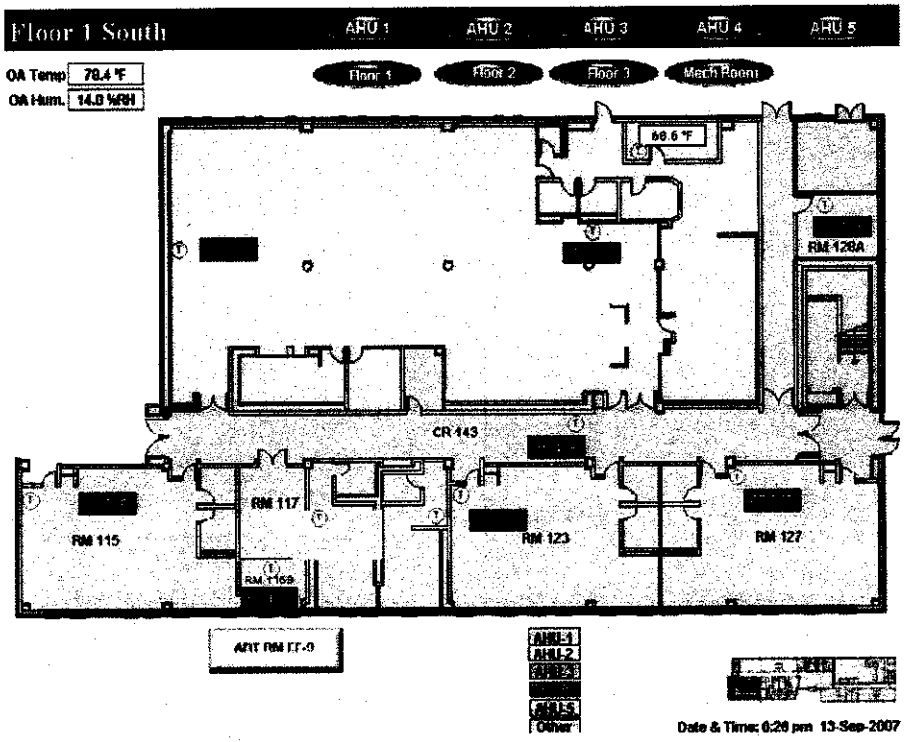
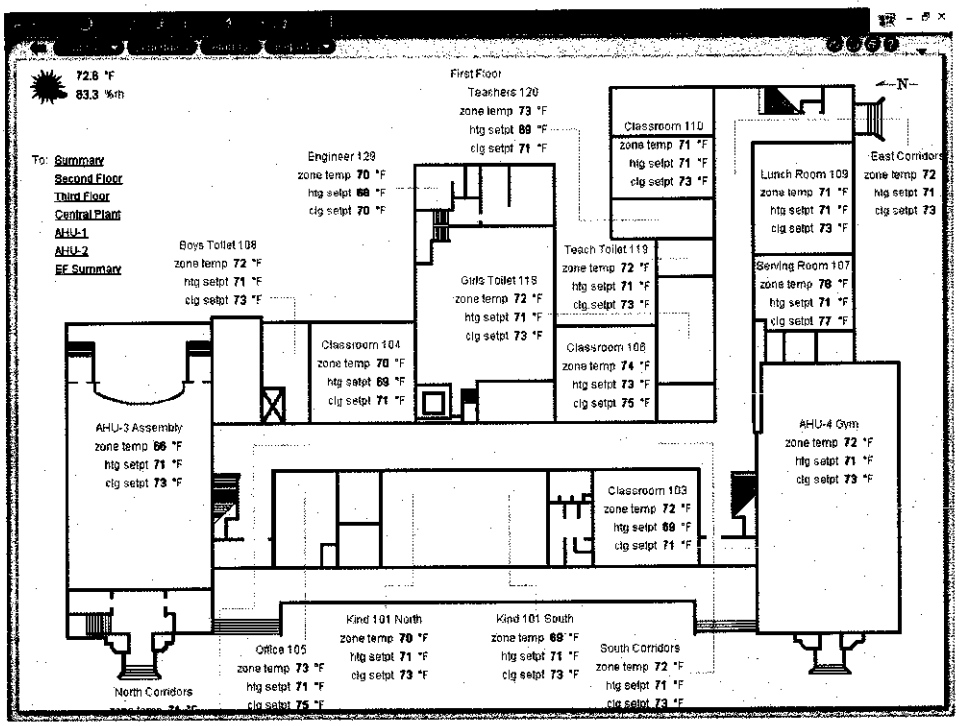
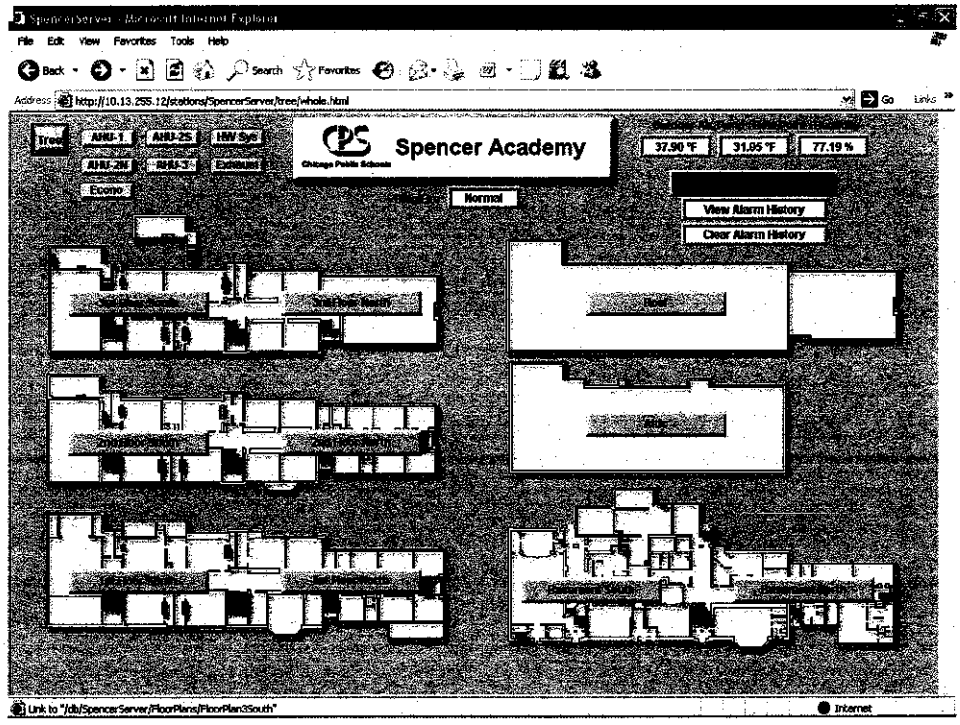
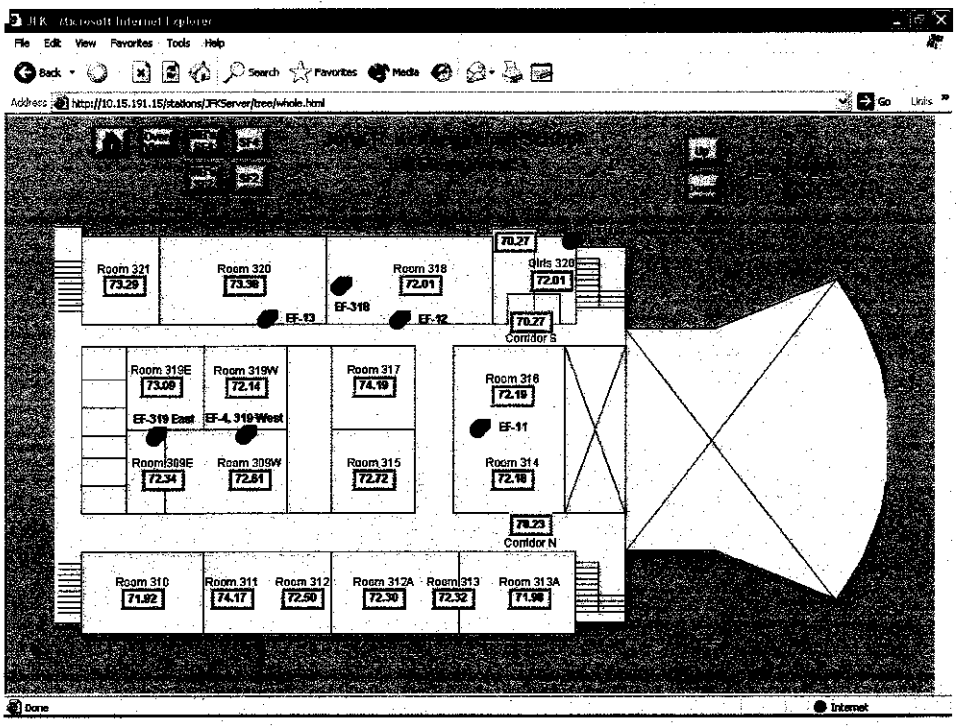

Tracer Summit [Graphic: DePriest, DePriest]
File Connect Status View Go Setup Tools Window Help
CHICAGO PUBLIC SCHOOLS
Oscar DePriest Elementary School
139 South Parkside Ave. Chicago, Illinois 60644
Outdoor Air Temp
Boilers
1st Floor FPB
1st Floor
2nd Floor FPB
2nd Floor
3rd Floor
3rd Floor FPB
Chiller
Air Handler 1
Ah 1 FPB
Air Handler 2
Ah 2 FPB
Air Handler 3
Air Handler 4
Ah 4 FPB
Air Handler 5
Ah 5 FPB
Exhaust
Power Meter
Riser
Vav Summary

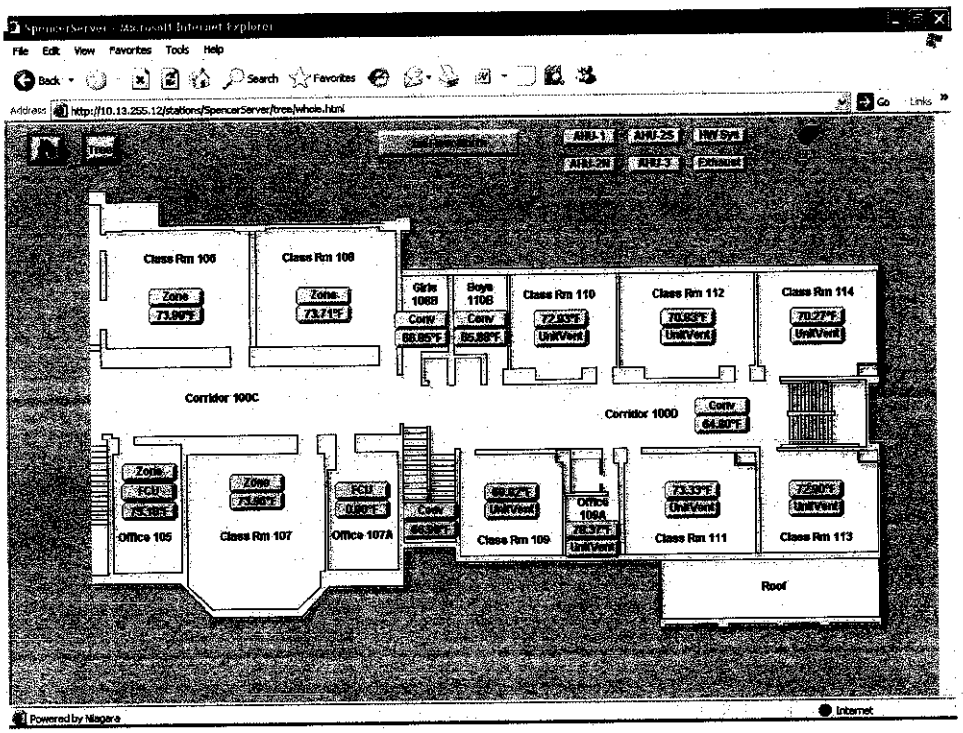
EXHIBIT B Floor Plan Example Graphics






Spencer Academy
AHU-1
AHU-2S
HW Sys
AHU-2N
AHU-3
Exhaust
Econo
37.90 °F
31.95 °F
77.19 %
Normal
View Alarm History
Clear Alarm History
Internet


Room 321
73.29
Room 320
73.36
Room 318
72.01
Girls 320
72.01
70.27
EF-13
EF-318
EF-12
Corridor S
Room 319E
73.09
Room 319W
72.14
Room 317
74.19
Room 316
72.19
EF-319 East
EF-4, 319 West
EF-11
Room 309E
72.34
Room 309W
72.81
Room 315
72.72
Room 314
72.18
78.23
Corridor N
Room 310
71.92
Room 311
74.17
Room 312
72.50
Room 312A
72.30
Room 313
72.32
Room 313A
71.98
Done
Internet


Class Rm 106
Class Rm 108
Girls 108B
Boys 110B
Class Rm 110
Class Rm 112
Class Rm 114
Corridor 100C
Corridor 100D
Office 105
Class Rm 107
Office 107A
Class Rm 109
Office 109A
Class Rm 111
Class Rm 113
Roof
Powered by Niagara
Internet

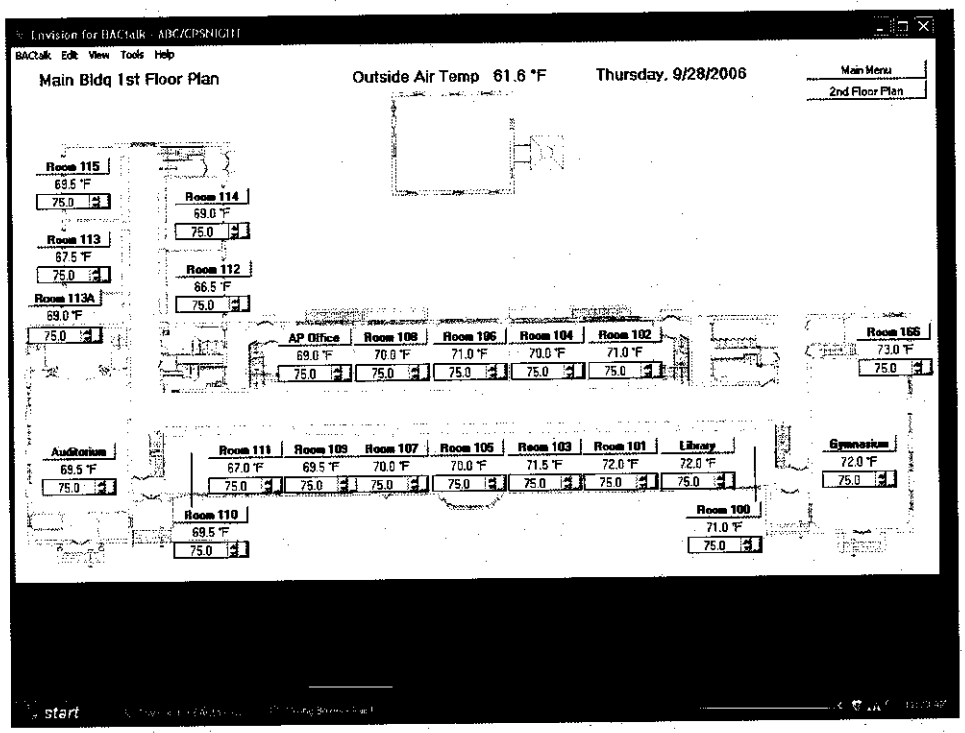
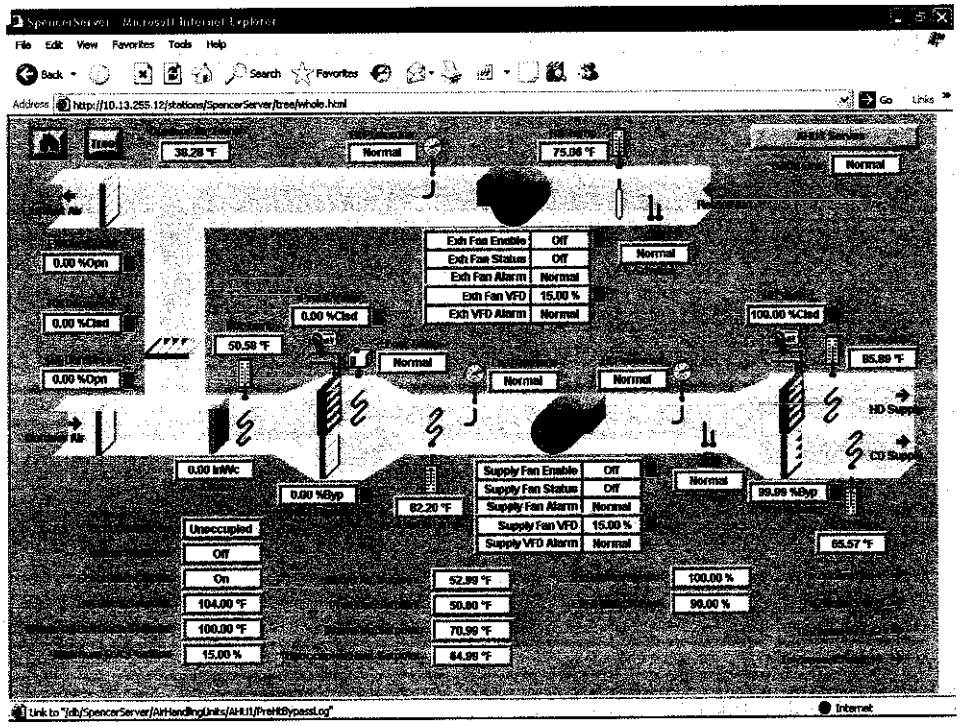
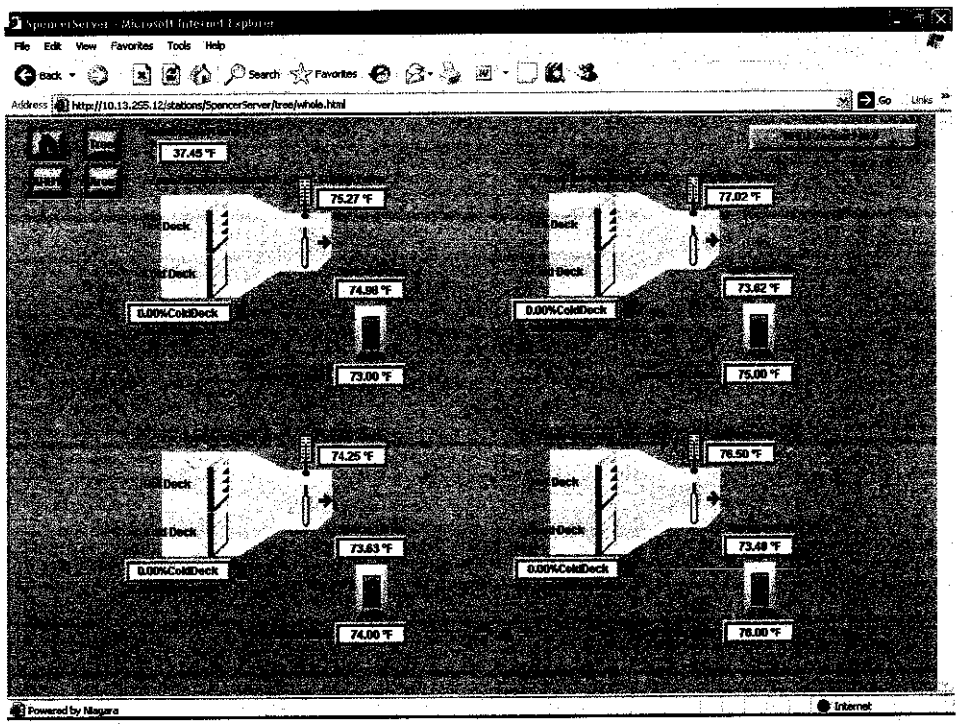
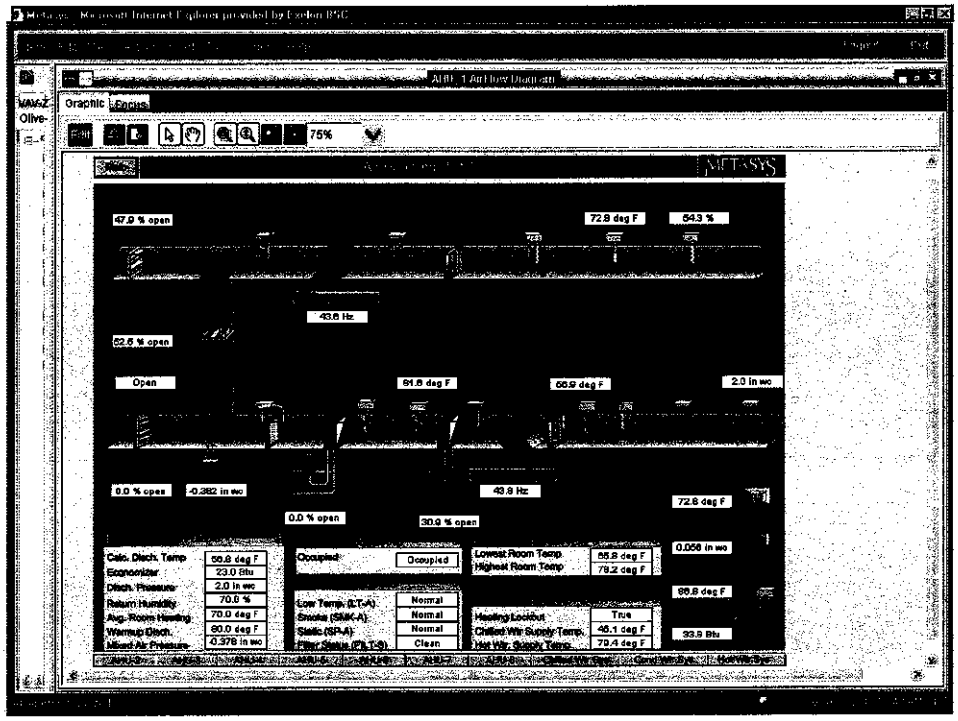
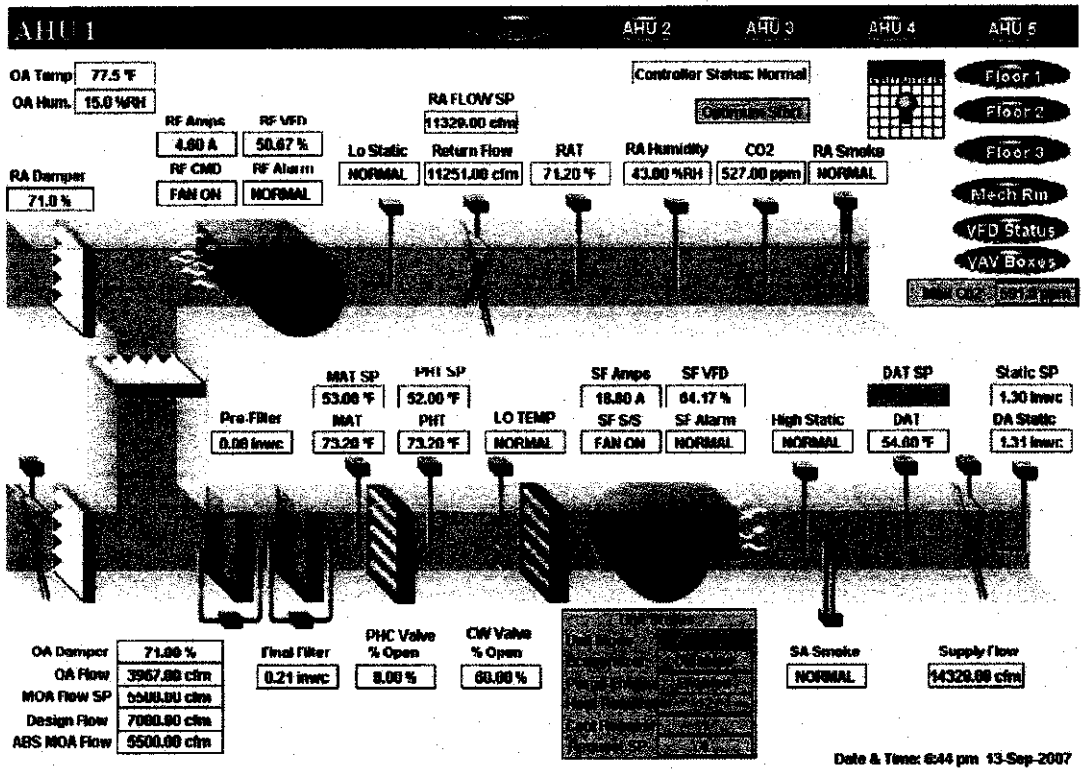

Main Bldg 1st Floor Plan
Outside Air Temp 61.6 °F
Thursday, 9/28/2006
Main Menu
2nd Floor Plan
Room 115
Room 114
Room 113
Room 112
Room 113A
AP Office
Room 108
Room 106
Room 104
Room 102
Room 116
Auditorium
Room 111
Room 109
Room 107
Room 105
Room 103
Room 101
Library
Gymnasium
Room 110
Room 100
start

EXHIBIT C System Schematic Example Graphics

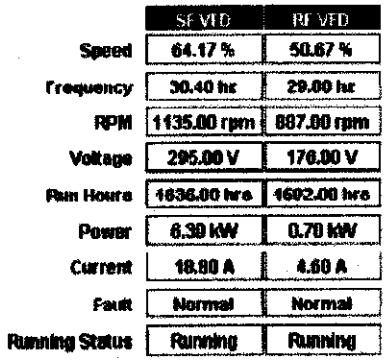




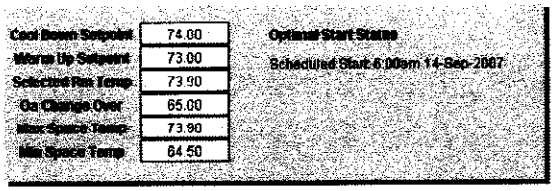



AHU 1
AHU 2
AHU 3
AHU 4
AHU 5
OA Temp 77.5 °F
OA Hum. 15.0 %RH
Controller Status: Normal
RA FLOW SP
11329.00 cfm
RF Amps
4.80 A
RF VFD
50.67 %
RF CMD
FAN ON
RF Alarm
NORMAL
RA Damper
71.0 %
Lo Static
NORMAL
Return Flow
11251.00 cfm
RAT
71.20 °F
RA Humidity
43.00 %RH
CO2
527.00 ppm
RA Smoke
NORMAL
Floor 1
Floor 2
Floor 3
Mech Rm
VFD Status
VAV Boxes
MAT SP
53.00 °F
PHT SP
52.00 °F
Pre-Filter
0.08 inwc
MAT
73.20 °F
PHT
73.20 °F
LO TEMP
NORMAL
SF Amps
18.80 A
SF VFD
64.17 %
SF S/S
FAN ON
SF Alarm
NORMAL
High Static
NORMAL
DAT SP
DAT
54.60 °F
Static SP
1.30 inwc
DA Static
1.31 inwc
OA Damper 71.00 %
OA Flow 3967.00 cfm
MOA Flow SP 6500.00 cfm
Design Flow 7080.00 cfm
ABS MOA Flow 6500.00 cfm
Final Filter
0.21 inwc
PHC Valve % Open
8.00 %
CW Valve % Open
68.00 %
SA Smoke
NORMAL
Supply Flow
14329.00 cfm
Date & Time: 6:44 pm 13-Sep-2007

Additional Info pages

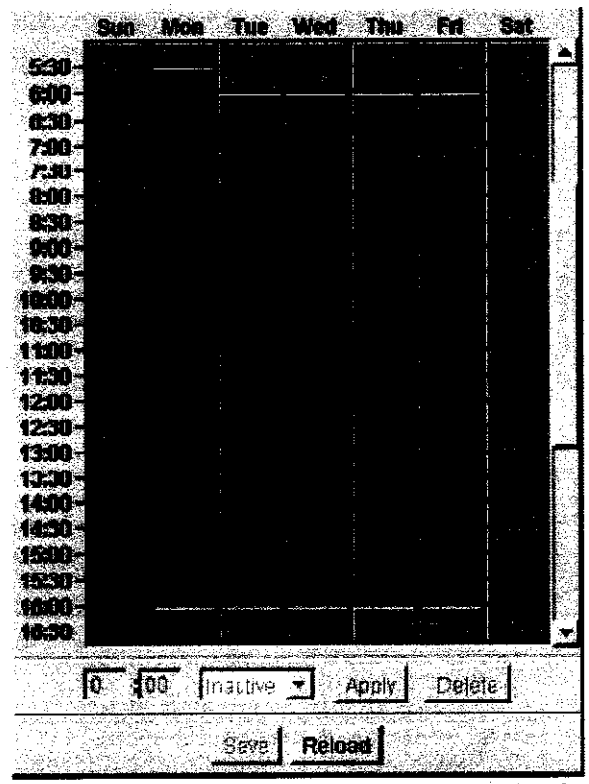


	SF VFD	RF VFD
Speed	64.17 %	50.67 %
Frequency	30.40 hz	29.00 hz
RPM	1135.00 rpm	887.00 rpm
Voltage	295.00 V	176.00 V
Run Hours	1636.00 hrs	1602.00 hrs
Power	6.39 kW	0.70 kW
Current	18.80 A	4.60 A
Fault	Normal	Normal
Running Status	Running	Running

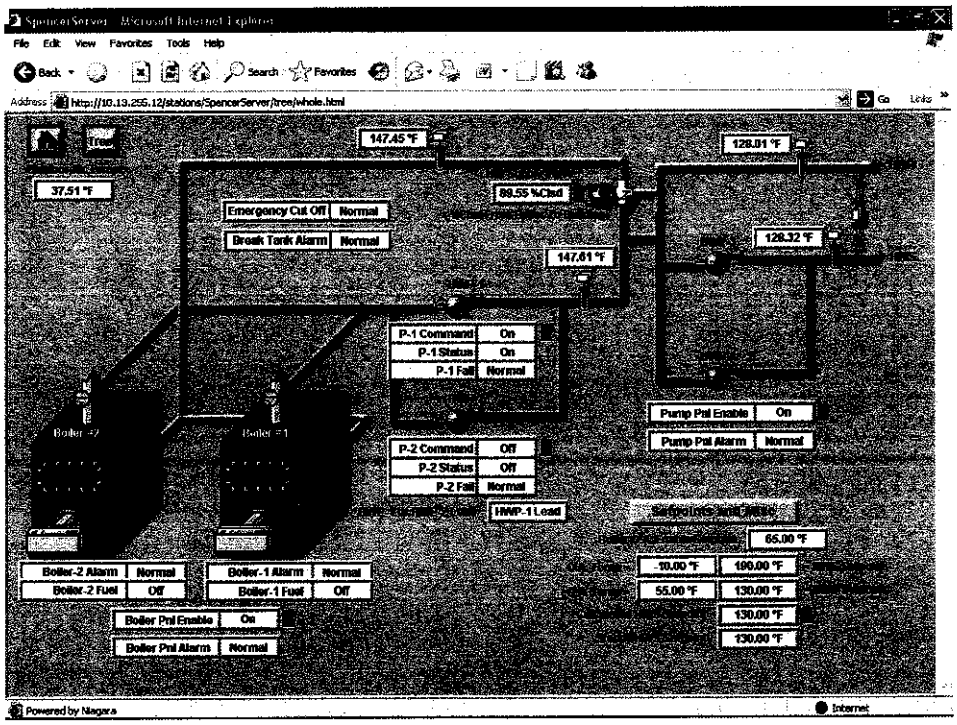


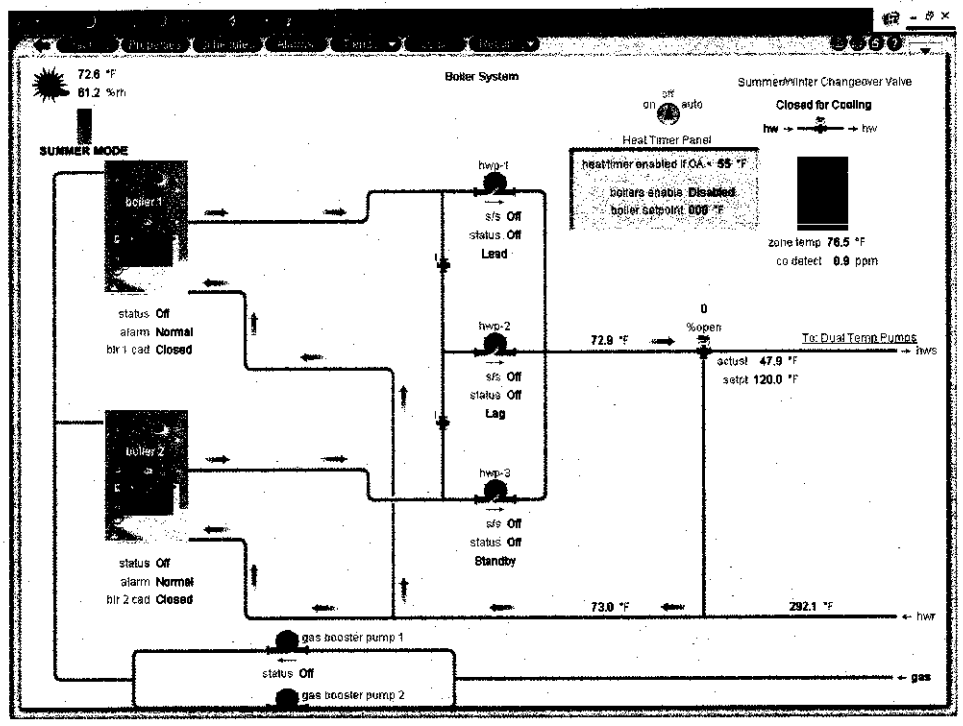
Schedule

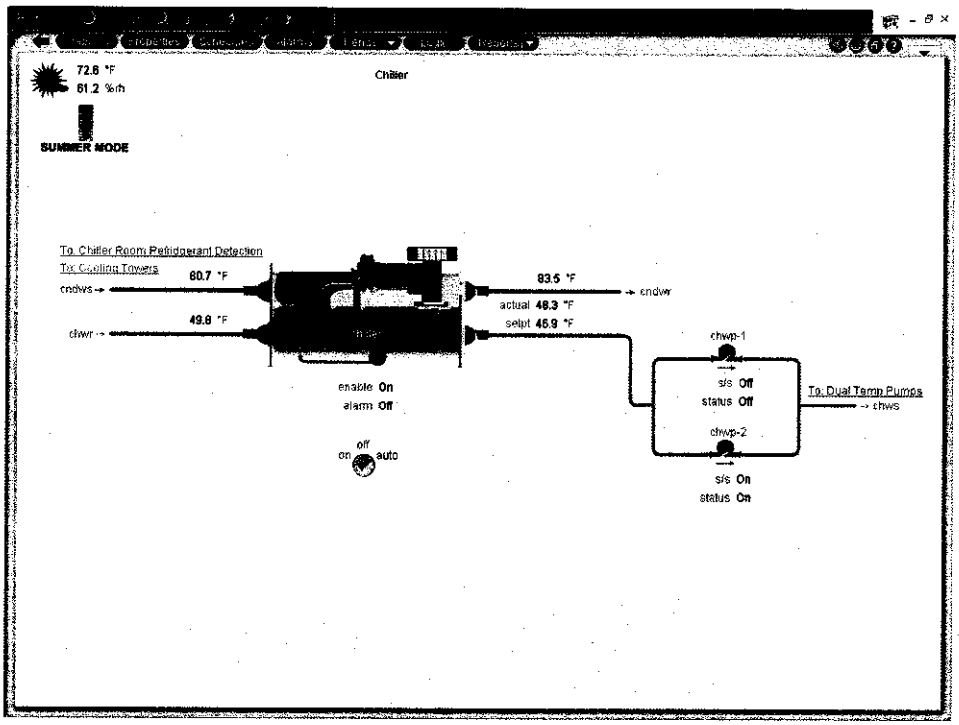
Weekly Schedule: /Albany_Park/Albany/AHU_1/Schedule

