PROJECT MANUAL

2019-2020 Mechanical HVAC Upgrades to Flat Rock & Rugby Middle Schools Hendersonville, NC

Henderson County Public Schools Henderson County, NC

January 07, 2020

(DEI Job No. 19005)



Enumeration of Contract Documents

Construction Documents Dated December 16, 2019

Prepared by Delta Engineering, Inc.

Engineer's Project Number #19005

Project Manual:

Bid Documents and Forms Conditions of Contracts Technical Specifications

Drawings:

ENGINEERING

TS-1 PROJECT TITLE SHEET AND LIST OF DRAWINGS (See all listed Mechanical HVAC, Electrical and Plumbing Systems Upgrades Drawing documents)

Identification of HUB Certified/ Minority Business Participation

hereby certify that on this project, we will a struction subcontractors, vendors, supplied	use the following HUB C ers or providers of profes	ertified/ minority ssional services.	business a
m Name, Address and Phone #	Work Type	*Minority Category	**HUB Certifie (Y/N)
*Minority categories: Black, African Americal Female (F) Socially a	 n (B), Hispanic (H), Asian <i>A</i> and Economically Disadvan		 ican Indian (

Attach to Bid Attach to Bid

State of North Carolina AFFIDAVIT A - Listing of Good Faith Efforts

County of
(Name of Bidder)
Affidavit of I have made a good faith effort to comply under the following areas checked:
Bidders must earn at least 50 points from the good faith efforts listed for their bid to be
considered responsive. (1 NC Administrative Code 30 I.0101)
1 – (10 pts) Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
2(10 pts) Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
3 – (15 pts) Broken down or combined elements of work into economically feasible units to facilitate minority participation.
4 – (10 pts) Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
□ 5 – (10 pts) Attended prebid meetings scheduled by the public owner.
☐ 6 – (20 pts) Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
7 – (15 pts) Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
8 – (25 pts) Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
9 – (20 pts) Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
10 - (20 pts) Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.
The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the dentification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.
The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.
Date:Name of Authorized Officer:
Signature:
Title:
State of Countries
State of, County of Subscribed and sworn to before me thisday of20
Notary Public
My commission expires

Attach to Bid Attach to Bid

State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of
Affidavit of
(Name of Bidder) I hereby certify that it is our intent to perform 100% of the work required for the
contract.
(Name of Project)
In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform <u>all</u> <u>elements of the work</u> on this project with his/her own current work forces; and
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.
The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.
Date:Name of Authorized Officer:
Signature:
Title:
SEAL
State of, County of
State of, County of Subscribed and sworn to before me thisday of20
Notary Public
My commission expires

Do not submit with bid Do not submit with bid Do not submit with bid

State of North Carolina - AFFIDAVIT C - Portion of the Work to be

Performed by	HUB Certified/Minority	Businesses
County of		

County of	•			
(Note this form is to be submitted on	ly by the app	parent lowes	st responsible, res	ponsive bidder.)
If the portion of the work to be executed 128.2(g) and 128.4(a),(b),(e) is equal to bidder must complete this affidavit. This affidavit shall be provided by the agafter notification of being low bidder.	or greater th	an 10% of th	e bidders total cont	ract price, then the
Affidavit of(Na			l do hereb	y certify that on the
(Na	ime of Bidder)			
Project ID#(Project	Name) 	Amount of Bio	d \$	
I will expend a minimum of% enterprises. Minority businesses will b or providers of professional services. below. Attach addit	e employed	as constructi will be subc	on subcontractors,	vendors, suppliers
Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value
		.,,,		
*Minority categories: Black, African America Female (F) Soc ** HUB Certification with the state HUB C	ially and Econ	omically Disac	dvantaged (D)	
Pursuant to GS143-128.2(d), the underwork listed in this schedule conditional this commitment may constitute a bread	upon execu	tion of a con	mal agreement with tract with the Own	h Minority Firms for er. Failure to fulfill
The undersigned hereby certifies that he authorized to bind the bidder to the com-			ns of this commitme	ent and is
Date:Name of Authorized	Officer:			
Si	gnature:			
(SEAL)	Title:			
State of	,	County of	_day of20	
Notary Public My commission exp				
ווון ככוווווופסוסוו פאן				

State of North Carolina

AFFIDAVIT D - Good Faith Efforts

County of				
(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)				
If the goal of 10% participation by HU provide the following documentation				the Bidder shall
Affidavit of			I do herek	by certify that on the
	(Name of Bidd	er)		
Project ID#(Project ID#	ect Name)	Amount	of Bid \$	
I will expend a minimum of	ity businesse fessional se	es will be en ervices. Suc	mployed as construction	subcontractors,
Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

Examples of documentation that <u>may</u> be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

- A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
- B. Copies of quotes or responses received from each firm responding to the solicitation.
- C. A telephone log of follow-up calls to each firm sent a solicitation.
- D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
- E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
- F. Copy of pre-bid roster
- G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
- H. Letter detailing reasons for rejection of minority business due to lack of qualification.
- I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

^{*}Minority categories: Black, African American (B), Hispanic (H), Asian American (A) American Indian (I), Female (F) Socially and Economically Disadvantaged (D)

^{**} HUB Certification with the state HUB Office required to be counted toward state participation goals.

Do not submit with the bid Do not submit with the bid Do not submit with the bid Do not submit with the bid

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date <u>:</u>	Name of Authorized Officer:	
	Signature:	
	Title:	
SEAL	State of, County ofday of Subscribed and sworn to before me thisday of Notary Public My commission expires	

SUPPLEMENTARY-CONDITIONS

The following supplements modify, change, delete from or add to the "referenced" "General Supplementary Conditions of the Contract for Construction," AIA Document A201. Where any Article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by the Supplementary Conditions, the unaltered provisions of the Article, Paragraph, Subparagraph or Clause shall remain in effect.

(A) CHANGE OF TERMS DEFINITION:

(1) Wherever the terms "Contractor" or "Sub-Contractor" is used throughout the AIA Document A201, these terms each shall mean independently of each other, that person or entity which is a duly registered and licensed contractor in the State of North Carolina, regularly licensed and practicing as a contractor regularly engaged in the service of contracting, and has practiced such regular engagements for a continuous livelihood period and record of not less than 5 years previous to the date of the Contract.

(B) ARTICLES:

ARTICLE 1 - GENERAL PROVISIONS:

1.1.4.1 Project Description:

Project consists of Phased Construction of selective designated Mechanical and Electrical Demolition and New work for classrooms & other areas of the Flat Rock and Rugby schools as designated on the drawing documents for:

- (a) the selective demolition of existing interior Mechanical Systems serving existing terminal HVAC Chilled & Hot Water Fan Coil Units and, (1) interior H&V Unit w/HW piping and controls serving Flat-Rock Lockers, and including all selective terminal insulated Ductwork systems, and branch & terminal CHW & HW Piping & Drain Piping, and terminal HVAC Controls, and the specific installation of New exterior & interior Mechanical HVAC Packaged Terminal (3-pipe) VRV DX Heating & Cooling Heat-Pumps Units Systems with all exterior concrete equipment supporting pads & roof rail supports and interior hangars and accessories with all new insulated copper refrigerant piping and ductwork systems with all new integral VRV Systems Electronic DDC Controls Systems & Wiring with new BacNet interface of new VRV DDC Controls to Owners existing central HVAC DDC Systems, and,
- (b) The selective partial cutting & demolition of existing roof areas at only the Flat Rock school for the new installation of a new packaged Rooftop HVAC Heating-Cooling-Ventilating Unit for the locker areas of this school only, with new supply and exhaust air duct and ductwork connections to existing and all insulated duct and piping systems, and,
- (c) the selective demolition of existing Electrical Systems serving existing terminal HVAC Fan Coil Units including Power Wiring & Control Wiring, and modifications to existing Main Distribution Power Panels & Branch Sub-Panel Boards/Circuits and Breakers and, the installation of new exterior & interior Electrical Power Systems to support the new HVAC Packaged Terminal (3-pipe) VRV DX Heating & Cooling Heat-Pumps Units Systems and new

- Rooftop HVAC Unit System at the Flat Rock school only, and,
- (d) the selective demolition of existing Overhead Acoustical 2'x4' Ceiling Systems (Grids &Tiles) and,
- (e) the selective temporary demolition & rehanging of existing Electrical Overhead Troffer Lighting Fixture Systems (T-8) into new Overhead Acoustical 2'x2' Ceiling Systems and,
- (f) for Add Alternate Electrical work, for both schools, the selective demolition and replacement of existing Electrical Overhead Troffer Lighting Fixture Systems (T-8) with New Electrical Overhead Troffer LED Lighting fixtures set into the new Overhead Acoustical 2'x2' Ceiling Systems. And,
- (g) for Add Alternate Mechanical & Electrical work, for both schools, the selective demolition and replacement of the existing air-cooled 185-Ton (Nominal) "McQuay-AGZ" Water Chiller Machine (each located at the existing Ice-House of each school) with a new 110-Ton (Nominal) Air-Cooled Water Chiller Machine, and the adjusting and balancing of existing Chilled Water Pumps associated with this Add Alternate, and all new Electrical Power Wiring and Main Power Panel Breaker Replacements as shown on the drawings.

ARTICLE 2 - OWNER:

- 2.1.1.1 Owner/Agency: Henderson County Public Schools, 414 Fourth Ave. West, Hendersonville, NC 28792, (Telephone: 828-698-4421) c/o Mr. Martin Ballard.
- 2.1.1.2 Project requires coordination with Owner for <u>Multiple Phasing</u> of the project and shall be coordinated by Contractor submitted schedule prior to construction in accordance with the Owner's designated and approved Phasing approvals.

ARTICLE 3 – CONTRACTOR PROTECTED MATERIALS AND "AS-BUILT" DOCUMENTS/ RECORD DRAWINGS:

- 3.4.1.1 The Contractor shall not allow the use of products containing asbestos, whether temporary or permanent and whether or not incorporated or to be incorporated in the work, even if the products are nonfriable and/or contain minimal amounts of asbestos, and even though such products may still be legally installed.
- 3.11.2 The Contractor shall prepare one set of "As-Built," documents using a set of reproducible black line printed sheets of the contract drawings and Project Manual, Including specifications, which incorporates all field and documented alterations, revisions, and changes, for submission to the Engineer along with the last request for payment. These documents shall be referred to as "Record Documents."
- 3.12.5.1

 (a) Shop Drawings: The Contractor shall submit submittals to the Engineer within 10 days after Notice to Proceed, six (6) copies of all Shop Drawings, Submittals, or Setting Drawings and Schedules required for the work of the various trades. All Submittals shall be forwarded to the Engineer only. Engineer will retain two (2) sets. Upon Contractor's receipt of returned submittals of four (4) to the Contractor, the Contractor shall forward one (1) set of marked submittals to the Owner's Project Manager Representative for

his record. All others shall be used by the Contractor to issue to field personnel, and to retain for Project Operation Manuals.

