



**2KM Architects, Inc.**  
529 Greene Street  
Augusta, GA 30901  
ph. 706.736-3333  
fx. 706.736-7100

## ADDENDUM #1

<b>DATE:</b>	<b>December 23, 2020</b>
<b>PROJECT:</b>	<b>HEPHZIBAH ELEMENTARY SCHOOL HVAC 2542 HWY 88, HEPHZIBAH, GA 30815</b>
<b>PROJECT NUMBER:</b>	<b>B-20-021-1602; 2KM #2020-02</b>

### Part 1 – Specifications:

- 1.101 Reference Bid Requirements, Invitation to Bid, fourth paragraph, Pre-Bid Conference.
- a. The following are made a part of the Contract Documents:
    1. See attached “*Pre-bid Conference Agenda.*”
    2. See attached “*Sign-in Log*” for attendance at Pre-bid Conference.
    3. See attached “*Meeting Notes*” from Pre-bid Conference.
- 1.102 Reference Bid Requirements, Invitation to Bid, first paragraph :
- a. **CHANGE:** Terrace Manor Roof and HVAC Project *to Hephzibah Elementary School HVAC Project.*
- 1.103 Reference Specification Division 23:
- a. **ADD:** Section 23 07 00 HVAC Insulation.

### Part 2 – Drawings:

1.201 N/A

### Part 3 – Contractor RFI Questions:

- 1.301 Question #1: Is there a certain date for Substantial Completion?  
**Response: Yes, substantial completion is to be achieved prior to school reopening in on August 5, 2021.**
- 1.302 Question #2: We cannot find a HVAC Insulation Specification. Can you please provide this?  
**Response: See Attached Specification Section 23 07 00**
- 1.303 Question #3: Will the Furniture in the school be removed and stored by others or do we have to remove the Furniture and store it?  
**Response: No furniture is anticipated to be moved.**

**END OF ADDENDUM #1**

SIGNED BY: Robert L. Mauldin  
Robert L. Mauldin, NCARB, AIA  
Principal Architect, GA-RA-005958

Enclosed: Pre Bid Conference Agenda  
Pre Bid Sign in Sheet  
Pre Bid Meeting Notes  
Section B – Invitation to Bid  
Specification Section 23 07 00



**PRE-BID CONFERENCE AGENDA  
HEPHZIBAH ELEMENTARY SCHOOL  
AUGUSTA, GEORGIA  
PROJECT NUMBER # B-20-021-1602; 2KM#: 2020-02**

**Date:** 12/15/2020

**Location:** *Hephzibah Elementary School  
2524 Hwy. 88 , Hephzibah, GA 30815*

**Time:** 10:00 am

**1. Sign-in:**

- a. Sign and provide complete contact information.
- b. Request all parties sign-in with Full Name, Title, Company Name, Phone Number, Fax Number and E-mail.

**2. Introductions:**

- a. A/E and Owner/GMKA
- b. Facility Representatives.
- c. All attendees.

**3. General Project Overview:**

- a. Building & use.
  - 1) Facility type and general project overview:
    - 2) Existing Elementary School.
- b. Renovations:
  - 1) **Building:**
    - a) General Renovations:
      - i. Reflash new RTU roof curbs (60 mil. EDPM).
      - ii. Reflash & seal any Electrical conduit penetrations.
      - iii. Install Roof Walk Pads at replacement RTUs.
      - iv. Reseal pipe penetrations & wall louvers at exterior walls.
      - v. Firestop seal walls at pipe penetrations.
      - vi. Stencil Fire Rated walls per NFPA 101 (10' o.c.; Fire Rating; etc.)
      - vii. Replace damaged Acoustical Ceiling Tile at HVAC Fan-coil
      - viii. Replacement (Add Alternate)
      - ix. Stencil Fire Rated walls per NFPA 101 (10' o.c.; Fire Rating; etc.)
    - b) Mechanical, HVAC & Plumbing:
      - i. Demo existing Chiller.
      - ii. Demo existing corroded piping and damaged insulation.
      - iii. Demo existing HVAC units
      - iv. Replace existing classroom water source heat pump HVAC units with similar equipment.
      - v. Rebuild existing classroom fresh air preconditioning equipment with similar component.
      - vi. Replace existing water source heat pump plant with similar equipment (cooling tower, boiler, heat exchanger, pumps).
      - vii. Replace existing exhaust fans throughout building with similar equipment.
      - viii. Refrigerant piping will be type ACR rigid copper piping with brazed joints and fittings. Piping insulation will be pre-molded flexible elastomeric cellular material.
      - ix. Low pressure supply and return ductwork will be rectangular shop-fabricated duct rated for 1"WC positive or negative pressure. All supply



