EASTERN PCM, LLC

ADDENDUM #2

June 16, 2011

Re: Harrisburg Area Community College
Evans Gym Pool HVAC Replacement
Solicitation #RFB11-22

From: Eastern PCM, LLC
Construction Manager – HACC
645 N. 12th Street, Suite 200
Lemoyne, PA 17043

To: All Planholders

This Addendum is hereby made part of the Plans and Project Manual dated June 6, 2011 for the above referenced project. The provisions of this Addendum are intended to supplement the provisions of the Plans and Project Manual and/or supersede them where contradictory thereto.

This Addendum contains changes to the requirements of the Plans and Project Manual. Such changes shall be incorporated into the Plans and Project Manual and shall apply to work with the same meaning and force as if they had been included in the original Plans and Project Manual. Where this Addendum modifies a portion of a paragraph or phrase of the Project Manual, the remaining unmodified portion of the paragraph or phrase shall remain in force.

The conditions and terms of the Plans and Project Manual shall govern work described in this Addendum. Whenever the conditions of work, or the quality or quantity of materials or workmanship are not fully described in this Addendum, the conditions of work etc. included in the Plans and Project Manual for similar items of work shall apply to the work described in this Addendum. If no similar items of work are included in the Plans and Project Manual, the quality of material and workmanship shall be subject to the written acceptance of the Architect.

2.1 CHANGES TO THE PROJECT MANUAL

A. Section 00010 – Table of Contents

REPLACE in its entirety.

B. Section 00410 – Bid Form

REPLACE in its entirety.

C. Section 01230 – Alternates

REPLACE in its entirety. The following Alternate No. 4 has been added:

Alternate Number 4 – Replacement of two inline circulation pumps in Basement Pump Room: Submit Cost to remove and replace the two inline circulators and associated trim. In addition, clean and insulate heating water piping in Basement Pump Room.

D. Section 15815 – Metal Ducts & Grilles

Article 3.6 Field Quality Control, DELETE items A.1, A.2, A.4

Article 3.7 Cleaning New Systems – DELETE in its entirety.

Article 3.8 Cleaning Existing Systems – DELETE in its entirety.

E. **ADD** the following Specification Sections:

15083 Pipe Insulation
15110 Valves
15120 Piping Specialties
15140 Heating Water Piping
15185 Hydronic Pumps

1.2 CHANGES TO THE DRAWINGS

A. ADD the following Drawings

SK-1, SK-2, SK-3, and SK-4 prepared by Johnson, Mirmiran, Thompson.

B. Drawing M102 – Mechanical Roof Plans

ADD the following General Note: "Roof exhaust fans remain untouched unless Alternate #1 is accepted."

C. Drawing M501 – Mechanical Schedules, Details & Symbols

ADD the following General Note: "Roof exhaust fans remain untouched unless Alternate #1 is accepted."

Attachments

Section 00010	Table of Contents
Section 00410	Bid Form
Section 01230	Alternates
Section 15083	Pipe Insulation
Section15110	Valves
Section 15120	Piping Specialties
Section 15140	Heating Water Piping
Section 15182	Hydronic Pumps
SK-1	
SK-2	
SK-3	
SK-4	

END OF ADDENDUM

EASTERN PCM, LLC

Please sign and return this page, via fax, to Eastern PCM, LLC at (717) 233-1666 indicating receipt of this Addendum.

Evans Pool HVAC Replacement
SOLICITATION #RFB11-22

Addendum #_____ has been received.

Company: _____
Print Company Name

Received By: _____
Print Name Signature

Date: _____

Please check one:

_____ We are bidding as a prime contractor
_____ We are not bidding
_____ We are a sub-contractor

SECTION 00010 - TABLE OF CONTENTS

DIVISION 0 – CONTRACT REQUIREMENTS

00100 INVITATION TO BID
00150 INFORMATION FOR BIDDERS
00200 INSTRUCTIONS TO BIDDERS - AIA DOCUMENT A701
00210 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS
00410 BID FORM
00430 BID BOND - AIA DOCUMENT A310
00440 MBE/WBE UTILIZATION
00453 NON-COLLUSION AFFIDAVIT
00500 STANDARD FORM OF AGREEMENT - AIA DOCUMENT A132
00615 PERFORMANCE AND PAYMENT BONDS - AIA DOCUMENT A312
00620 CERTIFICATE OF INSURANCE - AIA DOCUMENT G715
00700 GENERAL CONDITIONS OF THE CONTRACT - AIA DOCUMENT A232
00800 SUPPLEMENTARY GENERAL CONDITIONS
00820 PREVAILING WAGE RATES

DIVISION 1 – GENERAL REQUIREMENTS

01125 SUMMARY OF CONTRACT
01230 ALTERNATES
01250 CONTRACT MODIFICATION PROCEDURES
01290 PAYMENT PROCEDURES
01310 PROJECT MANAGEMENT AND COORDINATION
01320 CONSTRUCTION PROGRESS DOCUMENTATION
01330 SUBMITTAL PROCEDURES
01400 QUALITY REQUIREMENTS
01500 TEMPORARY FACILITIES AND CONTROLS
01500A CONSTRUCTION SIGN DETAILS
01600 PRODUCT REQUIREMENTS
01600A SUBSTITUTION REQUEST – APPENDIX A
01731 CUTTING AND PATCHING
01732 SELECTIVE DEMOLITION
01770 CLOSEOUT PROCEDURES
01781 PROJECT RECORD DOCUMENTS
01782 OPERATION AND MAINTENANCE DATA
01820 DEMONSTRATION AND TRAINING

DIVISION 03 – CONCRETE

03920 CONCRETE PATCHING

DIVISION 05 – METALS

05120 STRUCTURAL STEEL
05515 METAL LADDERS

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07920 ARCHITECTURAL JOINT SEALANTS

DIVISION 08 – DOORS AND WINDOWS

08110 STEEL DOORS AND FRAMES
08710 HARDWARE

DIVISION 09 – FINISHES

09910 PAINT

DIVISION 15 – MECHANICAL

15050 MECHANICAL MATERIALS AND METHODS
15055 MOTORS
15060 HANGERS AND SUPPORTS
15075 MECHANICAL IDENTIFICATION
15080 DUCT INSULATION
15083 PIPE INSULATION
15110 VALVES
15120 PIPING SPECIALTIES
15140 HEATING WATER PIPING
15183 REFRIGERANT PIPING
15185 HYDRONIC PUMPS
15755 MECHANICAL DEHUMIDFICATION UNITS
15761 AIR COILS
15762 UNIT HEATERS
15815 METAL DUCTS AND GRILLES
15838 POWER VENTILATORS
15900 FACILITY MANAGEMENT SYSTEM
15950 TESTING, ADJUSTING AND BALANCING

DIVISION 16 - ELECTRICAL

16050 BASIC MATERIALS
16060 GROUNDING AND BONDING
16072 SUPPORTS
16075 IDENTIFICATION
16120 CONDUCTORS
16130 RACEWAY
16410 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
16420 ENCLOSED CONTROLLERS
16491 FUSES

DRAWINGS LIST

A-101	ARCHITECTURAL PARTIAL FLOOR PLANS
M-001	MECHANICAL GENERAL NOTES & SYMBOLS
M-101	MECHANICAL PARTIAL FLOOR PLANS
M-102	MECHANICAL ROOF PLANS
M-501	MECHANICAL SCHEDULES, DETAILS, AND SYMBOLS
E-001	ELECTRICAL GENERAL NOTES ABBREVIATIONS AND LEGEND
E-101	ELECTRICAL DEMO WORK GROUND & FIRST FLOOR PLAN
E-102	ELECTRICAL DEMO WORK ROOF PLAN
E-103	ELECTRICAL NEW WORK GROUND & FIRST FLOOR PLAN
E-104	ELECTRICAL NEW WORK ROOF PLAN
E-501	ELECTRICAL SCHEDULES AND ONE LINE DIAGRAMS
SK-1	SKETCH #1
SK-2	SKETCH #2
SK-3	SKETCH #3
SK-4	SKETCH #4