- (b) <u>Samples:</u> The Contractor shall submit to the Engineer samples of the various finish materials, paint, etc., and other items that will need to match and have an impact on existing finishes or materials. Do not order finish materials or paint until the Engineer and Owner Representative have approved sample and selected finishes.
- (c) <u>Manufacturer's Recommendation:</u> The Contractor shall submit manufacturer's specifications, installation procedures and other data required to demonstrate compliance with specified requirements. The manufacturer's recommended installation procedures, when approved by the Engineer, will become the basis for inspection and accepting or rejecting actual installation procedures used on the work.
- 3.13.1.1 <u>Onsite Office or Trailer:</u> Contractor to verify location and all <u>Phasing</u> with Owner's Representative prior to mobilization.

<u>Utilities/Phasing of Work:</u> The Owner will provide utilities as listed in the specifications. Contractor to pay all related costs to modify phasing and modifications to suit his needs for the construction. Utilities provided by Owner will be furnished on an "As Is" basis. Contractor to pay any costs to modify existing or add for his own purpose.

<u>Restrooms:</u> Contractor shall use his own designated portable toilets provided at Project location, and these shall be maintained by the Contractor, and/or the Owner will designate one existing indoor toilet for the Contractor's use. The Contractor shall furnish labor and materials to maintain cleanliness and sanitation of the toilet.

3.13.1.2 Special Conditions for Use/Site:

- (a) Access to Site Coordination: Due to possible confinement of parking at site's proximity the possibility of congestion of vehicles, access to the site and working hours shall be fully coordinated with the Owner's Representatives.
- (b) <u>Contractor Badging and Parking Procedures:</u> The following procedures will apply to all contractors providing services or construction at the facilities.

Parking:

All contractor vehicles must be readily identified with the Contractor's logo or name visible on the sides of the vehicles. The Owner's Representative will designate specific parking areas for the contractor vehicles. Construction employees will be directed to park privately owned vehicles.

Badging/Identification:

When Contractor's on-site work overlaps student and staff occupancy of the facility.

all contractor personnel will be required to possess at all times and display their company identification to show they are a contractor on site.

3.15.3 The overall conditions of the limits of construction shall meet or exceed its original condition at the conclusion of this contract.

ARTICLE 4 - ADMINISTRATION OF THE CONTRACT:

4.1.1.1 The Engineer is:

Delta Engineering, Inc. (Greenville, SC Office): 315 East Broad Street Greenville, SC 29601 and

(Charleston office): 3106 Riverine View, Charleston, SC 29414 Telephone: (864) 505-2976

Contact Persons: Joe Capitan, PE

and Sean Braunbeck

4.2.9.1 The Contractor shall provide all warranties and/or guarantees.



Henderson County Capital Projects

100 North King Street, Suite 206 Hendersonville, North Carolina 28792

Memorandum To:

All Interested Qualified Bidders

From:

Martin Ballard, Facilities/Maintenance Director

Henderson County Public Schools, Henderson County, Hendersonville, NC

Subject:

Request for Bids (RFP)

"2019-2020 - Mechanical HVAC Upgrades to Flat Rock and Rugby Middle Schools",

Henderson County/Henderson County Public Schools, Henderson County,

Hendersonville, NC

Date:

January 06, 2020

Henderson County and Henderson County Public Schools requests Bid Proposals from NC Licensed Contractors for the Project:

"2019-2020 - Mechanical HVAC Upgrades to Flat Rock and Rugby Middle Schools", Henderson County Public Schools, Henderson County, Hendersonville, NC

Mandatory Attendance

Pre-Bid Meeting w/Owner:

January 14, 2020 at 09:30 am EST, at Owner's Main Conference Room

(Owner/Engineers/Bidders)

Office of Henderson County Public Schools

#414 - 4th Avenue West, Hendersonville, NC 28792

Location of Project Work:

Flat Rock Middle School & Rugby Middle School Flat Rock & Hendersonville, Henderson County, NC

Mandatory Attendance

Bid Date w/Owner:

February 19, at 3:00 pm EST, at Owner's Main Conference Room

(Owner/Engineers/Bidders)

Office of Henderson County Public Schools #414 - 4th Avenue West, Hendersonville, NC

Owner Intended Letter of Contract Award Date:

Contract will be awarded by Henderson County and a "Letter of Intent to Award

Contract" issued on or before February 25, at 5:00 pm

Engineer:

Delta Engineering, Inc.

Emails: <u>sherry.deisc@gmail.com</u>

P.O. Box 8354 (29604) 315 East Broad Street

joecapitan@gmail.com

Grannilla SC (20(01)

<u>Tel</u>: 864-505-2976

Greenville, SC (29601)

Fax: (none) (Must Use Both Emails)

Last Day for Questions:

February 11, 2020 at 5:00 pm EST. Engineer prefers written requests by email or USPS letter on or before, but NLT date indicated. Submit all emails/letters with questions to Engineer's above listed Emails or Engineer's address above.



Henderson County Capital Projects

100 North King Street, Suite 206 Hendersonville, North Carolina 28792

Detailed Scope of Work:

GENERAL:

- A full set of Bid/Construction Documents may be obtained (in electronic PDF Format) from the Henderson County Website on or after January 08, 2020 as follows: https://www.hendersoncountync.gov/county/page/doing-business-henderson-county
- Furnish the necessary supervision, labor, tools equipment and materials to complete the required work in multiple Phases of Construction beginning in and/or during the end of February 2020 through end of December 2020, for the Contract Phases listed herein.
- Bidder/Contractor shall obtain required local building renovation permits, insurance and bonds.

CONTRACT PHASE 1A: Project Contract, Pre-Con. Mtg, and Start of All Phased Construction

- February 28, 2020: On or before date, Owner & Contractor AIA Contract is executed & signed;
- March 10, 2020: On or before date, the Project Pre-Construction Meeting is held with the Owner/Engineer/Contractor (OEC) at the Owner's Offices and the Contractor shall present the Proposed Phased Construction Schedule (PPCS) for the total overall Project per school; the PPCS shall address the proposed schedule of time-phased selected upgraded areas of construction, and this is to be based on the designed new upgraded mechanical HVAC VRV Zones shown for each school and the PPCS shall be submitted to the Owner & Engineer. (Note: The PPCS shall be provided for the MEP Upgrades of each school within the total Project Time Schedule for Construction with Contractor's addressing any selective order of the specific designated new upgraded HVAC zoned areas for that of proposed phased demolition and new work to be shown in the PPCS for all proposed and zoned Phased Areas of the new upgrade work of Construction)

CONTRACT PHASE 1B thru Duration of Project: Start of All Phased Construction

- March 12, 2020: On or before date, on-site Contractor mobilizations begin at both school sites; Contractor may begin on this date @ 12:01am thru 6:30 a.m. and work shall resume at 4:00pm each week day of inschool operation (Mon-Fri) for the commencing of selected ceilings demolition and continuing other planned selective MEP demolitions and new work of upgrades. All work by the Contractor will cease daily on each week day of in-school operation (Mon-Fri) at 6:30am and the building area will be cleaned up and ready for Owner occupancy on each week day of in-school operation (Mon-Fri) for Owner to occupy the ceased work area by NLT 7:00 a.m. each week day of in-school operation (Mon-Fri). Contractor shall be free to occupy and perform construction work for all weekends beginning at 4:00pm every Friday of each week of in-school months of operation and cease work on every week ending work each Monday morning at NLT 6:30am (Mon. only). Contractor shall have the Buildings available at all times during out of school months and days.
- April 10, 2020: 4:00 p.m. Contractor will be permitted to resume all work through Sunday and Monday, until Tuesday morning April 21, 2020 until 3:00am, and all work will cease in buildings and cleanup to be completed by 6:00am Tuesday morning ready for Owner occupancy on Tuesday morning, April 21th, 2020, at 7:00 a.m.
- Contractor may have at his option to work at nights and weekends during all months during the duration
 of the Project and to end of the Project, December 15, 2020.

CLARIFICATIONS FOR FUNDING OF PROJECT/PROJECT FUNDING:

The Owner's representatives will address at the Mandatory Pre-bid Meeting, the Owner's requirements for funding the project in multiple Phases 1,2,3, and the Owner's need for multiple contractor payments during the duration of the contractor's work during each phase of the work. This issue of funding is relative to the



Henderson County Capital Projects

100 North King Street, Suite 206 Hendersonville, North Carolina 28792

Owner's requirements for the need to fund the project under the existing remaining portions of the Owner's 2019-2020 years' monies now and to be available, and to fund the remaining portions of the project under the Owner's future approved 2020 Funding Budget monies beginning after July 2, 2020. The dates of all funding and payments of the entire project will be reviewed and negotiated with the successful bidder contractor who will receive award and contract of the project prior to beginning any work.

ALL WORK PERFORMED & OWNER FUNDING - PAYMENT PHASES OF WORK

• Except on dates, days and times of day listed under timed Phased work above, the Contractor may not work during any weekdays of in-school months of operations on M-F days from 6:00 a.m. thru 4:00 p.m. for the entire duration of work from March 12, 2020 thru end date of December 11, 2020 except he may have access to the project buildings for all his work during the entire duration of project until end of December 11, 2020 provided that he may work ONLY nights and weekends, cleaning up each night of the week (5 days/week) for the Owner to occupy building by 7:00 a.m. the next day thru 4:00 p.m. for each weekday and he (contractor) may work on all the weekends.

