

# City of Portland, Maine - Building or Use Permit Application

389 Congress Street, 04101 Tel: (207) 874-8703, Fax: (207) 874-8716

PERMIT ISSUED

Location of Construction: 15 Surrenden St/ Bedford St		Owner Name: University Of Maine	Owner Address: 107 Maine Ave	CITY OF PORTLAND	Phone: 207-780-4160
Business Name: n/a		Contractor Name: Granger Northern, Inc.	Contractor Address: 84 Middle St. Portland		Phone: 2077743500
Lessee/Buyer's Name n/a		Phone: n/a	Permit Type: Commercial		
					Zone: R5

Past Use: Vacant \ Parking Lot	Proposed Use: Build New 32,285 sq. Ft. Building for offices, class room spaces and 500+ seat lecture hall. Amendment to permits #03-0011 and # 03-0070	Permit Fee:	Cost of Work: \$0.00	CEO District: 3
Proposed Project Description: Build new 32,285 sq. Ft. Building for offices, class room spaces and 500 + seat lecture hall. Amendment to permits 03-0011 & 03-0070.		FIRE DEPT: <input checked="" type="checkbox"/> Approved <input type="checkbox"/> Denied		INSPECTION: Use Group: A/B Type: 2c 5/24/04 Signature: [Signature]
		Signature: [Signature]		Signature: [Signature]
		PEDESTRIAN ACTIVITIES DISTRICT (P.A.D.)		
		Action: <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/Conditions <input type="checkbox"/> Denied		
		Signature: _____ Date: _____		

Permit Taken By: gg	Date Applied For: 02/13/2004	Zoning Approval		
<ol style="list-style-type: none"> <li>This permit application does not preclude the Applicant(s) from meeting applicable State and Federal Rules.</li> <li>Building permits do not include plumbing, septic or electrical work.</li> <li>Building permits are void if work is not started within six (6) months of the date of issuance. False information may invalidate a building permit and stop all work..</li> </ol>		Special Zone or Reviews	Zoning Appeal	Historic Preservation
		<input type="checkbox"/> Shoreland <input type="checkbox"/> Wetland <input type="checkbox"/> Flood Zone <input type="checkbox"/> Subdivision <input type="checkbox"/> Site Plan Maj <input type="checkbox"/> Minor <input type="checkbox"/> MM <input type="checkbox"/> Date: [Signature] 2/23/04	<input type="checkbox"/> Variance <input type="checkbox"/> Miscellaneous <input type="checkbox"/> Conditional Use <input type="checkbox"/> Interpretation <input type="checkbox"/> Approved <input type="checkbox"/> Denied Date: _____	<input checked="" type="checkbox"/> Not in District or Landmark <input type="checkbox"/> Does Not Require Review <input type="checkbox"/> Requires Review <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/Conditions <input type="checkbox"/> Denied Date: [Signature]

## CERTIFICATION

I hereby certify that I am the owner of record of the named property, or that the proposed work is authorized by the owner of record and that I have been authorized by the owner to make this application as his authorized agent and I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in the application is issued, I certify that the code official's authorized representative shall have the authority to enter all areas covered by such permit at any reasonable hour to enforce the provision of the code(s) applicable to such permit.

SIGNATURE OF APPLICANT	ADDRESS	DATE	PHONE
RESPONSIBLE PERSON IN CHARGE OF WORK, TITLE		DATE	PHONE

# DISPLAY THIS CARD ON PRINCIPAL FRONTAGE OF WORK

## CITY OF PORTLAND

Please Read  
Application And  
Notes, If Any,  
Attached

BUILDING INSPECTION

PERMIT

Permit Number W0481302004

CITY OF PORTLAND

This is to certify that University Of Maine/Grange Northern, Inc.  
has permission to Build new 32,285 sq. Ft. Building for offices, classroom space and 500 + seat lecture hall. Amendment to permits  
11 03 0011 & 03 0070  
AT 15 Surrenden St/ Bedford St 114 A004001

provided that the person or persons, firm or corporation accepting this permit shall comply with all of the provisions of the Statutes of Maine and of the ordinances of the City of Portland regulating the construction, maintenance and use of buildings and structures, and of the application on file in this department.

Apply to Public Works for street line and grade if nature of work requires such information.

Notification of inspection must be given and when permission is procured before this building or part thereof is occupied or closed-in. 24 HOUR NOTICE IS REQUIRED.

A certificate of occupancy must be procured by owner before this building or part thereof is occupied.

## OTHER REQUIRED APPROVALS

Fire Dept. [Signature]  
Health Dept. \_\_\_\_\_  
Appeal Board \_\_\_\_\_  
Other \_\_\_\_\_  
Department Name \_\_\_\_\_

[Signature] 5/21/04  
Director - Building & Inspection Services

PENALTY FOR REMOVING THIS CARD

**City of Portland, Maine - Building or Use Permit**

389 Congress Street, 04101 Tel: (207) 874-8703, Fax: (207) 874-8716

Permit No:	Date Applied For:	CBL:
04-0130	02/13/2004	114 A004001

Location of Construction: 15 Surrenden St/ Bedford St	Owner Name: University Of Maine	Owner Address: 107 Maine Ave	Phone: 207-780-4160
Business Name: n/a	Contractor Name: Granger Northern, Inc.	Contractor Address: 84 Middle St. Portland	Phone (207) 774-3500
Lessee/Buyer's Name n/a	Phone: n/a	Permit Type: Amendment to Commercial	

Proposed Use: Build New 32,285 sq. Ft. Building for offices, class room spaces and 500+ seat lecture hall. Amendment to permits #03-0011 and # 03-0070 .	Proposed Project Description: Build new 32,285 sq. Ft. Building for offices, class room spaces and 500 + seat lecture hall. Amendment to permits 03-0011 & 03-0070.
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Dept: Zoning      Status: Approved      Reviewer: Marge Schmuckal      Approval Date: 02/23/2004  
Note: See original permit for the full zoning review for this entire project      Ok to Issue: ☒

Dept: Building      Status: Approved with Conditions      Reviewer: Mike Nugent      Approval Date: 05/21/2005  
Note:      Ok to Issue: ☒  
1) This permit is limited in scope until the issues identified in the Memo dated 5/21/04 are addressed. Until these issues are resolved , phases of construction that involve thes issues are NOT permitted.

Dept: Fire      Status: Approved with Conditions      Reviewer: Lt. MacDougal      Approval Date: 05/04/2004  
Note:      Ok to Issue: ☒  
1) fire extinguishers shall be installed in accordance with NFPA 10 standards  
2) the fire alarm system and sprinkler system shall be tested to the appropriate standard and the results submitted to the Portland Fire Department  
3) the fire alarm system shall be installed in accordance with NFPA 72 standards  
4) the sprinkler system shall be installed in accordance with NFPA 13 standards

**Comments:**

2/18/2004-gg: Permit # 030011 was for parking garage. Permit # 030070 was for foundation only for parking garage. Waiting for cost breakdown of prior permits to determine if this was included in previous permit or not. Kwd

*Waiting for breakdown  
of cost of work to  
determine if paid  
for on earlier  
permit. 2/19/04*

389 Congress St. rm 315  
Portland, ME 04101  
Phone: (207)874-8700  
Fax: (207)874-8716

# facsimile transmittal

To: Bill Smith and Charles Kirby/EYP From: Mike Nugent  
Fax: 617-305-9800 Date: May 21, 2004  
Phone 617-305-9888 Pages: 1  
Re: USM CEC Building (114 A004)

☐ Urgent ☐ For Review ☐ Please Comment ☒ Please Reply ☐ Please Recycle

I have completed the review of the submissions for the above permit and have the following questions:

The Balcony Guards have openings in excess of the required "less than 4 inches" and have an ornamental pattern that is a ladder in affect.

Is the plywood structural sheathing, and is any part of the installation greater than 40 feet above grade? (See Section 1407 of the Code)

The floor loading info is limited to the classrooms, offices and a Mechanical room. Please review Table 1606 of the Code and address other areas like the corridors, lobbies and break out rooms.

Is it 5-36 inch doors and one 32 inch door or 6- 32 inch doors and where is the 32-inch door???

What is the Fire Classification of the roofing materials and also I couldn't find ballast information?

Was the roof designed in compliance with chapter 7.3 of ASCE ??

Also include the following structural info:

Roof Snow Exposure Factor

Snow Load Importance

Wind load internal pressure coefficient

Seismic Soil Profile

Seismic Analysis procedure



389 Congress St. Rm 315  
Portland, ME 04101  
Phone: (207)874-8700  
Fax: (207)874-8716

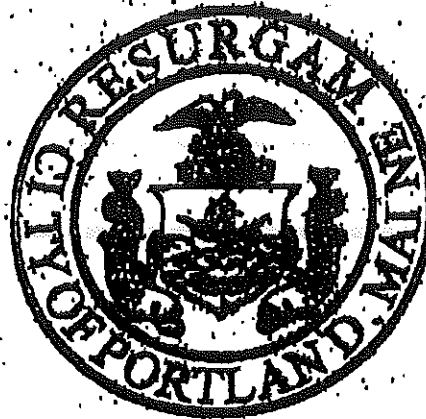
## facsimile transmittal

To: *Bill Smith* Charles Kirby From: Mike Nugent  
Fax: 617 305 9888 Date: March 5, 2004  
Phone 617 305 9800 Pages: 1  
Re: USM Community Building (114 A004)

☐ Urgent ☐ For Review ☐ Please Comment ☒ Please Reply ☐ Please Recycle

I have commenced the review the submissions for Permit #040130 and need the following information/technical submissions to continue the review:

- 1) Need the geotechnical report used for the footing design pursuant to Section 1804 of the 1999 BOCA Code.
- 2) Need a Statement of Special Inspections pursuant to Section 1705 of the 1999 BOCA Code.
- 3) A spec book did not end up with my plans, did one get submitted?



**CITY OF PORTLAND  
ACCESSIBILITY CERTIFICATE**

Designer: Charles J. Kirby AIA of Einhorn Yaffee Prescott Arch & Eng P.C.

Address of Project: Bedford Street, Portland, Maine

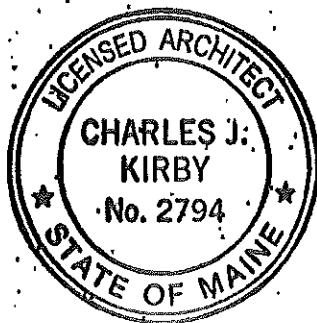
Nature of Project: University of Southern Maine

Community Education Center

Date: Feb. 10, 2004

The technical submissions covering the proposed construction work as described above have been designed in compliance with applicable referenced standards found in the Maine Human Rights Law and Federal Americans with Disability Act.

(SEAL)



Signature: Charles J. Kirby

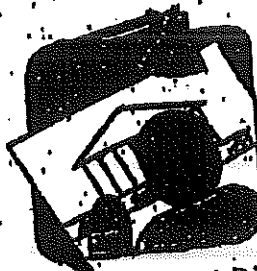
Title: MANAGING PRINCIPAL

Firm: EINHORN YAFFEE PRESCOTT

Address: 24 SCHOOL STREET

BOSTON, MA 02108

Telephone: (617) 305-9811



# CITY OF PORTLAND MAINE

389 Congress St., Rm 315  
Portland, ME 04101

Tel. - 207-874-8704  
Fax - 207-874-8716

TO: Inspector of Buildings City of Portland, Maine  
Planning & Urban Development  
Division of Housing & Community Services

FROM DESIGNER: Charles J. Kirby, AIA  
% Einhorn Yaffee Prescott Architecture & Engineering

DATE: Feb 10, 2004  
Job Name: University of Southern Maine Community Education Ctr. - Phase I  
Bedford Street Portland Maine

Address of Construction: Bedford Street Portland Maine

THE BOCA NATIONAL BUILDING CODE/1999 Fourteenth EDITION  
Construction project was designed according to the building code articles listed below:

Building Code and Year: BOCA '99 Use Group Classification(s): A-3  
Type of Construction: 2-C Bldg. Height: VARIES 42'-0" MAX Bldg. Sq. Footage: 34,170

Seismic Zone: HAZARDOUS EXPOSURE GROUP II PERFORMANCE CAT. C Group Class: II  
Roof Snow Load Per Sq. Ft.: 50 psf + drift Dead Load Per Sq. Ft.: As req'd for structure + 20 psf

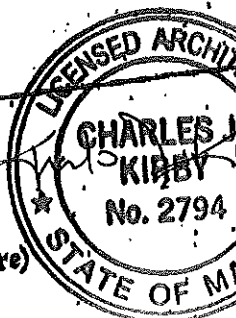
Basic Wind Speed (mph): 90 mph Effective Velocity Pressure Per Sq. Ft.: 30 psf  
Floor Live Load Per Sq. Ft.: 80 psf (plus noted allowance for partitions)

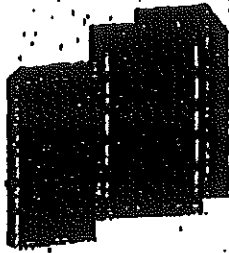
Structure has full sprinkler system? Yes ☒ No ☐ Alarm System? Yes ☒ No ☐  
Sprinkler & Alarm systems must be installed according to BOCA and NFPA Standards with approval from the Portland Fire Department.

Is structure being considered unlimited area building: Yes ☐ No ☒

If mixed use, what subsection of 513 is being considered: 313.1.1 Phase II  
List Occupant loading for each room or space, designed into this Project: PHASE II SEE SEP. PHASE I (GARAGE) BY 313.1.2  
SEE ATTACHED DWGS.

(Designer's Stamp & Signature)





**CITY OF PORTLAND  
BUILDING CODE CERTIFICATE**  
389 Congress St., Rm 315  
Portland, ME 04101

**TO:** Inspector of Buildings City of Portland, Maine  
Department of Planning & Urban Development  
Division of Housing & Community Service

**FROM:** Charles J. Kirby, AIA

**RE:** Certificate of Design

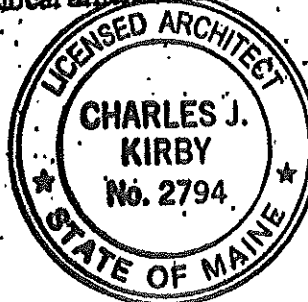
**DATE:** FEB 10, 2004

These plans and/or specifications covering construction work on:

University of Southern Maine - Community Education Center  
Phase II project

Have been designed and drawn up by the undersigned, a Maine registered architect/engineer according to the BOCA National Building Code/1999 Fourteenth Edition, and local amendments.

(SEAL)



Signature Charles J. Kirby

Title MANAGING PRINCIPAL

Firm Einhorn Yoffee Prescott Architecture & Eng

Address 24 School St. ; Boston MA 02108

As per Maine State Law:

\$50,000.00 or more in new construction, repair, expansion, addition, or modification for Building or Structures, shall be prepared by a registered design

**LETTER OF TRANSMITTAL**

Date: March 12, 2004

Project: Joel and Linda Abromson Community Education Facility

To: Michael Nugent, Inspection Services  
City of Portland

From: John Rasmussen

Tel: (207) 780-8412

Fax: (207) 780-4538

We are sending you the following:

Copies	Date	Description
1	3/9/04	Check for \$10,654.00- Building Permit- additional fee based on actual costs.
1	2/27/04	Calculation of Permit Fee

Remarks:

Signed: 

Date: 3/12/04

**City of Portland Building Permit Fee Calculation December 12, 2002**

\$ 9,419,000 Base Bid for Parking Garage from Granger Northern  
\$ 43,000 Alternate #1 from Granger Northern  
\$ 9,462,000 Garage Total  
\$ 6,000,000 CEC + Bridge estimate  
\$ 15,462,000 Total for Permit Fee Calculation

\$ 30 1st \$1000  
\$ 7 per \$1000 thereafter

$(15461 \times \$7.00) + \$30.00 =$

**\$ 108,257 Permit FEE**

**PERMIT FEE USING ACTUAL CONSTRUCTION COSTS February 27, 2004**

\$ 9,733,000.00 Parking Garage  
\$ 7,250,000.00 Community Education Center Guaranteed Maximum Price  
\$ 16,983,000.00

\$ 30 1st \$1000  
\$ 7 per \$1000 thereafter

$16,983 \times \$7.00 + \$30.00 =$

**\$ 118,911.00 New Permit FEE**

Difference owed to City of Portland

**\$ 10,654.00**

**USM UNIVERSITY OF  
Southern Maine**

**Facilities Management**

Facilities Management  
96 Falmouth Street  
PO Box 9300  
Portland, ME 04104  
(207) 780-4160  
FAX (207) 780-4538  
TTY (207) 780-5646

February, 12, 2004

To: Mike Nugent, Inspection Services Manager  
City of Portland

From: John Rasmussen, Construction Engineer

RE: USM Parking Garage and Joel and Linda Abromson Community Education Project  
Building Permit Application and Fee

Dear Mike,

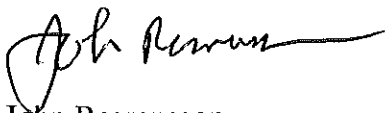
Attached is the Building Permit application for the aforementioned project. As we discussed on the phone last week, the fee for this phase of the project was included in the first phase permit application for the parking garage. I've included a copy of the first application and the fee calculation with this application. As you can see, the fee for the Community Education Center was based on a \$6 million estimated cost. When the final pricing comes in (it will probably be higher), I will share this number with you and make any adjustment to the fee you require.

If, during your review, you have any questions for the Architect, the contact there is Bill Smith @ 617-308-9876. His business card is attached for your reference.

We hope to begin site work within the next couple of weeks. Could we proceed as we did with the Parking Garage and start with a foundation permit to be followed by the general building permit? It would be a great help in expediting the construction of the phase of the project. Our goal is to complete this building and the Skywalk by January of 2005.

Thank you for your assistance. If you have any questions for USM, please call me at 207-228-8412.

Sincerely,



John Rasmussen  
Construction Engineer

Attachments

EYP/Fax

To/ Tammy Munson

At: City of Portland

Fax:

From: Carol Potter

Telephone:

Date: March 9, 2004

No. of Pages Including  
Cover: 10Project No.: 5001024.00  
USM CEC

Cc: file

Comments: Tammy,

As we discussed, please give this to Mike Nugent. He needed this prior to issuing a Foundation Permit.

Also, can you ask him if an original stamped copy is required.

Thanks so much!

My phone number is 228-8124





COMMUNITY EDUCATION CENTER  
University of Maine, Portland Campus

Ledge Probe Results  
January 14, 2004

Probe No.	X	Y	Existing Grade	Top of Ledge
1	0'	50'	41.2'	33.7'
2	0'	39'	40.6'	33.1'
3	0'	21'	39.5'	34.5'
4	0'	0'	38.4'	31.9'
5	25'	50'	40.4'	33.9'
6	25'	39'	40.0'	33.5'
7	25'	21'	39.4'	33.4'
8	25'	0'	35.3'	31.3'
9	50'	39'	39.2'	33.2'
10	50'	21'	35.2'	31.2'
11	72'	48'	39.0'	35.0'
12	72'	39'	38.5'	30.5'
13	72'	31'	38.5'	28.5'
14	101'	48'	37.8'	32.3'
15	101'	39'	37.2'	29.2'
16	101'	31'	37.6'	28.6'
17	42'	8'	Not taken	31.4'
18	63'	8'	Not taken	29.0'
19	82'	8'	Not taken	27.4'
20	103'	8'	Not taken	25.8'
21	123'	8'	Not taken	24.1'
22	143'	8'	Not taken	21.2'

**NOTES:**

1. X axis is Column Line CE.
2. Y axis is Column Line 1.
3. Probes Nos. 1 – 16 were completed by White Brothers on or about 3/27/03.
4. Probes Nos. 17 – 22 were completed by Haley & Aldrich on or about 7/12/02.
5. Probe numbers are reference numbers only and do not appear on any plans.

# All Purpose Building Permit Application

If you or the property owner owes real estate or personal property taxes or user charges on any property within the City, payment arrangements must be made before permits of any kind are accepted.

Location/Address of Construction: <del>228</del> 15 Surrenden St.			
Total Square Footage of Proposed Structure 408,000 <sup>sq</sup>		Square Footage of Lot 161,080 <sup>sq</sup>	
Tax Assessor's Chart, Block & Lot Chart# 114      Block# A      Lot# 004		Owner: UNIVERSITY OF SOUTHERN MAINE	Telephone: 228-8412
Lessee/Buyer's Name (If Applicable)		Applicant name, address & telephone: USM 96 FALMOUTH ST PORTLAND ME 04104 228-8412	Cost Of Work: \$ 15,462,000  Fee: \$ 108,257
Current use: <u>PARKING LOT</u>			
If the location is currently vacant, what was prior use: _____			
Approximately how long has it been vacant: _____			
Proposed use: <u>PARKING GARAGE AND CLASSROOM BUILDING</u>			
Project description: _____			
Contractor's name, address & telephone: GRANGER NORTHERN, INC. 774-3500 84 MIDDLE ST. PORTLAND ME 04101			
Who should we contact when the permit is ready: <u>JOHN RASMUSSEN</u>			
Mailing address: <u>P.O. Box 9300</u> <u>PORTLAND, ME 04104</u>			
We will contact you by phone when the permit is ready. You must come in and pick up the permit and review the requirements before starting any work, with a Plan Reviewer. A stop work order will be issued and a \$100.00 fee if any work starts before the permit is picked up. PHONE: 228-8412			

**IF THE REQUIRED INFORMATION IS NOT INCLUDED IN THE SUBMISSIONS THE PERMIT WILL BE AUTOMATICALLY DENIED AT THE DISCRETION OF THE BUILDING/PLANNING DEPARTMENT, WE MAY REQUIRE ADDITIONAL INFORMATION IN ORDER TO APPROVE THIS PERMIT.**

*I hereby certify that I am the Owner of record of the named property, or that the owner of record authorizes the proposed work and that I have been authorized by the owner to make this application as his/her authorized agent. I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in this application is issued, I certify that the Code Official's authorized representative shall have the authority to enter all areas covered by this permit at any reasonable hour to enforce the provisions of the codes applicable to this permit.*

Signature of applicant: <u>John Rasmussen</u>	Date: <u>12/23/02</u>
---	-----------------------

**This is NOT a permit, you may not commence ANY work until the permit is issued.  
If you are in a Historic District you may be subject to additional permitting and fees with the  
Planning Department on the 4<sup>th</sup> floor of City Hall**

### City of Portland Building Permit Fee Calculation

\$	9,419,000	Base Bid for Parking Garage from Granger Northern
\$	43,000	Alternate #1 from Granger Northern
\$	9,462,000	Garage Total
\$	6,000,000	CEC + Bridge estimate
\$	15,462,000	Total for Permit Fee Calculation

\$	30	1st \$1000
\$	7	per \$1000 thereafter

$(15461 \times \$7.00) + \$30.00 =$

<b>\$</b>	<b>108,257</b>	<b>Permit FEE</b>
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**City of Portland Building Permit Application  
Description of Project**

**Project:** Joel and Linda Abromson Community Education Center and Parking Garage  
**Applicant Name:** University of Southern Maine  
**Date:** December 12, 2002

Project site is bounded by Surrenden St, Bedford St., Winslow St. and Conant St. The current use of the site is a parking lot. Two small wooden office buildings will be demolished (demolition permit already received. The site of the first building, at 86 Winslow St., was cleared this past August. The second building site will be cleared the first week of January.

There are two components to this project for which the University is seeking a building permit. The first component is the construction of an 1,150 space, 5 level pre-cast concrete parking garage. It is rectangular in shape with 75,200 square feet per level, 376,000 square feet total. There will be a new 50 space surface lot adjacent to the Garage. The foundation of the garage requires approximately 250 steel "H" piles. Construction is scheduled to begin January 2003 (we hope to have a construction fence in place before students return from the holiday break on January 13) and be complete by mid January 2004.

The second component is the construction of the Joel and Linda Abromson Community Education Center -a 31,000 square foot, steel frame, two-story building, with partial basement. This facility includes a 500 seat lecture hall, classrooms and office space. The building will be attached to the Parking Garage with a shared elevator and utility core. The scope of the project includes provision for pedestrian circulation from the 4<sup>th</sup> level of the parking garage through the second level of Community Education Center over a new 110 foot pedestrian skywalk spanning Bedford Street, and landing between Masterton Hall and Luther Bonney Hall. Construction of the Center and skywalk is scheduled to begin immediately following beneficial occupancy of at least two decks of the Parking Garage.

# All Purpose Building Permit Application

If you or the property owner owes real estate or personal property taxes or user charges on any property within the City, payment arrangements must be made before permits of any kind are accepted.

Location/Address of Construction: <u>88 BEDFORD ST.</u>			
Total Square Footage of Proposed Structure <u>32,285</u>		Square Footage of Lot <u>89,555</u>	
Tax Assessor's Chart, Block & Lot Chart# <u>114</u> Block# <u>115 A</u> Lot# <u>004</u>		Owner: <u>University of Maine System</u> <u>% University of Southern Maine</u>	Telephone: <u>(207) 780-4160</u>
Lessee/Buyer's Name (If Applicable) <u>115 B 009</u>		Applicant name, address & telephone: <u>JOHN RASMUSSEN, CONST. ENGR.</u> <u>USM</u> <u>P.O. Box 9300</u> <u>PORTLAND, ME 04104-9300</u>	Cost Of Work: \$ <u>6.0</u> million Fee: \$ <u>SEE ATTACHED</u>
Current use: <u>vacant</u>			
If the location is currently vacant, what was prior use: <u>parking lot</u>			
Approximately how long has it been vacant: _____			
Proposed use: <u>500+ seat lecture hall, offices, and classroom spaces, Lecture Hall</u>			
Project description: <u>new building for classroom &amp; offices</u>			
Contractor's name, address & telephone: _____			
Who should we contact when the permit is ready: <u>Mr. John Rasmussen or Mr. David Early</u>			
Mailing address: <u>University of Southern Maine</u> <u>Facilities Planning Dept</u> <u>25 Bedford Street</u> <u>Portland Maine</u>			
We will contact you by phone when the permit is ready. You must come in and pick up the permit and review the requirements before starting any work with a Plan Reviewer. A stop work order will be issued and a \$100.00 fee if any work starts before the permit is picked up. PHONE: <u>(207) 780-4160</u>			

IF THE REQUIRED INFORMATION IS NOT INCLUDED IN THE SUBMISSIONS THE PERMIT WILL BE AUTOMATICALLY DENIED AT THE DISCRETION OF THE BUILDING/PLANNING DEPARTMENT. WE MAY REQUIRE ADDITIONAL INFORMATION IN ORDER TO APPROVE THIS PERMIT.

I hereby certify that I am the Owner of record of the named property, or that the owner of record authorizes the proposed work and that have been authorized by the owner to make this application as his/her authorized agent. I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in this application is issued, I certify that the Code Official's authorized representative shall have the authority to enter all areas covered by this permit at any reasonable hour to enforce the provisions of the codes applicable to this permit.

Signature of applicant: [Signature]

Date: 2/12/04

This is NOT a permit, you may not commence ANY work until the permit is issued.  
If you are in a Historic District you may be subject to additional permitting and fees with the Planning Department on the 4<sup>th</sup> floor of City Hall

# BUILDING PERMIT INSPECTION PROCEDURES

Please call 874-8703 or 874-8693 to schedule your inspections as agreed upon

Permits expire in 6 months, if the project is not started or ceases for 6 months.

The Owner or their designee is required to notify the inspections office for the following inspections and provide adequate notice. Notice must be called in 48-72 hours in advance in order to schedule an inspection:

By initializing at each inspection time, you are agreeing that you understand the inspection procedure and additional fees from a "Stop Work Order" and "Stop Work Order Release" will be incurred if the procedure is not followed as stated below.

Pre-construction Meeting: Must be scheduled with your inspection team upon receipt of this permit. Jay Reynolds, Development Review Coordinator at 874-8632 must also be contacted at this time, before any site work begins on any project other than single family additions or alterations.

✓ Footing/Building Location Inspection: Prior to pouring concrete  
✓ Re-Bar Schedule Inspection: Prior to pouring concrete  
✓ Foundation Inspection: Prior to placing ANY backfill  
✓ Framing/Rough Plumbing/Electrical: Prior to any insulating or drywalling  
✓ Final/Certificate of Occupancy: Prior to any occupancy of the structure or use. NOTE: There is a \$75.00 fee per inspection at this point.

Certificate of Occupancy is not required for certain projects. Your inspector can advise you if your project requires a Certificate of Occupancy. All projects DO require a final inspection

✓ If any of the inspections do not occur, the project cannot go on to the next phase, **REGARDLESS OF THE NOTICE OR CIRCUMSTANCES.**

✓ **CERIFICATE OF OCCUPANICES MUST BE ISSUED AND PAID FOR, BEFORE THE SPACE MAY BE OCCUPIED**

Carol Potter  
Signature of Applicant/Designee

5-26-04  
Date

[Signature]  
Signature of Inspections Official

5/26/04  
Date

CBL: 114 A004

Building Permit #: 040130

# BUILDING PERMIT INSPECTION PROCEDURES

Please call 874-8703 or 874-8693 to schedule your inspections as agreed upon

Permits expire in 6 months, if the project is not started or ceases for 6 months.

The Owner or their designee is required to notify the inspections office for the following inspections and provide adequate notice. Notice must be called in 48-72 hours in advance in order to schedule an inspection:

By initializing at each inspection time, you are agreeing that you understand the inspection procedure and additional fees from a "Stop Work Order" and "Stop Work Order Release" will be incurred if the procedure is not followed as stated below.

☒ **Pre-construction Meeting:** Must be scheduled with your inspection team upon receipt of this permit. Jay Reynolds, Development Review Coordinator at 874-8632 must also be contacted at this time, before any site work begins on any project other than single family additions or alterations.

☒ **Footing/Building Location Inspection:** Prior to pouring concrete

☒ **Re-Bar Schedule Inspection:** Prior to pouring concrete

☒ **Foundation Inspection:** Prior to placing ANY backfill

☒ **Framing/Rough Plumbing/Electrical:** Prior to any insulating or drywalling

☒ **Final/Certificate of Occupancy:** Prior to any occupancy of the structure or use. NOTE: There is a \$75.00 fee per inspection at this point.

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☒ Signature of applicant/designee

Date

Signature of Inspections Official

Date

CBL: 115-2009 Building Permit #:

030070

114 A004

# BUILDING PERMIT INSPECTION PROCEDURES

Please call 874-8703 or 874-8693 to schedule your inspections as agreed upon

Permits expire in 6 months, if the project is not started or ceases for 6 months.

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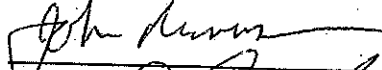
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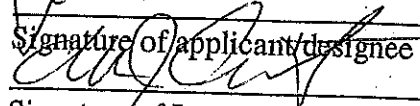
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☒ **CERTIFICATE OF OCCUPANCIES MUST BE ISSUED AND PAID FOR, BEFORE THE SPACE MAY BE OCCUPIED**

  
Signature of applicant/designee

4/14/03  
Date

  
Signature of Inspections Official

4/14/03  
Date

CBL: 11530009 Building Permit #: 030011

114A004



## SECTION 15975 - CONTROL SYSTEM EQUIPMENT

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

- A. The Building Automation System (BAS) manufacturer shall furnish and install a fully integrated building automation system, incorporating direct digital control (DDC) for energy management, equipment monitoring and control, and subsystems with open communications capabilities as herein specified. All systems in this project will be controlled through the DDC system, no exceptions. Provide open communications system. System shall be capable of utilizing standard protocols as follows as well as be able to integrate third-party systems via existing vendor protocols. System shall be native BACnet communication according to ASHRAE standard SPC-135A/95.
- B. The installation of the control system shall be performed under the direct supervision of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation or identification number and sequence of operation all bearing the name of the manufacturer. The installing manufacturer shall certify in writing, that the shop drawings have been prepared by the equipment manufacturer and that the equipment manufacturer has supervised their installation. In addition, the equipment manufacturer shall certify, in writing, that the shop drawings were prepared by their company and that all temperature control equipment was installed under their direct supervision.
- C. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed specially for this project. All systems and components shall have been thoroughly tested and proven in actual use for at least three years.
- D. BAS manufacturer shall be responsible for all BAS and Temperature Control wiring for a complete and operable system. All wiring shall be done in accordance with all local and national codes.
- E. The DDC system shall possess a fully modular architecture, permitting expansion in the future through additional DDC panels, sensors, actuators, and/or operator terminals.
- F. The DDC system shall monitor and control the equipment with respect to the indicated "Sequences of Operation" and Points List. Provide sufficient number of input/output units as determined by specific applications.
- G. Provide all hardware and software necessary for a complete and operable system specified herein. This includes all relays, sensors, power supplies, etc. required to perform the sequences intended.
- H. The Owner shall enlist the service of a Commissioning Agent and a Testing, Adjusting, and Balancing Agency under separate contracts. The Control Contractor shall coordinate

with all contractors including, but not limited to, the Commissioning Agent and Testing, Adjusting, and Balancing Agency.

1.02 WORK BY OTHERS

A. Mechanical Contractor shall provide:

1. Install automatic valves and separable wells that are specified to be supplied by the DDC contractor.
2. Furnish and install all necessary valved pressure taps water, drain, and overflow connections, and piping.
3. Provide, on magnetic starters furnished, all necessary auxiliary contacts, with buttons and switches in the required configuration.
4. Install all automatic dampers.
5. Assemble multiple section dampers with required inter-connecting linkages and extend required number of shafts through duct for external mounting of damper motors.
6. Provide access doors or other approved means of access through ducts for service to equipment.

B. General Contractor shall:

1. Provide all necessary cutting, patching and painting.
2. Provide access doors or other approved means of access through ceilings and walls for service to control equipment.

C. Electrical Contractor shall provide:

1. 120V power to all BAS and/or temperature control panels
2. Wiring of all power feeds through all disconnect starters to electrical motor.
3. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by BAS manufacturer
4. Wiring of any electrical sub-metering devices furnished by BAS manufacturer.

D. Products installed but not furnished under this section

1. Division 16 Section "Fire Alarm Systems"
  - a. Duct Mounted Smoke Detectors
2. Division 15 Section "Hydronic Piping"
  - a. Flow Switches.
  - b. Temperature Sensor Wells and Sockets.
3. Division 15 Section "Duct Accessories"
  - a. Automatic Control Dampers.
  - b. Terminal Unit Controls.

- 4. Division 15 Section "Valves"
  - a. Control Valves.
- 5. Division 15 Section "Meters and Gages"
  - a. Airflow measuring stations.
  - b. Hydronic flow meters.
- E. Products integrated to but not furnished or installed under this section
  - 1. Division 16 Section "Fire Alarm Systems"
    - a. Fire Alarm System Trouble.
    - b. Fire Alarm System Alarm.
  - 2. Division 15 Section "Geothermal Heat Pumps"
    - a. Geothermal heat pump control.
  - 3. Division 15 Section "Rooftop Air Handling Units"
    - a. Temperature Control.
    - b. Volume Control.
  - 4. Division 15 Section "Cabinet Unit Heaters"
    - a. Fan Speed Control.
    - b. Thermostats.
  - 5. Division 15 Section "Air Terminals"
    - a. Terminal Air Unit Controls
  - 6. Division 15 Section "Meters and Gages."
    - a. Airflow Measuring Stations
    - b. Water Flow Meters
- 1.03 RELATED WORK
  - A. Division 01000 General and Special Conditions
  - B. Division 15000 Mechanical
  - C. Division 16000 Electrical

#### 1.04 SUBMITTALS

- A. DDC Software Manuals: The software manual shall describe programming and testing, starting with a system overview and proceeding to a detailed description of each software feature. The manual shall instruct the user on programming or reprogramming an portion of the DDC system. This shall include control programs, algorithms, mathematical equations, variables, setpoints, time periods, messages, and other information necessary to load, later, test and execute the system.
1. Complete descriptions of programming language, including commands, editing and writing control programs, algorithms, printouts and logs, mathematical calculations and passwords.
  2. Instructions on modifying a control algorithm or initiating or disabling control programs.
  3. Software Documentation: All software programs shall be easily referenced from summary sheets which compare control programs with pertinent information about hardware and wiring information in the field. Documentation shall include:
    - a. Complete point identification, including terminal number, symbol, engineering units, and control program reference number.
    - b. Field information including location, device, device type and function, electrical parameters, and installation drawing number.
    - c. Location identification of DDC system control hardware.
  4. Control Software: Upon successful completion of the operational acceptance test, provide a medium and hardware for full storage of the accepted versions.
  5. DDC System Summary Forms: Provide data summary forms to be approved by the Owner to define the following information inclusion into the DDC for each point in the system by the Contractor:
    - a. Description of each piece of equipment and the function to be controlled.
    - b. For each DDC function, a listing of digital and/or analog hardware required to interface the DDC system to the equipment.
    - c. Listing of all digital and analog alarms.
    - d. Listing of all DDC application programs associated with each piece of equipment. This listing shall include all control algorithms and mathematical equations. The listing shall be in easy-to-understand English format.
    - e. Listing of all hardware point and "pseudo" point English descriptor names.
    - f. Listing of "failure" mode of all control points and devices.
    - g. Preparation or loading of control software will not commence until all submittals, including sequences, point nomenclature, drawings, material lists, control sequence, and other details have been approved by the Owner.
  6. DDC Point List: List of each control input and output; the device it is controlling; the location of the device; and the symbol or label of the control point in the software.
  7. DDC Temperature Control Drawings: This Contractor shall submit the following drawing for approval by the Engineer and Owner's Representative as specified in the "General Conditions" and shall provide to the Owner five sets of "Construction

Record" control drawings and instruction booklets. AutoCAD 2000 compatible files shall be provided to Owner for all "Construction Record" control drawings indicated below:

- a. Control drawings with detailed piping and wiring diagrams, including bill of material and description of operation for each system, including interfaces with equipment manufacturers, and other suppliers of equipment and systems.
  - b. I/O panel layouts and terminations along with interface panel drawings.
  - c. Valve and Damper Schedules showing size configuration, and capacity and location of all equipment.
  - d. Individual data sheets for each control and automation system components.
  - e. Process and instrumentation diagrams for each system.
  - f. Termination and Ladder wiring diagrams.
  - g. Small scale site and equipment plans showing the control component locations in occupied space, equipment rooms, mechanical equipment, etc.
8. DDC Sequence of Operation: A detailed sequence of operation describing exact method of control.

#### 1.05 ELECTRICAL POWER FOR HVAC INSTRUMENTATION AND CONTROLS

- A. All electric wiring and wiring connections required for the installation of the temperature control system, as herein specified, shall be provided by the DDC Contractor, unless specifically shown on the Electrical drawings or called for in the Electrical specifications.
- B. All wiring, including low voltage wiring, shall comply with the requirements of the Electrical Sections of the specifications. Wiring methods shall be in accordance with the requirements of applicable codes as indicated in Division 16.
- C. Data and AC power wiring shall not share the same conduit nor shall they occupy the same enclosure unless an appropriate grounded metallic barrier is installed between these wiring types.
- D. Wiring from remote equipment shall be to terminal blocks. The terminal blocks shall be permanently marked for identification. Protect all circuits to avoid interruption of service due to short-circuiting or other conditions which might adversely affect the connected devices. Number the blocks by circuit pairs, such as 1 to 25, 26 to 50, etc. Classify each individual signaling circuit as a circuit pair.
- E. Label or code each field wire at each end. Permanently label or code each point of all field terminal strips to show the instrument or item served. Color coded cable with cable diagrams may be used to accomplish cable identification.
- F. Splices shall not be made in shielded wiring except where specifically required. Splices shall be made on terminal blocks in approved uncton boxes. Outlet boxes shall not be used for splices. Comply with labeling requirements above.