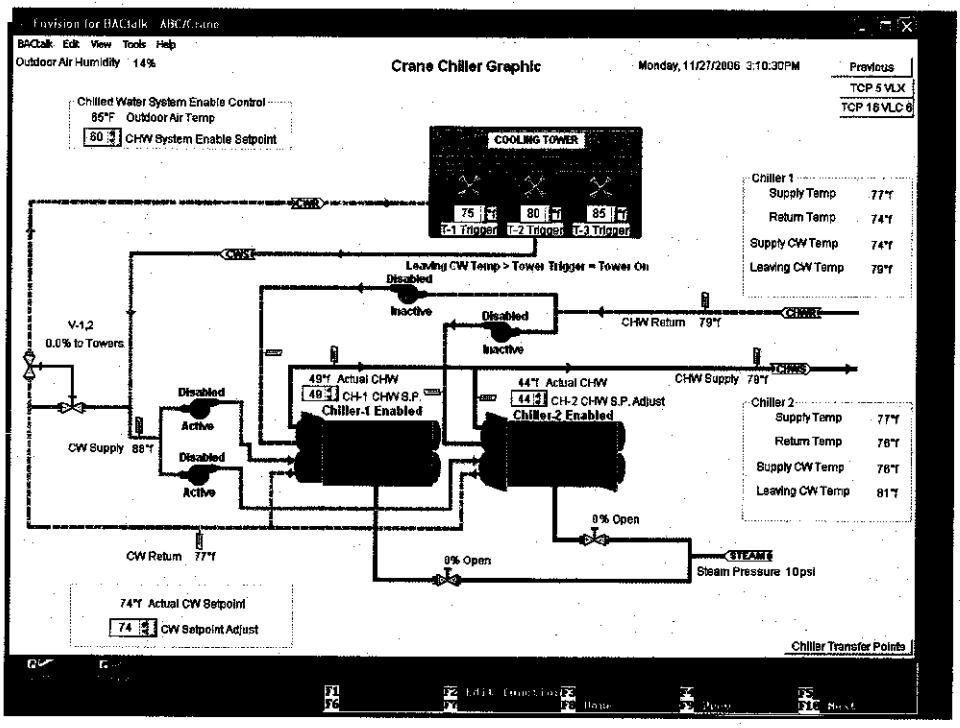


Summary Weekly Holiday Special Events Calendar


147.45 °F
128.01 °F
37.51 °F
89.55 %Clsd
Emergency Cut Off Normal
Break Tank Alarm Normal
147.61 °F
128.32 °F
P-1 Command On
P-1 Status On
P-1 Fail Normal
Pump Pri Enable On
Pump Pri Alarm Normal
Boiler #2
Boiler #1
P-2 Command Off
P-2 Status Off
P-2 Fail Normal
HWP-1 Lead
65.00 °F
Boiler-2 Alarm Normal
Boiler-2 Fuel Off
Boiler-1 Alarm Normal
Boiler-1 Fuel Off
Boiler Pri Enable On
Boiler Pri Alarm Normal
-10.00 °F
100.00 °F
55.00 °F
130.00 °F
130.00 °F
130.00 °F
Powered by Niagara
Internet


72.6 °F
61.2 %rh
Boiler System
Summer/Winter Changeover Valve
off
on auto
Closed for Cooling
hw → hw
Heat Timer Panel
heat timer enabled if OA < 55 °F
boilers enable Disabled
boiler setpoint 000 °F
SUMMER MODE
hwp-1
s/s Off
status Off
Lead
zone temp 76.5 °F
co detect 0.9 ppm
boiler 1
status Off
alarm Normal
blr 1 cad Closed
hwp-2
0
%open
72.9 °F
To Dual Temp Pumps
hws
actust 47.9 °F
setpt 120.0 °F
s/s Off
status Off
Lag
boiler 2
hwp-3
s/s Off
status Off
Standby
status Off
alarm Normal
blr 2 cad Closed
73.0 °F
292.1 °F
hwr
gas booster pump 1
status Off
gas booster pump 2
gas


72.8 °F
61.2 %rh
Chiller
SUMMER MODE
To Chiller Room Refrigerant Detection
To Cooling Towers
80.7 °F
cndws
49.8 °F
chwr
83.5 °F
cndwr
actual 48.3 °F
setpt 45.9 °F
chwp-1
s/s Off
status Off
chwp-2
s/s On
status On
To Dual Temp Pumps
chws
enable On
alarm Off
off
on
auto


Crane Chiller Graphic
Monday, 11/27/2006 3:10:30PM
Previous
TCP 5 VLX
TCP 18 VLC 6
Outdoor Air Humidity 14%
Chilled Water System Enable Control
85°F Outdoor Air Temp
60 CHW System Enable Setpoint
COOLING TOWER
75 T-1 Trigger
80 T-2 Trigger
85 T-3 Trigger
Chiller 1
Supply Temp 77°F
Return Temp 74°F
Supply CW Temp 74°F
Leaving CW Temp 79°F
CHWR
CWS
Leaving CW Temp > Tower Trigger = Tower On
Disabled
Inactive
CHW Return 79°F
V-1,2
0.0% to Towers
CHWS
CHW Supply 78°F
49°F Actual CHW
49 CH-1 CHW S.P.
Chiller-1 Enabled
44°F Actual CHW
44 CH-2 CHW S.P. Adjust
Chiller-2 Enabled
Chiller 2
Supply Temp 77°F
Return Temp 76°F
Supply CW Temp 76°F
Leaving CW Temp 81°F
Active
CW Supply 88°F
0% Open
CW Return 77°F
STEAM
Steam Pressure 10psi
74°F Actual CW Setpoint
74 CW Setpoint Adjust
Chiller Transfer Points

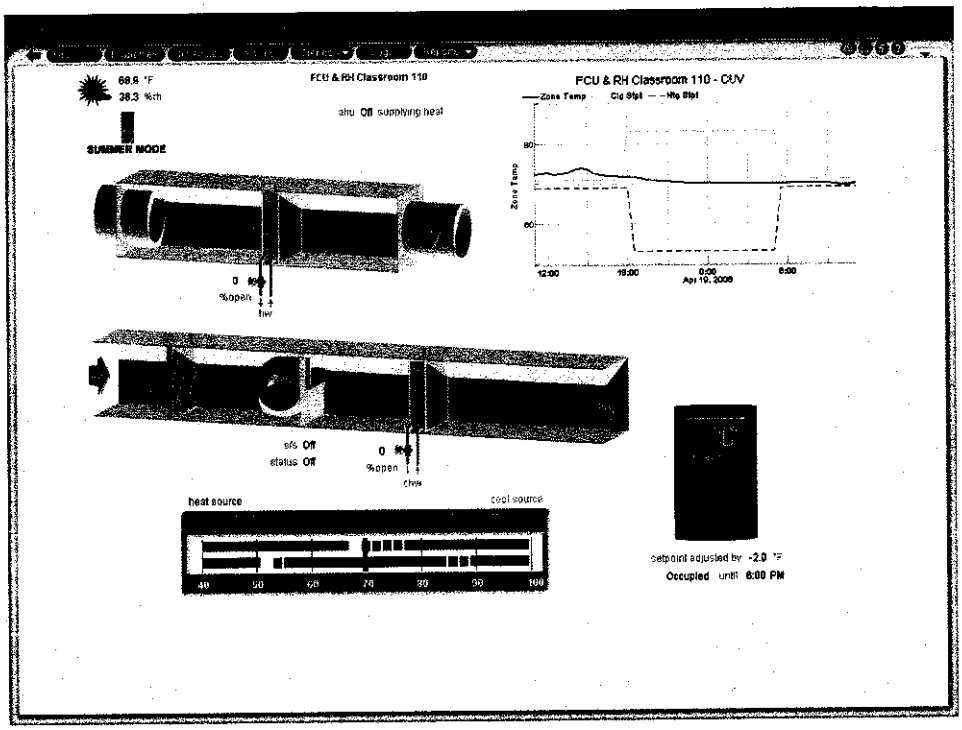
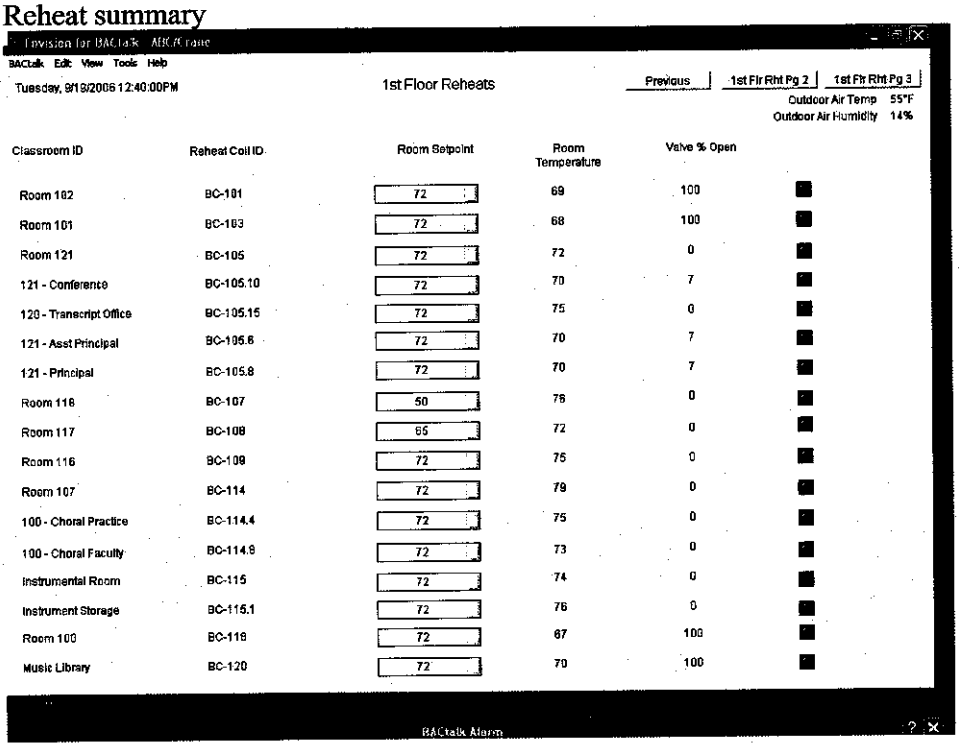

68.8 °F
38.3 %rh
SUMMER MODE
FCU & RH Classroom 110
ahu Off supplying heat
FCU & RH Classroom 110 - CUV
Zone Temp
Clg Stpt
Htg Stpt
Zone Temp
80
60
12:00
18:00
0:00
Apr 19, 2009
6:00
0 %
%open
tmr
sfs Off
status Off
0 %
%open
chw
heat source
cool source
40
50
60
70
80
90
100
setpoint adjusted by -2.0 °F
Occupied until 6:00 PM

EXHIBIT D System Summary Example Graphics

Reheat summary



Division for BACtalk ABC Corp

BACtalk Edit View Tools Help

Tuesday, 9/19/2006 12:40:00PM

1st Floor Reheats

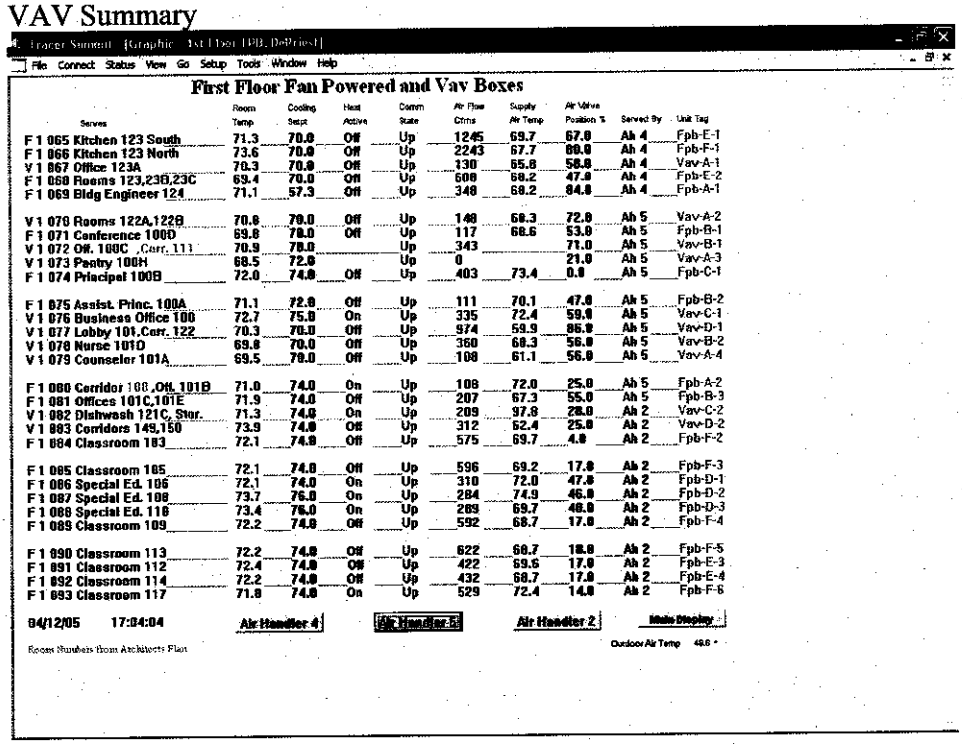
Previous | 1st Flr Rht Pg 2 | 1st Flr Rht Pg 3

Outdoor Air Temp 55°F
Outdoor Air Humidity 14%

Classroom ID	Reheat Coil ID	Room Setpoint	Room Temperature	Valve % Open
Room 102	BC-101	72	69	100
Room 101	BC-103	72	68	100
Room 121	BC-105	72	72	0
121 - Conference	BC-105.10	72	70	7
120 - Transcript Office	BC-105.15	72	75	0
121 - Asst Principal	BC-105.6	72	70	7
121 - Principal	BC-105.8	72	70	7
Room 116	BC-107	60	76	0
Room 117	BC-108	65	72	0
Room 116	BC-109	72	75	0
Room 107	BC-114	72	79	0
100 - Choral Practice	BC-114.4	72	75	0
100 - Choral Faculty	BC-114.8	72	73	0
Instrumental Room	BC-115	72	74	0
Instrument Storage	BC-115.1	72	76	0
Room 100	BC-118	72	67	100
Music Library	BC-120	72	70	100

BACtalk Alarm

VAV Summary



Tracer Summit [Graphic 1st Floor FPB, DePriest]

File Connect Status View Go Setup Tools Window Help

First Floor Fan Powered and Vav Boxes

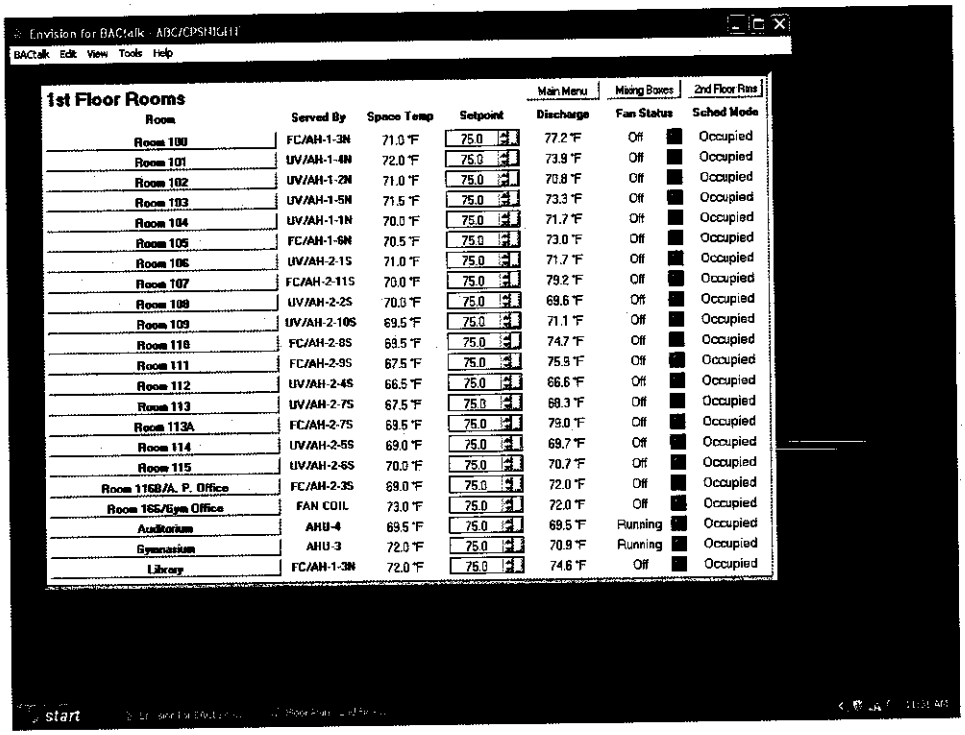
Serves	Room Temp	Cooling Setpt	Heat Active	Comm State	Air Flow Cfms	Supply Air Temp	Air Valve Position %	Served By	Unit Tag
F 1 065 Kitchen 123 South	71.3	70.0	Off	Up	1245	69.7	67.0	Ah 4	Fpb-E-1
F 1 066 Kitchen 123 North	73.6	70.0	Off	Up	2243	67.7	99.0	Ah 4	Fpb-F-1
V 1 067 Office 123A	70.3	70.0	Off	Up	130	65.8	58.0	Ah 4	Vav-A-1
F 1 068 Rooms 123,23B,23C	69.4	70.0	Off	Up	608	68.2	47.0	Ah 4	Fpb-E-2
F 1 069 Bldg Engineer 124	71.1	57.3	Off	Up	348	68.2	84.0	Ah 4	Fpb-A-1
V 1 070 Rooms 122A,122B	70.8	70.0	Off	Up	148	68.3	72.0	Ah 5	Vav-A-2
F 1 071 Conference 100D	69.8	70.0	Off	Up	117	68.6	53.0	Ah 5	Fpb-B-1
V 1 072 Off. 100C ,Corr. 111	70.9	70.0		Up	343		71.0	Ah 5	Vav-B-1
V 1 073 Pantry 100H	68.5	72.0		Up	0		21.0	Ah 5	Vav-A-3
F 1 074 Principal 100B	72.0	74.0	Off	Up	403	73.4	0.0	Ah 5	Fpb-C-1
F 1 075 Assist. Princ. 100A	71.1	72.0	Off	Up	111	70.1	47.0	Ah 5	Fpb-B-2
V 1 076 Business Office 100	72.7	75.0	On	Up	335	72.4	59.0	Ah 5	Vav-C-1
V 1 077 Lobby 101,Corr. 122	70.3	70.0	Off	Up	974	69.9	86.0	Ah 5	Vav-D-1
V 1 078 Nurse 101D	69.6	70.0	Off	Up	360	68.3	56.0	Ah 5	Vav-B-2
V 1 079 Counselor 101A	69.5	70.0	Off	Up	108	61.1	56.0	Ah 5	Vav-A-4
F 1 080 Corridor 108 ,Off. 101B	71.0	74.0	On	Up	108	72.0	25.0	Ah 5	Fpb-A-2
F 1 081 Offices 101C,101E	71.9	74.0	Off	Up	207	67.3	55.0	Ah 5	Fpb-B-3
V 1 082 Dishwash 121C, Stor.	71.3	74.0	On	Up	209	97.8	28.0	Ah 2	Vav-C-2
V 1 083 Corridors 149,150	73.9	74.0	Off	Up	312	62.4	25.0	Ah 2	Vav-D-2
F 1 084 Classroom 103	72.1	74.0	Off	Up	575	69.7	4.0	Ah 2	Fpb-F-2
F 1 085 Classroom 105	72.1	74.0	Off	Up	596	69.2	17.0	Ah 2	Fpb-F-3
F 1 086 Special Ed. 106	72.1	74.0	On	Up	310	72.0	47.0	Ah 2	Fpb-D-1
F 1 087 Special Ed. 108	73.7	76.0	On	Up	284	74.9	46.0	Ah 2	Fpb-D-2
F 1 088 Special Ed. 110	73.4	76.0	On	Up	269	69.7	46.0	Ah 2	Fpb-D-3
F 1 089 Classroom 109	72.2	74.0	Off	Up	592	68.7	17.0	Ah 2	Fpb-F-4
F 1 090 Classroom 113	72.2	74.0	Off	Up	622	68.7	18.0	Ah 2	Fpb-F-5
F 1 091 Classroom 112	72.4	74.0	Off	Up	422	69.6	17.0	Ah 2	Fpb-E-3
F 1 092 Classroom 114	72.2	74.0	Off	Up	432	68.7	17.0	Ah 2	Fpb-E-4
F 1 093 Classroom 117	71.8	74.0	On	Up	529	72.4	14.0	Ah 2	Fpb-F-6

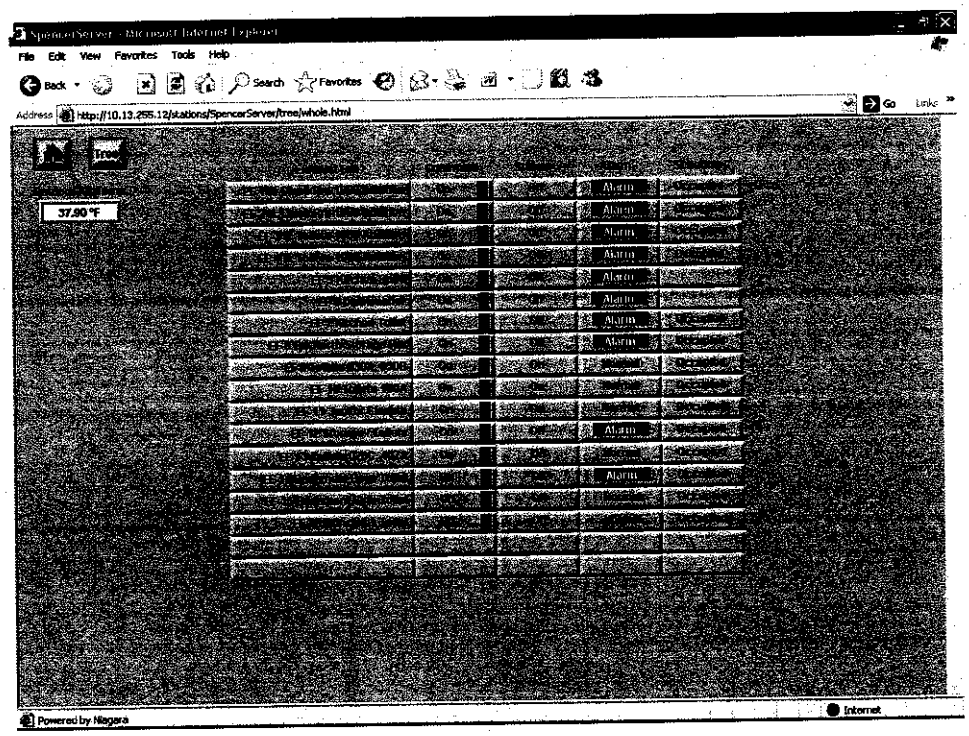
04/12/05 17:04:04

Air Handler 4 | Air Handler 5 | Air Handler 2 | Main Display

Outdoor Air Temp 48.6 °

Room Numbers from Architects Plan


Envision for BACtalk - ABC/CPSNIGHT
BACtalk Edit View Tools Help
1st Floor Rooms
Main Menu
Mixing Boxes
2nd Floor Rms
Room
Served By
Space Temp
Setpoint
Discharge
Fan Status
Sched Mode
Room 100 FC/AH-1-3N 71.0 °F 75.0 77.2 °F Off Occupied
Room 101 UV/AH-1-4N 72.0 °F 75.0 73.9 °F Off Occupied
Room 102 UV/AH-1-2N 71.0 °F 75.0 70.8 °F Off Occupied
Room 103 UV/AH-1-5N 71.5 °F 75.0 73.3 °F Off Occupied
Room 104 UV/AH-1-1N 70.0 °F 75.0 71.7 °F Off Occupied
Room 105 FC/AH-1-6N 70.5 °F 75.0 73.0 °F Off Occupied
Room 106 UV/AH-2-1S 71.0 °F 75.0 71.7 °F Off Occupied
Room 107 FC/AH-2-11S 70.0 °F 75.0 79.2 °F Off Occupied
Room 108 UV/AH-2-2S 70.0 °F 75.0 69.6 °F Off Occupied
Room 109 UV/AH-2-10S 69.5 °F 75.0 71.1 °F Off Occupied
Room 110 FC/AH-2-8S 69.5 °F 75.0 74.7 °F Off Occupied
Room 111 FC/AH-2-9S 67.5 °F 75.0 75.9 °F Off Occupied
Room 112 UV/AH-2-4S 66.5 °F 75.0 66.6 °F Off Occupied
Room 113 UV/AH-2-7S 67.5 °F 75.0 68.3 °F Off Occupied
Room 113A FC/AH-2-7S 69.5 °F 75.0 79.0 °F Off Occupied
Room 114 UV/AH-2-5S 69.0 °F 75.0 69.7 °F Off Occupied
Room 115 UV/AH-2-6S 70.0 °F 75.0 70.7 °F Off Occupied
Room 116B/A. P. Office FC/AH-2-3S 69.0 °F 75.0 72.0 °F Off Occupied
Room 165/Gym Office FAN COIL 73.0 °F 75.0 72.0 °F Off Occupied
Auditorium AHU-4 69.5 °F 75.0 69.5 °F Running Occupied
Gymnasium AHU-3 72.0 °F 75.0 70.9 °F Running Occupied
Library FC/AH-1-3N 72.0 °F 75.0 74.6 °F Off Occupied
start


File Edit View Favorites Tools Help
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37.90 °F
Alarm
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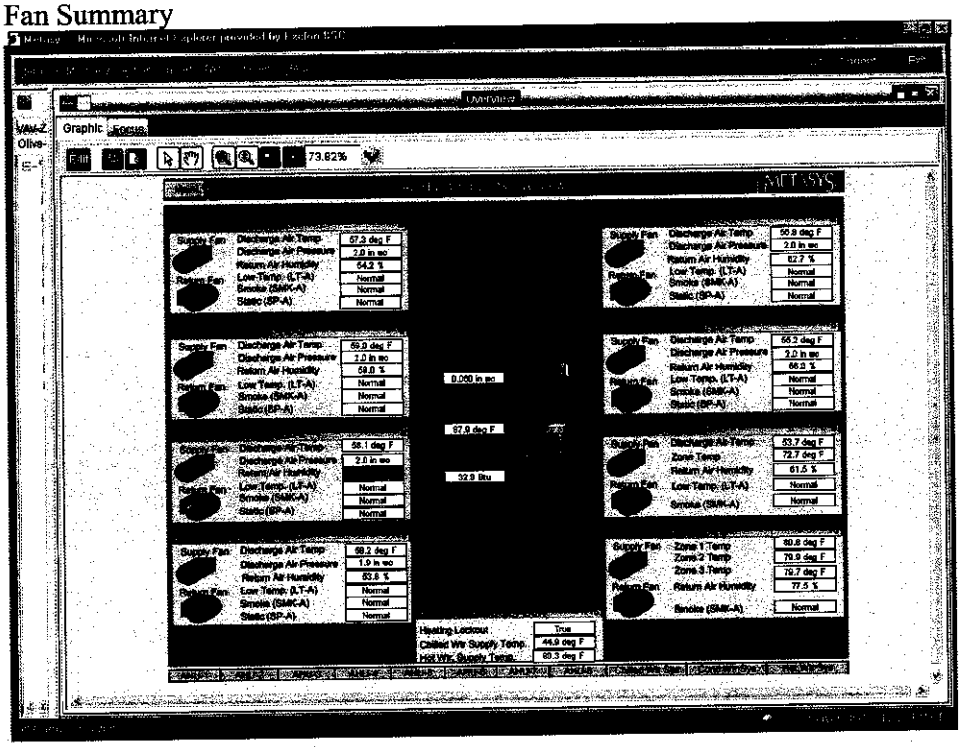
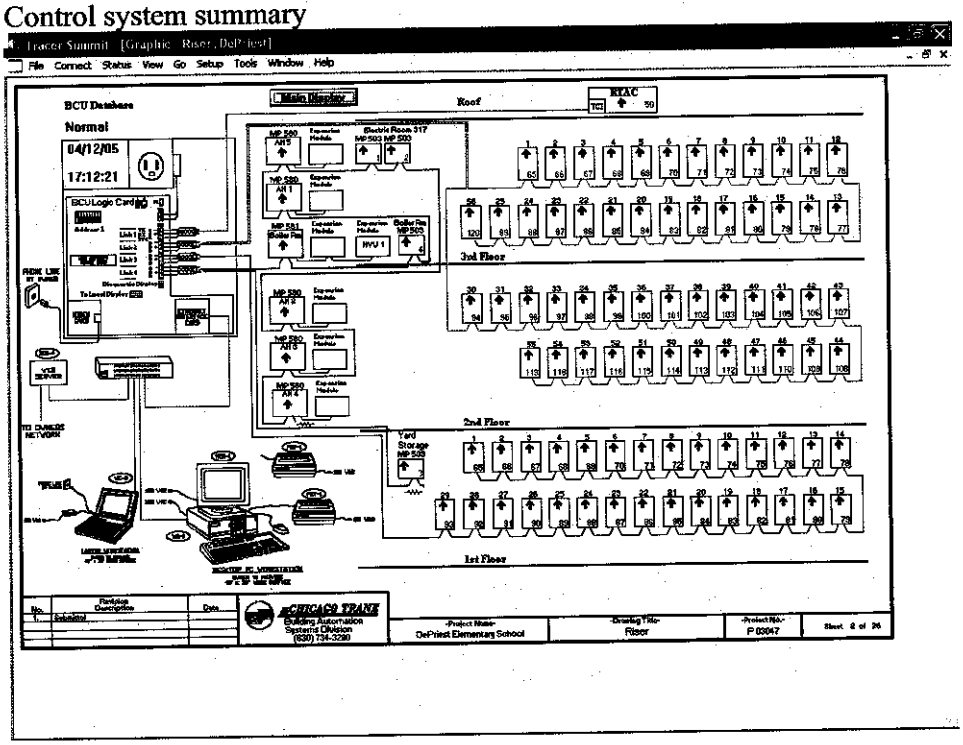
Internet

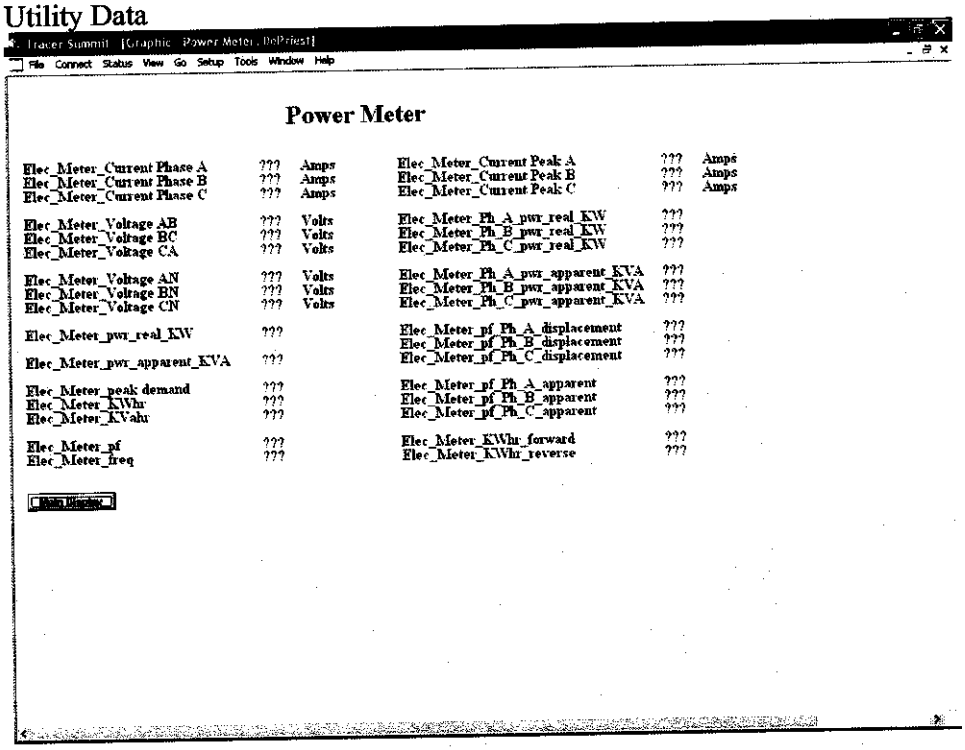
Fan Summary



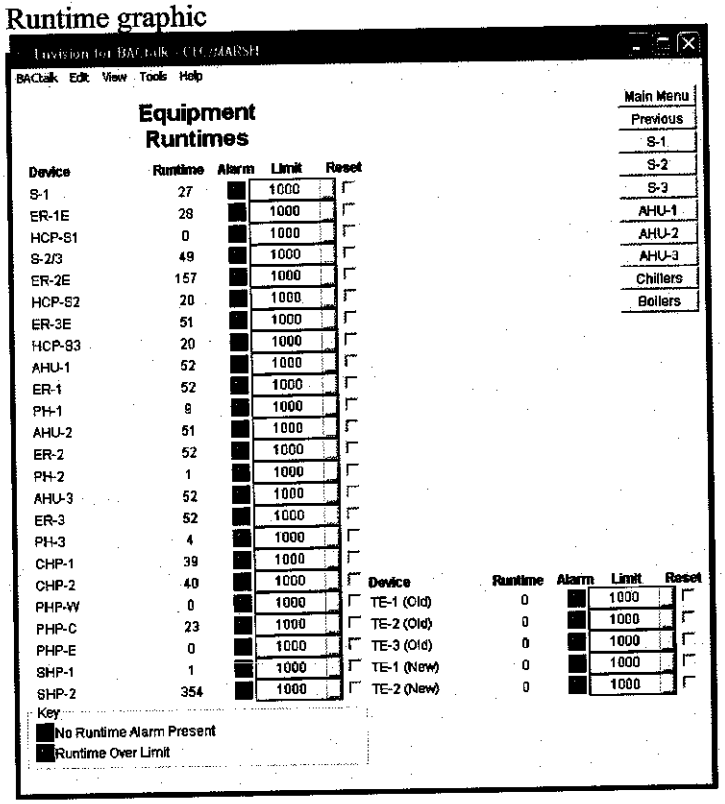
Control system summary



Utility Data



Runtime graphic



F. **Bypass Valve:**

1. On a continued increase in secondary differential pressure and as the pump speed is decreased, the bypass valve shall open to maintain the differential pressure at setpoint.
2. On a decrease in the differentical pressure PID output from 30% (adj.) to 0% (adj.) the bypass valve shall open from 0% to 100%.