END TABLE OF CONTENTS

SECTION 00410 - BID FORM

PROJECT: **Evans Gym Pool HVAC Replacement, RFP11-22**

BID TO: **Harrisburg Area Community College**

BID FROM: _____

TYPE or PRINT Name and Address of Entity Submitting Bid Here

1. The undersigned BIDDER agrees, if this Bid is accepted, to enter into an agreement with OWNER, in the form included in the Bidding Documents, to perform and furnish the Work as specified or indicated in the Bidding Documents for the Bid Price and within the Time indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

2. In submitting this Bid, BIDDER represents, acknowledges, and agrees, as more fully set forth in the Agreement, that:

   a. This Bid will remain subject to acceptance for 60 days after the date of Bid opening;
   b. The Owner has the right to reject this Bid, for it's convenience. The Owner also reserves to right to allow a Bidder to correct a defect in its Bid provided that correction of the defect does not alter the amount of the Bid or the scope of work required under the Bid.
   c. BIDDER accepts the provisions of the Instructions and Supplementary Instructions to Bidders regarding disposition of Bid Security;
   d. BIDDER will sign and submit the Agreement with the Bonds and other documents required by the Bidding Requirements within 15 days after the date of Owner's Notice of Award;
   e. BIDDER has examined and understands all Bidding Documents.
   f. BIDDER has visited site and become familiar with the general, local, and conditions; and that the Bidder has considered such laws and regulations in determining the cost, progress, performance, and furnishing of the Work for the Project;
   g. BIDDER is familiar with federal, state, and local laws and regulations;
   h. BIDDER is aware of the general nature of work to be performed by OWNER and others at the Site as such relates to the Work indicated in the Bidding Documents.
   i. BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports, and drawings identified in the Bidding Documents and additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;
   j. BIDDER does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
   k. This Bid is genuine and not made in the interest of or on behalf of an undisclosed person, firm, or corporation and is not submitted in conformity with an agreement or rules of a group, association, organization, or corporation; BIDDER has not directly or indirectly induced or solicited another Bidder to submit a false or sham Bid; BIDDER has not solicited or induced a person, firm, or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself an advantage over another BIDDER or over OWNER.

I. BIDDER has received the following Addenda receipt of which is hereby acknowledged:

Date/Number	Date/Number
_____	_____
_____	_____
_____	_____

BASE BID

3. BIDDER will complete the Work in accordance with the Contract Documents for the following STIPULATED-SUM BID PRICE:

   $_____(in words)

   $ _____(in figures)

ALTERNATES

4. Alternate #1 – Replacement of Exhaust Fans

   ADD $ _____

5. Alternate #2 – Installation of exhaust fan/unit heater serving Chemical Storage

   ADD $ _____

6. Alternate #3 – Installation of roof access from Penthouse Electrical Room

   ADD $ _____

7. Alternate #4 – Replacement of two inline circulation pumps in Basement Pump Room

   ADD $ _____

BIDDER agrees that the Work will be substantially complete and ready for final payment in accordance with the General Conditions on or before the dates or within the number of calendar days indicated in the Information for Bidders, Section 00150.

SUBMITTED: _____, 20 _____.
TYPE or PRINT date and time of bid submission Here

****SUBMIT BID FORM AND ALL ATTACHMENTS IN DUPLICATE****

The following attached documents are made a condition of this Bid:

Attachments:

1. Bid Security - (Required for Base bids equal to or greater than $10,000.00)
2. Non - Collusion Affidavit
3. MBE/WBE Utilization Form

By: **When Bidder is an Individual** Date:_____

_____ (SEAL)
(Legal Name of Contracting Firm Name)

Business Address: _____

Phone Number: _____ Fax: _____

_____ _____
(Signature of Person Authorized to Sign) (Signature of Witness)

_____ _____
(Printed name and Title of Person Authorized to Sign) (Printed name of Witness)

By: **When Bidder is a Partnership** Date:_____

_____ (SEAL)
(Legal Name of Contracting Firm Name)

Business Address: _____

Phone Number: _____ Fax: _____

_____ _____
(Signature of Partner Authorized to Sign) (Signature of Witness)

_____ _____
(Printed name of Partner Authorized to Sign) (Printed name of Witness)

_____ _____
(Signature of Partner Authorized to Sign) (Signature of Witness)

_____ _____
(Printed name of Partner Authorized to Sign) (Printed name of Witness)

By: **When Bidder is a Corporation** Date:_____

_____ (SEAL)
(Legal Name of Corporation)

Incorporated under the laws of : _____
(Printed Name of State)

Business Address: _____

Phone Number: _____ Fax: _____

_____ _____
(Signature of Authorized Officer) (Signature of Corporate Secretary)

_____ _____
(Printed name and Title of Authorized Officer) (Printed name of Corporate Secretary)

By: **When Bidder is a Limited Liability Corporation (LLC)** Date:_____

_____ (SEAL)
(Legal Name of Limited Liability Corporation [LLC])

Incorporated under the laws of : _____
(Printed Name of State)

Business Address: _____

Phone Number: _____ Fax: _____

_____ _____
(Signature of Authorized Officer) (Signature of Corporate Secretary)

_____ _____
(Printed name and Title of Authorized Officer) (Printed name of Corporate Secretary)

END OF BID FORM

SECTION 01230 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate Number 1 – Replacement of two exhaust fans on the roof serving the Evans Gym Pool.

B. Alternate Number 2 – Installation of exhaust fan and replacement of the unit heater serving the Chemical Storage Room.

C. Alternate Number 3 – Installation of a Roof Access from the Penthouse Electrical Room: Submit cost to demolish and remove existing exterior wall of Electrical Room 200 and provide masonry lintel, patch opening and mount metal ladder and exterior grade door for roof access. In addition existing interior and exterior conduit and wiring shall be re-routed to accommodate new door.

D. Alternate Number 4 – Replacement of two inline circulation pumps in Basement Pump Room: Submit Cost to remove and replace the two inline circulators and associated trim. In addition, clean and insulate heating water piping in Basement Pump Room.

END OF SECTION 01230

SECTION 15083 - PIPE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Division 15 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
2. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
3. Removable insulation at piping specialties and equipment connections.
4. Application of field-applied jackets.

C. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label

insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less and smoke-developed rating of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

1.7 SCHEDULING

A. Schedule insulation application after testing piping systems. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Mineral-Fiber Insulation:

a. CertainTeed Manson.
b. Knauf FiberGlass GmbH.
c. Owens-Corning Fiberglas Corp.
d. Schuller International, Inc.

2. Cellular-Glass Insulation:

a. Pittsburgh-Corning Corp.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:

    a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
    b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
5. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
6. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
7. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

B. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.

1. Preformed Pipe Insulation, without Jacket: Comply with ASTM C 552, Type II, Class 1.
2. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2.

C. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in performing insulation to cover valves, elbows, tees, and flanges.

2.3 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.

1. Adhesive: As recommended by insulation material manufacturer.
2. PVC Jacket Color: White.
3. PVC Jacket Color: Color-code piping jackets based on materials contained within the piping system.

D. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
2. Adhesive: As recommended by insulation material manufacturer.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, pre-sized a minimum of 8 oz./sq. yd..

1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide:

1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Apply multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

H. Keep insulation materials dry during application and finishing.

I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

J. Apply insulation with the least number of joints practical.

K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

M. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

N. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

O. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Circumferential Joints: Cover with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c.
3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

P. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.
2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal metal jacket to roof flashing with vapor-retarder mastic.