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**Time:** 10:00 am

- and return ductwork will be insulated with 2” fiberglass insulation.
- x. All building HVAC controls will be distributed digital/electronic controls with a Web-based system front-end integrated into the Owner’s data network.
- c) Electrical:
  - i. Equipment Power:
    - a) Reconnect new Mechanical Equipment. (one-for-one replacement)
    - b) Reseal Roof conduit penetrations.
    - c) Firestop seal wall conduit penetrations in Mechanical Rooms. (new work areas)
  - ii. Fire Alarm System:
    - a) Reconnect Smoke Detectors in AHU ductwork.
    - b) Recertify Fire Alarm devices & System.
  - iii. Re-lamping of lighting fixtures in Mechanical Rooms may be needed. Fixtures were present and mostly functional.
- c. Schedule: (*See Attached Invitation to Bid*)
  - 1) Bid date: **January 14, 2021 @ 3:00 p.m.**, Due to the Closure of the Richmond County Board of Education Building for COVID-19, completed bid package are to sent to the e-mail address [RCSSBIDS@rcboe.org](mailto:RCSSBIDS@rcboe.org)
  - 2) Construction Days: TBD.
- d. Review unique conditions and constraints of the project, site, and specifications:
  - 1) HVAC/Chiller Replacement:
    - a) Children are present during weekday school schedule.
    - b) Provide temporary barriers and protection for material storage/laydown areas and areas of work.
  - 2) This is an operating campus, occupied building and site.
    - a) Construction paths to be defined by GMKA/RCSS representatives.
    - b) Protect public from work hazards; safety barriers are required. (See phasing diagram)
  - 3) Conduct on Site:
    - a) Identification: all workers to have a valid Government issued Photo I.D. at all times.
    - b) Proper behavior/language & Attire is required from all suppliers, subcontractors and general contractor’s workmen.
- 4. **ADD ALTERNATES:**
  - a. **ADD ALTERNATE #1:**  
Administration HVAC Unit Replacement: Split System Unit Replacement for Administration Area (IHP/OHP-AD1 and IHP/OHP-AD2) to be included.
  - b. **ADD ALTERNATE #2:**  
Data Room HVAC: The addition of Data Room Units (AC/CU-1 and AC/CU-2) to be included.
  - c. **ADD ALTERNATE #3:**  
Remove and replace the Energy Recovery Units.



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- d. **ADD ALTERNATE #4:**  
Owner-preferred HVAC Controls – Automated Logic Corporation (ALC).

**5. ALLOWANCES:**

a. **ALLOWANCE NO. 1:** Unforeseen Conditions Allowance  
Allowance Amount: \$ 40,000.00  
Labor & Materials for unforeseen conditions (concealed work).

b. **ALLOWANCE NO. 4:** Owner Training for HVAC  
Allowance Amount: \$ 2,500.00

**TOTAL ALLOWANCE AMOUNT: \$ 42,500.00**

**6. Phasing: Single Phase**

**7. Addendum #1:**

- a. Clarifications.
- b. Pre-bid Agenda and Sign-In Sheet.