3.11 EXHAUST FANS (BAS-EF-01)

A. Toilet and General Exhaust fans EF 1-3: BAS shall control the starting and stopping of these fans as follows.

1. **Start/Stop**: BAS shall command the operation of the Exhaust fan and it shall run continuously during the occupied period.
2. **Proof**: BAS shall prove fan operation and use the status indication to accumulate runtime. Upon failure of the exhaust fan, the BAS shall enunciate an alarm as specified above.

B. T-Stat controlled Exhaust fans EF-10 and heater shall be controlled by a thermostat to maintain a maximum of 85°F. Whenever the fan runs, its associated isolation damper & OA damper shall open. Whenever the fan stops, the dampers shall close. Thermostat shall also operate unit heater UH-B1 to maintain a minimum temperature of 65°F.

C. Exhaust fans EF 4-6, 9: shall be controlled by a thermostat to maintain a maximum of 85°F. Whenever the fan runs, its associated OA damper shall open and when the fan stops the OA damper will close.

3.12 SUMP PUMPS (BAS-MISC-02)

A. Sump pumps will be controlled by their own package system.

B. Provide a separate ball float to monitor the high level of the tank through the BAS.

3.13 ELECTRICAL/TELECOM ROOM MONITORING (BAS-MISC-02)

A. Provide a space temperature sensor to monitor the temperature of the room through the BAS.

3.14 UTILITY METERING (BAS-MISC-01)

A. General:

1. CPS will coordinate with the utilities, (electric, gas and water), to provide electronic pulse output from the utility meters. The BAS system will have all required hardware and software to process those pulse inputs.
2. If a meter is configured to provide a pulse output, the contractor is to connect to that output including all of the wiring work including termination at the meter.

SECTION 16555

STAGE LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. All sections of Division 15 and 16 apply to this section.

C. Other related Divisions are as follows:

1. Division 3.

1.2 SUMMARY

A. This Section includes equipment for stage lighting systems including fixtures, lamps, dimmers, controls, and distribution components.

1.3 DEFINITIONS

A. Barn Doors: Rotatable attachment consisting of two or four metal flaps fixed to the front of Fresnel- or PAR-type fixtures to reduce beam spread in one or more directions.

B. Borderlight: Striplight with compartment for each lamp. Each compartment contains a reflector lamp or a lamp and a reflector, and a color frame. Compartments are aligned in-line and wired on two, three, or four alternate circuits, each circuit producing a different color.

C. Connector Strip: Adaptor for connecting many fixtures to one multiconductor cable; consists of multiple connecting stations, each with a plug connector and a short length of cable. The number of stations is related to the number of circuits in the cable.

D. Ellipsoidal Spotlight: Fixture with an elliptical reflector mounted in a fixed relationship to the lamp. The light is focused through a gate where the beam can be shaped by the use of shutters, a gobo, or an iris. The shaped beam is then focused by a system of lenses. Also known as a LEKO light.

E. Floor Pocket: Electrical socket mounted under a hinged cover in the stage floor.

F. Follow Spotlight: Narrow-beam, stand-mounted spotlight with its own dimmer, iris, color magazine, and shutters. Located in or above the auditorium; operator controlled so the light beam can be moved to follow an actor.

G. Fresnel Lens Spotlight: Fixture that produces an even, soft-edged beam of light through a glass lens with a series of stepped concentric circles on the front and a pebbled surface on the back.

H. Gridiron Junction Box: Transitions branch load circuits from conduits to flexible cables.

I. Plug-in Box: Small version of a connector strip.

J. Shutters: Metal blades that shape the edge of the beam. Shutters (normally four) are located in a gate at the center of the fixture. Similar in effect to barn doors.

K. Zoom Ellipsoidal Spotlight: A modification of an ellipsoidal spotlight; the distance between the reflector and lamp is adjustable.

1.4 SUBMITTALS

A. With Bid:

1. Contractor shall indicate any additional wire or conduit runs that are not shown on the drawings that will be required to install Manufacturer's system.
2. Contractor shall provide a schedule of quantities of dimmers, fixtures, color media, lamps, control equipment, and cables to be provided per schedules in drawings. If schedule of quantities is not provided with bid, the contractor will still be responsible for these quantities to make the space operational.

B. Product Data: For each type of product indicated.

C. Shop Drawings: Show fabrication and installation details for dimmer racks showing arrangements, characteristics, and circuit assignments of various modules. Include elevation views of front panels indicating devices and controls. Include illustrations and dimensioned outline drawings.

1. Wiring Diagrams: Power, signal, and control wiring. Show connections and circuit and channel assignments.
2. Equipment Legend: Show a unified system of designations for lighting instruments, panels, dimmers, circuits, and equipment.
3. Quantities of each component and sub-assembly

D. Samples: The manufacturer shall submit to the Architect for review prior to fabrication samples of any equipment component requested by the Theatre Consultant.

E. Qualification Data: For Installer and manufacturer.

F. Coordination Drawings: Floor plans showing dimensioned layout, required working clearances, and required area above and around dimming equipment where piping and ducts are prohibited. Show rack layout and relationships between components and adjacent structural and mechanical elements.

G. Operation and Maintenance Data: For fixtures, distribution components, software operating manuals, instructional videotapes, and controls to include in emergency, operation, and

maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Control-Console Introduction:
   a. Descriptions of controls and features.
   b. Software instruction manuals.
   c. Setup requirements for unit and related equipment.
   d. Default settings.
   e. Maintenance procedures and schedules.

2. Control-Console Operation:
   a. Elementary on-off operation.
   b. How to set cues manually.
   c. How to patch dimmer to channels electronically.
   d. How to operate two-scene presets manually.
   e. How to operate fundamental memory.
   f. How to set and record simple cues.
   g. How to recall, playback, and revise cues and scenes.
   h. How to use submasters, split cues, store and recall programs, set up special effects, and print out cues.
   i. How to set up and run system for a typical event or performance.
   j. How to get help.

3. Dimmer Bank:
   a. Descriptions of features, functions, and safety and security precautions.
   b. Descriptions of dimmer module features, dipswitches, non-dim functions, and racking systems.
   c. How to check loads against dimmer capacity ratings.
   d. How to set basic power-in and power-out connections.
   e. Basic maintenance requirements including need for qualified electrician for internal maintenance; basic maintenance schedule; techniques for keeping terminals properly tightened, filter screens clean, and overheat sensors checked; and techniques for performing other required servicing.
   f. How to adjust control cards.
   g. How to get help.
   h. Description of warranty.

4. System Troubleshooting: Procedures for common software, programming, control console, dimmer bank, and distribution system problems; include information on how to get help.

5. Relamping instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Dimming Equipment Manufacturer Qualifications: A qualified manufacturer. Maintain, within 30 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repair support within 24 hours' maximum response time. The manufacturer shall

have at least ten years experience in the fabrication of similar equipment. If requested, the Manufacturer shall submit a representative list of installations.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the Chicago Electrical Code by UL, and marked for intended use.

D. Comply with NECA 1.

E. Comply with NFPA 101.

F. Comply with City of Chicago Building Code.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be wrapped and sealed in polyethylene and substantially crated for shipment. Crates shall clearly indicate the equipment contained, nature of components, and theatre site allocation.

B. Dimmers shall be individually packaged.

C. Deliver equipment in fully enclosed vehicles after specified environmental conditions have been permanently established in spaces where equipment is to be placed.

D. Store equipment in spaces with environments controlled within manufacturer's ambient temperature and humidity tolerances for non-operating equipment.

E. The contractor shall provide full insurance against loss or damage during shipment, storage, installation, and testing. Certification of such coverage shall be furnished to the Architect within thirty days of award of contract.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Dimmer Modules: One of each type and rating installed.
2. Fuses: Three of each kind.
3. Lamps: One for every 10 of each type, and rating installed. Furnish at least one of each type.
4. Glass Roundels: One for every three of each type and color installed. Furnish at least one of each type.
5. Interchangeable Lenses: One for every fifty of each type installed. Furnish at least one of each type.

1.8 LEED REQUIREMENTS

A. Within 30-days after the date of system acceptance, record drawings of the actual installation shall be provided to the building owner.

B. Implement an independent commissioning authority to review the contractor submittals relative to systems being commissioned.

C. Implement providing the owner with a single manual that contains the information required for re-commissioning building systems.

D. Use a minimum of 20% of stage lighting materials that are manufactured regionally within a radius of 500 miles.

1.9 WARRANTY

A. The manufacturer shall unconditionally warrant all equipment and systems provided under this section to be free from defects in materials and workmanship for a period of at least twelve months from the date of final acceptance of all work of this section. Lamps and normal wear and tear are exempted.

B. Appropriate additional equipment to replace any and all equipment removed for service shall be provided at the job site at no expense to the owner. Replacement control console(s) must be of the same model as those removed for service.

C. Warranty service shall be performed by personnel in the employment of the manufacturer and shall not be sub-contracted or assigned to another company, service, or individual unless the owner has approved such assignment in writing in which event the manufacturer shall nevertheless be responsible to the owner for such work.

D. For a period of two years following acceptance, the manufacturer shall provide and install at no cost to the owner all control console operating system upgrades. Thereafter the manufacturer shall notify the owner of all operating system upgrades for the life of the control console. Manufacturer shall keep the system user's name and address in a database for this purpose. All upgrades shall include a full written description so as to allow existing data to be accessed and upgraded.

E. For a period of five years following acceptance, the manufacturer shall maintain service capability by guaranteeing a factory-authorized representative available for onsite service calls within twenty-four hours of notification by owner of a need for service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Dimming and Control
   a. Leviton (Colortran)
   b. Electronic Theatre Controls (ETC)
   c. Entertainment Technology
   d. Strand Lighting

2. Wiring Devices
   a. Electronic Theatre Controls (ETC)
   b. Strand Lighting
   c. Union Connector
3. Luminaires and Accessories
   a. Electronic Theatre Controls (ETC)
   b. Strand Lighting
   c. Selecon Lighting
4. Lamps
   a. GE Lighting
   b. Osram Sylvania
   c. Philips Lighting

5. Distribution Components
   a. Electronic Theatre Controls (ETC)
   b. Strand Lighting
   c. SSRC
   d. Union Connector Co.

6. Lighting Control System
   a. Leviton (Colortran)
   b. Strand
   c. Electronic Theatre Controls (ETC)

7. Color Media
   a. GAM
   b. Lee Filters
   c. Rosco

B. Dealers: Subject to compliance with requirements, the equipment indicated herein shall be provided by one of the following dealers:

1. Chicago Spotlight
2. Designlab Chicago
3. Grand Stage/Art Drapery Studios
4. Barbizon
5. Intelligent Lighting Creations

2.2 GENERAL

A. All components shall be new, in good condition, and under warranty.

B. All components shall bear UL labels and labels identifying the manufacturer, model number, and serial number. All such labels shall be permanently attached in a conspicuous location.

C. All control and receptacle faceplates not otherwise described elsewhere in this specification shall be black anodized aluminum or black painted steel, and all labels and legends shall be permanently engraved directly into the faceplate. Engravings shall be filled with white paint.

Minimum text height if not specified elsewhere shall be 1/4 inch. All faceplates shall have beveled edges and rounded corners.

D. Control signal protocol and connector types shall comply with "DMX-512A" as established and published by the U.S. Institute for Theatre Technology. Control consoles shall be interchangeable.

E. All control, signal and video connectors shall be of substantial construction and shall be of the locking or latching type. All plate-mounted connectors shall be bolted to faceplates – rivets shall not be acceptable.

F. All components requiring external electrical connections of more than eight conductors shall include barrier-type terminal strips properly sized and permanently labeled.

G. All keys for lockable devices in each theatre (i.e. control console, entry panels, dimmer racks, etc.) shall be keyed identically. Provide a total of two keys for each keyed device.

2.3 PLUG CONNECTORS

A. Plug Connectors: 20-A, slip pin, 2 wire plus ground, with integral strain relief

2.4 LIGHTING FIXTURES AND ACCESSORIES

A. General Lighting Fixture and Accessory Requirements:

1. Listed under UL 1573.
2. Fixtures: Equipped with pigtail, yoke with pipe clamp, safety cable for batten mounting, and filter holder.
3. Metal Parts: Free of burrs, sharp corners, and edges.
4. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
5. Fixture Doors and Their Internal Access: Smooth operating, free of light leakage under operating conditions, and arranged to permit relamping without use of tools. Doors, lenses, diffusers, and other pieces arranged to prevent accidental falling during relamping and when secured in operating position.
6. Pigtail: Factory wired, 36-inch long, 3-wire cord and plug connector assembly with cord encased in woven fiberglass or silicone tubing.
7. Lamp Sockets: Relampable without disturbing alignment or focus adjustment.
8. Fixture Ventilation Openings: Baffled against light leaks.
9. Fixture Operating Controls and Handles: Thermally insulated.
10. Lenses: Borosilicate glass in silicone mountings.
11. Framing Shutters: Stainless steel, four way; with each blade in a separate plane under adjustable tension mounting. Blades adjust plus or minus 30 degrees of rotation in gate, for 120-degree-minimum total angular rotation between adjacent blades.
12. Color Filter Frame Holder: Attached to front of fixture.
13. Fixture Yoke: Rigid metal, arranged for vertical aiming of unit and equipped with T-bolt or hand screw to lock alignment.

B. Ellipsoidal Spotlights: Fixtures with an elliptical reflector mounted in a fixed relationship to the lamp. The light shall be projected through a gate where the beam is shaped by the use of shutters, a gobo, or an iris. The shaped beam shall then be focused by a system of lenses.

1. Lamp Rating: 575 to 750 W. Provide lamp as specified on drawings with fixture.
2. Socket shall be mounted and shielded to withstand maximum lamp seal temperatures without substantial deterioration.
3. Reflector: Molded borosilicate, ellipsoidal, double flatted. Dichroic coatings to produce 95% minimum reflectance of visible light and 90% minimum transmissions of infrared radiance.
4. Shutters: Four stainless steel shutters, operating in two different planes. Shutter gate shall be rotating and locking, permitting flexible shutter cuts.
5. Pattern slot: Accepts standard pattern template holders.
6. Iris: In addition to shutters, when specified.
7. Lenses: Aspheric, with anti-reflective coating to reduce light loss. Lenses shall be reasonably clear, with no perceptible discoloration or clouding.
8. Lamp adjustment: Vertical, horizontal and axial adjustment.
9. Wiring: Three 36-inch type SF-2 leads in fiberglass sleeve.
10. Connector shall be factory installed prior to shipment to job site.
11. Color frame: Free of burrs and sharp edges; painted or anodized flat black.

C. Zoom Ellipsoidal Spotlights: Fixtures with an elliptical reflector mounted in an adjustable relationship to the lamp. The light shall be projected through a gate where the beam is shaped by the use of shutters, a gobo, or an iris. The shaped beam shall then be focused by a system of lenses.

1. Lamp Rating: 575 to 750 W. Provide lamp as specified on drawings with fixture.

2. Socket shall be mounted and shielded to withstand maximum lamp seal temperatures without substantial deterioration.

3. Reflector:
   a. Molded borosilicate, ellipsoidal, double flatted. Dichroic coatings to produce 95% minimum reflectance of visible light and 90% minimum transmission of infrared radiance, or:

4. Shutters: Four stainless steel shutters, operating in a minimum of two different planes.
5. Pattern slot: Accepts standard pattern template holders.
6. Iris: In addition to shutters, when specified.
7. Lenses:
   a. Aspheric, with anti-reflective coating to reduce light loss, or:
   b. Pyrex, plano-convex
   c. Lenses shall be reasonably clear, with no perceptible discoloration or clouding

8. Lamp adjustment: Vertical, horizontal and axial adjustment.
9. Wiring: Three 36-inch type SF-2 leads in fiberglass sleeve.
10. Connector shall be factory installed prior to shipment to job site.
11. Lens Adjustment: Lenses shall be "zoom" adjustable to produce a continuously variable field angle of between 30 degrees and 18 degrees. Modifying the beam spread shall not require disassembling the fixture. Each lens shall move independently on guides and shall lock into place with thermally insulated knobs.

12. Color frame: Free of burrs, and sharp edges; painted or anodized flat black.

D. Fresnel Lens Spotlights:

1. Die-cast extruded-aluminum housing, with hinged front for relamping.
2. Lamp Rating: 750 to 1000 W. Provide lamp as specified on drawings with fixture.
3. Socket: Medium 2-pin or medium prefocus.
4. Reflector: Specular Alzak, spherical.
5. Lens: Pyrex, fresnel, 6-inch diameter
6. Adjustment: Lamp carriage continuously adjustable to provide a field angle from 20 degrees to 45 degrees.
7. Wiring: Three 36-inch type SF-2 leads in fiberglass sleeve.
8. Connector: 20A slip pin connector, 2 wire plus ground.
9. Color frame: Free of burrs and sharp edges; painted or anodized flat black

E. PAR Spotlights:

1. Lamp Rating: 575 W. Provide lamp with fixture.
2. Lamp Holders: Steel or aluminum housing with porcelain-plated shell socket to suit lamp type indicated. Socket shall be mounted and shielded to withstand maximum lamp seal temperatures without substantial deterioration.
3. Reflector: Integral die-cast aluminum, faceted.
4. Lenses: Removable, rotating lenses fitting into fixture without the use of tools. Lenses shall be reasonably clear, with no perceptible discoloration or clouding. Each fixture shall be provided with four lenses: Wide Flood, Medium Flood, Narrow Spot, and Very Narrow Spot
5. Lamp adjustment: Vertical, horizontal and axial adjustment.
6. Wiring: Three 36-inch type SF-2 leads in fiberglass sleeve.
7. Connector shall be factory installed prior to shipment to job site.
8. Color frame: Free of burrs and sharp edges; painted or anodized flat black.

F. Borderlight Units: Compartmented 4-circuit striplight with sixteen 150-W PAR 38/FL or 250-W PAR 38/FL lamps in porcelain sockets and steel sheet housing, 90-inches long. Compartments shall be in line and wired on two, three, or four alternate circuits, each producing a different color.

1. Front Door: Spring loaded, designed to hold either filter frames or color roundels.
2. Color Roundels: One for each lamp; alternating red, blue, green and clear.
3. Hanger: Adjustable, steel-strap type equipped at each end with pipe clamp and safety cable for suspension from a batten.

G. Cyclorama Lights:

1. Each unit shall consist of two individual compartments, each containing a lamp, reflector, and color frame holder and wire separately.
2. Lamp Rating: 750 or 1000 W per compartment, clear lamp. Provide lamp specified on drawings with fixture.
3. Sockets: Double ended, recessed single contact.
4. Reflectors: Anodized aluminum.
5. Wiring: Four 36-inch type SF-2 leads in fiberglass sleeve, for each compartment.

6. Connectors: One per compartment, free of burrs and sharp edges; painted or anodized flat black.
7. Color Frame: One per compartment, free of burrs, and sharp edges; painted or anodized flat black.
8. Color Media: Provide stripped glass filters: primary red, primary blue, primary green and amber
9. Mounting hardware: Provide units ganged in two-cell units with manufacturer's hardware and pipe clamps.

2.5 LAMPS

A. Comply with the standard of the ANSI C78 Series that is applicable to each type of lamp. Where lamps of designated type, characteristics, and wattage are not indicated, provide lamps recommended by manufacturer of fixture in highest wattage for which fixture is listed.

2.6 DISTRIBUTION COMPONENTS

A. Connector Strip: UL-listed, factory-wired wireway and receptacle assembly.

1. Wireway: Steel or extruded aluminum; with removable cover and nominal cross-section dimensions of 3 by 4-1/2 inches.
2. Accessories: Cable clamps, support cradles, and cable strain relief grips for each cable.
3. Receptacles: Pigtail mounted, 18-inches long, with strain relief at wireway wall penetration.
4. Receptacle Wiring: For connecting to terminal blocks; with 125 deg C, cross-linked, polyethylene-insulated, identification-labeled wire.
5. Terminal Blocks: Molded-barrier type, with screw lugs to suit supply conductors.
6. Mounting Hardware: Furnished with each unit; permits surface, single-pipe-bracket, or double-pipe-bracket mounting.
7. Finish: Flat black baked enamel or black anodized aluminum.

B. Plug-in Boxes: UL-listed, factory-wired wireway and receptacle assembly, 24 inches long, unless otherwise indicated; and with the following features:

1. Wireway: Steel or extruded aluminum, with removable cover; nominal cross-section dimensions of 3 by 4-1/2 inches.
2. Accessories: Cable clamps, support cradles, and cable strain relief grips for each cable.
3. Receptacles: Pigtail mounted, 18-inches long, with strain relief at wireway wall penetration.
4. Receptacle Wiring: For connecting to terminal blocks; with 125 deg C, cross-linked, polyethylene-insulated, identification-labeled wire.
5. Terminal Blocks: Molded-barrier type, with screw lugs to suit supply conductors.
6. Surface or Grid Mounting: With accessories for surface mounting or with pipe-mounting accessory bracket.
7. Recessed Mounting: With flanged cover suitable for recessed mounting in wall.
8. Finish: Flat black enamel or black anodized aluminum.

C. Gridiron Junction Boxes: UL listed and factory wired with terminal strips and concentric knockouts on all sides.

1. Terminal Blocks: Molded-barrier type, with screw lugs to suit supply conductors.
2. Accessories: Cable clamps, support cradles, and cable strain relief grips for each cable, and brackets for surface or with pipe mounting.
3. Finish: Semigloss or matte black.

D. Power Wire and Cable:

1. Building Wire in Raceways: Comply with Division 16 Section "Conductors and Cables."
2. Portable Power Cable: UL listed; flexible stage and lighting power cable; Types SC, SCE, or SCT; 600 V; multiconductor; 60 deg C temperature rating.

2.7 LIGHTING CONTROL SYSTEM

A. Description: Microprocessor-based modular system consisting of dimmer and control modules operated from remote-control stations and a control console.

1. Comply with UL 508.
2. Comply with USITT DMX 512A for data transmission.

B. Dimmer Boards: Dead-front, UL-labeled, front-access, freestanding board for mounting modular dimmers; formed-steel or extruded-aluminum structural members, completely enclosed with steel or aluminum panels. Painted with manufacturer's standard corrosion-resistant primer and finish coats and the following features:
1. Hinged, locking front door, with openings to allow air intake across the face of all dimmer modules.
2. Individual board sections shall not exceed 84-inches high by 25-inches deep by 30-inches wide.
3. For each module position, provide support rails and control-pin configurations, constructed for precise alignment of dimmer modules into power and signal connector sockets.
4. Forced-air cooling of each board for maintaining operating temperature at each dimmer, assuming full load, in ambient temperature not to exceed 40 deg C. Exhaust rates shall be variable using temperature sensors and fan-speed control electronics. Individual control of multiple fans is acceptable in lieu of fan-speed control. Fan(s) shall start and stop automatically. Fan noise at full load shall be less than 3.1 sones.
5. Each board shall have an automatic air-temperature sensor to shut off all dimmers in the board should the internal temperature rise above maximum safe operating limits. In an overheat condition, the fan shall continue operating. When a safe operating temperature is restored, the system shall automatically reset allowing normal user control.

C. Dimmers: Modular solid-state units that operate smoothly over their operating ranges without audible lamp noise or radio-frequency interference at any setting. Modules shall be dead-front, draw-out type with floating line, load, and control sockets for smooth insertion and withdrawal; with load-side thermal-magnetic circuit breaker, speed-controlled cooling fan, and overtemperature sensor.

1. Non-Dim Units: On-off relay control only. Capable of serving inductive loads such as motors or high-intensity-discharge fixtures.
2. Surge Protection: Modules shall withstand power-line surges of 6000 V/3000 A according to IEEE C62.41.

3. Filter each dimmed circuit to provide a minimum 350-microsecond, current-rise time at a 90-degree conduction angle at 50 percent of rated dimmer capacity. At any load within rating, rate of current rise shall not exceed 30 mA/microsecond, measured from 10 to 90 percent of load current waveform.

D. Control System: Microprocessor-based control system with a nonvolatile system memory to adjust dimmer channel settings for different scenes, to patch dimmers to channels, and to manually or automatically change dimmer settings from one preset scene to another. Provide (10) 3-1/2-inch computer discs or (3) memory RAM cards as necessary for owner's use with this system.

E. Control Console: Tabletop unit with manual and computer-based programming controls, memory units, indicating devices, and the following features:

1. Servicing access through hinged top panel.
2. Grand-master level control.
3. Blackout switch.
4. 24 submaster level controls with overlapping pile-on performance.
5. Bump buttons for momentary control of channels or submasters; one for each submaster level control.
6. Two cross-fade controls for split dipless fade between scenes, each with its own fade progress indicator.
7. The control console shall provide at least 48 control channels and at least 512 dimmers.
8. Multibutton keypad for programming in multiscene memory mode.
9. Fade time control for assigning fade time to cues, with individual cue adjustment from 1 to 300 seconds, minimum.
10. Liquid-crystal display with associated display controls, for displaying operating menus and memory readout.
11. Controls for setting levels into memory.
12. Cord and connector for connecting console to outlets for console power and control.
13. Internal battery backup power shall hold all memory information for up to 24 hours.
14. A UPS capable of sustaining operating voltage to control the console system for up to 10 minutes in the event of a loss of power. Capable of filtering spikes, surges and noise from power source. Conditioner shall provide continuity of earth ground from source to the console. Shall include a test switch to confirm battery charge. UPS shall be sized to provide rated power supply for control system.

F. System Operation: Console shall include off-line data storage using internal 3-1/2-inch disc drive or memory card arrangement. Operational capability includes the following:

1. Live and blind programming.
2. Special effects programmability for automatic operation of lights in pulsating, sequential dimming and brightening, and other special operating modes. Special effects menu displays operator guidance for programming and individual step levels.
3. Signal from fire-alarm control panel that automatically brings selected circuits to fully on or fully bright condition, overriding normal dimming and on-off controls (may be included in dimmer rack controls).
4. Inserting cues between designated cues without renumbering.
5. Out-of-sequence playback of cues.
6. Controlling houselights and stage lights from console by assigning their dimmers or non-dim on-off controls to a channel.

7. Retaining programmed cues in memory for minimum of one year after power outage.
8. Automatic sequential execution of programmed cues.
9. The control board should have the capability to take control of the house lights away from the wall stations.
10. Printing cues using parallel or serial printer port, cable, and printer. Cable and printer are not included with this system.

G. Console Power and Control Outlets: Multiple receptacles matched to connector on console connector cord.

H. House Lighting Control Station: Architectural-type, multichannel, remote dimmer control station with the following features:

1. System controls designated houselights, stage lights, and other lights.
2. Stage lighting controls are compatible with dimming and control system.
3. Flush mounting.
4. Brushed-aluminum wall plate.
5. Six-channel slider potentiometer controls.
6. Master slider potentiometer controls lights on all channels proportionally from completely dimmed to degree of brightness that corresponds to individual slider positions.
7. Fully on switch that turns all channels on at full brightness regardless of slider position.
8. Take-control/off switch places station in control of channels and sets lighting to levels dictated by channel and master slider controls.
9. Legend on face of wall plate identifies items as "House Lighting Control Station" and identifies functions of each slider and switch position, with slider positions individually graduated from 0 to 10.
10. Illuminated push buttons for activating preset scenes of house lighting labeled Entry and Panic.
11. Flush wall mounted, unless otherwise indicated.

I. Entry Station: Push button activates or deactivates indicating light and presets scene of house lighting control system.

1. Light-emitting-diode indicating light illuminates when preset command is executed.
2. Labeled "Entry."
3. Flush wall mounted, unless otherwise indicated.

J. Key-Entry Station: Key-operated switch controls station to activate or deactivate indicating light and presets scene of lighting control system.

1. Light-emitting-diode indicating light illuminates when preset command is executed.
2. Labeled "Entry."
3. Flush wall mounted, unless otherwise indicated.

K. Emergency Lighting Control Station: Key-operated push button activates indicating light and brings selected dimmers to fully bright condition, i.e., the "panic" preset. Operating push button a second time returns dimmers to previous setting.

1. Indicating light on in emergency mode.
2. Labeled "Emergency Lights."

3. Flush wall mounted, unless otherwise indicated.

2.8 RIGGING COMPONENTS

A. Pipe Clamps: Malleable iron, suitable for clamping fixtures or items to pipe from 3/4 to 2 inches in OD. Arranged for horizontal rotation of yoke for aiming; equipped with T-bolt to lock alignment.

B. Safety Cables: Heavy-duty, flexible steel; 30-inch nominal length, with spring clip at one end and steel ring at other.

C. Cable Grips: Galvanized steel; basket-weave type for supporting stage cables.

2.9 ACCESSORIES

A. Sidearms: 24-inches long, 1-1/2" pipe with C-clamp and sliding tee.

B. Pipe booms: 50 lb., 24-inch diameter cast iron base threaded to accept 1-1/2" pipe, with 12'-0" long 1-1/2" pipe. Pipe threaded at both ends with coupling at top.

C. Pattern holders: Stainless steel with epoxy handle for holding standard size theatrical "gobo" patterns within the designated slot in the lighting instrument. Coordinate the pattern sizes with the type required by the fixtures supplied.

D. Drop-in iris assemblies: Provides irising of beam size from 100 percent to 10 percent of rated beam.

E. F-stop "donuts": Fabricated of 20 gauge steel minimum, outside dimension to fit color frame holder of ellipsoidal spotlights, with diameter of circle to match the focal plane "gate" dimension for ellipsoidal spotlighting served. Paint flat black with high-temperature paint.

F. Four-way barndoors: Full 360 degree rotating barndoor with four leaves, each with individual tension adjustment. Separate slot for color frame. Painted or anodized flat black.

G. Top Hats: Square frame attached to cylinder. Cylinder length shall be equal to its diameter. Painted or anodized flat black.

H. Stage cable:

1. 20A cable shall be 12-3 type SO cord with male plug at one end and female connector at other end.
2. Cable lengths shall be identified by both the color of the connector cover plate, and a number permanently engraved and painted in a contrasting color on the connector cover plate.
3. Each cable shall have one Velcro tiewrap permanently attached to the insulation near the female connect.