Q. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

R. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

5. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.
4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

5. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
6. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.
7. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

3.5 CELLULAR-GLASS INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.
5. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of cellular-glass insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.
4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with

manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

5. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply pre-molded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.6 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of jacket manufacturer's recommended adhesive.
3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Apply PVC jacket where indicated, with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

C. Apply metal jacket where indicated, with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

D. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

3.7 FINISHES

A. Insulation: Paint insulation finished as specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Color: Final color as selected by Owner's Representative. Vary first and second coats to allow visual inspection of the completed Work.

3.8 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Vibration-control devices.
3. Fire-suppression piping.
4. Drainage piping located in crawl spaces, unless otherwise indicated.
5. Below-grade piping, unless otherwise indicated.
6. Chrome-plated pipes and fittings, unless potential for personnel injury.

3.10 FIELD QUALITY CONTROL

A. Inspection: Owner will engage a qualified inspection agency to perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:

B. Inspection: Engage a qualified inspection agency to perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:

C. Inspection: Perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:

1. Inspect fittings and valves randomly selected by Owner's Representative.
2. Remove fitting covers from 20 elbows or 1 percent of elbows, whichever is less, for various pipe sizes.
3. Remove fitting covers from 20 valves or 1 percent of valves, whichever is less, for various pipe sizes.

D. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

E. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

3.11 INSULATION APPLICATION SCHEDULE, GENERAL

A. Refer to insulation application schedules for required insulation materials, vapor retarders, and field-applied jackets.

B. Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements.

3.12 INSULATION APPLICATION SCHEDULE

A. Refrigerant, Condensate, and Equipment Drain:

1. All Pipe Sizes
2. Insulation Material: Mineral fiber with jacket
3. Insulation Thickness: Apply the following insulation thicknesses:

   a. Copper Pipe, ¾" – 1": 1 "
   b. Copper and steel, 1 ½"-4": 1"

4. Field-Applied Jacket: None Typical; for interior: Provide canvas Jacket; for exterior spaces provide PVC jacket.
5. Vapor Retarder Required: Yes.
6. Finish: None.

B. Heating Water Supply and Return, 200 Deg F and below:

1. NPS 12 and Smaller: Insulation shall be any of the following:

   a. Mineral-Fiber, Preformed Pipe, Type I: 1 inch thick.

2. Field-Applied Jacket: None Typical; for interior spaces: Provide canvas Jacket.

END OF SECTION 15083

SECTION 15110 - VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following general-duty valves:

1. Bronze angle valves.
2. Copper-alloy ball valves.
3. Ferrous-alloy ball valves.
4. Ferrous-alloy butterfly valves.
5. Bronze check valves.
6. Ferrous-alloy wafer check valves.
7. Spring-loaded, lift-disc check valves.
8. Bronze globe valves.

B. Related Sections include the following:

1. Division 15 Section "Mechanical Identification" for valve tags and charts.
2. Division 15 piping Sections for specialty valves applicable to those Sections only.

1.3 DEFINITIONS

A. The following are standard abbreviations for valves:

1. CWP: Cold working pressure.
2. EPDM: Ethylene-propylene-diene terpolymer rubber.
3. NBR: Acrylonitrile-butadiene rubber.
4. PTFE: Polytetrafluoroethylene plastic.
5. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

A. ASME Compliance ASME B31.9 for building services piping valves.

1. Exceptions: Domestic hot- and cold-water, sanitary waste, and storm drainage piping valves unless referenced.

B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VALVES, GENERAL

A. Refer to Part 3 "Valve Applications" Article for applications of valves.

B. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.

C. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

F. Ball Valves: Full port type.

G. Valve Actuators:

1. Handwheel: For valves other than quarter-turn types.
2. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.
3. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.

H. Extended Valve Stems: On insulated valves.

I. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

J. Valve Grooved Ends: AWWA C606.

1. Solder Joint: With sockets according to ASME B16.18.

a. Caution: Use solder with melting point below 840 deg F for angle, check, gate, and globe valves; below 421 deg F for ball valves.

2. Threaded: With threads according to ASME B1.20.1.

K. Valve Bypass and Drain Connections: MSS SP-45.

2.3 COPPER-ALLOY BALL VALVES

A. Manufacturers:

1. Two-Piece, Copper-Alloy Ball Valves:

a. Conbraco Industries, Inc.; Apollo Div.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Div.
e. Grinnell Corporation.
f. Hammond Valve.
g. Jamesbury, Inc.

h. Milwaukee Valve Company.
i. NIBCO INC.
j. Watts Industries, Inc.; Water Products Div.

B. Copper-Alloy Ball Valves, General: MSS SP-110.

C. Two-Piece, Copper-Alloy Ball Valves: Bronze body with full port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.

2.4 FERROUS-ALLOY BALL VALVES

A. Manufacturers:

1. Conbraco Industries, Inc.; Apollo Div.
2. Crane Co.; Crane Valve Group; Stockham Div.
3. Flow-Tek, Inc.
4. Hammond Valve.
5. Jamesbury, Inc.
6. Milwaukee Valve Company.
7. NIBCO INC.
8. Worcester Controls.

B. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends.

C. Ferrous-Alloy Ball Valves: Class 150, full port.

2.5 FERROUS-ALLOY BUTTERFLY VALVES

A. Manufacturers:

1. Flangeless, Ferrous-Alloy Butterfly Valves:

a. Bray International, Inc.
b. Crane Co.; Crane Valve Group; Stockham Div.

2. Grooved-End, Ductile-Iron Butterfly Valves:

a. Bray International, Inc.
b. Crane Co.; Crane Valve Group; Stockham Div.

B. Ferrous-Alloy Butterfly Valves, General: MSS SP-67, Type I, for tight shutoff, with disc and lining suitable for potable water, unless otherwise indicated. Bray High Performance or Crane Flowseal High Performance.

C. Flangeless, 150-psig CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer type with one- or two-piece stem. Bray High Performance or Crane Flowseal High Performance.

D. Grooved-End, 175-psig CWP Rating, Ferrous-Alloy Butterfly Valves: Ductile-iron or steel body with grooved or shouldered ends. Bray High Performance or Crane Flowseal High Performance.

2.6 BRONZE CHECK VALVES

A. Manufacturers:

1. Type 2, Bronze, Horizontal Lift Check Valves with Nonmetallic Disc:

a. Cincinnati Valve Co.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Div.
e. Walworth Co.
f. Type 2, Bronze, Vertical Lift Check Valves with Nonmetallic Disc:
g. Grinnell Corporation.
h. Kitz Corporation of America.
i. Milwaukee Valve Company.

2. Type 4, Bronze, Swing Check Valves with Metal Disc:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Div.
d. Grinnell Corporation.
e. Hammond Valve.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Watts Industries, Inc.; Water Products Div.

B. Bronze Check Valves, General: MSS SP-80.

C. Type 2, Class 125, Bronze, Horizontal Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

D. Type 2, Class 125, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

E. Type 4, Class 150, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

2.7 SWING CHECK VALVES

A. Manufacturers:

1. Grooved-End, Ductile-Iron Swing Check Valves:

a. Grinnell Corporation.
b. Mueller Co.
c. Victaulic Co. of America.

B. 175-psig CWP Rating, Grooved-End, Swing Check Valves: Ductile-iron body with grooved or shouldered ends.

2.8 SPRING-LOADED, LIFT-DISC CHECK VALVES

A. Manufacturers:

1. Type I and II, Compact-Wafer, Lift-Disc Check Valves:

a. Grinnell Corporation.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.

2. Type IV, Threaded Lift-Disc Check Valves:

a. Grinnell Corporation.
b. Legend Valve & Fitting, Inc.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Watts Industries, Inc.; Water Products Div.

B. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.

C. Type I, Class 125, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.

D. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.

E. Type IV, Class 125, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

2.9 BRONZE GLOBE VALVES

A. Manufacturers:

1. Type 1, Bronze Globe Valves with Metal Disc:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Div.
d. Grinnell Corporation.
e. Hammond Valve.
f. Legend Valve & Fitting, Inc.
g. Milwaukee Valve Company.
h. NIBCO INC.