**8. Open for questions.**

**9. Site tour.**



**PRE-BID CONFERENCE SIGN-IN SHEET  
HEPHZIBAH ELEMENTARY SCHOOL  
AUGUSTA, GEORGIA  
PROJECT NUMBER # B-20-021-1602; 2KM#: 2020-02**

**Date:** 12/15/2020  
**Time:** 10:00 am

**Location:** Hephzibah Elementary School  
2524 Hwy. 88, Hephzibah, GA 3081

<b>SIGN IN LOG</b>		
<b>NAME &amp; COMPANY</b>	<b>ADDRESS</b>	<b>PHONE/FAX/EMAIL</b>
Rob Mauldin 2KM Architects, Inc.	529 Greene Street Augusta, GA 30901	PH: 706-736-3333 FX: 706-736-7100 Email: rmauldin@2kmarchitects.com
Todd Zills RCSS Facilities	1781 15 <sup>th</sup> Street Augusta, GA 30901	PH: 706-691-6916 FX: Email: zillsto@boe.richmond.k12.ga.us
Christopher S. Lehi 2KM Architects, Inc. <i>C. Lehi</i>	529 Greene Street Augusta, GA 30901	PH: 706-736-3333 FX: 706-736-7100 Email: mposton@2kmarchitects.com
Doug Shealy GMKA <i>D Shealy</i>	1201 Main Street Suite 2100 Columbia, SC 29201	PH: 803-513-2215 FX: Email: dshealy@gmka.com
Benton Starks RCSS Sr. Director of Facilities	1781 15 <sup>th</sup> Street Augusta, GA 30901	PH: 706-737-7188 FX: Email: starkbe@boe.richmond.k12.ga.us
<i>Kevin Hink</i> <i>Electrical Design Group</i>	<i>1201 Broad St</i> <i>Augusta, GA 30901</i>	PH: <i>706-724-3557</i> FX: Email:
<i>Stefanee Berry</i> <i>Asst Principal</i> <i>Heph Elem</i>		PH: <i>706 592-4561</i> FX: Email: <i>BerrySt1@boe.richmond.k12.ga.us</i>
<i>LORENZO A. MASOLI</i>  <i>CM I</i>	<i>1829</i> <i>Killingsworth Rd.</i> <i>Augusta, GA. 30904</i>	PH: <i>706-667-9033</i> FX: <i>706-667-9034</i> Email: <i>lorenzom@contractmgmtinc.com</i>
<i>CWI</i>	<i>" "</i>	PH: <i>706-667-9033</i> FX: <i>706-667-9034</i> Email: <i>gregory.w@contractmgmtinc.com</i>

*Grant Carledge*  
*PFA*



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**AUGUSTA, GEORGIA**  
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**Date:** 12/15/2020      **Location:** Hephzibah Elementary School  
**Time:** 10:00 am                      2524 Hwy. 88 , Hephzibah, GA 3081

10:00 AM 12-15-2020 Jeff FAIRLEY For Copper Const	Hephzibah Elementry School Standing in for John Miller	PH: 912-537-6420 FX: Email: jmillera@copperga.com
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**Date:** 12/15/2020  
**Time:** 10:00 am

**Location:** Hephzibah Elementary School  
 2524 Hwy. 88, Hephzibah, GA 3081

Billy Herron	ACSS HVAC	PH: 706 251 2560 FX: Email: herrobi@bae-richmond.com
Zach Herron	Silver Sheet Metal	PH: 706-830-1552 FX: Email: zherron@silversheetmetal.com
Christopher Michals	Gold Mech	PH: 706-722-1559 FX: Email: <del>cmichals</del> cmichals@goldmech.com
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**Time:** 10:00 am

**Location:** Hephzibah Elementary School  
 2524 Hwy. 88 , Hephzibah, GA 3081

LORENZO A. MASON		PH: 706-667- FX: Email: lorenzo@contractmanagement.com
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Bryce Howie R.D. Brown Contractors	410 Carolina Springs Rd N. Augusta, SC	PH: 706-799-0031 FX: Email: bhowie@browntrusted.com
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# MEETING NOTES

**Project Name:** Hephzibah Elementary School HVAC      **Project No.:** B-20-021-1602  
**Meeting Location:** Hephzibah Elementary School Media Center      **Date:** 2KM# 2020-02  
 2542 HWY 88, Hephzibah, GA 30815      **Time:** December 15, 2020  
**Purpose:** Pre-Bid Conference      **Time:** 10:00 AM