The following information must be included in the Contractor's Bid Proposal:

- 1. General Work Day Schedule for "all anticipated work day start and completions" or stoppage
- 2. Contractor's North Carolina Licensure No. and bidder's No. with North Carolina
- 3. Warranty on all above work

See "Doing Business with Henderson County" for general information and Henderson County Insurance and Bond Requirements along with Minority Business Participation Guidelines at https://www.hendersoncountync.gov/county/page/doing-business-henderson-county

As a party wishing to contract or otherwise do business with Henderson County, You must understand that you have a duty (imposed by North Carolina Law in 2013), as a condition of payment for goods provided or services rendered, to Comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statures (E-Verify). Further, if you provide the goods and services to the County utilizing a subcontractor, you must require the subcontractor to comply With the requirements of Article 2 of Chapter 64 of the General Statutes as well. You are required to verify, by affidavit, compliance of these terms of this Section upon the County's request.

Henderson County and/or Henderson County Schools reserves the right to reject any and/or all bids. Qualified contractors interested in bidding on the project should contact Martin Ballard at (828) 698-4421 and the Engineer (864-505-2976).

END OF RFP INVITATION

STANDARD BID FORM

BID OF:
(BIDDING CONTRACTOR NAME and CONTRACTOR N.C. BIDDER and/or LICENSE NUMBER)
BID TO: Henderson County, Henderson County Public Schools, Hendersonville, NC
(AGENCY/OWNER)
PROJECT NAME: "2019-2020 MECHANICAL HVAC UPGRADES to Flat Rock & Rugby Middle Schools,
Henderson County Schools, Hendersonville, NC
DEI/Engineer's PROJECT NUMBER: 19005 BID DATE: February 19, 2020
I. BID AGREEMENT:
The undersigned, having examined all the Bidding Documents and acknowledging all the following and Addendum(s) a
follows (Indicate Addendum number and date which you have received prior to your Bid):
(a) Addendum No.'s:, and the Contractor shall execute the entire work in the Bidding Documents all as required for this responsive bid and criteria as described along with
the below listed Fixed Bid Contract Sum(s) for the Project, with all work listed in (A. and B.) under one Contract.
(b) All Engineering is provided under a separate contract direct with the Owner by Delta Engineering, Inc. of
Greenville, SC for the Owner as the Owner's Engineer representative for the entire Project with the Owner an
Engineer shall assist the Owner for the Project for limited Construction Administration services during the
Construction of the Project. The project will be constructed in accordance with all Engineering documents issue
for the Project by the Engineer and Owner.
A. MECHANIAL HVAC UPGRADES for FLAT ROCK MIDDLE SCHOOL, HENDERSONVILLE, NC:
A. MECHANIAL HVAC OF GRADES 101 FLAT ROCK MIDDLE SCHOOL, HENDERSONVILLE, NC.
A-1: BASE BID: All work IAW all specified new HVAC "Diakin" VRV systems and accessories as listed on the Bid
Drawings /Specifications, with Multiple Phases of Construction: DOLLARS (in numbers): (\$
DOLLARS (in words):
A-1A: ADD ALTERNATE TO BASE BID: All work IAW specified Electrical work for New LED Lighting Fixtures,
shall be added to the above Base Bid A-1, ADD the following: DOLLARS (in numbers): (\$) ;
DOLLARS (in words):
A-1B: ADD ALTERNATE TO BASE BID: All work IAW specified Plumbing work to replace interior Domestic Col
Water Piping, shall be added to above Base Bid A-1, ADD the following: DOLLARS (in numbers): (\$);
DOLLARS (in words):
A-1C: ADD ALTERNATE TO BASE BID: All work IAW specified Mechanical & Electrical work for New "Diakin"
Replacement Air Cooled Water Chiller Machine & accessories, CHW System Rework of CHW Pumps & T&B work,
shall be added to the above Base Bid A-1, ADD the following: DOLLARS (in numbers): (\$);
DOLLARS (in words):
A-1S: BASE BID CONSTRUCTION SCHEDULE: All "A-1: BASE BID work IAW specified Multiple Phases of
Construction: Project will be completed in the following number of calendar days: (calendar days).
B. MECHANIAL HVAC UPGRADES for RUGBY MIDDLE SCHOOL, HENDERSONVILLE, NC:
B-1: BASE BID: All work IAW all specified new HVAC "Diakin" VRV systems and accessories as listed on the Bid
Drawings /Specifications, with Multiple Phases of Construction: DOLLARS (in numbers):*(\$) ;
DOLLARS (in words):
B-1A: ADD ALTERNATE TO BASE BID: All work IAW specified Electrical work for New LED Lighting Fixtures,
shall be added to the above Base Bid A-1, ADD the following: DOLLARS (in numbers):*(\$
DOLLARS (in words):
B-1B: ADD ALTERNATE TO BASE BID: All work IAW specified Mechanical & Electrical work for New "Diakin"
Replacement Air Cooled Water Chiller Machine & accessories, CHW System Rework of CHW Pumps & T&B work,
shall be added to the above Base Bid A-1, ADD the following: DOLLARS (in numbers): *(\$);
DOLLARS (in words):
B-1S: BASE BID CONSTRUCTION SCHEDULE: All "A-1: BASE BID work IAW specified Multiple Phases of
Construction: Project will be completed in the following number of calendar days: (calendar days).
construction. Project will be completed in the following number of earthquit days calcidat days).

*The Bidding Contractor shall be responsible for all N.C. State and Local Permitting and Associated Fees and all applicable N.C. Sales, Material & Labor Taxes for the Project and these are all included in all the above Bids .

II. DATE FOR COMMENCEMENT, CONTRACT AND SUBSTANTIAL COMPLETION:

The <u>Date for Commencement</u> to begin all work on Project sites for Bid Items (A) and (B) above will be established in the Contract and/or the <u>Notice to Proceed as given by the Owner</u>. The Contractor shall not incur any expense until the Contract has been awarded. An award for this Project requires that either the <u>Contract</u> between Owner and Contractor (AIA – A101) be signed by both the awarding authority and the Contractor or a formal written letterhead issued <u>Notice to Proceed</u> is executed by the Owner to the successful Bidder Contractor. It is understood by this Bidder Contractor that it is the intent by the Owner to execute a single Contract Agreement for all Base Bid work listed in Bid Items (A) and (B) above to be performed by the successful Contractor, and/or any Owner chosen "Add Alternate" bid items in (A) and (B) above.

All work shall be substantially completed (as evidenced by the date on the <u>CERTIFICATE OF SUBSTANTIAL COMPLETION</u>) per the AIA-A101 Contract and from the date set forth per the AIA-A101 Contract and in the <u>NOTICE TO PROCEED</u>, subject to adjustments of the Contract Time as provided in accordance with the Contract Documents.

Final completion of all work shall be performed from the scheduled contract time for substantial completion as listed within the Notice to Proceed and/or the Contract for Construction.

III. BID SURETY BID BOND AND BID SECURITY BONDS & INSURANCE:

The Bidding Contractor hereby has attached herewith his/her BID BOND to this submitted Bid in the required Bid Bond security surety amount of that equal, but not less than 5% Five-Percent of the Total Base Bid Amounts as listed in Bid Items (A) and (B) Base Bids; see the attached signed and executed surety Bid Bond with this Bid.

The Contractor shall have ten (10) days maximum from the date of executed Contract to deliver Performance and Payment Bonds, Certificate of Insurance, and the Contract (signed by Contractor only). Failure to deliver these documents, as required, shall entitle the Owner's agency to consider your bid unresponsive and declare your bid security forfeited, payable to the Owner.

IV. BID HOLDING TIME AND ACCEPTANCE:

The undersigned agrees that this Bid may not be revoked or withdrawn after the date and time set for the Opening of bids, but the Bid shall remain open for acceptance by the Owner for a period of sixty (60) days following the bid date.

V. PROGRESS PAYMENTS:

Contractor's Application for Payment shall be submitted to the Architect on AIA Document G702 and G703. The period covered by each Application for Payment shall be not less than one calendar month. The Owner shall make progress payments to the Contractor on undisputed amounts certified by the Architect within twenty-one (21) days from receipt of the Application for Payment by the Owner.

. CONTRACTORS FEI	DERAL IDENTIFICATION NUME	(Type or Print)
I. CONTRACTOR'S	CLASSIFICATIONS & SUBCLAS	SIFICATIONS WITH LIMITATION
(Classification)	(Sub-classification)	(Limitations)

VIII. NC CONTRACTOR'S LICENSE NUM	BER:		
IX. <u>AUTHORIZATION:</u>			
(Type or Print Name of Contractor)			
(Type or Print Address)	2		
(Type or Print City and State)			
(Type or Print Name)	(Title)	<u>.</u>	
(Signature Authorized for Contracts)	(Date)		

INVITATION FOR CONSTRUCTION BIDS

2019-2020 MECHANICAL HVAC UPGRADES to Flat Rock & Rugby Middle Schools, Henderson County Schools, Hendersonville, North Carolina

The Bid Documents of Drawings and Specifications for this project shall be a part of this Invitation for Construction Bids, the same as incorporated herein. (The Engineer's project No. is 19005).

Unless otherwise provided in the bid documents (in which case the provisions of the bid documents take precedence) the contractor shall list proposed bid Bond Company. All bonds shall be a surety company licensed in North Carolina with an "A" minimum rating of performance and a financial strength of at least five (5) times the contract price as listed in the most current publication of "Best's Key Rating Guide Property Liability." Performance and labor and Material Payment Bonds, each in an amount equal to 100% of the contract price shall be required of the successful bidder if contract is awarded. Each Bond shall be accompanied by a "Power of Attorney" authorizing the attorney-in-fact to bind the surety and certified to include the date of the

Contractors shall be licensed in accordance with the provisions of current North Carolina Code of Laws for contractor licensure. Failure to show contractor's license numbers on the bid envelope in accordance with this section shall render the contractor's bid unresponsive.

PROJECT NAME: "2019-2020 MECHANICAL HVAC UPGRADES to Flat Rock & Rugby Middle Schools, Henderson County Schools, Hendersonville, North Carolina"

DEI PROJECT NUMBER: 19005 LOCATION: Flat Rock & Rugby Middle Schools, Hendersonville, NC 28792

DESCRIPTION OF PROJECT: MECHANICAL HVAC UPGRADES to Flat Rock & Rugby Middle Schools (See the Supplementary Conditions for the General Description of the Project)

ENGINEER:

Delta Engineering, Inc.