#### 1.06 COORDINATION

- A. Certain materials will be furnished, installed, or furnished and installed, under other Sections and Contracts. Examine the Contract Documents to ascertain these requirements.
- B. Carefully check space requirements with other Trades to ensure that all material can be installed in the spaces allotted.
- C. Transmit to Trades doing work in other Sections all information required for work to be provided under their respective Sections.
- D. Wherever the DDC System Contract's work interconnects with work of other contractors, the DDC Contractor shall coordinate his work with these contractors to insure that all contractors have the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items (valves, dampers, etc.) in an approved manner in order that the Ceiling Contractor may know where to install access doors and panels.

#### 1.07 DDC SITE TESTING

- A. General: Provide field testing and adjustment of the complete DDC system and an on-site operation acceptance test. The Owner shall be notified of all tests, to allow system verification.
- B. Field Test: When installation of the DDC system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line. All testing, calibrating, adjusting and final field tests shall be completed by the Contractor for all control and monitoring points and control algorithms. Verify that all systems are operable from local controls in the specified failure mode upon DDC system failure or loss of power. Submit the results of functional and diagnostic tests and calibrations.
- C. Program loading/unloading capability shall be verified and tested to the Owner's Representative's satisfaction.
- D. Upon completion of the project, the DDC Contractor shall:
  - 1. Completely adjust and make ready for use all DDC panels, valves, damper operators, relays, etc. provided under this Section.
  - 2. Furnish five instructive manuals covering the function and operation of the control systems on the project for the use of the Owner's operating personnel.

#### 1.08 NOMENCLATURE

- A. Nomenclature associated with control point identifiers, descriptions and object names shall be based on standard University equipment nomenclature. A copy of this nomenclature will be provided by the Owner upon request. Contractor shall request from

Owner, in writing, an update of final room numbers or other changes from Contract Documents to ensure proper notation on all control documents and programming.

1.09 WARRANTY

- A. Provide all services, materials and equipment necessary for the successful operation of the entire BAS system for a period of one year after beneficial use.
- B. Within this warranty provide for the adjustment, required testing, and repair of the system includes all computer equipment, transmission equipment and all sensors and control devices.

1.10 CODES AND STANDARDS

- A. All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:
  - 1. National Electric Code (NEC).
  - 2. Uniform Building Code (UBC).
    - a. Section 608, Shutoff for Smoke Control.
    - b. Section 403.3, Smoke Detection Group B Office Buildings and Group R, Division 1 Occupancies.
    - c. Section 710.5, Wiring in Plenums.
    - d. Section 713.10, Smoke Dampers.
    - e. Section 1106, Refrigeration Machinery Rooms.
    - f. Section 1107, Refrigeration Machinery Room Ventilation.
    - g. Section 1108, Refrigeration Machinery Room Equipment and Controls.
    - h. Section 1120, Detection and Alarm Systems.
  - 3. Uniform Mechanical Code (UMC).
  - 4. ASHRAE 135-1995.
  - 5. FCC Regulation, Part 15-Governing Frequency Electromagnetic Interference.
  - 6. Underwriters Laboratories.
    - a. UL 916.
    - b. UL 864.

PART 2 - PRODUCTS

2.01 BUILDING CONTROL SYSTEM

- A. The building control system specified herein shall be a Direct Digital Control system which can perform all the control routines as required in this specification.

- B. Performance capabilities, field programmability and operation of DDC system shall meet all the specified requirements. Actual system architecture may vary slightly between system manufacturers.

## 2.02 ACCEPTABLE MANUFACTURERS

- A. Listing as an acceptable manufacturer does not relieve the Controls Contractor from meeting all requirements of the Specification. Manufacturer's standard equipment shall be upgraded as required to meet Project Specifications. Acceptable manufacturers are:
  - 1. Johnson Controls, Inc.
  - 2. Delta Controls.
  - 3. Seimens.

## 2.03 SYSTEM PERFORMANCE

- A. Performance Standards. The system shall conform to the following:
  - 1. Graphic Display. The system shall display a graphic with 20 dynamic points/objects with all current data within 10 seconds.
  - 2. Graphic Refresh. The system shall update a graphic with 20 dynamic points/objects with all current data within 8 seconds.
  - 3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be less than 2 seconds. Analog objects should start to adjust within 2 seconds.
  - 4. Object Scan. All changes of state and change of analog values will be transmitted over the high-speed Ethernet network such that any data used or displayed at a controller or workstation will have been current within the previous 60 seconds.
  - 5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 45 seconds.
  - 6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
  - 7. Performance. Programmable controllers shall be able to execute DDC PID control loops at a selectable frequency of at least once per second. The controller shall scan and update the process value and output generated by this calculation at this same frequency.
  - 8. Multiple Alarm Annunciation. All workstations on the network must receive alarms within 5 seconds of each other.
  - 9. Reporting Accuracy. The system shall report all values with an end-to-end accuracy as listed or better than those listed in Table 1.
  - 10. Stability of Control. Control loops shall maintain measured variable at setpoint within the tolerances listed in Table 2.



**Table 1: Reporting Accuracy**

<u>Measured Variable</u>	<u>Reported Accuracy</u>
Space Temperature	$\pm 0.5^{\circ}\text{C}$ [ $\pm 1^{\circ}\text{F}$ ]
Ducted Air	$\pm 0.5^{\circ}\text{C}$ [ $\pm 1^{\circ}\text{F}$ ]
Outside Air	$\pm 1.0^{\circ}\text{C}$ [ $\pm 2^{\circ}\text{F}$ ]
Dewpoint	$\pm 1.5^{\circ}\text{C}$ [ $\pm 3^{\circ}\text{F}$ ]
Water Temperature	$\pm 0.5^{\circ}\text{C}$ [ $\pm 1^{\circ}\text{F}$ ]
Delta-T	$\pm 0.15^{\circ}\text{C}$ [ $\pm 0.25^{\circ}\text{F}$ ]
Relative Humidity	$\pm 5\%$ RH
Water Flow	$\pm 5\%$ of full scale
Airflow (terminal)	$\pm 10\%$ of full scale (see Note 1)
Airflow (measuring stations)	$\pm 5\%$ of full scale
Air Pressure (ducts)	$\pm 25$ Pa [ $\pm 0.1$ "W.G.]
Air Pressure (space)	$\pm 3$ Pa [ $\pm 0.01$ "W.G.]
Water Pressure	$\pm 2\%$ of full scale (see Note 2)
Electrical (A, V, W, Power factor)	5% of reading (see Note 3)
Carbon Monoxide (CO)	$\pm 5\%$ of reading
Carbon Dioxide (CO <sub>2</sub> )	$\pm 50$ ppm

Note 1: 10%-100% of scale

Note 2: For both absolute and differential pressure

Note 3: Not including utility-supplied meters

**Table 2: Control Stability and Accuracy**

<u>Controlled Variable</u>	<u>Control Accuracy</u>	<u>Range of Medium</u>
Air Pressure	$\pm 50$ Pa [ $\pm 0.2$ " w.g.]	0-1.5 kPa [0-6" w.g.]
	$\pm 3$ Pa [ $\pm 0.01$ " w.g.]	-25 to 25 Pa [-0.1 to 0.1" w.g.]
Airflow	$\pm 100$ cfm	
Temperature	$\pm 0.5^{\circ}\text{C}$ [ $\pm 1.0^{\circ}\text{F}$ ]	
Fluid Pressure	$\pm 10$ kPa [ $\pm 1.5$ psi]	0-1 kPa [1-150 psi]
	$\pm 250$ Pa [ $\pm 1.0$ " w.g.]	0-12.5 kPa [0-50" w.g.] differential

## 2.04 COMMUNICATION

- A. All control products provided for this project shall comprise a BACnet internetwork. Communication involving control components (i.e., all types of controllers and operator interfaces) shall conform to ANSI/ASHRAE Standard 135-1995, BACnet.
- B. Each BACnet device shall operate on the BACnet Data Link/Physical layer protocol specified for that device as defined in this section.

- C. The Contractor shall provide all communication media, connectors, repeaters, bridges, hubs, and routers necessary for the internetwork.
- D. All controllers shall have a communication port for connections with the operator interfaces using the BACnet Data Link/ Physical layer protocol.
- E. A device on the internetwork shall be provided with a minimum 28,800-baud modem that will allow for remote operator interface using the BACnet PTP Data Link/ Physical layer protocol. Remote operator interface via this modem shall allow for communication with any and all controllers on this network as described in Paragraph F below.
- F. Communication services over the internetwork shall result in operator interface and value passing that is transparent to the internetwork architecture as follows:
  - 1. Connection of an operator interface device to any one controller on the internetwork will allow the operator to interface with all other controllers as if that interface were directly connected to the other controllers. Data, status information, reports, system software, custom programs, etc., for all controllers shall be available for viewing and editing from any one controller on the internetwork.
  - 2. All database values (e.g., objects, software variables, custom program variables) of any one controller shall be readable by any other controller on the internetwork. This value passing shall be automatically performed by a controller when a reference to a object name not located in that controller is entered into the controller's database. An operator/installer shall not be required to set up any communication services to perform internetwork value passing.
- G. The time clocks in all controllers shall be automatically synchronized daily via the internetwork. An operator change to the time clock in any controller shall be automatically broadcast to all controllers on the internetwork.
- H. The internetwork shall have the following minimum capacity for future expansion:
  - 1. Each Building Controller shall have routing capacity for 150 controllers.
  - 2. The Building Controller network shall have capacity for 1000 Building Controllers.
  - 3. The system shall have an overall capacity for 12,500 Building Controller, Custom Application Controller, and Application Specific Controller input/output objects.

## 2.05 OPERATOR INTERFACE

- A. Operator Interface. Furnish one PC-based workstation. The workstation shall be able to access all information in the system. The workstation shall reside on the same Ethernet protocol network as the Building Controllers.
- B. Workstation information access shall use the BACnet protocol. Communication shall use the ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol.
- C. Hardware. Each operator workstation and custom programming workstation shall consist of:

1. IBM Compatible with 256 MB Ram, 60 GB hard drive and controller, 40x EIDE CD-ROM, 3.5-inch diskette drive, 16MB AGP graphic card, mouse, 101-12ex enhanced keyboard, 750 MHZ Pentium processor, 19-inch diagonal monitor (resolution 640x480 pixels minimum with separate controls for color, contrast, and brightness, and a non-reflective screen), internal baud modem (56,000 speed and remote communication to network via dial-up telephone network and for automatic transmission of alarms to remote sites. Modem shall comply with Bell Standard 212A and 103 for both tone and pulse dialing networks).
2. Printer shall be Hewlett Packard ink jet. Provides 10 reams of auth 20 LBS xerographic quality letter size paper.
3. Operating system shall be Windows NT and provide all cables; connections, etc. for complete operating system.
4. BACnet Services. The workstation shall use the Read (Initiate) and Write (Execute) Services as defined in clauses 15.5 and 15.8, respectively, of ASHRAE Standard 135-95, to communicate with BACnet objects in the internetwork.

<i>Operator Workstation BACnet Services</i>	<i>Initiate</i>	<i>Execute</i>
Acknowledge Alarms	X	X
Confirmed COV Notification	X	X
Confirmed Event Notification	X	X
Get Alarm Summary	X	X
Get Enrollment Summary	X	X
Subscribe COV	X	X
Unconfirmed COV Notification	X	X
Unconfirmed Event Notification	X	X
Atomic Read File	X	X
Atomic Write File	X	X
Add List Element	--	X
Remove List Element	--	X
Create Object	X	X
Delete Object	X	X
Read Property	X	X
Read Property Multiple	X	X
Write Property	X	X
Read Range	X	X
Write Property Multiple	X	X
Device Communication Control	X	X
Confirmed Private Transfer	X	X
Unconfirmed Private Transfer	X	X

Reinitialize Device	X	--
Time Synchronization	X	--
Who-Has	--	X
I-Have	X	--
Who-Is	X	X
I-Am	X	X

5. BACnet Functional Groups. The Operator Workstation shall support the following BACnet functional groups: Clock, Event Initiation, Event Response, COV Event Response, Files, Reinitialize, Device Communication, Time Master and Router.
6. The Operator Workstation shall have the capability to create, delete and support the following BACnet Objects:
  - a. ANALOG INPUT, ANALOG OUTPUT AND ANALOG VALUE: These objects shall have the following writeable properties: Object Name; Object Value; Description; COV Increment; Out of Service and Units. In addition, these objects shall support the properties: Device type; Reliability; Min./Max. Values; Update Interval and Resolution.
  - b. BINARY INPUT, BINARY OUTPUT AND BINARY VALUE: These objects shall have the following writeable properties: Object Name; Object Value; Description; Polarity; Default Value; Min On/Off and Out of Service. In addition, these objects shall support the properties: Device Type; Reliability; Active/Inactive Texts; Update Interval; Resolution; Change-of-State Time; Count Times and Time Reset.
  - c. CALENDAR: This object shall have the following writeable properties: Object Name; Object Value; Description; and Date List.
  - d. DEVICE: This object shall have the following writeable properties: Object Name; Description; Location; and UTC Offset.
  - e. EVENT ENROLMENT: This object shall have the following writeable properties: Object Name; Object Value; Description; Out-of-Service; Event & Notify Types; Parameters; Property Ref; Enable; and Notification Class.
  - f. FILE: This object shall have the following writeable properties: Object Name; Description; File Type; and File Access.
  - g. LOOP (PID): This object shall have the following writeable properties: Object Name; Object Value; Description; Polarity; Output and Input Refs.; Input Value & Units; Setpoint Value; PID Values; Bias; Write Priority and COV Increment. In addition, this object shall support the properties: Reliability; Update Interval; Proportional Constant & Units; Derivative Constant & Units and Min./Max. Outputs.
  - h. NOTIFICATION CLASS: This object shall have the following writeable properties: Object Name; Object Value; Description; Priority and Ack Required.
  - i. PROGRAM: This object shall have the following writeable properties: Object Name; Object Value and Description. In addition, this object shall support the property Reliability.

- j. SCHEDULE: This object shall have the following writeable properties: Object Name; Object Value and Description; Effective period; Schedule; Exception; Controlled Properties and Write Properties.
- k. TREND LOG: This object shall have the following writeable properties: Object Name; Description; Log Enable; Start/stop Times; Log Device Object Property; Log Interval; Stop When Full; Buffer Size; and Record Count.

D. System Software

- 1. Operating System. Furnish a concurrent multi-tasking operating system. The operating system also shall support the use of other common software applications that operate under DOS or Microsoft Windows. Examples include Lotus 123, Microsoft Excel, WordPerfect, and Paradox. Acceptable operating systems are Windows 95, Windows 98 and Windows NT.
- 2. System Graphics. The operator workstation software shall be a graphical user interface (GUI). The system shall allow display of up to 10 dynamic and animated graphic screens at once for comparison and monitoring of system status. Provide a method for the operator to easily move between graphic displays and change the size and location of graphic displays on the screen. The system graphics shall be able to be modified while on-line. An operator with the proper password level shall be able to add, delete, or change dynamic objects on a graphic. Dynamic objects shall include analog and binary values, dynamic text, static text, and animation files. Graphics shall have the ability to show animation by shifting image files based on the status of the object.
- 3. Custom Graphics. Custom graphic files shall be created with the use of a graphics generation package furnished with the system. The graphics generation package shall be a graphically based system that uses the mouse to create and modify graphics that are saved in industry standard formats such as PCX, TIFF, and GEM. The graphics generation package also shall provide the capability of capturing or converting graphics from other programs such as Designer or AutoCad.
- 4. Graphics Library. Furnish a complete library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. This library also shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library shall be furnished in a file format compatible with the graphics generation package program. Graphics shall be created by drag-and-drop selection of graphic symbols and drag-and-link with BACnet objects with dynamic and interactive display fields.
- 5. Multilingual. Software shall support on-line operating language selection with on the fly toggling capabilities between English, Spanish, French, German, Chinese, etc.
- 6. Dynamic Data Exchange (DDE). Software shall support dynamic data sharing with other Windows-based programs for third party add-on functionality e.g. preventative maintenance, tenant billing, etc.

E. System Applications. Each workstation shall provide operator interface and off-line storage of system information. Provide the following applications at each workstation:

- 1. Automatic System Database Save and Restore. Each workstation shall store on the hard disk a copy of the current database of each Building Controller. This database

- shall be updated whenever a change is made in any system panel. The storage of this data shall be automatic and not require operator intervention. In the event of a database loss in a building management panel, the first workstation to detect the loss shall automatically restore the database for that panel. The operator may disable this capability.
2. **Manual Database Save and Restore.** A system operator with the proper password clearance shall be able to save the database from any system panel. The operator also shall be able to clear a panel database and manually initiate a download of a specified database to any panel in the system.
  3. **System Configuration.** The workstation software shall provide a method of configuring the system. This shall allow for future system changes or additions by users under proper password protection.
  4. **On-Line Help.** Provide a context-sensitive, on-line help system to assist the operator in operating and editing the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext.
  5. **Security.** Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system supervisor shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the functions accessible to viewing and/or changing each system application, editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto logoff time shall be set per operator password. All system security data shall be stored in an encrypted format.
  6. **System Diagnostics.** The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
  7. **Alarm Processing.** Any object in the system shall be configurable to alarm in and out of normal state. The operator shall be able to configure the alarm limits, alarm limit differentials, states, and reactions for each object in the system.
  8. **Alarm Messages.** Alarm messages shall use the English language descriptor for the object in alarm, in such a way that the operator will be able to recognize the source, location, and nature of the alarm without relying upon acronyms or other mnemonics.
  9. **Alarm Reactions.** The operator shall be able to determine (by object) what if any actions are to be taken during an alarm. Actions shall include logging, printing, starting programs, displaying messages, dialing out to remote stations, paging, providing audible annunciation, or displaying specific system graphics. Each of these actions shall be configurable by workstation and time of day. An object in alarm that has not been acknowledged within an operator-specified time period shall be moved to a higher level of priority. The actions for that level will then be followed.
  10. **Trend Logs.** The operator shall be able to define a custom trend log for any data object in the system. This definition shall include change-of-value digital, change-of-value analog, time interval, start time, and stop time. Trend data shall be sampled and stored on the Building Controller panel, and be archivable on the

- hard disk and be retrievable for use in spreadsheets and standard database programs.
11. Alarm and Event Log. The operator shall be able to view all system alarms and change of states from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and clear alarms. All that have not been cleared by the operator shall be archived to the hard disk on the workstation.
  12. Object and Property Status and Control. Provide a method for the operator to view, and edit if applicable, the status of any object and property in the system. The status shall be available by menu, on graphics, or through custom programs.
  13. Clock Synchronization. The real-time clocks in all building control panels and workstations shall be using the BACnet Time Synchronization service. The system also shall be able to automatically synchronize all system clocks daily from any operator-designated device in the system. The system shall automatically adjust for daylight savings and standard time, if applicable.
  14. Reports and Logs. Provide a reporting package that allows the operator to select, modify, or create reports. Each report shall be definable as to data content, format, interval, and date. Report data shall be archivable on the hard disk for historical reporting. Provide the ability for the operator to obtain real-time logs of all objects by type or status (e.g., alarm, lockout, normal). Reports and logs shall be stored on the PC hard disk in a format that is readily accessible by other standard software applications, including spreadsheets and word processing. Reports and logs shall be readily printed to the system printer and shall be set to be printed either on operator command or at a specific time each day.
  15. Standard Reports. The following standard system reports shall be provided for this project. Provide ability for the Owner to readily customize these reports for this project.
    - a. Electrical Meter Report: Provide a monthly report showing the daily electrical consumption and peak electrical demand for each building meter. Provide an annual (12-month) summary report showing the monthly electrical consumption and peak demand for each meter.
    - b. Gas Meter Report: Provide a monthly report showing the daily natural gas consumption for each meter. Provide an annual (12-month) report that shows the monthly consumption for each meter.
    - c. Weather Data Report: Provide a monthly report showing the daily minimum, maximum, and average outdoor air temperature - as well as the number of heating and cooling degree days for each day. Provide an annual (12-month) report showing the minimum, maximum, and average outdoor air temperature for the month - as well as the number of heating and cooling degree-days for the month.
    - d. Tenant Override Reports: Provide a monthly report showing the daily total time in hours that each tenant has requested after-hours HVAC and lighting services. Provide an annual summary report that shows the override usage on a monthly basis.
    - e. All Objects: All system (or sub-system) objects and their current values.
    - f. Alarm Summary: All current alarms (except those in alarm lockout).
    - g. Disabled Objects: All objects that are disabled.

- h. Alarm Lockout Objects: All objects in alarm lockout (whether manual or automatic).
  - i. Alarm Lockout Objects in Alarm: All objects in alarm lockout that are currently in alarm.
  - j. Logs:
    - 1) Alarm History
    - 2) System Messages
    - 3) System Events
    - 4) Trends
  - k. Custom Reports: Provide the capability for the operator to easily define any system data into a daily, weekly, monthly, or annual report. These reports shall be time and date stamped, and shall contain a report title and the name of the facility.
- F. Workstation Applications Editors. Each PC workstation shall support editing of all system applications. Provide editors for each application at the PC workstation. The applications shall be downloaded and executed at one or more of the controller panels.
  - 1. Controller. Provide a full-screen editor for each type of application that shall allow the operator to view and change the configuration, name, control parameters, and setpoints for all controllers.
  - 2. Scheduling. An editor for the scheduling application shall be provided at each workstation. Provide a method of selecting the desired schedule and month. This shall consist of a monthly calendar for each schedule. Exception schedules and holidays shall be shown clearly on the calendar. Provide a method for allowing several related objects to follow a schedule. The start and stop times for each object shall be adjustable from this master schedule. Schedules shall be easy to copy to other objects and/or dates.
  - 3. Custom Application Programming. Provide the tools to create, modify, and debug custom application programming. The operator shall be able to create, edit, and download custom programs at the same time that all other system applications are operating. The system shall be fully operable while custom routines are edited, compiled, and downloaded. The programming language shall have the following features:
    - a. The language shall be English language oriented, be based on the syntax of BASIC, FORTRAN, C, or PASCAL, and allow for free-form programming (i.e., not column-oriented or "fill in the blanks"). Alternatively, the programming language can be graphically-based using function blocks as long as blocks are available that directly provide the functions listed below, and that custom or compound function blocks can be created.
    - b. A full-screen character editor/programming environment shall be provided. The editor shall be cursor/mouse-driven and allow the user to insert, add, modify, and delete custom programming code. It also shall incorporate word processing features such as cut/paste and find/replace.



- c. The programming language shall allow independently executing program modules to be developed. Each module shall be able to independently enable and disable other modules.
- d. The editor/programming environment shall have a debugging/simulation capability that allows the user to step through the program and observe any intermediate values and/or results. The debugger also shall provide error messages for syntax and execution errors.
- e. The programming language shall support conditional statements (IF/THEN/ELSE/ELSE-IF) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
- f. The programming language shall support floating point arithmetic using the following operators: +, -, /, x, square root, and x-to-the-y-power. The following mathematical functions also shall be provided: natural log, log, trigonometric functions (sine, cosine, etc.), absolute value, and minimum/maximum value from a list of values.
- g. The programming language shall have predefined variables that represent time of day, day of the week, month of the year, and the date. Other predefined variables shall provide elapsed time in seconds, minutes, hours, and days. These elapsed time variables shall be able to be reset by the language so that interval-timing functions can be stopped and started within a program. Values from all of the above variables shall be readable by the language so that they can be used in a program for such purposes as IF/THEN comparisons, calculations, etc.
- h. The language shall be able to read the values of the variables and use them in programming statement logic, comparisons, and calculations.
- i. The programming language shall have predefined variables representing the status and results of the System Software, and shall be able to enable, disable, and change the setpoints of the System Software described below.

G. Laptop Computer:

- 1. Windows 98/2000 or Windows NT 4.0 based, capable of accessing all system data. Laptop computer may be connected to any point on system LAN or may be connected directly to controllers for programming, setup and troubleshooting. Dedicated purpose interfaces are not acceptable. Laptop computer to contain the following as a minimum:
  - a. 300 MHz Pentium Processor.
  - b. 128 Meg RAM.
  - c. 6 GB Hard File.
  - d. 3.5-inch 1.44 Meg Floppy Disk Drive.
  - e. 24x EIDE CD-ROM Drive.
  - f. 8 MB AGP graphic card.
- 2. 25 line screen display with English language prompting for quick access to system information through pop-up menus.

3. When plugged into any multi-purpose controller on the DDC network, laptop computer to have same functionality as Operator Workstation with full editing, programming, display and command functions. Each laptop to allow access to entire control network.

H. Portable Operator's Terminal:

1. Provide 1 hand held Portable Operator's Terminal and controller interface software for communication with any DDC control panel. Portable Operator's Terminal capable of accessing all system data. Portable Operator's Terminal may be connected to any point on the system LAN, or may be connected directly to DDC panels of controllers for programming, setup, and troubleshooting. Dedicated purpose interfaces are not acceptable.
2. Portable Operator's Terminal to have English language prompting for quick access to system information.
3. When plugged into any multi-purpose controller on the DDC network, Portable Operator's Terminal to allow access to entire control network.

- I. Pager's Software: Provide pager software to beep on selected alarms and notify paged individual to call for service.

2.06 CONTROLLER SOFTWARE

- A. Furnish the following applications software for building and energy management. All software applications shall reside and operate in the system controllers. Editing of applications shall occur at the operator workstation.

B. System Security

1. User access shall be secured using individual security passwords and user names.
2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
3. User Log On/Log Off attempts shall be recorded.
4. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.

- C. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each schedule shall consist of the following:

1. Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop, optimal start, optimal stop, and night economizer. Each schedule may consist of up to 10 events. When a group of objects are scheduled together, provide the capability to adjust the start and stop times for each member.
2. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by the standard schedule for that day of the week.

3. Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.
- D. System Coordination. Provide a standard application for the proper coordination of equipment. This application shall provide the operator with a method of grouping together equipment based on function and location. This group may then be used for scheduling and other applications.
- E. Binary Alarms. Each binary object shall be set to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
- F. Analog Alarms. Each analog object shall have both high and low alarm limits. Alarming must be able to be automatically and manually disabled.
- G. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. Alarms shall be routed to the appropriate workstations based on time and other conditions. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display graphics.
- H. Remote Communication. The system shall have the ability to dial out in the event of an alarm using BACnet Point-To-Point at a minimum of 28,800 baud. Receivers shall be BACnet workstations.
- I. Demand Limiting.
  1. The demand limiting program shall monitor building power consumption from signals generated by a pulse generator (provided by others) mounted at the building power meter, or from a watt transducer or current transformer attached to the building feeder lines.
  2. The demand-limiting program shall predict the probable power demand such that action can be taken to prevent exceeding the demand limit. When demand prediction exceeds demand limit, action will be taken to reduce loads in a predetermined manner. When demand prediction indicates the demand limit will not be exceeded, action will be taken to restore loads in a predetermined manner.
  3. Demand reduction shall be accomplished by the following means:
    - a. Reset air handling unit supply temperature setpoint up by 1°C [2°F].
    - b. Reset space temperature setpoints up by 1°C [2°F].
    - c. De-energize equipment based upon priority.
  4. Demand limiting parameters, frequency of calculations, time intervals, and other relevant variables shall be based on the means by which the local power company computes demand charges.
  5. Provide demand-limiting prediction and control for any individual meter monitored by the system or for the total of any combination of meters.
  6. Provide the means for an operator to make the following changes on-line:

- a. Addition and deletion of loads controlled.
  - b. Changes in demand intervals.
  - c. Changes in demand limit for meter(s).
  - d. Maximum shutoff time for equipment.
  - e. Minimum shutoff time for equipment
  - f. Select rotational or sequential shedding and restoring.
  - g. Shed/restore priority.
- 7. Provide the following information and reports, to be available on an hourly, daily, and monthly basis:
  - a. Total electric consumption.
  - b. Peak demand.
  - c. Date and time of peak demand.
  - d. Daily peak demand.
- J. Maintenance Management. The system shall monitor equipment status and generate maintenance messages based upon user-designated run-time, starts, and/or calendar date limits.
- K. Sequencing. Provide application software to properly sequence the start and stop of chillers, boilers, and pumps to minimize energy usage in the facility.
- L. PID Control. A PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-windup shall be supplied. The algorithm shall calculate a time-varying analog value that is used to position an output or stage a series of outputs. The controlled variable, setpoint, and PID gains shall be user-selectable.
- M. Staggered Start. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user-selectable.
- N. Energy Calculations. Provide software to allow instantaneous power (e.g., kW) or flow rates (e.g., L/s [GPM]) to be accumulated and converted to energy usage data. Provide an algorithm that calculates a sliding-window kW demand value.
- O. Anti-Short Cycling. All binary output objects shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected.
- P. On/Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and setpoint. The algorithm shall be direct-acting or reverse-acting, and incorporate an adjustable differential.
- Q. Run-time Totalization. Provide software to totalize run-times for all binary input objects. A high run-time alarm shall be assigned, if required, by the operator.

## 2.07 BUILDING CONTROLLERS

- A. General. Provide an adequate number of Building Controllers to achieve the performance specified and shown on drawings. Each of these panels shall meet the following requirements.
1. The Building Automation System shall be comprised of one or more independent, standalone, microprocessor-based Building Controllers to manage the global strategies described in the System Software section.
  2. The Building Controller shall have sufficient memory to support its operating system, database, and programming requirements.
  3. Data shall be shared between networked Building Controllers.
  4. The operating system of the Building Controller shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information, and allow central monitoring and alarms.
  5. Controllers that perform scheduling shall have a real-time clock.
  6. The Building Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:
    - a. Assume a predetermined failure mode.
    - b. Generate an alarm notification.
  7. The Building Controller shall communicate with other BACnet objects on the internetwork using the Read (Execute and Initiate) and Write (Execute and Initiate) Property services as defined in Clauses 15.5 and 15.8, respectively, of ASHRAE Standard 135-95.

<i>Building Controller BACnet Services</i>	<i>Initiate</i>	<i>Execute</i>
Acknowledge Alarms	--	X
Confirmed COV Notification	X	X
Confirmed Event Notification	X	X
Get Alarm Summary	X	X
Get Enrollment Summary	X	X
Subscribe COV	X	X
Unconfirmed COV Notification	X	X
Unconfirmed Event Notification	X	X
Atomic Read File	--	X
Atomic Write File	--	X
Add List Element	--	X
Remove List Element	--	X
Create Object	--	X
Delete Object	--	X
Read Property	X	X

Read Property Multiple	X	X
Write Property	X	X
Read Range	--	X
Write Property Multiple	X	X
Device Communication Control	--	X
Confirmed Private Transfer	X	X
Unconfirmed Private Transfer	X	X
Reinitialize Device	--	X
Time Synchronization	X	X
Who-Has	--	X
I-Have	X	X
Who-Is	X	X
I-Am	X	X

8. BACnet Functional Groups. The Building Controller shall support the following BACnet functional groups: Clock, Event Initiation, COV Event Response, Files, Device Communication, Time Master and Router.

B. Communication.

1. Each Building Controller shall support a communications card. The communications card shall be connected to the Building Controller by an industry stackable PC-104 bus connection. The communications card is connected to the BACnet network using the ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol. The communications card shall provide for three diverse Ethernet installations; 10Base2, 10BASE5 and 10BaseT connections.
2. Each Building Controller with a communications card shall perform BACnet routing if connected to a network of Custom Application and Application Specific Controllers.
3. The controller shall provide a service communication port using BACnet Data Link/ Physical layer protocol P-T-P for connection to a hand-held workstation/or printer and/or modem.
4. The Building Controller secondary communication network shall support one LonWorks FTT port at 78 Kbits/s.
5. The Building Controller shall support non-proprietary open protocols, e.g. Modbus, CAB, etc. Interface to the Building Controller shall be through an EIA 232 Point-To-Point connection.

C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof and dust proof enclosures, and shall be rated for operation at -29°C to 40°C (-20°F to 100°F) and 10 to 90% RH.

2. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].
- D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field- removable, modular terminal strips - or to a termination card connected by a ribbon cable.
  - E. Memory. The Building Controller shall have as a minimum standard SRAM of 256 KB, standard DRAM of 1MB and standard non-volatile 1 MB of flash memory in lieu of EPROM. Memory shall be user extendible through RAM chip sockets and SIMMs for future memory expansion.
  - F. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. The Building Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft].
  - G. Inputs/Outputs. Controller shall support a directly connected input/output board with 16 universal inputs and 16 universal outputs. Input/output board to be expandable through individual I/O modules and up to 3 I/O expansion boards. A fully expanded controller shall support up to 145 connected inputs/outputs.
    1. Inputs. Controller input/output board shall support dry contact, 0-5 VDC and 0-10 VDC- voltage, 4-20 mA- current and thermistor-resistive signal types on an individual basis for connecting any status or sensing device. Analog resolution shall be 12-bit A to D.
    2. Outputs. Controller input/output board shall support plug-and-play I/O modules configured with manual-auto-off override switch, potentiometer and input channel for feedback status or and unrelated analog or digital input. Output supported shall be 0-10 VDC-voltage and/or 4-20mA-current.
    3. Diagnostics. Controller input/output board shall have red LEDs providing input status indication.
    4. External Power. Controller input/output board shall have four on-board 24 VDC terminal for directly connected active transducers.
    5. The Building Controller shall have the capability to create, delete and support the following BACnet Objects:
      - a. ANALOG INPUT, ANALOG OUTPUT AND ANALOG VALUE: These objects shall have the following writeable properties: Object Name; Object Value; Description; COV Increment; Out of Service and Units. In addition, these objects shall support the properties: Device type; Reliability; Min./Max. Values; Update Interval and Resolution.
      - b. BINARY INPUT, BINARY OUTPUT AND BINARY VALUE: These objects shall have the following writeable properties: Object Name; Object Value; Description; Polarity; Default Value; Min On/Off and Out of Service. In addition, these objects shall support the properties: Device Type; Reliability;

- Active/Inactive Texts; Update Interval; Resolution; Change-of-State Time; Count Times and Time Reset.
- c. CALENDAR: This object shall have the following writeable properties: Object Name; Object Value; Description; and Date List.
  - d. DEVICE: This object shall have the following writeable properties: Object Name; Description; Location; and UTC Offset.
  - e. EVENT ENROLMENT: This object shall have the following writeable properties: Object Name; Object Value; Description; Out-of-Service; Event & Notify Types; Parameters; Property Ref; Enable; and Notification Class.
  - f. FILE: This object shall have the following writeable properties: Object Name; Description; File Type; and File Access.
  - g. LOOP (PID): This object shall have the following writeable properties: Object Name; Object Value; Description; Polarity; Output and Input Refs.; Input Value & Units; Setpoint Value; PID Values; Bias; Write Priority and COV Increment. In addition, this object shall support the properties: Reliability; Update Interval; Proportional Constant & Units; Derivative Constant & Units and Min./Max. Outputs.
  - h. NOTIFICATION CLASS: This object shall have the following writeable properties: Object Name; Object Value; Description; Priority and Ack Required.
  - i. PROGRAM: This object shall have the following writeable properties: Object Name; Object Value and Description. In addition, this object shall support the property Reliability.
  - j. SCHEDULE: This object shall have the following writeable properties: Object Name; Object Value and Description; Effective period; Schedule; Exception; Controlled Properties and Write Properties.
  - k. TREND LOG: This object shall have the following writeable properties: Object Name; Description; Log Enable; Start/stop Times; Log Device Object Property; Log Interval; Stop When Full; Buffer Size; and Record Count.

## 2.08 CUSTOM APPLICATION CONTROLLERS

- A. General. Provide an adequate number of Custom Application Controllers to achieve the performance specified in the Part 1 Article on "System Performance." Each of these panels shall meet the following requirements.
  - 1. The Custom Application Controller shall have sufficient memory to support its operating system, database, and programming requirements.
  - 2. Data shall be shared between networked Custom Application Controllers.
  - 3. The operating system of the Controller shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information, and allow central monitoring and alarms.
  - 4. Controllers that perform scheduling shall have a real-time clock.
  - 5. The Custom Application Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:
    - a. Assume a predetermined failure mode.
    - b. Generate an alarm notification.



6. The Custom Application Controller shall communicate with other BACnet objects on the internetwork using the Read (Execute and Initiate) and Write (Execute and Initiate) Property services as defined in Clauses 15.5 and 15.8, respectively, of ASHRAE Standard 135-95.
- B. Communication.
    1. Each Custom Application Controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol.
    2. The controller shall provide a service communication port using BACnet Data Link/ Physical layer protocol for connection to a hand-held workstation.
  - C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.
    1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof and dustproof enclosures, and shall be rated for operation at -29°C to 40°C [32°F to 120°F].
    2. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].
  - D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips - or to a termination card connected by a ribbon cable.
  - E. Memory. The Custom Application Controller shall be non-volatile FLASH memory.
  - F. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft].
- ## 2.09 APPLICATION SPECIFIC CONTROLLERS
- A. General. Application Specific Controllers (ASCs) are microprocessor-based DDC controllers which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user-programmable, but are customized for operation within the confines of the equipment they are designed to serve. Application Specific Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of ASHRAE Standard 135-95.
    1. Each ASC shall be capable of standalone operation and shall continue to provide control functions without being connected to the network.
    2. Each ASC will contain sufficient I/O capacity to control the target system.

B. Communication.

1. The controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol. Each ASC shall be connected to one Building Controller. Each Building Controller shall support a network of 150 ASCs. Each ASC shall be optically isolated from the network.
2. Each controller shall have a BACnet Data Link/ Physical layer compatible connection for a laptop computer or a portable operator's tool. This connection shall be extended to a space temperature sensor port where shown.

C. Environment. The hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof and dustproof enclosures, and shall be rated for operation at -28°C to 65°C (E-10°F to 150°F).
2. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips - or to a termination card connected by a ribbon cable.

E. Memory. The Application Specific Controller shall use non-volatile memory and maintain all BIOS and programming information in the event of a power loss.

F. Immunity to power and noise. ASC shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

G. Transformer. Power supply for the ASC must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type.

H. Input/Output. ASC shall support as a minimum, directly connected, four analog or digital inputs and two analog outputs and five digital outputs. ASC inputs shall support 0-5 VDC-voltage, 4-20mA-current, thermistor-resistance and dry contacts. ASC outputs shall support 0-10 VDC-voltage, 4-20 mA-current and digital triac rated at 0.5 amps at 24 VAC.

I. System Object Capacity. The system size shall be expandable to at least twice the number of input/output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

## 2.10 INPUT/OUTPUT INTERFACE

A. Hardwired inputs and output points/objects may be wired into the system through Building, Custom Application, or Application Specific Controllers.