I. Extension cords: 12-3 type SO cord with male plug at one end and female connector at other end. Connectors shall be NEMA 5-15 20A 125V.

J. Two-fers: Two-fers shall contain one male plug and two female connectors, wire in parallel with molded "Y" configuration. Cable shall be 12-3 type SO cord.

K. Adapters: Adapters shall be constructed of 12-3 type SO cord, 18 inches long, with a male plug at one end and a female connector at the other end.

L. Safety cables: Minimum 1/8" aircraft cable, with 2" diameter loops on each end, seized by swaged copper sleeves; one loop shall include an operable spring clip rated for 200 pounds breaking strength. Finished cable length shall be 36".

M. Color Media: 20" x 24" sheets of theatrical color media.

N. Color Filter Storage Cabinet: To accept 20" x 24" color media sheets. 10 shelves, with 50-sheet capacity per shelf.

2.10 SCHEDULE OF QUANTITIES

A. Provide quantities of dimmers, fixtures, color media, lamps, control equipment, and cables per schedules in drawings.

B. If schedule of quantities for dimmers, fixtures, color media, lamps, control equipment, and cables are not found on the drawings, contact the Architect prior to submission of bid.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set permanently mounted items level, plumb, and square with ceilings and walls.

B. Indicated mounting heights on drawings are to bottom of unit for suspended items and to center of unit for wall-mounted items.

C. Mount and connect fixtures, and install and connect distribution devices.
1. Thirty (30) days prior to installation submit for approval a full-sized lighting plot using not less than 60% of fixed luminaires and all automated luminaires or automated accessories. Include an instrument schedule and indication of focus points.
2. Deliver, uncrate, lamp, bench focus, hang & focus all luminaires according the approved lighting plot.
3. Luminaires not included in the plot shall be stored either in open positions on the lighting catwalks or another location at the owner's option.
4. Install safety cables secured to stage rigging or gridiron for all pipe-mounted electrical fixtures and equipment.

D. Install and anchor dimmer boards level on concrete bases, 4-inch nominal thickness. Concrete materials and installation requirements are specified in Division 3.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.

2. For dimmer boards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to dimmer boards.

E. Consult and coordinate work with trades doing adjoining work.

F. Position all items accurately as indicated on the drawings, and true to plumb line and level. Maintain maximum headroom and clearance at all points.

G. Do not uncrate, unpack, unwrap, or install control console, video monitor(s), remote controls, or other auxiliary control components until construction is complete and environment is clean and dust-free

H. Install dimmer rack using resilient pads as specified herein. No portion of the dimmer rack shall contact any part of the building structure or walls except through resilient connections specifically approved by the theatre consultant. All load, feed, and control conduit connections to the dimmer racks shall be isolated through the use of deflection fittings, Type DF.

3.2 WIRING

A. Power Wiring:

1. Install wiring as specified in Division 16 Section "Conductors and Cables" for hard-wired connections. Install wiring in raceways except cable and plug connections.
2. Install power wiring with a separate neutral for each output circuit from main dimmer and for each house and stage lighting circuit.
3. Install power and control wiring for the stage lighting system in raceways that are unique to only that system.

B. Signaling, Remote-Control, and Power-Limited Circuits:

1. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
2. Remote-control circuits associated with emergency lighting control shall be installed complying with Class 1 Circuit standards in the Chicago Electrical Code.
3. Install data-transmission cabling per manufacturer's recommendation.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

E. Remove wall plates and protect devices and assemblies during painting.

F. Support lighting fixtures, distribution components, and accessories per manufacturer's recommendation. Equip all pipe-mounted equipment with safety cables that are secured to supporting pipe.

G. Ground equipment according to Division 16 Section "Grounding and Bonding."

3.3 IDENTIFICATION

A. Identify components, power, and control wiring according to Division 16 Section "Electrical Identification."

B. Label each fixture, lighting outlet, distribution device, and dimmer module with unique designation. Make designations on elevated components readable from floor.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Schedule electrical tests and visual and mechanical inspections with at least seven days' advance notice.

C. Visual and Mechanical Tests and Inspections:

1. Inspect each fixture, outlet, module, control, and device for defects, finish failure, corrosion, physical damage, labeling by nationally recognized testing laboratory, and nameplate.
2. Exercise and perform operational tests on mechanical parts and operable devices according to manufacturer's written instructions.
3. Check tightness of electrical connections with torque wrench.
4. Verify proper protective device settings, fuse types, and ratings.
5. Record results of tests and inspections.

D. Electrical Tests: Perform tests according to manufacturer's written instructions.

1. Continuity tests of circuits.
2. Operational Tests: Connect each outlet to a fixture and a dimmer output circuit so each dimmer module, dimmer control and output circuit, outlet, and fixture in a typical operating mode will be sequentially tested. Set and operate controls to demonstrate fixtures, outlets, dimmers, and controls in a sequence that cues and reproduces actual operating functions for a typical system of the size and scope installed. Include operation and control of houselights and stage lights from each control location and station including optional plug-in control-console outlet locations. Record fixture and outlet assignments, control settings, operations, cues, and observations of performance.

E. Correct deficiencies disclosed by tests and inspections, and retest deficient items. Verify that specified requirements are met.

F. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible organization and person.

G. Reports: Prepare a schedule of lighting outlets by number; indicate circuits, dimmers, connected fixtures, and control-channel assignments. Prepare a schedule of control settings and circuit assignments for house control channels. Prepare written reports of tests and observations. Report defective materials, workmanship, and unsatisfactory test results. Include records of repairs and adjustments made.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting and programming system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

3.6 CLEANING

A. The contractor shall remove all paint spatters and other spots, dirt and debris from the equipment. Clean equipment and devices internally and externally using methods and materials recommended by the manufacturer.

3.7 CONTRACTOR STARTUP AND REPORTING

A. Contractor shall prepare and submit a complete set of record drawings, operation and maintenance data and certificates as outlined in this section.

B. Contractor shall align all ellipsoidal spotlights for cosine (hot center) alignment at jobsite, prior to delivery to the owner. Such alignment to be supervised by an experienced representative of the theatrical dealer. Dealer shall train and supervise the electrical contractor's workers in the alignment of ellipsoidal spotlights.

C. Upon completion of all installation work, the contractor shall certify in writing to the architect that the work is complete and ready for final inspection. Final inspection shall be scheduled by the owner, architect, and the theatre consultant within fourteen days following the contractor's notice of completion.

3.8 COMMISSIONING AND DEMONSTRATION

A. After system checkout and adjustment, the manufacturer's engineer shall operate the system for the review of the owner, architect and theatre consultant. Necessary adjustments or modifications shall be made as required by the owner, architect or theatre consultant.

B. A knowledgeable representative of the manufacturer shall instruct the owner's staff or representatives in the operation and maintenance of the system. This instruction session shall be scheduled to last a minimum of six hours. While it may be possible to schedule this instruction session to coincide with the system checkout, such coincidence shall not be assumed.

C. The manufacturer shall provide to the owner videotaped instructions of the operation and maintenance of the system. Information contained in the videotape(s) will cover all points of operation and maintenance covered in the instruction session with the owner's staff. A

videotaped recording of the actual instruction session is acceptable. Provide (2) full copies of videotaped instruction. Videotape format shall be VHS or standard DVD.

END OF SECTION 16555

PUBLIC BUILDING COMMISSION OF CHICAGO

ADDENDUM NO. 2 TO CONTRACT NO. 1478
FOR

LEE PASTEUR HURLEY AREA ELEMENTARY SCHOOL
FOR
NEW CONSTRUCTION

DATE: January 28, 2009

NOTICE OF CHANGES IN CONTRACT DOCUMENTS

The following changes are hereby made in the Contract Documents.

CHANGES TO BOOK 3 - TECHNICAL SPECIFICATIONS:

Change 1: Table of Contents

a. Page 2, Division 07 – Thermal and Moisture Protection, **ADD** line reading, "07115 Bituminous Dampproofing....3"

Change 2: **DELETE** Section 02511 – Bituminous Concrete Paving in its entirety, and **REPLACE** with Section 02511 – Bituminous Concrete Paving per attached specification section.

Change 3: Section 04200 – Unit Masonry

a. Page 04200-6, Article 2.1 Masonry Materials, Paragraph B, Sub-Paragraph 5, Sub-Sub-Paragraph a, **ADD** Sub-Sub-Sub-Paragraph 3) to read, "Van Poppelen Bros".
b. Page 04200-6, Article 2.1 Masonry Materials, Paragraph B, Sub-Paragraph 6, Sub-Sub-Paragraph a, **ADD** Sub-Sub-Sub-Paragraph 3) to read, "Van Poppelen Bros".

Change 4: **ADD** Section 07115 – Bituminous Dampproofing per attached specification section.

Change 5: **DELETE** Section 08710 – Door Hardware in its entirety, and **REPLACE** with Section 08710 – Door Hardware per attached specification section.

Change 6: Section 09680 – Carpeting

a. Page 09680-3, Article 2.1 Carpet Products, Paragraph B, Sub-Paragraph 1, **REVISE** Sub-Sub-Paragraph b to read, "Gauge: 5/64" to 1/10"."
b. Page 09680-3, Article 2.1 Carpet Products, Paragraph B, Sub-Paragraph 4, **REVISE** Sub-Sub-Paragraphs a to read, "Lees Carpets, Bello III with Unibond RE Backing."
c. Page 09680-3, Article 2.1 Carpet Products, Paragraph B, Sub-Paragraph 4, **REVISE** Sub-Sub-Paragraphs b to read, "Atlas Aegea with Permian Bac Backing."
d. Page 09680-3, Article 2.1 Carpet Products, Paragraph B, Sub-Paragraph 4, **REVISE** Sub-Sub-Paragraphs c to read, "Begelow/Mohawk Pavia Everset with Lifeloc Laminate Backing."
e. Page 09680-4, Article 2.1 Carpet Products, Paragraph C, Sub-Paragraph 4, **REVISE** Sub-Sub-Paragraph a to read, "Lees Flamestitch II."
f. Page 09680-4, Article 2.1 Carpet Products, Paragraph C, Sub-Paragraph 4, **REVISE** Sub-Sub-Paragraph c to read, "Bigelow/Mohawk Siena."

CHANGES TO DRAWINGS:

Change 7: **DELETE** Civil Drawings C0.0, C1.0, C2.0, C3.0, C4.0, C4.1, C5.0, C5.1 and C5.5 in their entirety, and **REPLACE** with Drawings C0.0, C1.0, C2.0, C3.0, C4.0, C4.1, C5.0, C5.1 and C5.5, attached.

Change 8: Drawing L1.0, titled, "Overall Landscape Plan"

a. **REVISE** "1/L1.0 – Overall Landscape Plan" per attached Sketch No LSK-01.
b. **ADD** Sections A-A and B-B, and Grass Grid Details per attached Sketch No's LSK-02 and LSK-03.
c. At " Key to Symbols", **REVISE** description for hatch pattern reading "Area of structural soil under sod – 18" depth – Structural soil with 6" top-soil cover" to read, "Area of grass grid."

Change 9: Drawing L2.0, titled, "Key Landscape Plan"

a. At " Key to Symbols", **REVISE** description for hatch pattern reading "Area of structural soil under sod – 18" depth – Structural soil with 6" top-soil cover" to read, "Area of grass grid."

Change 10: Drawing AS.3, titled, "Concessions and Trash/Transformer Enclosure Plan"

a. At "1/AS.3 – Concessions and Trash/Transformer Enclosure Floor Plan", **ADD** notes to Trash Enclosure 4001 and Transformer Enclosure 4002 to read, "Provide elastomeric coating to all exterior, exposed (non-ground faced) masonry surfaces."

Change 11: Drawing AS.4, titled, "Trash and Recycling Elevations and Sections"

a. **ADD** a note to "6/AS.4 – West Elevation at Transformer Enclosure 4002" and "7/AS.4 – Building Section" to read, "All exposed steel beams, angles and grating to be galvanized."

Change 12: Drawing A3.2, titled, "Partial North Elevations"

a. At "2/A3.2 – Partial North Elevation", **ADD** arrows at the (3) first floor windows along the right side of the elevation to designate single hung windows.

Change 13: Drawing A3.3, titled, "Partial North Elevations"

a. At "1/A3.3 – Partial North Elevation", **ADD** an arrow at the (1) first floor windows along the left side of the elevation to designate a single hung window.

Change 14: Drawing A9.5, titled, "Typical Roofing Details"

a. At "6/A9.5 – Base Flashing Detail", **REVISE** dimension from "1'-8 3/8" Min." to read, "4" Min."

Change 15: Drawing A12.1, titled, "Opening Schedule"

a. **REVISE** the Opening Schedule per attached Sketch No's ASK-01 through ASK-04.

Change 16: Drawing A13.0, titled, "Finish Legend and Details"

a. **REVISE** the Finish Legend as follows:
   1. At CAR-1 and CAR-2, **REVISE** the "Material" columns to read, "Carpet", and **REVISE** the "Description" columns to read, "Broadloom, Color TBD".

2. At SGT-1 through SGT-7, **REVISE** the "Material" columns to read, "Glazed CMU", and **REVISE** the "Description" columns to read, "Color TBD, See General Finish Note #10".

b. At "8/13.0 – Structural Glazed Tile Base Condition", **REVISE** notes reading "Structural glazed tile cove base" to read, "Glazed CMU base".

Change 17: Drawing TR2.01, titled, "

a. At "C1/TR2.01 – Curtain Schedule", **ADD** note to all velour curtains to read, "Include 4" hems at offstage ends of travelers and borders. Provide 12" hems for onstage sides of traveler curtains."

b. At "C1/TR2.01 – Curtain Schedule", **REVISE** "Material" column for Set No. 16, Skydrop from "Muslin" to "Vinyl".

Change 18: Drawing S3.2, titled, "Sections and Details"

a. **REVISE** "10/S3.2 – Typ. Stud Connection at Floor Deck" per attached Sketch No. SSK-01.

Change 19: Drawing S3.3, titled, "Sections and Details"

a. **REVISE** "3/S3.3 – Curb at Gym" per attached Sketch No. SSK-02.

Change 20: Drawing M1.1C, titled, "First Floor Mechanical Piping Plan – Module A"

a. **REVISE** "1/M1.1C – First Floor Mechanical Piping Plan" per attached Sketch No. MSK-01.

b. **ADD** Drawing Keyed Note No. 6 per attached Sketch No. MSK-01.

Change 21: Drawing M5.4, titled, "Mechanical Details"

a. **ADD** "4/M5.4 – Lab Teachers Desk Gas Jet Detail" per attached Sketch No. MSK-02.

Change 22: Drawing M7.2, titled, "Ventilation Schedule – Second and Third Floor"

a. **REVISE** "Air Handling Unit Schedule" per attached Sketch No. MSK-03.

Change 23: Drawing M7.4, titled, "Mechanical Schedules"

a. **REVISE** "Radiant Panel Schedule" per attached Sketch No. MSK-04.

Change 24: Drawing P0.1B, titled, "Plumbing Underground Plan – Module B"

a. **REVISE** the top note along the south side of the building to read, "3/4" CW DN to underground. Route to ground hydrants at parking lot. Coordinate routing with Civil. Route piping around parking lot. Refer to Drawing L2.2 for location of quick couplers at parking lot."

Change 25: Sheet E1.1A, titled, "First Floor Electrical Power Plan – Module A"

a. **ADD** conduit and wiring for ADA push plates at Vestibule 1059, south wall of Corridor 1024 adjacent to Vestibule 1059, and exterior south wall adjacent to Vestibule 1059.

b. At Gymnasium 1085, **REVISE** Note No. 2 to read, "Gymnasium sound system equipment shall be provided and installed by Electrical Contractor per CPS specifications."

c. At Gymnasium 1085, **REVISE** Note No. 3 to read, "Gymnasium assisted listening

devices shall be provided and installed by Electrical Contractor per CPS specifications.

d. At Dining Room 1066, **ADD** tag referencing Keyed Note No. 36.

Change 26: Sheet E1.1B, titled, "First Floor Electrical Power Plan – Module B"

a. **REVISE** Keyed Note No. 36 to read, "Dining Room sound system equipment and assisted listening devices shall be provided and installed by Electrical Contractor in accordance with project specifications. Electrical contractor shall provide all conduits, junction boxes, wiring, etc."

b. **ADD** conduit and wiring for ADA push plates at Vestibule 1043, east wall of Corridor 1032 adjacent to Vestibule 1043, and exterior east wall adjacent to Vestibule 1043.

Change 27: Drawing E1.2A, titled, "First Floor Lighting Plan – Module A"

a. At Platform 1083, **ADD** one additional circuit for each "Plug Box Dimmer Panel" (total of 4). Coordinate circuit numbering with TL2.01.

Change 28: Drawing E2.2A, titled, "Second Floor Lighting Plan – Module A"

a. At Gymnasium 1085, **ADD** nine additional circuits for lighting cage at front of house – stage right. Coordinate circuit numbering with TL2.1.

b. At Gymnasium 1085, **ADD** nine additional circuits for lighting cage at front of house – stage left. Coordinate circuit numbering with TL2.1.

c. At Platform 1083, **ADD** thirteen additional circuits to "Row 1 Fixture Type 32 Dimmer Panel".

d. At Platform 1083, **ADD** seven additional circuits to "Row 2 Fixture Type 32 Dimmer Panel".

e. At Platform 1083, **ADD** seven additional circuits to "Row 3 Fixture Type 32 Dimmer Panel".

f. At Platform 1083, **ADD** "Row 4 Fixture Type 32 Dimmer Panel" with twelve total circuits.

Change 29: Drawing E4.1A, titled, "Electrical Roof Power Plan – Module A"

a. **REVISE** Keyed Note No. 1 to read, "Provide (1) 4PR UTP cable and 18 GA 2PR twisted shielded cable in 1" rigid galvanized conduit to MDF Room."

Change 30: Drawing E4.1B, titled, "Electrical Roof Power Plan – Module B"

a. **REVISE** Keyed Note No. 1 to read, "Provide (1) 4PR UTP cable and 18 GA 2PR twisted shielded cable in 1" rigid galvanized conduit to MDF Room."

Change 31: Drawing E6.2, titled, "Rescue Assistance System Riser Diagram"

a. **DELETE** one vertical column with Rescue Assistance devices on the Riser Diagram.

b. At the three remaining vertical columns with Rescue Assistance devices on the Riser Diagram, **DELETE** one Rescue Assistance sign and one Rescue Assistance communication station per floor. There should be one sign in the corridor by the exit door, and one communication station in the stair, per floor, per stairwell.

Change 32: Drawing E7.2, titled, "Electrical Schedules"

a. **REVISE** Lighting Fixture Schedule as follows:

1. At Fixture Type F3, **REVISE** "Description/Usage" column to read, "12" metal

halide enclosed down light w/acrylic lens; Option No. 1 with metal halide; Option No. 2 with quartz re-strikes."

2. At Fixture Types F31 and F32, **ADD** a note to read, "Fixtures shall be obtained by Electrical Contractor from Theatrical Distributor as part of dimming package."
3. At Fixture Type F35, **REVISE** "Description/Usage" column to read, "8" metal halide downlight with acrylic lens."

QUESTIONS & ANSWERS:

Q1. Is the area referenced in the attachment 8" side walk per Concrete Sidewalk Detail on C5.2? And, is it to be jointed as shown (see email attachment)?

A1. The concrete areas indicated along the south and east sides of the play lot are to be 8" thick concrete, per the "Concrete Sidewalk Detail" on Drawing C5.2. Jointing shall be as indicated on Drawing AS.2.

Q2. The detail shown on C5.2 for the ROW sidewalk asks for 4" FA1 bedding under the 5" walk. The detail, Concrete Sidewalk Detail asks for 6" of CA-6 under 5" walk. Which material and depth is required under 5" pc sidewalk?

A2. ROW sidewalks have been designed to CDOT standards, while the remaining sidewalks have been designed to CPS standards. Sidewalks that run parallel to and mostly within the ROW should be constructed per "Concrete Sidewalk Detail (ROW)" on Drawing C5.2. All other sidewalk should be constructed per "Concrete Sidewalk Detail" on Drawing C5.2. Where ROW and non-ROW sidewalk meet, the change in paving section should occur at the nearest joint.

Q3. What is a "tined finish" shown in the bus turn around detail on C5.1?

A3. A note has been added to Detail C5.1. Refer to Change 7.

Q4. Note 6 on C2.0 instructs that the parking area base or pavement cannot be installed until after the work on the southern adjacent parcel is complete. This is the only area on the site where the contractor can set up trailers and stage material. This note implies that this area will be unavailable as a marshalling area for the project. Is this correct? And, if not here, where can the contractor's compound be located?

A4. The JOC Contractor will be performing work south of the Work Limit Line concurrently with the Work of this contract. Access for the JOC Contractor shall be through the parking lot. Refer to Addendum 1, Question/Answer 8 for additional information regarding staging, etc.

Q5. The Door Schedule drawing Sheet A12.1 does not have any hardware sets assigned to the doors. Please provide as soon as possible for bidding.

A5. Hardware sets have been added to the Opening Schedule on Drawing A12.1. Refer to Change 15.

Q6. There is no gate shown at the south end of the curved sidewalk that defines the play lot. Should a gate be installed at this location?

A6. There is no gate designed along the south side of the Future Playlot.

Q7. In regards to Sheet C2.0 - Soil Excavation Plan (for reference only) dated 12/18/08, are

the areas where unsuitable clay and/or buried topsoil was removed now topped with topsoil?

A7. The JOC Contractor performing the site prep work will not be placing any topsoil. Refer to site prep drawings reissued in Addendum 1.

Q8. Please confirm that the separate grading contract will include the detention pond grading. Will this separate contractor place all the topsoil in the detention pond?

A8. Excavation and sub-grading for the detention pond shall be completed as part of the site prep work by the JOC Contractor. Final grading and landscaping of the detention pond will be completed by the JOC Contractor under separate contract. Refer to the Landscape drawings for the extent of topsoil work under this contract.

Q9. Sheet C4.0 Note 12 – This note is inequitable. Please establish a grading tolerance that can be assumed for the separate contract that will complete grading work (for example +/- 0.1").

A9. Note 23 has been added to sheet C0.0 outlining tolerances. Refer to Change 7.

Q10. No landscaping was shown for the detention pond on the landscape plans. If we are to complete any landscaping in this area in this contract, please provide landscape plans / details for the detention area.

A10. Landscaping for the detention pond will be completed by Owner under separate contract.

Q11. To what exterior concrete surface areas does Section 09963 apply?

A11. Section 09963 applies to the exterior, exposed (non-ground faced) masonry surfaces at Trash Enclosure 4001 and Transformer Enclosure 4002. Refer to Change 10.

Q12. Will you consider establishing an allowance for all tap fees, sewer fees, cutoff fees, etc.? The amount of these types of fees cannot be determined prior to bid.

A12. No. Refer to Book 2, ARTICLE 6. PERMITS AND LICENSES.

Q13. The drawings indicate structural glazed tile while the specifications indicate glazed CMU. Please clarify which is correct.

A13. All references to structural glazed tile (SGT) on the drawings have been revised to glazed CMU. Refer to Change 16.

Q14. Drawing E4.1A and E4.1B Keyed Note 1: Why is the note stating coax RG59 cable for the PTZ cameras when the CPS specification for CCTV cables is purple Cat6 cable?

A14. The "RG-59" references have been changed to "(1) 4PR UTP Cables". Refer to Change 29.

Q15. On Drawing E7.9, the Voice and Data Riser shows a "QCE" enclosure for Room 145 serving 3 additional rooms. Where is Room 145? All other rooms have 4-Digit numbers.

A15. As indicated on the Drawing 1/E7.9 – Voice and Data Distribution Diagram, the QCE Enclosure is shown "for reference only." Refer to the floor plans for all enclosure locations. There are no QCE used in this project.

Q16. Drawing E6.2 shows four rescue assistance risers, but the floor plan only shows three. Please clarify. If there is a fourth riser, where is this riser going?

A16. There is no fourth stair that requires rescue assistance devices. Consequently, one vertical column of devices has been eliminated from the Riser Diagram. See Change 31.

Q17. Drawing E6.2 also shows two RA devices at each floor, but the floor plan only shows one in the stairway and one just outside the stairway.

A17. There should be one Rescue Assistance sign in the corridor by the exit door, and one Rescue Assistance communication station in the stair, per floor, per stairwell. Refer to Change 31. Follow floor plan layouts for Rescue Assistance devices.

Q18. Is the sound system equipment and wiring being installed by others?

A18. The sound system equipment and associated wiring shall be provided and installed by the Contractor, per specification Sections 16726 – Public Address and Music Equipment and 16765 – Assistive Listening Device. Keyed notes have also been revised on Drawings E1.1A and E1.1B to reflect this. Refer to Changes 25 and 26.

Q19. Detail 1 on Drawing E7.3 shows CT's. On certain panels, this detail states that the CT's are being provided by Div. 15. Is the connection from these CT's to the BAS by others, as well?

A19. The connection between the CT's and the BAS system will be provided by the Division 15 Temperature Control Contractor. Note No. 4 on 1/E7.3 further defines the responsibilities.

Q20. In written specifications, Section 02810, Article 1.1 – Summary, Paragraph A indicates, "Design and installation of quick coupler system in parking lot." But Article 1.2 – System Performance Requirements, Paragraph A and all following articles and paragraphs relate to a full automatic irrigation system with sprinklers, quick couplers, automatic control valves, electric wiring, automatic controller, booster pump and all related fittings and piping. The only plan available is the overall landscape plan L1.0, and on this plan, there are only four quick couplers around the parking lot. Is the intent to provide only the four quick couplers around the parking lot, or to provide 100% coverage of all lawn and planting areas including parkways, as the written specifications shows.

A20. There are currently (5) quick couplers shown on Drawing L2.2 – Landscape Partial Plan – East. Refer to Drawings P0.1B – Plumbing Underground Plan – Module B and C3.0 – Utility Plan, and Change 22 for routing of water line. This Is the only irrigation work within the project.

Q21. At the Pre-Bid Meeting, it was indicated that a "JOC" contractor will complete the undercut work at the building and site grading. On what date can we assume the separate grading and undercut will be completed?

A21. March 20th.

Q22. Not Used

A22. Not Used

Q23. The spec sheets of the carpet call for CAR 1 as 12 foot carpet, and the drawings call for carpet tile. CPT1 calls for carpet for the library bench to match the carpet tile (CAR-1) on the library floor. The specified Mohawk carpet is only available in broadloom and the Atlas Amalfi is special order, and the quantity is too small. CAR 2 is asking for Mohawk

Siena in carpet tiles, but is not made in carpet tiles. The Atlas Eaton may not be made in carpet tiles either. Please clarify what is really wanted, broadloom or carpet tiles, and verify the carpet style, color, etc. Or should we spec a carpet that will meet the specs?

A23. References to "carpet tile" on the Finish Schedule have been revised to "carpet, broadloom" (refer to Change 16), and the specifications have been revised to reflect current product lines (refer to Change 6).

Q24. The concentrator details show the telephone locations looping through and on to the MDF room. These details also show a 25 pair terminating in the concentrator. Isn't this for the telephone locations, and shouldn't the telephone cables be terminating in the concentrator?

A24. The concentrator details are shown correctly. The phone wiring shall only loop in the concentrator, and no connection shall be made.

Q25. The Opening Schedule on Sheet A12.1 indicates that doors D1001A and D1001E require automatic door openers (per notation N6). Please confirm that all 5 of these doors are auto doors.

A25. The following doors will require automatic door openers: D1001A, D1001E, D1043C, D1043F, D1059A and D1059F. Doors D1001B, D1001C, D1001D, D1001F, D1001G and D1001H do not require automatic door openers. The Opening Schedule on Drawing A12.1 has been revised accordingly. Refer to Change 15.

Q26. The plans show (2) 4" PVC air intakes for the water heaters going out the side wall of the school and (2) 4" PVC flues from the heaters going out of the pump room and up through floors 2-3 then out the roof. Direct vent heaters usually have limitations on the amount of pipe (distance). Has the engineer determined that these PVC runs are within the safety and performance ranges of these heaters?

A26. The PVC runs have been determined by the EOR to be within the safety and performance ranges of the specified heaters.

Q27. Sheet A1.2B shows mark "8 TB" in corridor 2022. Other drawings list the tack boards in corridors where there are lockers as "2 x 8 TB". We assume that all of the tackboards shown in corridors with lockers are to be the 2' x 8' tackboards rather than the 4' x 8' tackboards represented by the "8 TB" designation. Please confirm.

A27. Where the 8'TB designation is indicated in the corridors at locker locations, 2' x 8' tackboards are to be provided. This is further indicated on Drawing A4.5.

Q28. Can schedule 10 black pipe be used for the fire protection mains? The drawings state all schedule 40 pipe, but the specifications state schedule 10 pipe is acceptable.

A28. As stated in the specifications, schedule 10 pipe is acceptable.

Q29. Can extended coverage sprinkler heads be used per NFPA requirements?

A29. Per the Chicago Building Code and NFPA, extended coverage sprinklers are acceptable in light hazard areas in non-obstructed construction. The Sprinkler System Hydraulic Design Schedule on Drawing FP4.1 further identifies light hazard areas.

Q30. CPT 1 calls for broadloom to match CAR 1. CAR 1 Atlas Amalfi (discontinued) use Aegea. Not made in tiles for small quantities. CAR 1 Mohawk Pavia, not available in carpet tiles.

Lees has not responded yet. CAR 2 Atlas Eaton only made in broadloom. CAR 2 Mohawk Sienna is available in carpet tiles. Lees has not responded yet. See if you can get better information.

A30. See response to QA 23, above.

Q31. 1, 2, 3/S3.2 and 3, 12/A9.2 show similar but different details for stabilizing the tops of masonry walls to the deck. Which detail is to be followed.

A31. Details 3/A9.2 and 1/S3.2 are virtually the same detail, but the structural detail (1/S3.2) will govern for stabilization of the wall. Walls must be sealed per the architectural details. Details 12/A9.2 and 2/S3.2 indicate more specific instances where walls align with or run parallel to steel beams. In each case, follow the most stringent detail.

Q32. AS 4 shows the transformer enclosure and calls for steel grate over the top of it. It is detailed in the structural drawings. Are the beams and grating to be galvanized.

A32. All exposed steel beams, angles and grating must be galvanized at Transformer Enclosure 4002. Refer to Change 11.

Q33. No pit ladder is called out in the elevator pit. Is one required? No sump is shown in the elevator pit. Is one required? The plumbing drawings do not show a sump pump in the elevator pit. Is one required?

A33. A pit ladder is required at the elevator, and it is called out on "1/A7.3 – Plan @ Elevator" (southwest corner of the elevator shaft). Additionally, the sump pump and sump pit is indicated on "1/P1.1A – First Floor Plumbing Plan – Module A" and "1/P6.1 – Elevator Pit Pump Detail". "11/S2.2 – Section at Elevator Sump" gives additional information regarding the sump pit construction.

Q34. The angle and bolt assembly as drawn in section 7/S3.2 can only be installed prior to installing the CMU. That is, the bolt and nut assembly will be welded in place as described in the attendant notes, and then the mason will embed the bolt when he lays up the wall. Is this acceptable? If this is acceptable in this detail, is it acceptable in other similar details?

A34. This means of construction is acceptable for the angle and bolt assembly indicated on Detail 7/S3.2 and other details.

Q35. What are the metal studs for in detail 10/S3.2? Does this detail apply to any place in particular on the plans or is it a general detail?

A35. Detail 10/S3.2 is a Typical Brick Support Detail (refer to Change 18).

Q36. A plate is shown graphically in section 3/S3.3 atop the beams. It is not identified in terms of size or dimensional limits. Please define.

A36. Detail "3/S3.3 – Curb at Gym" has been revised to eliminate the plate in question. Refer to Change 19.

Q37. A provision for building expansion is not apparent on the structural steel drawings. Is there an expansion joint in the building?

A37. There is no expansion joint in the building.

Q38. Is Gordian Group preparing a storm water plan? Won't that plan become the GC's plan

when he takes over the site?

A38. No. The final storm water management plan for the project has been prepared by the Architect of Record. The General Contractor is responsible for storm water management required during construction.

Q39. Acoustical metal deck is not shown in the gym; is this intentional?

A29. There is no acoustical metal deck in the gymnasium.

Q40. Why is it the contractor's responsibility to verify sewer connections not related to the project?

A40. General Contractor is responsible for coordinating and verifying sewer connections covered under the scope of work.

Q41. To what extent are the following insurances necessary: a) Pollution Insurance? b) Professional Liability Insurance? c) Railroad Protective Insurance?

A41. Refer to Book 1, III. INSTRUCTION FOR BIDDERS, U. Performance and Payment Bond and Insurance. Also refer to Book 1, Exhibits, 2. Insurance Requirements.

Q42. Will the entire access road's stone base be done before this contract begins?

A42. As indicated in the site prep drawings (refer to drawings reissued in Addendum 1), the JOC Contractor will complete the subgrade within the access road, but not the stone base. The stone base shall be provided by the General Contractor.

Q43. Not Used

A43. Not Used

Q44. The fire pump schedule calls for a 750 gpm, 50 psi, 50 hp pump. 50 psi is the max pump rating for a 30 hp motor and 85 is the max for a 50 hp motor. Which hp is correct?

A44. The 50 hp requirement is correct.

Q45. Exhibit 2 in Book 1, Item 7 requires Railroad Protective Liability. In order to secure a proposal, we will need the following information: 1) Name of insured railroad. 2) Number of regular trains per day for the following: a) Passenger, b) Freight, c) Unscheduled. 3) Trains passing worksite during working hours: a) Passenger, b) Freight, c) Unscheduled. 4) Are slow orders in effect?