MAILING ADDRESS: 315 East Broad St., Greenville, South Carolina, 29601

864-505-2976 or 864-505-5358 PHONE NUMBER: FAX NUMBER:

PRE-BID CONFERENCE/SITE VISIT REMARKS:

Mandatory Attendance to Pre-Bid Meeting

PRE-BID DATE: 01/14/20 TIME: 11:00 AM PLACE: 414 Fourth Ave., "Hendersonville, NC 28792

BID DATE: 02/19/20 TIME: 3:00 PM PLACE: 414 Fourth Ave., Hendersonville, NC

"PDF" (only) RFP, BID DOCUMENTS/

PLANS MAY BE OBTAINED FROM:

Henderson County Public Website, ("RFP's"):

http://www.hendersoncountync.org/rfp/index.html

PLANS ON FILE AT:

ENGINEER'S OFFICE:

Delta Engineering, Inc.

315 E. Broad Street, Greenville, SC 29601

Tel: 864-505-2976 Other: 864-505-5358

AGENCY/OWNER: Henderson County Public Schools NAME OF AGENCY COORDINATOR: Mr. Martin Ballard

TITLE OF AGENCY COORDINATOR: Director of Facilities

ADDRESS: 246 Education Drive, Flat Rock, NC 28731 PHONE: TEL: (828) 698-4421 FAX: (828) 697-4843

RFI Ouestions regarding the Contract Documents must be submitted in Email writing NLT (7) days prior to the Bid date and submit all RFI's by numbered reference and descriptions/questions; submit RFI's to Mr. Joe Capitan, PE, and Mr. Sean Braunbeck of Delta Engineering, Inc. to be submitted to both email addresses of: (joecapitan@gmail.com) and (sbraunbeck@gmail.com) (Copies of the Contract Documents are available on the Henderson County Public Website,

("RFP's"): http://www.hendersoncountync.org/rfp/index.html

All bidders shall adhere to ethical standards set forth by the Practices Board of the Associated General Contractors of America branch having jurisdiction over the Project location. The Owner and Engineer assume no responsibility regarding any provisions or interpretations the BIDDER chooses to make regarding compliance with the Code.

No bid may be withdrawn for a period of 30 days after the closing time for the receipt of bids. The Owner reserves the right to reject any and all bids and to waive any and all technical defects in the execution of or informalities associated with the submission of any bid.

END OF INVITATION FOR CONSTRUCTION BIDS

INSTRUCTIONS FOR BIDDING

- 1) Bidders are requested to review the prepared project documents and visit project location in order to submit responsive bid criteria in accordance with the requirements listed herein for the <u>Henderson County Public Schools', "Replace Plumbing Piping (Aboveground Sanitary Sewer and all Domestic Hot/Cold Water Piping)" at Bruce Drysdale Elementary School, Hendersonville, NC , hereinafter known as the Owner.</u>
- 2) Bidders shall submit sealed responsive bid criteria with Contractor License No. on outside of bid envelope. The Closing Bid Date and Time will be the Location named hereinafter on the "Invitation for Construction Bids" form attached herein. No bids will be received after the listed above time and date. The Owner reserves the right to accept or reject any or all bids.
- 3) The Engineering firm for the Project is:

Delta Engineering, Inc.

315 East Broad Street P.O. Box 8354

Greenville, South Carolina 29604

Contacts:

Stan Dunn, Construction Administrator

<u>Telephone</u>: (864) 271-7343 <u>Fax</u>: (864) 232-5313 <u>deiscl 981@gmail.com</u>

- 4) Only "Qualified" Bidders may submit bids for the project. Only Licensed General Contractors will be considered as "Qualified". Such contractors shall be licensed to do business in North Carolina and shall be primarily and regularly engaged in the business of contracting as a daily livelihood. Such qualified contractors shall employee only sub-contractors, entities, or individuals which are similarly licensed and primarily and regularly engaged in the daily livelihood business of sub-contracting only. When possible, such Contractors shall adhere to NC "Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts" (Revision 01/2002) with Appendixes A,B,C, and D.
- 6) Bids will be binding for a period of thirty (30) calendar days following the date on which the bids are opened, unless noted by Addendum or Amendment to the Bid Document.
- 7) Contractor shall list his proposed bid bond and bid bond company name with his responsive bid criteria. Bid security in the form of a Bid Bond, Certified Check or Cashier's Check will be required to secure his responsive bid criteria to Henderson County Public Schools in the amount of not less than 5% of the proposed Estimated Contract Budget Sum; NC "Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts" (Revision 01/2002) with Appendixes A,B,C, and/or D shall also be submitted with the Contractor's Bid Form, for those MBA businesses proposed to be used for the project.

General Guarantee By Contractor

Owner: Henderson County Public Schools 246 Education Drive Flat Rock, NC 28731	Contractor:
Project: 2019-2020 Mechanical HVAC Upgrades to Flat Rock & Rugby Middle Schools, Henderson County Public Schools, Hendersonville, SC	Engineer's Project No.: DEI 19005
STATE OF	
COUNTY OF	_
referenced Project above, against defect(s) due to failure to comply with the terms and conditions period of 12 Months for the general gua materials not covered by specific Sections of th CONDITIONS and SUPPLEMENTARY be designated by specific Sections of the Production of the Product	ue to normal usage conditions and does not cover
Sworn to subscribed before me	
This	By:
Day of,	Printed Name:
	Company:
Notary Public	Title:
My Commission Expires:	Date:

SECTION 15M019 - OPERATING AND MAINTENANCE DATA

1. RELATED DOCUMENTS:

The provisions of Division 1 and Section 15M001, 15M002, 15M013, and 15M050 shall apply and govern this section. Contractor shall refer to all listed sections for requirements specific to each Section.

2. GENERAL:

The Contractor shall employ resume proven, competent personnel to thoroughly instruct the Owner's authorized representative(s) in operating and maintenance requirements of the systems as installed. The representatives shall have a minimum of 10 years of installation experience within the types of systems installed in this project. The Contractor of Division 15M shall submit to the Engineer for his review of a detailed resume of each individual assigned to the portion of work by the specifications listed herein.

3. INSTRUCTIONS:

- (a) The Contractor shall include in his proposal sufficient man-hours to assure that the Owner's authorized operating and maintenance representative(s) are cognizant of the following:
 - 1. Understand the functional sequences and intent of the systems.
 - 2. Understand the limitations of the system.
 - 3. Know where safety controls, start and stop switches, and re-set switches are located.
 - 4. Normal Setpoints and Operating ranges of all controls and their normal positions, and limits of equipment systems.
 - 5. Know where and how to change all filters, including filter units.
 - 6. Know where and how to change oil and lubricate bearings and other moving parts for pumps.
 - 7. Know where and how to adjust all controls and change recording charts, or setpoints.
 - 8. Know where all drains, air vents, and makeup water valves are located. Know what equipment to protect from freezing temperature and how to drain and refill if necessary.
 - 9. Know who and where to call or write for service or information necessary to keep system operable.
- (b) To accomplish the items listed in Paragraph (a) above, the Contractor shall include a minimum of ten (10) working days for this purpose.
- (c) The actual instruction periods shall be coordinated between the Owner and the Contractor. THE CONTRACTOR SHALL VERIFY IN WRITING TO THE OWNERS WHEN THE INSTRUCTIONS TO THE OWNER'S PERSONNEL HAS BEEN COMPLETED. A COPY OF THIS LETTER SHALL BE SENT TO THE ENGINEERS, INCLUDING THE COMMISSIONING AFFADAVIT LISTED IN SECTIONS 15M001 and 15M013.

4. OPERATING INSTRUCTIONS:

- (a) AFTER ALL TESTING AND BALANCING AND INSTRUCTING OWNER'S OPERATING AND MAINTENANCE PERSONNEL HAVE COMPLETED AND FINAL APPROVAL GIVEN, THE CONTRACTOR SHALL FURNISH FIVE (5) BOUND SETS OF OPERATING AND MAINTENANCE INSTRUCTIONS, TWO (2) COPIES OF WHICH ARE TO BE TURNED OVER TO THE OWNER AND THREE (3) COPIES TO THE ENGINEERS. TO BE INCLUDED WITH THE INSTRUCTIONS SHALL BE PARTS LISTS AND SOURCES OF SUPPLY FOR ITEMS NEEDING MOST FREQUENT MAINTENANCE, REPAIR AND/OR REPLACEMENT.
- (b) ALL ITEMS IN PARAGRAPH 3(a) ABOVE ARE A REQUIREMENT OF THE MECHANICAL CONTRACT AND FINAL PAYMENT WILL NOT BE MADE TO THE CONTRACTOR UNTIL THIS REQUIREMENT IS SUBMITTED AND APPROVED BY THE ENGINEERS.

END OF SECTION 15M019

SECTION 15M094 - VIBRATION ISOLATION & ACCESSORIES

1. RELATED DOCUMENTS:

The provisions of Division 1 and Sections 15M001, 15M050, 15M099, 15M652MUN,15M664, 15M665, 15M824, and 15M925 shall govern and/or relate to this section.

1.1 GENERAL:

- 1.1.1 <u>All material and equipment</u> for vibration isolation hangers and supports shall be installed and provided under this section of the specification, and shall be new, unless otherwise shown or called for, and shall be furnished in accordance with the standard mentioned throughout this section.
- 1.1.2 Equipment, Pipe and Pipe fittings. The arrangement of equipment and general location and size of all piping is clearly shown. Install all equipment to clear level condition and piping accurately to grade and alignment. Should structural or other conditions require installation of pipe mains or any of the piping differently from the manner shown, the Contractor shall consult with the Architect Engineer and obtain written approval for all changes before proceeding with the work. All piping shall be installed to allow for expansion using offsets, expansion bends or expansion joints as may be required, to prevent undue strain on the piping.
- 1.1.3 <u>Vibration Isolation Requirements/Equipment:</u> All piping and equipment shall be supported to prevent undue vibration and movement within the acceptable limits for the system or equipment isolated, as specified and required by other sections of the specifications. Vibration control materials, sizes, types and models listed herein shall be as manufactured by "Vibration Mountings and Controls, Inc.," or approved equal devices. Approved equal manufacturers are "Kinetics-Peabody," "Mason Industries," or "Vibration Eliminators, Inc.." OTHER MANUFACTURERS MAY BE CONSIDERED FOR APPROVAL IN ACCORDANCE WITH "PRIOR-APPROVAL" REQUIREMENTS OF SECTION 15ME001.