2. Type 2, Bronze Globe Valves with Nonmetallic Disc:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Div.
d. Grinnell Corporation.
e. Hammond Valve.
f. Milwaukee Valve Company.
g. NIBCO INC.

B. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 1, Class 125, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.

D. Type 2, Class 150, Bronze Globe Valves: Bronze body with nonmetallic PTFE or TFE disc and union-ring bonnet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, or plug valves.
2. Throttling Service: Ball, butterfly, or globe valves.
3. Pump Discharge: Spring-loaded, lift-disc check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Heating, Piping: Use the following types of valves:

1. Ball Valves, NPS 2 and Smaller: Two piece, 400-psig CWP rating, copper alloy.
2. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 125 horizontal or vertical, bronze.
3. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 150, bronze.
4. Spring-Loaded, Lift-Disc Check Valves, NPS 2 and Smaller: Type IV, Class 125 minimum.
5. Globe Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
6. Plug Valves, NPS 2 and Larger: Class 125 or 150, nonlubricated-type, cast iron.

D. Select valves, except wafer and flangeless types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Solder-joint or threaded ends, except provide valves with threaded ends for heating hot water services.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded ends.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded ends.
5. For Steel Piping, NPS 5 and Larger: Flanged ends.
6. For Grooved-End, Copper Tubing and Steel Piping: Valve ends may be grooved. Do not use for steam or steam condensate piping.

3.3 VALVE INSTALLATION

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

F. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

3.4 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 15110

SECTION 15120 - PIPING SPECIALITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pressure gages.
2. Pressure gage taps.
3. Thermometers.
4. Thermometer supports.
5. Test plugs.
6. Strainers.
7. Pump suction fittings.
8. Orifice flowmeters.
9. Relief valves.
10. Air Vents.

B. Related Sections:

1. Section 15180 - Heating Water Piping: Execution requirements for piping connections to products specified by this section.
2. Section 15185 - Pumps: Execution requirements for piping connections to products specified by this section.

1.2 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

B. ASTM International:

1. ASTM A105/A105M - Standard Specification for Carbon Steel Forgings for Piping Applications.
2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
3. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
4. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
5. ASTM E1 - Standard Specification for ASTM Thermometers.
6. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

C. American Water Works Association:

1. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
2. AWWA C702 - Cold-Water Meters - Compound Type.
3. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
4. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

D. Underwriters Laboratories Inc.:

1. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.
2. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service.

1.3 PERFORMANCE REQUIREMENTS

A. Flexible Connectors: Provide at or near pumps compressors and motorized equipment where piping configuration does not absorb vibration.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit for manufactured products and assemblies used in this Project.

1. Manufacturer's data and list indicating use, operating range, total range, accuracy, and location for manufactured components.
2. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each piping specialty.
4. Submit electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures, application, selection, and hookup configuration. Include pipe and accessory elevations.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

B. Project Record Documents: As-Built Record drawings indicting actual locations of actual locations of components and instrumentation.

C. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Accept piping specialties on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Product Requirements.

B. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

1.9 FIELD MEASUREMENTS

A. Verify field measurements before fabrication.

1.10 WARRANTY

A. Section 01700 - Execution Requirements: Product warranties and product bonds.

B. Furnish one year manufacturer warranty for piping specialties.

1.11 MAINTENANCE SERVICE

A. Section 01700 - Execution Requirements: Maintenance service.

1.12 MAINTENANCE MATERIALS

A. Section 01700 - Execution Requirements: Spare parts and maintenance materials.

B. Furnish two bottles of red gage oil for static pressure gages.

PART 2 - PRODUCTS

2.1 THERMOMETERS (Solar Digital)

A. Manufacturers:

1. Ernst Gage Co.
2. Eugene Ernst Products Co.
3. Marsh Bellofram.
4. Trerice, H. O. Co.
5. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Model SX9 by H. O. Trerice Co.

C. Case: Aluminum, 7 inches long.

D. Digital display, LCD switciable between F and C.

E. Sensor: Glass passivated thermistor

F. Window: Glass or plastic.

G. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

H. Stem: Metal, for thermowell installation and of length to suit installation.

1. Accuracy: Plus or minus 1 percent of range or plus or maximum of 1.5 percent of range.

2.2 DUCT-TYPE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers:

1. Miljoco Corp.
2. Palmer - Wahl Instruments Inc.
3. Trerice, H. O. Co.
4. Weiss Instruments, Inc.

B. Case: Metal or plastic, 7 inches (178 mm) long.

C. Tube: Red or blue reading, organic filled, with magnifying lens.

D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.

E. Window: Glass or plastic.

F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

G. Stem: Metal, for installation in mounting bracket and of length to suit installation.

H. Mounting Bracket: Flanged fitting for attachment to duct and made to hold thermometer stem.

I. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.3 THERMOWELLS

A. Manufacturers:

1. AMETEK, Inc.; U.S. Gauge Div.
2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
3. Ernst Gage Co.
4. Marsh Bellofram.
5. Tel-Tru Manufacturing Company.
6. Trerice, H. O. Co.
7. Weiss Instruments, Inc.
8. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Manufacturers: Same as manufacturer of thermometer being used.

C. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.4 PRESSURE GAGES

A. Manufacturers:

1. AMETEK, Inc.; U.S. Gauge Div.
2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
3. Marsh Bellofram.
4. Trerice, H. O. Co.
5. Weiss Instruments, Inc.
6. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Liquid-filled type, drawn steel or cast aluminum, 6-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: other dark-color metal.

7. Window: Glass or plastic.
8. Ring: Metal.
9. Accuracy: Grade B, plus or minus 2 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:

1. Valves: NPS 1/4 brass or stainless-steel needle type.
2. Syphons: NPS 1/4 coil of brass tubing with threaded ends.
3. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.5 TEST PLUGS

A. Manufacturers:

1. Flow Design, Inc.
2. MG Piping Products Co.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Trerice, H. O. Co.
6. Watts Industries, Inc.; Water Products Div.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for air, water, oil, or gas service at 20 to 200 deg F shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F shall be EPDM.

E. Test Kit: Furnish one test kit containing one pressure gage and adaptor, two thermometer(s), and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit test plugs and of length to project into piping.

1. Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch-diameter dial and probe. Dial range shall be 0 to 200 psig.
2. Low-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial ranges shall be 25 to 125 deg F.
3. High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F.

4. Carrying case shall have formed instrument padding.

F. Socket: Brass separable sockets for thermometer stems with or without extensions, and with cap and chain.

G. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.6 STRAINERS

A. Size 2 inch and Smaller:

1. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 2-1/2 inch to 4 inch:

1. Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

2.7 PUMP SUCTION FITTINGS

A. Manufacturers:

1. ITT Bell Gossett
2. Taco MFG Co.
3. Armstrong Pumps
4. Or Approved Equal

B. Fitting: Angle pattern, cast-iron body. Threaded for 2 inch (50 mm) and smaller, flanged for 2-1/2 inch (65 mm) and larger. Rated for 175 psig (1200 kPa) working pressure, with inlet vanes, cylinder strainer with 3/16 inch (5 mm) diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.

C. Accessories: Adjustable foot support, blow-down tapping in bottom, gage tapping in side.

2.8 PRESSURE REDUCING VALVES

A. Manufacturers:

1. Watts
2. Zurn
3. Keystone
4. Or Approved Equal

B. Bronze body, stainless or chrome steel valve spring, stem, and trim, phosphor bronze diaphragm, direct acting, threaded 2 inches (50 mm) and smaller, flanged 2 inches (50 mm) and larger.

2.9 AIR VENTS

A. Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150-psig working pressure; 240 deg F operating temperature; with NPS 1/4 discharge connection and NPS ½ inlet connection.

2.10 SAFETY RELIEF VALVES

A. Manufacturers:

1. Watts
2. Zurn
3. Keystone
4. Or Approved Equal

B. Valve: Bronze body, stainless steel valve spring, stem, and trim, direct pressure actuated, capacities ASME certified and labeled.