A45. The name of the railroad is The Belt Railway of Chicago. Answers to the remaining three questions (indicated above) may be obtained by contacting the railroad General Counsel directly.

Timothy E. Coffey
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The Beltway Railway Company
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Q46. Base flashing Detail 6/A9.5 shows membrane flashing material to extend to a minimum +/- 1'-8" onto finished membrane field sheet. All other various details scale out to approximately 6" flashing material onto field surface, yet they all reference back to Detail 6/A9.5. Should we install per manufacturer's recommendations and details? Please advise.

A46. The dimension of "1'-8 3/8" Min." indicated for the horizontal lap is incorrect. The correct dimension should be "4" Min." Refer to Change 14.

Q47. Detail 5/A9.5 calls out a stainless steel counterflashing receiver and a .063 aluminum counterflashing insert piece. Is this correct? Please advise.

A47. Detail 5/A9.5 is correct.

Q48. Is there a specification section for single hung windows and projected windows. The elevations and detail indicate Projected windows, however, the plan note legend 107-A says these are to be "fixed/SH" combination windows. What windows are to be used?

A48. The following window specifications were included in the Project Manual, Section 08524 – Aluminum Vertical Sliding (Hung) Sound Reduction Windows, and Section 08528 – Aluminum Projected Sound Reduction Windows. Refer to the A3 Series sheets for locations of projected and single hung windows. Refer to Changes 12 and 13.

Q49. The window details on sheet A6.1 indicate that the windows are to be framed out in curtainwall. Is this in fact the way this is to be, or are these windows to be a complete window system without curtainwall framing?

A49. The window details, as currently shown, are correct. Windows along the south side of the building have both sun shades and light shelves which anchor directly to the curtainwall system. Windows along the north side of the building, although they do not have sun shades and light shelves, were designed to emulate the windows along the south side.

Q50. How are the sunshades attached to the window system? Can details be provided?

A50. The sun shades and light shelves are to be provided by the window wall or curtain wall manufacturer. Consequently, each manufacturer will have their own proprietary anchoring details.

Q51. Is the as built for the existing conditions for the site going to be in the addendum drawings? Can you also tell me when the addendum is due to come out?

A51. No.

Q52. The structural notes call for steel fibers in the concrete. The drawings show mesh. Which is required?

A52. As indicated on the foundation plan and details, welded wire fabric is required.

Q53. Sheet A1.3A: This series of drawings portrays all of the marker boards, tack boards and projection screens in the rooms. No projection screens are shown in the library. Enlarged drawing 1/A8.15 shows (2) back to back projection screens located over some shelving that is FBO. Are there to be any projection screens in the library? Please clarify locations and count.

A53. As indicated on "1/A8.15 – Enlarged Plan", there are (2) projection screens to be

provided in Library 3002.

Q54. The specifications omit Section 07115 – Bituminous Damproofing. Please confirm no specification is required. If the specification is required, please provide Spec. Section 07115 – Bituminous Damproofing.

A54. Specification Section 07115 – Bituminous Dampproofing has been added to the Project Manual. Dampproofing is to be provided as a vapor barrier at all masonry cavity wall locations.

Q55. How will the landscape depths of soils coordinate with the site prep contractor? Will removal of excavated new fill just recently placed by the remediation contractor also have to be disposed of as sub-title D? In other words, is remediation coordinated with landscaping and civil, or just civil?

A55. The remediation work indicated in the site prep drawings has been coordinated with the civil and landscaping work. All fill placed by the JOC Contractor under the site prep work to be removed by the General Contractor under the scope of this Work must be disposed of at a Sub-Title D landfill.

Q56. Is structural fill shown by GC or Gordian?

A56. All work shown in bid documents shall be performed by the General Contractor unless otherwise noted.

ATTACHMENTS:

Book 3, V1	Section 02511 – Bituminous Concrete Paving (7 pages)
Book 3, V1	Section 07115 – Bituminous Dampproofing (3 pages)
Book 3, V1	Section 08710 – Door Hardware (24 pages)
Drawings	C0.0, dated, 01.27.09 (1 page, 30" x 42" format)
Drawings	C1.0, dated, 01.27.09 (1 page, 30" x 42" format)
Drawings	C2.0, dated, 01.27.09 (1 page, 30" x 42" format)
Drawings	C3.0, dated, 01.27.09 (1 page, 30" x 42" format)
Drawings	C4.0, dated, 01.27.09 (1 page, 30" x 42" format)
Drawings	C4.1, dated, 01.27.09 (1 page, 30" x 42" format)
Drawings	C5.0, dated, 01.27.09 (1 page, 30" x 42" format)
Drawings	C5.1, dated, 01.27.09 (1 page, 30" x 42" format)
Drawings	C5.5, dated, 01.27.09 (1 page, 30" x 42" format)
Drawings	LSK-01, dated 01.23.09 (1 page, 8 1/2" x 11" format)
Drawings	LSK-02, dated 01.23.09 (1 page, 8 1/2" x 11" format)
Drawings	LSK-03, dated 01.23.09 (1 page, 8 1/2" x 11" format)
Drawings	ASK-01, dated 01.26.09 (1 page, 11" x 17" format)
Drawings	ASK-02, dated 01.26.09 (1 page, 11" x 17" format)
Drawings	ASK-03, dated 01.26.09 (1 page, 11" x 17" format)
Drawings	ASK-04, dated 01.26.09 (1 page, 11" x 17" format)
Drawings	SSK-01, dated 01.21.09 (1 page, 8 ½" x 11" format)
Drawings	SSK-02, dated 01.21.09 (1 page, 8 ½" x 11" format)
Drawings	MSK-01, dated 01.26.09 (1 page, 11" x 17" format)
Drawings	MSK-02, dated 01.26.09 (1 page, 8 1/2" x 11" format)
Drawings	MSK-03, dated 01.26.09 (1 page, 8 1/2" x 11" format)

Drawings MSK-04, dated 01.21.09 (1 page, 11" x 17" format)

END OF ADDENDUM NO.2

SECTION 02511

BITUMINOUS CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes bituminous concrete paving required to complete the project.

1.2 SUBMITTALS

A. Product Data: Submit manufacturers' product data for traffic marking paint and handicapped parking signs demonstrating compliance with the specified requirements.

B. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

C. Pavement Marking Plan: Submit 4 copies of the pavement marking plan, indicating lane separations, dedicated handicapped parking spaces and diagonally striped access aisles, parking space lines, and other markings. Dedicated handicapped parking spaces shall be marked with the international graphics symbol. All handicapped traffic markings shall comply with the Illinois Accessibility Code and the Americans with Disabilities Act. All pavement markings within public Right of Way shall be Thermoplastic in accordance with specifications as noted below.

1.3 REFERENCES

A. Specified references, or cited portions thereof, current at date of bidding documents unless otherwise specified, govern the work.

B. Asphalt Institute (AI) :
1. ES-11 Asphalt Surface Treatments - Specifications.
2. ES-12 Asphalt Surface Treatments - Construction Techniques.
3. MS-1 Thickness Design - Asphalt Pavements for Highways.
4. MS-2 Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
5. MS-5 Introduction to Asphalt.
6. MS-8 Asphalt Paving Manual.
7. MS-10 Soils Manual.
8. MS-14 Asphalt Cold-Mix Manual.
9. MS-15 Drainage of Asphalt Pavement Structures.
10. MS-17 Asphalt Overlays for Highway and Street Rehabilitation.
11. MS-22 Principles of Construction of Hot-Mix Asphalt Pavements.

C. The American Society of Testing and Materials (ASTM):
1. ASTM D698 - Tests for Moisture-Density Relationship of Soils and Soil-Aggregate Mixtures, Using 5 Lb. Rammer and 12 in. Drop.

D. Illinois Department of Transportation:
1. Latest version of Standard Specifications for Road and Bridge Construction, including all addenda.

2. Manual of Instructions for Bituminous Proportioning and Testing.
3. Thermoplastic pavement marking work shall be performed in accordance with Section 780 of the Standard Specifications and details shown on the plans, except as herein modified.
4. Pavement marking removal shall be performed in accordance with Section 783 of the Standard Specifications.

1.4 TESTING & INSPECTION

A. Testing and inspection of bituminous concrete mixes and testing of placed stabilized base course and bituminous concrete pavement will be performed by an independent testing laboratory employed by the Owner.

B. Allow testing laboratory access to mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in preparation of bituminous concrete mix.

C. When requested, testing laboratory shall perform tests on proposed bituminous pavement mixes to determine conformity with specifications.

D. Testing laboratory shall perform one series of compaction tests for stabilizing base course and for each bituminous pavement course. The Contractor shall pay for all costs of additional testing due to improper performance of work.

E. When stabilizing base course, or portion thereof, has been placed and compacted in accord with specifications, notify testing laboratory to perform density tests. Do not place bituminous concrete pavement until satisfactory results have been verified and base course approved in writing by Architect.

F. When compaction test results indicate nonconforming work, remove defective work, replace and retest.

G. Observe the proof-rolling of the subgrade prior to placing base course materials.

H. Check base course materials for conformance to specifications.

I. Perform extraction analysis on samples of bituminous concrete mixes to check for conformance to the Illinois Department of Transportation Class I requirements.

J. The thickness of the thermoplastic pavement markings will be measured above the pavement surface at such random points as the Commissioner selects to determine conformance to Article 780.05. If the measurements show less than 2.50 mm (0.100 in.), the Commissioner will "chip" the edges of the markings at random points and measure the thickness of the chips to determine if the overall thickness or the thickness above the pavement surface is substantially in conformance with the thickness requirements, payment will be made at 100 percent of the contract unit prices involved. When the thickness at a given location is less than 2.50 mm (0.100 inc.), additional measurements will be taken on each side of such location at such intervals as the Commissioner may select to determine the extent of the deficient portion of the markings. If the average thickness of the deficient portion is less than 2.50 mm (0.100 in.) but not less than 1.50 mm (0.060 in.), an adjusted unit price of 50 percent of the contract unit price involved will be used in computing payment for the deficient portion. If the measurements show the average thickness to be less than 1.50 mm (0.060 in.), the Contractor shall grind away

the surface of the deficient portions of the markings sufficiently to reduce the average thickness to approximately 1.25 mm (0.50 in.) or less. The Contractor shall then apply additional thermoplastic material and beads to bring the thickness of the markings to at least 2.50 mm (0.100 in.) and the reflectivity to at least the minimum required values.

K. The thermoplastic pavement markings will be inspected following installation but no later than November 1. In addition, they will be inspected following a winter performance period that will extend 180 days from Nov. 1. Within 15 consecutive calendar days after the end of the winter performance period, a final performance inspection will be made. If this inspection discloses any work, in whole or in part, as not being visibly intact and serviceable to the following extent, the Contractor shall, within 30 consecutive calendar days, completely repair or replace such work to the satisfaction of the Commissioner:
   1. Lane lines: 90 percent by area of each individual dashed line segment.
   2. Crosswalks, stop lines, arrows, and words: 90 percent by area of each individual line, symbol, or letter.
   3. Center lines, edge lines, gore markings, and channelizing lines: 90 percent by area measured over any 3 meter (10-foot) length of any individual line regardless of width.
   4. Entire project: Measured in entirety in accordance with (a), (b), and (c) above, the entire project shall be 95 percent intact.

   Upon completion of the final performance inspection, or after satisfactory completion of any necessary corrections, the Commissioner will notify the Contractor, in writing, of the date of such final performance inspection and release him from further performance responsibility.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stabilizing Base Course: Comply with IDOT for gradation CA-6.

B. Bituminous Pavement Materials: Comply with IDOT Section 1032:
   1. Bituminous surface treatment: Section 403, Class A-1.
   2. Hot-mix asphalt: Section 1030.
   3. Hot-mix asphalt binder and surface course: Section 406.

C. Geotextile Filter Fabric: 100 percent nonwoven fabric, needle punched continuous filament polyester fabric.

D. Traffic Marking Paint:
   1. The colors for pavement markings shall conform to the standard highway colors, unless otherwise indicated.
   2. Alkyd resin type, ready mixed, complying with AASHTO M248 Type I.

E. Handicapped Parking Sign: Aluminum signs mounted as shown on the drawings, complete with anchors, and complying with the American with Disabilities Act Accessibility Guidelines and the Illinois Accessibility Code.

F. Thermoplastic Pavement Markings:
   1. Materials shall meet the requirements of Section 1095.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide all items and perform all preparation and work in accord with IDOT, referenced Sections:
   1. Subgrade: Comply with IDOT, Division 300.
   2. Granular Base: Comply with IDOT, Divisions 300 and 1000.

3.2 PLACEMENT OF STABILIZING BASE COURSE

A. Bring base course to indicated depths and profiles. Place in layers not exceeding 4 in. in depth. Compact each layer 95% in accordance with ASTM D 1557. Properly compact areas adjacent to curbs, catch basins, manholes and other areas not accessible to rollers with mechanical or hand tamping devices. Ensure granular base course materials are not contaminated with deleterious materials.

B. Add water during compaction to bring granular material to optimum moisture content.

C. Spread base course materials over prepared granular subbase to a 3 inch compacted depth. Compact to 95% per ASTM D 1557. Ensure top surface of base course is true to lines and grades indicated, with all points within 1/2 in. of indicated elevations.

D. Add water during compaction to bring stabilizing base course to optimum moisture content determined in accord with ASTM D1557. When an excess of moisture exists, rework stabilizing base course materials until optimum moisture content is obtained.

3.3 PRIMING PREPARED STABILIZED BASE COURSE

A. Ensure stabilized base course is dry and free of loose or foreign material before priming.

B. Apply primer over prepared stabilizing base course at a uniform rate of 0.3 gallon/sq. yd. Ensure primer is at temperature recommended by manufacturer. Use clean natural sand to blot excess primer.

C. Similarly prime surfaces of curbs and gutters which will be in contact with bituminous pavement.

D. Coat surfaces of manholes and catch basins that are to remain free of asphalt with oil to prevent asphalt adhesion.

3.4 PLACEMENT OF BITUMINOUS PAVEMENT

A. Place bituminous pavement within twenty-four (24) hours of priming stabilizing base course.

B. Place binder course to compacted depth as shown on Drawings.

C. Place surface course to compacted depth as shown on Drawings.

D. Do not place bituminous pavement when surface temperature is 40 F. or lower.

E. Compact each bituminous paving course to specified density, with rolling equipment approved by Architect. Start compaction as soon as pavement will bear equipment without checking or undue displacement.

F. Execute compaction in three operations in pass sequence. Ensure each pass of roller overlaps previous passes to ensure smooth surface, free of roller marks. Keep roller wheels sufficiently moist not to pick up material.

G. Hand tamp in areas not accessible to rolling equipment.

H. Ensure joints made during paving operations are straight, clean, vertical and free of broken or loose material. Prime vertical surfaces of joints to ensure tight bond.

I. Ensure surface of completed bituminous pavement is true to lines, profiles and elevations indicated, and is free from depressions exceeding 1/4 in. when measured with a 10 ft. straightedge.

J. Do not allow vehicular traffic on newly paved areas until surface coat has cooled to ambient atmospheric temperature.

3.5 TRAFFIC MARKINGS

A. Cleaning: Sweep and clean surface to remove loose material and dust.

B. Do not apply traffic marking paint until layout and placement has been verified with the Architect.

C. Apply paint with mechanical equipment to produce uniform straight edges. Apply to produce a minimum of 12 mils dry thickness.

3.6 THERMOPLASTIC PAVEMENT MARKING

A. This work shall be done at each location where pavement markings are required within 3 working days after the final bituminous surface is in place.

B. Thermoplastic Pavement Marking shall not be placed on short-term, temporary or existing pavement markings.

C. The Contractor shall protect all markings from traffic until the thermoplastic has set sufficiently to assume traffic. Any damage to the markings due to traffic shall be replaced immediately by the Contractor at his/her expense.

D. Thermoplastic pavement markings shall be applied only by contractors on the list of Approved Thermoplastic Contractors maintained by the Engineer of Operation and in effect on the dated of advertisement for bids.

E. Thermoplastic pavement marking shall be installed in accordance with the following requirements:
   1. Before applying thermoplastic, the Contractor shall remove any dirt, glaze, grease, or any other material that would reduce the adhesion of the thermoplastic to the pavement.

2. New thermoplastic material shall not be applied over existing pavement markings, unless otherwise specified. The Contractor shall remove all existing material that might cause premature failure of the new material. When the contractor is required to remove the existing paint pavement markings prior to applying the thermoplastic pavement markings, the area removed shall be no wider than the width of the pavement markings to be removed. The new thermoplastic pavement markings shall be applied over the same location where the existing pavement markings were removed.
3. The compound shall be installed in a molten state at a minimum temperature of 204 C (400 F) and maximum temperature of 246 C (475 F). Scorching or discoloration of material shall be cause for rejection by the Commissioner. The machinery shall be constructed so that all mixing and conveying parts, up to and including the shaping-die, maintain the material in the molten state.
4. Thermoplastic shall be applied only when the pavement temperature is 13 C (55 F) or greater and in no case later than November 1 or earlier than April 15. Where the thermoplastic markings cannot be placed in accordance with these specifications and the road is to be opened to traffic between November 1 and April 15 with no adequate pavement markings in place, the Contractor shall, at the direction of the Commissioner, place temporary pavement markings in accordance with Section 703 of the Standard Specification. The Contractor shall then remove the temporary pavement markings and place the thermoplastic pavement markings on or as soon after April 15 as the requirements of these specifications can be met or at such time as may be agreed upon by the Commissioner.
5. Unless directed by the Commissioner, lines shall not be laid directly over a longitudinal crack or joint. The edge of a center line or lane line shall be offset a minimum distance of 50 mm (2 in.) From a longitudinal crack or joint. Edge lines shall be approximately 50 mm (2 in.) From the edge of pavement. The finished center and lane lines shall be straight, with the lateral deviation of any 3-meter (10-foot) line not to exceed 25 mm (1 in.).
6. A binder sealer shall be applied on all bituminous pavements over 60 days old and on all P.C.C. pavement surfaces where the new thermoplastic material is to be installed. The binder sealer material shall be one of the following: butadiene styrene, neoprene, epoxy, or other binder recommended by the manufacture of the thermoplastic. The binder sealer material shall be applied in sufficient quantities to entirely cover the surface on which the thermoplastic is to be laid.
7. The thermoplastic material shall be applied at a thickness of not less than 2.50 mm (0.100-in.), but in no case shall it exceed a thickness of 2.75 mm (0.110 in.). Finished lines shall be within 7 mm (0.25 in.) of the width specified in the plans.
8. Pavement marking words and symbols shall conform closely to the dimensions and spacing specified in Article 780.12 Table 1 and the detailed drawings. Deviations from the required dimensions and spacing or other departures from reasonable standards of workmanship shall be cause for rejection by the Commissioner. Unless otherwise specified in the plans, the words and symbols shall be as specified in Table 1.
9. The Contractor shall place the thermoplastic markings with adequate drop on glass beads in accordance with Section 1095, uniformly applied to assure adequate nighttime reflectivity. It shall be the Contractor's responsibility to use a compatible combination of thermoplastic material and beads to preclude the surface beads from sinking deeply into thermoplastic.
10. Equipment used for installing thermoplastic pavement marking materials shall meet the requirements of Article 1105.01.

a. The application equipment shall have the capability of placing both white and yellow lane and edge lines on freeways and the permanently mounted on a truck of sufficient size and stability with an adequate power source to ensure smooth, straight application and which is capable of maintaining a continuous operating speed of at least 5 km/hr (3 mph). The truck shall be equipped to carry a maximum of 1,800 kg (4,000 pounds) of molten thermoplastic. The equipment shall have the capability of automatically placing intermittent and continuous lines. The equipment shall be so constructed as to provide the various widths of pavement marking lines specified. The mounting shall be such as to allow the extrusion equipment to accurately follow road irregularities and produce lines of uniform dimensions. The Commissioner may also permit the use of a hand-operated machine for those locations where only a limited quantity of lane and edge lining is required. Words, symbols, and lines other than lane and edge lines may be placed with a hand-operated machine capable of containing a minimum of 55 kg (125 pounds) of molten material. Unless specified in the plans, markings on roads other than freeways may be placed with either truck-mounted or hand-operated equipment. For the purpose of these specifications, "hand-operated" shall also include any riding units not considered as "truck-mounted".

b. The material shall be applied to the pavement by an extrusion method wherein one side of the shaping-die is the pavement or by means of an extruded ribbon. If used, the shaping-die should be equal to the width of the line specified in the plans. The methods used shall produce sharp edges on both sides and square ends on each stripe. The use of pans, aprons, or similar devices to prevent die overruns shall not be permitted.

c. The Contractor shall abide by all local ordinances governing the use of this type of equipment.

d. A mechanical beader of a design approved by the Commissioner shall be used.

e. The Contractor shall provide an accurate temperature measuring device which shall be capable of measuring the pavement temperature prior to installation of the thermoplastic and the temperature of the molten thermoplastic material immediately after it is applied.

END OF SECTION

SECTION 07115

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Dampproofing where indicated and as specified.

1.2 SUBMITTALS

A. Product Data: Submit complete printed data for each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Gardner
2. Henry
3. Kranak
4. Koppers.
5. Meadows
6. Sonneborn; Degussa
7. Tamms

2.2 BITUMINOUS DAMPPROOFING

A. Cold-Applied, Emulsified-Asphalt Dampproofing:

1. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

2.3 MISCELLANEOUS MATERIALS

A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

C. Protection Course, Asphalt-Board Type: Premolded, 1/8-inch- (3-mm-) thick, multi-ply, semirigid board consisting of a mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt, and faced on 1 side with polyethylene film.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.

1. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory condition has been corrected.

3.2 PREPARATION

A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrate of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.3 APPLICATION

A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.

1. Apply additional coats if recommended by manufacturer or required to achieve coverages indicated.
2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- (200-mm-) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.

B. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.

1. Lap dampproofing at least 1/4 inch (6 mm) onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
2. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe, and lap dampproofing at least 1/4 inch (6 mm) onto shelf angles supporting veneer.

C. On Concrete: Apply one fibered brush or spray coat at not less than 3 gal./100 sq. ft. (1.2 L/sq. m).

D. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one fibrated brush or spray coat at not less than 3 gal./100 sq. ft. (1.2 L/sq. m).

3.4 INSTALLATION OF PROTECTION COURSE

A. below grade and where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing material manufacturer's written recommendations for attaching protection course. Support protection course with spot application of trowel-grade mastic where not otherwise indicated.

3.5 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION

SECTION 08710
DOOR HARDWARE

PART 1 - GENERAL

SUMMARY

A. Section Includes: Finish hardware as required and as specified.

1.2 SUBMITTALS

A. Product Data: Submit manufacturers technical product data for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.

B. Hardware Schedule: Submit finish hardware schedule in a vertical format separate from door and frame schedule, conforming to "Sequence and Format for the Hardware Schedule" published by the Door and Hardware Institute (DHI). Horizontal and coded schedules are not acceptable.
   1. Finish Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Schedules not having the following information will be rejected:
      Type, style, function, size and finish of each hardware item.
      a. Name and manufacturer of each item.
      b. Fastenings and other pertinent information.
      c. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
      d. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
      e. Mounting locations for hardware.
      f. Door and frame sizes and materials.
   2. All hardware for Aluminum doors shall be grouped and segregated from other hardware in the schedule, and may be processed separately. Only the portion of hardware schedule pertaining to Aluminum doors and frames should be forwarded to the aluminum door contractor.
   3. Submit schedule at earliest possible date, particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) that is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule. Review and acceptance by the Owner or Architect does not relieve Contractor of responsibility to fulfill requirements of Contract Documents.

C. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule.
   1. Samples may be retrieved by the supplier. Units that are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

D. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

E. Keying Schedule: Submit keying schedule after meeting with Owner's agent for keying instructions.

F. Electrified Hardware Coordination: Where electric strikes, magnetic locks, low energy door operators are listed, provide power supplies by the device manufacturer and wiring diagrams for all items, whether listed in the sets or not. Provide elevations of each system showing locations for each item and description of system operation. Coordinate with electric contractor.

1.3 QUALITY ASSURANCE

A. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or employs an experienced architectural hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.

C. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware that has been tested and listed by UL or FM or WHI for types and sizes of doors required and complies with requirements of door and door frame labels.
   1. Exit Devices: Where required on fire-rated doors (with supplementary marking on doors' UL, FM, or WHI labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL, FM, or WHI label on exit devices indicating "Fire Exit Hardware".
   2. Fire exit devices and door closers shall be certified to be in compliance with UBC7.2 and UL 10C.

1.4 PREINSTALLATION CONFERENCE:

A. Conduct preconstruction conference at the project site in compliance with requirements of Division 1 Section "Project Management and Coordination.

B. Contractor shall notify hardware supplier two weeks prior to beginning of hardware installation to set up pre-installation meeting with installation carpenters. Hardware supplier shall provide a qualified Architectural Hardware Consultant to personally meet with, and instruct installers on job site in proper techniques for installation and adjustment of locks, closers and exit devices, and advise on required wire types and gauges for access control/electrical locking hardware.
   1. Lock, Door Closer and Exit Device Manufacturer's representative shall be available for a post installation walk and punch list assistance on behalf of the General Contractor, Architect and Owner.
   2. Review electrical roughing-in and preparatory work.
   3. Review construction keying and final keying.

1.5 DELIVERY, STORAGE AND HANDLING

A. Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Inventory hardware jointly with representatives of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

C. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

D. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

PART 2 - PRODUCTS

2.1 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of door hardware item is indicated in the Schedule of Hardware sets.

B. Manufacturer's Product Designations: A manufacturer's symbol in the hardware sets indicates whose product designation is used in the Schedule *of Hardware Sets* for purposes of establishing minimum requirements. Provide either the product designated, or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers that comply with requirements including those specified elsewhere in this section.

C. ANSI/BHMA designations used elsewhere in this section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this section.

1. Butts and Hinges: ANSI/BHMA A156.1
2. Locks & Lock Trim: ANSI/BHMA A156.13
3. Exit Devices: ANSI/BHMA A156.3
4. Door Controls - Closers: ANSI/BHMA A156.4
5. Auxiliary Locks: ANSI/BHMA A 156.5
6. Architectural Door Trim: ANSI/BHMA A156.6
7. Template Hinge Dimensions: ANSI//BHMA A156.7.
8. Door Controls - Overhead Holders: ANSI/BHMA A156.8
9. Closer Holder Release Devices: ANSI/BHMA A156.15
10. Auxiliary Hardware: ANSI//BHMA A156.16
11. Materials & Finishes: ANSI/BHMA A156.18
12. Power Assist and Low Energy Operated Door: ANSI/BHMA 156.19
13. Thresholds: ANSI/BHMA A156.21
14. Door Gasketing Systems: ANSI/BHMA A156.22
15. Continuous Hinges: ANS/BHMA 156.26

2.2 MATERIALS AND FABRICATION, GENERAL

A. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement shown.

B. Manufacturer's Name Plate: Do not use manufacturer's products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to Architect.

C. Manufacturer's identification will be permitted on rim of lock cylinders, and armor front.

D. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser quality than specified for the applicable hardware units by applicable ANSI A156 series standard for each type hardware and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

E. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

F. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

G. Provide concealed fasteners for hardware units that are exposed when door is closed, except to extent no standard units of the type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on the opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

2.3 HARDWARE FINISHES

A. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch- lock sets) for color and texture.

B. Provide finishes that match those established by BHMA as indicated in the hardware schedule or, if none indicated, match the finish to which the item is applied.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.

D. Finish Designations: Scheduled designations refer to ANSI A156.18 "Materials & Finishes Standard", including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

2.4 HINGES, BUTTS

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template- produced units.

B. Screws: Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated in the hardware schedule, provide hinge pins as follows:
1. Material: Stainless steel pins.
2. Exterior Doors: Non-removable pins (NRP).
3. Interior Doors: Non-removable pins (NRP).
4. Tips: Flat button and matching plug, finished to match leaves.
5. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.
6. All hinges shall be ball bearing type.
7. Provide safety stud and locking hole for hinges where scheduled.

D. Manufacturer, (Butts): Subject to compliance with requirements, provide products of one of the following:
1. Butts and Hinges:
   a. Bommer Industries.
   b. Hager Hinge Co.
   c. Ives; Ingersoll-Rand Co.
   d. McKinney Mfg. Co.; Assa Abloy Co.
   e. PBB, Inc.
   f. Stanley Hardware

E. Manufacturer, (Geared Continuous Hinges): Provide products having UL listed units equal to or better than the rating of the opening of one of the following manufacturers:

1.	ABH, Inc.	4240HD series
2.	Hager/Roton	780-224-HD series
3.	Pemko	FMHD series
4.	Select Products	SL-24-HD series
5.	Stanley	520 series
6.	Zero	914DB series

2.5 LOCK CYLINDERS AND KEYING

A. General: Supplier shall meet with Owner to finalize keying requirements and obtain final instructions in writing. Comply with Owner's instructions for master keying and except as otherwise indicated, provide individual change key for each lock which is not designed to be keyed alike with a group of related locks.

B. Standard System: Except as otherwise indicated, provide new master key system for project. The following is standard system for keying hierarchy per CPS MASTER KEY ORGANIZATION.
1. Great grand master
2. Grand master: Principal and Building Engineer.
3. Sub Master for the following areas and conditions:
   a. Exterior doors
   b. Special Rooms: Including rooms such auditorium, gymnasium and special use classrooms.
   c. Single User Keys: Teacher's classroom key

C. All cylinder cores shall be keyed at the factory by the cylinder manufacturer where records will be established and maintained.

D. Provide construction cores and keys during the construction period. Construction control and operating keys and cores shall not be part of the Owner's permanent key system or be furnished on the same key way as the Owner's permanent key system. Permanent core and keys shall be furnished by the hardware supplier direct to the Contractor as specified in part 3All cylinders shall be not less than six (6) pin interchangeable core and keyed into a new factory registered Grand Master Key System with a restricted key way.

2.6 LOCKS, LATCHES AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.
   1. Foot Bolts: Provide dust-proof strikes, except where special threshold construction provides non-recessed strike for bolt.
   2. Roller Strikes: Provide where recommended by manufacturer of the latch and lock units.

B. Mortise Locks:
   1. Locks shall have all functions available in one size case, manufactured from heavy gauge steel, minimum thickness 3/32", completely chrome plated for corrosion resistance and lubricity of parts. Cases shall be closed on all sides to protect internal parts. Locks shall have adjustable, beveled and armored fronts, secured with spanner head security screws. Standard 2-3/4" backset convertible from one function to another, with a full 3/4" throw two-piece, or approved one-piece anti-friction latch bolt and 1" throw dead bolt with hardened steel insert and available for a minimum door thickness of 1-3/4". Internal parts shall be heavy gauge steel, zinc dichromate-plated and nickel steel hubs.
   2. All locksets with latch bolts, regardless of trim, shall be listed by UL for A and lesser labeled doors, single or pairs.
   3. Lock trim shall be solid stainless steel levers with wrought rose, through bolted through the lock case to assure correct alignment.
   4. Lockset shall conform to, and be certified as meeting, ANSI A156.13 Grade 1 requirements.
   5. Subject to compliance with specifications, provide one of the following:
      a. Best Lock; Stanley Works, Inc. 35H-14H series
      b. Corbin Russwin; Assa Abloy Co. ML2200 LSA series
      c. Sargent; Assa Abloy Co. 8200 LNJseries
      d. Schlage;Ingersoll-Rand Co. L9000-B03 series
      e. Yale Security; Assa Abloy Co. CRR 8700FL series

C. Exit Devices:
   1. Surface applied rim, mortise and vertical rod exit devices shall be available as a complete series, listed in UL "Accident Equipment List-Panic Hardware" and "Fire Exit Hardware". All devices shall be the modern push type. These devices shall have met Performance Test Requirements in accordance with ANSI Standard A156.3 for Grade 1 exit devices. All exit devices shall be furnished with thru-bolts and sex nuts. Provide cylinder dogging for all devices except "Fire Exit Devices"
   2. Rim exit device for single doors and pairs of doors with fixed or removable mullions shall be equipped with one of the following type of latch bolts, deadlocking, guarded or square bolt with a minimum ¾" throw.
   3. All rim exit devices for pairs of doors with fixed or removable mullion shall have two-piece interlocking stabilizer blocks installed above and below the latch case.

4. Exit devices shall be the type, function, and design as listed in the schedule of finish hardware sets and shall have a manufacturer's warranty of five (5) years.
5. Removable Mullions:
   a. Constructed of 2 inch by 3 inch steel tubing prepared to receive the required strike plates.
   b. The top mounting shall be self-locking key removable type.
   c. Provide a wall mounted storage mount for each mullion by the same manufacturer.
   d. Provide stainless steel bottom floor fitting.
   e. Provide stabilizers above and below each exit device latch case.
   f. Provide factory applied paint finish cnforming to ANSI/BHMA 689.
6. Subject to complience with specifications, provide one of the following:
   a. Dorma; Dorma Co. 9000 Series
   b. Precision; Prevision Co. Apex Series
   c. Sargent; Assa Abloy Co. 80 Series
   d. Yale Security; Assa Abloy Co. 7000 Series
   e. Von Duprin; Ingersoll-Rand Co. 98 Series

D. Multi-Point Lock: Three point lock.
1. Description: Three ½" x 1" solid steel bolts with 3/4" throw; 16 gauge galvanized steel case; 12 gauge plated steel strikes; 3" backset.
2. Function: Levers on both sides of lock. Turning lever retracts bolts in unison. Bolts are held retracted and are released when door closes.
3. Acceptable Product/Manufacturer: Lock 301C; Wm. J. Perkinson Co., Inc.