- B. All input and output points shall be protected such that shorting of the point to itself, to another point, or to ground, will cause no damage to the controller. All input and output points shall be protected from voltage up to 24 volts of any duration, such that contact with this voltage will cause no damage to the controller. Inputs and outputs shall be arranged on interchangeable modules or circuit boards to allow the replacement of a damaged module or board without replacing the entire controller.
- C. Digital inputs shall allow the monitoring of ON/OFF signals from remote devices. The digital inputs shall provide a current of at least 12 mA to be compatible with commonly available control devices, and shall be protected against the effects of contact bounce and noise. Digital inputs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.
- D. Pulse accumulation inputs. This type of point/object shall conform to all requirements of a binary input point/object, and also accept up to 10 pulses per second for pulse accumulation.
- E. Analog inputs shall allow the monitoring of 0-5 VDC, 0-10 VDC-voltage, 4-20 mA-current, or thermistors, RTD-resistance signals. Analog inputs shall be compatible, and be field configurable to commonly available sensing devices.
- F. Digital outputs shall provide for ON/OFF operation, or a pulsed low-voltage signal for pulse width modulation control. Digital outputs on Building and Custom Application Controllers shall have three-position override switches, Hand-Off-Auto with status lights. Outputs shall be selectable for either normally open or normally closed operation.
- G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10 VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs on Building or Custom Application Controllers shall have status lights and a two-position (AUTO/MANUAL) switch and manually adjustable potentiometer for manual override. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.
- H. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
- I. Input/Output points/objects shall be universal type, i.e., controller input or output may be designated (in software) as either a binary or analog type point/object with appropriate properties. Application Specific Controllers are exempted from this requirement.
- J. System Object Capacity. The system size shall be expandable to at least twice the number of input/output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity.

requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

## 2.11 POWER SUPPLIES AND LINE FILTERING

A. Control transformers shall be UL Listed. Furnish Class 2 current-limiting type, or furnish over-current protection in both primary and secondary circuits for Class 2 service per NEC requirements. Limit connected loads to 80% of rated capacity.

1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100 microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection, and shall be able to withstand a 150% current overload for at least 3 seconds without trip-out or failure.

a. Unit shall operate between 0°C and 50°C [32°F and 120°F]. EM/RF shall meet FCC Class B and VDE 0871 for Class B, and MIL-STD 810C for shock and vibration.

b. Line voltage units shall be UL Recognized and CSA Approved.

B. Power line filtering.

1. Provide transient voltage and surge suppression for all workstations and controllers either internally or as an external component. Surge protection shall have the following at a minimum:

a. dielectric strength of 1,000 volts minimum

b. response time of 10 nanoseconds or less

c. transverse mode noise attenuation of 65 dB or greater

d. common mode noise attenuation of 150 dB or better at 40 Hz to 100 Hz.

## 2.12 AUXILIARY CONTROL DEVICES

A. Motorized control dampers, unless otherwise specified elsewhere, shall be as follows:

1. Control dampers shall be parallel or opposed blade type as below or as scheduled on drawings.

2. Control dampers are specified in Division 15, Section "Duct Accessories."

B. Electric damper/valve actuators.

1. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.

2. Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing.

3. All rotary spring-return actuators shall be capable of both clockwise or counter-clockwise spring-return operation. Linear actuators shall spring-return to the retracted position.
4. Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mA control signal and provide a 2 to 10 VDC or 4 to 20 mA operating range.
5. All 24 VAC/VDC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 W for DC applications. Actuators operating on 120 VAC or 230 VAC shall not require more than 11 VA.
6. All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring-return actuators with more than 7 N·m [60 in-lb] torque capacity shall have a manual crank for this purpose.
7. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation.
8. Actuators shall be provided with a raceway fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
9. Actuators shall be UL Standard 873 Listed and CSA Class 4813 02 Certified as meeting correct safety requirements and recognized industry standards.
10. Actuators shall be designed for a minimum of 60,000 full-stroke cycles at the actuator's rated torque.

C. Control valves.

1. Control valves shall be two-way or three-way type for two-position or modulating service as shown.
2. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
  - a. Water Valves:
    - 1) Two-way: 150% of total system (pump) head.
    - 2) Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
3. Water Valves:
  - a. Body and trim style and materials shall be per manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
  - b. Sizing Criteria:
    - 1) Two-position service: Line size.
    - 2) Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 5 psi, whichever is greater.

- 3) Three-way modulating service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), 35 kPa [5 psi] maximum.
- 4) Valves ½" through 2" shall be bronze body or cast brass ANSI Class 250, spring-loaded, Teflon packing, quick opening for two-position service. Two-way valves to have replaceable composition disc, or stainless steel ball.
- 5) 2½" valves and larger shall be cast iron ANSI Class 125 with guided plug and Teflon packing.
- 6) Water valves shall fail normally open or closed as scheduled on plans, or as follows:
  - a) Water zone valves - normally open preferred.
  - b) Heating coils in air handlers - normally open.
  - c) Chilled water control valves - normally closed.
  - d) Other applications - as scheduled or as required by sequences of operation.

D. Binary Temperature Devices

1. Low-voltage space thermostat shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C to 30°C [55°F to 85°F] setpoint range, 1°C [2°F] maximum differential, and vented ABS plastic cover.
2. Line-voltage space thermostat shall be bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, UL listed for electrical rating, concealed setpoint adjustment, 13°C to 30°C [55°F to 85°F] setpoint range, 1°C [2°F] maximum differential, and vented ABS plastic cover.
3. Low-limit thermostats. Low-limit thermostats shall be vapor pressure type with an element 6 m [20 ft] minimum length. Element shall respond to the lowest temperature sensed by any 30 cm [1 ft] section. The low-limit thermostat shall be manual reset only.

E. Temperature sensors.

1. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistors.
2. Duct sensors shall be rigid or averaging as shown. Averaging sensors shall be a minimum of 1.5 m [5 feet] in length.
3. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
4. Space sensors shall be equipped with setpoint adjustment, override switch, display, and/or communication port as shown.
5. Provide matched temperature sensors for differential temperature measurement.

F. Humidity sensors.

1. Duct and room sensors shall have a sensing range of 20% to 80%.
2. Duct sensors shall be provided with a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall be suitable for ambient conditions of -40°C to 75°C [-40°F to 170°F].
4. Humidity sensor's drift shall not exceed 1% of full scale per year.

G. Carbon Dioxide Sensors

1. Duct and room sensors shall have a nominal range of 0 PPM to 2000 PPM of carbon dioxide with recalibration ability to adjust range to 0 PPM to 5000 PPM.
2. Duct sensors shall have sampling tube and an operating flow rate from 0 FPM to 1950 FPM.
3. Outside air carbon dioxide sensors shall have a range of 0 PPM to 1000 PPM with an accuracy of 20 ppm +/- % of reading.
4. Indoor carbon dioxide sensors shall have operating temperature of -5° C to 45°C and a humidity range of 0%RH to 85%RH (non condensing).
5. Outdoor carbon dioxide sensors shall have an operating temperature range of -30° C to 60° C and a humidity range of 0%RH to 100%RH.
6. Outdoor carbon dioxide sensor shall have a PC plastic probe tube. Sensor shall be suitable for outside operation.
7. Carbon dioxide sensors control housing shall be NEMA 4 Enclosures.

H. Flow switches.

1. Flow-proving switches shall be either paddle or differential pressure type, as shown.
2. Paddle type switches (water service only) shall be UL Listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA 1 enclosure unless otherwise specified.
3. Differential pressure type switches (air or water service) shall be UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application, or as specified.

I. Relays.

1. Control relays shall be UL Listed plug-in type with dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage suitable for application.
2. Time delay relays shall be UL Listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable  $\pm 200\%$  (minimum) from setpoint shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

J. Override timers.

1. Override timers shall be spring-wound line voltage UL Listed, contact rating and configuration as required by application. Provide 0-to-6-hour calibrated dial unless

otherwise specified; suitable for flush mounting on control panel face, located on local control panels or where shown.

K. Current transmitters.

1. AC current transmitters shall be self-powered combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4 to 20 Ma two-wire output. Unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A full scale, internal zero and span adjustment, and  $\pm 1\%$  full scale accuracy at 500 ohm maximum burden.
2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
3. Unit shall be split-core type for clamp-on installation on existing wiring.

L. Current transformers.

1. AC current transformers shall be UL/CSA recognized and completely encased (except for terminals) in approved plastic material.
2. Transformers shall be available in various current ratios and shall be selected for  $\pm 1\%$  accuracy at 5 A full scale output.
3. Transformers shall be fixed-core or split-core type for installation on new or existing wiring, respectively.

M. Voltage transmitters.

1. AC voltage transmitters shall be self-powered single loop (two-wire) type, 4 to 20 mA output with zero and span adjustment.
2. Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with  $\pm 1\%$  full-scale accuracy with 500 ohm maximum burden.
3. Transmitters shall be UL/CSA recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.

N. Voltage transformers.

1. AC voltage transformers shall be UL/CSA recognized, 600 VAC rated, complete with built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 4 to 55°C [40 to 130°F] and shall provide  $\pm 0.5\%$  accuracy at 24 VAC and a 5 VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic material.

O. Power monitors.

1. Power monitors shall be three-phase type furnished with three-phase disconnect/shorting switch assembly, UL Listed voltage transformers and UL Listed split-core current transformers.



2. Shall provide a selectable rate pulse output for kWh reading and a 4 to 20 mA output for kW reading. Shall operate with 5 A current inputs with a maximum error of  $\pm 2\%$  at 1.0 power factor or  $\pm 2.5\%$  at 0.5 power factor.
- P. Current switches.
1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.
- Q. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application, or as shown.
- R. Local control panels.
1. All indoor control cabinets shall be fully enclosed NEMA 1 construction. All outdoor control cabinets shall be NEMA 4 construction. All cabinets shall have hinged door, key-lock latch, removable sub-panels. A single key shall be common to all field panels and sub-panels.
  2. Interconnections between internal and face-mounted devices pre-wired with color coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL Listed for 600 volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
  3. Provide ON/OFF power switch with over-current protection for control power sources to each local panel.
- 2.13 WIRING AND RACEWAYS
- A. General: Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of Division 16.
- B. All insulated wire to be copper conductors, UL labeled for 90C minimum service.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Verify that conditioned power supply is available to control units and operator workstation.
- B. Verify that duct-, pipe-, and equipment-mounted devices and wiring are installed before proceeding with installation.

- C. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.
- D. The Contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the Engineer for resolution before rough-in work is started.
- E. The Contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate – or if any discrepancies occur between the plans and the Contractor's work, and the plans and the work of others – the Contractor shall report these discrepancies to the Engineer and shall obtain written instructions for any changes necessary to accommodate the Contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the Contractor to report such discrepancies shall be made by – and at the expense of – this Contractor.

### 3.02 PROTECTION

- A. The Contractor shall protect all work and material from damage by its work or employees, and shall be liable for all damage thus caused.
- B. The Contractor shall be responsible for its work and equipment until finally inspected, tested and accepted. The Contractor shall protect any material that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

### 3.03 INSTALLATION

- A. Install equipment level and plumb.
- B. Install software in control units and operator workstation. Implement all features of programs to specified requirements and as appropriate to sequence of operation.
- C. Connect and configure equipment and software to achieve sequence of operation as specified on drawings.
- D. Install automatic dampers according to Division 15 Section "Duct Accessories."
- E. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
- F. Install labels and nameplates to identify control components according to Division 15 Section "Mechanical Identification."
- G. Install hydronic instrument wells, valves, and other accessories according to Division 15 Section "Duct Accessories."

- H. Install all equipment in accordance with equipment manufacturer's published instructions.
- I. Review the project design drawings to become thoroughly familiar with all details of the work and working conditions. The DDC contractor shall be responsible for the coordination of the control work with the work of all trades.
- J. Where installation procedures, or any part thereof, are required to be in accordance with the recommendations of the manufacturer of the material being installed, furnish printed copies of these recommendations to the Owner's Representative prior to installation.
- K. All control wiring shall be installed in electrical conduit when being routed exposed within the space, mechanical rooms, exterior locations, etc. Control wiring installed within a concealed location, such as above a ceiling, may be neatly bundled and routed in a logical and organized manner. Bundle shall be sheathed and supported by zinc plated steel hangers 4 feet on center maximum. In all cases, exposed control wiring to be plenum rated.
- L. Conduit and boxes associated with new sensors in space below ceiling shall be ran inside of existing walls whenever possible. When it is not possible to do so, conduit and boxes shall be a decorative type selected to match surroundings on which they are being installed and approved by owner.
- M. All system control points and devices shall be clearly labeled using engraved plastic laminate tags. Nomenclature for system labeling shall be consistent with that used on system shop drawings.
- N. All control and interlock wiring shall comply with national and local electrical codes and Division 16 of this specification. Where the requirements of this section differ with those in Division 16, the requirements of this section shall take precedence.
- O. All NEC Class 1 (line voltage) wiring shall be UL Listed in approved raceway per NEC and Division 16 requirements.
- P. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)
- Q. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations including ceiling return air plenum, approved cables not in raceway may be used, provided that cables are UL Listed for the intended application. For example, cables used in ceiling plenum shall be UL Listed specifically for that purpose.
- R. All wiring in mechanical, electrical, or service rooms - or where subject to mechanical damage - shall be installed in raceway at levels below 3m [10ft].
- S. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

- T. Do not install wiring in raceway containing tubing.
- U. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it, and neatly tied at 3m [10ft] intervals.
- V. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.
- W. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.
- X. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- Y. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the Contractor shall provide step-down transformers.
- Z. All wiring shall be installed as continuous lengths, with no splices permitted between termination points/objects.
- AA. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.
- BB. Size of raceway and size and type of wire shall be the responsibility of the Contractor, in keeping with the manufacturer's recommendation and NEC requirements, except as noted elsewhere.
- CC. Include one pull string in each raceway 2.5 cm [1"] or larger.
- DD. Use coded conductors throughout with different colored conductors.
- EE. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.
- FF. Conceal all raceways, except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15cm [6"] from high-temperature equipment (e.g., steam pipes or flues).
- GG. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.
- HH. Adhere to Division 16 requirements where raceway crosses building expansion joints.

- II. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of all vertical raceways.
- JJ. The Contractor shall terminate all control and/or interlock wiring, and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- KK. Flexible metal raceways and liquid-tight, flexible metal raceways shall not exceed 1 m [3 ft] in length and shall be supported at each end. Flexible metal raceway less than ½ " electrical trade size shall not be used. In areas exposed to moisture - including chiller and boiler rooms - liquid-tight, flexible metal raceways shall be used.
- LL. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (per code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.
- MM. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.
- NN. Maximum pulling, tension, and bend radius for cable installation as specified by the cable manufacturer shall not be exceeded during installation.
- OO. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.
- PP. When a cable enters or exits a building, a lightning arrester must be installed between the lines and ground. The lightning arrester shall be installed according to the manufacturer's instructions. All runs of communication wiring shall be unspliced length when that length is commercially available.
- QQ. All communication wiring shall be labeled to indicate origination and destination data.
- RR. Grounding of coaxial cable shall be in accordance with NEC regulations Article on Communications Circuits, Cable and Protector Grounding.

### 3.04 PROJECT MANAGEMENT

- A. Provide a designated project manager who will be responsible for the following:

- 1. Construct and maintain project schedule
- 2. On-site coordination with all applicable trades, subcontractors, and other integration vendors
- 3. Authorized to accept and execute orders or instructions from owner/engineer
- 4. Attend project meetings as necessary to avoid conflicts and delays
- 5. Make necessary field decisions relating to this scope of work
- 6. Coordination/Single point of contact

### 3.05 START-UP

- A. When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line. The manufacturer shall complete all testing, calibrating, adjusting and final field tests. Verify that all systems are operable from local controls in the specified failure mode upon panel failure or loss of power.
- B. Provide any recommendation for system modification in writing to owner. Do not make any system modification, including operating parameters and control settings, without prior approval of owner.
- C. After manufacturer has completed system start-up and commissioning. Joint commissioning of integrated system segments shall be completed.

### 3.06 ELECTRICAL WIRING AND MATERIALS

- A. Install, connect and wire the items included under this Section. This work includes providing required conduit, wire, fittings, and related wiring accessories. All wiring shall be installed in conduit.
- B. Provide wiring between thermostats, aquastats and unit heater motors, all control and alarm wiring for all control and alarm devices for all Sections of Specifications
- C. Provide 120 volt, single phase, 60 hertz emergency power to every BAS DDC Controller panel, HVAC/Mechanical Equipment Controller, PC console, power supply, transformer, annunciator, modems, printers and to other devices as required. It is the intent that the entire building management system except terminal equipment shall be operative under emergency power conditions in the building. The power supplies are to be extended in conduit and wire from emergency circuit breakers.
- D. Provide status function conduit and wiring for equipment covered under this Section.
- E. Provide conduit and wiring between the BAS panels and the temperature, humidity, or pressure sensing elements, including low voltage control wiring in conduit.
- F. Provide conduit and control wiring for devices specified in this Section
- G. Provide conduit and signal wiring between motor starters in motor control centers and high and/or low temperature relay contacts and remote relays in BAS panels located in the vicinity of motor control centers.
- H. Provide conduit and wiring between the PC workstation, electrical panels, metering instrumentation, indicating devices, miscellaneous alarm points, remotely operated contractors, and BAS panels, as shown on the drawings or as specified
- I. All wiring to be compliant to local building code and the NEC.
- J. Provide electrical wall box and conduit sleeve for all wall mounted

- K. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets shall be connected in interlock circuit of power controllers.
- L. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

### 3.07 INSTALLATION OF SENSORS

- A. Install all sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequately for the environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.
- D. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.
- E. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across duct. Each bend shall be supported with a capillary clip.
- F. Low limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m of sensing element for each 1 m<sup>2</sup> [1 ft of sensing element for each 1 ft<sup>2</sup>] of coil area
- G. All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.
- H. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.
- I. Differential air static pressure.
  - 1. Supply Duct Static Pressure: Pipe the high-pressure tap to the duct using a pivot tube. Pipe the low-pressure port to a tee in the high-pressure tap tubing of the corresponding building static pressure sensor (if applicable), or to the location of the duct high-pressure tap and leave open to the plenum.
  - 2. Return Duct Static Pressure: Pipe the high-pressure tap to the duct using a pivot tube. Pipe the low-pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor
  - 3. Building Static Pressure: Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.
  - 4. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.

5. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment
6. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shutoff valves installed before the tee.

### 3.08 FLOW SWITCH INSTALLATION

- A. Use correct paddle for pipe diameter.
- B. Adjust flow switch in accordance with manufacturer's instructions.

### 3.09 ACTUATORS

- A. Mount and link control damper actuators per manufacturer's instructions.
  1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage
  2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions
  3. Provide all mounting hardware and linkages for actuator installation.
- B. Electric/Electronic
  1. Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations.
  2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

### 3.10 WARNING LABELS

- A. Permanent warning labels shall be affixed to all equipment which can be automatically started by the DDC system.
  1. Labels shall use white lettering (12-point type or larger) on a red background.
  2. Warning labels shall read as follows:

#### CAUTION

This equipment is operating under automatic control  
and may start or stop at any time without warning.  
Switch disconnect to "Off" position before servicing.



- B. Permanent warning labels shall be affixed to all motor starters and all control panels which are connected to multiple power sources utilizing separate disconnects.
  - 1. Labels shall use white lettering (12-point type or larger) on a red background.
  - 2. Warning labels shall read as follows:

**CAUTION**

This equipment is fed from more than one  
power source with separate disconnects.  
Disconnect all power sources before servicing.

**3.11 IDENTIFICATION OF HARDWARE AND WIRING**

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 5 cm [2"] of termination with the DDC address or termination number
- B. Permanently label or code each point/object of field terminal strips to show the instrument or item served.
- C. Identify control panels with minimum 1 cm [½"] letters on laminated plastic nameplates.
- D. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.
- E. Identify room sensors relating to terminal box or valves with nameplates
- F. Manufacturers' nameplates and UL or CSA labels to be visible and legible after equipment is installed.
- G. Identifiers shall match record documents.

**3.12 CONTROLLERS**

- A. Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points/objects associated with the system are assigned to the same DDC controller. Points/objects used for control loop reset such as outside air or space temperature are exempt from this requirement.
- B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point/object capacity for each point/object type found at each location. If input/objects are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point/object used.
  - 1. Future use of spare capacity shall require providing the field device, field wiring, point/object database definition, and custom software. No additional controller

boards or point/object modules shall be required to implement use of these spare points.

### 3.13 PROGRAMMING

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging. There shall be a minimum of 25% of available memory free for future use.
- B. Point/object Naming: System point/object names shall be modular in design, allowing easy operator interface without the use of a written point/object index. Use the following naming convention:

AAABBBCCCDDDEEE where:

AAA is used to designate the location of the point/object within the building such as mechanical room, wing, or level, or the building itself in a multi-building environment.

BBB is used to designate the mechanical system with which the point/object is associated (e.g., A01, HTG, CLG, LTG).

CCC represents the equipment or material referenced (e.g., SAF for supply air fan, EXF for exhaust fan, RAF for return air fan).

D or DD or DDD may be used for clarification or for identification if more than one of CCC exists (e.g., SAF10, EXF121).

EE represents the action or state of the equipment or medium (e.g., T for temperature, RH for humidity, CO for control, S for status, D for damper control, I for current).

#### C. Software Programming

- 1. Provide programming for the system and adhere to the sequences of operation provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by the Contractor. Embed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:

##### a. Text-based:

- 1) must provide actions for all possible situations
- 2) must be modular and structured
- 3) must be commented

##### b. Graphic-based:

- 1) must provide actions for all possible situations
- 2) must be documented

c. Parameter-based:

- 1) must provide actions for all possible situations
- 2) must be documented

D. Operator Interface

1. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point/object information on the graphic displays shall dynamically update. Show on each graphic all input and output points/objects for the system. Also show relevant calculated points/objects such as setpoints.
2. Show terminal equipment information on a "graphic" summary table. Provide dynamic information for each point/object shown.
3. The Contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

3.14 CONTROL SYSTEM CHECKOUT AND TESTING

A. Start-up Testing: All testing listed in this article shall be performed by the Contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the Owner's Representative is notified of the system demonstration.

1. The Contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.
2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures per manufacturers' recommendations
4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.
5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The Contractor shall check all control valves and automatic dampers to ensure proper action and closure. The Contractor shall make any necessary adjustments to valve stem and damper blade travel

6. Verify that the system operation adheres to the Sequences of Operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimum Start/Stop routines
7. Alarms and Interlocks:
  - a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
  - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
  - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

### 3.15 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

#### A. Demonstration

1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed its own tests.
2. The tests described in this section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, startup, and debugging process and as specified in the "Control System Checkout and Testing" Article in Part 3 of this specification. The Engineer will be present to observe and review these tests. The Engineer shall be notified at least 10 days in advance of the start of the testing procedures.
3. The demonstration process shall follow that approved in Part 1: "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
4. The Contractor shall provide at least two persons equipped with two-way communication, and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point/object and system. Any test equipment required to prove the proper operation shall be provided by and operated by the Contractor.
5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
6. Demonstrate compliance with Sequences of Operation through all modes of operation.
7. Demonstrate complete operation of Operator Interface.
8. Additionally, the following items shall be demonstrated:
  - a. DDC Loop Response. The Contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in setpoint, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the

loop. The trend data shall show for each sample the setpoint, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.

- b. Demand limiting. The Contractor shall supply a trend data output showing the action of the demand-limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting setpoint, and the status of sheddable equipment outputs.
- c. Optimum Start/Stop. The Contractor shall supply a trend data output showing the capability of the algorithm. The hour-by-hour trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.
- d. Interface to the building fire alarm system.
- e. Operational logs for each system that indicate all setpoints, operating points, valve positions, mode, and equipment status shall be submitted to the Architect/Engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.
- f. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The Contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

B. Acceptance

1. All tests described in this specification shall have been performed to the satisfaction of both the Engineer and Owner prior to the acceptance of the control system as meeting the requirements of Completion. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Engineer. Such tests shall then be performed as part of the warranty.
2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1: "Submittals."

3.16 CLEANING

- A. The Contractor shall clean up all debris resulting from its activities daily. The Contractor shall remove all cartons, containers, crates, etc., under its control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.
- B. At the completion of work in any area, the Contractor shall clean all of its work, equipment, etc., keeping it free from dust, dirt, and debris, etc.
- C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to

match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.17 TRAINING

- A. Provide a minimum of four on-site or classroom training sessions, three days each, throughout the contract period for personnel designated by the Owner.
- B. Provide two additional training sessions at 6 and 12 months following building's turnover. Each session shall be three days in length and must be coordinated with the building Owner.
- C. Train the designated staff of Owner's Representative and Owner to enable them to:

1. Day-to-day Operators:

- a. Proficiently operate the system
- b. Understand control system architecture and
- c. Understand DDC system components
- d. Understand system operation, including DDC system control and optimizing routines (algorithms)
- e. Operate the workstation and peripherals
- f. Log on and off the system
- g. Access graphics, point/object reports, and logs
- h. Adjust and change system setpoints, time schedules, and holiday schedules
- 9. Recognize malfunctions of the system by observation of the printed copy and graphical visual
- i. Understand system drawings, and Operation and Maintenance manual
- j. Understand the job layout and location of control components
- k. Access data from DDC controllers and ASCs
- l. Operate portable operator's terminals

2. Advanced Operators:

- a. Make and change graphics on the workstation
- b. Create, delete, and modify alarms, including annunciation and routing of these
- c. Create, delete, and modify point/object trend logs, and graph or print these both on an ad-hoc basis and at user-definable time
- d. Create, delete, and modify
- e. Add, remove, and modify system's physical points/objects
- f. Create, modify, and delete programming
- g. Add panels when required
- h. Add operator interface
- i. Create, delete, and modify system displays - both graphical and
- j. Perform DDC system field checkout
- k. Perform DDC controller unit operation and maintenance
- l. Perform workstation and peripheral operation and maintenance procedures

- m. Perform DDC system diagnostic procedures
    - n. Configure hardware including PC boards, switches, communication, and I/O points/objects
    - o. Maintain, calibrate, troubleshoot, diagnose, and repair hardware
    - p. Adjust, calibrate, and replace system components
  - 3. System Managers/Administrators:
    - a. Maintain software and prepare
    - b. Interface with job-specific, third-party operator
    - c. Add new users and understand password security procedures
  - D. These objectives will be divided into three logical groupings. Participants may attend one or more of these, depending on level of knowledge required:
    - 1. Day-to-day Operators: parts 1-13
    - 2. Advanced Operators: parts 1-29
    - 3. System Managers/Administrators: parts 1-13, and 30-32
  - E. Provide course outline and materials as per "Submittals" Article in Part 1 of this specification. The instructor(s) shall provide one copy of training material per student
  - F. The instructor(s) shall be factory-trained instructors experienced in presenting this material.
  - G. Classroom training shall be done using a network of working controllers representative of the installed hardware.
- 3.18 SEQUENCES OF OPERATION
- A. Provide operation as shown on drawings.
- 3.19 OBJECT LIST
- A. Provide complete device list as part of the submittal. Use the following form type to describe devices (see next page):

[illegible]

- A. Valve submittals shall be coordinated for type, quantity, size, and piping configuration to ensure compatibility with pipe design.
- B. Slip-stem control valves shall be installed so that the stem position is not more than 60 degrees from the vertical up position. Ball type control valves shall be installed with the stem in the horizontal position.



- C. Valves shall be installed in accordance with the manufacturer's recommendations.
- D. Control valves shall be installed so that they are accessible and serviceable, and such that actuators may be serviced and removed without interference from structure or other pipes and/or equipment.
- E. Isolation valves shall be installed such that the control valve body may be serviced without draining the supply/return side piping system. Unions shall be installed at all connections to screw-type control valves.
- F. Provide tags for all control valves indicating service and number. Tags shall be in accordance with Division 15 Section "Mechanical Identification."

### 3.21 CONTROL DAMPER INSTALLATION

- A. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.
- B. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure  $\frac{1}{4}$  " larger than damper dimensions and shall be square, straight, and level.
- C. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 0.3 cm [ $\frac{1}{8}$ " ] of each other.
- D. Follow manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
- E. Install extended shaft or jackshaft per manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
- F. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to assure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
- G. Provide a visible and accessible indication of damper position on the drive shaft end.
- H. Support ductwork in area of damper when required to prevent sagging due to damper weight.
- I. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

### 3.22 SMOKE DAMPER INSTALLATION

- A. The Contractor shall coordinate all smoke and smoke/fire damper installation, wiring and checkout to assure that these dampers function properly, and that they respond to the proper fire alarm system general, zone, and/or detector trips. The Contractor shall immediately report any discrepancies to the Engineer no less than two weeks prior to inspection by the code authority having jurisdiction.
- B. Provide complete submittal data to Controls System Subcontractor for coordination of duct smoke detector interface to HVAC systems.

### 3.23 DUCT SMOKE DETECTION

- A. Submit data for coordination of duct smoke detector interface to HVAC systems as required in Part 1: "Submittals."
- B. This Contractor shall provide a dry-contact alarm output in the same room as the HVAC equipment to be controlled.
- C. This Contractor shall interlock wire duct smoke detector for fan/system shutdown.

### 3.24 CONTROLS COMMUNICATION PROTOCOL

- A. General. The electronic controls packaged with this equipment shall communicate with the building direct digital control (DDC) system. The DDC system shall communicate with these controls to read the information and change the control setpoints as shown in the points/object list, sequences of operation, and control schematics. The information to be communicated between the DDC system and these controls shall be in the standard object format as defined in ASHRAE Standard 135-1995 (BACnet). Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of ASHRAE Standard 135-95.
- B. Distributed Processing. The Controller shall be capable of standalone operation and shall continue to provide control functions without being connected to the network.
- C. I/O Capacity. The Controller shall contain sufficient I/O capacity to control and monitor the target system with a minimum of 16 universal inputs and 16 universal outputs.
- D. Communication. The Controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol. Each network of controllers shall be connected to one Building Controller.
- E. The Controller shall have a BACnet Data Link/ Physical layer compatible connection for a laptop computer or a portable operator's tool.
- F. Environment. The hardware shall be suitable for the anticipated ambient conditions.
- G. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at -40°C to 65°C [-40°F to 150°F].

- H. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F]
  - I. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
  - J. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.
  - K. Immunity to Power and Noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft].
  - L. Transformer. Power supply for the Controller must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type.
  - M. Protocol Implementation Conformance Statement (PICS). Supplier of the electronic controls packaged with this equipment shall provide to the controls contractor a PICS list, complete with object list and wiring diagrams for proper and complete interface.
- 3.25 STARTUP AND CHECKOUT PROCEDURES
- A. Start up, check out, and test all hardware and software, and verify communication between all components.
    - 1. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
    - 2. Verify that all analog and binary input/output points/objects read properly.
    - 3. Verify alarms and interlocks.
    - 4. Verify operation of the integrated system.

END OF SECTION 15975

C. 100

University of Southern Maine  
Community Education Center  
PORTLAND, MAINE  
GMP Documents

ADDENDUM NO. 5  
FEBRUARY 2, 2004

**TO ALL BIDDERS:**

This Addendum is organized in six (6) parts plus attachments:

- Part I Overview
- Part II Revisions/Clarifications to the Bidding Requirements
- Part III Revisions to Contract Requirements
- Part IV General Clarifications
- Part V Revisions to the Drawings
- Part VI Revisions to the Specifications
- Attachments

**PART I: OVERVIEW:**

- A. This Addendum No. 5 is hereby incorporated into, and amends (by addition, deletion, clarification or alteration) the Bid Documents dated Jan 19 2004 for the University of Southern Maine CEC, Portland, Maine.
- B. The bidder shall acknowledge all addenda on the SUBMISSION OF GMP. Bidders are to please contact Einhorn Yaffee Prescott, Att: Mr. William F. Smith if any document is missing from the bidder's package. Additional costs for items missed in this addendum shall not be accepted for failing to include said work.

**PART II: REVISIONS/CLARIFICATIONS TO THE BIDDING REQUIREMENTS:**

NO CHANGES

**PART III: REVISIONS TO CONTRACT REQUIREMENTS:**

NO CHANGES

PART IV: GENERAL CLARIFICATIONS:

ITEM 1: STAGE 4 COMMISSIONING

- A. Delete the Master Equipment and Systems List submitted as part of Addendum #4, dated 1/30/2004.
- B. Add the attached Master Equipment and Systems List (6 pages, Dated 2/2/2004) for the USM - Community Education Center.

PART V: REVISIONS TO THE DRAWINGS:

ITEM 1: SHEET C-S501

- A. Modify pedestrian bridge roof framing as shown on SKS-4 (attached).
- B. Revise Plan Detail #8 as per SKS-5 (attached).
- C. Revise Plan Detail #9 as per SKS-6 (attached).
- D. Revise Section Detail #11 as per SKS-7 (attached).
- E. Revise Notes as per SKS-8 (attached).

ITEM 2: SHEET C207

- A. At North end of pedestrian ramp (North of Bedford Street), revise note "PROVIDE TRENCH DRAIN" to read as follows:  
"PROVIDE THREE (3) TRENCH DRAINS AND  
CONNECT TO PROPOSED 8" PVC STORMDRAIN.  
SEE SHEET C-A307, PLAN E1 FOR LOCATIONS."

PART VI: REVISIONS TO THE SPECIFICATIONS:

ITEM 1. SECTION 01210 - ALLOWANCES

- A. Delete Paragraph 01210-3.03-A in its entirety.
- B. Delete Paragraph 01210-3.03-B in its entirety.
- C. Delete Paragraph 01210-3.03-C in its entirety.
- D. Insert the following Paragraph 01210-3.03-A:
  - "A. The second level display wall: Allow \$40,000 for the construction of wall, millwork and display units yet to be detailed."

ITEM 1. SECTION 01230 - ALTERNATES

A. Delete Paragraph 01230-1.03 in its entirety.

B. Insert the following Paragraph 01230-1.03:

**"1.03 DESCRIPTION OF ALTERNATES**

A. Deduct Alternates shall include the following:

1. Alternate No. 1: Provide a deduct alternate price to deduct finish grading, top soil, plant materials, plant beds, and all installations as shown on Drawings L101, L102, L103. General Contractor shall be responsible for rough grading and coordination for preparation of the scope of the work outlined above.
2. Alternate No. 2: Provide a deduct alternate price to deduct materials and installation of concrete pavers as shown on Drawing L104 and supporting base of 6-in. reinforced concrete. Provide as alternate for all areas shown as concrete paver: 4-in. bituminous concrete as specified in Section 02513.

B. Add Alternates shall include the following:

1. Alternate No. 3: Along Bedford Street, in addition to the base underground utility work, provide an add alternate to move lines underground from Pole #1 ½ (next to Bleachers restaurant) to CMP Pole #7.
2. Alternate No. 4: Provide an add alternate to connect the Garage Primary to the existing Campus Primary Loop in the Campus Center Parking Lot, install duct-bank from the Garage meter pad across Bedford Street to existing loop. Include islands in the Campus Center Parking Lot with 227v transformer and light pole bases, one in each island. Refer to electrical drawings for further information."

ITEM 3: SECTION 08331 - OVERHEAD COILING DOORS

A. Insert Section 08331 (attached) in its entirety.

ATTACHMENTS:

STAGE 4 COMMISSIONING:

6 PAGES, 8-1/2 x 11.

SKETCHES:

5 Sheets; 8-1/2 x 11, Dated 2-2-04: SKS-4; SKS-5; SKS-6; SKS-7; SKS-8.

SECTION 08331 – OVERHEAD COILING DOORS:

4 PAGES, 8-1/2 x 11.

END OF ADDENDUM #5



# Master Equipment and Systems List

## Stage 4 Commissioning

**Project:** USM - Community Education Center  
**SMRT Project #:** 03155-00  
**Field Commissioning Agent:** Ted Hollidge, PE

**ISSUED FOR GMP**

The following is intended to serve as a tracking mechanism for the status of the work. The work is as defined by the Contract Documents. Not all work defined by the Contract Documents is necessarily covered herein.

### Air Handling Systems

No.	Identifier	Description / Service	Location	Verifications					Issue Key <sup>1</sup>
				Pre-Functional Test / Start-up	Controls Checkout / TAB	Functional Testing	O & M Manuals	Owner Training	
A-01	AHU-1	Office and Lobby (includes Heat Recovery)	Roof						
A-02	AHU-2	Lecture Hall (includes Heat Recovery)	Roof						
A-03		Displacement Ventilation System	Lecture Hall						
A-04	VAV 1-1	Break out Room 110	Open Office 111						
A-05	VAV 1-2	North end of Open Office 111	Open Office 111						
A-06	VAV 1-3	South end of Open Office 111	Director FOB 111A						
A-07	VAV 1-4	Reception & Rooms 111K & 111J	Open Office 111						
A-08	VAV 1-5	Lobby 102	Open Office 111						
A-09	VAV 1-6	Lobby 102	Open Office 111						
A-10	VAV 1-7	Womens 106 & Mens 107	Lobby 102						
A-11	VAV 1-8	Lobby 102	Open Office 111						
A-12	VAV 1-9	Lobby 102	Open Office 111						
A-13	VAV 1-10	Break out Room 109	Break out Room 109						
A-14	VAV 1-11	Director FOB 111A	Director FOB 111A						

<sup>1</sup> Outstanding Issues and Comments are listed and described at the end of this document.



**Air Handling Systems**

No.	Identifier	Description / Service	Location	Verifications					Issues
				Pre-Functional Test / Start-up	Controls Checkout / TAB	Functional Testing	O & M Manuals	Owner Training	
A-15	VAV 1-12	FOB Client Meeting 111B	FOB Client Mtg 111B						
A-16	VAV 1-13	111C, D, F, G	Office Suite 111						
A-17	VAV 1-14	Conference Room 111E	Office Suite 111						
A-18	VAV 1-15	111H, Office Suite 111	Office Suite 111						
A-19	VAV 1-16	A/V Control Room 104	Mens 107						
A-20	VAV 2-1	Break out Lounge 202	Womens Room 106						
A-21	VAV 2-2	Gallery 221	Gallery 221						
A-22	VAV 2-3	Break out Lounge 202	Gallery 221						
A-23	VAV 2-4	Break out Lounge 202	Break out Room 212						
A-24	VAV 2-5	Break out Room 212	Break out Room 213						
A-25	VAV 2-6	Break out Room 213	Break out Room 213						
A-26	VAV 2-7	Break out Room 214	Break out Room 214						
A-27	VAV 2-8	Break out Room 215	Break out Room 215						
A-28	VAV 2-9	Break out Room 216	Corr. 220, Conf. Rm 217						
A-29	VAV 2-10	Break out Room 216	Break out Room 216						
A-30	VAV 2-11	Womens 208 & Mens 209	Mens 209						
A-31	FPTU 2-1	Computer Classroom 218 & Corridor 201	Computer Classroom 218						
A-32	FPTU 2-2	Computer Classroom 219 & Corridor 220	Computer Classroom 219						
A-33	FPTU 2-3	Breakout Lounge 202	A/V Storage 206						
A-34	FPTU B-1	Basement / Storage 001	Basement / Storage 001						
A-35	SEF-1	Smoke Exhaust Fan	Roof						
A-36	SF-1	Mech Room 005	Mech Room 005						

<sup>1</sup> Outstanding Issues and Comments are listed and described at the end of this document.