2.0 REQUIRED ISOLATION:

- 2.1 <u>HVAC Units, Condensing Units, & Fan Base Units:</u> Equipment supported by integral bases and/or base-footed supports shall be provided with vibration isolators of the rubber- in-shear pad types. Isolators shall be provided with the equipment or by this section of the specification. Pump connections to piping shall be made with flexible rubber arch-type (Type XV) pipe connectors as called for on the drawings.
- 2.2 <u>Piping:</u> As may be applicable, all duct runs up to a combined straight distance from air handling units and duct mounted in-line fans (such as return air fans) and where specifically called for on the drawings, shall be vibration isolated by hanging the ducts with Type IV combined spring-flex and neoprene-in-shear hanger isolator, or Type VI neoprene-in-shear hangers. All piping within mechanical equipment rooms shall be hung utilizing Type V or Type VII spring-flex with neoprene-in-shear hangers.
- 3. Products and Device Types:
- 3.1 <u>Products:</u> shall be the standard of one manufacturer and shall be provided with all parts required to meet the industry standards for "Type" numbers referred to by this specification. Product model numbers given are listed using "Vibration Mountings and Controls, Inc." model numbers for reference. Equal types of model numbers for Mason Industries, Kinetics-Peabody, or Vibration Eliminators, Inc. will be acceptable provided they meet the intent of the specification types for proper vibration isolation.

- 3.2 <u>Vibration Isolation Device Types:</u> shall be as listed herein by the industry standard <u>Type Number</u>, as follows:
- 1. <u>Type I:</u> shall be double deflection Neoprene-In-Shear mountings of a steel top plate and base plate completely embedded in colored oil-resistant neoprene stock. Static deflection shall be 0.40" minimum. Mountings shall have ribbed neoprene surfaces on top and bottom and be provided with holes for bolting. (Equipment having severe overhang such as utility sets, vent sets or close coupled pumps shall be mounted on steel channel rails incorporating double deflection neoprene-in-shear mountings.) "Vibration Mountings and Controls, Inc.," Neoprene-In-Shear mountings Type "RD" and steel channel rails Type "RB."
- 2. <u>Type II (Open Springs)</u>: shall be Spring/Flex mountings, free standing, laterally stable without housing, snubbers, or guides complete with steel reinforced ribbed neoprene cups top and bottom. All mountings shall have a bolt hole in bottom cup and be provided with adjusting bolt, cap screw, and washer in top cup for leveling and attachment to equipment. Springs shall be capable of minimum additional travel to solid equal to 50% of the rated deflection. Springs shall be color coded for proper identification of rated load capacity. "Vibration Mountings and Controls Inc." Spring- Flex mountings series "AC" or "AB" series with the addition of two-hole rectangular steel base plate for bolting to the structure.
- 3. <u>Type II (Housed Springs):</u> shall be Spring-Flex mountings of a telescoping housing containing one or more steel springs as the isolation medium, shall have built-in leveling bolt, resilient inserts to act as upper and lower housing guides, and neoprene acoustical non-skid pad bonded to the bottom. Springs shall be color coded for proper identification of rated load capacity. "Vibration Mountings & Controls Inc." Spring-Flex mountings series "B" or "C."
- 4. <u>Type III:</u> shall be Spring-Flex mountings free standing, laterally stable, and incorporate resilient vertical limit stops to prevent spring extension during weight changes. Spring diameter shall not be less than 0.80" of the operating spring height. Springs shall be capable of minimum additional travel to solid equal to 50% of the rated deflection. Mountings shall be provided with adjusting bolt and neoprene acoustical non-skid pad bonded to bottom plate. Mountings shall be color coded or stamped with spring size for proper identification of rated load capacity. "Vibration Mountings & Controls, Inc." Spring-Flex mountings shall be type "AWR."
- 5. <u>Type IV:</u> shall be Spring-Flex hangers of a color-coded steel spring in series with a Neoprene-In-Shear element molded in specific colors for proper identification of rated load capacity. The minimum total static deflection shall be 1.25". "Vibration Mountings & Controls, Inc." Spring- Flex hangers series "RSH."
- 6. <u>Type V:</u> shall be Spring-Flex hangers of a color-coded steel spring in series with a Neoprene-In-Shear element molded in specific colors for proper identification of rated load capacity. Spring-Flex hanger design shall incorporate a means for supporting the suspended equipment or piping at a fixed elevation during installation regardless of load changes as well as a means for transferring the load to the spring "Vibration Mountings & Controls, Inc." Spring-Flex hangers series "RSHP."
- 7. <u>Type VI:</u> shall be double deflection Neoprene-In-Shear hangers, and shall have a minimum static deflection of 0.40". The elements shall be molded in specific colors for proper identification of rated load capacity. The hanger configuration shall be designed for direct attachment to flat iron straps. "Vibration Mountings & Controls, Inc." Neoprene-In-Shear hangers series "RHDC."
- 8. <u>Type VII:</u> shall be Spring-Flex hangers and shall consist of a color-coded steel spring in series with a Neoprene-In-Shear element molded in specific colors for proper identification of rated load capacity.

Spring- Flex hanger design shall permit lower hanger rod to swing through a 30 degree arc without metal to metal contact. The minimum total static deflection shall be 1.25". Vibration Mountings & Controls, Inc." Spring- Flex hangers series "RSH=30A."

- 9. <u>Type VIII:</u> shall be horizontal thrust restraints provided to prevent excessive movement of air handling equipment having high air thrust in relation to its weight. The horizontal thrust restraint shall consist of a steel housing containing a steel spring in series with a neoprene pad. The restraint assembly shall be designed to be pre-adjusted by the manufacturer and permit further adjustment in the field to limit horizontal movement to a maximum of 1/4". Assembly shall be furnished with back up plates and hardware for attachment to both the equipment and ductwork or structure. Horizontal restraints shall be attached on the centerline of thrust on each side of the unit. "Vibration Mountings & Controls, Inc." Horizontal Thrust Restraints series "HTR."
- 10. <u>Type XV:</u> shall be tin arch and/or elbow flexible connectors molded of multiple-layer neoprene and nylon reinforcing fabric. Connectors up to and including 2-1/2" diameter may have threaded ends. Connectors over 2-1/2" diameter shall be molded with raised faces and provided with floating steel flanges. Connectors shall be rated at 150 psi at 170 degrees F, and vacuum of 26" Hg. Control rods shall be furnished when recommended by the manufacturer. "Vibration Mountings & Controls, Inc." Quiet-Flex Style "TA" (flanged ends) or "TTA" (threaded ends).
- 11. <u>Type XVI:</u> shall be expansion joints of machine molded rubber and nylon construction internally reinforced by means of steel wire. Expansion joints shall incorporated cadmium plated steel flanges tapped to mate with 150 # ASA capable of operating at a temperature of 20 degrees F through 240 degrees F and at a pressure ranging from 16" Hg vacuum through 225 psi working pressure. Expansion joints shall be capable of 15 degree angular offset. "Vibration Mountings & Controls, Inc." expansion joints shall be "Quiet-Sphere."

END OF SECTION 15M094

SECTION 15M001 - MECHANICAL GENERAL PROVISIONS

1. PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

The provisions of Division 1 and this Section shall govern all Sections of the Division 15M Specifications. Contractor shall refer to all listed sections for requirements specific to each Section.

1.1.1 MECHANICAL, PLUMBING AND PROJECT MANAGER AFFIDAVIT:

PLUMBING AND MECHANICAL SUPERINTENDENT(S) AND THE PROJECT MANAGER ARE REQUIRED TO SUBMIT A SIGNED AFFIDAVIT INDICATING THAT EACH PERSON HAS READ THESE MECHANICAL AND PLUMBING SPECIFICATIONS IN THEIR ENTIRETY WITH THE DRAWINGS PRIOR TO CONSTRUCTION.

1.2 <u>DESCRIPTION OF WORK/COORDINATION, PHASING, & INSTALLATI</u>ON & FIELD CHECKING:

- 1.2.1 <u>General:</u> This section specifies several categories of provisions for all work, including all mechanical materials and labor work which is all inclusive of including "Proposed Phasing of the Work", and "Add Alternate Bid Items" as listed in Division 1 and Division 15M for the Phased Construction Work; the following is applicable but not limited to:
- 1) Certain adaptive special and limited connections to existing systems for some new portions of the Phases of HVAC VRV terminal equipment & devices, including new refrigerant piping connections, wiring and controls connections. These limited connections, as designated on the drawings, are within the new Phased construction areas of the building and are designated to be connected to certain portions the existing mechanical HVAC Controls DDC Systems & Ductwork systems for the new work associated with the new VRV refrigerant systems and controls systems The limited new connections for portions of the new HVAC VRV terminal equipment, refrigerant piping, wiring and controls, equipment, materials and labor requirements shall be done under the new Phased mechanical construction work of the project. Refer to all specifications as specified in Division 15M Mechanical and 15M sub-sections of Specifications, as they are uniquely and exclusively applicable to the above limited connections work and for that of all Division15M Mechanical work,
- 2) All Phased work shall be inclusive to the Project Base Bid for each school and is the general Mechanical HVAC work to be performed as mechanical work, because of its designated specified designed work per the contract drawings and the close association with Div15M mechanical work, including Phased mechanical HVAC demolition and new work complete. In addition to the Base Bid general Mechanical HVAC work, should the Owner select any one or more of the "Add Alternate Bid Items" for the project, the Division 15M contractor shall perform all mechanical HVAC work for the selected "Add Alternate Bid Items" of the work as listed in Project Manual and IAW the Standard Bid Form and as may be listed herein under Division 15M and/or as shown on the drawings.
- 3) Complete mechanical HVAC project management of all office and field Installation and coordination and all field coordination drawings and Shop Drawings for ALL equipment, ductwork, piping, drains, duct & pipe supports, seismic restraints & supports and related sub-systems required for the complete project. All materials, labor and services for the above shall be all inclusive for the all project phased demolition work and new installation work. All mechanical HVAC systems work shown on the plans shall be inclusive of all coordination for and with:
 - (a) Demolition removal of existing designated interior above ceiling (4-pipe) terminal fan coil units with terminal ducted systems and a designated horizontal mounted H&V heating-ventilating units &