C. Accessories: Drip-pan elbow.

PART 3 - EXECUTION

3.1 INSTALLATION - THERMOMETERS AND GAGES

A. Install pressure gages for each pump, locate on taps before strainers and on suction and discharge of pump; a minimum of three gages.

B. Install gage taps in piping

C. Install pressure gages with pulsation dampers. Provide ball valve to isolate each gage. Extend nipples to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches (65 mm) for installation of thermometer sockets. Allow clearance from insulation.

E. Install thermometers in air duct systems on flanges.

F. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets.

G. Locate duct-mounted thermometers minimum 10 feet (3 m) downstream of mixing-dampers, coils, or other devices causing air turbulence.

H. Coil and conceal excess capillary on remote element instruments.

I. Install static pressure gages to measure across filters and filter banks, (inlet to outlet). On multiple banks, provide manifold and single gage.

J. Provide instruments with scale ranges selected according to service with largest appropriate scale.

K. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

L. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.2 INSTALLATION - HYDRONIC PIPING SPECIALTIES

A. Locate test plugs adjacent to thermometers and thermometer sockets as indicated on Drawings.

B. Where large air quantities accumulate, provide enlarged air collection standpipes.

C. Install manual air vents at system high points.

D. For automatic air vents in ceiling spaces or other concealed locations, install vent tubing to nearest drain.

E. Provide air separator on suction side of system circulation pump and connect to expansion tank.

F. Provide drain and hose connection with valve on strainer blow down connection.

G. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems.

H. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps.

I. Support pump fittings with floor mounted pipe and flange supports.

J. Provide radiator valves on water inlet for the following terminal heating unit types: radiation, unit heaters, and fan coil units.

K. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.

L. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

M. Pipe relief valve outlet to nearest floor drain.

N. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

3.3 ADJUSTING

A. Calibrate meters according to manufacturer's written instructions, after installation.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and Inspection Services 01700 - Execution Requirements: Testing, adjusting, and balancing.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01700 - Execution Requirements: Requirements for protecting installed construction.

B. Remove thermostatic elements from steam traps during temporary and trial usage, and until system has been operated and dirt pockets cleaned of sediment and scale.

C. Do not install hydronic pressure gauges until after systems are pressure tested.

END OF SECTION 15120

SECTION 15140 - HEATING WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes domestic water piping from locations indicated to fixtures and equipment inside the building.

1.2 SUBMITTALS

A. Water Samples: Specified in "Cleaning" Article in Part 3.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Transition Couplings: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

2.2 VALVES AND SPECIALTIES

A. Refer to Division 15 Section "Valves" for bronze and cast-iron, general-duty valves.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Domestic Water Piping: Use the following piping materials for each size range:

1. 2 ½" and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

3.2 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 and smaller.
2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller.
3. Drain Duty: Hose-end drain valves.

B. Isolation valves at all fixtures shall be required to allow equipment Isolation from domestic water service main for maintenance and repair.

3.3 PIPING INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

B. Install water piping level without pitch and plumb.

C. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

D. Perform appropriate county start-up measures prior to system operation.

E. Check equipment and verify proper settings, adjustments, and operation.

F. Check piping specialties and verify proper settings, adjustments, and operation.

G. Energize pumps and verify proper operation.

3.4 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 VALVE INSTALLATION

A. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

B. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 and smaller.

C. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.
2. Install stop-and-waste drain valves where indicated.

3.6 HANGER AND SUPPORT INSTALLATION

A. Install supports according to Division 15 Section "Hangers and Supports."

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

E. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect water piping to existing system piping with shutoff valve, and extend and connect to the following:

1. Heating Coil: water supply and return piping in sizes indicated. Refer to Division 15 Section "Piping Specialties."

3.8 FIELD QUALITY CONTROL

A. Inspect water piping as follows:

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test water piping as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow standing for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action. Test reports shall indicate section of the piping system tested with a drawing representation of tested areas, duration of test, pressures maintained, repair work performed with location shown on drawings, and signature of project superintendent affirming that the system has passed the testing process in accordance with the specification.

3.9 CLEANING

A. Clean and disinfect water piping as follows:

1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

a. Flush piping system with clean, potable water until dirty water does not appear at drain outlets.
b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of water piping system. Remove dirt and debris as work progresses.

END OF SECTION 15140

SECTION 15185 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Close coupled, in-line centrifugal pumps.

1.3 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Shop Drawings: Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

C. 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.

D. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store pumps in dry location.

C. Retain protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Pumps Inc.
2. ITT Corporation; Bell & Gossett (BASIS OF DESIGN).
3. TACO Incorporated.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically.

C. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, replaceable bronze wear rings, and threaded companion-flange connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Seal: EPT carbon/ceramic seal.
5. Pump Bearings: Permanently lubricated ball bearings.

D. Motor: Single speed and rigidly mounted to pump casing.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 15058 "Common Motor Requirements for HVAC Equipment."

E. Accessories: Provide manufacturer's standard paint to apply and additional coat after installation.

F. Capacities and Characteristic:

1. See Drawings for schedules.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

A. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

B. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

C. Apply and additional coat of manufacturer's standard paint after installation.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pump to allow service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install pressure gages on pump suction and discharge.

F. Install electrical connections for power, controls, and devices.

G. Ground equipment according to Division 16 section "Grounding".

H. Connect wiring according to Division 16.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Perform the following startup checks for each pump before starting:

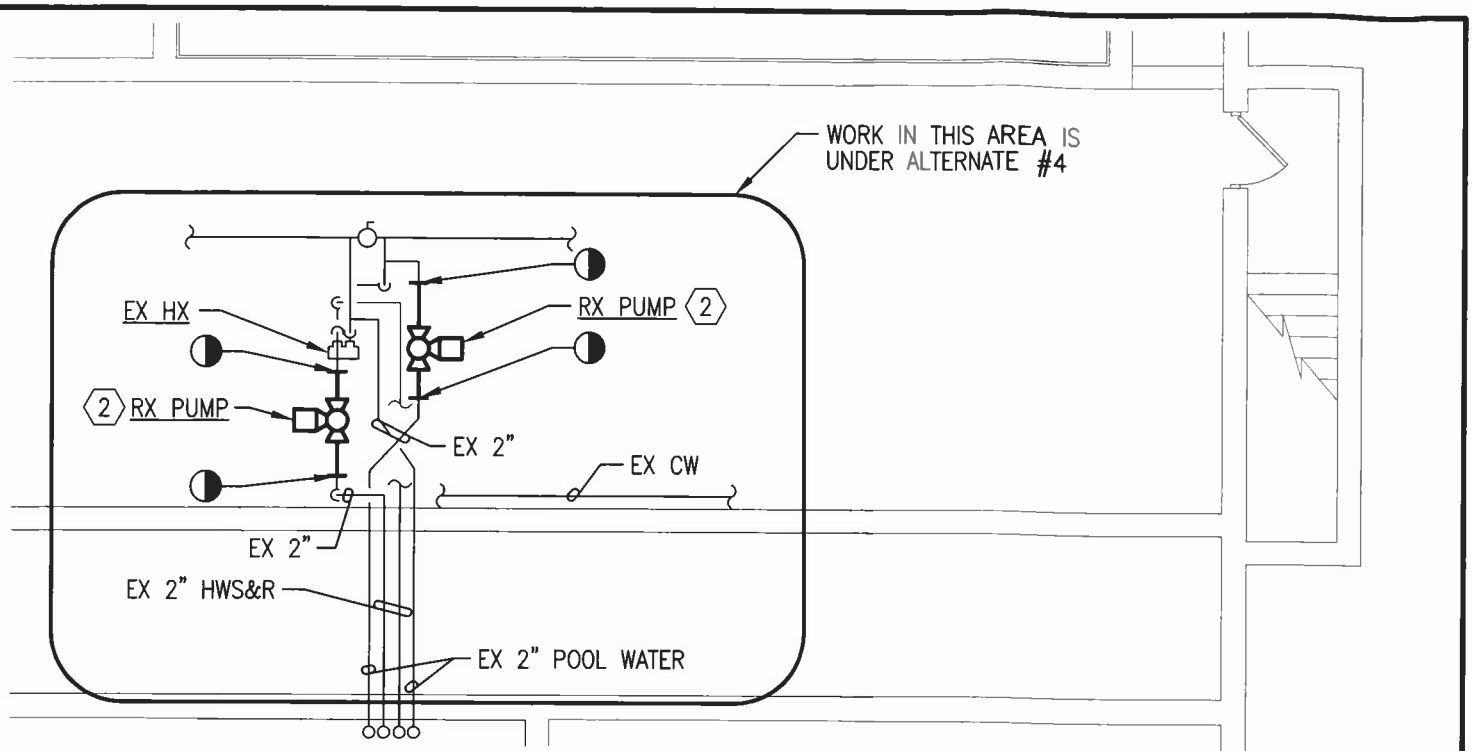
    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in the correct direction.