**Geothermal Systems**

No.	Identifier	Description / Service	Location	Verifications					Issues
				Pre-Functional Test / Start-up	Controls Checkout / TAB	Functional Testing	O & M Manuals	Owner Training	
G-1	P GW-1	Ground Water Pump	Site / Well						
G-2	P GW-2	Ground Water Pump	Site / Well						
G-3	P GW-3	Ground Water Pump	Site / Well						
G-4	P GW-4	Ground Water Pump	Site / Well						
G-5	P GW-5	Ground Water Pump	Site / Well						
G-6	GTHP-1	Geothermal (Water Source) Heat Pump	Basement						
G-7	GTHP-2	Geothermal (Water Source) Heat Pump	Basement						
G-8	GTHP-3	Geothermal (Water Source) Heat Pump	Basement						
G-9	GTHP-4	Geothermal (Water Source) Heat Pump	Basement						
G-10	GTHP-5	Geothermal (Water Source) Heat Pump	Basement						
G-11	GTHP-6	Geothermal (Water Source) Heat Pump	Basement						
G-12	GTHP-7	Geothermal (Water Source) Heat Pump	Tel / Data 003						
G-13	GTHP-8	Geothermal (Water Source) Heat Pump	Tel / Data 115						
G-14	P HW-1	Primary Heating Water Pump	Tel / Data 222						
G-15	P HW-2	Primary Heating Water Pump	Basement						
G-16	P HW-3	Secondary Heating Water Pump	Basement						
G-17	P HW-4	Secondary Heating Water Pump	Basement						
G-18	P CH-1	Primary Chilled Water Pump	Basement						
G-19	P CH-2	Primary Chilled Water Pump	Basement						
G-20	P CH-3	Secondary Chilled Water Pump	Basement						
G-21	P CH-4	Secondary Chilled Water Pump	Basement						
G-22	ST-1	Heating Water Storage Tank	Basement						
G-23	ST-2	Chilled Water Storage Tank	Basement						
G-24	AS-1	Geothermal Water Air Separator	Basement						

<sup>1</sup> Outstanding issues and Comments are listed and described at the end of this document.

[illegible]

<sup>1</sup> Outstanding Issues and Comments are listed and described at the end of this document.

**Gray Water System**

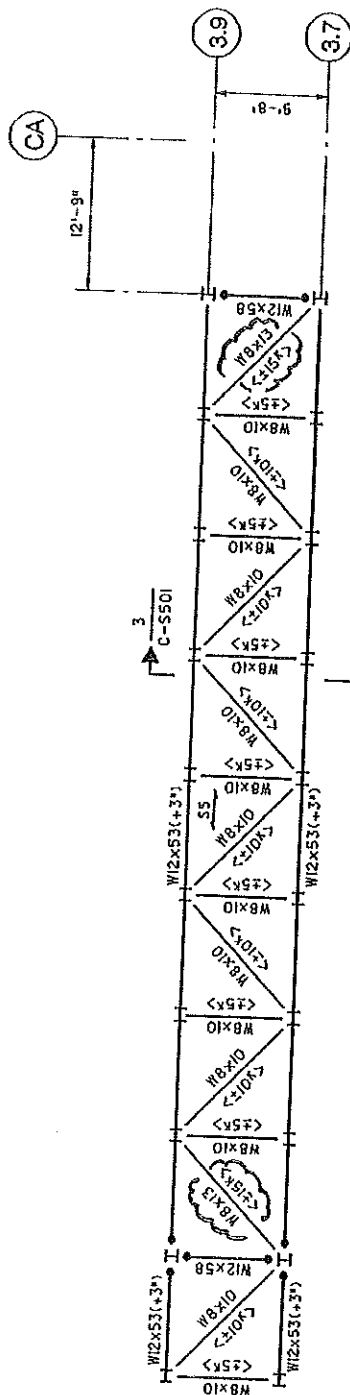
No.	Identifier	Description / Service	Location	Verifications					Issues
				Pre-Functional Test / Start-up	Controls / TAB	Functional Testing	O & M Manuals	Owner Training	
R-1		Storm Water Cisterns	Site						
R-2	P-1	Duplex Cistern Pumps & Level Controls	Cistern						
R-3	P-2	Duplex Distribution Pump Skid	Basement						
R-4	P-3, 4A & 4B	Water Treatment Pumps	Basement						
R-5		Storm Water and Vent Piping Connections	Site / Cistern						
R-6		Gray Water Piping at Source Equipment	Site / Cistern / Basement						
R-7		Bladder Tank	Basement						
R-8		Filtration System	Basement						
<b><u>Controls</u></b>									
C-1		Auxiliary Control Devices	throughout						
C-2		Wiring & Raceways	throughout						
C-3		Control Panels	throughout						
C-4		Operator Hardware							
C-5		Software							
C-6		Electrical Sub-Metering							
C-7		Public Video Display							
<b><u>Electrical</u></b>									
E-1	ATS #2	Smoke Exhaust Transfer Switch	Parking Garage						

<sup>1</sup> Outstanding Issues and Comments are listed and described at the end of this document.

### Outstanding Issues & Comments

[illegible]

<sup>1</sup> Outstanding Issues and Comments are listed and described at the end of this document.



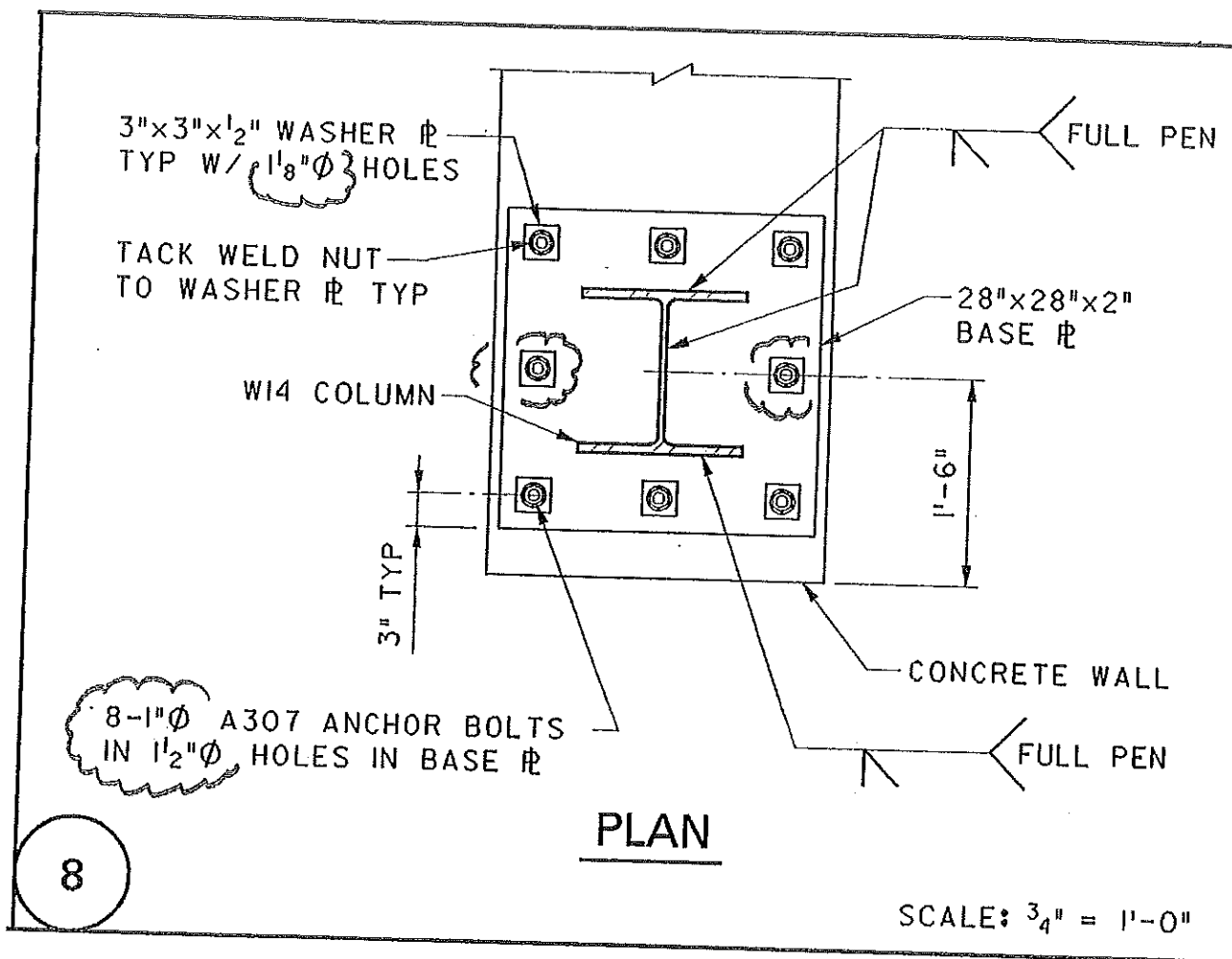
**NOTES:**

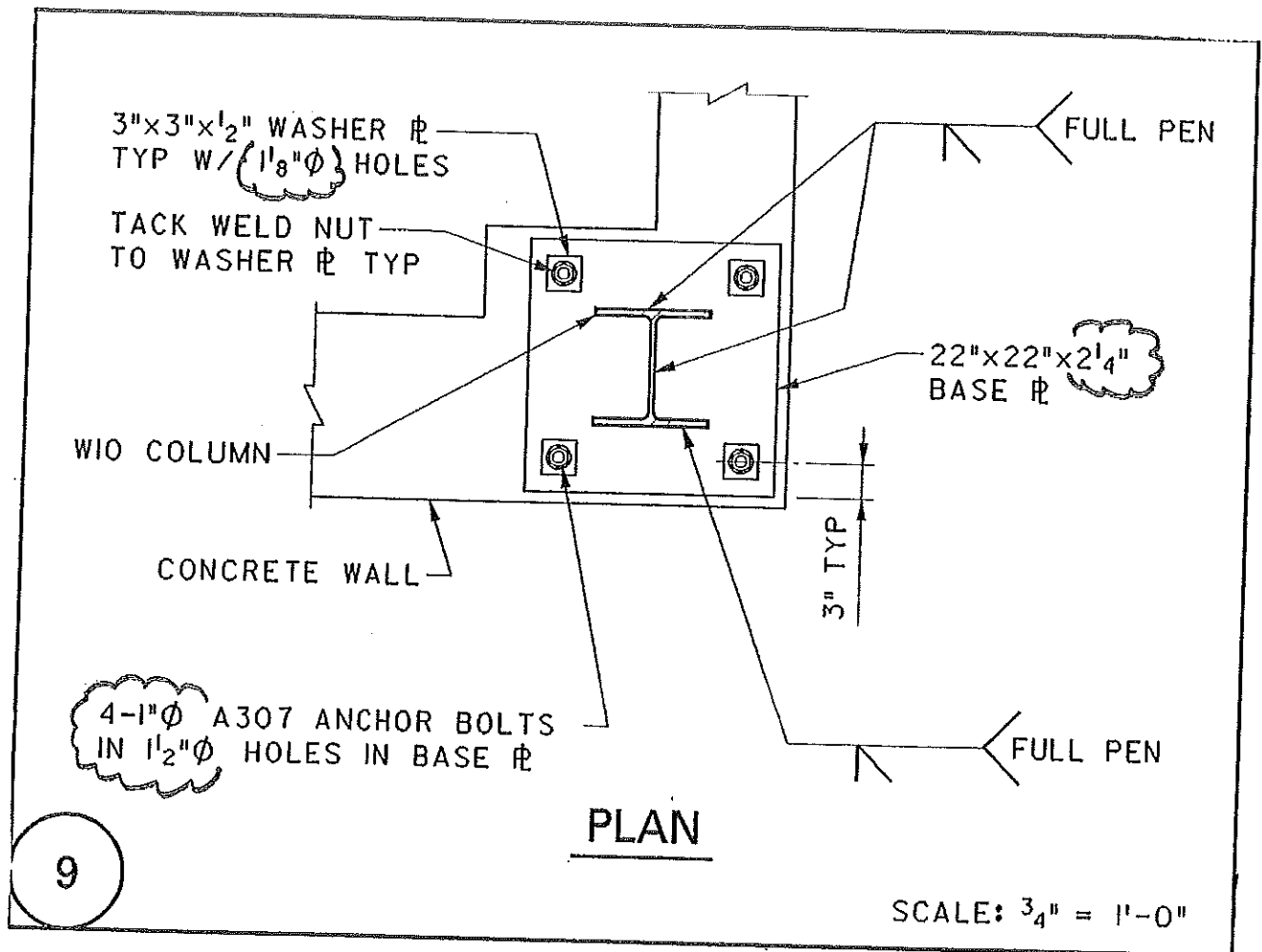
1. **SS** INDICATES ROOF CONSTRUCTION SHALL BE 3" 18 GA. GALVANIZED ROOF DECK
2. TOP OF STRUCTURAL STEEL AT EL 70'-9" UNLESS NOTED (+) OR (-) ON PLAN.



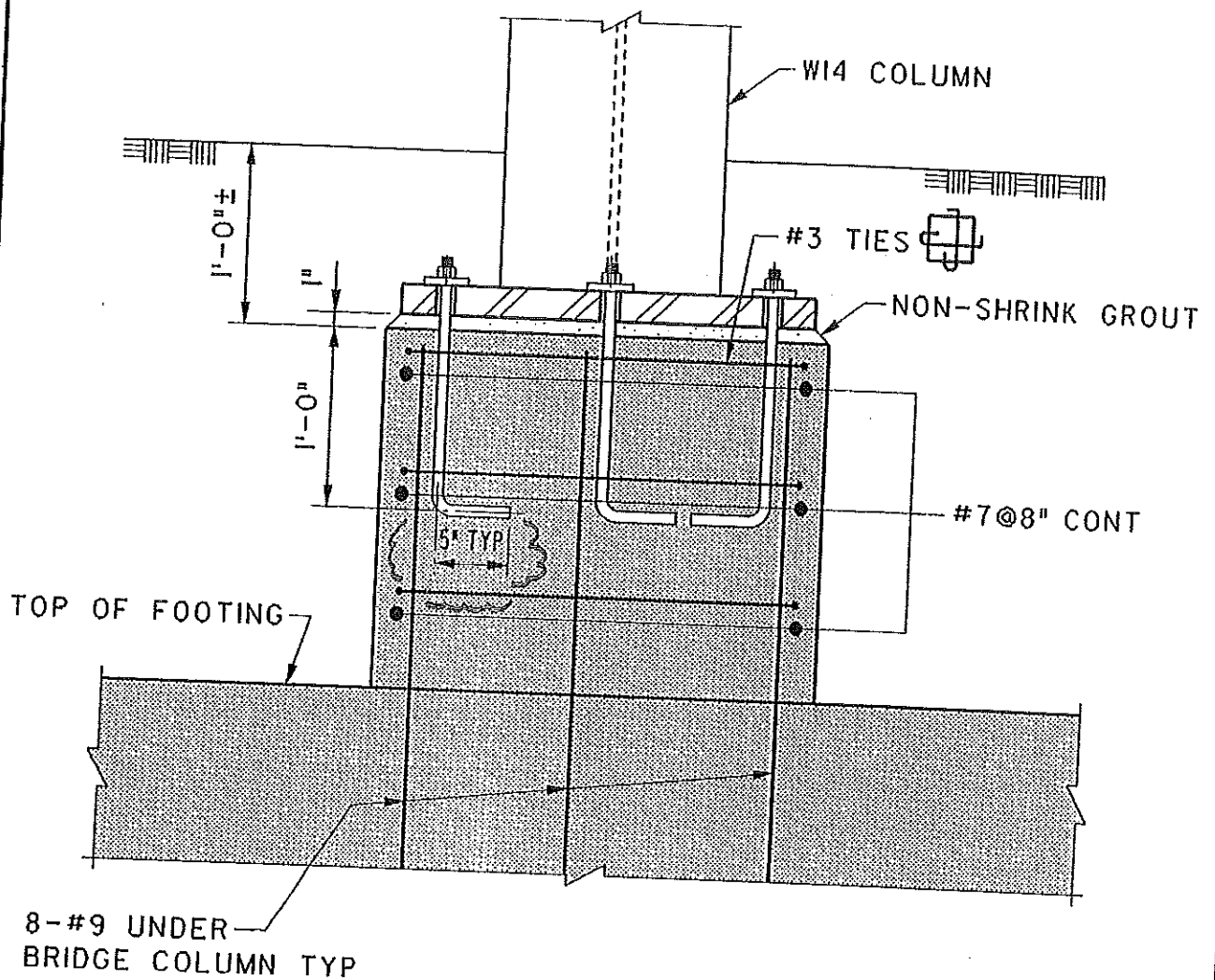
**PEDESTRIAN BRIDGE ROOF**

**5**











11

SCALE: 1" = 1'-0"

NOTES:

1. FOR GENERAL NOTES AND ABBREVIATIONS SEE DRAWING C-S001.  
FOR TYPICAL DETAILS SEE DRAWING C-S002 & C-S003.
2. ALL STEEL BRIDGE MEMBERS SHALL CONFORM TO AISC "ARCHITECTURALLY EXPOSED STRUCTURAL STEEL" (AESS), AND BE PAINTED (SEE SPECIFICATIONS).
3.  INDICATES SPAN DIRECTION OF STEEL DECK.
4.  INDICATES MOMENT CONNECTION, FOR DETAILS SEE DRAWING C-S003.
5. FOR BEAM EXPLANATION DIAGRAM SEE DRAWING C-S003.
6.  $\langle \pm 10K \rangle$ , ETC, INDICATES AXIAL FORCE IN KIPS  
(+ = TENSION, - = COMPRESSION) FOR CONNECTION DESIGN. FORCES ARE IN ADDITION TO VERTICAL REACTIONS.
7. FORCES ARE UNFACTORED (ASD). NO STRESS INCREASE SHALL BE TAKEN FOR CONNECTION DESIGN.
8. CHARPY V-NOTCH IMPACT TESTS SHALL BE PERFORMED ACCORDING TO ASTM A673 ON ALL STEEL USED IN ALL PEDESTRIAN BRIDGE MEMBERS. THE TEST TEMPERATURE SHALL BE 40 DEGREES FAHRENHEIT AND THE ABSORBED ENERGY SHALL BE 15 FOOT-POUNDS.

## SECTION 08331 - OVERHEAD COILING DOORS

### **PART 1 GENERAL**

#### **1.00 RELATED DOCUMENTS**

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

#### **1.01 WORK INCLUDED**

- A. Work of this Section includes, but is not limited to:
1. Interior steel overhead coiling fire-door assemblies.

#### **1.02 RELATED WORK**

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that relate directly to Work of this Section include, but are not limited to:
1. Section 05500, METAL FABRICATIONS; Metal framing and supports.
  2. Section 09900, PAINTING; Finish painting of overhead coiling door assemblies.
  3. Division 16, ELECTRICAL; Electrical service and connections.
  4. Division 16, ELECTRICAL; Security connections.

#### **1.03 REFERENCES**

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):

A 466	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
-------	---

A 525	General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
-------	---

E 152	Fire Tests of Door Assemblies
-------	-------------------------------

2. National Fire Protection Association (NFPA):

80	Standard for Fire Doors and Windows
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#### **1.04 SUBMITTALS**

- A. Product Data: Submit manufacturer's product data, rough-in and wiring diagrams, installation instructions, use limitations and recommendations for each material used. Provide operating instructions and maintenance manuals. Provide certifications stating that materials comply with requirements.
- B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work not fully described by manufacturer's product data. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide installation templates for work installed by others.
- C. Field Measurements: Take accurate field measurements before preparation of shop drawings and fabrication. Do not delay job progress.
- D. Label Certification: Submit UL certification for oversized fire-rated doors and frames (if any) that each assembly has been constructed with materials and methods equivalent to requirements for labeled construction.

#### **1.05 QUALITY ASSURANCE**

- A. Source: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.
- B. Provide motorized assemblies bearing the UL seal.
- C. Where fire-rated assemblies are indicated, provide fire door assemblies that comply with NFPA 80 and have been fire tested, rated, and labeled in accordance with ASTM E 152. Provide fire-rated doors with metal UL label indicating rating in hours of duration of exposure to fire, and letter designation of location for which assembly is designed.
  - 1. Oversized Fire Doors: For fire-rated doors exceeding size that testing and labeling service is offered, provide UL "Certificate of Inspection" in lieu of label, certifying that design, materials, and construction are equal to doors tested and labeled by UL.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage.
- B. Sequence deliveries to avoid delays, but minimize on-site storage.

#### **1.07 PROJECT CONDITIONS**

- A. Provide inserts and anchorages which must be built into other work at the time they are needed. Avoid project delays.

## **PART 2 PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Provide products of one of the following, or approved equal, that meet or exceed requirements specified:
1. Atlas Door Corporation
  2. Cookson Company
  3. Kinnear
  4. North American Door
  5. Overhead Door Corporation
  6. Windsor Door Co.

### **2.02 INTERIOR OVERHEAD COILING STEEL FIRE AND SMOKE DOORS**

- A. Assemble door curtain with interlocking rolled slats, cold-formed to rectangular profile design with flush, square, 2-1/4 in. wide face, from galvanized sheet steel. Slats shall be of section sufficient to provide curtain strength to safely resist design live load of 20 lb. per sq. ft.
1. Bottom bar shall be single steel angle or two steel angles placed back to back.
  2. Exposed steel members shall be hot-dip galvanized, with coating weight of 1.25 oz. per square foot of flat metal in accordance with applicable ASTM standards.
  3. Curtain shall be coiled on steel barrel of sufficient size to carry curtain load with a deflection not to exceed 0.015 in. per foot of opening, evenly balanced by helical torsion springs contains within the pipe. Springs shall be anchored to single torsion rod and held in position by single adjusting wheel from outside. Welding of plugs at ends of barrels will not be acceptable.
  4. End bracket plates to house ends of coils shall be fabricated of high grade iron or steel. Hoods to house the coils shall be formed to fit contour of end brackets of 24 gauge galvanized sheet steel, reinforced as required.
  5. Guides shall be fabricated of structural steel to form a slot of sufficient depth to retain curtain in guides against the above mentioned design load. Include all steel angle and/or plate jamb members, as indicated.
  6. Gears shall be of best grade gray iron, cast teeth machine molded from machine cut patterns.
- B. Shop Finish: Exposed parts of the installation shall be hot-phosphate treated at factory. Steel and galvanized steel parts shall then be given one coat of baked-on rust-inhibitive shop primer ready to receive finish paint in field under Section 09900, PAINTING.
- C. Fire-Rating: Overhead coiling doors shall be equipped for fire-rating and shall bear the UL label of Class and hour-rating scheduled on Drawings, and shall be equipped with UL labeled automatic self-closing device, equipped with fusible-link (temperature rating to

conform to local code requirements) and also for release by remote smoke detection (smoke detector and wiring by Electrical trade). Closing speed shall be controlled by escapement-type speed-control governor, inoperative during normal operation.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Installation of work of this Section shall be by the manufacturer or his authorized representative.
- B. Install units plumb, level and true, securely anchored, complete in all respects, and in perfect operating condition, in strict accordance with the manufacturer's printed installation instructions and specifications.

END OF SECTION

University of Southern Maine  
PORTLAND, MAINE  
GMP Documents

ADDENDUM NO. 1  
JANUARY 20, 2004

TO ALL BIDDERS:

This Addendum is organized in three parts plus attachments:

- Part I Overview
- Part II Revisions/Clarifications
- Part III Attachments

PART I: OVERVIEW:

- A. This Addendum No. 1 is hereby incorporated into, and amends (by addition, deletion, clarification or alteration) the Bid Documents dated Jan 19 2004 for the University of Southern Maine CEC, Portland, Maine.
- B. The bidder shall acknowledge all addenda on the SUBMISSION OF GMP Bidders are to please contact Einhorn Yaffee Prescott, Att: Mr. Bill Smith if any document is missing from the bidder's package. Additional costs for items missed in this addendum shall not be accepted for failing to include said work.

PART II: REVISIONS/CLARIFICATIONS:

ITEM 1: FINISH HARDWARE SPECIFICATION SECTION 08710

Attached is the finish hardware schedule for this project.

END OF ADDENDUM #1

Section 08710

Finish Hardware

Part 1--General

1.01 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to this section.

1.02 SUMMARY

- A. Work included: Furnish and install hardware for all doors except as noted on the door schedule and/or drawings, including electrified hardware components required for security doors. The hardware shall include the furnishing of necessary and special screws, regular and special bolts, expansion shields, drop plates, and other devices necessary for the proper application of the hardware.

1. Provide hardware supplier with schedule of door and frame supplier(s) to review related work to insure hardware will be properly reinforced and applied in accordance with each manufacturers instructions.

- B. Construction keying.

- C. Related work in other Sections:

- 1. Hardware for millwork: Section 06400
- 2. Door Schedule: Section 08001
- 3. Steel Door and Frames: Section 08110
- 5. Access Doors; work requiring lock cylinders: Section 08305
- 6. Aluminum entrance door hardware, except lock cylinders: Section 08410
- 7. Hardware for manufactured casework: Section 12300

1.03 REFERENCE STANDARDS

- A. Standards

ANSI/BHMA A156.1-2000 Butts and Hinges  
ANSI/BHMA A156.2-1996 Bored and Pre-assembled Locks and Latches  
ANSI/BHMA A156.3-2000 Exit Devices  
ANSI/BHMA A156.4-2000 Door Controls -- Closers  
ANSI/BHMA A156.5-2001 Auxiliary Locks and Associated Products  
ANSI/BHMA A156.6-2001 Architectural Door Trim  
ANSI/BHMA A156.7-2003 Template Hinge Dimensions



ANSI/BHMA A156.8-2000 Door Controls – Overhead Holders  
ANSI/BHMA A156.15-2001 Closer/Holder/Release Devices  
ANSI/BHMA A156.18-2000 Materials and Finishes  
ANSI/BHMA A156.19-2002 Power Assist and Low Energy Power Operated Doors  
ANSI/BHMA A115.1-1990 for Standard Steel Door and Steel Frame Preparations for Mortise Locks  
ANSI A117.1 – American National Standards Institute – Accessible and Usable Buildings and Facilities.

- B. NFPA – National Fire Protection Association:
  - 1. NFPA 80 – 1999 – Standard for Fire Doors and Fire Windows
  - 2. NFPA 101 – 2000 – Life Safety Code
  - 3. NFPA 105 – 1993 – Installation of Smoke-Control Door Assemblies
- C. DHI – Door and Hardware Institute:
  - 1. 1989 - Recommended locations
  - 2. 1983 - Abbreviations and symbols.
  - 3. 1996 - Sequence and format for the hardware schedule.
  - 4. 1989 - Recommended procedure for processing hardware schedules and templates.
  - 5. 1989 - Keying systems and nomenclature.
- D. ADA – The American Disabilities Act – Title III – Public Accommodations.
- E. WH – Warnock Hersey, “Certification Listing”

#### 1.04 SUBMITTALS

- A. Product Data: Manufacturer’s illustrated product literature and specifications for each item of hardware.
- B. Hardware Schedule: Submit for review, within 21 days of award of contract, 6 copies of a complete, properly itemized schedule of Builders Finish Hardware to be furnished under this Contract. Clearly refer to each item using manufacturer’s code letters and numbers. Use same set numbers used on door schedule on Drawings. Identify lockset functions. List the actual product series numbers.
  - 1. Schedule for hardware shall be in vertical format.
- C. Samples: If requested, submit to the Architect for approval, a complete line of samples as directed. Samples shall be plainly marked giving hardware number used in this specification, the manufacturer's numbers, types and sizes. The Architect will deliver approved samples to the project site to be stored. Samples will remain with the Architect until delivery of all hardware to the project is complete, after which time they will be turned over to the Contractor for incorporation into the work.
- D. Key Schedule: After a keying meeting between representatives of the Owner, Architect, and the

Hardware Supplier, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled. This schedule can be submitted as a part of the Hardware Schedule or as a separate schedule.

- E. Templates: Hardware supplier shall immediately, but not later than thirty (30) days after approval of his Schedule by the Architect, furnish the Contractor with complete template information necessary for the fabrication of doors and frames. No templates shall be furnished prior to the approval of the hardware schedule.
- F. Operations and Maintenance Manuals
  - 1. At the end of the project the hardware supplier shall submit, as a part of the close out package, a three ring binder containing the following information:
    - a. Maintenance instructions for each item of hardware.
    - b. Catalog pages of each product.
    - c. Name, address, phone and fax numbers of the finish hardware distributor.
    - d. Parts list for each major hardware item.
    - e. Copy of the approved hardware schedule.
    - f. Copy of the approved keying schedule.

#### 1.05 QUALITY ASSURANCE

- A. Hardware supplier shall be, or have in his employ, a certified Architectural Hardware Consultant, who is registered in the continuing education program as administered by the Door and Hardware Institute. This Consultant shall review the schedule prior to submittal and affix his or her seal attesting to the completeness and correctness of the schedule and to certify that the work of this section meets or exceeds the requirements of authorities having jurisdiction.
- B. U.L. Listing: Whether specifically mentioned or not, equip fire-rated doors with UL approved hardware of corresponding rating and bearing the proper UL listing mark.
- C. Responsibility for Sizing Hardware: Hardware supplier shall determine conditions and materials of doors and frames for proper application of hardware. Follow manufacturers' catalogue requirement for the actual size of door closers, brackets and holders. Door sizes are as noted on the Door Schedule and the hardware shall be in strict accordance with requirements of height, width, and thickness.
- D. All items of hardware are referenced by manufacturer's names and numbers. The manufacturer's names and numbers are used to define the function, design, and quality of the material to be supplied. Substitution of products other than those listed shall be in accordance with Section 01620, Product Options & Substitutions.

#### 1.06 PRODUCT DELIVERY , STORAGE AND HANDLING

- A. Require the Hardware Supplier to deliver hardware to the project site in accordance with the instructions of the Contractor.

- B. Contractor shall prepare a locked storage room with adequate shelving, for hardware. The storage room shall be in a dry, secure area, and shall not include storage of other products by other trades.
- C. The Contractor shall furnish the Hardware Supplier with receipts for all hardware and accessory items received, and shall send copies of these receipts to the Architect, if requested.

#### 1.07 WARRANTY

- A. Hardware supplier shall warrant and guarantee, in writing, that hardware supplied is free of defective material and workmanship. Supplier shall further warrant and guarantee for a period of one year from Owner's Use and Occupancy that the hardware shall function in a satisfactory manner without binding, collapse, or dislodging of its parts, provided the installation is made to the manufacturer's recommendations.

#### 1.08 REGULATORY REQUIREMENTS

- A. Conform to all applicable codes. Provide throws, projections, coatings, knurling, opening and closing forces, and other special functions required by all State of Maine and Local Building Codes, and all applicable Access Code requirements, including ADA
- B. For fire rated openings provide hardware complying with NFPA 80 and NFPA 101. Provide hardware tested by UL for the type and size of door installed and fire resistance rating required.

#### 1.09 COORDINATION

- A. Hardware Supplier shall determine conditions and materials of all doors and frames for proper application of hardware.

#### 1.10 MAINTENANCE MATERIALS AND TOOLS

- A. Provide adjusting tools and wrenches for the following operating products:
  - 1. Locksets (all types)
  - 2. Door Closers
  - 3. Exit Devices

### PART 2 --PRODUCTS

#### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, furnish products by the following manufacturers; furnish all hardware of each type from a single manufacturer.

Hinges	McKinney	Scranton, PA
	Hager	St. Louis, MO
	Bommer	Landrum, SC

Continuous Hinges	Pemko McKinney Select	Memphis, TN Scranton, PA Kalamazoo, MI
Locksets (no substitutions)	Schlage	Colorado Springs, CO
Exit Devices (no substitutions)	Von Duprin	Indianapolis, IN
Door Closers (no substitutions)	LCN	Princeton, IL
Concealed Overhead Door Stops	Sargent Glynn-Johnson ABH	New Haven, CT Indianapolis, IN Elk Grove Village, IL
Flush Bolts / Door Coordinators	Ives Door Controls Rockwood	Indianapolis, IN Dexter, MI Rockwood, PA
Door Stops	Quality Ives Rockwood	Brea, CA Indianapolis, IN Rockwood, PA
Magnetic Door Holders	ABH Rixson LCN	Elk Grove Village, IL Charlotte, NC Princeton, IL
Power Supplies (no substitutions)	Von Duprin	Indianapolis, IN
Push / Pulls	Rockwood Burns Ives	Rockwood, PA Erie, PA Indianapolis, IN
Protective Plates	Rockwood Burns Ives	Rockwood, PA Erie, PA Indianapolis, IN
Thresholds / Door Sweeps / Rain Drips	NGP Pemko Reese	Memphis, TN Memphis, TN Rosemount, MN

Silencers

Ives  
Rockwood  
Hager Companies

New Haven, CT  
Rockwood, PA  
St. Louis, MO

- B. No other products will be considered for those listed (NO SUBSTITUTION).

## 2.02 MATERIALS AND QUALITY

- A. All hardware shall be of the best grade of solid metal entirely free from imperfections in manufacturer and finish.
- B. Qualities, weights, and sizes specified in this Section are the minimum that will be accepted. It is the responsibility of the Hardware Supplier to supply the specified size and weight of hardware and the proper function of hardware in each case and to provide UL approved hardware at all fire-rated doors.
- C. Provide, as far as possible, locks of one lock manufacturer and hinges of one hinge manufacturer. Modifications to hardware that are necessary to conform to construction shown or specified shall be provided as required for the specified operation and functional features.
- D. Follow manufacturers' catalog requirements for the actual size of door closers, brackets and holders.

## 2.03 HARDWARE FOR LABELED FIRE DOORS.

- A. Hardware shall conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Labeling and listing by UL Building Materials Directory, for class of door being used will be accepted as evidence of conformance to these requirements. Install minimum latch throw as specified on label of individual doors. Provide hardware listed by UL except where heavier materials, larger sizes, or better grades are specified herein under paragraph entitled "Hardware Sets". In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements. Specific hardware requirements of door or frame manufacturers which exceed sizes or weights of hardware listed in this Section shall be provided with no additional charge.

## 2.04 FASTENERS

- A. Manufacture hardware to conform to published templates, generally prepared for machine screw installation.
- B. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Furnish exposed screws to match the hardware finish, or, if exposed in surfaces of other work, to match the finish of such other work as closely as possible, except as otherwise indicated.
- C. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to

the extent no standard manufactured units of the type specified are available with concealed fasteners. Do not use thru-bolts unless specifically approved by the Architect.

- D. Use only the fasteners supplied by manufacturers of specific products.
- E. All hardware shall have the required screws, bolts and fastenings necessary for proper installation and shall be wrapped in the same package as the hardware item for which it is intended,

## 2.05 PACKING AND MARKING

- A. Clearly label each package to indicate the portion of the work for which it is intended.

## 2.06 ENVIRONMENTAL CONCERN FOR PACKAGING

- A. The hardware shipped to the jobsite is to be packaged in biodegradable packs such as paper or cardboard boxes and wrapping. If non-biodegradable packing such as plastic, plastic bags or large amounts of styrofoam is utilized, then the Contractor will be responsible for the disposal of the non-biodegradable packing to a licensed or authorized collector for recycling of the non-biodegradable packing.

## 2.07 FINISH HARDWARE DESCRIPTION

- A. Hardware items shall conform to respective specifications and standards and to requirements specified herein.
- B. Continuous Geared Hinges: Hinges on exterior and interior doors where scheduled, shall be full-mortise Continuous Geared Hinges. Geared Hinges shall be manufactured of extruded 6063-T6 aluminum alloy temper. Hinges shall consist of three interlocking extrusions in a pinless assembly applied to the full height of the door and frame. All hinges shall be manufactured non-handed. Door leaf and jamb leaf shall be geared together for the entire length of the hinge and joined by a cover channel. All Geared Hinges shall be heavy duty (HD).
  - 1. Manufacturer and Product: Pemko, McKinney or Select as follows:
    - a. Pemko CFM SLFHD Series
    - b. McKinney MCK-12HD
    - c. Select SL11HD
- C. Butt Hinges:
  - 1. Number of hinges per door: Provide two hinges for doors up to and including five feet in height, and an additional hinge for each two-and-one-half feet or fraction thereof, of the height of the door. Dutch doors are to be provided with four hinges.
  - 2. Hinges on interior doors shall be oil-impregnated bearings, steel and sized as follows, unless other wise specified in the hardware sets below:

<u>Door thickness</u>	<u>Door width</u>	<u>Hinge Weight</u>	<u>Hinge</u>
1-3/4"	40" and under	Regular	4-1/2"
1-3/4"	Over 40"	Extra heavy	5 x 4-1/2"

Width of hinge shall be determined by trim conditions

3. Bearing hinges shall have flush bearings and button tips.
4. Manufacturer: Hinges shall be McKinney, Hager or Bommer as follows:

<u>McKinney</u>	<u>Hager</u>	<u>Bommer</u>
TA2714	BB1279	BB5000
T4A3786	BB1168	BB5004
- D. Pocket pivots: Shall be No. 91105F as manufactured by Ives or No. Ph-4 as manufactured by McKinney.
- E. Pivot Set: Shall be No. H117 3/4 x 587 side load arm as manufactured by Rixson.
- F. Door Closers:
  1. Door closers shall have fully hydraulic, full rack and pinion action. Cylinder body shall be 1-1/2" in diameter, and double heat treated pinion shall be 11/16" in diameter.
  2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
  3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and hydraulic back-check.
  4. Arms: Solid forged steel main arms (and forged forearms for parallel arm closers).
  5. Closer arms (and metal covers when specified) shall have a powder coating finish.
  6. Provide drop, mounting plates where required.
  7. Do not locate closers on the side of doors facing corridors, passageways or similar type areas. Where it is necessary, due to certain conditions and approval of the Architect, to have closers in corridors, provide such closers with parallel or track type arms.
  8. Adjust door closers in accordance with the manufacturer's templates and written instructions. Adjust back-check feature on closers with parallel arms prior to installation.
  9. Closers shall conform to applicable code requirements relative to setting closing speeds for closers and maximum pressure for operating interior and exterior doors.

10. Door closers meeting this specification are as follows:

	<u>LCN (no substitutions)</u>
<u>Exterior</u>	4111S-H-CUSH 2610 – Concealed Power-Assisted Door Operator
<u>Interior</u>	4011 – surface (pull) side mounting 4111 – surface (push) side mounting 2610 – Concealed Power-Assisted Door Operator

G. Exit Devices:

1. Shall be Von Duprin. (no substitutions)

<u>Function</u>	<u>Von Duprin</u>
A	99EO
B	99L-F-BE
C	EL99NL-OP
D	CD9927L x LBR
E	CD99L
F	9547L-F-BE x LBR
G	CD9947NL-OP
H	CD9947EO
I	SDEL9947NL-OP
J	SDEL9947EO

- I. Power Transfer: Provides a means to transfer power from the frame to the door stile. When the door is closed, the unit is concealed and tamper resistant. Von Duprin EPT-2 – SP28 finish.
- J. Power Supplies: Provide power supplies for use with electrified exit devices. Von Duprin PS873-2.
- K. Control Box: Shall be LCN ES7902S.
- L. Blow Out Control Box: Shall be LCN ES7949
- M. Push Plate Actuators: Shall be LCN 7910-956.
- N. Key Switch: Shall be Locknetics No. 653-14.
- O. Latch Protector: Non-handed and incorporate security frame pin to prevent separation of the door and frame. Rockwood 320, Ives LG1, or Don-Jo PLP-111 – US32D or as listed.



P. Dutch Door Bolt: Shall be Ives 054, or Rockwood 630-4.

Q. Electro-Magnetic Door Holders: Surface mounted wall magnetic units; one of the following:

<u>Manufacturer</u>	<u>Product</u>
ABH	2100 Series
Rixson	FM-998
LCN	SEM 7850

R. Flush Bolts: Self-latching or automatic type at label doors, manual flush bolts at non-label doors. Furnish dust proof strikes at all floor locations.

		<u>Ives</u>	<u>Door Controls</u>	<u>Rockwood</u>
Manual	HM	FB458	780	555
	WD	FB458	780	555
Self-Latching	HM	FB51P	845	1845
	WD	FB61P	945	1945

S. Automatic Coordinating: Shall be provided at all pairs of label doors equipped with overlapping astragals or where improper closing sequence would interfere with proper operating of the doors. Coordinators shall be Ives COR Series, Door Controls 600 series or Rockwood 1600 series. Furnish filler pieces to close opening between coordinator and the jamb of frame. Provide mounting brackets as required for proper mounting of additional hardware.