- piping & duct systems with all limited removal of portions of existing chilled & hot water piping system; inclusive of all portions of exposed & concealed overhead interior supply & return ducts, and accessories; inclusive of removal of existing duct mounted accessories, dampers, w/terminal controls and all existing HVAC controls associated with these removed units and systems.
- (b) Demolition of some existing concealed above ceiling supply, return and exhaust ducts, chilled & hot water piping, and pneumatic/electric/electronic control systems; and ducts removed thru existing interior fire rated and non-rated partitions;
- (c) Demolition for Base Bid and Add Alternate Bid Items of all partial existing main lower and upper level suspended ceilings inclusive of ceiling mounted 2'x4' electric light fixtures with the Mechanical HVAC designated equipment Units, inclusive of (1) each electric-driven air-cooled water chiller machine (to be salvaged for the Owner & turned over to the Owner), and the partial demolition of exterior piped return & supply chilled water piping, and adjusting existing chiller chilled water pumps and all associated designated exterior above ground piping complete, with preparations of remaining piping to accept new work chilled water piping to new air-cooled water chiller unit machine.
- (d) Installation of new Div 15M Contractor provided Daikin Inverter Driven Exterior & Interior new VRV (3-Pipe) HVAC DX Air-Source Heat Pump Systems and Inverter Driven Mini Split DX Het Pump and Cooling Only Unit Systems and New Packaged Rooftop DX Inverter Driven HVAC ventilation air unit(s) with all installation complete for the new schools as specified on the drawings. Also providing new Daikin VRV DDC Central Controls System using the Bacnet based "i-Touch Manager" DDC Building HVAC Controls for the new above listed equipment serving the lower and upper level portions of the buildings of the project;
- (f) Installation of multiple roof & ground mounted new "VRV" type exterior mounted direct expansion air-cooled Variable Refrigerant Volume type system Units ("CU" units) with roof mounting support rails and pads and all new insulated 3-pipe ASTM-B88 copper brazed refrigerant piping systems, roof piping supports and rails, water-tight/weather proof roof piping penetration curbs, all new refrigerant branch selector units ("BS" units), and all interior VRV ceiling mounted cassette type units and VRV wall mounted VRV fan-coil DX evaporator units with controls & thermostats ("IDU" units) with complete integrated terminal sub-master DDC controls systems, and all pumped and gravity flow insulated HVAC condensate drain piping for the interior "IDU" units (complete with new condensate drain piping connected to to portions of the existing interior above ceilings HVAC condensate drain piping as specified on the dwgs). Such unit systems above shall be fully compatible, connectable and, be of the integrated intelligent DDC management type for interconnection wiring for the new installed "VRV-DDC Intelligent HVAC Building Management Control System" of the "Daikin" control protocol, to be installed in each school's main mechanical rooms (see plans) for the new installations for all the Phased installations (see plans for locations);
- (g) Complete and operational service of all new systems, including new ventilation ducted systems and the new (3-pipe) type "VRV" type system with all DX refrigerant piping, drain piping, and vent piping, all ductwork, duct insulation, wiring and controls for the new mechanical HVAC systems.
- (h) The design and installation of seismic systems for all Div15M mechanical HVAC systems and piping in accordance with the IBC- Category "C" requirements of the Code and in accordance with Section 15M090 of the specifications.
- 3) Complete installation and/or fabrication and FIELD CHECKING BEFORE FABRICATION OF ANY AND ALL NEW HVAC SYSTEMS. The Contractor shall see the drawings and specifications.
- 1.3 <u>COORDINATION DRAWINGS FOR ALL DIV15M MECHANICAL HVAC WORK:</u> the Div 15M contractor shall prepare coordination installation Shop Drawings for the requirements of this Division 15M work to provide all HVAC systems; see para. 1.4, especially requirements outlined in para.1,4,2.
- 1.3.1 <u>Piping Layout/Field Checking:</u> Refer to all contract drawings for graphic representations, schedules and notations showing Div. 15M mechanical work, and associated work relative to mechanical work. ALL PIPING SHOWN ON THE CONTRACT DRAWINGS IS A REPRESENTATIVE OF THE

INTENDED SIZES AND GENERAL ROUTING, ALL PIPING IS DRAWN TO SCALE AND SHALL BE COORDINATED BY THE DIV.15M CONTRACTOR FOR PROPER COORDINATED INSTALLATION & ALL FIELD VERIFICATION. (SEE PARA. 1.4 HEREIN). THE COORDINATION SHOP DWGS. SHALL BE SUBMITTED TO THE ENGINEER FOR HIS REVIEWS. PROVIDE ALL COORDINATION DRAWINGS FOR THE WORK; ALL WORK DRAWINGS SHALL BE VERIFIED BY THE DIV. 15M CONTRACTOR FOR FINAL ACTUAL PHYSICAL ROUTING, CLEARANCES AND INSTALLATION BEFORE ANY FABRICATION OR INSTALLATION OF PIPING AND EQUIPMENT. Deviations from routing or sizes shall be called to the attention of, and receive approval from the Design Engineer before any changes are made in the field. The Contractor shall check all existing conditions and systems before any changes or revisions work shall be done by the Contractor before work is to begin.

1.3.2 <u>All Div. 15M Specifications:</u> Refer to all sections of Division 15M for the primary technical specifications of all mechanical work. <u>THIS SECTION GOVERNS ALL DIVISION 15M SECTIONS OF THE SPECIFICATIONS.</u>

1.4 COORDINATION AND INSTALLATION OF MECHANICAL WORK:

1.4.1 <u>General:</u> Refer to other specification sections for general coordination requirements applicable to the entire work. It shall be recognized by the Div.15M Contractor that the Contract Documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work including existing overhead utilities and electrical work, etc. and that such establishment of these systems is the exclusive responsibility of the Div15M Contractor for coordinating all work. Contractor shall verify all clearances, dimensions and sizes of ducts, piping, and equipment with the Contract Documents before fabrication of any materials or work to be performed and prepared <u>"to-scale"</u> ductwork and piping shop drawings, as listed hereafter.

Arrange mechanical work in a neat, well-organized manner with layout and installation of piping and similar services running parallel with primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance. Locate all wall and floor openings before fabrication and installation of any materials.

Give right-of-way to piping, which must slope for drainage.

ADVISE OTHER TRADES OF OPENINGS REQUIRED IN THEIR WORK FOR THE SUBSEQUENT MOVE-IN OF LARGE UNITS OF MECHANICAL WORK (EQUIPMENT), AND ALL PIPING AND DUCTWORK RUNS FOR THE ENTIRE PROJECT.

- 1.4.2 Contractor Coordination of Work HVAC Ductwork Installation Shop Drawings Layout Drawings *

 Before ordering Material and/or Fabrication: For locations where any element or elements of mechanical (or combined mechanical and electrical) equipment work will need to be closely coordinated, verified, sequenced, and positioned with precision in order to fit into the available space, such as DUCTWORK AND ALL PIPING within chases overhead, ceiling spaces, etc.; piping within duct chases and equipment and piping & duct within mechanical rooms, as required for the proper coordination of the installation of the new systems, the Div15M contractor shall prepare "to scale" installation layout drawings for all ductwork and piping for Engineer's reviews and for his use for all duct and pipe installation. These drawings shall be required for all conditions of coordination purposes, and such layout drawings shall done IAW the following protocol and effort:
 - A. THE CONTRACTOR SHALL PREPARE AND SUBMIT INSTALLATION COORDINATION DRAWINGS, PREPARED IN AN "AUTO-CAD" FORMAT PRIOR TO PURCHASE AND OR FABRICATION-INSTALLATION OF ANY OF THE ELEMENTS INVOLVED IN THE

COORDINATION. ANY DEVIATIONS FROM THE LAYOUT CONTRACT DRAWINGS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR FULLY COORDINATED BY THESE INSTALLATION DRAWINGS FOR ALL DUCTWORK AND PIPING SYSTEMS.

- B. THE CONTRACTOR MAY, AT HIS OPTION, OBTAIN FROM THE DESIGN ENGINEERS, LIMITED COPIES OF ELECTRONIC DWG. FILE(S) IN "AUTO CAD" FORMAT OF THE MECHANICAL HVAC EQUIPMENT AND PIPING PLANS TO PREPARE HIS DRAWINGS. THESE COPIES SHALL BE PROVIDED IN ACCORDANCE WITH THE ENGINEER'S "LIMITED" USE AGREEMENTS AND FEES FOR SAME. THE ENGINEER'S CAD DWG. FILES MAY BE PURCHASED FROM THE ENGINEERS BY THE CONTRACTOR AT THE RATE OF \$50.00 PER DWG. FILE. THE CONTRACTOR MAY UTILIZE THE CAD FILES TO PREPARE ALL INSTALLATION COORDINATION DRAWINGS (REVIEW DRAWINGS) SHOWING THE ACTUAL PHYSICAL DIMENSIONS (AT ACCURATE SCALE) REQUIRED FOR THE INSTALLATIONS.
- C. UPON THE COMPLETION OF FINAL DEVELOPED COORDINATION DRAWINGS, THE CONTRACTOR SHALL THEN SUBMIT TO THE ENGINEER AS FINAL REVIEW COORDINATION DRAWINGS, (3) SETS OFTHESE DRAWINGS OF NEW MECHANICAL HVAC DUCTWORK SYSTEMS AND PIPING SYSTEMS AND ALL ITEMS OF EQUIPMENT OR SPECIAL DRAWINGS REQUIRED FOR THE WORK.
- D. THESE FINAL REVIEW COORDINATION DRAWING SUBMISSIONS ARE FOR THE ENGINEER'S REVIEWS OF THE CONTRACTOR'S MECHANICAL HVAC DUCTWORK SYSTEMS AND PIPING SYSTEMS ONLY; THIS SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ERRORS, OMISSIONS, OR DEVIATIONS FROM PLANS AND SPECIFICATIONS.
- 1.4.3 Contractor's Work, Performance and Responsibility:

The Contractor shall install systems as designed and set forth by the Contract Documents and specifications and the design concept intended by the documents. The Contractor shall be responsible for all dimensions which shall be confirmed and correlated at the job site, fabrication processes and techniques of construction, coordination of his work with that of all other trades, and the satisfactory performance of his work.

The Architect and Engineer shall not be responsible for any acts or omissions of any contractor, or sub-contractor or any of the contractors' or sub- contractors' agents, employees or any other persons.