5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
6. Start motor.
7. Open discharge valve slowly.

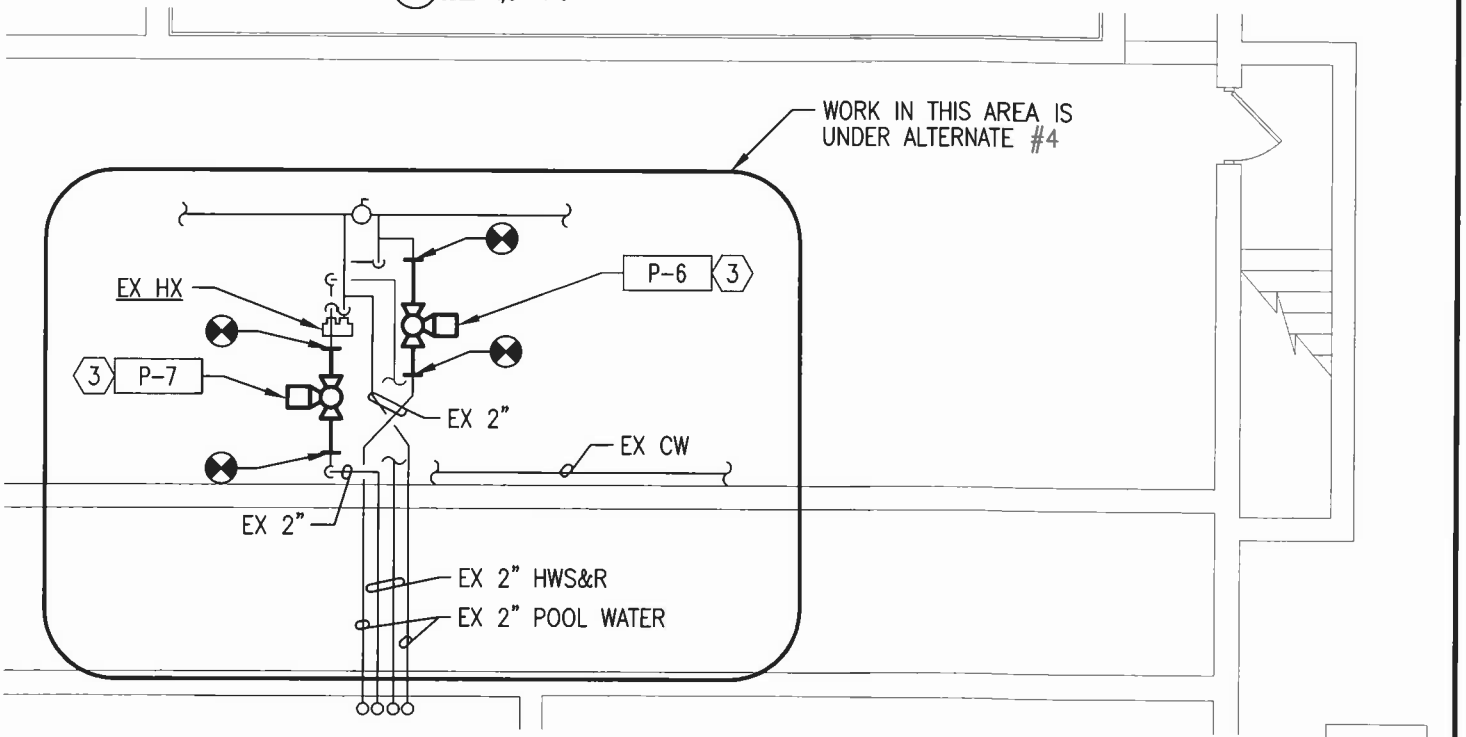
3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 15185



(4) M101 **MECHANICAL DEMOLITION – BASEMENT PUMP ROOM**
SCALE: 1/8" = 1'-0"

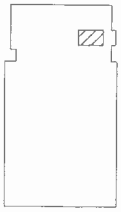


(5) M101 **MECHANICAL NEW WORK – BASEMENT PUMP ROOM**
SCALE: 1/8" = 1'-0"

SHEET KEYNOTES:

(2) REMOVE EXISTING PUMP AND BALANCING VALVE.

(3) NEW PUMP. SEE DETAIL (4/M201). CLEAN EXISTING PIPE TO REMAIN AND INSULATE EXTENT OF EXPOSED COPPER PIPING IN MECHANICAL ROOM



KEYPLAN
SCALE: NOT TO SCALE

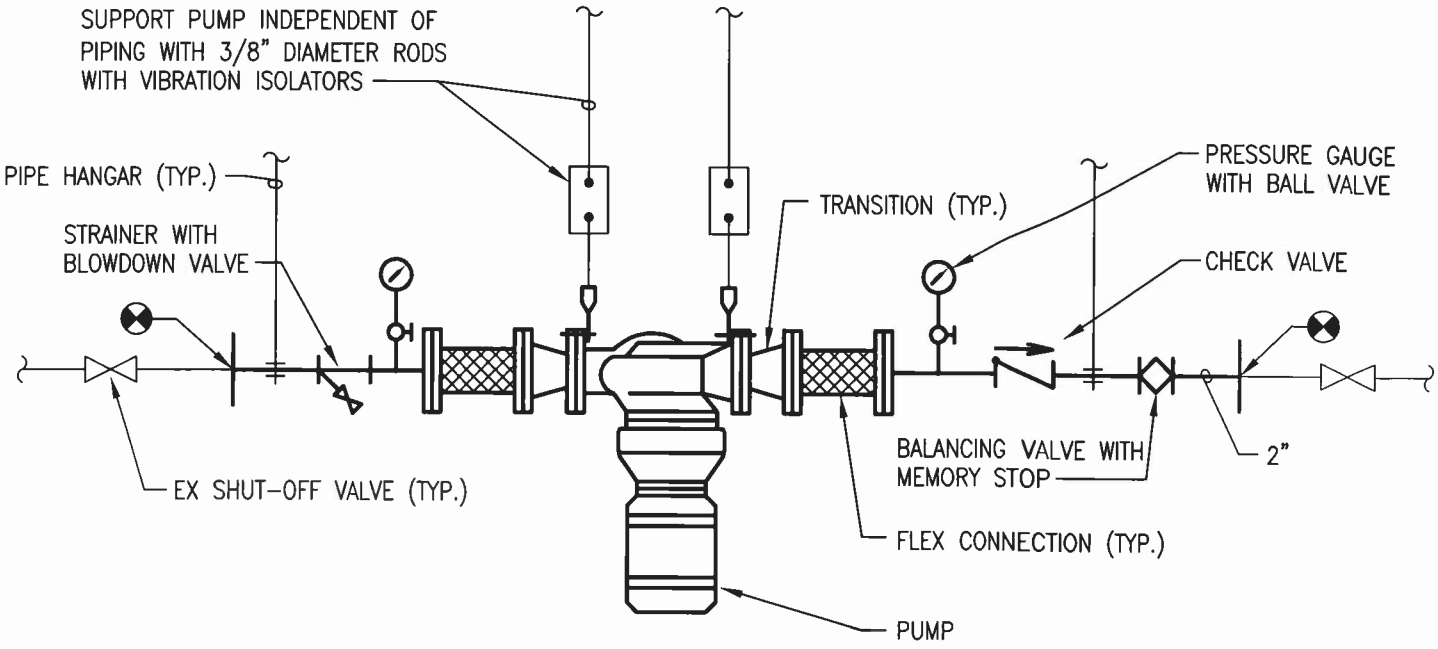
JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future®
72 Loveton Circle Baltimore, Maryland 21152-0949
220 St. Charles Way, Suite 200 York, PA 17402