2.7 PUSH/PULL UNITS

A. Concealed Fasteners: Provide manufacturer's special concealed fastener system for installation; through-bolted for matched pairs, but not for single units. Pulls to have 2-½" clearance from face of the door to the underside of the pull.

B. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following~~, or equal~~:
1. Rockwood
2. Hager
3. H B Ives
4. Trimco
5. Hiawatha

2.8 CLOSERS AND DOOR CONTROL DEVICES

A. Closers shall be rack and pinion construction with both rack and pinion of heat treated steel and with a cast iron or cast aluminum case. Closing the door will be controlled by 2 valves, one to control closing speed and one to control latching speed. Closers shall be regularly furnished with fully adjustable backcheck allowing approximate 70 degrees backcheck on both regular and parallel are closers. Delayed action shall be available. Valves shall be concealed against unauthorized adjustment and non-critical needle valve type. Spring power adjustment shall be standard with an adjustment size 1 to size 6. Closers shall be surface applied with rectangular metal covers, void of manufacturers' trademarks. All door closers intended to be mounted to the door shall be furnished with thru-bolts and sex nuts.

B. Closers shall be certified as meeting the ANSI A156.4 Grade 1 requirements, be listed by UL for all classes of labeled doors and shall have a manufacturer's warranty of ten (10) years.

C. Size of units: Except as otherwise specifically indicated, comply with the manufacturers recommendations for size of door control unit depending upon size of door, exposure to weather and anticipated frequency of use.
   1. Provide heavy duty arms.
   2. Provide spring cushion stops on parallel arm closers.
   3. Provide heavy duty dead stop parallel arms on doors equipped with electric hold open/release devices.
   4. Provide all necessary plates, brackets, arms and shoes required for proper installation of closer.

D. Acceptable Manufacturers:
   1. Dorma 8900 Series
   2. LCN 4040 Series
   3. Norton 7500 Series
   4. Sargent 281 Series

E. Door Holder/Release: Provide electric holder/release meeting the requirements of ANSI Standard A156.15.
   1. Holder/release: Surface, wall-mounted
   2. Door Armature: Cast aluminum furnished with Through-bolted and sex nuts with the projection required for wall and door conditions. Armatures requiring rod or tube extensions are not acceptable. Where required to make contact, provide shims of the same material and shape as the armature base.
   3. Electric boxes, conduit and wiring to be provided under Division 16.
   4. Voltage to be as required under Division 16.
   5. Acceptable manufacturers:
      a. LCN SEM7800 Series and SHE Series
      b. Sargent 1500 Series
      c. Rixson 900 Series

2.9 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops and similar units); either machine screws of self-tapping screw.

B. Door protection plates will be stainless steel 18-8 type 302, 0.050" thick, beveled three sides with vertical finish grain.

2.10 STOP AND HOLDERS

A. Provide wall mounted door stops and wall mounted door stop and holders as required to protect the wall and door lever.
   1. Wall door stops: BHMA Type L52261
   2. Door Holders, Interior Doors: BHMA Type L1191
   3. Door Holders, Exterior doors: BHMA Type L11271

B. Acceptable Manufacturers:
   1. Rockwood Mfg. Co.
   2. Lock Manufacturer
   3. Hager
   4. Architectural Builders Hardware (ABH)
   5. Trimco

2.11 THRESHOLDS, WEATHER SEALS AND RAIN DRIPS

A. Provide thresholds and weather seals on all exterior doors as scheduled.

B. Acceptable Manufacturers:
1. National Guard Products
2. Pemko
3. Hager
4. Zero
5. Reese

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting Locations: As indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, and "ADA Accessibility Guidelines for Buildings and Facilities", except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

C. Install door hardware units using fasteners provided by the manufacturer as specified.
1. Hinges: Phillips flat head wood screws into wood Phillips flat head machine screws into metal.
2. Exit devices: Through bolts and sex nuts.
3. Closers Through bolts and sex nuts.
4. Door holder/release; armature mounted with through bolts and sex nuts.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set thresholds for exterior doors in full bed of butyl- rubber or polyisobutylene mastic sealant. Thresholds shall be notched or coped to fit around removable mullions.

G. Removable mullion sill brackets shall be secured to the concrete floor with approved fasteners and anchors.

H. Hardware shall be installed with the fasteners and anchors provided by the manufacturer of that hardware item.

3.2 ADJUSTMENT, CLEANING AND KEYING

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Permanent cores and keys shall be delivered by the hardware supplier directly to the contractor at the keying meeting. The contractor and representative of the hardware supplier shall jointly install the permanent cores in the presence of the Owner's agent who shall receive the keys. Hardware supplier shall return the construction cores and construction keys to the manufacturer.

D. Tools and instructions: At the time of keying the hardware supplier shall provide a complete set of specialized tools and maintenance instructions and shall instruct the Owner's agent in the proper maintenance.

E. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
   1. Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

F. Continued Maintenance Service: Approximately three months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re- adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items that have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.3 SCHEDULE OF FINISH HARDWARE SETS

A. Provide finish hardware for each door to comply with requirements of this Section, hardware set numbers indicated on Door Schedule and the schedule of hardware sets on drawings.

B. Manufacturer's function and catalog numbers used in the hardware sets are identified by the following symbols.

1.	Hager Hinge Co.	H
2.	Yale Security	Y
3.	LCN Closers	L
4.	Glynn Johnson	G
5.	Rockwood Mfg. Co	R
6.	Architectural Builders Hardware Products	A
7.	Von Duprin	V
8.	National Guard	N
9.	Larco	LA
10.	Wm J. Perkenson	WP
11.	Du Seung	D

FINISH HARDWARE SETS.

HARDWARE SET # 1

HINGES	BB1279 4 ½ X 4 ½	HA	652
CLASSROOM LOCK	8808-2FL (F32)	Y	630
CLOSER	4041 EDA	L	689
KICK PLATE	15" X 2" LDW	R	630
WALL DOOR STOP	WS406/407CCV	I	630

NOTE: PROVIDE SOUND SEAL HARDWARE AND SWEEPS AT ALL CLASSROOMS

HARDWARE SET # 2

HINGES	BB1279 4 ½ X 4 ½	HA	652
STOREROOM LOCK	8805FL (FO7)	Y	630
DOOR CLOSER	4041 SPRING-CUSH	L	689

NOTE: KNURL OUTSIDE LEVER ON ELECTRICAL/ELEVATOR ROOMS

HARDWARE SET # 3

HINGES	BB1279 4 ½ X 4 ½	HA	652
STOREROOM LOCK	8805 FL (FO7)	Y	630
WALL DOOR STOP	WS406/407CCV	G	630
DOOR CLOSER	4041-ST2795	L	630

NOTE: KNURL OUTSIDE LEVER ON ELECTRICAL/ELEVATOR ROOMS

HARDWARE SET # 4

HINGES	BB1279 4 ½ X 4 ½	HA	652
CLASSROOM LOCK	8808-2FL (F32)	Y	630
DOOR CLOSER	4041-ST2795	L	689
KICK PLATE	15" X 2" LDW	R	630
WALL DOOR STOP	WS406/407CCV	I	630

HARDWARE SET # 5

HINGES	BB1279 4 ½ X 4 ½	HA	652
STORE ROOM LOCK	8805FL (FO7)	Y	630
DOOR CLOSER	4041 SPRING-CUSH	L	689
KICK PLATE	15" X 2" LDW	R	630

NOTE: KNURL OUTSIDE LEVER ON ELECTRICAL/ELEVATOR ROOMS

HARDWARE SET # 6

HINGES	BB1279 4 ½ X 4 ½	HA	652
INTRUDER LOCK	8812-2FL (F34)	Y	630
DOOR CLOSER	4041-ST2795	L	689

KICK PLATE	15" X 2" LDW	I	630
WALL DOOR STOP	WS406/407CCV	G	630

HARDWARE SET # 7

HINGES	BB1279 4 ½ X 4 ½	HA	652
CLASSROOM LOCK	8808FL (FO5)	Y	630
DOOR CLOSER	4041-ST2795	L	689
KICKPLATE	15" X 2" LDW	R	630
WALL DOOR STOP	WS406/407CCV	I	630

NOTE: FOR DOORS THAT WILL NOT STRIKE A WALL
PROVIDE, 4041 SPRING-CUSH AND OMIT WALL STOP

HARDWARE SET # 8

GEARED HINGES	780-224-HD-UL-STUD	HA	TBS
EXIT DEVICES	9827L-F-LBR-994L	V	630
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSERS	4041 EDA	L	689
KICKPLATES	15" X 1" LDW	R	630
WALL DOOR STOPS	WS406/407CCV	I	630

NOTE: IF ASTRAGAL IS REQUIRED BY UL LISTING FURNISH
1 MORTISE DEVICE 9875f-2-994L
1 VERTICAL ROD DEVICE 9827EO
1 COORDINATOR 1600 SERIES W/CLOSER BRACKETS

HARDWARE SET # 9

HINGES	BB1279 4 ½ X 4 ½	HA	652
CLASSROOM LOCK	8808FL (FO5)	Y	630
DOOR CLOSER	4041 SPRING-CUSH	L	689
KICK PLATE	15" X 2" LDW	R	630

HARDWARE SET #10

HINGES	BB1279 4 ½ X 4 ½	HA	652
HOTEL LOCK	8820FL (F15)	Y	630
DOOR CLOSER	4041 EDA OR SPRING-CUSH	L	689
KICK PLATE	15" X 2" LDW	R	630
WALL DOOR STOP	WS406/407CCV	I	630

NOTE: FOR IN-SWING DOOR USE 4041-ST2795 CLOSER

HARDWARE SET # 11

HINGES	BB1279 4 ½ X 4 ½	HA	652
INTRUDER LOCK	8812-2FL (F34)	Y	630
DOOR CLOSER	4041 SPRING-CUSH	L	689
KICK PLATE	15" X 2" LDW	R	630

HARDWARE SET # 12

HINGES	BB1279 4 ½ X 4 ½	HA	652
CLASSROOM LOCK	8808FL (FO5)	L	630
WALL DOOR STOP	WS406/407CCV	I	630

NOTE: PROVIDE DOOR CLOSER AND KICK PLATE FOR FIRE RATED DOORS

HARDWARE SET # 13

HINGES	BB1279 4 ½ X 4 ½	HA	652
VESTIBULE LOCK	8817-2FL 1" LTC (FO9)	Y	630
SEMI AUTO FLUSH BOLTS	1845 OR 1945	R	626
DUSTPROOF STRIKE	570	R	626
COORDINATOR	1600 SERIES W/CLOSER BRACKET	R	600
DOOR CLOSER	4041 EDA	L	689
WALL STOP	WS406/407CCV	I	630
KICK PLATE	15" X 1" LDW	R	630

HARDWARE SET # 14

HINGES	BB1168 4 ½ X 4 ½	HA	652
INTRUDER LOCK	8812-2FL (F34)	Y	630
DOOR CLOSER	4041-ST2795	L	689
WALL DOOR STOP	WS406/407CCV	I	630
KICK PLATES	15" X 2" LDW	R	630
MOP PLATE	15" X 1" LDW	R	630

HARDWARE SET # 15

HINGES	BB1279 4 ½ X 4 ½	HA	652
PRIVACY LOCK	8802 FL (F19 OR F22)	Y	630
DOOR CLOSER	4041-ST2795	L	689
KICK PLATE	15" X 2" LDW	R	630
WALL DOOR STOP	WS406/407CCV	I	630

HARDWARE SET # 16

HINGES	BB1279 4 ½ X 4 ½	HA	652
PRIVACY LOCK	8802FL (F19 OR F22)	Y	630
OVERHEAD STOP	4430 SERIES	A	630

KICK PLATE	15" X 2" LDW	R	630

HARDWARE SET # 17

GEARED HINGES	780-224-HD-UL-STUD	HA	652
EXIT DEVICES	9827L-F-LBR-994L	V	630
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSERS	4041 EDA	L	689
KICKPLATES	15" X 1" LDW	R	630
WALL DOOR STOP	WS406/407CCV	I	630

NOTE: IF ASTRAGAL IS REQUIRED BY UL LISTING FURNISH
1 MORTISE DEVICE 9875F-2-994L
1 VERTICAL ROD DEVICE 9827EO
1 COORDINATOR 1600 SERIES W/CLOSER BRACKETS

HARDWARE SET # 18

HINGES	BB1279 41/2 X 41/2	HA	652
PRIVACY LOCK	8802FL (F19 OR F22)	Y	630
WALL DOOR STOP	WS 406/407 CCV	I	630

NOTE: KINDERGARDEN ROOMS, PROVIDE PASSAGE LATCH 8701FL (F01)

HARDWARE SET # 19

HINGES	BB1279 4 ½ X 4 ½	HA	652
STOREROOM LOCK	8805FL (FO7)	Y	630
AUTO FLUSH BOLTS	1842 OR 1942	R	626
DOOR CLOSERS	4041 SPRING-CUSH	L	689
COORDINATOR	1600 SERIES W/CLOSER BRACKETS	R	600
KICKPLATES	15" X 1" LDW	R	630
DUST PROOF STRIKE	570	R	626

HARDWARE SET # 20

GEARED HINGES	780-224-HD SERIES	HD	TBS
EXIT DEVICE(S)	CD98EO	V	630
STABILIZER SETS	154	V	---
FURNISH BELOW IF H.M. DOOR(S)			
DOOR CLOSER(S)	4041 SPRING -CUSH	L	689
THRESHOLD(S)	626S	HA	---
SWEEP(S)	345-B	P	TBS
DRIP CAP	346	P	TBS
WEATHERSTRIP	2891-S HEAD	P	TBS
WEATHERSTRIP(S)	303-S0D JAMBS	P	TBS

HARDWARE SET # 21

CYLINDER/CYLINDERS OR PAD LOCK AS REQUIRED
BALANCE OF HARDWARE BY THE DOOR MANUFACTURER.

HARDWARE SET # 22

GEARED HINGES	780-224-HD-UL-STUD	HA	TBS
EXIT DEVICES	98L-F-994L	V	630
DOOR CLOSERS	4041 EDA	L	689
ELEC. HOLDER/RELEASE	SEM 7800 SERIES	L	689
CYLINDERS	AS REQUIRED	Y	626
KICKPLATES	15" X 1" LDW	R	630

HARDWARE SET # 23

GEARED HINGES	780-224-HD-UL-STUD	HA	TBS
EXIT DEVICES	9827L-F-LBR-994L	V	630
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSERS	4041 EDA	L	689
ELEC.HOLDER/RELEASE	SEM 7800 SERIES	L	689
KICK PLATES	15" X 1" LDW	R	630

NOTE: IF ASTRAGAL IS REQUIRED BY UL RATING FURNISH:

1	MORTISE DEVICE	9875L-2-F-994L
1	VERTICAL ROD DEVICE	9827 EO-F
1	COORDIINATOR	1600 SERIES W/CLOSER BRACKET

HARDWARE SET # 24

HINGES	BB1279 4 ½ X 4 ½	HA	652
CLASSROOM LOCK	8808FL (FO5)	Y	630
AUTO FLUSH BOLTS	1842 OR 1942	R	626
DUST PROOF STRIKE	570	R	626
O.H. FRICTION STOP/HOLD	4430 SERIES	A	630
ROLLER LATCH	590 SERIES (INACTIVE DOOR)	R	626
KICKPLATES	15" X 1" LDW	R	630

NOTE: FIRE RATED DOOR
OMIT O.H. HOLDER AND ROLLER LATCH
PROVIDE 2-4041 SPRING-CUSH CLOSERS AND A COORDINATOR

HARDWARE SET # 25

GEARED HINGE	780-224-UL-STUD	HA	TBS
EXIT DEVICE	98L-2-F-994L	V	630
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSER	4041 EDA	L	689

WALL DOOR STOP	WS406/407CCV	I	630
KICK PLATES	15" X 2" LDW	R	630

HARDWARE SET # 26

GEARED HINGE	780-224-UL-STUD	HA	TBS
EXIT DEVICE	98L-F-2 994L	V	630
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSER	4041 EDA	L	689
ELEC. HOLDER/RELEASE	SEM 7800 SERIES	L	689
KICKPLATE	15" X 2" LDW	R	630

HARDWARE SET # 27

GEARED HINGES	780-224-UL-STUD	HA	TBS
EXIT DEVICES	9827L-F-994L LBR	B	630
DOOR CLOSER	4041 EDA RHR	L	689
DOOR CLOSER	4041 -CUSH LHR	L	689
DOOR HOLDER/RELEASE	SEM 7800 SERIES RHR	L	689
DOOR HOLDER/RELEASE	SEH LHR	L	689
KICKPLATES	15" X 1" LDW	R	630
CYLINDERS	AS REQUIRED	Y	626

NOTE: IF ASTRAGAL IS REQUIRED BY UL LISTING PROVIDE

1	MORTISE DEVICE	9827EO
1	VERTICAL ROD DEVICE	9827EO-F
1	COORDINATOR	1600 SERIES W/CLOSER BRACKET

HARDWARE SET #28

GEARED HINGES	780-224-HD-UL-STUD	HA	TBS
EXIT DEVICES	98L-F-2-994L	V	630
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSERS	4041 SPRING-CUSH	L	689
KICKPLATES	15" X 1" LDW	R	630

HARDWARE SET #29

HINGES	BB1279 4 ½ X 4 ½	HA	652
STOREROOM LOCK	8805FL (F07)	Y	630
AUTO FLUSH BOLTS	1842 0R 1942 LH DOOR	R	626
DOOR CLOSERS	4041-ST2795	L	689
WALL DOOR STOP	WS406/407CCV	I	630
DUST PROOF STRIKE	210	R	626
COORDINATOR	1600 SERIES W/CLOSER BRACKETS	R	600

HARDWARE SET #30

GEARED HINGES	780-224-HD-UL-STUD	HA	652
EXIT DEVICES	98EO-F	V	630
DOOR CLOSERS	4041 EDA	L	689
ELECTRIC HOLDER/RELEASE	SEM 7800 SERIES	L	689
KICKPLATES	15" X 2" LDW	R	630
MOP PLATES	15" X 1" LDW	R	630

HARDWARE SET #31

HINGES	BB1279 4 ½ X 4 ½	HA	652
INTRUDER LOCK	8812-2FL (F34)	Y	630
DOOR CLOSER	4041 ST2795	L	689
KICKPLATE	15" X 2" LDW	R	630
WALL DOOR STOP	WS406/407CCV	I	630

HARDWARE SET #32

HINGES	BB1279 4 ½ X 4 ½	HA	652
VESTIBULE LOCK	8817-2FL (F09)	Y	630
DOOR CLOSER	4041 EDA	L	689
KICKPLATE	15" X 2" LDW	R	630
WALL DOOR STOP	WS 406/407CCV	I	630

HARDWARE SET #33

HINGES	BB1279 4 ½ X 4 ½	HA	652
CLASSROOM LOCK 8808FL	(FO5)	Y	630
O.H. STOP	4430 SERIES	A	630

HARDWARE SET # 34

HINGES	BB1168 5" X 4 ½	HA	632
STOREROOM LOCK 8805FL	(FO7)	Y	630
DOOR CLOSER	4041 SPRING-CUSH	L	689
KICKPLATE	15" X 2" LDW	R	630

HARDWARE SET #35

HINGES	BB1279 4 ½ X 4 ½	HA	630
CLASSROOM LOCK	8808-2FL (F32)	Y	630
DOOR CLOSER	4041 EDA	R	689
KICKPLATE	15" X 2" LDW	R	630
STOP & HOLD	WS40	I	626

HARDWARE SET #36

GEARED HINGES	780-224-HD-UL-STUD		HA	TBS
EXIT DEVICES	9827L-F-994L LBR		V	630
CYLINDERS	AS REQUIRED		Y	626
DOOR CLOSER	4041 EDA LHR		L	689
DOOR CLOSER	4041 CUSH RHR		L	6889
DOOR HOLDER/RELEASE	SEM 7800 SERIES	RHR	L	689
DOOR HOLDER/RELEASE	SEH	LHR	L	689
KICKPLATES	15" X 1" LDW		R	630

NOTE: IF ASTRAGAL IS REQUIRED PROVIDE

1	MORTISE DEVICE	9827EO
1	VERTICAL ROD DEVICE	9827EO-F
1	COORDINATOR	1600 SERIES W/CLOSER BRACKET

HARDWARE SET #37

GEARED HINGES	780-224-HD SERIES		HA	TBS
STORE LOCK	8860-2FL KNURL INSIDE (F14)		Y	630
DOOR CLOSER	4041 SPRING-CUSH		L	689
THRESHOLD	253X226AFGT		P	---
WEATHERSTRIP	2891-S	HEAD	P	TBS
WEATHERSTRIP	303-S	JAMBS	P	TBS
SWEEP	345-P		P	TBS
DRIP CAP	345		P	TBS

HARDWARE SET #38

GEARED HINGES	780-224-HD SERIES		HA	TBS
STORE LOCK	8860-2FL 7/8" LTC (F14)		Y	630
SURFACE BOLTS	N1825L 12" SERIES		A	630
DOOR CLOSER	4040H SPRING-CUSH ACT. DR.		L	689
O.H. STOP & HOLDER	8010 SERIES INACTIVE DOOR		A	630
PADLOCKS	400 SERIES		Y	---
THRESHOLD	253X226AFGT		P	---
WEATHERSTRIP	2891-S	HEAD	P	TBS
WEATHERSTRIP	303-S	JAMBS	P	TBS
SWEEPS	345-B		P	TBS
DRIP CAP	346		P	TBS

NOTE: FULL HEIGHT ASTRAGAL BY DOOR MANUFACTURER
APPLIED ON OUTSIDE OF ACTIVE DOOR .

HARDWARE SET #39

GEARED HINGE	780-224-HD SERIES	HA	TBS
EXIT DEVICES	CD98NL-2-697NL	V	630
STABILIZER SETS	154	V	---

CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSER	4041 CUSH/SPRING	L	689
KICKPLATES	15" X 2" LDW	R	630
THRESHOLD	626S 5"	HA	---
WEATHERSTRIP	2891-SHEAD	P	TBS
WEATHERSTRIP	303-S JAMBS	P	TBS
SWEEP	345-P	P	TBS
DRIP CAP	346	P	TBS

HARDWARE SET #40

GEARED HINGES	780-224-HD SERIES	HA	TBS
EXIT DEVICES	CD98-DT-697DT	V	630
STABILISER SETS	154	V	...
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSER	4041 CUSH-SPRING	L	689
KICK PLATE	15" X 2" LDW	R	630
THRESHOLD	626S 5"	H	---
WEATHERSTRIP	2891-SHEAD	P	TBS
WEATHERSTRIP	303-S JAMBS	P	TBS
SWEEP	345-P	P	TBS
DRIP CAP	346	P	TBS

HARDWARE SET # 41

GEARED HINGES	780-224-HD SERIES	HA	TBS
EXIT DEVICE	CD98NL-2-697NL	V	630
STABILLIZER SETS	154	V	---
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSER	4041H SPRING- CUSH	L	689
DOOR SCOPE	DS/2000	D	---
ARMOR PLATE	32" X 2" LDW	R	630
THRESHOLD	626S 5"	HA	TBS
WEATHERSTRIP	2891-SHEAD	P	TBS
WEATHERSTRIP	303-S JAMBS	P	TBS
SWEEP	345-P	P	TBS
DRIP CAP	346	P	TBS

HARDWARE SET # 42

GEARED HINGES	780-224-HD SERIES	HA	TBS
POWER TRANSFER	EPT SERIES	V	689
EXIT DEVICE	EL98NL-697DT	V	630
EXIT DEVICE	CD98DT-697DT	V	630
REMOVABLE MULLION	KR4954	V	689
STORAGE MOUNT	MT54	V	689
STABILIZERS	154	V	---

CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSERS	4041H-CUSH/SPRING	L	689
THRESHOLD	621S 5"	HA	TBS
WEATHERSTRIP	2891-SHEAD	P	TBS
WEATHERSTRIP	303-S JAMB	P	TBS
SWEEPS	345-P	P	TBS
DRIP CAP	346	P	TBS

HARDWARE SET #43

GEARED HINGES	780-224-HD SERIES	HA	TBS
EXIT DEVICE	CD98NL-697NL	V	630
EXIT DEVICE	CD98EO	V	630
REMOVABLE MULLION	KR4954	V	689
STORAGE MOUNT	164	V	689
STABILIZER SETS	154	V	---
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSERS	4041 SPRING-CUSH	L	689
KICKPLATES	15" X 2" LDW	R	630
THRESHOLD	627S 5"	HA	---
WEATHERSTRIP	2891-S HEAD	P	TBS
WEATHERSTRIP	303-S JAMB	P	TBS
SWEEPS	345-P	P	TBS
DRIP CAP	346	P	TBS

HARDWARE SET #44

GEARED HINGES	780-224-HD SERIES	HA	TBS
POWER TRANSFER EPT	SERIES	V	689
EXIT DEVICES	EL98NL-697NL	V	630
EXIT DEVICE	CD98DT-697DT	V	630
REMOVABLE MULLION	K4854	V	689
STORAGE MOUNT	MT54	V	689
STABILIZER SETS	154	V	---
CYLINDERS	AS REQUIRED	Y	626
LOW ENERGY OPERATOR	FURNISHED IN SECTION 08716	--	---
DOOR CLOSER	4041 SPRING-CUSH	L	689

NOTE: THRESHOLDS, WEATHERSTRIPPING AND SWEEPS TO BE FURNISHED BY THE ALUMINUM DOOR AND FRAME MANUFACTURER.

HARDWARE SET #45

GEARED HINGES	780-224-HD SERIES	HA	TBS
EXIT DEVICE	CD98NL-697NL	V	630
CYLINDERS	AS REQUIRED	Y	626
STABLIZER SETS	154	V	---
ELECTRIC STRIKE	6111DS-LC FAIL SECURE	V	630

LOW ENERGY OPERATOR	FURNISHED IN SECTION 08716 --	---	
DOOR CLOSERS	4041 SPRING-CUSH	L	689

NOTE: THRESHOLLDS, WEATHERSTRIPING, AND SWEEPS TO BE FURNISHED BY THE ALUMINUM DOOR AND FRAME MANUFACTURER.

HARDWARE SET # 46

GEARED HINGES	780-224-HD SERIES	HA	TBS
EXIT DEVICE	CD98DT-697DT	V	630
CYLINDERS	AS REQUIRED	Y	626
ELECTRIC STRIKE	6111DS-LC FAIL SECURE	V	630
STABILIZER SETS	154	V	---
DOOR CLOSERS	4041 SPRING-CUSH	L	689

NOTE: THRESHOLDS, WEATHERSTRIPPING AND SWEEPS TO BE FURNISHED BY THE ALUMINUM DOOR AND FRAME MANUFACTURER.

HARDWARE SET #47

GEARED HINGES	780-224-HD SERIES	HA	TBS
EXIT DEVICE	CD98DT-697DT	V	630
STABILIZER SETS	154	V	---
CYLINDERS	AS REQUIRED	Y	626
DOOR CLOSERS	4041 SPRING-CUSH	L	689

NOTE: THRESHOLDS, WEATHERSTRIPPING AND SWEEPS TO BE FURNISHED BY THE ALUMINUM DOOR AND FRAME MANUFACTURER.

HARDWARE SET #48

GEARED HINGES	780-224-HD SERIES	HA	TBS
DOOR CLOSERS	4041 SPRING-CUSH	L	689
DUMMY PUSH BARS	350	V	630
PULLS	697DT	V	630

HARDWARE SET # 49

GEARED HINGES	780-224-HD SERIES	HA	TBS
LOW ENERGY OPERATOR	FURNISHED IN SECTION 08716 --	---	
DUMMY PUSH BAR	350	V	630
PULL	697DT	V	630
CYLINDERS	AS REQUIRED	S	TBS

HARDWARE SET # 50

GEARED HINGES	780-224-HD-UL-STUD SERIES	HA	628
EXIT DEVICES	9827L-F-994L-BE LBR	V	630

DOOR CLOSER	4041 EDA	LHR	L	689
DOOR CLOSER	4041 CUSH	RHR	L	689
DOOR HOLDER RELEASE	SEM 7800 SERIES	LHR	L	689
DOOR HOLDER RELEASE	SEH	LHR	L	689
KICKPLATES	15" X 1" LDW		R	630

NOTE: IF ASTRAGAL IS REQUIRED, PROVIDE
1 MORTISE DEVICE 9875L-F 994L-BE
1 VERTICAL ROD DEVICE 9827EO-F
1 COORDINATOR 1600 SERIES W/CLOSER BRACKETS

HARDWARE SET # 51

GEARED HINGES	780-224-HD	HA	628
EXIT DEVICE	CD98L-994L-O3	V	630
CYLINDERS	AS REQUIRED	-	626
DOOR CLOSER	4041 EDA	L	689
WALL DOOR STOP	WS 406/407 CCV	I	630
KICKPLATE	15" X 2" LDW	R	630

HARDWARE SET # 52

GEARED HINGES	780-224-HD	HA	628
EXIT DEVICE	CD98EO	V	630
REMOVABLE MULLION	KR4954	V	630
STORAGE MOUNT	MT54	V	689
STABILIZERS	154	V	---
CYLINDERS	AS REQUIRED	-	626
DOOR CLOSER	4041 SPRING-CUSH	L	689
KICKPLATE	15" X 2" LDW	R	630
THRESHOLD	626S 5"	HA	---
WEATHERSTRIP	2891-1 HEAD	P	TBS
WEATHERSTRIP	303-S JAMBS	P	TBS
SWEEPS	345-P	P	TBS
DRIP CAP	346	P	TBS

HARDWARE SET # 53

HINGES	BB1279 4 ½ X 4 ½	HA	652
STOREROOM LOCK	8805FL (F07)	Y	630
DOOR CLOSER	4041 EDA	L	689
WALL DOOR STOP	WS406/407 CCV	I	630

HARDWARE SET # 54

GEARED HINGES	780-224-HD SERIES	HA	628
EXIT DEVICE	CD98EO	V	630

REMOVABLE MULLION	KR4954	V	630
STORAGE MOUNT	MT54	V	689
STABILIZERS	154	V	---
CYLINDERS	AS REQUIRED	-	626
DOOR CLOSER	4041 SPRING-CUSH	L	689

NOTE: THRESHOLDS, WEATHERSTRIPPING, AND SWEEPS TO BE FURNISHED BY THE ALUMINUM DOOR AND FRAME MANUFACTURER.