T. Lock Sets, Latch Sets: Cylindrical type shall be Schlage heavy-duty ANSI A156.2, Series 4000, Grade 1, 2-3/4" backset, interchangeable core cylinder with lever handles. (no substitutions)

1. Manufacturer and products:

<u>Manufacturer</u>	<u>Series</u>	<u>Lever Design</u>
Schlage	D	ATH

2. Lock functions as indicated in the hardware schedule shall be as follows:

<u>Function</u>	<u>Schlage</u>
A (Storeroom)	ND80TD x knurled O/S lever
B (Storeroom)	ND80TD
C (Classroom))	ND70TD
D (Office)	ND53TD
E (Passage)	ND10S

U. Mortise Deadlocks: ANSI A115.5, Grade 1.

<u>Function</u>	<u>Schlage</u>
-----------------	----------------

A (Classroom)	L463TD
B (Cylinder)	L464TD

V. Push Plates, Door Pulls, Push/Pull Bars Sets:

1. Manufacturers: Rockwood, Burns or Ives.
2. Push Plates: 8" x 16", stile permitting, or 4" x 16" for narrow stile x .50 thickness:
  - a. Rockwood 70 Series
  - b. Burns 50 Series
  - c. Ives 8200 Series
3. Door Pulls, Type A:
  - a. Rockwood BF111
  - b. Burns BF26C
  - c. Ives 8103EZ-0
4. Door Pulls, Type B x Mod. to have 7" CTC:
  - a. Rockwood 157
  - b. Burns 39C
  - c. Ives 8190
5. Push / Pull Bar Sets:
  - a. Rockwood 15747 x T4 fastening
  - b. Burns 39C x 422 x sim. fastening
  - c. Ives 9190 x sim. fastening 484-10"

W. Flush Pulls: Shall be Rockwood BF94C.

X. Kick Plates: .050 inch thick, beveled 4 edges, furnish with oval head counter-sunk. screws for fastening; widths 2 in. less the width of door; as follows:

1. Kick Plates: 8 in. high.

Y. Stops: Furnish at all doors. Wherever an opened door or any item of hardware thereon strikes a wall, at 90 degrees. Provide wall bumpers, unless otherwise indicated in hardware sets.

1. Where wall bumpers cannot be effectively used, a floor stop shall be furnished and installed.
2. Provide roller bumpers for each door where two doors interfere with each other in swinging.

<u>Manufacturer</u>	<u>Wall Bumpers</u>	<u>Floor Stops</u>	<u>Roller Bumpers</u>
Rockwood	409	440, 442	456
Ives	WS407CCV	FS436, FS438	RB470 Series
Quality	W302-TB	331, 431	

3. Where door stops / holders are listed they shall be heavy duty, wall mounted type as follows:

<u>Manufacturer</u>	<u>Product Number</u>
Rockwood	476
Ives	WS449
Quality	36

4. Where overhead concealed door holders are listed they shall be heavy-duty type as follows:

<u>Manufacturer</u>	<u>Series</u>
Glynn-Johnson	GJ100H
Sargent	690H
ABH	1010

5. Where overhead door stops are listed they shall be the surface mounted type as follows:

<u>Manufacturer</u>	<u>Series</u>
Glynn-Johnson	GJ450
Sargent	1540
ABH	4400

Z. Thresholds, Door Sweeps:

1. Thresholds: Extruded aluminum; furnish at all doors indicated. Set thresholds for exterior / stair doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants".
2. Products:

<u>Item</u>	<u>Pemko</u>	<u>Reese</u>	<u>NGP</u>
Threshold		as detailed	
Brush Seal	45062CP	970C	A626A
Auto. Door Bottom	434ARL	430A	422N (Mortise)
Door Sweep	345AV	353C	101VA
Rain Drip	346C	R201A	16A

- AA. Gasketing: #105 "Cush-N-Seal" as manufactured by Door and Hardware Systems, Inc. – 13 Silver Street – Rochester, New York 14611 – Tel. No. 716-235-8543 – Fax No. 716-235-0431.
- AB. Astragal: #AST-SURF as manufactured by Door and Hardware Systems, Inc. – 13 Silver Street – Rochester, New York 14611 – Tel. No. 716-235-8543 – Fax No. 716-235-0431.
- AC. Silencers: Provide silencers on all metal and wood frames. Silencers shall be Ives SR64 / SR65,

Hager 307D / 308D or Rockwood 608 / 609.

2.08 FINISHES

- A. Materials and finish: Materials and finishes shall be:
1. Interior Butts: US26D (BHMA 652)
  2. Geared Hinges: US28 (BHMA 628)
  3. Pocket Pivots: USP (BHMA 600)
  4. Door Closers: Sprayed to match hardware finish
  5. Kick Plates, Push Plates, Door Pulls, Push / Pull Bars: US32D (BHMA 630)
  6. All other hardware shall be: US26D (BHMA 626), or as scheduled.

2.09 KEYS AND KEYING

- A. The hardware supplier shall review the specific hardware functions with the Architect and Owner at the time of the keying review, to assure the appropriateness of each of the hardware functions. Failure to make this review does not relieve the hardware supplier from providing the proper functions.
- B. Key System: All permanent cylinder cores are to be furnished by the owner, keyed to the existing Schlage system.
1. All cylinders are to be of the interchangeable core type. These cylinders are to be furnished complete with temporary removable construction cores for use by the contractor during the construction period. Furnish three (3) control keys for removal of the construction cores.
  2. Furnish ten (10) Construction keys.

PART 3--EXECUTION

3.01 INSPECTION

- A. Inspect door openings and doors to determine that each door and door frame has been properly prepared for the required hardware. If errors in dimensions or preparation are encountered, they are to be corrected by the responsible parties prior to the installation of hardware.

3.02 PREPARATION

- A. All doors and frames, requiring field preparation for finish hardware, shall be carefully mortised, drilled for pilot holes, or tapped for machine screws for all items of finish hardware in accordance with the manufacturers templates and instructions.

3.03 INSTALLATION/ADJUSTMENT/LOCATION

- A. Install materials in a workmanlike manner following the manufacturer's recommended instructions.
- B. Install Door Closers in accordance with the manufacturer's instructions. Each door closer shall be

carefully installed, on each door, at the degree of opening indicated on the hardware schedule. Arm position shall be as shown on the instruction sheets and required by the finish hardware schedule.

- C. The adjustments for door closers shall be the installers responsibility and these adjustments shall be made at the time of installation of the door closer. The closing speed and the latching speed valves, shall be adjusted individually to provide a smooth, continuous closing action without slamming. The delayed action feature or back check valve shall also be adjusted so as to permit the correct delayed action cycle or hydraulic back check cushioning of the door in the opening cycle. All valves must be properly adjusted at the time of installation. Each door closer has adjustable spring power capable of being adjusted, in the field, from size 2 thru 6. It shall be the installers responsibility to adjust the spring power for each door closer in exact accordance with the spring power adjustment chart illustrated in the door closer installation sheet packed with each door closer.
- D. Installation of all other hardware, including locksets, door stops, plates and other items, shall be carefully coordinated with the hardware schedule and the manufacturer's instruction sheets.
- E. Locations for finish hardware shall be in accordance with dimensions listed in the pamphlet "Recommended locations for Builders' Hardware for custom steel doors and frames" published by the Door and Hardware Institute unless noted differently by the Architect.

#### 3.04 FIELD QUALITY CONTROL

- A. Upon completion of the installation of the finish hardware, a representative of the finish hardware supplier is to visit the project and to examine the hardware for each door on which he or she has provided hardware and to verify that all hardware is in proper working order. Should items of hardware not operating properly, make a report, in writing, to the Contractor, advising the Contractor of the problem and the measures required to correct the problem.

#### 3.05 PROTECTION

- A. Carefully protect exposed surfaces of finish hardware, by use of cloth, adhesive backed paper or other materials, immediately after installation of the hardware item on the door. The finish shall remain protected until completion of the project. Just prior to the inspection at the time of Substantial Completion, remove the protective material.

#### 3.06 CLEANING

- A. Clean finish hardware and remove remaining pieces of protective materials and labels.

#### 3.07 HARDWARE SETS

- A. Each Hardware Set listed below represents the complete hardware requirements for one opening (single door or pair of doors). Furnish the quantities required for each set for the work.

Set No. EX1

- 1 – Continuous Hinge
- 1 – Lockset (Function B - storeroom)
- 1 – Cylinder Core
- 1 – Latch Protector
- 1 – Door Closer – H-CUSH
- 1 – Kick Plate
- 1 – Threshold – as detailed
- 1 – Door Sweep
- 1 – Rain Drip
- 1 – Set Weatherstripping (H, J)

Set No. EX2

- 1 – Continuous Hinge
- 1 – Exit Device (Function B-exit only)
- 1 – Door Closer – H-CUSH
- 1 – Mounting Plate – if required
- 1 – Kick Plate
- 1 – Threshold – as detailed
- 1 – Door Sweep
- 1 – Rain Drip
- 1 – Set Weatherstripping (H, J)

Set No. EX3

- 1 – Continuous Hinge
- 1 – Lockset (Function A - storeroom x knurled o/s lever)
- 1 – Cylinder Core
- 1 – Door Closer – H-CUSH
- 1 – Kick Plate
- 1 – Threshold Assembly – as detailed
- 1 – Door Sweep
- 1 – Rain Drip
- 1 – Set Weatherstripping (H, J)

Note: Install cylinder on the stair side of the door.

Set No. EXAL1

- 1 – Continuous Hinge
- 1 – Exit Device (Function B-exit only)
- 1 – Door Closer – H-CUSH
- 1 – Mounting Plate – if required
- 1 – Kick Plate

- 1 – Threshold – as detailed
- 1 – Door Sweep – manufacturers standard
- 1 – Set Weatherstripping – manufacturers standard

Set No. EXAL2

- 1 – Continuous Hinge – prep for EPT
  - 1 – Power Transfer
  - 1 – Exit Device (Function C)
  - 1 – Schlage I/C Cylinder
  - 1 – Cylinder Core
  - 1 – Power Supply
  - 1 – Door Pull – type B
  - 1 – Concealed Power-Assisted Door Operator
  - 1 – Control Box
  - 1 – Blow Out Control Box
  - 2 – Push Plate Actuators
  - 1 – Key Switch
  - 1 – Schlage I/C Cylinder
  - 1 – Cylinder Core
  - 1 – Kick Plate
  - 1 – Threshold – as detailed
  - 1 – Door Sweep – manufacturers standard
  - 1 – Set Weatherstripping – manufacturers standard
- Note: The control boxes listed are for use with the door operator at both doors 101A, 101C.  
The key switch is to provide on / off power to the outside push plate actuator.

Set No. EXAL3

- 2 – Continuous Hinges – prep for EPT
  - 2 – Power Transfers
  - 1 – Exit Device (Function I)
  - 1 – Exit Device (Function J)
  - 3 – Schlage I/C Cylinders
  - 3 – Cylinder Cores
  - 1 – Power Supply
  - 2 – Door Pulls – type B
  - 2 – Concealed Power-Assisted Door Operators
  - 1 – Blow Out Control Box
  - 2 – Kick Plates
  - 1 – Threshold – as detailed
  - 2 – Door Sweeps – manufacturers standard
  - 1 – Set Weatherstripping – manufacturers standard
- Note: The blow out control box listed is for use with the door operators at doors 101B, 101D.

Set No. EXAL4

- 2 – Continuous Hinges
- 1 – Exit Device (Function G)
- 1 – Exit Device (Function H)
- 3 – Schlage I/C Cylinders
- 3 – Cylinder Cores
- 2 – Door Pulls – type B
- 2 – Door Closers – H-CUSH
- 2 – Mounting Plates – if required
- 2 – Kick Plates
- 1 – Threshold – as detailed
- 2 – Door Sweeps – manufacturers standard
- 1 – Set Weatherstripping – manufacturers standard

Set No. AL1

- 1 – Continuous Hinge
- 1 – Set Push / Pull Bars
- 1 – Door Stop
- 1 – Concealed Power-Assisted Door Operator
- 2 – Push Plate Actuators
- 1 – Kick Plate

Note: Power for the door operator is provided from the control box listed at Set No. EXAL2 (door 101A).

Set No. AL2

- 2 – Continuous Hinges
- 2 – Sets Push / Pull Bars
- 2 – Door Stops
- 2 – Concealed Power-Assisted Door Operators
- 2 – Kick Plates

Note: Power for the door operators is provide from the blow out control box listed at Set No. EXAL3 (pair doors 101B).

Set No. 1

- Butts
- 1 – Lockset (Function A – storeroom x knurled o/s lever)
- 1 – Cylinder Core
- 1 – Door Closer - CUSH
- 3 – Silencers



Set No. 2

Butts

- 1 – Lockset (Function A – storeroom x knurled o/s lever)
- 1 – Cylinder Core
- 1 – Door Stop
- 1 – Door Closer (Reg. arm)
- 1 – Kick Plate
- 3 – Silencers

Note: Par. arm door closer at door 005B.

Set No. 3

Butts

- 1 – Lockset (Function B – storeroom)
- 1 – Cylinder Core
- 1 – Door Stop
- 1 – Door Closer (Reg. arm)
- 1 – Kick Plate
- 3 – Silencers

Set No. 3A

Butts

- 1 – Lockset (Function B – storeroom)
- 1 – Cylinder Core
- 1 – Door Closer (Par. arm)
- 3 – Silencers

Set No. 4

Butts

- 1 – Lockset (Function A – storeroom x knurled o/s lever)
- 1 – Cylinder Core
- 1 – Set Self-Latching Flush Bolts
- 1 – Dust Proof Strike
- 1 – Door Coordinator x mounting brackets as required
- 2 – Door Stops
- 2 – Door Closers (Par. arm)
- 2 – Silencers

Set No. 4A

Butts

- 1 – Lockset (Function A – storeroom x knurled o/s lever)

- 1 – Cylinder Core
- 2 – Manual Flush Bolts
- 1 – Dust Proof Strike
- 2 – Door Stops
- 1 – Door Closer (Par. arm)
- 2 – Kick Plates
- 2 – Silencers

Note: Door closer is only required on the active leaf.

Set No. 5

Butts

- 1 – Lockset (Function B – storeroom)
- 1 – Cylinder Core
- 1 – Door Stop
- 1 – Door Closer (Par. arm)
- 1 – Kick Plate
- 1 – Set Gasketing (H, J)

Set No. 6

Not used

Set No. 7

Not used

Set No. 8

Butts

- 2 – Exit Devices (Function D)
- 4 – Schlage I/C Cylinders
- 4 – Cylinder Cores
- 2 – Door Stops
- 2 – Door Closers (Par. arm)
- 2 – Kick Plates
- 1 – Astragal
- 2 – Automatic Door Bottoms
- 1 – Set Gasketing (H, J)

Set No. 9

Butts

- 1 – Lockset (Function C – classroom)
- 1 – Cylinder Core

- 1 – Door Stop
- 1 – Automatic Door Bottom
- 1 – Set Gasketing (H, J)

Set No. 10

Butts

- 1 – Push Plate
- 1 – Door Pull – type A
- 1 – Door Stop
- 1 – Door Closer (Reg. arm)
- 1 – Kick Plate – 16" x 2" LWOD
- 1 – Automatic Door Bottom
- 1 – Set Gasketing (H, J)

Set No. 11

Butts

- 1 – Exit Device (Function E)
- 2 – Schlage I/C Cylinders
- 2 – Cylinder Cores
- 1 – Door Stop
- 1 – Door Closer (Par. arm)
- 1 – Kick Plate – 16" x 2" LWOD
- 3 – Silencers

Set No. 12

- 1 – Continuous Hinge
- 1 – Deadlock (Function A)
- 1 – Cylinder Core
- 1 – Push Plate
- 1 – Door Pull – type A
- 1 – Door Stop
- 1 – Door Closer (Reg. arm)
- 1 – Kick Plate – 16" x 2" LWOD
- 3 – Silencers

Set No. 13

Butts

- 1 – Lockset (Function B – storeroom)
- 1 – Cylinder Core
- 1 – Door Stop
- 3 – Silencers

Set No. 14

Butts

- 1 – Lockset (Function D – office)
- 1 – Cylinder Core
- 1 – Door Stop
- 1 – Set Gasketing (H, J)

Set No. 15

Butts

- 1 – Lockset (Function C – classroom)
- 1 – Cylinder Core
- 1 – Door Stop
- 1 – Door Closer (Par. arm)
- 1 – Kick Plate
- 3 – Silencers

Set No. 16

Butts

- 1 – Lockset (Function D – office)
- 1 – Cylinder Core
- 1 – Dutch Door Bolt
- 1 – Door Stop / Hook
- 4 – Silencers

Set No. 17

Butts

- 1 – Exit Device (Function B)
- 1 – Door Stop
- 1 – Door Closer (Reg. arm)
- 1 – Kick Plate
- 1 – Set Gasketing (H, J)

Set No. 18

- 6 – Pocket Pivots
- 2 – Exit Devices (Function F)
- 2 – Door Stops
- 2 – Electro-Magnetic Door Holders
- 2 – Door Closers – LCN 4000T

- 2 – Kick Plates
- 1 – Astragal
- 1 – Set Gasketing (H, J)

Note: Contractor is to provide blocking in the wall, behind the door, to allow installation of the door closer body to the wall.

Set No. 19

Butts

- 1 – Lockset (Function B-storeroom)
- 1 – Cylinder Core
- 1 – Door Stop
- 3 – Silencers

Set No. 20

Butts

- 2 – Exit Devices (Function D)
- 4 – Schlage I/C Cylinders
- 4 – Cylinder Cores
- 2 – Door Stops
- 2 – Door Closers (Par. arm)
- 2 – Kick Plates
- 2 – Silencers

Set No. 21

Butts

- 1 – Lockset (Function C – classroom)
- 1 – Cylinder Core
- 1 – Door Stop
- 3 – Silencers

Set No. 22

- 1 – Pivot Set
- 1 – Deadlock (Function B)
- 1 – Cylinder Core
- 1 – Flush Pull
- 1 – Overhead Concealed Door Holder
- 2 – Astragals

Note: Mount one astragal piece at the end of each door.

Set No. 23

Butts

1 – Latchset (Function E)

1 – Door Stop

3 - Silencers

Set No. 24

The following material is required to operate the pneumatically powered low-energy power operators specified for use at doors 101A, 101B, 101C and 101D:

1 – Compressor – LCN 922

Pneumatic Tubing – LCN 7910-925 (length as required)

**END OF SECTION**

**University of Southern Maine  
Community Education Center  
PORTLAND, MAINE  
GMP Documents**

**ADDENDUM NO. 2  
JANUARY 23, 2004**

**TO ALL BIDDERS:**

This Addendum is organized in three (3) parts:

- Part I      Overview
- Part II     Revisions/Clarifications
- Part III    Attachments

**PART I: OVERVIEW:**

- A.      This Addendum No. 2 is hereby incorporated into, and amends (by addition, deletion, clarification or alteration) the Bid Documents dated Jan 19 2004 for the University of Southern Maine CEC, Portland, Maine.
- B.      The bidder shall acknowledge all addenda on the SUBMISSION OF GMP Bidders are to please contact Einhorn Yaffee Prescott, Att: Mr. William F. Smith if any document is missing from the bidder's package. Additional costs for items missed in this addendum shall not be accepted for failing to include said work.

**PART II: REVISIONS/CLARIFICATIONS:**

ITEM 1: CONTROL SYSTEM EQUIPMENT SPECIFICATION SECTION 15975

ITEM 2: GEOTECHNICAL INFORMATION

**Part III: Attachments:**

Attachment 1: CONTROL SYSTEM EQUIPMENT SPECIFICATION SECTION 15975

Attachment 2: Haley and Aldrich report on Subsurface and Foundation Investigation Proposed Community Education Facility and Parking Garage dated July 2002

Attachment 3: Haley and Aldrich Report on Proposed Pedestrian Skyway dated November 2003

Attachment 4: Community Education Center Ledge Probe Results dated January 14, 2004

Attachment 5: Sketch no: GEO-001, Probe Results dated January 23, 2004

END OF ADDENDUM #2



**University of Southern Maine  
Community Education Center  
PORTLAND, MAINE  
GMP Documents**

ADDENDUM NO. 3  
JANUARY 28, 2004

**TO ALL BIDDERS:**

This Addendum is organized in three (3) parts:

- Part I      Overview
- Part II     Revisions/Clarifications
- Part III    Attachments

**PART I: OVERVIEW:**

- A.      This Addendum No. 3 is hereby incorporated into, and amends (by addition, deletion, clarification or alteration) the Bid Documents dated Jan 19 2004 for the University of Southern Maine CEC, Portland, Maine.
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**PART II: REVISIONS/CLARIFICATIONS :**

ITEM 1: DELETION TO SPECIFICATION SECTION 02200 PARAGRAPH 3.02A.

ITEM 2: ADD TO SPECIFICATION SECTION 02200, PARAGRAPH 3.02G

ITEM 3: ADD TO SPECIFICATION SECTION 02200, PARAGRAPH 3.02H

**Part III: Attachments :**

Attachment 1: Specification Section 02200

Attachment 2: Civil Drawing C301-Civil Details

**END OF ADDENDUM #3**

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Work included: All excavating, filling, backfilling, and removal of materials. Earthwork for utilities is included in this section.
- B. Related Work Specified Elsewhere:
  - Shoring and Bracing: Section 02150
  - Slope Protection and Temporary Erosion Control: Section 02210

1.02 PROTECTION:

- A. Paved Surfaces: Do not operate equipment that will cause damage on paved surfaces. Any damage to existing roads or other paved surfaces caused by construction equipment shall be repaired at no additional cost to OWNER.
- B. Maintain Excavations with approved barricades, lights, and signs to protect life and property until excavation is filled and graded to a condition acceptable to the ENGINEER.
- C. Protect structures, utilities, monitoring wells, property monuments, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations. The CONTRACTOR shall be responsible for actual cost of repair or replacement of any items damaged as a result of construction activities, including any professional services required for inspection of repairs and replacement.

1.03 QUALITY ASSURANCE:

- A. Testing and Inspection: OWNER shall be responsible for all testing, unless otherwise noted. The cost for retesting due to failed tests shall be the responsibility of the CONTRACTOR.

The CONTRACTOR shall be responsible for coordinating with ENGINEER to allow for testing to be performed at the frequencies specified. A minimum of 48 hours notice for in-place testing shall be given to allow proper scheduling by ENGINEER.

- B. Materials Testing Firm: Company specializing in materials testing with a minimum of five years documented experience. Company to be acceptable by ENGINEER and OWNER. Materials testing firm to be independent of CONTRACTOR. Acceptable testing firms are Summit Environmental, Inc., Haley and Aldrich, and S.W. Cole Engineering, Inc. Other firms will be considered upon receipt of corporate literature.

1.04 JOB CONDITIONS:

- A. Site Information: The CONTRACTOR may make his own borings, hand probes, explorations, and observations to determine soil, water levels, and other subsurface conditions at no additional cost to OWNER. Coordinate with OWNER prior to start of additional investigative work.
- B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations. Coordinate with utility companies for actual locations and shut-off services. If utilities are encountered that are not shown or that are shown incorrectly on the Drawings, notify ENGINEER immediately. Repair damaged utilities to satisfaction of ENGINEER and utility.

1.05 REFERENCES:

- A. Manual of Accident Prevention in Construction - Associated General Contractors of America, Inc.
- B. 29 CFR 1926/1910 - OSHA Safety and Health Standards for Construction Industry
- C. Standard Specifications for Highways and Bridges - Maine Department of Transportation, current edition

- 1.06 SUBMITTALS: Submit results of all aggregate gradation, moisture density, and field compaction testing for all materials to ENGINEER.

PART 2 - MATERIALS

2.01 MATERIALS:

- A. General: All materials utilized for this Project shall be obtained from a source that has been licensed or permitted for such use by local and state authorities. The CONTRACTOR shall be required to submit evidence of such if so requested.
  - 1. Suitable materials: Suitable soil materials are defined as those complying with ASTM D2487 soil classification groups GW, SM, SW, and SP.
  - 2. Unsuitable materials: Materials containing excessive amounts of water, blue clay, vegetation, organic matter, debris, pavement, stones or boulders over 6-inches in greatest dimension, frozen material, and material which, in the opinion of the ENGINEER, will not provide a suitable foundation or subgrade.
  - 3. On-Site Material: Any suitable material from on-site excavation.
  - 4. Material for embankments and general site fills may contain pieces of excavated ledge having a greatest dimension of up to 6-inches, unless otherwise approved by ENGINEER.

5. Inspection: The ENGINEER may inspect off-site sources of materials and order tests of these materials to verify compliance with these Specifications.
6. Sieve Analysis: Submit sieve analysis in accordance with ASTM D422 for all materials prior to start of construction.
- B. Gravel/Aggregate Base: Hard, durable gravel contained only particles passing the 2-inch sieve. Equal to MDOT 703.06, Type A material. Sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
2"	100
1/2"	45 - 70
1/4"	30 - 55
No. 40	0 - 20
No. 200	0 - 5

- C. Aggregate Subbase: Sand or gravel of hard, durable particles; equal to MDOT 703.06 Type D material. Aggregate subbase shall not contain particles that will not pass the 6-inch sieve. The part that passes the 3-inch sieve shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
1/4"	25 - 70
No. 40	0 - 30
No. 200	0 - 7

- D. Subbase Fill: Sand or gravel of hard, durable particles; equal to MDOT 703.06 Type F material. Subbase fill shall not contain particles that will not pass the 6-inch sieve. The part that passes the 3-inch sieve shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
1/4"	60 - 100
No. 40	0 - 50
No. 200	0 - 7

- E. 3/4" Crushed Stone: Durable, clean angular rock fragments obtained by breaking and crushing rock material.

<u>Sieve Size</u>	<u>% Passing by Weight</u>
1"	100
3/4"	90 - 100
3/8"	20 - 55
No. 4	0 - 10
No. 200	0 - 1.5

- F. Sand: Sand shall be well-graded coarse sand without excessive fines and free from loam, clay, and organic matter. Beach sand shall not be used. The grading requirements are as follows:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
3/8"	100
No. 4	95 - 100
No. 16	50 - 85
No. 50	10 - 30
No. 100	2 - 10

- G. Riprap: In accordance with MDOT 703.26 – Plain and Hand Laid Riprap, or as otherwise noted.
- H. Refill Material: Use 3/4" crushed stone for refilling excavation below normal grade, rock excavation or refilling excavations of unsuitable material, unless otherwise directed by ENGINEER.
- I. Fabric Protection Layer: As specified in Section 02210.
- J. Select Backfill: Use gravel/aggregate base material as directed by ENGINEER.
- K. Common Borrow: Earth suitable for embankment and general site fills construction free from frozen material, perishable rubble, peat and other unsuitable material. Moisture content shall be sufficient to provide required compaction and stable embankment, but shall not exceed 4% above optimum.

### PART 3 - EXECUTION

#### 3.01 EXCAVATION:

- A. General: Remove all materials encountered to the limits shown on the Drawings, or designated in the Specifications.
- B. Classifications: The following classifications of excavation will be made which will be paid for on a unit cost basis:

Rock Excavation  
Excavation below Normal Grade

- C. Rock Excavation includes removal and disposal of materials and obstructions encountered that cannot be excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping; includes boulders larger than 2 cubic yards each.

Do not perform rock excavation or excavation of unsuitable materials until material to be excavated has been cross-sectioned and classified by ENGINEER. Pre-drilling and blasting of bedrock through overburden may be allowed. However, if this method is used, the rock excavation quantities will be adjusted downward in proportion to the ground swell from this blasting method.

- D. Earth Excavation: Remove and dispose of obstructions visible on ground surface, underground structures, utilities, and items indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation.
- E. Excavation in Paved Areas: Cut pavement prior to excavation to provide a clean, uniform edge. Minimize disturbance of remaining pavement. Cut and remove the minimum amount of pavement required to do the Work. Use shoring and bracing where sides of excavation will not stand without undermining pavement.
- F. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete formwork and reinforcement is installed. Trim bottoms to required lines and grades to leave solid base to receive other Work. When excavating in clay material, use a smooth-edged bucket to avoid disturbance of the bottom of the excavation. Use shoring and bracing where sides of excavation will not support itself.

- G. Excavation for Utility Trenches: Excavate to widths shown on the Drawings and depths indicated or required to establish indicated slope and invert elevations.

Produce an evenly graded, flat trench bottom at the subgrade elevation required for installation of pipe and bedding material. Place backfill material directly into trench or excavation. Do not stockpile material to be used as backfill along edges of trenches. Load excavated material directly into trucks, unless otherwise permitted by the ENGINEER.

- H. Unauthorized Excavation: Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of ENGINEER. Unauthorized excavation, as well as remedial work directed by ENGINEER, including refilling, shall be at CONTRACTOR's expense.
- I. Refilling Unauthorized Excavation: For trenches, use 3/4-inch crushed stone. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by ENGINEER.
- J. Excavation of Unsuitable Materials: When excavation has reached required subgrade elevations, notify ENGINEER who will make an inspection of conditions. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper as directed by ENGINEER and replace excavated material as specified. Removal of unsuitable material and its replacement as directed by ENGINEER will be paid for as Excavation Below Normal Grade unless material has been made unsuitable by CONTRACTOR's operations. In this instance, removal and replacement will be performed at CONTRACTOR's expense.
- K. Material Storage: Stockpile and maintain suitable surplus excavated materials for re-use as backfill within the Project limits, as directed by ENGINEER. Place, grade and shape stockpiles for proper drainage. Locate and retain soil materials away from edge of excavations.

3.02 BLASTING

- A. General: Obtain approval of OWNER and ENGINEER before blasting. All blasting for utilities shall be paid as Utility Trench Blasting. All blasting related to footings, foundations and other site elements NOT related to utilities shall be paid as Open Blasting or Bulk Rock Excavation.
- B. Pre-blast Survey shall be the responsibility of the CONTRACTOR. Provide pre-blast survey prior to any blasting or blasting related operations. A written report of the preblast survey will be provided to the University of Maine System (UMS) by the CONTRACTOR and will be available for review by the City of Portland. A copy of the blasting plan will be submitted to the City of Portland and UMS for review and approval prior to the initiation of the site preparation work.

All owners of dwellings or residences located within 500-feet of the blasting location shall be notified, in writing, by the CONTRACTOR a minimum of 30 days prior to the scheduled blasting date about the proposed blasting and how to request a pre-blast survey. Upon request, the CONTRACTOR shall determine the pre-blasting condition of any structure located within this area and prepare a written report. The pre-blast survey shall be limited to the surface conditions of the structures but shall comply in all respects with 30 CFR, Chapter VII, Section 816.62.

1. Pre-blast Survey shall include, but not be limited to:
    - a. Video tape of each structure within 500-feet of the blasting location to show pre-blast conditions. Highlight existing defects in structures and pavements. Provide some means of establishing scale of existing defects (i.e., include tape measure or folding ruler at defect during video taping).
    - b. Video taping shall be done with commercial grade equipment to allow equipment still viewing without distortion of the viewed area.
    - c. Still photos and videotapes shall be retained by the pre-blast surveyor and shall be available for viewing by the OWNER and ENGINEER within 24 hours upon request.
  2. A blasting plan shall be prepared which addresses:
    - a. Airblast Limits
    - b. Ground Vibrations
    - c. Maximum Peak Particle Velocity
  3. The blasting plan shall meet criteria established in Chapter 3 (Control of Adverse Effects) in the Blasting Guidance Manual of the United States Department of the Interior Office of Surface Mining Reclamation and Enforcement.
  4. Provisions and measures to monitor and assure compliance with the blasting plan.
  5. The blasting plan and preblast survey shall conform to all recommendations of the project geotechnical report and supplemental geotechnical evaluations included in these Specifications.
- C. Particle Velocities: Maximum allowable peak particle velocity shall be limited to 1.25 inches per second within 300 feet of the blast site. Monitor at location designated by ENGINEER.
- D. Documentation: Submit an accurate record of the blasting operation to the ENGINEER. A copy should be retained by the blasting firm for at least 3 years. This record shall consist of the following information as listed in 30 CFR, Chapter VII, Section 816.68.
1. Name of the firm conducting the blast.
  2. Location, date, and time of the blast.
  3. Name, signature, and certification number of the blaster conducting the blast.
  4. Identification, direction, and distance, in feet, from the nearest blast hole to the nearest dwelling, public building, school, church, community or institutional building outside the project area.
  5. Weather conditions, including those that may cause possible adverse blasting effects.



6. Type of material blasted.
  7. Sketches of the blast pattern including number of holes, burden, spacing, decks, and delay pattern.
  8. Diameter and depth of holes.
  9. Types and total weight of explosives used.
  10. Mats or other protections used.
  11. Seismographic and airblast records, which shall include: type of instrument, sensitivity, and calibration signal or certification of annual calibration; exact location of instrument and the date, time, and distance from the blast; and the vibration and/or airblast level recorded.
- E. All blasting shall be performed in accordance with all pertinent provisions of the "Manual of Accident Prevention in Construction", issued by the Associated General Contractors of America, Inc., of the "Construction Safety Rules and Regulations", as adopted by the State Board of Construction Safety, Augusta, Maine, and the Maine Department of Transportation "Standard Specifications" Section 105.2.6, Use of Explosives. Blasting through the overburden will not be allowed.
- F. Drilling Equipment will be equipped with suitable dust control apparatus that must be kept in repair and used during all drilling operations.
- G. Open Blasting shall pertain to all blasting required for the placement of foundations, footings, and other project elements not specifically identified in paragraph H, Utility Trench Blasting. Vertical pay limits for all Open Blasting shall be one (1) foot below the base of structural elements to be placed. Horizontal pay limits for all Open Blasting shall be two (2) feet beyond each outside edge of structural elements to be placed. Blasting for placement of underdrain piping and associated appurtenances depicted along building footings will be considered Open Blasting.
- H. Utility Trench Blasting shall pertain to all blasting required for the placement of any pipe, utility structure, or associated appurtenances. Utilities associated with the site shall include water distribution and service, sanitary sewer collection and service, storm sewer collection, underground electrical service, telecommunications, data, and geothermal related elements, as indicated on the drawings. All blasting required for the placement of utilities outside the horizontal and vertical pay limits defined by Open Blasting described in paragraph G, shall be paid as Utility Trench Blasting. Pay limits for piping and utility structures shall be as depicted on the contract drawings.

3.03 STABILITY OF EXCAVATIONS:

- A. General: Slope sides of excavations to comply with OSHA Regulations and Local Codes. Shore and brace where sloping is not possible due to space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- B. Refer to Section 02150 for shoring and bracing requirements.

3.04     DEWATERING:

- A.     General: Perform all Work in the dry. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

Do not allow water to accumulate in excavations. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey water removed from excavations and rainwater to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

3.05 BACKFILL AND FILL:

- A. General: Place suitable soil material in layers to required elevations as shown on the Drawings. Fill, backfill, and compact to produce minimum subsequent settlement of the material and provide adequate support for the surface treatment or structure to be placed on the material. Place material in approximately horizontal layers of beginning at lowest area to be filled. Do not impair drainage.
- B. Ground Surface Preparation: Remove vegetation, debris, unsuitable soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Remove material to the full extent of root penetration. Scarify surfaces so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified under Paragraph 3.06, Compaction, for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum dry density.

- C. Placement: Place backfill and fill materials in layers not more than 9-inches in loose depth for material compacted by heavy compaction equipment, and not more than 6-inches in loose depth for material compacted by hand-operated tampers. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to structures to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

Do not allow heavy machinery within 5 feet of structure during backfilling and compacting.

- D. Backfill excavations as promptly as work permits, but not until completion of the following:

Acceptance of construction below finish grade including dampproofing, and/or waterproofing.

Inspection, approval and recording locations of underground utilities.

Removal of concrete formwork.

Removal of shoring and bracing, and backfilling of voids with suitable materials.

Removal of trash and debris from excavation.

Permanent or temporary horizontal bracing is in place on horizontally supported walls.

Backfill cast-in-place concrete structures when the concrete has developed adequate strength.

Use care in backfilling to avoid damage or displacement of underground structures and pipe.

- E. Backfilling Trenches: See Trench Detail on the Drawings.

Bed pipe in 3/4-inch crushed stone, unless otherwise indicated. Limits of bedding and requirements for remaining trench backfill shown on Drawings.

- F. Replacement of Unsuitable Materials:

Below normal grade: See paragraph 3.01J.

Above normal grade: Replace unsuitable material with suitable material from on-site. All excess suitable material must be used before additional material from off-site is used.

3.06 COMPACTION:

- A. Methods: Use methods which produce the required degree of compaction throughout the entire depth of material placed without damage to new or existing facilities and which are approved by the ENGINEER. Adjust moisture content of soil as required. Remove and replace material that is too wet to compact to required density. Compact each horizontal layer of fill and slope as Work progresses.
- B. Degree of Compaction: Compact to the following minimum densities:

<u>FILL AND BACKFILL LOCATION</u>	<u>DENSITY</u>
Under structure foundations and slab on grade	95% of max.
Top 2 feet under pavement	95%
Below top 2 feet under pavement	92%
Structural fills	95%
Pipe Bedding	95%
Adjacent to structure foundation walls, retaining walls, and tank walls	92% - 95%
Trenches through Gravel areas	95%
Trenches through other non-paved areas	90%
Embankments	90%

Maximum density: ASTM D1557.

Field density tests: ASTM D1556 (sand cone) or ASTM D2167 (rubber balloon), or ASTM D2922 (nuclear methods).

- C. Testing: Determine actual in-place densities using field tests as directed by the ENGINEER. Tests will be made by an independent laboratory. Costs for initial tests will be paid by

OWNER. Perform additional work to obtain proper compaction if in-place densities do not meet specified densities. Costs of re-testing shall be borne by CONTRACTOR.

- D. Minimum Number of Tests: For areas to be paved and building subgrade, a minimum of one (1) test per 2,000 square feet (sf) per lift of material, but in no case less than three (3) tests. For trenches, a minimum of one (1) test per 100 lineal feet (lf) per lift of material. Other areas shall be tested at a minimum frequency of one (1) field test per 10,000 sf per lift of material, unless otherwise directed by ENGINEER.

3.07 GRADING:

- A. Grading: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finish surface within specified tolerances and compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Grading Outside Structure Lines: Grade areas adjacent to structure to drain away from structures and to prevent ponding.
- C. Finish surfaces free from irregular surface changes and as follows:

Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.

Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.

Fill Under Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a 10-foot straightedge.

- D. Compaction: After grading, compact subgrade surfaces as required.

3.08 EROSION CONTROL: Provide erosion control measures as specified in Section 02210 and as shown on Drawings.

3.09 MAINTENANCE:

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.
- C. Settling: Where settling is measurable or observable at excavated areas during warranty period; remove surface, add backfill material, compact, and replace surface. Restore

appearance, quality, and condition of surface to match adjacent work, and eliminate evidence of restoration work to greatest extent possible.

- 3.10 DISPOSAL OF EXCESS MATERIALS: Remove excess excavated material and dispose of it off-site in a lawful manner, unless otherwise directed by ENGINEER.