## ATTENDEES

NAME	FIRM	PHONE
See Sign-in Log	See Attached.	
ITEM	DISCUSSION	COMMENT
A.	<p>Reviewed Agenda in detail (See attached Agenda)</p> <ol style="list-style-type: none"> <li>1. Doug Shealy, GMKA and Chris Lehi, 2KM Architects gave overall introductions reviewed the updated Bid/Award process and proposed timing.               <ol style="list-style-type: none"> <li>a. Chris Lehi, 2KM Architects made introductions for A/E Team.                   <ol style="list-style-type: none"> <li>1) Grant Cartledge, Pruett Ford &amp; Associates – Mechanical HVAC.</li> <li>2) Kevin Hink, Electrical Design Consultants (EDC) – Electrical.</li> </ol> </li> </ol> </li> <li>2. All parties signed in.</li> <li>3. Architect of Record: 2KM Architects, Inc., Robert Mauldin, Principal Architect.</li> <li>4. C. Lehi outlined the site and building renovations:               <ol style="list-style-type: none"> <li>a. Building:                   <ol style="list-style-type: none"> <li>1) <u>General Renovation:</u> <ol style="list-style-type: none"> <li>a) Reflash new RTU roof curbs (60 mil. EDPM).</li> <li>b) Reflash &amp; seal any Electrical conduit penetrations.</li> <li>c) Install Roof Walk Pads at replacement RTUs.</li> <li>d) Reseal pipe penetrations &amp; wall louvers at exterior walls.</li> <li>e) Firestop seal walls at pipe penetrations</li> <li>f) Stencil Fire Rated walls per NFPA 101 (10' o.c.; Fire Rating; etc.).</li> <li>g) Replace damaged Acoustical Ceiling Tile at HVAC Fan-coil.</li> </ol> </li> <li>2) <u>HVAC/Plumbing:</u> <ol style="list-style-type: none"> <li>a) Refurbish existing cooling tower.</li> <li>b) Demo existing corroded piping and damaged insulation.</li> <li>c) Demo existing select HVAC units (indicated on drawings).</li> <li>d) Rebuild existing classroom fresh air preconditioning equipment with similar component. (See Alternate).</li> <li>e) Replace existing water source Heat Pump plant with similar equipment (cooling tower, boiler, heat exchanger, pumps).</li> <li>f) Refrigerant piping will be type ACR rigid copper piping with brazed joints and fittings. Piping insulation will be pre-molded flexible elastomeric cellular material</li> <li>g) Low pressure supply and return ductwork will be rectangular shop-fabricated duct rated for 1"WC positive or negative pressure. All supply and return ductwork will be insulated with 2" fiberglass insulation.</li> <li>h) All building HVAC controls will be distributed digital/electronic controls with a Web-based system front-end integrated into the Owner's data network</li> </ol> </li> <li>3) Electrical:                   <ol style="list-style-type: none"> <li>a) Equipment Power:                       <ol style="list-style-type: none"> <li>i. Reconnect new Mechanical Equipment. (one-for-one replacement)</li> <li>ii. Firestop seal wall conduit penetrations in Mechanical Rooms.</li> </ol> </li> </ol> </li> </ol> </li> </ol> </li></ol>	<ol style="list-style-type: none"> <li>1. Bid Date/Time.</li> </ol>