HARDWARE SET # 55

GEARED HINGES	780-224-HD-UL-STUD SERIES	HA	628
EXIT DEVICES	SS98NL-F-994NL	V	630
REMOVABLE MULLION	KR4954	V	630
STORAGE MOUNT	MT54	V	689
CYLINDERS	AS REQUIRED	-	626
DOOR CLOSERS	4041 EDA	L	689
KICKPLATES	15" X 2" LDW	R	630
WALL DOOR STOP	WS406/407 CCV	I	630

NOTE: HORN, POWER SUPPLY, KEY SWITCH AND DOOR CONTACTS BY ALARM CONTRACTOR

HARDWARE SET # 56

HINGES	BB1279 4 ½ X 4 ½		HA	652
PRIVACY LOCK	8802 FL	(F19 OR F22)	Y	630
DOOR CLOSER	4041-ST2795		L	689
KICK PLATE	15" X 2" LDW		R	630
WALL DOOR STOP	WS406/407CCV		I	630
THRESHOLD	626S 5"		HA	---
WEATHERSTRIP	2891-1	HEAD	P	TBS
WEATHERSTRIP	303-S	JAMBS	P	TBS
SWEEPS	345-P		P	TBS
DRIP CAP	346		P	TBS

HARDWARE SET # 57

GEARED HINGES	780-224-HD SERIES	HA	628
DORMITORY LOCK	8861FL (F13)	Y	63
DOOR CLOSER	4041-ST2795	L	689
WEATHERSTRIP	303-S	P	TBS
SWEEP	18100-NB	P	TBS
THRESHOLD	626S 5"	HA	---
DOOR DRIP	345	P	TBS
DRIP CAP	346	P	TBS

HARDWARE SET # 58

HARDWARE SET # 59

HINGES	BB1279 4 ½ X 4 ½	HA	652
STOREROOM LOCK	8805FL (F32)	Y	630
AUTO FLUSH BOLTS	1845 OR 1945	R	626
COORDINATOR	1600 SERIES W/CLOSER BRACKETS	R	600
DOOR CLOSER	4041 EDA LHR	L	689
DOOR CLOSER	4041 SPRING RHR	L	689
KICKPLATES	15" X 2" LDW	R	630
WALL DOOR STOP	WS406/407 CCV	I	630

HARDWARE SET # 60

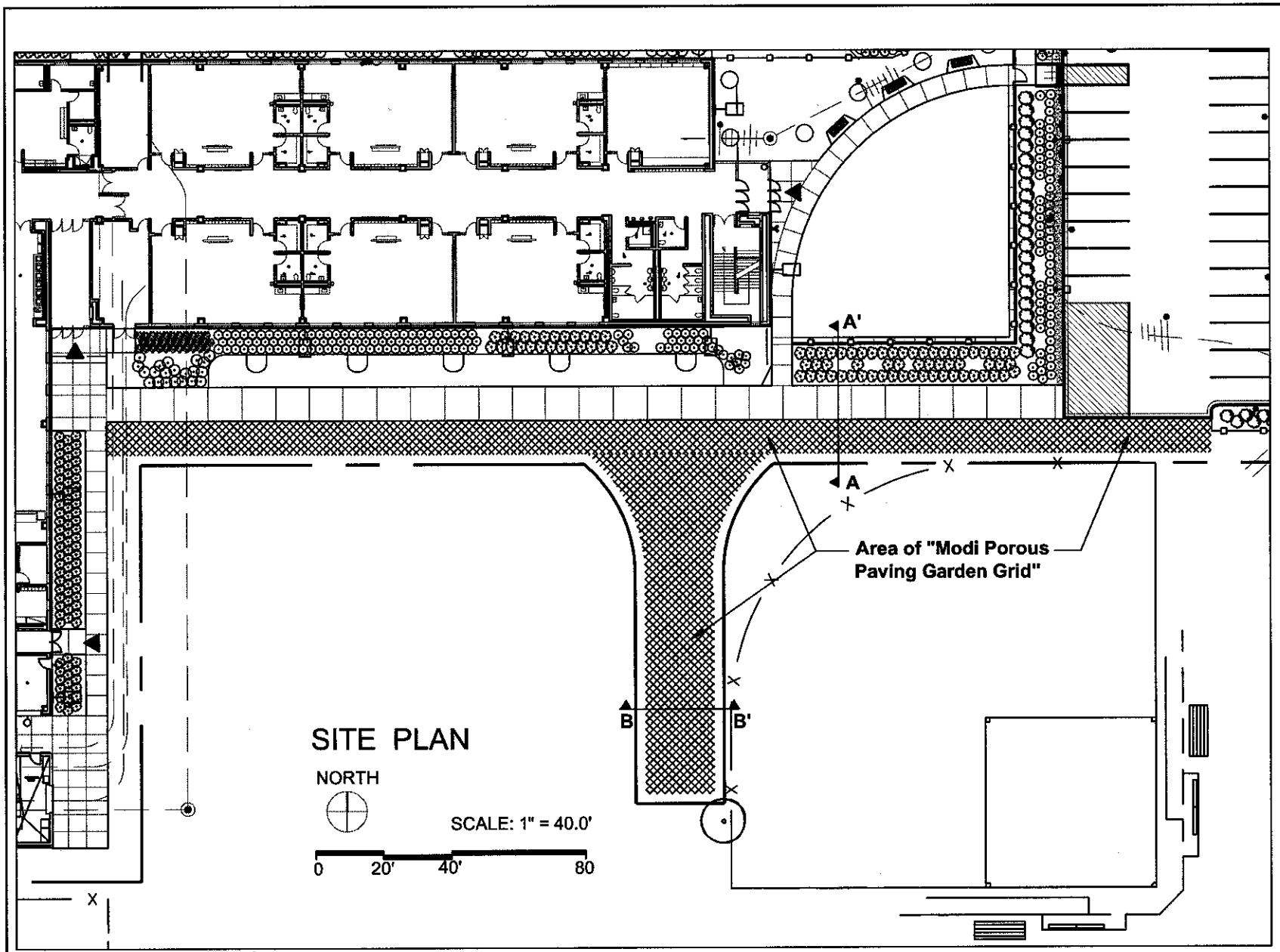
GEARED HINGES	780-224-HD-UL-STUD SERIES	HA	628
EXIT DEVICES	9827L-F-994L	V	630
CYLINDERS	AS REQUIRED	-	626
DOOR CLOSER	4041 CUSH	L	689
DOOR HOLDER RELEASE	SEH LHR	L	689
KICKPLATES	15" X 2" LDW	R	630

HARDWARE SET # 61

GEARED HINGES	780-224-HD SERIES	HA	628
STORE LOCK	8860-2FL KNURL INSIDE (F14)	Y	630
DOOR CLOSER	4041 EDA	L	689
WALL DOOR STOP	WS 443	I	626

NOTE: THRESHOLD, WEATHERSTRIPPING AND SWEEPS TO BE FURNISHED BY THE ALUMINUM DOOR AND FRAME MANUFACTURER.

END HARDWARE SETS
End of Section



CYLA Design Assoc., Inc.
Oak Park, Illinois
Landscape Architect

Lee Pasteur Hurley Area Elementary School
Drawing Title: Location of "Modi Porous Paving Garden Grid"
Reference: L 1.0

Legat No. 208028.00
PBC No. CPS-32
Contract No. 1478

Issue Date: 01.23.09
LSK-01
Addendum No. 2

LEGAT ARCHITECTS
651 West Washington Blvd. – Suite One
Chicago, Illinois 60661-2122
Tel 312.258.9595 Fax 312.258.1555
www.legat.com

NOTES:

1. Excavate and prepare sub–base for both Garden Grid and adjacent PCC pavement. Form and install PCC pavement prior to installing Garden Grids.

2. Install 8" depth CA–7 crushed stone base over compacted subgrade and compact to 98% Proctor Density. Final compacted surface should be level and pitched to drain.

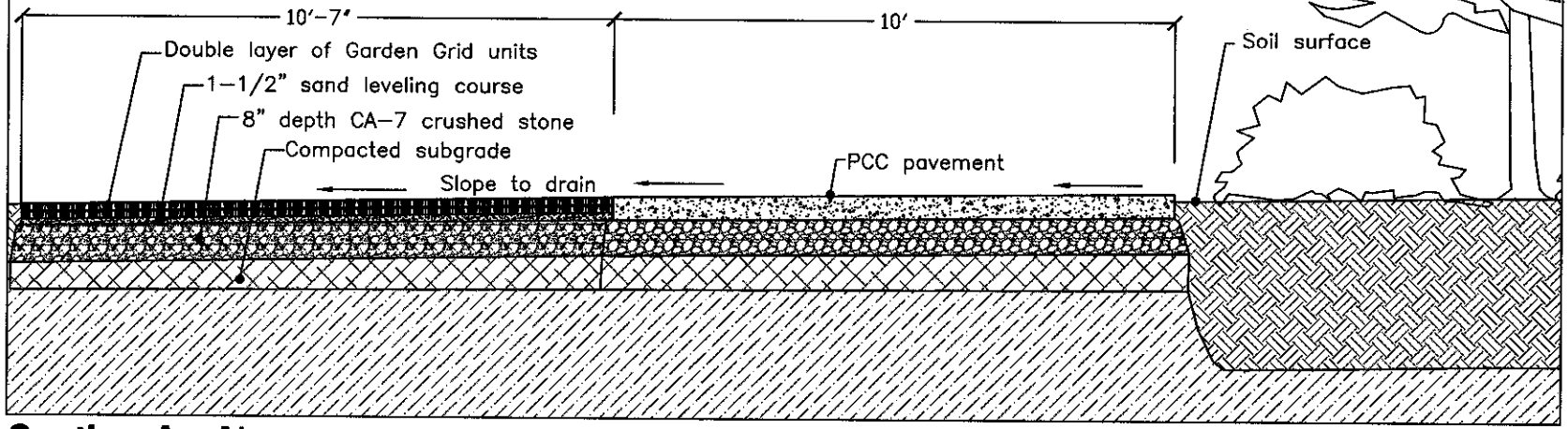
3. Install 1–2" sand leveling course.

4. Install lower layer of Grass Grid units, rounded side up, interlocking units, then install upper layer of Grass Grid units. Stagger top and bottom units to avoid aligning seams. Cut to fit as necessary.

5. Top layer of installed Garden Grid units should be flush with finished grade of adjacent PCC pavement.

6. Fill Grass Grid matrix with pulverized sandy loam topsoil mixed with spedified turfgrass seed. Grade backfilled soil level with rounded tops of top–most layer of units.

7. Product is manufactured by Green Innovations, Totonto, Ontario, Canada. To contact: phone: 1–888–725–7524; e–mail: gardengrid@greeninnovations.ca; web site: www.greeninnovations.ca



Section A - A'

CYLA Design Assoc., Inc.
Oak Park, Illinois
Landscape Architect

Issue Date: 01.23.09
LSK-02
Addendum No. 2

Legat No. 208028.00
PBC No. CPS-32
Contract No. 1478

Lee Pasteur Hurley Area Elementary School

Drawing Title: Garden Grid - Section A-A'

Reference: L 1.0

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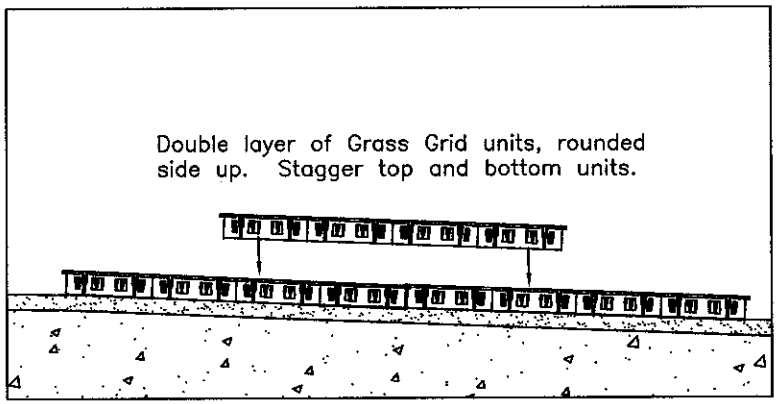
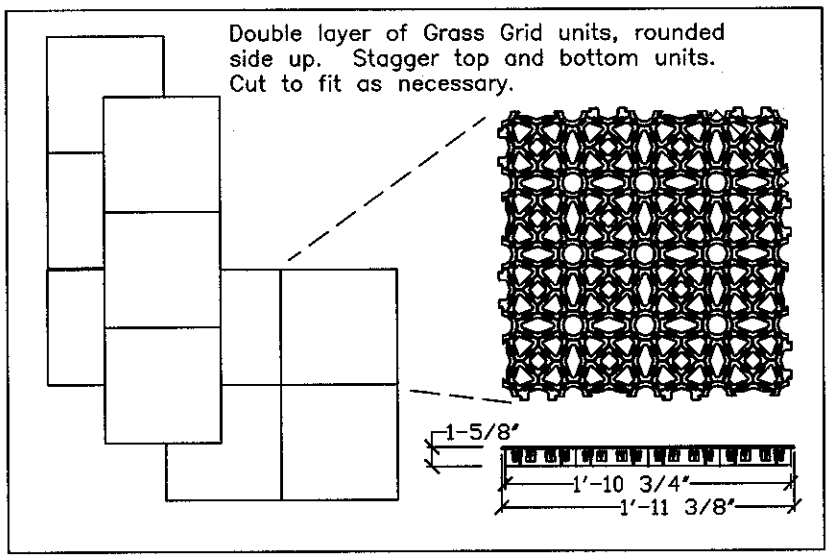
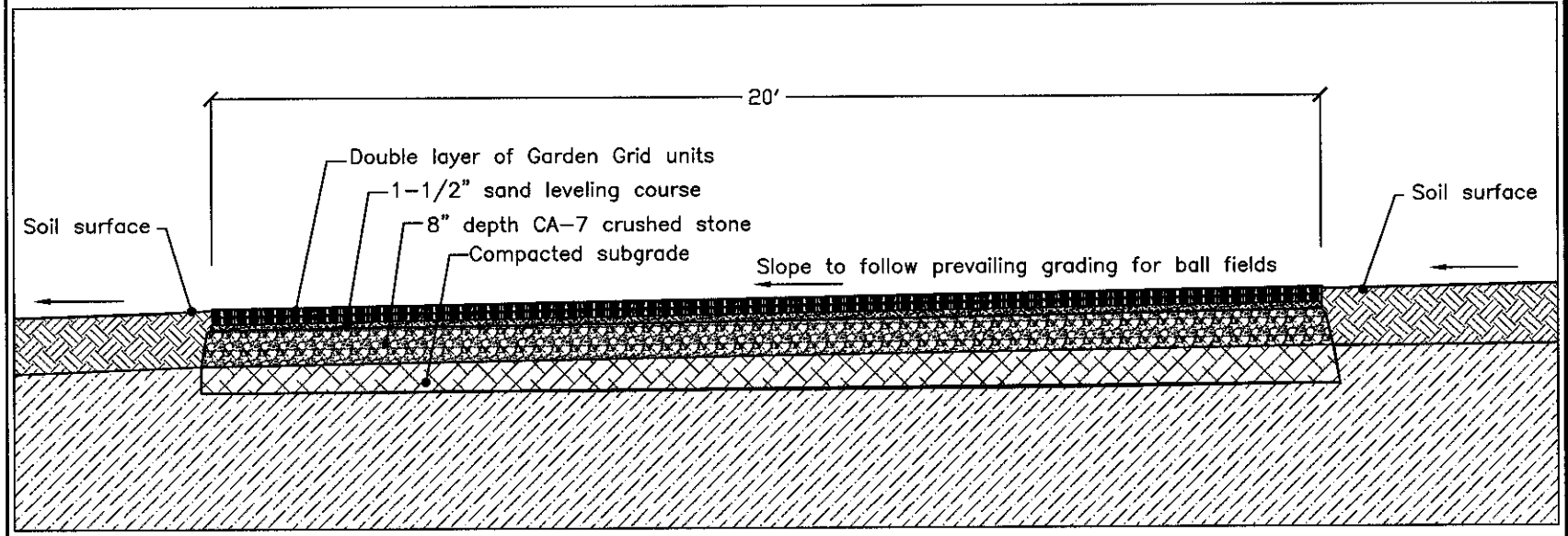


Details - Grass Grid Installation





Section B - B'

CYLA Design Assoc., Inc.
Oak Park, Illinois
Landscape Architect

Issue Date: 01.23.09
LSK-03
Addendum No. 2

Legat No. 208028.00
PBC No. CPS-32
Contract No. 1478

Lee Pasteur Hurley Area Elementary School
Drawing Title: Details - Grass Grid Installation
Section B-B'
Reference: L 1.0

LEGAT ARCHITECTS
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OPENING SCHEDULE

FLOOR	OPNG NO	OPENING						HDW SET (2)	FRAME					GLAZING	LABEL	STC RATING	NOTE KEY (2)
		TYPE	SIZE				MAT		TYPE	MAT	DETAILS						
			WIDTH	HT	THK	TRANS					HEAD	JAMB	SILL				
FIRST FLOOR	D1001A	C	3'-0"	7'-2"	1 3/4"	Y	AL	45	WW	AL				G4	NR	–	N1, N3, N5, N6, N17,N18, N19
	D1001B	C	3'-0"	7'-2"	1 3/4"	Y	AL	46	WW	AL				G4	NR	–	N1, N3, N5, N17,N18, N19
	D1001C	C	3'-0"	7'-2"	1 3/4"	Y	AL	47	WW	AL				G4	NR	–	N1, N3, N5, N17,N18, N19
	D1001D	C	3'-0"	7'-2"	1 3/4"	Y	AL	47	WW	AL				G4	NR	–	N1, N3, N5, N17,N18, N19
	D1001E	C	3'-0"	7'-2"	1 3/4"	Y	AL	49	WW	AL				G2	NR	–	N6,N17,N18
	D1001F	C	3'-0"	7'-2"	1 3/4"	Y	AL	48	WW	AL				G2	NR	–	
	D1001G	C	3'-0"	7'-2"	1 3/4"	Y	AL	48	WW	AL				G2	NR	–	N17,N18
	D1001H	C	3'-0"	7'-2"	1 3/4"	Y	AL	48	WW	AL				G2	NR	–	N17,N18
	D1002A	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	C	–	N9
	D1003	A	3'-0"	7'-2"	1 3/4"	N	HM	11	3	HM	1,2,4/A12.1	1,2,4/A12.1		G3	C	–	
	D1005	A	3'-0"	7'-2"	1 3/4"	N	WD	33	1	HM	1/A12.1	1/A12.1		–	NR	–	
	D1006	A	3'-0"	7'-2"	1 3/4"	N	WD	33	1	HM	1/A12.1	1/A12.1		–	NR	–	
	D1008	A	3'-0"	7'-2"	1 3/4"	N	WD	12	2	HM	1,2/A12.1	1,2,4/A12.1		G2	NR	–	
	D1009	A	3'-0"	7'-2"	1 3/4"	N	WD	12	2	HM	1,2/A12.1	1,2,4/A12.1		G2	NR	–	
	D1010	A	3'-0"	7'-2"	1 3/4"	N	WD	12	2	HM	1,2/A12.1	1,2,4/A12.1		G2	NR	–	
	D1011	A	3'-0"	7'-2"	1 3/4"	N	HM	14	1	HM	1/A12.1	1/A12.1		NA	B	–	
	D1012	A	3'-0"	7'-2"	1 3/4"	N	WD	14	2	HM	1,2/A12.1	1,4,5/A12.1		G2	NR	–	
	D1015	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1016	A	3'-0"	7'-2"	1 3/4"	N	HM	15	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1017	B	3'-0"	7'-2"	1 3/4"	N	HM	32	1	HM	1/A12.1	1/A12.1		G3	C	–	
	D1018A	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	23	1	HM	1/A12.1	1/A12.1		G3	B	–	N7,N17,N18
	D1018B	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	23	1	HM	1/A12.1	1/A12.1		G3	B	–	N7,N17,N18
	D1019A	A	3'-0"	7'-2"	1 3/4"	N	WD	12	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	–	
	D1019B	F	4'-10"	4'-0"	COILING	NA	GALV.	21	MFR	GALV.	9/A12.1	6/A12.1		NA	C	–	N12
	D1020	A	3'-0"	7'-2"	1 3/4"	N	WD	12	2	HM	1,2/A12.1	4,7/A12.1		G2	NR	–	
	D1021	A	3'-0"	7'-2"	1 3/4"	N	WD	12	2	HM	1,2/A12.1	1,2,4/A12.1		G2	NR	–	
	D1022	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	–	
	D1023	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	B	–	N9
	D1025	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	–	
	D1026	A	3'-0"	7'-2"	1 3/4"	N	HM	12	1	HM	1/A12.1	1/A12.1		NA	NR	–	N9
	D1027	A	3'-0"	7'-2"	1 3/4"	N	HM	18	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1028	A	3'-0"	7'-2"	1 3/4"	N	HM	18	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1029	A	3'-0"	7'-2"	1 3/4"	N	HM	12	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1030	A	3'-0"	7'-2"	1 3/4"	N	HM	15	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1031	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	B	–	N9,N17
	D1032A	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	50	1	HM	1/A12.1	1,7/A12.1		G2	NR	–	N7,N17,N18
	D1032B	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	50	1	HM	1/A12.1	1,7/A12.1		G2	NR	–	N7,N17,N18
	D1033A	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1033B	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1034	A	3'-0"	7'-2"	1 3/4"	N	WD	18	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1035	A	3'-0"	7'-2"	1 3/4"	N	WD	12	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1036A	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1036B	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1037	A	3'-0"	7'-2"	1 3/4"	N	WD	18	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1038	A	3'-0"	7'-2"	1 3/4"	N	WD	12	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1039A	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1039B	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1040	A	3'-0"	7'-2"	1 3/4"	N	WD	18	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1041	A	3'-0"	7'-2"	1 3/4"	N	WD	12	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1042	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1043A	C	3'-0"	7'-2"	1 3/4"	Y	AL	47	WW	AL	4/A2.2	1/A6.5,12/A6.6		G2	NR	–	N1,N3,N17,N18,N19
	D1043B	C	3'-0"	7'-2"	1 3/4"	Y	AL	47	WW	AL	4/A2.2	1/A6.5,12/A6.6		G2	NR	–	N1,N3,N17,N18,N19
	D1043C	C	3'-0"	7'-2"	1 3/4"	Y	AL	45	WW	AL	4/A2.2	1/A6.5,12/A6.6		G2	NR	–	N1,N3,N17,N18,N19,N6
	D1043D	C	3'-0"	7'-2"	1 3/4"	Y	AL	48	11	AL	4/A2.2	4,5/A6.6		G2	NR	–	N1,N17,N18
	D1043E	C	3'-0"	7'-2"	1 3/4"	Y	AL	48	11	AL	4/A2.2	4,5/A6.6		G2	NR	–	N1,N17,N18
	D1043F	C	3'-0"	7'-2"	1 3/4"	Y	AL	49	11	AL	4/A2.2	4,5/A6.6		G2	NR	–	N1,N17,N18,N6
	D1044	B1	3'-0"	7'-2"	1 3/4"	N	HM	23	1	HM	1/A12.1	1/A12.1		G3	B	–	N7,N17,N18 (2)
	D1046	A	3'-0"	7'-2"	1 3/4"	N	HM	10	1	HM	1/A12.1	1,7/A12.1		NA	C	–	
	D1047	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1,7/A12.1		NA	C	–	N9
	D1049A	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1049B	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1050	A	3'-0"	7'-2"	1 3/4"	N	WD	18	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1051	A	3'-0"	7'-2"	1 3/4"	N	WD	12	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1052A	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1052B	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1053	A	3'-0"	7'-2"	1 3/4"	N	WD	18	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1054	A	3'-0"	7'-2"	1 3/4"	N	WD	12	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1055A	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1055B	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D1056	A	3'-0"	7'-2"	1 3/4"	N	WD	18	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1057	A	3'-0"	7'-2"	1 3/4"	N	WD	12	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1058A	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	B	–	N9,N17 (2)
	D1058B	A1	2@3'-0"	7'-2"	1 3/4"	N	HM	43	1	HM	9/A12.1	6/A12.1		NA	NR	–	N3,N9,N17,N18,N19
	D1059A	C	3'-0"	7'-2"	1 3/4"	Y	AL	49	11	AL				G3	NR	–	N1,N17,N18,N6
	D1059B	C	3'-0"	7'-2"	1 3/4"	Y	AL	48	11	AL				G3	NR	–	N1,N17,N18
	D1059C	C	3'-0"	7'-2"	1 3/4"	Y	AL	48	11	AL				G3	NR	–	N1,N17,N18
	D1059D	C	3'-0"	7'-2"	1 3/4"	Y	AL	45	WW	AL				G2	NR	–	N1,N3,N17,N18,N19,N6

LEGATARCHITECTS

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Lee Pasteur Hurley Area Elementary School

Drawing Title: Opening Schedule

Reference: A12.1

Legat No. 208028.00

PBC No. CPS-32

Contract No. 1478

Issue Date: 01.27.09

ASK-01

Addendum No. 2

FLOOR	NO OPNG	TYPE	OPENING WIDTH	OPENING HT	OPENING THK	OPENING TRANS	OPENING MAT	SET HDW	FRAME TYPE	FRAME MAT	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	GLAZING	LABEL	STC RATING	KEY NOTE
	D1059E	C	3'-0"	7'-2"	1 3/4"	Y	AL	47	WW	AL				G2	NR	–	N1,N3,N17,N18,N19
	D1059F	C	3'-0"	7'-2"	1 3/4"	Y	AL	47	WW	AL				G2	NR	–	N1,N3,N17,N18,N19
	D1060	B1	2@3'-0"	7'-2"	1 3/4"	Y	HM	23	5	HM	1/A12.1	1/A12.1		G3	B	–	
	D1061	A	3'-0"	7'-2"	1 3/4"	N	HM	10	1	HM	1/A12.1	1/A12.1		NA	C	–	
	D1062	A1	2@3'-0"	7'-2"	1 3/4"	N	HM	19	1	HM	1/A12.1	1/A12.1		NA	B	–	
	D1063	ELEVATOR	–	–	–	–	S.S.	–	–	S.S.	–	–		–	B	–	N10
	D1066A	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	27	5	HM	1/A12.1	1/A12.1		G3	B	–	N7,N17,N20
	D1066B	B	3'-0"	7'-2"	1 3/4"	N	HM	51	1	HM	1/A12.1	1/A12.1		G2	NR	–	N17,N18,N20
	D1067A	B	4'-0"	7'-2"	1 3/4"	N	HM	35	1	HM	1/A12.1	1/A12.1		G2	NR	–	
	D1067B	B	2@3'-0"	7'-2"	1 3/4"	N	HM	23	5	HM	1/A12.1	1/A12.1		G3	B	–	N7,N17,N18,N20
	D1068A	A	3'-0"	7'-2"	1 3/4"	N	HM	12	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1068B	LITE	3'-4"	4'-8"	–	NA	NA	–	9	HM	2/A12.1	2/A12.1		G1	NR	–	N15
	D1069	A	3'-0"	7'-2"	1 3/4"	N	HM	12	1	HM	1/A12.1	1/A12.1		NA	NR	–	
	D1071	A1	2@3'-0"	7'-2"	1 3/4"	N	HM	42	5	HM	9/A12.1	8/A12.1		NA	NR	–	N3,N14,N17,N18,N19
	D1072A	A1	2@3'-0"	7'-2"	1 3/4"	N	HM	52	5	HM	9/A12.1	8/A12.1		NA	NR	–	N3,N14,N17,N18,N19
	D1072B	A1	2@3'-0"	7'-2"	1 3/4"	N	HM	55	5	HM	9/A12.1	8/A12.1		NA	NR	–	N3,N14,N17,N18,N19
	D1073	A	3'-0"	7'-2"	1 3/4"	N	WD	6	3	HM	1,2/A12.1	1,2,4/A12.1		G3	C	–	N20
	D1074	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	C	–	N9
	D1075	A	3'-0"	7'-2"	1 3/4"	N	HM	7	1	HM	1/A12.1	1/A12.1		NA	B	–	N9
	D1076	A	3'-0"	7'-2"	1 3/4"	N	HM	15	1	HM	1/A12.1	1/A12.1		NA	C	–	
	D1077	A	3'-0"	7'-2"	1 3/4"	N	HM	56	1	HM	1/A12.1	1/A12.1		NA	C	–	
	D1078	A	3'-0"	7'-2"	1 3/4"	N	HM	15	1	HM	1/A12.1	1/A12.1		NA	C	–	N3,N9,N18
	D1079	A	3'-0"	7'-2"	1 3/4"	N	HM	56	1	HM	1/A12.1	1/A12.1		NA	C	–	
	D1080A	A	3'-0"	7'-2"	1 3/4"	N	HM	57	1	HM	9/A12.1	8/A12.1		NA	NR	–	
	D1080B	F	8'-0"	9'-0"	COILING	NA	GALV.	21	MFR	GALV.				NA	NR	–	N12
	D1081	B	3'-0"	7'-2"	1 3/4"	N	HM	56	1	HM	1/A12.1	1/A12.1		G3	B	–	
	D1082	A	3'-0"	7'-3"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	B	–	
	D1083A	A	3'-0"	7'-2"	1 3/4"	N	HM	51	1	HM	1/A12.1	1/A12.1		NA	B	–	N17,N18
	D1083B	A	3'-0"	7'-2"	1 3/4"	N	HM	28	1	HM	1/A12.1	1/A12.1		NA	B	–	N17,N18
	D1083C	A	3'-0"	7'-2"	1 3/4"	N	HM	28	1	HM	1/A12.1	1/A12.1		NA	B	–	N17,N18
	D1084	A	3'-0"	7'-3"	1 3/4"	N	HM	53	1	HM	1/A12.1	1/A12.1		NA	B	–	
	D1085A	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	23	5	HM	1/A12.1	1/A12.1		G3	B	30	N4,N7,N17,N18
	D1085B	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	23	5	HM	1/A12.1	1/A12.1		G3	B	30	N4,N7,N17,N18
	D1085C	C1	2@3'-0"	7'-2"	1 3/4"	Y	AL	54	WW	AL	9/A6.3	6/A6.5		G2	NR	–	N1,N3,N17,N18,N19
	D1085D	C1	2@3'-0"	7'-2"	1 3/4"	Y	AL	54	WW	AL	9/A6.3	6/A6.5		G2	NR	–	N1,N3,N17,N18,N19
	D1086A	A	3'-0"	7'-2"	1 3/4"	N	HM	4	1	HM	1/A12.1	1,7/A12.1		NA	B	–	
	D1088B	LITE	4'-6"	4'-8"	–	NA	NA	–	9	HM	2/A12.1	2/A12.1		G3	B	–	N15
	D1087	A1	2@3'-0"	7'-2"	1 3/4"	N	HM	19	5	HM	1/A12.1	7/A12.1		NA	B	–	

OPENING SCHEDULE

FLOOR	OPNG NO	OPENING TYPE	OPENING SIZE WIDTH	OPENING SIZE HT	OPENING SIZE THK	OPENING SIZE TRANS	OPENING MAT	HDW SET	FRAME TYPE	FRAME MAT	FRAME DETAILS HEAD	FRAME DETAILS JAMB	FRAME DETAILS SILL	GLAZING	LABEL	STC RATING	NOTE KEY
SECOND FLOOR	D2002	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D2003	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D2004	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2005	A	3'-0"	7'-2"	1 3/4"	N	WD	7	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D2005A	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2006B	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2007	A	3'-0"	7'-2"	1 3/4"	N	WD	9	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D2008	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	23	1	HM	1/A12.1	1/A12.1		G3	B	-	N7,N17,N18
	D2010A	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2010B	A1	3'-0"	7'-2"	1 3/4"	N	WD	3	1	HM	1/A12.1	1/A12.1		NA	NR	-	
	D2011A	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2011B	A	2@3'-0"	7'-2"	1 3/4"	N	WD	19	1	HM	1/A12.1	1/A12.1		NA	NR	-	
	D2012	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2013	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2014	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2015	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2016	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2017	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2018	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	23	1	HM	1/A12.1	1/A12.1		G3	B	-	N7,N17,N18
	D2020	A	3'-0"	7'-2"	1 3/4"	N	HM	10	1	HM	1/A12.1	1/A12.1		NA	C	-	
	D2021A	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	C	-	N9
	D2022A	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	50	1	HM	1/A12.1	1,7/A12.1		G2	NR	-	N7,N17,N18
	D2022B	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	50	1	HM	1/A12.1	1,7/A12.1		G2	NR	-	N7,N17,N18
	D2023	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2024	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2025	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2026	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2027	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2028	A	3'-0"	7'-2"	1 3/4"	N	HM	2	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D2029	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D2030	A	3'-0"	7'-2"	1 3/4"	N	WD	32	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D2031	A	3'-0"	7'-2"	1 3/4"	N	HM	10	1	HM	1/A12.1	1/A12.1		NA	C	-	
	D2032	A1	2@3'-0"	7'-2"	1 3/4"		HM	19	1	HM	1/A12.1	1/A12.1			B	-	
	D2035	ELEVATOR	-	-	-	-	S.S.	-	-	S.S.	-	-		-	B	-	N10
	D2036	A	3'-0"	7'-2"	1 3/4"	N	HM	9	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D2037	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM				NA	C	-	N9
	D2038A	A1	2@3'-0"	7'-2"	1 3/4"	N	HM	59	5	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D2038B	A	3'-0"	7'-2"	1 3/4"	N	HM	53	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D2039	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	55	1	HM	1/A12.1	1/A12.1		G3	C	-	N7,N17,N18
	D2040	A	3'-0"	7'-2"	1 3/4"	N	HM	58	1	HM	1/A12.1	1/A12.1		NA	A	-	N9
	D2041	A	3'-0"	7'-2"	1 3/4"	N	HM	2	1	HM	1/A12.1	1/A12.1		NA	A	-	N9
	D2042	B	3'-0"	7'-2"	1 3/4"	N	HM	25	1	HM	1/A12.1	1/A12.1		G3	B	-	N17,N18

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Lee Pasteur Hurley Area Elementary School