\*\*\* END OF SECTION \*\*\*

University of Southern Maine  
Community Education Center  
PORTLAND, MAINE  
GMP Documents

ADDENDUM NO. 4  
JANUARY 30, 2004

TO ALL BIDDERS:

This Addendum is organized in six (6) parts plus attachments:

- Part I Overview
- Part II Revisions/Clarifications to the Bidding Requirements
- Part III Revisions to Contract Requirements
- Part IV General Clarifications
- Part V Revisions to the Drawings
- Part VI Revisions to the Specifications
- Attachments

PART I: OVERVIEW:

- A. This Addendum No. 4 is hereby incorporated into, and amends (by addition, deletion, clarification or alteration) the Bid Documents dated Jan 19 2004 for the University of Southern Maine CEC, Portland, Maine.
- B. The bidder shall acknowledge all addenda on the SUBMISSION OF GMP. Bidders are to please contact Einhorn Yaffee Prescott, Att: Mr. William F. Smith if any document is missing from the bidder's package. Additional costs for items missed in this addendum shall not be accepted for failing to include said work.

PART II: REVISIONS/CLARIFICATIONS TO THE BIDDING REQUIREMENTS:

NO CHANGES

PART III: REVISIONS TO CONTRACT REQUIREMENTS:

NO CHANGES

PART IV: GENERAL CLARIFICATIONS:

ITEM 1: STAGE 4 COMMISSIONING

- A. See attached Master Equipment and Systems List (6 pages, Dated 1/28/2004) for the USM – Community Education Center.

PART V: REVISIONS TO THE DRAWINGS:

ITEM 1: SHEETS C-A101 THROUGH C-A904

- A. Delete all wood finish references to Cherry. Wood species is to be Maple.

ITEM 2: REISSUED SHEETS

- A. Replace the following sheets in the GMP set. Revisions are tagged with the number "4".
- B. C-LS102
- C. C-A101; C-A102; C-A103; C-A104; C-A105
- D. C-A201; C-A202; C-A203; C-A204
- E. C-A301; C-A303; C-A305; C-A306; C-A307, C-A308
- F. C-A403; C-A404; C-A405; C-A406; C-A407; C-A408; C-A410; C-A414
- G. C-A501; C-A502
- H. C-A610; C-A612; C-A613; C-A614; C-A617
- I. C-A703; C-A704; C-A706
- J. C-A802; C-A803; C-A804
- K. C-A902; C-A904
- L. C-F001; C-F101; C-F102; C-F104
- M. C-H001
- N. C-H101; C-H102; C-H103; C-H104
- O. C-H201; C-H202; C-H203
- P. C-H401; C-H402; C-H403; C-H404
- Q. C-H501; C-H502; C-H503; C-H504; C-H505
- R. C-H601; C-H602
- S. C-E002; C-E003
- T. C-E102; C-E103



- U. C-E201; C-E202; C-E203
- V. C-E400
- W. C-E500; C-E501

ITEM 3: NEW SHEETS

- A. The following list of sheets are new to the GMP set:
- B. ✓C-A415
- C. ✓C-A707; ~~C~~-A708
- D. ~~C~~-A905

ITEM 4: SHEET C-S001

- A. Note H3 (A) applies to the CEC building.
- B. Add Note H3 (B) BRIDGE: AASHTO "GUIDE TO PEDESTRIAN BRIDGES WIND LOAD: 35 PSF FULL VERTICAL PROJECTED AREA.

ITEM 5: SHEET C-S102

- A. Add bent plate at 2nd floor slab edge per SKS-1 and SKS-2 (attached).

ITEM 6: SHEET C-S103

- A. Modify roof framing as shown on SKS-3 (attached).

ITEM 7: SHEET C-S104

- A. Provide top chord joist extensions typical at line CC (2'-6" long), line CAA (2'-7" long) and line 6.4 (3'-10" long.) Provide 2'-6" long WT6x7 outriggers at approx 5' on center typical at line 3 and at corner columns. Provide a continuous angle (L3x3x5/16) around high roof (det 9/C-S401 similar.)

ITEM 8: SHEET C-S401

- A. Add detail 11 per SKS-2 (attached).

ITEM 9: SHEET C-A302 – WALL SECTIONS

- A. Detail A13: Extend underslab insulation a distance of 4'-0' from the perimeter foundation walls. This is the typical placement for all underslab insulation.

- B. Detail A13: Place perimeter foundation insulation along the full height of the interior face of perimeter foundation walls. This is the typical placement for all perimeter foundation wall insulation, including the south wall where the building abuts the existing garage structure.

**PART VI: REVISIONS TO THE SPECIFICATIONS:**

**ITEM 1. SECTION 01320 – COMMISSIONING REQUIREMENTS**

- A. Insert Section 01320 (attached) in its entirety.

**ITEM 2: SECTION 01500 - TEMPOARARY FACILITIES AND CONTROLS.**

- A. Page 1, Paragraph 1.02-A.-1. – Insert the following at the end of the paragraph:  
“2. SECTION 01511 TEMPORARY DEHUMIDIFICATION, HEATING AND COOLING.”
- B. Page 4, Paragraph 2.03-B. – Delete paragraph and associated subparagraphs in their entirety and replace with the following:  
“B. Temporary Heat and Ventilation: Refer to Section 01511 TEMPORARY DEHUMIDIFICATION, HEATING AND COOLING for requirements.”

**ITEM 3: SECTION 01511 - TEMPOARARY DEHUMIDIFICATION, HEATING AND COOLING.**

- A. Insert “Section 01511 TEMPORARY DEHUMIDIFICATION, HEATING AND COOLING”, attached at end of this Addendum.

**ITEM 4. SECTION 06400 – ARCHITECTURAL WOODWORK**

- A. Delete all references to Cherry and/or American Cherry.
- B. Wood species is Maple. Veneers are plain sawn w/o hearts. Slip matched veneers shall not have veneer narrower than 6-inches.
- C. Stain all stock (solid and veneers) to match.
- D. All wood and backers to be FSC Certified.

**ITEM 5. SECTION 07812 – INTUMESCENT FIREPROOFING**

- A. Delete this section in its entirety. References to this coating system to be deleted and paint finishes as specified in 09900 are to be applied.

ITEM 6. SECTION 08520 – ALUMINUM WINDOWS

- A. Exterior sunscreen to be Kawneer 1600 Sunshade System (Pre-engineered) or approved equal.
- B. Lightshelves (interior) to be Kawneer Inlighten™ (lightshelf) system or approved equal.

ITEM 7. SECTION 09510 – ACOUSTICAL CEILINGS

- A. Add Paragraph 09510-2.03-C: Metal ceilings to be USG Paraline™ II unperforated 004 (white) finish. No substitutions will be accepted.

ITEM 8. SECTION 10520 – FIRE EXTINGUISHERS

- A. Omit Paragraph 2.03. There will not be any bracket mounted fire extinguishers.
- B. All fire extinguishers to be located in cabinets as specified in paragraph 2.04.
- C. Contractor to allow for installation of 16 fire extinguishers and cabinets. Final locations to be determined at a later date.

ITEM 9. SECTION 12730 – LECTURE HALL SEATING

- A. This section provided for reference. Owner is furnishing and installing the seating under separate contract. The contractor is responsible for field layouts, coordination, and all field electrical connections, etc.
- B. The seating furnish and install is N.I.C.

ITEM 10: SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS.

- A. Page 6, Paragraph 1.09-E. – Insert the following at the end of the paragraph:  
"1.10 WARRANTY
  - A. General Warranty: The HVAC System Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by equipment manufacturers or the Conditions of the Contract.
  - B. HVAC System Warranty: The Mechanical Contractor shall submit a written warranty that agrees to repair, replace components for the entire HVAC System, including operation, parts, equipment, and all other

components that fail in material or workmanship within the specified warranty period.

1. Warranty Period: 1- year from the date of Substantial Completion."

ITEM 11: SECTION 15055 - ELECTIRCAL REQUIREMENTS FOR HVAC WORK.

- A. Page 1, Paragraph 1.01- C.-10. – Delete paragraph and replace with:

"10. Division 15 Section "Rooftop Air Handling Units"."

- B. Page 1, Paragraph 1.01- C.-15. - Insert the following at the end of the paragraph:  
"16. Division 15 Section "Propeller Unit Heaters"."

- C. Page 1, Paragraph 1.01- D.-2. – Delete: paragraph and replace with:

"2. Submittal Procedures, Contract Closeout requirements, Integrated Deliverables and Testing Plan, and other General Requirements for the Project: Division 1."

- D. Page 4, Paragraph 1.07-C. – Insert the following at the end of the paragraph:

"1.08 WARRANTY

- a. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.
- b. Special Warranty: The Equipment (motors, starters, disconnect switches, and VFDs ) Manufacturers shall submit a written warranty for electrical devices for HVAC work agreeing to repair or replace components within the equipment that fail in material or workmanship within the specified warranty period.
  1. Warranty Period: 1- year from the date of Substantial Completion."

- E. Page 20, Paragraph 3.04-A.-5. – Delete paragraph and replace with:

"5. Measure the current and voltage, for each phase, as applicable under loading. Compare amperage values to nameplate data. Notify the engineer, in wiring, when amperage values exceed nameplate values by greater than 10%."

ITEM 12: SECTION 15060 – HANGERS AND SUPPORTS.

- A. Page 1, Paragraph 1.01-B.-22. - Insert the following at the end of the paragraph:  
"23. Division 15 Section "Propeller Unit Heaters"."

ITEM 13: SECTION 15071 – HVAC VIBRATION CONTROLS AND SEISMIC RESTRAINTS.

- A. Page 1, Paragraph 1.01-B.-20. - Insert the following at the end of the paragraph:  
"21. Division 15 Section "Propeller Unit Heaters"."
- B. Page 1, Paragraph 1.02-A. – Delete paragraph and replace with:
  - "A. Submit the following in accordance with Division 1 Section "Submittal Procedures"."
- C. Page 6, Paragraph 1.11-A. – Insert the following at the end of the paragraph:  
"1.12 WARRANTY
  - A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.
  - B. Special Warranty: The Equipment (vibration isolators and seismic restraints) Manufacturers shall submit a written warranty for devices for HVAC work agreeing to repair or replace components within the equipment that fail in material or workmanship within the specified warranty period.
    - 1. Warranty Period: 1- year from the date of Substantial Completion."

ITEM 14: SECTION 15075 – MECHANICAL IDENTIFICATION.

- A. Page 1, Paragraph 1.01-B.-20. - Insert the following at the end of the paragraph:  
"21. Division 15 Section "Propeller Unit Heaters"."

ITEM 15: SECTION 15081 – DUCT INSULATION.

- A. Page 1, Paragraph 1.01-B.-11. - Insert the following at the end of the paragraph:  
"12. Division 7 Section "Joint Sealers"."

ITEM 16: SECTION 15082 – EQUIPMENT INSULATION

- A. Page 9, Paragraph 3.09 – Delete paragraph and all sub paragraphs in their entirety, and add the following to the end of Paragraph 3.08-A.:
  - "B. HVAC air separators, storage tanks, expansion tanks, and pump housings.
    - 1. Operating Temperatures 32 to 200°F (0 to 93°C).F
    - 2. Insulating Material: Mineral fiber board.

3. Insulation Thickness: 2".
4. Jacket: Foil and paper.
5. Field-Applied Jacket: PVC.
6. Vapor Barrier Required: Yes.
7. Finish: Subject to Painting. Coordinate with Division 9 and Drawings."

ITEM 17: SECTION 15110 – VALVES.

- A. Page 1, Paragraph 1.01-B.-16. - Insert the following at the end of the paragraph:  
"17. Division 15 Section "Propeller Unit Heaters"."
- B. Page 2, Paragraph 1.05-C. – Insert the following at the end of the paragraph:  
"1.06 WARRANTY  
A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.  
B. Special Warranty: The Valve Manufacturers shall submit a written warranty for their products agreeing to repair or replace components within the valves that fail in material or workmanship within the specified warranty period.
  1. Warranty Period: 1- year from the date of Substantial Completion."
- C. Page 4, Paragraph 2.04-A. – Delete paragraph and associated subparagraphs in their entirety and replace with the following:  
"A. Flanged Butterfly Valves: 2 ½" and larger, High Performance, with bubble tight shutoff, MSS SP-67, 200-psi CWP, 150-psi maximum pressure differential, ASTM A 126 full lug, self aligning cast-iron body and bonnet, extended neck, 316 stainless-steel stem, disc, field-replaceable EPDM stem seals, Teflon reinforced seat. Valve shall be suitable for end service use. Keystone Fig. No. AR2, NIBCO Fig. No. 20821, Jenkins Fig. No.230 BL/BG, Stocham Fig. LG-712 or approved Equal.
  1. Operator: Lever operators with lock.
  2. Stem Extension: For valves installed in insulated piping.
  3. Memory Stops: For throttling, metering or balancing service.

- B. Grooved End Butterfly Valves 2 ½" to 6", 300 psi maximum pressure rating, with copper tubing sized grooved ends. Cast bronze body to CDA-836 (85-5-5-5). Elastomer encapsulated ductile iron disc, ASTM A-536, Grade 65-35-12, with integrally cast stem. Bubble tight, dead end or bi-directional service. With memory stop for throttling, metering or balancing service. Lever operator with locks and stem extensions for valves installed in insulated piping. Basis of design Victaulic CTS Copper Grooved Piping System."
- D. Page 7, Paragraph 3.04-A. – Insert the following at the end of the paragraph:
  - "B. All components (couplings, fittings, valves, gaskets, bolts and nuts) shall be of the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components."

ITEM 18: SECTION 15122 – METERS AND GAGES.

- A. Page 1, Paragraph 1.01-B.-20. – At the end of the paragraph add the following:
  - "21. Division 15 Section "Propeller Unit Heaters"."
- B. Page 2, Paragraph 1.03-B. – Insert the following at the end of the paragraph:
  - "1.04 WARRANTY
  - A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.
  - B. Special Warranty: The Manufacturers shall submit a written warranty for their products agreeing to repair or replace components within the valves that fail in material or workmanship within the specified warranty period.
    - 1. Warranty Period: 3- years from the date of delivery."
- C. Page 4, Paragraph 2.01-A.-9.-c. – Insert the following at the end of the paragraph:
  - "d. Ebtron."
- D. Page 9, Paragraph 2.15 – Delete paragraph and all associated subparagraphs in their entirety.
- E. Page 9, Paragraph 2.16-A. – Delete paragraph in its entirety and replace with the following:
  - "A. Description: Inline stainless steel type flow meters with gallon per minute (GPM) readings."
- F. Page 10, Paragraph 2.17 – Delete paragraph and all associated subparagraphs and replace with the following:

"2.17 AIR FLOW MEASURING STATIONS

A. Duct Mounted Air Flow Measuring Station Probes

1. Tube Construction: 6061 aluminum alloy.
2. Sensor Assembly: Two hermetically sealed "bead -in - glass" thermistors in a glass filled polypropylene housing.
3. Mounting Brackets: 304 stainless steel.
4. Standard Probe Lengths: 8 inches to 120 inches.
5. Cabling: Plenum rated; 5/8 inch circular with DIN connections. Length as required for installation.
6. Number of Air Velocity Calibration Points: 16.
7. Number of Temperature Calibration Points: 3.
8. Maximum Number of Sensor per Sensor Probe: 4.
9. Sensor Distribution Equal area or Modified Log-Tchebyceff.
10. Airflow Sensor Accuracy ( $\pm$ of reading): 2%
11. Calibration Range: 0 – 5000 FPM.
12. Temperature Sensor Accuracy: 0.15°F
13. Sensor Temperature Range: For velocities less than 1500 FPM: -20°F to 160°F.  
For velocities greater than 1500 FPM: 30°F to 160°F.
14. Humidity Range: 0 to 99% R.H. (non-condensing).

B. Fan Inlet Mounted Air Flow Measuring Station Probes

1. Tube Construction: 304 stainless steel sensor assembly housing with 304 cadmium plated rods.
2. Sensor Assembly: Two hermetically sealed "bead -in - glass" thermistors in a glass filled polypropylene housing.
3. Standard Probe Lengths: 11 inches to 64 inches.
4. Cabling: Plenum rated; 5/8 inch circular with DIN connections. Length as required for installation.
5. Number of Air Velocity Calibration Points: 16.
6. Number of Temperature Calibration Points: 3.
7. Maximum Number of Sensor per Sensor Probe: 3.
8. Number of Sensors per Fan Inlet: 2.
9. Sensor Distribution Equal area or Modified Log-Tchebyceff.
10. Airflow Sensor Accuracy ( $\pm$ of reading): 2%



11. Calibration Range: 0 – 10000 FPM.
  12. Temperature Sensor Accuracy: 0.15°F.
  13. Sensor Temperature Range: For velocities less than 1500 FPM: -20°F to 160°F. For velocities greater than 1500 FPM: 30°F to 160°F.
  14. Humidity Range: 0 to 99% R.H. (non-condensing).
- C. Transmitter for Air Flow Measuring Station Probes
1. Sensor Independent Electronics: Yes.
  2. A/D Converter: 12 bit.
  3. Power requirement: 24 Volt VAC @ 8VA max (fused and protected on transmitter, isolation not required.).
  4. Enclosure: NEMA 1 for indoor applications and NEMA 4 for outdoor application.
  5. Output Signal Adjustments: Field adjustable digital airflow output gain.
  6. Analog Output Protection: Fused and protected, isolated outputs.
  7. Analog Output Signals: Field selectable, linear analog output signals of 4-20 mA and 0-10 VDC for airflow and temperature.
  8. Airflow Analog Output Scaling 0 to 10000 FPM, field adjustable.
  9. Temperature Analog Output Scaling: Range from -20°F to 160°F, field selectable.
  10. Transmitter Temperature Range: -20°F to 160°F.
  11. Analog Output Resolution for Full Scale Output: 0.025%
- G. Page 12, Paragraph 3.07-F. – Insert the following at the end of the paragraph:
- “3.08 TRAINING
- A. Engage a factory –authorized service representative to train the Owner’s maintenance personnel to adjust, operate and maintain meter and gages.
  - B. Review data in the operation and maintenance manuals. Refer to Division 1 Section “Closeout Procedures”.
  - C. Schedule at least 8 hours of training with the Owner, through the Architect, with at least seven days’ advanced noticed.

ITEM 19: 15181 – HYDRONIC PIPING.

- A. Page 1, Paragraph 1.01-C.-21. – Insert the following at the end of the paragraph:
- “22. Division 15 Section “Propeller Unit Heaters”.
  23. Division 15 Section HVAC Water Treatment”.”

- B. Page 2, Paragraph 1.03-F. – Insert the following at the end of the paragraph:
- “G. All grooved components (couplings, valves, gaskets, bolts and nuts) shall be of the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.”
- C. Page 3, Paragraph 1.05-G. -
- “1.06 WARRANTY
- A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.
- B. Special Warranty: The Hydronic Specialty (Tank, Heat Exchanger, Separator, Strainer, and Valve) Manufacturers shall submit a written warranty for their products agreeing to repair or replace components within the their equipment that fail in material or workmanship within the specified warranty period.
0. Warranty Period: 1- year from the date of Substantial Completion.”
- D. Page 5, Paragraph 2.01-A.-6. – Delete paragraph and associated subparagraphs in their entirety and replace with the following:
- “6. Sediment Centrifuge Separators:
- a. Rusco, Inc.”
- E. Page 5, Paragraph 2.03-H. – Insert the following at the end of the paragraph:
- “I. Grooved Copper Piping System:
1. General: Copper tubing systems from 2 ½” NPS through 8” NPS (DN 75 –DN 200) shall be installed using mechanical piping couplings of a bolted type, with a pressure-responsive gasket along the grooved end copper or bronze fittings as available.
2. Copper Tube: ASTM B-88, Type L roll grooved only, in accordance with manufacturer’s current listed standards.
3. Mechanical Couplings: 2 ½” NPS through 8” NPS (DN 75 –DN 200) for copper tubing consisting of ductile iron cast housings. Complete with a synthetic rubber, pressure-responsive gasket, with plated nuts and bolts to secure the unit together. Couplings shall be manufactured to connect copper tubing sized tube and fittings. Flaring of tube and fitting ends to IPS dimensions shall not be allowed.
- a. Copper Housings: Ductile iron conforming to ASTM A-536, Grade 65-45-12, coated with copper colored alkyd

- enamel. Housing cast with offsetting, angle – pattern bolt pads to provide rigidity.
- b. Coupling Gasket: Synthetic rubber conforming to the grooved copper tube size outside diameter and coupling housing of elastomers having properties as designated in ASTM D-2000. Gasket material shall be selected based upon associated system's intended service.
- 4. Flange Adapters for Copper Tubing: 2 ½" NPS to 6" NPS (DN 75 – DN 150) for copper consisting of ASTM A-536, Grade 65-45-12, ductile iron housing coated with copper colored alkyd enamel. Flange adapters shall be manufactured for engaging directly into copper tubing sized roll grooved copper tube and fittings and bolting directly to ANSI Class 125 cast iron and Class 150 steel flanged components.
  - 5. Fittings: Fittings shall be manufactured to copper tubing sizes, with grooves designed to accept grooved end couplings of the same manufacturer. Fittings shall be wrought copper, conforming to ASTM B-75 alloy C12200 or ASTM B-152 copper alloy CDA 836 (85-5-5-5) per ANSI B16.18."
- F. Page 8, Paragraph 2.07-B. – Delete paragraph in its entirety and replace with the following:
- "B. Automatic Air Vents: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150 – psig (1035-kPa) working pressure; 240°F (116°C) operating temperature; with NPS ¼" (DN 8) discharge connection and ½" NPS (DN 15) inlet connection."
- G. Page 8, Paragraph 2.07-C. – Delete paragraph in its entirety.
- H. Page 10, Paragraph 3.01-D. – Insert the following at the end of the paragraph:
- "E. Geo Thermal Water Piping within the building, NPS 2 ½" (DN 65) and larger: Type L drawn-tempered copper tubing with groove coupling or flanged joints."
- I. Page 10, Paragraph 3.02-B – Delete paragraph in its entirety and replace with the following:
- "B. Install calibrated balancing valves in the return water lines of each terminal equipment connection, as indicated on drawings and elsewhere to facilitate system balancing. Calibrated balancing valves shall be used for balancing purposes only. A separate isolation service valve shall be provided for isolation and shutoff requirements."
- J. Page 11, Paragraph 3.03-E. – Delete paragraph in its entirety and replace with the following:

- "E. Reduce pipe sizes using eccentric reducer fittings installed to facilitate the draining of the system."
- K. Page 11, Paragraph 3.03-H. – Delete paragraph in its entirety and replace with the following:
- "H. Install all flanges or mechanical couplings for grooved piping on valves and equipment having 2 ½" NPS (DN 65) and larger connections."
- L. Page 11, Paragraph 3.03-I. – Delete paragraph in its entirety and replace with the following:
- "I. Do not leave piping open ended during construction. Provide temporary caps to protect flanges, threads, unions, grooves and internal surfaces of pipes."
- M. Page 11, Paragraph 3.03-J. – Delete paragraph in its entirety and replace with the following:
- "J. Install strainers on the supply side of each pump, pressure reducing valve, solenoid valve, pressure regulating valves, control valves and elsewhere as indicated on drawings. Install ¾" nipple and ball valve in the blowdown connection for strainers 2" and larger or as shown on drawings."
- N. Page 11, Paragraph 3.03-N. – Inset the following at the end of the paragraph:
- "M. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing.
- N. The gasket style and elastomeric material (grade) shall be verified as suitable for intended service as specified."
- O. Page 12, Paragraph 3.04-D.-3. – Delete paragraph in its entirety and replace with the following:
- "3. NPS 1 ½" (DN40): Maximum span, 7 feet (2.1 m); minimum rod size, 3/8 inch (10 mm)."
- P. Page 12, Paragraph 3.04-D.-6 – Inset the following at the end of the paragraph:
- "7. NPS 4" (DN100): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (10 mm).
8. NPS 6" (DN150): Maximum span, 12 feet (3.7 m); minimum rod size, 3/8 inch (10 mm)."
- Q. Page 13, Paragraph 3.04-E. – Delete paragraph and associated subparagraphs their entirety.
- R. Page 13, Paragraph 3.05-B. – Delete paragraph in its entirety and replace with the following:

- "B. All grooved components (couplings, valves, gaskets, bolts and nuts) shall be of the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components."
- N. Page 14, Paragraph 3.07-D. – Inset the following at the end of the paragraph:
- "E. Refer to drawings for all piping terminal equipment connections."

ITEM 20: 15182 – GEO THERMAL STANDING COLUMN WELLS.

- A. Page 4, Paragraph 1.04-F. - Delete the paragraph in its entirety.
- B. Page 5, Paragraph 1.05-C. - Delete paragraph in its entirety and replace with the following:
- "C. The Well Contractor shall, if required, assist the Construction Manager in the preparation of request for temporary DEP/EPA permit to allow discharge of drilling water to the existing storm drains. Discharge to sewer or sanitary systems shall not be allowed. The General Contractor shall be responsible for the disposal of drilling water and drill tailings."
- C. Page 6, Paragraph 1.07-A.-1. –Delete paragraph in its entirety and replace with the following:
- "1. Shall be made only after the first well is drilled and a mean static level is determined for all wells. Well pumps shall not be installed until after submittal is approved by the Engineer. Refer to Division 15, Section "Hydronic Pumps" for Coordination. Each standing column well shall be tested to determine a minimum drawdown static at 15 GPM."
- D. Page 14, WSHP Report – Insert the following at the end of the report form:
- "END OF SECTION 15182"

ITEM 21: 15184 – ELECTRIC HEAT TRACE.

- A. Page 1, Paragraph 1.01-B.-5. - Delete the paragraph in its entirety and replace with the following:
- "5. Division 15 Section "Pipe Insulation"."
- B. Page 2, Paragraph 1.04 – Insert the following at the end of the paragraph:
- "1.05 WARRANTY
- A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.

- B. Special Warranty: The Manufacturers shall submit a written warranty for their products agreeing to repair or replace components that fail in material or workmanship within the specified warranty period.
  - 1. Warranty Period: 1- year from the date of substantial completion."
- C. Page 3, Paragraph 3.01-C. – Delete the paragraph in its entirety and replace with the following:
  - "C. Apply piping markers to the outside of the thermal insulation's outer jacket indicating "CAUTION – ELECTRICALLY HEAT TRACED" as specified in Division 15 Section "Mechanical Identification"."

ITEM 22: 15185 – HYDRONIC PUMPS.

- A. Page 2, Paragraph 1.05-D. – Insert the following at the end of the paragraph:
  - "1.06 WARRANTY
  - A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.
  - B. Special Warranty: The Manufacturers shall submit a written warranty for their products agreeing to repair or replace components that fail in material or workmanship within the specified warranty period.
    - 1. Warranty Period: 1- year from the date of Substantial Completion."
- B. Page 5, Paragraph 3.03-D. – Delete paragraph and replace with the following:
  - "D. After alignment is correct, tighten bolts evenly, as recommended by manufacturer's written instructions. Do not over torque bolts."
- C. Page 6, Paragraph 3.06-A.-2. – Delete paragraph and replace with the following:
  - "2. Review data in maintenance manuals, refer to Division 1 Section : Closeout Procedures"."
- D. Page 6, Paragraph 3.06-A.-3. – Delete paragraph and replace with the following:
  - "3. Schedule at least 8 hours of training with the Owner's maintenance staff, through the Architect, with at least seven days' advanced notice."

ITEM 23: SECTION 15189 – HVAC WATER TREATMENT.

- A. Page 1, Paragraph 1.01-B.-21. - Insert the following at the end of the paragraph:
  - "22. Division 15 Section "Propeller Unit Heaters"."
- B. Page 4, Paragraph 1.07-A.-1. – Insert the following at the end of the paragraph:
  - "1.08 WARRANTY

- A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.
- B. Special Warranty: The Manufacturers shall submit a written warranty for their products agreeing to repair or replace components or equipment that fail in material or workmanship within the specified warranty period.
  - 1. Warranty Period: 1- year from the date of Substantial Completion."

ITEM 24: 15732 – ROOFTOP AIR CONDITIONERS.

- A. All Pages – Replace "ROOF TOP AIR CONDITIONERS" with "ROOF TOP AIR HANDLING UNITS" in all headers and footers.
- B. Page 2, Paragraph 1.03-C. – Insert the following at the end of the paragraph:
  - "1. Design Calculations: Calculate requirements for selecting vibration isolators, seismic restraints and for designing vibration isolation bases.
  - 2. Detail mounting and securing to roof dunnage. Indicate point weight locations and other loading requirements.
  - 3. Wiring Diagrams: Power, signal and control wiring."
- B. Page 2, Paragraph 1.03-D.-1. – Delete paragraph in its entirety.
- C. Page 2, Paragraph 1.03-D.-2. – Delete paragraph in its entirety.
- D. Page 2, Paragraph 1.03-D.-3. – Delete paragraph in its entirety.
- E. Page 4, Paragraph 1.08 – Delete paragraph and all associated subparagraphs in their entirety and replace with the following:

"1.08 WARRANTY

  - A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.
  - B. Special Warranty: The Manufacturers shall submit a written warranty for their products agreeing to repair or replace components or equipment that fail in material or workmanship within the specified warranty period.
    - 1. Warranty Period: 1- year from the date of Start Up or 18 months from date of delivery, whichever occurs first.

2. The warranty shall not include parts associated with routine maintenance such as belts, air filters, etc..."
- F. Page 6, Paragraph 2.-03-C.-6.-b. – Delete paragraph and replace with the following:  
"b. Insulation shall be 3.0 pounds per cubic foot in density."
- G. Page 8, Paragraph 2.07-D. – Insert the following at the end of the paragraph:  
"E. The control programming for the VFD shall have native BacNet Protocols."
- H. Page 13, Paragraph 2.13-A.-4. – Insert the following at the end of the paragraph:  
"2.14 CONTROLS  
B. The controls for the rooftop air handling units shall be supplied by the Controls Contractor under the automatic temperature controls Division 15, Section " Control System Equipment and installed by the rooftop air handling manufacturer. The Control Contractor shall, in addition to sending the controls to the rooftop air handling manufacturer, provide technical data sheets for all components to be installed, including dimension data, mounting hardware, and method, as well as application specific wiring and piping diagrams as depicted on drawings."
- I. Page 15, Paragraph 3.05-A. – Delete paragraph and all associated subparagraphs in their entirety and replace with the following:  
"A. Engage a factory – authorized service representative to train the Owner's maintenance personnel to adjust, operate and maintain fans.  
1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.  
2. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Closeout Procedures".  
3. Schedule at least sixteen hours of training with the Owner, through the Architect, with a t least seven days' advanced notice."

ITEM 25: 15745 – GEOTHERMAL HEAT PUMPS.

- A. Page 5, Paragraph 2.02-B. – Delete paragraph and replace with:  
"B. General: Factory built unit able to operate with an entering source water temperature range from 20°F to 110°F (-6.6° to 43.3°C) as standard. All equipment shall be rated in accordance with ARI/ISO/ASHRAE. The unit shall have an ETL Safety Listing Label. All units shall be factory run tested. The factory testing reports shall be shipped with each unit stating performance in both heating and cooling modes. Factory reports shall be included within the operation and maintenance manuals as



specified in Division 1, Section "Closeout Procedures". Units tested without water are not acceptable."

ITEM 26: SECTION 15761 – DUCT MOUNTED AIR COILS.

- A. Page 1, Paragraph 1.02-D. - Delete the paragraph in its entirety and replace with the following:

"D. Coordination Drawings: Show Duct Mounted Air Coils with all associated appurtenances and all clearances required for operation, maintenance, and service as part of the coordination drawing process. Refer to Division 15 Section "Basic Mechanical Material and Methods" for all additional requirements."

- B. Page 2, Paragraph 1.03-A.-1. - Insert the following at the end of the paragraph:

"1.04 WARRANTY

A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.

B. Special Warranty: The Manufacturers shall submit a written warranty for their coils agreeing to repair or replace components or equipment that fail in material or workmanship within the specified warranty period.

1. Warranty Period: 1- year from the date of Substantial Completion."

ITEM 27: SECTION 15764 – RADIATORS.

- A. Page 1, Paragraph 1.02-D. - Delete the paragraph in its entirety and replace with the following:

"D. Samples for Initial Selection: Manufacturer's custom color charts showing the full range of colors available for the units with factory-applied finished."

- B. Page 1, Paragraph 1.02-E. - Delete the paragraph in its entirety and replace with the following:

"E. Maintenance Data: For radiators and radiant panels to be included in the operation and maintenance manuals specified in Division 1, Section "Closeout Procedures".

- C. Page 1, Paragraph 1.02-F. - Delete the paragraph in its entirety and replace with the following:

"F. Coordination Drawings: Show radiation, indicating element lengths, locations, enclosure lengths, enclosure fittings, location of valving and trim, location of access door for enclosures; and show radiant panels, indicating lengths, location of valving and trim as part of the coordination drawing process. Refer to Division 15 Section "Basic Mechanical Materials and Methods for all additional requirements."

"1.03 WARRANTY

- A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.
- B. Special Warranty: The Manufacturers shall submit a written warranty for their products agreeing to repair or replace components or equipment that fail in material or workmanship within the specified warranty period.
  - 1. Warranty Period: 1- year from the date of Substantial Completion."
- D. Page 2, Paragraph 2.01-A.-1.-b. - Delete the paragraph in its entirety and replace with the following:

"b. Runtal Radiators."
- E. Page 2, Paragraph 2.01-A.-1.-d. - Delete the paragraph in its entirety and replace with the following:

"d. The Sterling Heating Equipment Company."
- F. Page 4, Paragraph 3.03-A. - Insert the following at the end of the paragraph:
  - "B. Clean and straighten fins for fin tube radiators.
  - C. Apply manufacturer's touch up paint to finished surface that have been damaged during construction in accordance with the manufacture's written instructions."

ITEM 28: SECTION 15766 – CABINET UNIT HEATERS.

- A. Page 1, Paragraph 1.01-B.-12. - Insert the following at the end of the paragraph:

"13. Division 15 Section "Propeller Unit Heaters"."
- B. Page 1, Paragraph 1.02-E. - Delete the paragraph in its entirety and replace with the following:
  - "E. Coordination Drawings: Show Cabinet Unit Heater, associated appurtenances and all required clearances for operation, maintenance, and service as part of the coordination drawing process. Refer to

Division 15 Section "Basic Mechanical Materials and Methods" for all additional requirements."

- C. Page 3, Paragraph 1.05-F. - Insert the following at the end of the paragraph:  
"1.06 WARRANTY
- A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.
  - B. Special Warranty: The Manufacturers shall submit a written warranty for their products agreeing to repair or replace components or equipment that fail in material or workmanship within the specified warranty period.
    - 1. Warranty Period: 1- year from the date of Substantial Completion."
- D. Page 5, Paragraph 2.08-A. - Delete the paragraph in its entirety and replace with the following:  
"A. Control Devices: Unit-mounted fan-speed switch, wall mounted thermostat and control valve provided by the Controls Contractor."
- E. Page 6, Paragraph 3.05-C. - Insert the following at the end of the paragraph:  
"D. Clean and straighten fins for heating coils.  
E. Apply manufacturer's touch up paint to finished surface that have been damaged during construction in accordance with the manufacture's Written instructions."
- F. Page 6, Paragraph 3.06-A.-1. - Delete the paragraph in its entirety and replace with the following:  
"1. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Closeout Procedures"."
- G. Page 6, Paragraph 3.06-A.-2. - Delete the paragraph in its entirety and replace with the following:  
"2. Schedule at least four hours of training with the Owner, through the Architect, with a t least seven days' advanced notice."

ITEM 29: SECTION 15767 - PROPELLER UNIT HEATERS.

- A. Insert "Section 15767 – Propeller Unit Heaters", attached at the end of this Addendum.

ITEM 30: SECTION 15815 - METAL DUCTS.

- A. Page 1, Paragraph 1.01-B.-16. - Insert the following at the end of the paragraph:
- “17. Division 15 Section “Cabinet Unit Heaters”.”
- B. Page 3, Paragraph 1.04-B. - Delete the paragraph in its entirety and replace with the following:
- “E. Lined ductwork shall have all open ends sealed during delivery and storage periods.”
- C. Page 8, Paragraph 2.08-E.3. - Insert the following at the end of the paragraph:
- “2.09 DOUBLE WALL DUCT AND FITTING FABRICATION
- A. Manufacturers:
1. Linlab, Inc.
  2. McGill AirFlow Corporation.
  3. SEMCO Incorporated.
- B. Ducts: Fabricate insulated double wall ducts with an outer shell an inner duct. Dimensions indicated on drawings are for inner dimensions.
1. Outer Shell: Base metal thickness on outer-shell dimensions. Fabricate outer-shell lengths 2 inches (50mm) longer than the inner duct and insulation and in metal thickness specified for the single-wall duct.
  2. Insulation: 1 inch (25 mm) thick fibrous glass, unless otherwise indicated. Terminate insulation where double-wall duct connects to single-wall duct or uninsulated components, and reduce outer shell diameter to inner duct dimensions.
    - a. Thermal Conductivity (k-Value): 0.26 at 75°F mean temperature.
  3. Solid Inner Ducts: Use the metal thickness and seam construction in accordance the required pressure classification indicated on the drawings and the latest edition of SMACNA “HVAC Duct Construction Standards – Metal and Flexible
  4. Maintain concentricity of inner duct to out shell by mechanical means. To prevent dislocation of insulation by mechanical means.
- C. Fittings: Fabricate insulated double fittings with an outer shell and inner duct.
1. Solid Inner ducts: Use the following sheet metal thicknesses:

- a. Ducts 3 to 34 inches in Equivalent Diameter: 0.028 inches.
- b. Ducts 35 to 58 inches in Equivalent Diameter: 0.034 inches.
- c. Duct 60 to 88 inches in Equivalent Diameter: 0.040 inches.

ITEM 31: SECTION 15820 - DUCT ACCESSORIES.

- A. Page 1, Paragraph 1.01-B.-8. - Delete paragraph and replace with the following:

"8. Division 15 Section "Hangers and Supports""

- B. Page 3, Paragraph 1.05-C. - Insert the following at the end of the paragraph:

"1.06 WARRANTY

A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.

B. Special Warranty: The Manufacturers (for fire dampers, smoke dampers, control dampers , motorized outside air control dampers, and duct silencers) shall submit a written warranty for their products agreeing to repair or replace components or equipment that fail in material or workmanship within the specified warranty period.

- 1. Warranty Period: 1- year from the date of Substantial Completion."

ITEM 32: SECTION 15838 - FANS.

- D. Page 2, Paragraph 1.03-A. - Delete paragraph and replace with the following:

"A. General: Submit the each item in this article according to the Conditions of the Contract and Division 1 Section "Submittal Procedures"."

- E. Page 3, Paragraph 1.08-A. - Delete paragraph and replace with the following:

"A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with other warranties made by the Conditions of the Contract.

- B. Special Warranty: The Manufacturers (for fire dampers, smoke dampers, control dampers , motorized outside air control dampers, and duct silencers) shall submit a written warranty for their products agreeing to repair or replace components or equipment that fail in material or workmanship within the specified warranty period.

1. Warranty Period: 1- year from the date of Purchase."

ITEM 33: SECTION 15975 - CONTROL SYSTEM EQUIPMENT.