	(new work areas) b) Fire Alarm System: i. Reconnect Smoke Detectors in AHU ductwork. ii. Recertify Fire Alarm devices & System.	
B.	Schedule: 1. Bid date <b>January 14<sup>th</sup> 2021 at 3:00 p.m.</b> a. Bid Opening to be through email submittal only. Bid results will be posted per the updated RCSS Bid Submittal Process. b. <u>General Contractor's license is required.</u> 2. Construction Days: <b>TBD.</b> 3. Contractors to read Bid Requirements very carefully and Submit all required documents per the updated RCSS Bid Submittal Process (E-mail only). 5. All prior approvals and questions must be submitted prior to the end of the day Thursday, January 7, 2021.	
C.	C. Lehi, 2KM, outlined provisions for work in occupied buildings: 1. Work on Site – protect areas from access by children. a. Protect access and egress on all occupied building egress paths. b. Protect staff, visitors and students from areas of work or hazards. c. All workers must wear identifiable clothing and have a government issued I.D on them at all times. 2. Project work will be conducted during summer break 2021 school year. a. Must work closely with Assistant Principal Berry and RCSS for sequence of work. 3. Hephzibah Elementary School <b>Summer Schedule.</b> a. Students are released for summer on May 28, 2021. b. Teachers back to school on June 21, 2021. 4. School Operating Hours: a. Students Begin to Arrive at 7:30 a.m. b. Class Bell Starts at 8:00 a.m. c. Final Dismissal at 3:10 p.m. 5. Assistant Principal Berry is the main contact person on-site for Hephzibah Elementary School. a. Call ahead to D. Shealy to arrange site visitation several hours to schedule & coordinate with the school. b. Check-in and a visitor's pass is required, and contact with custodial staff to review project rooms is required.	
D.	All workers must have government issued photo I.D.	
E.	Site tour was conducted: select G.C.'s & Subcontractors participated: 1. General areas of work at the Cooling Tower, mechanical room and a typical classroom mechanical room were visited.	
F.	All questions should be issued in writing: <a href="mailto:mail@2kmarchitects.com">mail@2kmarchitects.com</a> or <a href="mailto:clehi@2kmarchitects.com">clehi@2kmarchitects.com</a>	<b>Call to verify receipt.</b>
G.	Meeting Adjourned.	

Please notify the recorder of these minutes of corrections within 10 days of receipt.

Meeting minutes Submitted by: *Christopher S. Lehi*

Christopher S. Lehi  
Project Manager/Contract Administrator

Meeting minutes approved by: *Robert L. Mauldin*

Robert L. Mauldin NCARB, AIA  
Principal Architect, GA-RA-05958

Encl: 2KM Pre-Bid Agenda  
Sign in Log  
cc: RCSS, GMKA  
PFA, EDC, 2KM File

COUNTY BOARD OF EDUCATION OF RICHMOND COUNTY  
INVITATION TO BID

Due to the closure of the Richmond County Board of Education building for Covid-19, sealed proposals from Contractors will be received for the B-20-021-1602 - Hephzibah Elementary School HVAC Project via e-mail until 3:00 p.m. local time, Thursday, January 14, 2021, Please send the completed bid package to the e-mail address [RCSSBIDS@rcboe.org](mailto:RCSSBIDS@rcboe.org) and use in the subject line "<Your Company Name>, Hephzibah Elementary School HVAC Project". No extension of the bidding period will be made. A bid tabulation will be made available to each contractor who submits a bona fide bid.

A Pre-Bid Conference will be held Tuesday, December 15, 2020 @ 10:00 a.m. local time in the Media Center Conference Room, Hephzibah Elementary School, 2524 Hwy. 88 , Hephzibah, GA 30815

Drawings and project manual on this work may be examined at the Department of Maintenance and Facilities, Richmond County Board of Education, 1781 15<sup>th</sup> Street, Augusta, Georgia 30901.

Bidding documents may be obtained at the Office of the Architect: 2KM Architects, Inc., 529 Greene Street, Augusta, Georgia 30901. Applications for documents together with refundable deposit of \$200.00 set should be filed promptly with the Architect. Bidding material will be forwarded (shipping charges collect) as soon as possible. The full amount of deposit for one set will be refunded to each prime contractor who submits a bona fide bid upon return of such set in good condition within 10 days after date of opening bids. All other deposits will be refunded with deductions approximating cost of reproduction of documents upon return of same in good condition within 10 days after date of opening bid.

Contract, if awarded, will be on a lump sum basis. No bid may be withdrawn for a period of 35 days after time has been called on the date of opening.