- 1.4.4 MECHANICAL HVAC COORDINATOR: THE CONTRACTOR SHALL PROVIDE A FULL-TIME * MECH. HVAC PROJECT MANAGER COORDINATOR WITH NOT LESS THAN TEN (10) YEARS OF SUPERVISORY EXPERIENCE IN THE INSTALLATION OF MECHANICAL HVAC WORK SIMILAR TO THAT OF THIS PROJECT. THE HVAC CONTRACTOR SHALL SUBMIT A COMPLETE FULLY LISTED RESUME OF THE MECH. HVAC PROJECT MANAGER COORDINATOR TO THE ENGINEERS FOR REVIEW BEFORE THE WORK BEGINS.
- 1.5 QUALITY ASSURANCE, STANDARDS CODES AND SYMBOLS:
- 1.5.1 <u>General:</u> Refer to Division 1 sections for general administrative/procedural requirements related to compliance with codes and standards. Specifically, for the mechanical work (in addition to standards specified in individual work sections), the following codes standards are imposed, as applicable to the work in each instance, (with all latest revisions and amendments up to and including all time of work during construction).

International Standard Building Code w/all required additions
International Standard Mechanical Code w/all required additions
All Local Governing NC Codes and Requirements by Local Code Officials
Where any discrepancies or differences occur between Codes, the Code which is most stringent shall govern. All interpretations of the Codes shall be by the governing Code official; if no Code official is governing, the final interpretation of the Code will be by the Architect/ Engineer.

- 1.5.2 <u>Permits & Fees:</u> Division 15M Contractor shall provide all costs for his work to secure and pay permits & fees for all costs related to and necessary for the proper execution and completion of all work, as is applicable at the time the bids are received.
- 1.5.3 <u>Symbols & Legends:</u> Except as otherwise indicated by "<u>legends"</u> on the drawings, Contractor shall refer to the latest 2005 edition of "ASHRAE Handbook of Fundamentals" for definitions of symbols used on the drawings to show mechanical work.

1.6 SUBMITTALS:

- 1.6.1 <u>General:</u> Refer to Division 1 sections for general requirements concerning work- related submittals (refer to other Division 1 sections for administrative submittals). For mechanical work, the following quantities are required for each category of submittal (in lieu of quantities specified in Division 1, unless otherwise indicated in individual work sections, quantity does not include copies required by governing authorities, or by Contractor for its own purposes).
- 1.6.2 <u>Engineers Stamping of Shop Drawings:</u> Each submittal shall bear the following * Shop Drawing Stamp to constitute review by the Architect/Engineer. <u>NO ITEM REQUIRING SUBMITTAL SHALL BE FABRICATED</u>, OR PROVIDED OR INSTALLED UNLESS SUBMITTAL BEARS THIS STAMPING AND IS COMPLETED AS SET FORTH BY MARKING AND DATE.

Engineers Shop Drawings Stamp:
(THE ABOVE IS Engr SHOP DRAWING STAMP PROVIDED BY Engr; NOT the CONTRACTOR's)

- 1.6.3 <u>Shop Drawings:</u> Refer to General Provisions Division 1 for number of submittals required and submittal procedures.
- 1.6.4 <u>Product Data:</u> Refer to General Provisions Division 1. Data shall include the following, but not limited to:

Exhaust Fans & accessories;

Exterior & Interior VRV Condensing & evaporator HP Units w/controls & accessories with Interior VRV Heating & Cooling Units & Controls, w/accessories;

All HVAC DDC Control devices & accessories,

All Air Distribution Ductwork (single wall), air Diffusers, registers, grilles, dampers & air control devices, duct hangers, fire dampers, duct access doors, and all air ducts accessories;

All Piping, pipe fittings, piping Specialties, piping accessories, all pipe hangers and supports, and accessories:

All Pipe & Duct Insulation (Interior & Exterior)

Div15M Installed HVAC DDC Controls w/Graphics & Software – (All Devices and Hardware)

All Valves (All)

All Refrigerant Piping & Refrigerant Valves, and refrigerant piping accessories.

Contractor Prepared Ductwork Shop Drawings to scale with all sizes and sections for installation of all ductwork systems.

- 1.6.5 Samples: Refer to General Provisions Division 1.
- 1.6.6 <u>Warranties (Guarantees):</u> Warranty shall be standard one year parts and labor for all mechanical equipment and systems, unless noted otherwise to include the warranties beyond the one (1) year warranty for an extended longer period warranty as may be listed in the drawings and/or specific requirements of the specifications.
- 1.6.7 <u>Maintenance Manuals:</u> 3 complete sets with individual sets of this data bound in * 10-1/2 x 11-1/2 loose-leaf, 3-ring binders, 1-1/2", 2" or 3" ring size, with rigid permanent vinyl covered back and front. Separators with index tabs and loose-leaf sheet protectors shall be provided. One set shall have all sheets individually encased in clear plastic document protectors.

Each set shall include the following data:

<u>Valve Directory</u> indicating valve number, size, manufacturer, location, function, and normal position. Valve tag numbers shall be contained on Solid Brass Tags chained to the valve (tags by "Seton Nameplate") which match all data to be listed in the Valve Directory as specified. See paragraph 2.4 for description of valve tags required.

Mechanical Equipment: Show the following information for all mechanical equipment:

Nameplate designation

Manufacturer's nameplate data

Location of equipment

Area served

Complete parts drawing and list

Manufacturer's operating instructions

Manufacturer's maintenance instructions

Manufacturer's installation instructions

Nearest supplier's address for parts and replacements with telephone number

Nearest service organization's address for equipment with telephone number

Control Data:

Control diagrams and wiring diagrams
Description of control system
Catalog data, maintenance and calibration instruction for all control components
Control supplier and address
Control installer and address

<u>Maintenance Instructions:</u> A typewritten form of instructions for maintenance of the systems, in itemized form and with time schedule for maintenance work, shall be furnished. The instructions shall list each item of mechanical equipment requiring inspection, lubrication or service and describe the performance of such maintenance. The list shall include the type of bearings for each piece of equipment, the type of and frequency of lubrication required. The operating personnel shall be instructed in the care of the system in accordance with the typewritten instructions.

1.7 PRODUCTS, MECHANICAL WORK:

1.7.1 <u>General:</u> Refer to Division 1 sections and Section 15M002, para. 4, for general requirements on products, materials and equipment. The following provisions expand or modify the requirements as applicable to mechanical work.

1.7.1.1 PRE-BID PRIOR APPROVAL REQUIREMENTS: THE REQUIREMENTS OF DIVISION 1 SHALL GOVERN THIS PARAGRAPH AND SHALL REQUIRE THE MINIMUM AS FOLLOWS:

- ANY PRODUCT OR MATERIAL IN THE DIV. 15M DRAWINGS AND/OR SPECIFICATIONS THAT
 ARE LISTED OR NOT LISTED, AS "<u>EQUAL</u>", OR "<u>APPROVED EQUAL</u>", SHALL REQUIRE THE
 CONTRACTOR TO OBTAIN "<u>PRE-BID PRIOR APPROVAL</u>" FROM THE ENGINEERS FOR ANY
 CONTRACTOR SUBSTITUTED PRODUCT OR MATERIAL DEEMED BY THE CONTRACTOR AS
 "<u>AN EQUAL</u>" TO THAT SHOWN. <u>NO CONTRACTOR ONLY PRE-APPROVED PRODUCT OR</u>
 MATERIAL WILL BE ACCEPTED.
- REQUEST FOR "PRE-BID PRIOR APPROVAL" IS THE RESPONSIBILITY OF THE BIDDING CONTRACTOR(S) AND VENDORS, AND/OR SUPPLIERS. THIS REQUEST SHALL BE SENT IN WRITING ON DATED LETTERHEAD TO THE ENGINEER NO LATER THAN FOURTEEN (14) CALENDAR DAYS PRIOR TO BID DATE.
- EACH WRITTEN "REQUEST FOR PRIOR APPROVAL" SHALL HAVE ATTACHED WITH IT THE SUBMITTAL DRAWING DATA, CUT SHEETS, DIMENSIONAL DATA, PERFORMANCE AND CONSTRUCTION SPECIFICATIONS INDICATING THE ITEM REQUESTED FOR "PRE-BID PRIOR APPROVAL." INFORMATION SHALL BE CLEARLY MARKED WITH EITHER "RED" ARROW OR HIGHLIGHTED WITH "YELLOW" TRANSPARENT MARKING TO INDICATE THE SPECIFIC SIZE, TYPE, ETC. IF THE SUBMITTAL DATA IS NOT PROPERLY MARKED AS INDICATED ABOVE, THE ENGINEER SHALL RESERVE THE RIGHT TO REJECT THE REQUEST FOR PRIOR APPROVAL. REJECTED REQUESTS WILL BE FINAL AND BINDING.

1.7.1.2 PRODUCT LISTINGS AND SUBSTITUTE PRODUCT APPROVALS:

1.7.1.2.1 Product Listings (By Prime-Contractor): The successful Prime-Contractor with his subcontractor(s) shall prepare and submit to the Engineer a product listing for mechanical work, separately from the listing(s) of products for other work. Include all specified and pre-bid prior approved products listing each significant item of equipment, and material used in the work; and indicate the generic name, product name, manufacturer, model number, related specification section number(s), and estimated date for start of installation. Bulk materials, including pipe and sheet metal, taken from Installer's stock, need not be listed.

- 1.7.1.2.2 <u>Substitute Products:</u> Where one, or more than one, manufacturer is listed within the specifications, or listed by the clause "Approved Equal", or items which have been Pre-Bid Prior Approved by the Engineer, and the Contractor desires to list such item as a substitute for approval as an equal to that specified, then the Contractor shall furnish adequate product listing data along with shop drawing sketches, as necessary, that will demonstrate that the substitute item is equal in all respects to the specified item and that the substitute item will dimensionally fit into the space or system as designed and is compatible with other components specified. Substitute item approval shall be the responsibility of the Engineer.
- 1.7.1.2.3 THE ABOVE "INTENDED PRODUCT LISTING" SHALL BE SUBMITTED TO THE ENGINEER WITHIN, BUT NOT MORE THAN 21 CALENDAR DAYS AFTER CONTRACT AWARD FOR NOTICE TO PROCEED HAS BEEN GIVEN TO THE SUCCESSFUL PRIME CONTRACTOR (GENERAL CONTRACTOR).

ENGINEER APPROVED PRE-BID ITEMS WILL NOT BE APPROVED ON CONTRACTOR SUBSTITUTE SUBMITTALS IF NOT LISTED ON THIS "INTENDED PRODUCT LISTING" SUBMISSION. IF PRODUCTS ARE NOT LISTED ON THIS LISTING IT WILL BE INTERPRETED BY THE ENGINEER THAT THE CONTRACTOR WILL PROVIDE THE ITEMS SPECIFIED BY THE ENGINEER ON THE CONTRACT DOCUMENTS.