- A. Page 2, Paragraph 1.02-D-2. - Delete paragraph and all associated subparagraphs in their entirety.
- B. Page 2, Paragraph 1.02-D.- 3. - Delete paragraph and all associated subparagraphs in their entirety.
- C. Page 3, Paragraph 1.02-D.-4. - Delete paragraph and all associated subparagraphs in their entirety.
- D. Page 3, Paragraph 1.02-E.-3. - Delete paragraph and all associated subparagraphs in their entirety and replace with the following:  
"3. Division 15 Section "Electrical Requirements for HVAC Work"  
a. VFD's."
- E. Page3, Paragraph 1.02-E.-4.-b. - Delete paragraph in its entirety.
- F. Page 3, Paragraph 1.02-E.-5. - Delete paragraph and all associated subparagraphs in their entirety and replace with the following:  
"5. Division 15 Section "Propeller Unit Heaters"  
a. Fan Speed Control."
- G. Page 3, Paragraph 1.02-E.-6.-b. - Insert the following at the end of the paragraph:  
"6. Division 15 Section "Duct Accessories"  
a. Automatic Control Dampers.
- F. Products provided under this section but installed by others  
1. Electric Meters for HVAC Systems.  
2. Control Valves  
3. Air Terminal Controls  
4. Rooftop Air Handling Unit Controls.
- H. Page 8, Paragraph 2.02-A.-3. - Delete paragraph in its entirety and replace with the following:  
"3. Andover Controls Company

4. Alterton Controls."

- I. Page 13, Paragraph 2.05-D.-2. – Delete paragraph in its entirety and replace with the following:
  - "2. System Graphics. The operator workstation software shall be a graphical user interface (GUI). The interface displays, nomenclature and symbols shall not be part of this contract and the University of Southern Maine shall contract this part of the graphic systems under a separate contract.
- J. Page 13, Paragraph 2.04-D.-3. – Delete paragraph in its entirety.
- K. Page 13, Paragraph 2.04-D.-4. – Delete paragraph in its entirety.

ITEM 34: SECTION 15995 - COMMISSIONING OF HVAC SYSTEMS.

Delete this Section in its entirety.

ITEM 35. SECTION 16510 – INTERIOR LIGHTING

- A. Replace pages 9 through 11 with the attached pages. Revisions are noted with vertical lines in the right margin.

ATTACHMENTS:

STAGE 4 COMMISSIONING:

6 PAGES, 8-1/2 x 11.

SECTION 01320 – COMMISSIONING REQUIREMENTS:

14 PAGES, 8-1/2 x 11.

SECTION 01511 – TEMPORARY DEHUMIDIFICATION, HEATING AND COOLING:

12 PAGES, 8-1/2 x 11.

SECTION 15767 – PROPELLER UNIT HEATERS:

4 PAGES, 8-1/2 x 11.

SECTION 16510 – INTERIOR LIGHTING:

PAGES 9, 10 AND 11, 8-1/2 x 11.

REISSUED SHEETS:

- A. 71 Sheets; 30 x 42.

1. C-LS102

2. C-A101; C-A102; C-A103; C-A104; C-A105
3. C-A201; C-A202; C-A203; C-A204
4. C-A301; C-A303; C-A305; C-A306; C-A307
5. C-A403; C-A404; C-A405; C-A406; C-A407; C-A408; C-A410; C-A414
6. C-A501; C-A502
7. C-A610; C-A612; C-A613; C-A614; C-A617
8. C-A703; C-A704; C-A706
9. C-A802; C-A803; C-A804
10. C-A902; C-A904
11. C-F001; C-F101; C-F102; C-F104
12. C-H001
13. C-H101; C-H102; C-H103; C-H104
14. C-H201; C-H202; C-H203
15. C-H401; C-H402; C-H403; C-H404
16. C-H501; C-H502; C-H503; C-H504; C-H505
17. C-H601; C-H602
18. C-E002; C-E003
19. C-E102; C-E103
20. C-E201; C-E202; C-E203
21. C-E400
22. C-E500; C-E501.

NEW SHEETS:

- A. 4 Sheets; 30 x 42.
1. C-A415
  2. C-A707; C-A708
  3. C-A905

SKETCHES:

3 Sheets; 8-1/2 x 11, Dated 1-30-04: SKS-1; SKS-2; SKS-3.

END OF ADDENDUM #4





# Master Equipment and Systems List

## Stage 4 Commissioning

Project: USM - Community Education Center  
SMRT Project #: 03155-00  
Field Commissioning Agent: Ted Hollidge, PE

**ISSUED FOR GMP**

The following is intended to serve as a tracking mechanism for the status of the work. The work is as defined by the Contract Documents. Not all work defined by the Contract Documents is necessarily covered herein.

### Air Handling Systems

No.	Identifier	Description / Service	Location	Verifications					Issue Key <sup>1</sup>
				Pre-Functional Test / Start-up	Controls / TAB	Functional Testing	O & M Manuals	Owner Training	
A-01	AHU-1	Office and Lobby (includes Heat Recovery)	Roof						
A-02	AHU-2	Lecture Hall (includes Heat Recovery)	Roof						
A-03		Displacement Ventilation System	Lecture Hall						
A-04	VAV 1-1	Break out Room 110	Open Office 111						
A-05	VAV 1-2	North end of Open Office 111	Open Office 111						
A-06	VAV 1-3	South end of Open Office 111	Director FOB 111A						
A-07	VAV 1-4	Reception & Rooms 111K & 111J	Open Office 111						
A-08	VAV 1-5	Lobby 102	Open Office 111						
A-09	VAV 1-6	Lobby 102	Open Office 111						
A-10	VAV 1-7	Womens 106 & Mens 107	Open Office 111						
A-11	VAV 1-8	Lobby 102	Lobby 102						
A-12	VAV 1-9	Lobby 102	Open Office 111						
A-13	VAV 1-10	Break out Room 109	Open Office 111						
A-14	VAV 1-11	Director FOB 111A	Break out Room 109						
			Director FOB 111A						

<sup>1</sup> Outstanding Issues and Comments are listed and described at the end of this document.

**Air Handling Systems**

No.	Identifier	Description / Service	Location	Verifications					Issues
				Pre-Functional Test / Start-up	Controls Checkout / TAB	Functional Testing	O & M Manuals	Owner Training	
A-15	VAV 1-12	FOB Client Meeting 111B	FOB Client Mtg 111B						
A-16	VAV 1-13	111C, D, F, G	Office Suite 111						
A-17	VAV 1-14	Conference Room 111E	Office Suite 111						
A-18	VAV 1-15	111H, Office Suite 111	Office Suite 111						
A-19	VAV 2-1	Break out Lounge 202	Womens Room 106						
A-20	VAV 2-2	Gallery 221	Gallery 221						
A-21	VAV 2-3	Break out Lounge 202	Gallery 221						
A-22	VAV 2-4	Break out Lounge 202	Break out Room 212						
A-23	VAV 2-5	Break out Room 212	Break out Room 213						
A-24	VAV 2-6	Break out Room 213	Break out Room 213						
A-25	VAV 2-7	Break out Room 214	Break out Room 214						
A-26	VAV 2-8	Corr. 201, Comp. Classroom 218	Corridor 201						
A-27	VAV 2-9	Break out Room 215	Break out Room 215						
A-28	VAV 2-10	Break out Room 216	Corr. 220, Conf. Rm 217						
A-29	VAV 2-11	Break out Room 216	Break out Room 216						
A-30	VAV B-1	Basement Storage 001	Basement Storage 001						
A-31	VAV B-2	Basement Storage 001	Basement Storage 001						
A-32	VAV B-3	Elec. Room 003 & Tel/Data Room 004	Basement Storage 001						
A-33	FPTU 2-1	Womens 208 & Mens 209	Basement Storage 001						
A-34	SEF-1	Smoke Exhaust Fan	Mens 209						
A-35	SD	Smoke Exhaust Plenum Dampers	Roof						
A-36		Ductwork Systems	Basement throughout						

**Geothermal Systems**

No.	Identifier	Description / Service	Location	Verifications					Issues
				Pre-Functional Test / Start-up	Controls Checkout / TAB	Functional Testing	O & M Manuals	Owner Training	
G-1	P GW-1	Ground Water Pump	Site / Well						
G-2	P GW-2	Ground Water Pump	Site / Well						
G-3	P GW-3	Ground Water Pump	Site / Well						
G-4	P GW-4	Ground Water Pump	Site / Well						
G-5	P GW-5	Ground Water Pump	Site / Well						
G-6	GTHP-1	Geothermal (Water Source) Heat Pump	Basement						
G-7	GTHP-2	Geothermal (Water Source) Heat Pump	Basement						
G-8	GTHP-3	Geothermal (Water Source) Heat Pump	Basement						
G-9	GTHP-4	Geothermal (Water Source) Heat Pump	Basement						
G-10	GTHP-5	Geothermal (Water Source) Heat Pump	Basement						
G-11	P HW-1	Primary Heating Water Pump	Basement						
G-12	P HW-2	Primary Heating Water Pump	Basement						
G-13	P HW-3	Primary Heating Water Pump	Basement						
G-14	P HW-4	Secondary Heating Water Pump	Basement						
G-15	P HW-5	Secondary Heating Water Pump	Basement						
G-16	P CH-1	Primary Chilled Water Pump	Basement						
G-17	P CH-2	Primary Chilled Water Pump	Basement						
G-18	P CH-3	Primary Chilled Water Pump	Basement						
G-19	P CH-4	Secondary Chilled Water Pump	Basement						
G-20	P CH-5	Secondary Chilled Water Pump	Basement						
G-21	ST-1	Heating Water Storage Tank	Basement						
G-22	ST-2	Chilled Water Storage Tank	Basement						
G-23	AT-1	Geothermal Water Air Separator	Basement						

## Geothermal Systems

[illegible]

## Gray Water System

[illegible]

### Outstanding Issues & Comments

[illegible]

## **SECTION 01320 - COMMISSIONING REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. This Section specifies project commissioning requirements. Commissioning efforts are intended to serve as the link between design intent and the final delivered building product. Commissioning efforts are also intended to meet project LEED requirements.
- B. Systems being commissioned include the following:
  - 1. Two air handling units, the displacement ventilation system associated with one of the units, and 30 VAV boxes associated with the other unit.
  - 2. Desiccant heat recovery system for the air handling units.
  - 3. Building Automation System.
  - 4. Geothermal System.
  - 5. Storm Water reclaim / gray water system.
  - 6. Emergency generator transfer switches.
  - 7. Atrium smoke control system.
- C. Refer to the attached Stage 4 Master List for a comprehensive breakdown of these systems.

#### **1.02 RELATED REQUIREMENTS**

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to;
  - 1. Section 01010, "Summary of Work."
  - 2. Section 01290, "Payment Procedures."
  - 3. Section 01310, "Project Management and Coordination."
  - 4. Section 01330, "Submittal Procedures."
  - 5. Section 01352, "Leed Requirements."
  - 6. Section 01400, "Quality Requirements."
  - 7. Section 01770, "Closeout Procedures."
  - 8. Section 02665, "Water System Distribution" for site gray water piping systems.
  - 9. Section 02710, "Sewers and Drains" for site storm water piping systems associated with the gray water system.
  - 10. Division 15 Sections for mechanical systems and equipment being commissioned.
  - 11. Division 16 Sections for electrical systems, equipment, and connections to mechanical and gray water systems being commissioned.

#### **1.03 COMMISSIONING TEAM**

- A. General: The Commissioning Team shall consist of the following parties.
  - 1. Owner, (USM): University of Southern Maine.

2. Architect / Engineer, (AE): Einhorn Yaffee Prescott Architecture & Engineering, PC.
3. Commissioning Authority, (CA): SMRT, Inc.
  - a. The CA Contract is a separately held USM Contract.
4. Construction Manager, (CM).
5. Mechanical Sub-Contractor, (MS).
  - a. If the Mechanical Sub-Contract is divided between HVAC and Plumbing trades, then the MS requirements described herein apply to both Contractors.
6. Controls Vendor, (CV).
7. Electrical Sub-Contractor, (ES).
8. Testing, Adjusting and Balancing Contractor, (TAB).
  - a. The TAB Contract is a separately held USM Contract.

#### **1.04 QUALITY ASSURANCE**

- A. Commissioning efforts shall comply with the US Green Building Council LEED Energy and Atmosphere Prerequisite 1 and Credit 3 – Additional Commissioning.
- B. Commissioning efforts will adhere to the Building Commissioning Association, (BCA) Essential Attributes and Valuable Elements.

#### **1.05 SCHEDULE OF VALUES**

- A. General: Payment for Commissioning related activities shall be as per the requirements of Section 01290, "Payment Procedures."
- B. Schedule of Values: The following minimum amounts shall be carried in the Section 01290 Schedule of Values, for Commissioning activities.
  1. General: The following values are not intended to reflect the actual costs of the work to the construction team. The CM and associated trades shall bear the responsibility of capturing Commissioning related project scope in their respective bids. However, the following are minimum acceptable values to be carried in the Schedule of Values.
  2. Stage 3 Activities: \$10,000.
  3. Stage 4 Activities: \$10,000.
  4. Stage 5 Activities: \$10,000.

#### **1.06 ROLES, RESPONSIBILITIES AND LINES OF COMMUNICATION**

- A. General: The following roles and responsibilities are assigned to each member of the Commissioning Team. Refer to Part 3 for additional requirements.
- B. Owner, (USM):
  1. USM holds the prime contracts for services that include; design, construction, commissioning and TAB.



2. The base construction project TAB contract will not cover Stage 5 work. As such, USM will secure additional TAB services as required to support Stage 5 Retro-Commissioning efforts.
  3. It will be the responsibility of USM to route correspondence generated by the CA to the various parties and visa versa.
  4. USM holds the responsibility of authorizing / not authorizing the AE and CM to make document and construction modifications based on CA correspondence.
- C. Architect / Engineer, (AE):
1. The AE will be responsible for tracking and compiling LEED documentation. The CA will provide the commissioning portions of this documentation to USM in support of this effort.
  2. The AE will respond to CA generated Stage 2 Design Review comments. The AE will keep a record log of these Design Reviews and will periodically issue this log to USM such that the status of these reviews can be tracked.
  3. The AE will provide a Basis of Design narrative integral to the Construction Document set for systems being commissioned, per LEED requirements.
  4. The AE will conduct a review of the TAB report against design requirements.
  5. The AE will direct all commissioning and TAB related correspondence to USM.
  6. The AE shall courtesy copy the CA on commissioning and TAB related correspondence.
- D. Commissioning Authority, (CA):
1. The CA shall be an independent advocate for the Owner and shall have the lead responsibility for the commissioning process.
  2. The CA is contracted directly to USM and will direct all correspondence to USM.
  3. The CA will courtesy copy correspondence to the AE and CM as applicable.
  4. The CA will lead commissioning related meetings and will keep minutes of these meetings.
  5. The CA will administer the USM held TAB Contract, including a redundant review of the TAB report against design requirements. The CA will courtesy copy the TAB on related correspondence.
  6. The CA will generate the LEED documentation associated with commissioning efforts and provide this information to USM.
- E. Construction Manager, (CM):
1. The CM shall include the cost of commissioning efforts in their contract price.
  2. The CM will provide timely responses to CA generated Stage 3 Construction Oversight. The CM will keep a record log of these Construction Oversights and will periodically issue this log to USM such that the status of these reviews can be tracked.
  3. The CM will provide timely responses to Stage 4 Verification and Closeout issues.
  4. The CM will expedite actions required by Stage 5 Retro-Commissioning efforts.
  5. The CM will make project shop drawings, RFI's, addenda, bulletins, drawing revisions and similar documentation available to the CA at the field construction office. The CM will provide hard copies of select documents as well, (if extended off-site review becomes necessary).
  6. In support of CA Stage 4 Verification and Closeout efforts, the CM will create and maintain an Integrated Deliverables and Testing, (IDAT) Plan. This plan will include proposed dates for project close-out activities. This schedule will also give advanced

notice to USM and the CA such that they may witness these actions, (see Stage 1 Commissioning Specification below for clarification).

7. The CM will expedite actions required by Stage 5 Retro-Commissioning efforts.
8. The CM will direct all commissioning related correspondence to USM.
9. The CM will courtesy copy the CA on commissioning related correspondence.

F. Mechanical Sub-Contractor, (MS):

1. The MS shall include the cost of commissioning efforts in their contract price.
2. The MS will direct all commissioning related correspondence to the CM.
3. The MS will coordinate efforts with USM's TAB contractor. .
4. The MS will insure that the O&M and training requirements of this project are included in each equipment purchase order or service sub-contract. The MS is responsible for compiling and presenting this data in a form consistent with the requirements of this project.
5. The MS will provide timely responses to Stage 3 Construction Oversight comments.
6. The MS will provide timely responses to Stage 4 Verification and Closeout issues.
7. The MS will expedite actions required by Stage 5 Retro-Commissioning efforts.

G. Controls Vendor, (CV):

1. The CV shall include the cost of commissioning efforts in their contract price.
2. The CV will be a sub-contract to the MS. As such, the CV will direct all commissioning related correspondence to the MS.
3. The CV will coordinate efforts with the MS, ES, CA and TAB.
4. The CV will develop a written step-by-step Controls Check-out Plan which describes the process they intend to follow in checking out the facility control system. The CV will present a draft of this plan to the Commissioning Team for review and comment prior to formal issuance.
5. The CV will insure that the O&M and training requirements of this project are included in each equipment purchase order or service sub-contract. The CV is responsible for compiling and presenting this data in a form consistent with the requirements of this project.
6. The CV will verify performance and adherence to sequences of operation for equipment and systems being commissioned in the presence of, and participating with the CA.
7. The CV will provide timely responses to Stage 3 Construction Oversight comments.
8. The CV will provide timely responses to Stage 4 Verification and Closeout issues.
9. The CV will expedite actions required by Stage 5 Retro-Commissioning efforts.

H. Electrical Sub-Contractor, (ES):

1. The ES shall include the cost of commissioning efforts in their contract price.
2. The ES will direct all commissioning related correspondence to the CM.
3. The ES will insure that the O&M and training requirements of this project are included in each equipment purchase order or service sub-contract. The ES is responsible for compiling and presenting this data in a form consistent with the requirements of this project
4. The ES will provide timely responses to Stage 3 Construction Oversight comments.
5. The ES will provide timely responses to Stage 4 Verification and Closeout issues.
6. The ES will expedite actions required by Stage 5 Retro-Commissioning efforts.

- I. Testing, Adjusting and Balancing Contractor, (TAB):
  1. The TAB is contracted directly to USM and will direct all correspondence to USM. The TAB will also courtesy copy the CA on all correspondence as the CA will be administering USM's TAB contract.
  2. The TAB will coordinate efforts with the MS, CV and CA, as directed by the CA.
  3. Upon completion of the TAB work, the TAB will demonstrate performance of equipment and systems to USM and the CA.
  4. The TAB will repeat any measurement contained in the TAB report, where required by USM or the CA for verification purposes.
  5. The TAB will provide timely responses to Stage 4 Verification and Closeout issues.

#### **1.07 INTEGRATED TESTING AND DELIVERABLES (IDAT) PLAN**

- A. General: The IDAT plan and associated schedule is the master document that describes the results of the monitoring, documentation and scheduling process for ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. The process of IDAT during the construction of this project is intended to achieve the following specific objectives, according to the Contract Documents:
  1. Ensure that applicable equipment and systems are installed as specified and receive adequate Pre-functional and Functional operational checkout by installing contractors.
  2. Verify and document proper performance of equipment and systems.
  3. Ensure that O&M documentation left on site is complete.
  4. Ensure that the Owner's operating personnel are adequately trained.
- B. It is the responsibility of the CM to facilitate and execute the IDAT process. The various requirements for the equipment and systems being commissioned are located in their respective Specification Sections.
  1. Administrative processes and services will be directed, coordinated and provided by the CM.
  2. Submittals, testing and training will be coordinated and verified by the CM. USM, AE and CA will back check and verify these as well.
  3. The CM shall ensure that Subs perform their responsibilities and shall integrate IDAT into the construction processes and schedules.
- C. Refer to Part 3 Article, "Execution of the IDAT Process."

#### **1.08 OPERATING AND MAINTENANCE DATA**

- A. General: The following submittals shall be made for systems and equipment being commissioned, as defined by the Stage 4 Master List.
- B. Checklists: Submittals shall include pre-functional checklists and functional testing checklists. These lists shall be used in subsequent Stage 4 close-out activities. Where ever possible, checklists shall be as provided by the original equipment manufacturers.
  1. Submit drafts of these checklists at the time of initial product data submittal.

2. Schedule close-out activities via the IDAT process. Fill out these checklists as part of close-out activities. The CA shall verify these activities.
  3. Completed checklists shall be made part of the O&M Manuals.
- C. Re-Commissioning Data: Submittals shall include original manufacturer's preventative maintenance data.
1. Submit this data at the time of initial product data submittal.
  2. Include this data in a separately bound volume, as part of the O&M Manuals. The CA will use this as a basis for Stage 5 Retro-Commissioning efforts.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 COMMISSIONING APPROACH**

- A. General: The CA will employ a staged approach to the Commissioning process;
1. Stage 1 – Programming.
  2. Stage 2 – Design Review.
  3. Stage 3 – Construction Oversight.
  4. Stage 4 – Verification and Closeout.
  5. Stage 5 – Retro-Commissioning.
- B. At the time of bidding, Stage 1 and 2 efforts are essentially complete. If design related issues come to light at any point after the completion of Construction Documents the CA will issue Stage 2 Design Review memorandums to USM for consideration by the AE.

### **3.02 EXECUTION OF THE IDAT PROCESS**

- A. General: The following sequential priorities shall be followed:
1. Equipment shall not be "temporarily" started (for heating or cooling), until pre-start checklist items and all manufacturers' pre-start procedures are completed and moisture, dust and other environmental and building integrity issues have been addressed.
  2. Functional testing shall not begin until pre-functional and start-up and is completed, for a given system (this does not preclude a phased approach).
  3. The controls system and equipment it controls shall not be functionally tested until all points have been calibrated and pre-functional testing completed.
  4. TAB shall not be performed until the controls system has been fully tested functionally and approved.
  5. TAB shall not be performed until the envelope is completely enclosed and ceiling complete, unless the returns are ducted.
- B. IDAT Scoping Meeting, (Part of the Stage 3 Kick-off Meeting):
1. As part of the Stage 3 Kick-off Meeting, the CM shall conduct an initial IDAT scope definition and informational session.

2. The agenda of the session shall include; review of document flow, how much and when submittal data will be received, approved, etc. Other highlights shall include:
  - a. The overall IDAT process.
  - b. Process questions are addressed.
  - c. Lines of reporting and communications are reviewed.
  - d. The work products list is discussed.
  - e. General list of each party's responsibilities, (i.e. who is responsible to develop the startup plan for each piece of equipment).
  - f. The proposed IDAT schedule.
3. The goal of the meeting is to increase understanding by all parties of the IDAT process and their respective responsibilities. The meeting should provide the CM additional information needed to finalize the IDAT Plan, including the IDAT schedule.

C. IDAT Plan:

1. The CM shall finalize the draft IDAT using the information gathered from the scoping session. An initial IDAT schedule shall also be developed. The plan's content and status updates shall be fine-tuned as construction progresses. In particular, the CM shall work with the Subs to develop a detailed schedule for project closeout requirements for each piece of equipment and system in advance of the Stage 4 Kick-off Meeting. The CM will present a draft of these detailed schedules to the Commissioning Team at the Stage 4 Kick-off Meeting.
2. IDAT Plan Contents: At a minimum, the IDAT Plan shall consist of the following:
  - a. Identification of each piece of equipment. This list shall be consistent with the list contained in the CA Stage 4 Master List.
  - b. Identification of the parties responsible for developing and implementing close-out plans for each system and piece of equipment.
  - c. Schedules which identify project closeout milestones for each system and piece of equipment, (start and end dates identified):
    - 1) Pre-Functional Checklists, Testing and Start-up.
    - 2) Controls Checkout and TAB.
    - 3) Functional Testing.
    - 4) O&M Manuals.
    - 5) Owner Training.

D. Submittals:

1. The CM shall coordinate IDAT documentation requirements with Subs and responsible parties for their respective equipment and systems. This data request shall coincide with the normal AE submittal process. At minimum and in support of the IDAT process, submittal data shall include the following:
  - a. Installation, pre-functional and start-up procedures and checklists.
  - b. Performance data and control drawings.
  - c. Functional testing procedures and checklists.
  - d. O&M Data, including preventative maintenance data for inclusion in the CA's Stage 5 Re-Commissioning Maintenance Manual.
2. The CM shall review and approve submissions relative to IDAT issues expressed in the contract documents, not for general contract compliance, (which is the AE's responsibility) unless specifically directed by USM to do so.

E. Stage 4 IDAT Requirements:

1. Pre-Functional Checklists, Testing and Start-up:
  - a. Pre-functional checklists are important to ensure that the equipment and systems are hooked up and operational and that functional performance testing may proceed without unnecessary delays.
  - b. Each piece of equipment shall receive full pre-functional checkout by the Contractors, (no sampling strategies are to be used). In general, the pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.
  - c. Pre functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation, (e.g., oil levels OK, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system, (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word "pre-functional" refers to "before" functional testing.
  - d. Pre-Functional checklist shall be as per the respective Specification Sections for systems and equipment being commissioned.
  - e. Pre-Functional checklist and documentation shall be made part of O&M Manuals per the requirements of Section 01770, "Closeout Procedures."
2. Controls Checkout Plan and TAB:
  - a. The CV shall develop and submit a written step-by-step draft Controls Checkout Plan for review by USM, the CM, AE and CA. The plan shall describe the process they intend to follow in checking out the control system and the forms on which they will document the process. The CV shall submit this to the Commissioning Team in advance of the Stage 4 Kick-off Meeting. The CV shall also present this draft plan and shall meet with USM's TAB as part of the meeting, (prior to the start of TAB) to review the TAB plan to determine the capabilities of the control system for use in TAB.
  - b. Upon receipt of input at and subsequent to the meeting, the CV shall issue a final Controls Checkout Plan.
  - c. The CV will provide the TAB with any necessary unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.). The CV shall also provide a technician qualified to operate the controls to assist the TAB in performing TAB.
  - d. All CM-required controls pre-functional checklists, calibrations, start-up and selected functional tests of the system shall be completed and approved prior to TAB.
3. Development of Functional Testing Procedures:
  - a. Overview: Functional testing is the dynamic testing of systems, (rather than just components) under full operation, (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure set point). Systems shall be tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems shall be run through all of the control system's sequences of operation and components shall be verified to be responding as the sequences state. The CM shall ensure that the functional test procedures are in sequential written form,

- coordinate, oversee and document the actual testing, (which is usually performed by the installing contractor or vendor).
- b. Scope of Testing: Testing requirements are defined in each respective equipment and system Specification Section.
4. Execution of Functional Testing Procedures:
- a. Overview and Process: The CM shall schedule functional testing. The CM shall oversee, witness and document the functional testing of all equipment and systems according to the requirements of the respective Specification Sections. The Subs responsible for the work shall execute the tests.
    - 1) For any given system and prior to performing functional testing, the CM shall wait until the pre-functional checklist has been submitted with the necessary signatures, confirming that the system is ready for functional testing.
    - 2) The control system shall be tested before it is used to verify performance of other components or systems.
    - 3) The CM shall coordinate with the CA and USM to have TAB work completed and debugged before functional testing of air-related or water-related equipment or systems.
    - 4) Testing shall proceed from components to subsystems to systems and finally to interlocks and connections between systems.
  - b. Controls Requirement: The final test of the commissioned systems cannot include I/O LOOP tuning or manual overrides as part of the final acceptance functional testing. It is the intent to have the entire system or systems run in the intended operational manner with complete software control as applicable.
  - c. Deficiencies and Retesting: The CM shall document test results on appropriate procedure or test forms. Corrections of minor deficiencies shall be permitted to be made during the tests.
    - 1) Deficiencies or non-conformance issues shall be noted and reported to USM and the AE via USM Form C-6, IDAT Corrective Action Report.
    - 2) Parties responsible shall correct deficiencies, notify the CM and return Form C-6 certifying correction.
    - 3) The CM shall schedule retesting as necessary once deficiencies have been corrected.
    - 4) For areas in dispute, final authority resides with USM and the AE.
  - d. Participation and Witnessing: The CM shall notify the Commissioning Team as to dates and times proposed for systems testing. The CM shall provide reminders to USM, the AE and CA a minimum of one week prior to each scheduled test. The Owner's facilities operating staff are encouraged to attend and participate in the testing process.
5. O&M Manuals: The CM shall verify that IDAT related documentation is made part of the project O&M Manuals, as per the requirements of Section 01770, "Closeout Procedures."
6. As-Built Drawings: The CM shall verify that as-built drawings have been provided and are in compliance with the project requirements.
7. Owner Training: The CM shall oversee and verify that project required USM training has taken place to the satisfaction of USM.
8. Summary Report: The CM shall provide a draft IDAT Summary Report for review by USM, the AE and CA. The report shall include a list of outstanding issues. Where

applicable, issues shall be accompanied by an IDAT Corrective Action Report form. In any case, each identified issue shall include a proposed plan of action and a schedule for completing the work.

- a. The report shall be provided concurrent with the request for certification of Substantial Completion.
- b. Upon completion of the work, the CM shall issue a final IDAT Summary Report.

### 3.03 CONSTRUCTION PHASE

#### A. Stage 3 – Construction Oversight;

1. Preparation for Construction Phase Kick-Off: The CA will review Stage 1 and 2 efforts and status with USM and the AE. The CA will solicit team member concerns and goals for Stage 3 & 4 efforts.
2. Stage 3 Kick-Off Meeting:
  - a. The CA will conduct a meeting with the entire Commissioning Team, (except for the TAB – who is not expected to be on-board at this time). The focus of the meeting will be to present the commissioning process and goals to the Commissioning Team.
  - b. The CA and USM will present IDAT Plan requirements to the Team, emphasizing the CM's roles and responsibilities.
  - c. The CA and USM will present Controls Checkout Plan requirements.
  - d. The CA will review the Stage 4 Master List and its function. The CA will identify the progression from Stage 3 to Stage 4 and touch base on the project requirements for Stage 5 efforts.
3. Periodic Construction Oversight: The CA will make field visits and will issue Stage 3 Construction Oversight reports during the course of construction. The purpose of these visits will be to track Contractor compliance with the AE Basis of Design, the Construction Documents, and good industry practices.
4. Submittal Review: The CA will review submittals for the commissioned systems concurrent with site visits. For the most part, submittal reviews will be conducted at the construction trailer. Submittal reviews will be conducted to verify adherence with the Construction Documents.

#### B. Stage 4 – Verification and Closeout

1. Close-out Plans:
  - a. The CM will generate and maintain a comprehensive IDAT Plan. This plan will reflect the project close out requirements for the systems being commissioned.
  - b. The CV will generate and maintain a comprehensive Controls Check-out Plan.
  - c. A draft of these plans will be made available for review by the Commissioning Team prior to the Stage 4 kick-off meeting.
2. Stage 4 Kick-Off Meeting:
  - a. The CA will conduct a meeting with USM, the CM, MS, ES, CV and TAB. Lines of communication, goals, and the role of the CA will be reviewed.
  - b. The CM will present the IDAT Plan. Roles and responsibilities of the IDAT process will again be emphasized, including IDAT Corrective Action Reports.
  - c. The CV will present the Controls Check-out Plan.



- d. The Stage 4 Master List will again be reviewed. Requirements for Stage 5 efforts will be discussed.
3. Pre-Functional, Start-up and Functional Testing Verification:
  - a. The CA will make more frequent field visits during the final stages of construction. Stage 3 Construction Oversight reports will be issued on a weekly basis. The CA will witness pre-functional testing, start-up and functional testing of the commissioned systems.
  - b. The CM will schedule and monitor the status of these efforts via the IDAT Plan.
  - c. The CA will verify these efforts.
4. Controls Check-out / Testing and Balancing:
  - a. The CV will perform services in accord with the Controls Check-out Plan.
  - b. The CM will schedule and monitor the status of this effort via the IDAT Plan.
  - c. The TAB will perform testing and balancing services and submit results to USM, (for review by the AE and CA).
  - d. The CA will verify CV and TAB efforts.
5. Review of O&M Manuals, (and As-Built Drawings):
  - a. The CM will compile the O&M Manuals with input from the various sub-contractors. The O&M's will reflect the requirements of the construction documents.
  - b. The AE will review the O&M's for compliance with the construction documents.
  - c. The CA will also review O&M's with emphasis on Stage 5 Re-Commissioning Management Manual requirements.
  - d. The CM will schedule and monitor the status of this effort via the IDAT Plan.
  - e. The CA will verify O&M efforts.
6. Verification of Owner Training:
  - a. The CM will coordinate the scheduling and delivering of Owner training with the various sub-contractors.
  - b. The CM, MS, ES and CV will conduct training with manufacturer's representatives as required by the contract documents.
  - c. The CM will schedule and monitor the status of these efforts via the IDAT Plan.
  - d. The CA will verify training efforts.
7. Verify and Track Close-Out Status:
  - a. As stated above, the CM will continually track the status of the various project close-out requirements via the IDAT Plan.
  - b. The CA will continually verify these efforts and track this verification via the Stage 4 Master List. The CM and CA will periodically distribute these documents to USM as status reporting mechanisms.
8. Compile Draft Close-out Reports:
  - a. The CM will issue a draft IDAT Summary Report to USM, summarizing the status of project close-out activities. Outstanding issues will be clearly identified, including identification of responsible parties.
  - b. The CA will subsequently issue a draft Commissioning Report to USM. The report will include the Stage 4 Master List verifications.
9. Final Close-out Reports:
  - a. Upon completion of outstanding items, the CM shall issue a final IDAT Summary Report. The report shall state that the outstanding issues have been addressed, and shall include completed IDAT Corrective Action Reports.

- b. Upon subsequent notification by USM that outstanding issues have been addressed, the CA will visit the project site, verify these elements, and issue a final Commissioning Report to USM.
10. LEED Documentation: The CA will compile and transmit the commissioning related pieces of project LEED documentation to USM. Documentation will cover Prerequisite 1 and the Additional Commissioning Credit.

### 3.04 RETRO-COMMISSIONING PHASE

- A. Stage 5 – Retro-Commissioning:
  1. Write Re-Commissioning Management Manual: The CA will oversee the compilation of a Stage 5 Re-Commissioning Management Manual, (preventative maintenance manual). The contents of this manual will be as per LEED V2.1 Credit 3, Table 1. The CA will augment re-commissioning volumes of the O&M Manuals provided by the CM to meet USM and LEED requirements.
  2. Retro-Commissioning:
    - a. The CA will conduct a post-occupancy review of the commissioned systems off-season, while the project one year warrantee is still in effect. This service is as requested by USM and as required to satisfy LEED Additional Commissioning Credit requirements.
    - b. USM shall make trend logs available for systems and equipment being retro-commissioned.
    - c. The CA will review system and equipment operation, as well as functionally test items not extensively exercised previously due to seasonal reasons. The CA will issue a letter report identifying issues that require attention, including responsible parties.
    - d. The CM, MS and CV shall participate in this effort as necessary to insure proper performance of systems and equipment. USM will contract directly with a Stage 5 TAB as necessary to support this effort.
    - e. The CM shall issue and complete IDAT Corrective Action Reports as required.
    - f. Upon subsequent notification by USM that outstanding issues have been addressed, the CA will visit the project site, verify these elements, and issue a final letter report to USM.

### 3.05 REFERENCE DOCUMENTS

- A. General: The following documents are attached to the end of this Section:
  1. IDAT Corrective Action Report: This sample template shall be used by the CM in identifying and documenting corrective actions.
  2. Stage 4 Master List: This document offers a comprehensive breakdown of the components which make up the systems being commissioned.

END OF SECTION

**University of Southern Maine  
Integrated Deliverables and Testing Plan  
Corrective Action Report**

Project: Community Education Center ID: \_\_\_\_\_ Date: \_\_\_\_\_

Equipment: \_\_\_\_\_ Equipment ID: \_\_\_\_\_

Identified from: \_\_\_ Test, \_\_\_ Review, \_\_\_ Discussion \_\_\_, ☐ Site visit \_\_\_

The above equipment has been observed, tested or the performance report reviewed and was found to not comply with the contract documents.

Deficiencies or Issues and Effects:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Corrective Action: ☐ Required ☐ Recommended.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

For testing to proceed in a timely manner, it is imperative that the required corrective action be completed by: \_\_\_\_\_  
Date or Event

IDTP CM Agent \_\_\_\_\_ Date \_\_\_\_\_ PM / Owner's Representative \_\_\_\_\_ Date \_\_\_\_\_

Forwarded to the following parties on \_\_\_\_\_ for corrective action:  
Date

Attachments: Yes \_\_\_ No \_\_\_ Comment:

\_\_\_\_\_

**Distribution**

The following checked individuals will receive these documents for action, review and/or approval as appropriate:

Party	For review & comment only	For review & action	For record only
USM, John Rasmussen	_____	_____	_____
USM, Dana Gray	_____	_____	_____
AE	_____	_____	_____
CA	_____	_____	_____
	_____	_____	_____

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Fill in the following section and return entire form to USM PM agent when corrected.

**Statement of Correction**

The above deficiencies have been corrected with the following actions:

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Signature

Firm

Date

## SECTION 01511 – TEMPORARY DEHUMIDIFICATION, HEATING AND COOLING

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section Includes: System(s) for conditioning interior spaces during construction and provides ventilation in accordance with SMACNA's "IAQ Guidelines for Occupied Building Under Construction."
- B. The conditions for a two-week building flush-out with 100% outside air after construction ends and prior to occupancy.

#### 1.02 DEFINITIONS

- A. Temporary Climate Control System: Defined to include heating, cooling and desiccant dehumidification equipment and associated power cable, gas lines and temporary ducting.

#### 1.03 SUBMITTALS

- A. General: Submit the following in accordance with Division 1, Section "Submittal Procedures."
- B. Product Data for Temporary HVAC System to include:
  - 1. Climate Control Equipment.
  - 2. Temperature and humidity controls.
  - 3. Duct, duct accessories, pipe, and piping accessories materials and construction.
- C. Shop Drawings: Design layouts and descriptive data showing:
  - 1. Equipment layout and duct and/or pipe routing.
  - 2. Staging and Sequencing layouts.
  - 3. Enclosure and barricade construction.
- D. Submit reports as described in Part 2 of this section.

#### 1.04 QUALITY ASSURANCE

- A. Comply with provisions of Section 01450.
- B. Follow regulatory agency requirements for required temporary facilities not specified herein.
- C. Design Standards: Follow Division 1 Section "Product Requirements." Requirements for temporary facilities are minimum standards. Provide additional facilities as required for proper execution of Work and to meet responsibilities for protection of persons and property.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
2. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
3. Desiccant wheels: Bacteriostatic and non-toxic, manufactured under ISO 9001 certification. glass fibers which form support matrix shall be made from uniform continuous strands larger than five microns in diameter which are non-respirable and are not considered a possible health risk by International Agency for Research on Cancer (IARC). wheel shall be tested according to ASTM E84-90 (Standard Test Method for Surface Burning of Building Materials) and shall achieve a flame spread index of 0 and a smoke developed index of 10.
4. Dry bulb temperature and relative humidity shall be continuously monitored on each floor, using an electronic monitoring device (EMD). This device must be capable of recording readings at 15 minute intervals and data downloadable to a PC. A printout of data from each EMD shall be delivered to Architect as requested and at project completion.
5. A sling psychrometer shall be used to measure dry bulb and wet bulb in space on each floor. These readings shall be taken and recorded at beginning and end of each shift and delivered to Architect as requested and at project completion.
6. All work shall be in accordance with ASHRAE 62-2001 "Ventilation for Acceptable Indoor Air Quality," the State of Maine Building Code, and all Authorities having jurisdiction.