Bid must be accompanied by a bid bond in an amount not less than 5% of the base bid. Personal checks, certified checks, letters of credit, etc., are not acceptable. The successful bidder will be required to furnish performance and payment bonds in an amount equal to 100% of the contract price.

The Owner reserves the right to reject any and all bids and to waive technicalities and informalities.

BID LIST: The Richmond County Board of Education maintains a bid list for many categories that are let for bid each year. If your company wishes to remain on our bid list, we must receive a response either through a bid or by a no bid response. If we do not receive a response, your company's name will be removed from our bid list. Please call the bid office at 706-826-1298 if you fail to receive a post card.

To promote local participation, a database of Sub-contractors, Suppliers, and Vendors has been developed by the Program Manager, GMK Associates. Contact Jeanine Usry with GMK Associates at (706) 826-1127 for location to review and obtain this database.

Bids shall be submitted and addressed to:

Dr. Kenneth Bradshaw  
County Board of Education of Richmond County  
Administrative Office  
864 Broad Street  
Augusta, Georgia 30901  
c/o: Mr. Bobby Smith, CPA

**DIVISION 23 - HVAC**  
**SECTION 23 07 00 – HVAC INSULATION**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract apply to this Section.

**1.2 SUMMARY**

- A. This Section includes pipe, duct, and equipment insulation.

**1.3 DEFINITIONS**

- A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.
- B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.
- C. Cold Surfaces: Normal operating temperatures less than 75 deg F.
- D. Thermal resistivity is designated by an r-value that represents the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivity (r-value) is expressed by the temperature difference in degrees Fahrenheit between the two exposed faces required to cause 1 BTU per hour to flow through 1 square foot at mean temperatures indicated.
- E. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.
- F. Density: Is expressed in lb./cu.ft.

**1.4 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract.
- B. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories. Provide a summary in schedule form of intended insulation material, jacket type, thickness and adhesive type for each pipe, duct or equipment using manufacturer's nomenclature.

**1.5 QUALITY ASSURANCE**

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
  - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
  - 2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

**1.6 SEQUENCING AND SCHEDULING**

- A. Schedule insulation application after testing of piping and duct systems.
- B. Schedule insulation application after installation and testing of heat trace tape.

## PART 2 - PRODUCTS

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Glass Fiber:
    - a. CertainTeed Corporation.
    - b. Knauf Fiberglass GmbH.
    - c. Manville.
    - d. Owens-Corning Fiberglas Corporation.
    - e. USG Interiors, Inc. - Thermafiber Division.
  - 2. Flexible Elastomeric Cellular:
    - a. Armaflex; Armacell LLC
    - b. K-Flex; Nomaco K-Flex Corporation.
    - c. Aerocel; Aeroflex USA, inc.

### **2.2 GLASS FIBER**

- A. Material: Inorganic glass fibers, bonded with a thermosetting resin.
- B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.
- C. Board: ASTM C 612, Class 2, semi-rigid jacketed board.
  - 1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
  - 2. Density: 3 pcf minimum.
- D. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.
  - 1. Thermal Conductivity: 0.32 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
  - 2. Density: 3/4 pcf minimum within building envelope.
  - 3. Density: 1 pcf minimum exterior to building envelope.
- E. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.
  - 1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.
  - 2. Density: 3 pcf minimum.
- F. Adhesive: Produced under the UL Classification and Follow-up service.
  - 1. Type: Non-flammable, solvent-based.
  - 2. Service Temperature Range: Minus 20 to 180 deg F.
- G. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

### **2.3 FLEXIBLE ELASTOMERIC CELLULAR**

- A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
  - 1. Tubular Materials: ASTM C 534, Type I.
  - 2. Sheet Materials: ASTM C 534, Type II.
- B. Thermal Conductivity: 0.25 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F.
- C. Coating: Water based latex enamel coating recommended by insulation manufacturer.

- D. Fire Performance Characteristics: Provide material having the following fire performance characteristics as determined by UL in accordance with ASTM Standard E84:  
Flame Spread = 25  
Smoke Developed = 50

## 2.4 INSULATING CEMENTS

- A. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.
  - 1. Thermal Conductivity: 1.2 Btu x inch/h x sq. ft. x deg F average maximum at 400 deg F mean temperature.
  - 2. Compressive Strength: 100 psi at 5 percent deformation.