UNIT HVAC REPLACEMENT
FOR EVANS GYM POOLS
HARRISBURG CAMPUS
ONE HACC DRIVE
HARRISBURG, PA
17110-2999

HACC
HARRISBURG
CENTRAL PENNSYLVANIA'S COMMUNITY COLLEGE

HACC
HARRISBURG AREA
COMMUNITY COLLEGE

ADDENDUM No. 2: SK-1
DWG REF No.: M-101
DATE: 6/15/2011



NOTE:
1. PUMP SHALL BE INSTALLED HORIZONTAL.

4 M501 **CIRCULATING PUMP**
SCALE: NOT TO SCALE

PUMP SCHEDULE

DESIG.	LOCATION	SERVICE	TYPE	GPM	FLUID PD Ft. H2O	RPM	HP	ELEC	BASIS	NOTES
P-6	MECH RM	POOL WATER	IN-LINE CENTRIFUGAL	40	50	1750	2	480/3	B&G 1.5X1.5X9.5 SERIES 80	1
P-7	MECH RM	BOILER WATER	IN-LINE CENTRIFUGAL	40	50	1750	2	480/3	B&G 1.5X1.5X9.5 SERIES 80	1

NOTES:
1.) SEE M-501 FOR INSTALLATION DETAIL AND CONTROLS.

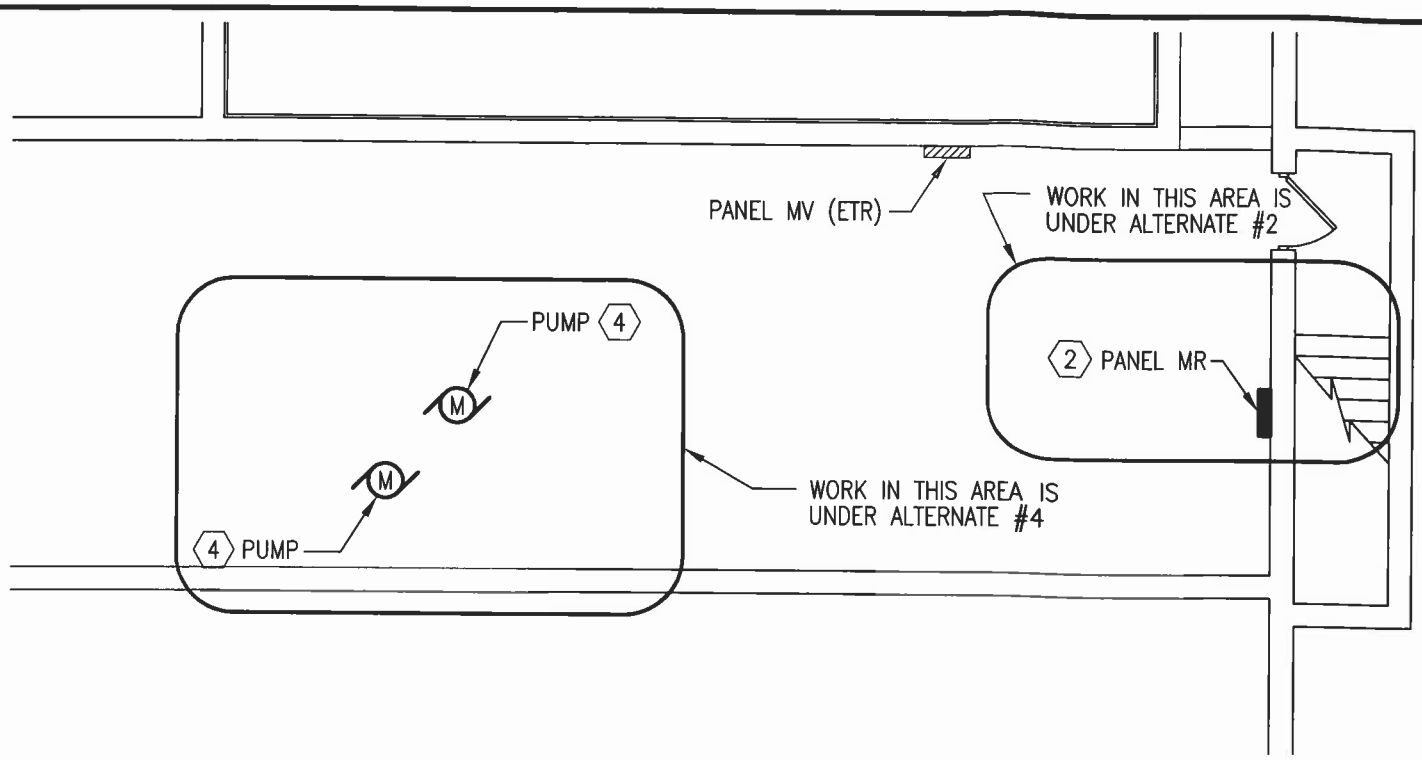
JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future®
72 Loveton Circle Baltimore, Maryland 21152-0949
220 St. Charles Way, Suit 200 York, PA 17402