#### 1.05 SEQUENCING AND SCHEDULING

- A. Refer to this section's Parts 2 and 3 for scheduling requirements for temporary HVAC systems and building flush-out requirements.
- B. Coordinate layout and installation of temporary climate control equipment with finish trades.
- C. Utility Service:
  1. Follow rules and regulations of utility service companies or authorities having jurisdiction.
  2. Arrange with utility service companies for temporary services.
- D. All contractors shall coordinate with the Construction Manager their schedules regarding when heavy construction or other process in which odors, debris, dust and other airborne contaminants are generated. All required procedures to prevent the spread of the airborne contaminants to the remainder of the building.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Provide products for temporary construction using equivalent type as required for permanent construction, except for products that are manufactured for that specific temporary intent and approved by Architect.
- B. Where materials for use in this Section are not specified or detailed, propose products in writing and obtain approval from Architect before commencing work.
- C. Size temporary air systems to supply a minimum of one complete air change every 120 minutes.
- D. Temporary units shall have a minimum pre-filter system with a Minimum Efficiency Reporting Value (MERV) of 6 and a minimum final filter system with a minimum MERV of 13.

### 2.02 TEMPORARY COOLING UNITS

- A. Size temporary cooling equipment to maintain temperatures below 80 degrees F.
- B. Equipment: Provide minimum air quantities as specified this Section.
- C. Cooling equipment may be used to control humidity under following conditions:
  - 1. Equipment is capable of maintaining humidity in the range specified here or elsewhere in specification.
  - 2. Reheat coils are utilized to lower relative humidity in air stream.

### 2.03 TEMPORARY HEATING UNITS

- A. Heaters: Electric, indirect fired combustion, or steam coil auxiliary heaters. No direct-fired space heaters or propane, salamander type, heaters permitted.
- B. Heater Controls: Automatically turn heater off if airflow is interrupted or internal temperature of heater exceeds its design temperature or that of supply duct.

### 2.04 TEMPORARY DEHUMIDIFICATION EQUIPMENT

- A. Use dehumidification equipment to control environment in space 24 hours a day while joint compounds, paints, fireproofing and wall paper are being installed and until materials in space reach moisture levels as recommended by manufacturer(s). This equipment may also be necessary to maintain specified conditions until building is commissioned.
- B. Desiccant dehumidifiers shall be of solid desiccant design having a single rotary desiccant wheel capable of fully automatic continuous operation.
- C. Do not re-circulate air through dehumidification equipment unless positive pressure is maintained.

## 2.05 TEMPORARY DUCTWORK AND AIR DISTRIBUTION

- A. Supply Ductwork: Canvas spiral duct. If supply ductwork is placed outside building, securely attach or anchor to withstand damage from winds.
- B. Interior Distribution Ductwork: Polyethylene tubing (Layflat) of appropriate diameter to inflate fully without flutter.
- C. Distribute conditioned air through 2-3 inch holes cut in Layflat ducting.
  - 1. Distribute air evenly throughout area being served.
  - 2. Suspend temporary system from existing ceiling structure as recommended by system manufacturer.
  - 3. Coordinate with Architect for mounting locations within building.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Modify and extend temporary facilities as required by Work progress.
- B. Provide weather protection and environmental controls as required to prevent damage to Work, and to other property.
- C. Clean and repair damage caused by installation or use of temporary climate control equipment. Where disposal of spoil and waste products, whether or not they are contaminated, is required, make legal dispositions off site following governing authorities' requirement.
- D. For areas that require plaster and gypsum wallboard: Provide temporary climate controls, maintain a dry bulb temperature between 55 F and relative humidity of 50% or less 48 hours prior to installation, taping, and plastering and after installation. Refer to Division 9 for all additional requirements. If Manufacturer's recommendation vary from the specification, the more stringent method and requirements shall be implemented.
- E. For Flooring:
  - 1. If moisture levels in concrete slabs are too high, temporary climate control will be used to removed excess moisture to levels acceptable to flooring manufacturer.
  - 2. Moisture testing shall be performed at least 60 days in advance of flooring installation to allow sufficient drying time if levels are found to be excessive.
  - 3. Temporary climate control will be used to control humidity during hardwood floor installation. Temporary climate control will be used to stabilize moisture content in hardwood prior to installation if moisture levels are above those recommended on the Wood Flooring Moisture Map, provided by the USDA Forrest Products Laboratory or manufacturer, whichever is more stringent.



- F. For areas that require finished carpentry and architectural woodwork, including hardwood floor installation: Temporary climate control will be used to stabilize moisture content in hardwoods prior to installation if moisture levels are above those recommended on the Wood Flooring Moisture Map, provided by the USDA Forest Products Laboratory, or manufacturer, whichever is more stringent.
  - G. For Painting and Coating:
    - 1. Temporary climate control will be used to control condensation and maintain proper conditions for surface preparation, application and curing as per manufacturer's recommendations.
    - 2. When dry abrasive blasting carbon steel surfaces, dew point temperature in space must be maintained at least 17 degrees lower than temperature of surface being prepared.
    - 3. During paint and coating application, dew point temperature in space must be maintained at least 10 degrees lower than temperature of surface being painted.
    - 4. Maintain air and surface temperatures within parameters set forth in manufacturer's printed application instructions.
    - 5. Refer to Division 9 for all additional requirements. If Manufacturer's instructions differ from this section, the more stringent method and requirements shall be implemented.
  - H. Waste materials that release odor or dust shall be covered and sealed.
  - I. Containers of wet products shall be kept closed as often as possible.
  - J. In lieu of open kettles for roofing enclose tankers shall be used.
- 3.02 TEMPORARY EQUIPMENT CONFIGURATION
- A. Size and configure temporary climate control to maintain occupied space temperatures between 40 and 80 degrees F during hours unless conditions that are more stringent are required in other sections. Relative humidity shall be maintained at or below 60% unless conditions that are more stringent are required by other Sections.
  - B. Utilize temporary ducting to distribute conditioned air to affected areas of the building. Do not use permanent ductwork to distribute temporary conditioned air.
  - C. Keep doors closed and cover openings to maintain a reasonably airtight envelop around space to minimize infiltration and avoid pockets of high humidity.
- 3.03 REMOVAL OF TEMPORARY EQUIPMENT
- A. Maintain temporary climate control equipment in service until Substantial Completion and successful commissioning of permanent HVAC systems.
  - B. Completely remove temporary climate control equipment from site at completion.

3.04 MAINTENANCE

- A. Maintain in proper operating condition until use is no longer required or as otherwise approved.

3.05 HVAC PROTECTION:

- A. General: All permanent HVAC equipment and materials shall be protected from dust and all contaminants, including odor, during construction.
- B. Return and Transfer Air Systems: During construction the return air system shall be shut down and isolated temporarily to areas in which demolition or other processes that produce air borne contaminants such as, but not limited to, welding, sanding, use of torches, use of powder activated fasteners, etc. ... All return air system openings in areas in which airborne contaminants are used shall be sealed with plastic.
- C. Supply Air System: when the system in an area is off for a long period of time, the openings (diffusers, registers, and grilles) shall be covered and sealed with plastic.
- D. Diffusers, Registers, Grilles, and Louvers: During construction diffusers, registers, grilles, and louvers for permanent air systems shall be covered and sealed with plastic to prevent construction debris and odors from infiltrating the new duct systems.
- E. Filters: Filters for temporary HVAC systems shall be closely monitored to ensure that they are not clogged, overloaded, and are functioning properly. Filter shall be changed prior to the filter manufacturer's written information pertaining to the maximum allowable air pressure drops. In areas in which processes that produce large amounts of construction dust, odor, or other airborne contaminants, additional filtration shall be implemented. This additional filtration shall include the use of activate charcoal, potassium permanganate, or other types of filters that reduce odor or upgrading filtration efficiencies to protect the remainder of the Building from the contaminants.
- F. Duct Cleaning: Temporary ductwork shall be periodically inspected to ensure that it is clean and does not spread airborne contaminants. Dirty ductwork shall either be replaced or cleaned. Cleaning of ductwork shall be as specified in Division 15, Section "Metal Ducts."
- G. Local Exhaust: Airborne pollution sources can be directly exhausted to the outside through dedicated temporary exhaust system. Depending on the nature of the materials and the location of the exhaust, special filtration for the exhaust shall be considered.
- H. Air Cleaning: Where exhaust is not feasible, local recirculation of air through a portable air cleaner shall be used. The type of air cleaner and filter shall be suitable for the material being controlled (e.g. charcoal or potassium permanganate for odors or a moderate to high efficiency for dust).
- I. Air Pressurization: In areas in which odors and other airborne contaminants are anticipated during construction, a negative pressure relationship shall be maintained to adjoining spaces. A negative pressure relationship shall be defined as the air from adjoining spaces shall infiltrate into the areas in which odors or airborne contaminants are

being generated. This negative pressure relationship shall be maintained by increasing the amount of exhaust air to the area in which odor or other airborne contaminants so that it is 110% greater than the supply airflow rate to that area. In areas where materials are stored and are susceptible to dust, dirt, construction debris, odors, and all airborne contaminants, a positive pressure relationship shall be maintained to adjoining spaces. A positive pressure relationship shall be defined as the air from adjoining spaces shall exfiltrate out of the areas in which materials that can be damaged by odors and airborne contaminants from adjoining spaces. This positive pressure relationship shall be maintained by increasing the amount of supply air to the area in which materials that can be damaged by odors and airborne contaminants so it is 110% greater than the exhaust airflow rate to that area. Conversely, an area in which stored material produce odors or airborne contaminants shall be maintained at a negative pressure relationship as defined above. Do not store materials that produce odors or airborne contaminants with materials that are susceptible to odors or airborne contaminants.

### 3.06 HOUSEKEEPING

- A. General: As dust and debris accumulate on a project, it will become airborne and disturbed by nearby activity. This also applies to spills or excess application of solvents that produce odors. All procedures shall minimize these occurrences.
- B. Site Cleaning: During construction, the site shall be cleaned, at a minimum, at the end of the day or when all area is under heavy construction and there is a large amount of odors and contaminants produced, the following procedures shall be employed:
  - 1. Suppress dust with wetting agents or sweeping compounds.
  - 2. Remove spills or excess applications of solvent-containing products as soon as possible.
  - 3. Remove accumulated water. Keep areas as dry as possible.
  - 4. Vacuum areas that have HEPA filters and prevent the aerolization of settled dust.
  - 5. Protect porous materials such as insulation and masonry from exposure to moisture.
  - 6. Increase the frequency of cleaning as required to maintain good indoor air quality.
  - 7. Water permeably and porous materials that are exposed to excessive moisture shall be replaced.

### 3.07 REPORTS:

- A. GENERAL: All reports shall be submitted for approval in accordance with Division 1.
- B. Prior to the start of work in an area, a Planning Checklist (see the end of this section) shall be filled out and submitted for review to the Construction Manager. The methods as described within the approved Planning Checklist shall be adhered to without exception. If a modification is required, the Planning Checklist shall be amended. The construction manager shall keep a record of the Planning Checklist and submit them to the Owner and Architect for their records.
- C. On a daily basis (minimum) the Clerk of the Work for the project will inspect all spaces of the project in which work is proceeding. The Clerk of the Work shall fill out Inspection

Checklist (included at the end of this specification section). The Inspection Checklists shall be submitted to the Owner, Architect, and Engineer for their review and comments.

END OF SECTION

**Planning Checklist**

Project/Phase/Area \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Date(s) \_\_\_\_\_

**1.0 Potential Emissions**

**Source**

**Class**

- 1.1 Materials disturbed
- 1.2 New products
- 1.3 Equipment operation
- 1.4 System disruption
- 1.5 Waster materials

**2.0 Pathway**

**Affected Areas**

**Worst-Case**

- 2.1 HVAC recirculation
- 2.2 Direct exposure
- 2.3 Negative pressure
- 2.4 Tracking

**3.0 Controls**

**Options**

**Comments**

- 3.1 HVAC Protection
- 3.2 Product substitution
- 3.3 Equipment Modification
- 3.4 Local exhaust
- 3.5 Air cleaning
- 3.6 Covering/sealing
- 3.7 Negative pressure

(Inspection Checklist, cont'd.)

- 3.8 Barriers
- 3.9 Source relocation
- 3.10 Dust suppression
- 3.11 Upgraded cleaning
- 3.12 Buffer zones
- 3.13 Off-hours
- 3.14 Move hypersensititives

### Inspection Checklist

Project \_\_\_\_\_

Status \_\_\_\_\_

Date \_\_\_\_\_

Inspector \_\_\_\_\_

Contractor(s) \_\_\_\_\_

Date and time \_\_\_\_\_

**1.0 Active Work Areas**

**Location**

**Odor?**

**Dust?**

1.1 Materials disturbed

1.2 New products

1.3 Equipment operation

1.4 System disruption

1.5 Waste materials

**2.0 Potentially Affected Areas**

**Location?**

**Odor?**

**Dust?**

2.1 HVAC recirculation

2.2 Direct exposure

2.3 Negative pressure

2.4 Tracking

**3.0 Controls**

**Description**

**Status**

3.1 HVAC protection

3.2 Source control

3.3 Pathway interruption

3.4 Housekeeping

3.5 Scheduling

(Inspection Checklist, cont'd.)

4.0 Occupant

complaints/observations

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5.0 Occupant

complaints/observations

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## **SECTION 15767 - PROPELLER UNIT HEATERS**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. This section includes the following:
  - 1. Propeller type, hydronic, unit heaters.
- B. Related sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods."
  - 2. Division 15 Section "Electrical Requirements for HVAC Work."
  - 3. Division 15 Section "Mechanical Identification."
  - 4. Division 15 Section "Hangers and Supports."
  - 5. Division 15 Section "Hydronic Piping."
  - 6. Division 15 Section "Valves."
  - 7. Division 15 Section "Meters and Gages."
  - 8. Division 15 Section "HVAC Vibration Controls and Seismic Restraints."
  - 9. Division 15 Section "Control System Equipment."

#### **1.02 SUBMITTALS**

- A. General: Submit the following in accordance with Division 1, Section "Submittal Procedures."
- B. Product Data: Include specialties and accessories for each unit type and configuration.
- C. Shop Drawings: Submit the following for each unit type and configuration:
  - 1. Plans, elevations, sections, and details.
  - 2. Details of anchorages and attachments to structure and to supported equipment.
  - 3. Power, signal, and control wiring diagrams. Differentiate between manufacturer-installed and field-installed wiring.
  - 4. Equipment schedules to include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- D. Field Test Reports: Written reports of tests specified in Part 3 of this Section.
- E. Maintenance Data: For propeller unit heaters to include in operation and maintenance manuals specified in Division 1. Include the following:
  - 1. Maintenance schedules and repair parts lists for motors, coils, integral controls, and filters.
- F. Coordination Drawings: Show unit heaters and all associated appurtenances, and clearances for operation, maintenance, and service as part of the coordination drawing

process. Refer to Division 15, Section "Basic Mechanical Materials and Methods" for all additional requirements.

### 1.03 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

### 1.04 WARRANTY

- A. General Warranty: The Special Warranty specified in this Article shall not deprive the Owner of other rights to Owner may have under other provisions of the Conditions of the Contract and shall be in addition to, and run concurrently with, other warranties made by the Conditions of the Contract.
- B. Special Warranty: The Unit Heater Manufacturer shall submit a written warranty for their equipment agreeing to repair or replace components within the equipment that fail in material or workmanship within the specified warranty period.

- 1. Warranty Period: 1-year from the date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Carrier Corp.
  - 2. Dunham-Bush, Inc.
  - 3. International Environmental Corp.
  - 4. York International, Inc.
  - 5. Trane Company (The); North American Commercial Group.
  - 6. The Sterling Heating Equipment Company.

### 2.02 UNIT HEATERS

- A. Description: An assembly including casing, coil, fan, and motor horizontal discharge configuration with horizontal, adjustable louvers in blow-through configuration.

### 2.03 MATERIALS

- A. Casing: Galvanized steel, with removable panels.
- B. Cabinet Finish: Bonderize, phosphatize, and flow-coat with baked-on primer and manufacturer's standard custom paint applied to factory-assembled and -tested propeller unit heater before shipping.

2.04 COILS

- A. Hot-Water Coil: Copper tube, 0.031-inch (0.78-mm) wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm) and rated for a minimum working pressure of 200 psig (1380 kPa) and a maximum entering water temperature of 325 deg F (163 deg C), with manual air vent. Test for leaks to 375 psig (2690 kPa) underwater.

2.05 FAN

- A. Propeller with aluminum blades directly connected to motor.

2.06 FAN MOTORS

- A. Motors, 1/2 hp and Smaller: Shaded-pole Permanent-split capacitor, multispeed motor with integral thermal-overload protection.
- B. Motors, 3/4 hp and Larger: Totally enclosed with permanently lubricated ball bearings.

2.07 ACCESSORIES

- A. Horizontal Configuration: Louver fin diffuser discharge.

2.08 CONTROLS

- A. Control Devices: Integral fan-speed switch and thermostat.

2.09 SOURCE QUALITY CONTROL

- A. Test propeller unit heater coils according to ASHRAE 33.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive propeller unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before propeller unit heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install propeller unit heaters level and plumb.
- B. Install propeller unit heaters to comply with NFPA 90A.

- C. Suspend propeller unit heaters from structure as specified in Division 15 Sections "Hangers and Supports" and "HVAC Vibration Controls and Seismic Restraints."

### 3.03 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Unless otherwise indicated, install shutoff valve and union or flange on each connection.
- C. Install piping adjacent to machine to allow service and maintenance.
- D. Ground equipment.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.04 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing and report results in writing:
  - 1. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 2. Test and adjust controls and safeties.
- B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

### 3.05 CLEANING

- A. After installing units, inspect unit cabinet for damage to finish. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. After installing units, clean propeller and unit heaters internally according to manufacturer's written instructions.

END OF SECTION 15767H

## 2.04 LAMP HOLDERS

- A. Incandescent: Body: porcelain; Screw Shell: nickel-plated brass, prelubricated with silicone compound.
- B. Fluorescent: Body: white urea plastic; Contacts: silver-plated phosphor bronze.

## 2.05 FINISHES

- A. Painted Surfaces: Synthetic enamel, with acrylic, alkyd, epoxy, polyester, or polyurethane base, light stabilized, baked on at 350° Fahrenheit minimum, catalytically or photochemically polymerized after application.
- B. White finishes: minimum of 85 percent reflectance.
- C. Ceiling opening frames shall either be manufactured of non-ferrous metal, or be suitably rustproofed after fabrication.
- D. Selection: Unless otherwise noted, finishes shall be as selected by the Architect.
- E. Undercoat: Except for stainless steel give ferrous metal surfaces a five stage phosphate treatment or other acceptable base bonding treatment before final painting and after fabrication.
- F. Unpainted non-reflecting surfaces shall be satin finished and coated with a baked-on clear lacquer to preserve the surface. Where aluminum surfaces are treated with an anodic process, the clear lacquer coating may be omitted.
- G. Unpainted Aluminum Surfaces: Finish interior aluminum trims with an anodized coating of not less than 7 mg. per square inch, of a color and surface finish as selected by the Architect. Finish exterior aluminum and aluminum trims with an anodized coating of not less than 35 mg. per square inch, of a color and surface finish as selected by the Architect.
- H. Porcelain Enamel Surfaces: Apply porcelain finishes smoothly. Finish shall be not less than 7.5 mils thick of non-yellowing, white, vitreous porcelain enamel with a reflectance of not less than 85%.

## 2.06 LAMPS

- A. Manufacturer: Lamps shall be manufactured by General Electric or Osram/Sylvania. Unless otherwise noted, all lamps of a given fixture designation and lamp type shall be supplied by the same manufacturer.
- B. If a specific manufacturer is noted in the schedule, only that manufacturer shall be acceptable.
- C. Provide lamps for all lighting fixtures (furnished as part of the electric work). Lamps shall carry a three-year warranty.

- D. Incandescent and tungsten halogen lamps shall not be operated, other than for initial testing, prior to final inspection.

## 2.07 FLUORESCENT LIGHTING FIXTURES

- A. General Construction and Materials: Housing end plates, socket bridges, reflectors, wiring channels and ballast covers shall be die formed of not less than #20 gauge (0.0359 inch thick) cold rolled steel unless specified otherwise.
- B. Lampholders shall be heavy white with definite locking-in feature and silver-plated contacts for proper lamp operation and life. Outdoor lampholders shall be neoprene gasketed and compression type. Sockets with open-circuit voltage over 300 volts: safety type and designed to open supply circuit on lamp removal.
- C. Mount lamps on rapid-start circuits within one inch of grounded metal, minimum one inch wide, as long as lamp.
- D. Construct fixtures so that ballast may be serviced or replaced without removal of fixture housing.

## 2.08 FLUORESCENT BALLASTS

- A. Electronic: Where called for in the Lighting Fixture Schedule, provide electronic ballasts for fluorescent light fixtures. Contractor is responsible for coordination of ballast compatibility with specified lamps. Electronic ballasts shall be acceptable and listed by Underwriters' Laboratories Inc., and Class "P" thermally protected. Ballasts shall have total harmonic distortion less than 10%. Ballasts shall have a minimum starting temperature of 10 degrees Celsius. Ballasts shall be free of Polychlorinated biphenyls (PCB's). Ballasts shall be designed for frequency of operation greater than 25KHz nominal, and shall operate at the nominal voltages indicated on label, 120 volt and/or 277 volt as required. Ballasts shall be Osram Sylvania Quictronic PRO start PSX or GE Ultramax H.
  - 1. It shall be possible to operate ballasts for different length lamps on a single circuit.
  - 2. It shall be possible to operate multiple lamp ballasts on a single circuit with no perceptible difference in lamp light output.
  - 3. Fixture and ballast combination shall be inaudible in a 27 db room ambient.
  - 4. Ballast shall comply with all applicable state and federal efficiency standards.
  - 5. Ballasts shall comply with FCC and NEMA limits governing electromagnetic and radio frequency interference and shall not interfere with operation of other normal electrical equipment.
  - 6. Ballasts shall meet all applicable ANSI and IEEE standards regarding harmonic distortion and surge protection.

7. Ballasts shall not be affected by lamp failure and shall yield normal lamp life.
  8. Ballasts shall operate at an input frequency of 60 HZ and an input voltage of 108 to 132 (120V models) or 249 to 305 (277V models).
  9. Ballasts that operate as a parallel circuit shall allow remaining lamp(s) to maintain full output if companion lamp(s) fail.
  10. Ballast manufacturers shall have been producing electronic ballasts in the U.S. for more than 10 years with a low failure rate.
  11. Ballast shall carry five-year warranty, including labor allowance.
- C. Electronic Dimming: Where called for in the Lighting Fixture Schedule, provide electronic dimming ballasts for fluorescent light fixtures. Contractor is responsible for coordination of ballast compatibility with specified lamps and dimmers. Electronic dimming ballasts shall be acceptable and listed by Underwriters' Laboratories Inc., and Class "P" thermally protected. Ballasts shall have a power factor greater than 0.95, ballast factor equal to 0.93, total harmonic distortion less than 10%, and lamp current crest factor less than or equal to 1.6. Ballasts shall have a minimum starting temperature of 10° Celsius. The electronic dimming ballast shall be designed and tested to withstand, without impairment to performance, voltage surges of 6000 volts and 200 amperes per ANSI/IEEE Standard C62.41-1980. Ballasts must comply with FCC Part 18 regulations and shall not interfere with other properly installed electrical equipment. Ballasts shall be free of Polychlorinated biphenyls (PCB's). Ballasts shall be designed for frequency of operation greater than 25KHz nominal, and shall operate at the nominal voltages indicated on label, 120 volt and/or 277 volt as required.
1. Approved Dimming Ballasts:
    - (1) Lutron "Hi-lume" FDB series dimming ballasts
  2. Dimming shall be smooth and continuous without flicker with ranges as follows:
    - (1) 120 volt systems
      - 430 ma lamps: Full to 1 percent light
      - 265 ma lamps: Full to 1 percent light
    - (2) 277 volt systems
      - 430 ma lamps: Full to 1 percent light
      - 265 ma lamps: Full to 1 percent light
  3. It shall be possible to operate ballasts for different length lamps on a single circuit, and the different length lamps shall track evenly with no perceptible difference in lamp light output.
  4. It shall be possible to operate one and two lamp ballasts on a single circuit with no perceptible difference in lamp light output.
  5. Fixture and ballast combination shall be inaudible in a 27 db room ambient.





**LeMessurier Consultants**  
Structural Engineers

By **SKH**

Date **1-30-04**

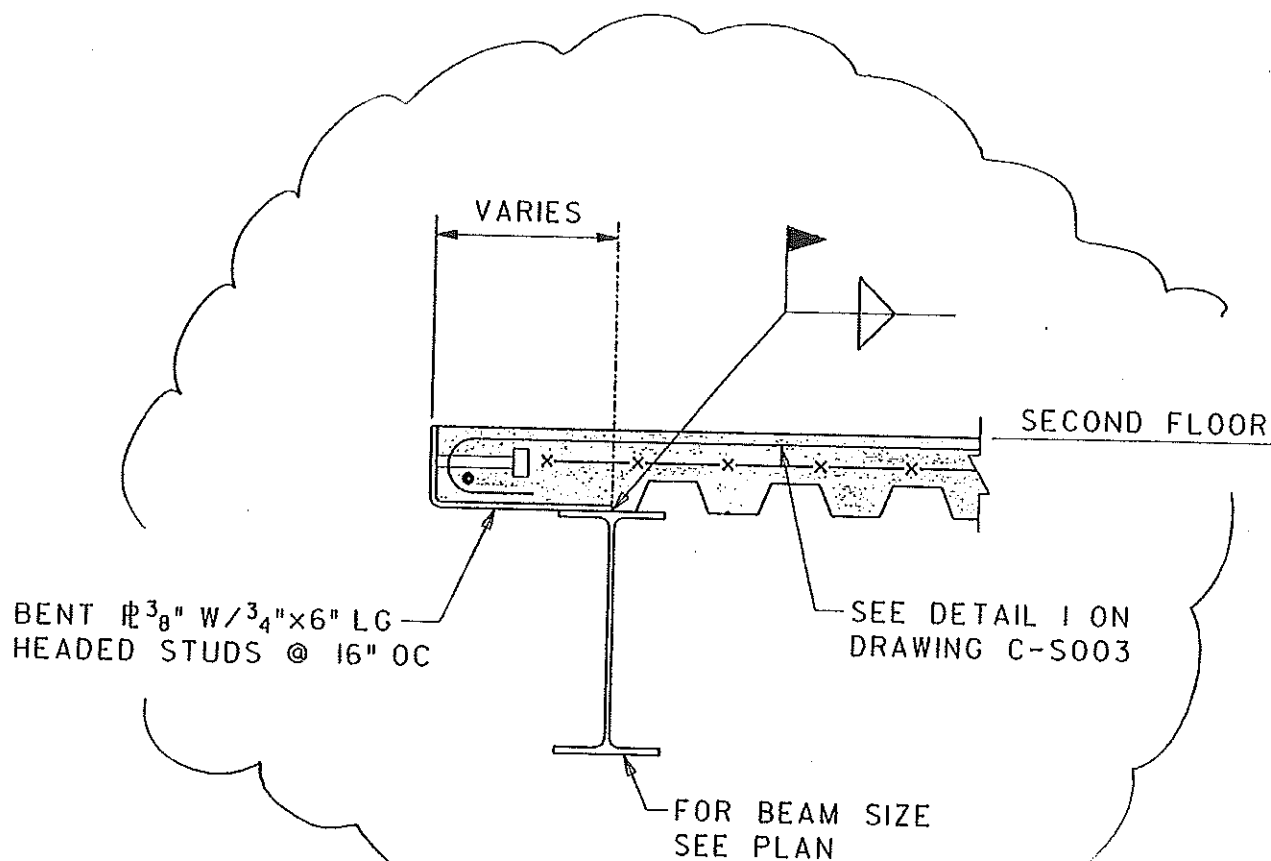
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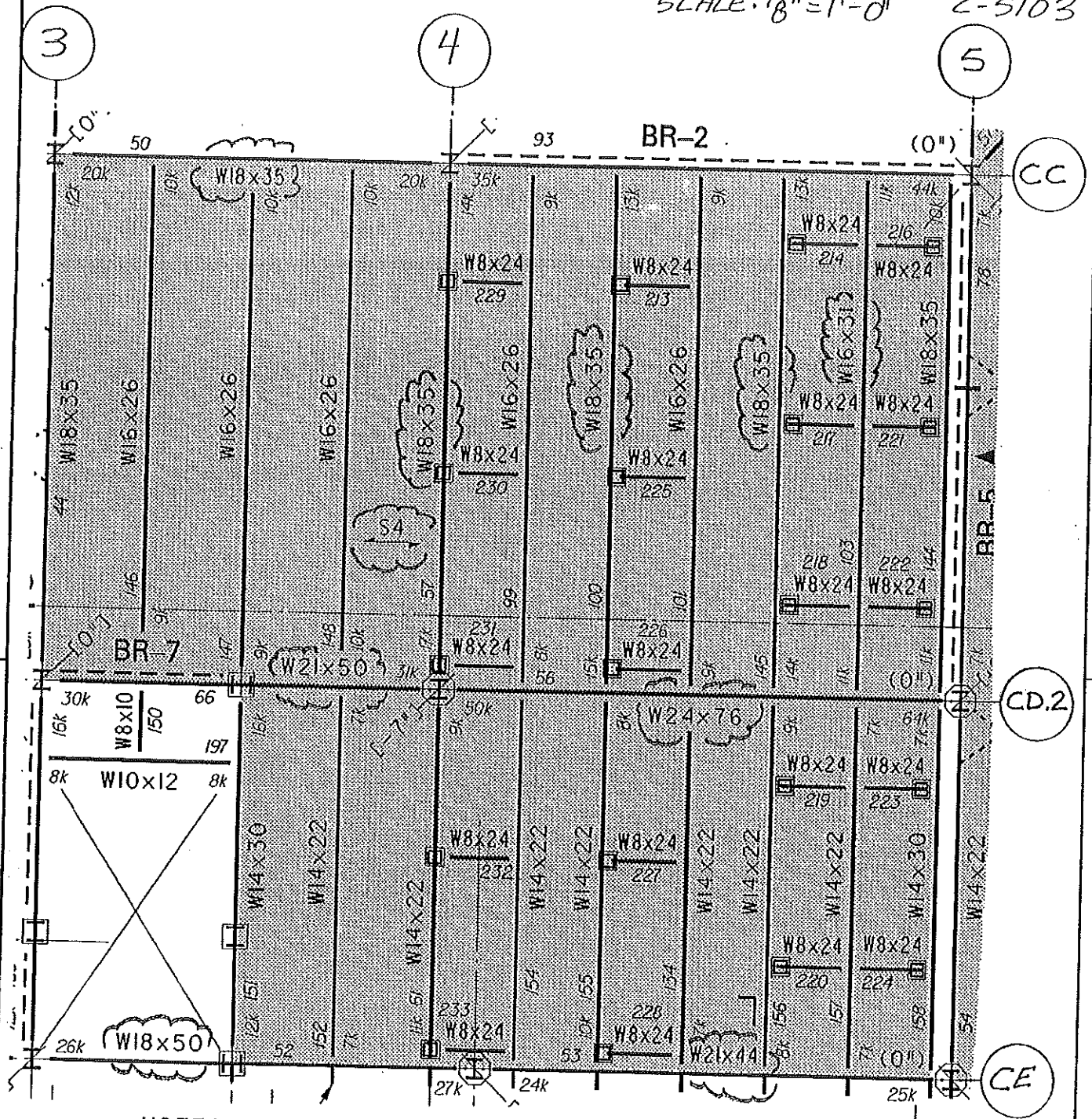
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Subject **USM-CEC, BENT DET @ LOBBY RAILING**

**1"=1'-0"**

**11/ C-5401**





**NOTES (ROOF LEVEL):**

1.  $\overleftarrow{S3}$  INDICATES ROOF CONSTRUCTION SHALL BE  $\frac{1}{2}"$  DEEP, 20 GA, ROOF DECK, TYPICAL UNLESS NOTED OTHERWISE.
2.  $\overleftarrow{S4}$  INDICATES AREA WHERE SLAB CONSTRUCTION SHALL BE 2" LIGHTWEIGHT CONCRETE ON  $\frac{1}{2}"$  DEEP, 20 GA, COMPOSITE STEEL DECK. TOTAL THICKNESS =  $3\frac{1}{2}"$ . REINF SLAB WITH WWF 6x6-W2.9xW2.9.

## **Amendment to Program of Special Tests and Inspections**

Project: University of Southern Maine- Portland Campus  
Joel and Linda Abromson Community Education Center

### **List of Agents**

SER	LeMessurier Consultants 675 Massachusetts Avenue Cambridge, MA 02139 617-868-1200 Attn: Andy Lewis
AR	Einhorn Yaffee and Prescott Architecture and Engineering P.C. 24 Scholl St. Boston, MA 02108 617-305-9800 Attn: Mike Collard
OIAF	R.W. Gillespie & Assoc., Inc. 86 Industrial Park Rd. Ste 4 Saco, ME 04072 207-286-8008 Attn: Rob Gillespie
OIAP	R.W. Gillespie
GE	Haley and Aldrich, Inc. 500 Southborough Drive South Portland, ME 04106 207-772-5439 Attn: Jim Weaver
FQP	Maguire and Jones, Inc. Structural Steel 1156 Broadway South Portland, ME 04106 207-799-8555 Attn: Jeff Spiller
CQP	Granger Northern, Inc. 84 Middle St. Portland, ME 04101 207-774-3500 Attn: Ron Milley

University of Southern Maine  
Community Education Center  
PORTLAND, MAINE  
GMP Documents

ADDENDUM NO. 6  
FEBRUARY 13, 2004

TO ALL BIDDERS:

This Addendum is organized in six (6) parts plus attachments:

- Part I Overview
- Part II Revisions/Clarifications to the Bidding Requirements
- Part III Revisions to Contract Requirements
- Part IV General Clarifications
- Part V Revisions to the Drawings
- Part VI Revisions to the Specifications
- Attachments

PART I: OVERVIEW:

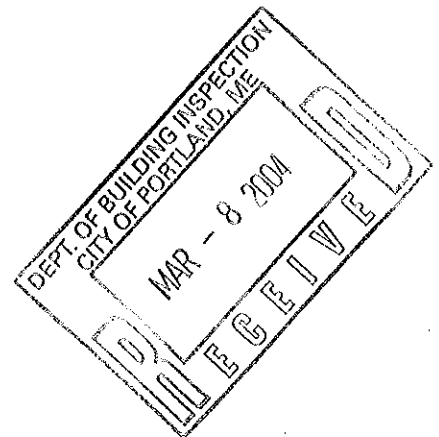
- A. This Addendum No. 6 is hereby incorporated into, and amends (by addition, deletion, clarification or alteration) the Bid Documents dated Jan 19 2004 for the University of Southern Maine CEC, Portland, Maine.
- B. The bidder shall acknowledge all addenda on the SUBMISSION OF GMP. Bidders are to please contact Einhorn Yaffee Prescott, Att: Mr. William F. Smith if any document is missing from the bidder's package. Additional costs for items missed in this addendum shall not be accepted for failing to include said work.

PART II: REVISIONS/CLARIFICATIONS TO THE BIDDING REQUIREMENTS:

NO CHANGES

PART III: REVISIONS TO CONTRACT REQUIREMENTS:

NO CHANGES



PART IV: GENERAL CLARIFICATIONS:

NO CHANGES

PART V: REVISIONS TO THE DRAWINGS:

ITEM 1: SHEET C-AV21

- A. Computer classrooms 218 and 219 shall have one projection screen per room, in lieu of one shared projection screen as indicated in the January 19, 2004 GMP documents. Projection screens in these rooms shall be as identified in Specification Section 11132, Paragraph 2.01-M-1

PART VI: REVISIONS TO THE SPECIFICATIONS:

ITEM 1: SECTION 11132 - PROJECTION SCREENS

- A. Insert Section 11132 (attached) in its entirety

ATTACHMENTS:

SECTION 11132 - PROJECTION SCREENS:

4 PAGES, 8-1/2 x 11.

END OF ADDENDUM #6

## **SECTION 11132 – PROJECTION SCREENS**

### **PART 1 GENERAL**

#### **1.02 SECTION INCLUDES**

- A. Projection Screens

#### **1.03 RELATED SECTIONS**

- A. Section 09500 Ceilings
- B. Section 16050 Basic Electrical Materials and Methods
- C. Section 16200 Electrical Power

#### **1.04 REFERENCES**

- A. Examine contract documents that affect work in this section. Coordinate other work as necessary to form a complete installation
- B. AV drawings issued separately by Owner
- C. Manufacturer's specifications, cut sheets, installation and owner's manuals

#### **1.05 SUBMITTALS**

- A. See Section 01300 – Administrative Requirements for submittal procedures.
- B. Shop Drawings: Submit large-scale shop drawings showing screen mounting methods and ceiling tile detail. Submit shop drawings for low voltage and high voltage wiring. Clearly indicate dimensions, space requirements, connections, materials, quantities and other pertinent data.
- C. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for the projection screens and all products used. Provide certifications that products and assemblies comply with requirements
- D. Sample: Submit a sample of screen case finishes for approval

#### **1.06 QUALITY ASSURANCE**

- A. Source: Provide projection screens from a single manufacturer for the entire project.

#### **1.07 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for fire retardant requirements.

K. All visible hardware shall be of a uniform color and finish. Obtain, and strictly adhere to manufacturer recommendations concerning painting the screen.

L. Inspect screen surface upon installation for dents and other defects. Obtain replacement or repair as required to provide for zero defects in the screen surface

M. Screens from the following manufacturers shall be considered acceptable:

1. For classrooms, breakout rooms and computer classrooms:

Stewart Filmscreen Model SEL120VUM13W with model LVC low voltage control with wall switch

2. For smaller conference rooms and classrooms (Classroom 212 and Conference Room 217):

Stewart Filmscreen Model SEL100VUM13W with model LVC low voltage control with wall switch

3. For Lecture Hall:

Stewart Filmscreen B240VUM13W-24-6-13 with model LVC low voltage control with wall switch

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine wall, ceilings and conditions under which this work is to be performed.
- B. Notify Contractor in writing of conditions detrimental to proper completion of the work. Beginning work means Installer accepts substrates and conditions.

#### **3.02 INSTALLATION**

- A. Manufacturer's Instructions: Strictly comply with manufacturer's instructions and recommendations, except where requirements that are more restrictive are specified in this Section. Comply with all referenced standards
- B. Wire Class 1 wiring in accordance with manufacturer's instructions and per code.
- C. Install low voltage interface.
- D. Install low voltage switches as shown on electrical drawings and as directed by Architect.
- E. Coordinate with AV Contractor for low voltage interface into AV control system.
- F. Fit ceiling around screen as shown on drawings and as directed by Architect.
- G. Adjust screen limit switches for full retraction, and lower limit stops

H. Clean screen housing of fingerprints, grease or other marks, touch-up paint as required.

I. Paint visible screen case surfaces as directed by the Architect.

J. Provide all other work for a complete and unified installation.

**3.03      ADJUSTING, TOUCH-UP AND REPAIR**

A. After installation of hardware, make adjustments and corrections to leave operating parts in perfect operating condition.

B. Touch-up damaged shop coatings and repair minor damage to eliminate all evidence of repair.

C. Remove and replace work that cannot be satisfactorily repaired

**END OF SECTION**