## 2.5 ADHESIVES

- A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.
- B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
  - 1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
  - 2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

## 2.6 JACKETS

- A. General: ASTM C 921, Type 1, except as otherwise indicated.
- B. Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
  - 1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.
  - 2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.

## 2.7 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, presized a minimum of 8 ounces per sq. yd.
  - 1. Tape Width: 3 inches.
  - 2. Cloth Standard: MIL-C-20079H, Type I.
  - 3. Tape Standard: MIL-C-20079H, Type II.
- B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:
  - 1. Stainless Steel: Type 304, 0.020 inch thick.
  - 2. Galvanized Steel: 0.005 inch thick.
  - 3. Aluminum: 0.007 inch thick.
  - 4. Brass: 0.01 inch thick.
  - 5. Nickel-Copper Alloy: 0.005 inch thick.
- C. Wire: 14 gage nickel copper alloy, 16 gage, soft-annealed stainless steel, or 16 gage, soft-annealed galvanized steel.
- D. Corner Angles: 28 gage, 1 inch by 1 inch aluminum, adhered to 2 inches by 2 inches kraft paper.
- E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

## **2.8 SEALING COMPOUNDS**

- A. Vapor Barrier Compound: Water-based, fire-resistive composition.
  - 1. Water Vapor Permeance: 0.08 perm maximum.
  - 2. Temperature Range: Minus 20 to 180 deg F.
- B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.
  - 1. Water Vapor Permeance: 0.02 perm maximum.
  - 2. Temperature Range: Minus 50 to 250 deg F.
  - 3. Color: Aluminum.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.
- B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless-steel surfaces with demineralized water.
  - 1. Follow cement manufacturer's printed instructions for mixing and portions.

### **3.2 INSTALLATION, GENERAL**

- A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.
- B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.
- D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- E. Install insulation with smooth, straight, and even surfaces.
- F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.
- G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.
- H. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.
- I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.
- J. Keep insulation materials dry during application and finishing.
- K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
  - 1. Factory-insulated flexible ducts.
  - 2. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.



3. Flexible connectors for ducts and pipes.
4. Vibration control devices.
5. Testing laboratory labels and stamps.
6. Nameplates and data plates.
7. Pre-insulated access panels and doors in air distribution systems.
8. Sanitary drainage and vent piping. (Drainage piping receiving air conditioning condensate shall be insulated.)
9. Below grade piping.

### **3.3 PIPE INSULATION INSTALLATION, GENERAL**

- A. Tightly butt longitudinal seams and end joints. Bond with adhesive.
- B. Stagger joints on double layers of insulation.
- C. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.
- D. Apply insulation with a minimum number of joints.
- E. Apply insulation with integral jackets as follows:
  1. Pull jacket tight and smooth.
  2. Cover circumferential joints with butt strips, at least 3 inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.
  3. Longitudinal Seams: Overlap 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 on center.
    - a. Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35 deg F.
  4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.
  5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
  6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.
- F. Wall and Partition Penetration: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- G. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with a U.L. Listed firestopping or fire-resistant joint sealer.
- H. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.
- I. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply pre-molded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
  1. Use same material and thickness as adjacent pipe insulation.
  2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.
  3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
  4. Insulate elbows and tees smaller than 3 inches pipe size with premolded insulation.

5. Insulate elbows and tees 3 inches and larger with pre-molded insulation or insulation material segments. Use at least 3 segments for each elbow.
  6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
- J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Division 23 Section "Hangers and Supports."

### **3.4 BELOW GROUND PIPE INSULATION INSTALLATION**

- A. See individual piping sections.

### **3.5 GLASS FIBER PIPE INSULATION INSTALLATION**

- A. Bond insulation to pipe with lagging adhesive.
- B. Seal exposed ends with lagging adhesive.
- C. Seal seams and joints with vapor barrier compound.