UNIT HVAC REPLACEMENT
FOR EVANS GYM POOLS
HARRISBURG CAMPUS
ONE HACC DRIVE
HARRISBURG, PA
17110-2999

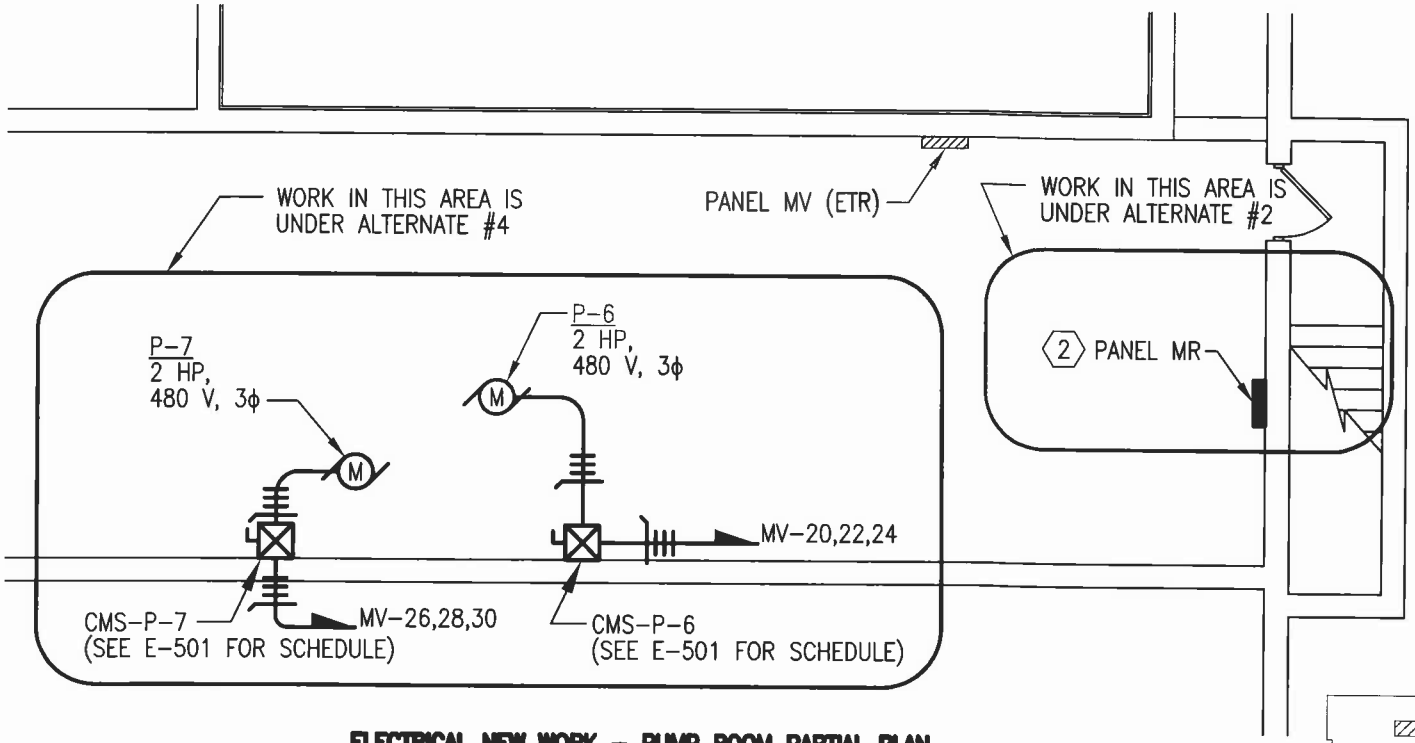
HACC
CENTRAL PENNSYLVANIA'S COMMUNITY COLLEGE
HARRISBURG

HACC
HARRISBURG AREA
COMMUNITY COLLEGE

ADDENDUM No. 2: SK-2
DWG REF No.: M-501
DATE: 6/15/2011



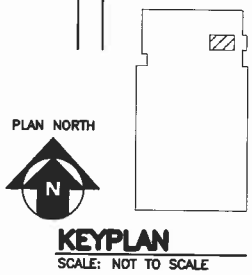
ELECTRICAL DEMO WORK – PUMP ROOM PARTIAL PLAN
SCALE: 1/8" = 1'0"



ELECTRICAL NEW WORK – PUMP ROOM PARTIAL PLAN
SCALE: 1/8" = 1'0"

SHEET KEYNOTES:

4 DISCONNECT EXISTING PUMP AND REMOVE ASSOCIATED STARTER/DISCONNECT SWITCH, JUNCTION BOXES, WIRING AND CONDUIT. REMOVE CONDUIT AND WIRING BACK TO SOURCE.



KEYPLAN
SCALE: NOT TO SCALE

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future®
72 Loveton Circle Baltimore, Maryland 21152-0949
220 St. Charles Way, Suit 200 York, PA 17402

UNIT HVAC REPLACEMENT
FOR EVANS GYM POOLS
HARRISBURG CAMPUS
ONE HACC DRIVE
HARRISBURG, PA
17110-2999

HACC HARRISBURG

HACC
HARRISBURG AREA COMMUNITY COLLEGE

ADDENDUM No. 2: SK-3
DWG REF No.: E-101
DATE: 6/15/2011

COMBINATION MOTOR STARTER DISCONNECT SCHEDULE

DESIGNATION	VOLTS	POLES	NEMA ENCL.	MOTOR HP	DISCONNECT			MOTOR STARTER					CONTROLS					COMMENTS
					CIRCUIT BREAKER	DISC. SWITCH	DUAL ELEMENT FUSE	TYPE	NEMA SIZE	COIL VOLTS	AUX. CONTACT	O.L. HTR.	XFMR	PUSH BUTTON	PILOT LIGHT	SEL. SWITCH	NOTES	
CMS-P-6	480V	3	1	2	N/A	30A	6 A	FVNR	0	120V	2NO 2NC	NOTE 1	NOTE 2	N/A	NOTE 3	NOTE 6	NOTE 4	NOTE 7
CMS-P-7	480V	3	1	2	N/A	30A	6 A	FVNR	0	120V	2NO 2NC	NOTE 1	NOTE 2	N/A	NOTE 3	NOTE 6	NOTE 4	NOTE 7

NOTES:
1. E.C. SHALL SIZE OVERLOAD HEATERS IN FIELD PER ACTUAL MOTOR NAMEPLATE DATA.
2. UNIT SHALL BE EQUIPPED WITH CONTROL TRANSFORMER WITH 480V PRIMARY AND 120V FUSED SECONDARY.
3. UNIT SHALL BE EQUIPPED WITH RED "RUN" AND GREEN "OFF" PUSH TO TEST TYPE PILOT LIGHTS.
4. COORDINATE WITH BUILDING MANAGEMENT SYSTEM.
5. PUSHBUTTONS SHALL BE RED "RUN" AND GREEN "STOP".
6. UNIT SHALL BE EQUIPPED WITH A "HAND-OFF-AUTO" SELECTOR SWITCH.
7. PROVIDE SOLID-STATE OVERLOAD RELAY. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.

EXISTING PANEL

PANEL: MV

AMP: 225 **VOLT: 277/480**

PHASE: 3 **4 WIRE + GND**

MOUNTING: **SURFACE**

MAIN: MLO

AIC: 14K AMPS RMS SYM

LIGHT TEXT - EXISTING TO REMAIN; **BOLD TEXT - PROVIDE or NEW LOAD INDICATED**

Branch Circuit Load Description	KVA Load A	KVA Load B	KVA Load C	Trip Poles	Ckt. No.	Phase	Ckt. No.	Trip Poles	KVA Load A	KVA Load B	KVA Load C	Branch Circuit Load Description
EXISTING LOAD	EX			20/3	1	A	2	20/3	EX			EXISTING LOAD
EXISTING LOAD		EX		**	3	B	4	**		EX		**
EXISTING LOAD			EX	**	5	C	6	**			EX	**
EXISTING LOAD	EX			20/3	7	A	8	20/3	EX			EXISTING LOAD
EXISTING LOAD		EX		**	9	B	10	**		EX		**
EXISTING LOAD			EX	**	11	C	12	**			EX	**
EXISTING LOAD	EX			20/3	13	A	14	20/3	EX			EXISTING LOAD
EXISTING LOAD		EX		**	15	B	16	**		EX		**
EXISTING LOAD			EX	**	17	C	18	**			EX	**
EXISTING LOAD	EX			60/3	19	A	20	15/3	1.33			PUMP 6
EXISTING LOAD		EX		**	21	B	22	**		1.33		**
EXISTING LOAD			EX	**	23	C	24	**			1.33	**
SPACE	0.00			–	25	A	26	15/3	1.33			PUMP 7
SPACE		0.00		–	27	B	28	**		1.33		**
SPACE			EX	–	29	C	30	**			1.33	**
	0.00	0.00	0.00	<< PHASE SUB-TOTALS >>					2.66	2.66	2.66	MECH EQUIPMENT CIRCUIT BRKRS SHALL BE HACR RATED.

PROVIDE THE FOLLOWING

PHASE A	2.66	kVA
PHASE B	2.66	kVA
PHASE C	2.66	kVA

7.98	kVA TOTAL CONNECTED LOAD
3.99	kVA TOTAL DEMAND LOAD

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future®
72 Loveton Circle Baltimore, Maryland 21152-0948
220 St. Charles Way, Suit 200 York, PA 17402

UNIT HVAC REPLACEMENT
FOR EVANS GYM POOLS
HARRISBURG CAMPUS
ONE HACC DRIVE
HARRISBURG, PA
17110-2999

HACC CENTRAL PENNSYLVANIA'S COMMUNITY COLLEGE HARRISBURG

HACC
HARRISBURG AREA
COMMUNITY COLLEGE

ADDENDUM No. 2: SK-4
DWG REF No.: E-501
DATE: 6/15/2011