Drawing Title: Opening Schedule

Reference: A12.1

Legat No. 208028.00

PBC No. CPS-32

Contract No. 1478

Issue Date: 01.27.09

ASK-03

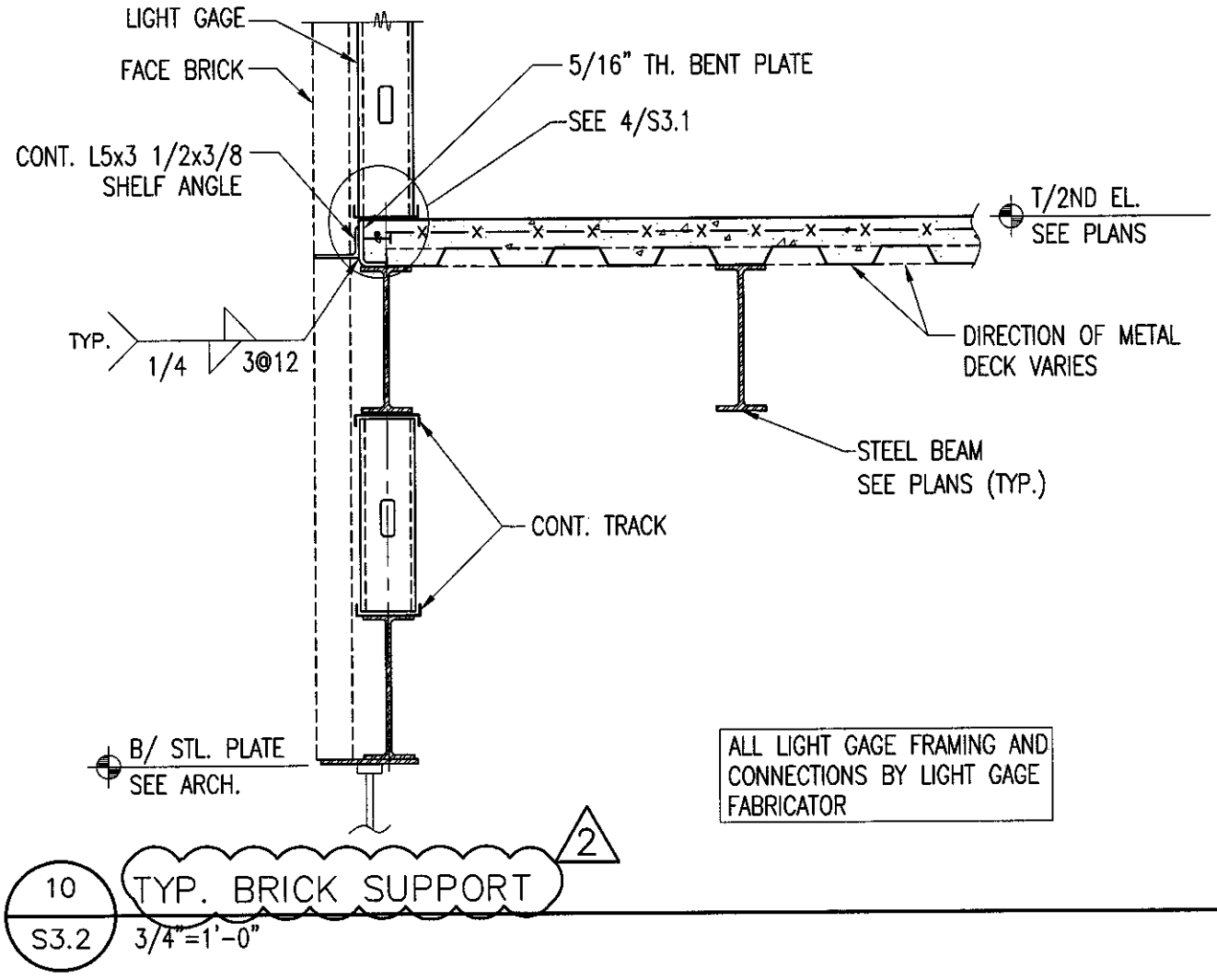
Addendum No. 2

OPENING SCHEDULE

FLOOR	OPNG NO	OPENING TYPE	SIZE WIDTH	SIZE HT	SIZE THK	SIZE TRANS	MAT	HDW SET	FRAME TYPE	FRAME MAT	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	GLAZING	LABEL	STC RATING	NOTE KEY
THIRD FLOOR	D3002A	C2	2@3'-0"	7'-2"	1 3/4"	Y	HM	60	4	HM	1,2/A12.1	2/A12.1		G3	C	30	N4,N7,N17,N18,N20
	D3002B	C3	3'-0"	7'-2"	1 3/4"	N	HM	25	2	HM	1/A12.1	1/A12.1		NA	C	30	N4,N17,N20
	D3002C	B	3'-0"	7'-2"	1 3/4"	N	WD	7	1	HM	1/A12.1	1/A12.1		G2	NR	-	
	D3002D	LITE	8'-0"	3'-4"	-	NA	NA	-	10	HM	2/A12.1	2/A12.1		G2	NR	-	N15
	D3004	A	3'-0"	7'-2"	1 3/4"	N	HM	7	1	HM	1/A12.1	1/A12.1		NA	B	-	
	D3005	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	23	1	HM	1/A12.1	1/A12.1		G3	B	-	N7,N17,N18
	D3007	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3008	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3009	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3010	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3011	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3012	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3013	A	3'-0"	7'-2"	1 3/4"	N	WD	7	1	HM	1/A12.1	1/A12.1		NA	B	-	
	D3014	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	B	-	
	D3014A	A1	2@3'-0"	7'-2"	1 3/4"	N	HM	19	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D3015A	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	4,7/A12.1		G3	C	30	N4,N20
	D3015B	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	2,4/A12.1		G3	C	30	N4,N20
	D3016	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	23	1	HM	1/A12.1	1/A12.1		G3	B	-	N7,N17,N18
	D3018	A	3'-0"	7'-2"	1 3/4"	N	HM	10	1	HM	1/A12.1	1/A12.1		NA	C	-	
	D3019	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	C	-	N9
	D3021A	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	50	1	HM	1/A12.1	1/A12.1		G2	NR	-	N7,N17,N18
	D3021B	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	50	1	HM	1/A12.1	1/A12.1		G2	NR	-	N7,N17,N18
	D3022	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3023	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3024	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3025	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3026	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3027	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	30	N4,N20
	D3028	A	3'-0"	7'-2"	1 3/4"	N	HM	10	1	HM	1/A12.1	1/A12.1		NA	C	-	
	D3029	A1	2@3'-0"	7'-2"	1 3/4"		HM	19	1	HM	1/A12.1	7/A12.1		NA	B	-	
	D3032	ELEVATOR	-	-	-	-	S.S.	-	-	S.S.	-	-		-	B	-	N10
	D3033A	B1	2@3'-0"	7'-2"	1 3/4"	N	HM	55	1	HM	1/A12.1	1/A12.1		G3	B	-	N17,N18
	D3033B	C	3'-0"	7'-2"	1 3/4"	N	AL	61	1	AL	9/A12.1	8/A12.1		G2	NR	-	N3,N18
	D3034	A	3'-6"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	B	-	
	D3035	A	3'-0"	7'-2"	1 3/4"	N	WD	1	2	HM	1,2/A12.1	1,2,4/A12.1		G3	C	40	N4,N20
	D3036	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	1/A12.1	1/A12.1		NA	C	-	N9
	D3037A	A1	2@3'-0"	7'-2"	1 3/4"	N	HM	19	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D3037B	A	3'-0"	7'-2"	1 3/4"	N	HM	53	1	HM	1/A12.1	1/A12.1		NA	B	-	N9
	D3038	A1	2@3'-0"	7'-2"	1 3/4"	N	HM	38	1	HM	9/A12.1	8/A12.1		NA	NR	-	N3,N18
	D3039	B	3'-0"	7'-2"	1 3/4"	N	HM	25	1	HM	1/A12.1	1/A12.1		G3	B	-	N7,N17,N18
FLOOR	NO OPNG	OPENING TYPE	SIZE WIDTH	SIZE HT	SIZE THK	SIZE TRANS	MAT	SET HDW	FRAME TYPE	FRAME MAT	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	GLAZING	LABEL	STC RATING	KEY NOTE

OPENING SCHEDULE

FLOOR	OPNG NO	OPENING TYPE	SIZE WIDTH	SIZE HT	SIZE THK	SIZE TRANS	MAT	HDW SET	FRAME TYPE	FRAME MAT	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	GLAZING	LABEL	STC RATING	NOTE KEY
CONCESSIONS	04003	A	3'-0"	7'-2"	1 3/4"	N	HM	57	1	HM	7/A12.2	7/A12.2		NA		-	N3,N19
	04005	A	3'-0"	7'-2"	1 3/4"	N	HM	57	1	HM	7/A12.2	7/A12.2		NA		-	N3,N19
	D4005A	F	6'-0"	4'-8"	COILING	NA	GALV	21	PR	GALV	5/A5.9	-		NA	NR	-	N12
	04006	A	3'-0"	7'-2"	1 3/4"	N	HM	3	1	HM	7/A12.2	7/A12.2		NA		-	
FLOOR	NO OPNG	OPENING TYPE	SIZE WIDTH	SIZE HT	SIZE THK	SIZE TRANS	MAT	SET HDW	FRAME TYPE	FRAME MAT	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	GLAZING	LABEL	STC RATING	KEY NOTE



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Lee Pasteur Hurley Area Elementary School

Drawing Title: SHEET S3.2 - SECTIONS & DETAILS

Reference: DETAIL 10/S3.2

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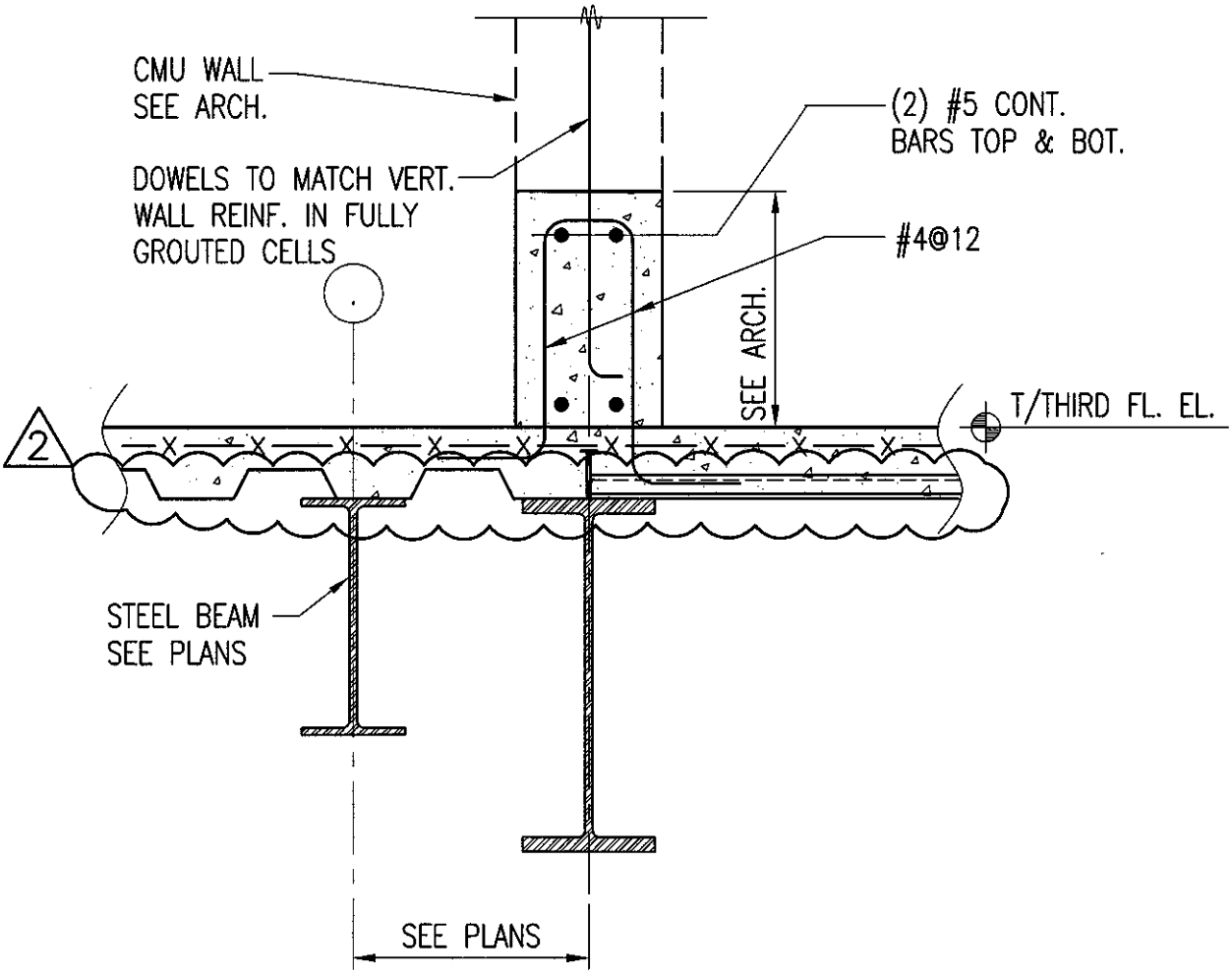
SSK-01

Addendum No. 2



3 / S3.3 CURB AT GYM

1"=1'-0"

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Drawing Title: SHEET S3.3 - SECTIONS & DETAILS

Reference: DETAIL 3/S3.3

Legat No. 208028.00

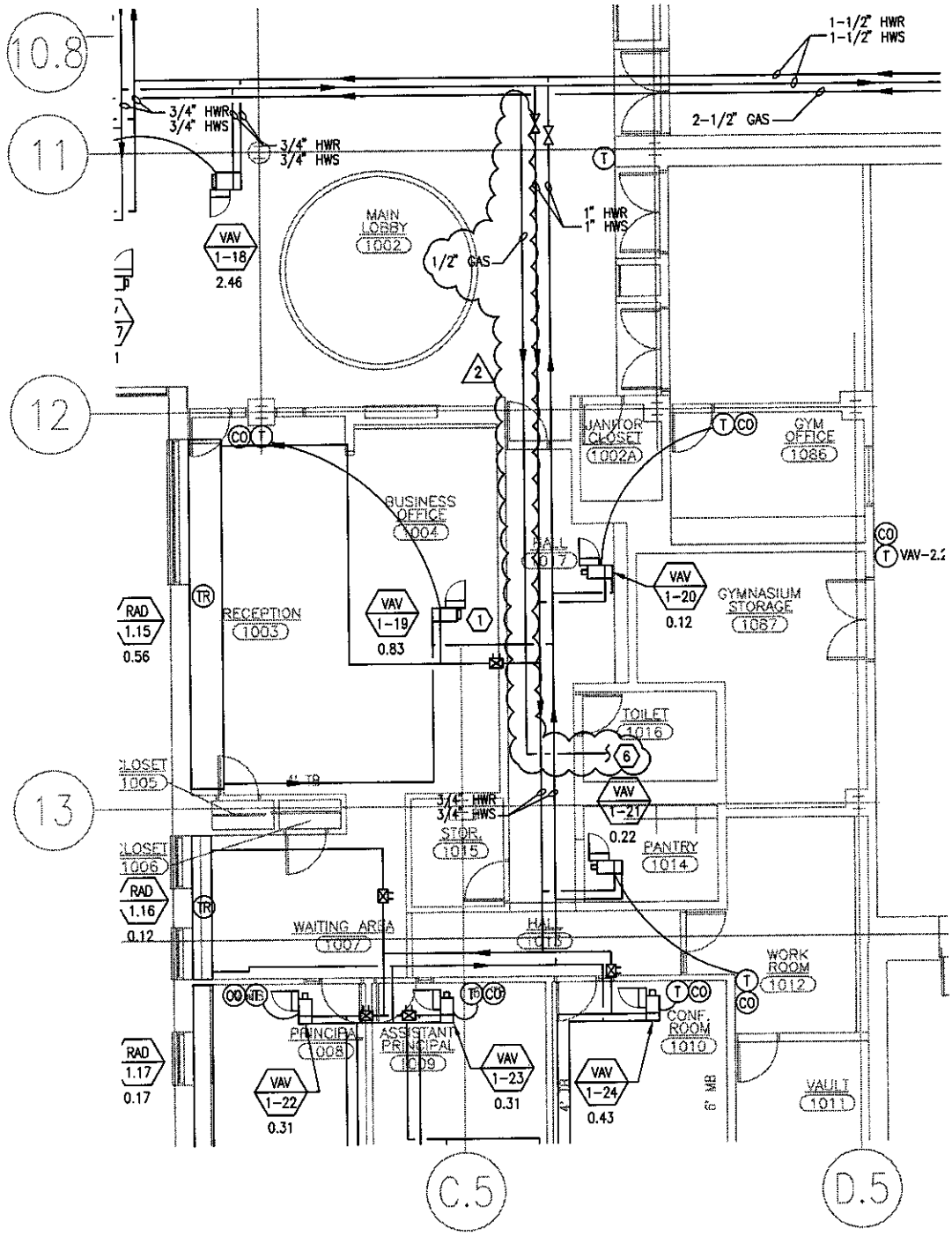
PBC No. CPS-32

Contract No. 1478

Issue Date: 01.21.09

SSK-02

Addendum No. 2



5 SEE DETAIL 3 ON SHEET P6.1 FOR WATER HEATERS GAS PIPING INSTALLATION DETAILS.

6 PROVIDE A 1/2" GAS LINE TO TEACHERS DEMONSTRATION SINK IN LAB ON SECOND FLOOR. PROVIDE ELECTRONIC SOLENOID, GAS COCK AND EMERGENCY DISCONNECT AT DESK. SEE DETAIL 4 ON SHEET M5.4 FOR CONNECTION AND COORDINATION. CONTRACTOR WILL COORDINATE WITH ARCHITECTURAL THE EXACT LOCATION OF GAS RISER THROUGH THE SECOND FLOOR. GAS LINE WILL PENETRATE FLOOR UNDER TEACHERS DEMONSTRATION DESK ON SECOND FLOOR.

1 PARTIAL FIRST FLOOR MECHANICAL PIPING PLAN

MSK-01 1/8" = 1'-0"

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Drawing Title: Mechanical Piping First Floor Plan - Gas Piping Modifications

Reference: M1.1C

Legat No. 208028.00

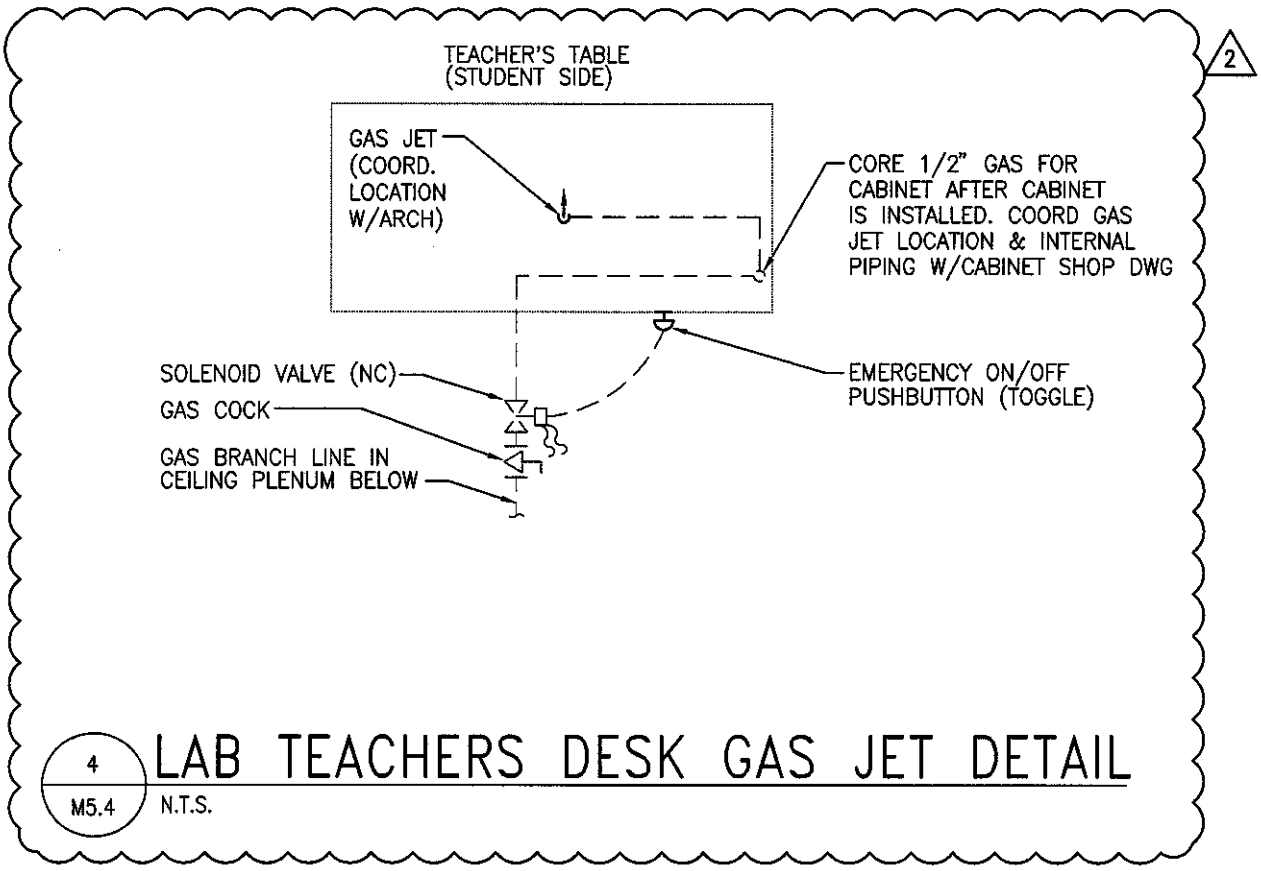
PBC No. CPS-32

Contract No. 1478

Issue Date: 01.21.09

MSK-01

Addendum No. 2



4 / M5.4

LAB TEACHERS DESK GAS JET DETAIL

N.T.S.

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Lee Pasteur Hurley Area Elementary School

Drawing Title: Lab Teachers Desk Gas Jet Detail

Reference: M5.4

Legat No. 208028.00

PBC No. CPS-32

Contract No. 1478

Issue Date: 01.21.09

MSK-02

Addendum No. 2

AIR HANDLING UNIT SCHEDULE

TAG	LOCATION	AREA SERVED	CFM	SUPPLY FAN								MOTOR DATA			COOLING COIL	HEATING COIL	FILTER	UNIT WT LBS	MANUFACTURER AND MODEL	REMARKS
				OUTSIDE AIR		TOTAL S.P. "W"	ESP "W"	FAN SPEED RPM	SOUND LEVEL	HP	TYPE	CLASS	VOLTS	PH	HZ	TAG	TAG	TAG		
				MIN	MAX															
AHU-1	3RD FLOOR MECH ROOM	1ST FLOOR	19,740	8,295	19,480	5.20	2.70	1347	N/A	20.0	PLENUM	2	460	3	60	CC-1	HC-1	F-1	8,683	TRANE: MCC0840	①②③
AHU-2	3RD FLOOR MECH ROOM	2ND FLOOR	25,050	7,825	25,050	5.68	3.10	1539	N/A	40.0	PLENUM	2	460	3	60	CC-2	HC-2	F-2	10,417	TRANE: MCC0850	①②③
AHU-3	3RD FLOOR MECH ROOM	3RD FLOOR	27,580	8,510	27,580	5.34	2.80	1595	N/A	40.0	PLENUM	2	460	3	60	CC-3	HC-3	F-3	11,205	TRANE: MCC0857	①②③
AHU-4	3RD FLOOR MECH ROOM	GYM/LUNCH RM	18,850	6,225	18,850	6.51	3.20	1460	N/A	30.0	PLENUM	2	460	3	60	CC-4	HC-4	F-4	11,272	TRANE: MCC0840	①②③④

⑥ VFD AND UNIT CONTROLS SHALL BE UNIT MOUNTED. COORDINATE FINAL LOCATION THROUGH SHOP DRAWINGS

2 ① PROVIDE A UNIT MOUNTED DISCONNECT
② NOT USED
③ ELECTRICAL CONTRACTOR WILL PROVIDE HOA STARTER, MECHANICAL WILL INSTALL, CONTRACTOR WILL WIRE AND POWER FOR SINGLE POWER CONNECTION PROVIDE A SEPARATE CIRCUIT FOR A/H INTERIOR LIGHTING
④ PROVIDE ENERGY RECOVERY WHEEL
⑤ ALL AIR HANDLING UNITS TO HAVE MERV-13 PRE FILTERS

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Lee Pasteur Hurley Area Elementary School

Drawing Title: AIR HANDLING UNIT SCHEDULE

Reference: M7.2

Legat No. 208028.00

PBC No. CPS-32

Contract No. 1478

Issue Date: 01.21.09

MSK-03

Addendum No. 2

RADIANT PANEL SCHEDULE (HYDRONIC)

TAG	LOCATION	GPM	NUMBER OF TUBES	W/O PER 100 FT. FT W.G.	TOTAL PANEL W/O FT W.G.	EAT (F)	LAT (F)	LENGTH	BTUH PER LN. FT.	MBH	MANUFACTURER	MODEL	REMARKS
RAD-1.1	PRE-K/K-1 1033	0.26	5	0.5	0.3	150	120	13'-6"	285	3.8	STERLING	LRP-30	1, 2
RAD-1.2	PRE-K/K-1 1033	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-1.3	PRE-K/K-2 1036	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-1.4	PRE-K/K-2 1036	0.26	5	0.5	0.3	150	120	13'-6"	285	3.8	STERLING	LRP-30	1, 2
RAD-1.5	PRE-K/K-3 1039	0.26	5	0.5	0.3	150	120	13'-6"	285	3.8	STERLING	LRP-30	1, 2
RAD-1.6	PRE-K/K-3 1039	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-1.7	CLASSROOM 1 1042	0.44	4	0.5	0.8	150	120	28'-0"	238	6.7	STERLING	LRP-24	1, 2
RAD-1.8	CLASSROOM 1 1042	0.44	4	0.5	0.8	150	120	28'-0"	238	6.7	STERLING	LRP-24	1, 2
RAD-1.9	PRE-K/K-6 1046	0.53	4	0.8	0.9	150	120	28'-0"	285	8.0	STERLING	LRP-24	1, 2
RAD-1.10	PRE-K/K-6 1046	0.26	5	0.5	0.3	150	120	13'-6"	285	3.8	STERLING	LRP-30	1, 2
RAD-1.11	PRE-K/K-5 1052	0.26	5	0.5	0.3	150	120	13'-6"	285	3.8	STERLING	LRP-30	1, 2
RAD-1.12	PRE-K/K-5 1052	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-1.13	PRE-K/K-4 1055	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-1.14	PRE-K/K-4 1055	0.26	5	0.5	0.3	150	120	13'-6"	285	3.8	STERLING	LRP-30	1, 2
RAD-1.15	RECEPTION 1003	0.58	6	0.8	1.3	150	120	28'-6"	327	9.2	STERLING	LRP-36	1, 2
RAD-1.16	WAITING AREA 1007	0.12	3	0.5	0.2	150	120	11'-0"	166	1.8	STERLING	LRP-18	1, 2
RAD-1.17	PRINCIPAL 1008	0.18	4	0.5	0.3	150	120	18'-0"	147	2.4	STERLING	LRP-18	1, 2
RAD-1.18	PRINCIPAL 1006	0.09	4	0.5	0.2	150	120	9'-5"	147	1.3	STERLING	LRP-18	1, 2
RAD-1.19	ASST. PRINCIPAL 1009	0.08	4	0.5	0.1	150	120	9'-0"	238	1.2	STERLING	LRP-24	1, 2
RAD-1.20	ASST. PRINCIPAL 1009	0.08	4	0.5	0.1	150	120	9'-10"	238	1.3	STERLING	LRP-24	1, 2
RAD-1.21	CONFERENCE 1010	0.14	3	0.5	0.2	150	120	13'-0"	166	2.2	STERLING	LRP-18	1, 2
RAD-1.22	ENGINEER 1073	0.20	4	0.5	0.3	150	120	12'-6"	238	3.0	STERLING	LRP-24	1, 2
RAD-1.23	MEN'S TOILET 1079	0.09	3	0.5	0.1	150	120	11'-0"	166	1.3	STERLING	LRP-18	1, 2
RAD-1.24	WOMENS TOILET 1077	0.09	3	0.5	0.1	150	120	8'-0"	166	1.3	STERLING	LRP-18	1, 2
RAD-1.25	OFFICE 1059	0.12	3	0.5	0.2	150	120	11'-0"	166	1.8	STERLING	LRP-18	1, 2
RAD-1.26	BOY'S TOILET 1048	0.13	3	0.5	0.2	150	120	12'-0"	166	2.0	STERLING	LRP-18	1, 2
RAD-1.27	GIRL'S TOILET 1045	0.13	3	0.5	0.2	150	120	12'-0"	166	2.0	STERLING	LRP-18	1, 2
RAD-1.28	CORRIDOR 1072	0.07	3	0.5	0.1	150	120	6'-6"	166	1.1	STERLING	LRP-18	1, 2
RAD-1.29	PLATFORM 1063	0.46	7	0.5	0.8	150	120	17'-0"	408	6.9	STERLING	LRP-42	1, 2, 3
RAD-1.30	PLATFORM 1063	0.80	7	0.5	0.8	150	120	22'-0"	408	8.9	STERLING	LRP-42	1, 2, 3
RAD-1.31	EXAM 1038	0.26	5	0.5	0.3	150	120	13'-6"	285	3.8	STERLING	LRP-30	1,2
RAD-1.32	EXAM 1027	0.24	5	0.5	0.3	150	120	12'-6"	285	3.6	STERLING	LRP-30	1,2
RAD-1.33	STUDENT SERVICE 1021	0.31	5	0.5	0.4	150	120	16'-6"	285	4.7	STERLING	LRP-30	1,2
RAD-1.34	STUDENT SERVICE 1020	0.20	5	0.5	0.3	150	120	10'-6"	285	3.0	STERLING	LRP-30	1,2
RAD-1.35	DINING ROOM	0.72	7	1.0	1.9	150	120	26'-5"	408	10.8	STERLING	LRP-42	1,2
RAD-1.36	DINING ROOM	0.51	7	1.0	1.3	150	120	18'-0"	408	7.7	STERLING	LRP-42	1,2
RAD-1.37	DINING ROOM	0.10	4	1.0	0.3	150	120	8'-0"	185	1.5	STERLING	LRP-18	1,2
RAD-2.1	CLASSROOM 7 2017	0.44	4	0.5	0.8	150	120	28'-0"	238	6.7	STERLING	LRP-24	1, 2
RAD-2.20	CLASSROOM 7 2017	0.44	4	0.5	0.8	150	120	28'-0"	238	6.7	STERLING	LRP-24	1,2
RAD-2.2	CLASSROOM 6 2016	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.3	CLASSROOM 5 2015	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.4	CLASSROOM 4 2014	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.5	CLASSROOM 3 2013	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.6	CLASSROOM 2 2012	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.7	MULTI-PURP 2 2011	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.8	MULTI-PURP 1 2010	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.9	CLASSROOM 12 2023	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.10	CLASSROOM 11 2024	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.11	CLASSROOM 10 2025	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.12	CLASSROOM 9 2026	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.13	CLASSROOM 8 2027	0.53	5	0.8	1.1	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-2.14	STAFF ROOM 2030	0.22	4	0.5	0.3	150	120	16'-0"	238	3.3	STERLING	LRP-24	1, 2
RAD-2.15	GIRL'S TOILET 2019	0.13	3	0.5	0.2	150	120	12'-0"	166	2.0	STERLING	LRP-18	1, 2
RAD-2.16	BOY'S TOILET 2021	0.13	3	0.5	0.2	150	120	12'-0"	166	2.0	STERLING	LRP-18	1, 2
RAD-2.17	ART CLASSROOM 2008	0.23	3	0.5	0.3	150	120	21'-0"	166	3.5	STERLING	LRP-18	1, 2
RAD-2.18	ART CLASSROOM 2008	0.30	3	0.5	0.4	150	120	27'-6"	166	4.6	STERLING	LRP-18	1, 2
RAD-2.19	SCIENCE LAB 2004	0.30	3	0.5	0.4	150	120	27'-6"	166	4.6	STERLING	LRP-18	1,2
RAD-2.21	SCIENCE LAB 2004	0.19	3	0.5	0.3	150	120	17'-0"	166	2.8	STERLING	LRP-18	1,2
RAD-3.1	MUSIC CLASS 3015	0.46	5	0.5	0.8	150	120	24'-0"	285	6.8	STERLING	LRP-30	1, 2
RAD-3.2	MUSIC CLASS 3015	0.44	5	0.5	0.8	150	120	23'-0"	285	6.6	STERLING	LRP-30	1, 2
RAD-3.3	MUSIC CLASS 3015	0.22	5	0.5	0.3	150	120	11'-6"	285	3.3	STERLING	LRP-30	1, 2
RAD-3.4	CLASSROOM 18 3012	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.5	CLASSROOM 17 3011	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.6	CLASSROOM 16 3010	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.7	CLASSROOM 15 3009	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.8	CLASSROOM 14 3008	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.9	CLASSROOM 13 3007	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.10	CLASSROOM 19 3027	0.22	4	0.5	0.3	150	120	14'-0"	238	3.3	STERLING	LRP-24	1, 2
RAD-3.30	CLASSROOM 19 3027	0.22	4	0.5	0.3	150	120	11'-6"	238	3.3	STERLING	LRP-24	1,2
RAD-3.11	CLASSROOM 20 3028	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.12	CLASSROOM 21 3025	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.13	CLASSROOM 22 3024	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.14	CLASSROOM 23 3023	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.15	CLASSROOM 24 3022	0.61	6	1.0	1.7	150	120	28'-0"	327	9.2	STERLING	LRP-36	1, 2
RAD-3.16	COMPUTER LAB 3035	0.44	4	0.5	0.8	150	120	28'-0"	238	6.7	STERLING	LRP-24	1, 2
RAD-3.27	COMPUTER LAB 3035	0.44	4	0.5	0.8	150	120	28'-0"	238	6.7	STERLING	LRP-24	1, 2
RAD-3.17	GIRL'S TOILET 3017	0.13	3	0.5	0.2	150	120	12'-0"	166	2.0	STERLING	LRP-18	1, 2
RAD-3.18	BOY'S TOILET 3020	0.13	3	0.5	0.2	150	120	12'-0"	166	2.0	STERLING	LRP-18	1, 2
RAD-3.19	MUSIC STORAGE 3013	0.17	3	0.5	0.2	150	120	15'-0"	166	2.5	STERLING	LRP-18	1, 2
RAD-3.21	LIBRARY 3002	0.53	5	1.0	1.4	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-3.22	LIBRARY 3002	0.51	5	1.0	1.4	150	120	27'-0"	285	7.7	STERLING	LRP-30	1, 2
RAD-3.23	LIBRARY 3002	0.52	5	1.0	1.4	150	120	27'-6"	285	7.8	STERLING	LRP-30	1, 2
RAD-3.24	LIBRARY 3002	0.53	5	1.0	1.4	150	120	28'-0"	285	8.0	STERLING	LRP-30	1, 2
RAD-3.25	LIBRARY 3002	0.51	5	1.0	1.4	150	120	27'-0"	285	7.7	STERLING	LRP-30	1, 2
RAD-3.26	LIBRARY 3002	0.55	5	1.0	1.5	150	120	29'-0"	285	8.3	STERLING	LRP-30	1, 2

1 COLOR BY ARCHITECT
2 COORDINATE THERMOSTAT REQUIREMENTS AND UNIT CONTROL WITH 15050 SEQUENCE OF OPERATION SPECIFICATION.
3 WALL MOUNTED RADIANT PANELS