### **3.6 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION**

- A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
- B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
1. Miter cut materials to cover soldered elbows and tees.
  2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

### **3.7 DUCT INSULATION**

- A. Install block and board insulation as follows:
1. Adhesive and Band Attachment: Secure block and board insulation tight and smooth with at least 50 percent coverage of adhesive. Install bands spaced 12 inches apart. Protect insulation under bands and at exterior corners with metal corner angles. Fill joints, seams, and chipped edges with vapor barrier compound.
  2. Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 18 inches apart each way and 3 inches from insulation joints. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures, and voids in insulation.
- B. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:
1. Smaller Than 24 Inches: Bonding adhesive applied in 6 inches wide transverse strips on 12 inches centers.
  2. 24 Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.
  3. Overlap joints 3 inches.
  4. Seal joints, breaks, and punctures with vapor barrier compound and glass tape (glasfab and mastic).

### **3.8 JACKETS**

- A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inches laps at longitudinal joints and 3 inch wide butt strips at end joints.
  - 1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound (mastic) and glass tape (glassfab).

### **3.9 FINISHES**

- A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed exterior insulation.

### **3.10 APPLICATIONS**

- A. General: Materials and thicknesses are specified in schedules at the end of this Section.
- B. Piping Systems: Unless otherwise indicated, insulate the following piping systems:
  - 1. Domestic makeup water piping.
  - 2. Tempered water.
  - 3. Air conditioning condensate drains and sanitary P-traps receiving air conditioning condensate.
  - 4. Refrigerant suction and hot gas piping.
  - 5. All refrigerant piping used for split systems with inverter-driven outdoor units (i.e. mini-splits, ductless split systems.)
- C. Duct Systems: Unless otherwise indicated, insulate the following duct systems:
  - 1. Supply, return and outside air ductwork. (Except double-wall spiral duct exposed in occupied building spaces.)
  - 2. Above-ceiling surfaces of all air devices except where pre-insulated.
  - 3. Interior exposed supply, return and outside air ductwork.
  - 4. Exterior exposed supply and return ductwork.
  - 5. Relief ductwork between air inlet devices and energy recovery units.

### **3.11 PIPE INSULATION SCHEDULES**

- A. General: Furnish insulation vapor barrier on all piping carrying fluids below 60°F.
- B. Schedules:
  - 1. Refrigerant Suction and Hot Gas Piping: 3/4" flexible elastomeric insulation. Paint exterior insulation with two coats of manufacturer recommended coating or polymeric pipe covering as recommended by the manufacturer.
  - 2. All refrigerant piping used for split systems with inverter driven outdoor units (i.e. mini-splits, ductless split systems): 3/4" flexible elastomeric insulation. Paint exterior insulation with two coats of manufacturer's recommended coating.
  - 3. All refrigerant piping used for variable refrigerant volume systems: 3/4" flexible elastomeric insulation. Paint exterior insulation with two coats of manufacturer's recommended coating.
  - 4. Air Conditioning Condensate Drain and Humidifier Drain Piping: 3/8" flexible elastomeric insulation (interior applications only).
  - 5. Domestic Makeup Water Piping (exterior): 3/4" flexible elastomeric insulation.

### **3.12 DUCTWORK AND PLENUM INSULATION SCHEDULES**

- A. General: Furnish vapor barrier on all ductwork insulation.

- B. Schedules:
1. Interior Supply and return, relief ductwork between air inlet devices and energy recovery units, and outdoor air ductwork:
    - a. Lined and unlined within building insulation envelope: 2" glass fiber blanket. Seal all joints and penetrations in jacket with glasfab and mastic.
    - b. Outside Building Insulation Envelope: 3" glass fiber blanket or board.
  2. Exterior Supply and return, relief ductwork between air inlet devices and energy recovery units, and outdoor air ductwork (lined and unlined): 3" glass fiber board with aluminum jacket.
  3. Supply, Return and Outdoor Air Ductwork (lined and unlined) Exposed in Mechanical Rooms: 2" glass fiber board.

**END OF SECTION 23 07 00**