SHOULD THE ABOVE "INTENDED PRODUCT LISTING" SUBMISSION NOT BE RECEIVED, POSTMARKED WITHIN THE ABOVE 21 CALENDAR DAYS IT SHALL BE UNDERSTOOD THAT THE CONTRACTOR INTENDS TO PROVIDE THE MATERIAL AND/OR EQUIPMENT AS SPECIFIED BY THE CONTRACT DOCUMENTS.

- 1.7.1.2.4 THE ABOVE "SUBSTITUTE PRODUCTS" SUBMITTED BY THE CONTRACTOR FOR APPROVAL SHALL BE SUBMITTED UNDER REQUIREMENTS OF SHOP DRAWING SUBMITTALS PROVIDING THAT SUCH SUBSTITUTE PRODUCTS HAVE BEEN PREVIOUSLY LISTED AND SUBMITTED ON THE "INTENDED PRODUCT LISTING" SUBMITTAL ABOVE.
- 1.7.2 <u>Compatibility:</u> Provide products which are compatible with other products of the mechanical work, and with other work requiring interface with the mechanical work. Coordinate the selections from among options (if any) for compatibility of products.
- 1.7.3 PRIOR APPROVAL REQUEST for all new PHASED "VRV" DX DUCTLESS SPLIT HEAT PUMP HVAC SYSTEMS & DDC CONTROLS :

NOTE: THE "BASE BID" FOR THE ENTIRE PROJECT SHALL BE BASED ON EXACTLY WHAT IS SPECIFIED ON THE BIDDING DOCUMENTS AND THE DIV-15M BIDDER SHALL ONLY BID THE "DAIKIN" BASED VRV SYSTEMS AS SPECIFIED ON THE DRAWINGS AND THE SPECS. FOR THE LISTED EQUIPMENT ONLY AND SHALL BE BID ONLY FOR THE BASE BID OF EACH SCHOOL (AS SHOWN ON THE BID DOCUMENTS STANDARD BID FORM).

"BASE BID" FOR THE ENTIRE PROJECT SHALL BE BASED ON EXACTLY WHAT IS SPECIFIED ON THE BIDDING DOCUMENTS AND THE DIV-15M BIDDER SHALL ONLY BID THE "DAIKIN" BASED EQUIPMENT ONLY FOR THE "BASE BID" OF EACH SCHOOL (AS SHOWN ON THE BID DOCUMENTS STANDARD BID FORM).

NOTE: THE DIV-15M BIDDER SHALL BE PERMITTED TO OFFER AN "ALTERNATE BID" FOR BIDDING TO USE ONLY THE ENGINEER "PRIOR-APPROVED" VENDORS & THEIR SUBMITTED PRIOR APPROVED DESIGNS AS LISTED HEREIN AS ONLY "PRIOR APPROVED ONLY TO BID" AS FOR THE "ALTERNATE BID" FROM THAT OF THE "BASE BID" USING ONLY THE "DAIKIN" BASED EQUIPMENT ONLY FOR THE BASE BID OF EACH SCHOOL (AS SHOWN ON THE BID DOCUMENTS STANDARD BID FORM).

- (A) Vendor manufacturers who may select to submit Prior-Approval Request of their Products for the Phased "VRV" DX Ductless Split Heat Pump Systems and DDC Controls shall, in addition to the above requirements, provide the following mandatory additional design information and data. The Vendor manufacturer representative shall submit his formal requests for prior approval in a formal written cover letter on the Vendor Manufacturer's letterhead stating his requests for prior approval of his products and systems by specific model numbers with all attached data and cut-sheets for the model units to and DDC Controls proposed to be provided and used on the project. The Vendor's formal prior approval letter request shall be sent directly to the Engineer. The Vendor manufacturer shall obtain the written approval for his formal request in a written letter directly from the Engineer and/or the Owner.
- (B) The Vendor manufacturer shall obtain the Engineer's written approval for his formal request before he submits a bid to any Mechanical HVAC Div15M Bidder for the materials and systems specified in Sections 15M700 and 15M701 sections of the work. Manufacturer's that will be considered for prior approval review are "MITSUBISHI" or other manufacturers that may be submitting such prior approval requests. The requirements for "MITSUBISHI" or other manufacturers who make their formal "Request for Prior Approval" shall be done in strict accordance with that listed hereinbefore and specifically that of this Specifications Section 15M001, para. 1.7 in entirety and as mandatory listed and stated below hereinafter. It shall be mandatory required of the requesting Prior Approval Vendor Manufacturer listed above or any who are not listed above that a complete and detailed technical proposal and VRV system design be submitted within 14 days prior to and before the actual bid date of the project to include the following:
 - Submit ALL Vendor Product data sheets describing all aspects of the equipment, devices, system
 type, hardware, hardware configuration, controls and software and functional operation of the
 proposed new Phased "VRV" DX Ductless Split Heat Pump Systems and DDC Controls HVAC DDC
 System.
 - 2. Submit complete set of HVAC designed layout design drawings prepared in AutoCAD format with system details representative of the new Phased VRV-DX systems; all drawings shall be prepared on 30"x42" format drawings with all the details and sizes of the units and systems shown for the building with all DDC Controls for proper interface control to and with the existing Main Central HVAC DDC Controls systems. The drawings shall depict all equipment types, refrigerant piping designs with piping sizes and wiring sizing for all power and controls wiring and all systems unit locations for that of all exterior and interior VRV units and dedicated OAHRU units.
- (C) The requesting Prior Approval Vendors may obtain files and/or a CD disk of files containing the electronic format backgrounds of the building floor plan areas for the Phase-3 VRV-DX systems work showing the floor plans of the building. The Project contract drawings showing the designed VRV and other HVAC systems as indicated, may be obtained in an PDF background and in PDF format from the OWNER's WEB SITE.

2. PART 2 - PRODUCTS AND EXECUTION

2.1 ELECTRICAL PROVISIONS OF MECHANICAL WORK:

2.1.1 WIRING:

All control wiring complete to all motorized equipment, and control devices listed in this specification and shown on the mechanical drawings, shall be done under Division 15. The Contractor shall refer to the electrical plans and specifications to determine the source of electrical energy for the various control circuits.

ALL WIRING SHALL BE IN CONDUIT, SHALL CONFORM WITH DIVISION 16 OF THESE SPECIFICATIONS, ALL LOCAL CODES, THE NATIONAL ELECTRICAL CODE, AND SHALL BE INSTALLED BY AN APPROVED LICENSED ELECTRICAL CONTRACTOR. WIRING DIAGRAMS INDICATING WIRE SIZES AND CONDUIT RUNS FOR ALL ELECTRICAL WORK THAT IS REQUIRED TO BE INSTALLED UNDER THIS CONTRACT SHALL BE SUBMITTED TO THE ARCHITECT/ENGINEER FOR PRIOR APPROVAL BEFORE WORK IS BEGUN. UPON COMPLETION OF THE WORK, THE WIRING DIAGRAMS SHALL BE REVISED TO INCORPORATE ADDITIONS/CORRECTIONS AND TWO COPIES OF THE "AS INSTALLED" DIAGRAMS SHALL BE FURNISHED TO THE OWNER AND ONE TO THE ENGINEER.

2.1.2 <u>Motors:</u> Motors for equipment shall be of approved manufacture and of electrical, speed, and torque characteristics shown on the drawings. Motors 3/4 h.p. and above shall be wound for either 208volt or 460 volt, 3 phase, 60 cycle current all as listed on the electrical drawings; and 1/2 h.p. and under, 120 volt, 1 phase, 60 cycle current, unless specified otherwise. Single phase motors shall be furnished with built-in overload and under-voltage protection. Nameplates for all motors shall be stamped for the current characteristics indicated on the drawings.

The use of shaded pole motors is prohibited. Only split capacitance (small fractional horsepower) motors shall be permitted for use on any mechanical equipment where below 1/3 HP.

Motors shall have capacity of not less than the horsepower noted on the drawings, and shall not exceed their full rated load when the driven equipment is operating at specified capacity under the most severe conditions likely to be encountered.

Motors shall have continuous-duty classification based on 40 degree C. ambient temperature of reference.

All motors 1/2 h.p. and larger shall have grease lubricated ball bearings.

All motors, regardless of horsepower, shall have over-current protection installed either as an integral part of the motor, or within the motor controlling device in accordance with the National Electrical Code Paragraph 430-32.

2.1.3 STARTERS:

All starters for mechanical equipment indicated by schedule or notation on the Mechanical Drawings or Specifications shall be furnished integral with the mechanical equipment under this Division 15M, and installed by the Mechanical under Division 15M. Devices furnished under the Electrical Division 16 shall be as specified under Division 16 Drawings and Specifications and IAW Section 15M950. Mechanical equipment with integral devices (provided by Division 15M) shall meet all the requirements of NEC and U.L., and shall be heavy-duty, non-fused Type "S" with NEMA Class 1 or NEMA Class 4 enclosures. Switches shall be "General Electric", "Allen-Bradley," "G.E.", "Square D," "Cutler-Hamer," or Prior Approved Equal.

2.1.4 EACH ELECTRICAL AND/OR CONTROLS ENCLOSURE:

Each enclosure for electrical and/or control devices not mounted in control cabinets, such as magnetic starters, magnetic contactors, junction boxes, manual switches, etc., shall have a phenolic strip to indicate the device or circuit which it protects. The lettering on the strips shall be white-filled engraved; the strip shall be of black finish, the letters in white and 3/16" in height; and the use of manufactured nameplates similar to those fabricated by the Seton Name Plate Company, or equal, is recommended. Minimum controls enclosure requirements shall be NEMA 4 enclosure.

All separately provided equipment of magnetic starters, contactors, disconnects, and panels, etc., provided with the mechanical equipment under this Division 15M, shall be supported on suitable angle iron racks or stands securely anchored to the floor or wall construction, but shall not be attached to any equipment unless attached to, or the provisions for the attachment of same to the equipment by the equipment manufacturer. No steel shall be in direct contact with the floor, but shall be supported on concrete pads at least 4" high.

<u>Separate Starters and Drives</u> provided with any mechanical equipment under Division 15M shall be panel mounted or located adjacent or near the equipment or in rooms specified, which they control, but shall not be supported by or anchored to such equipment unless attached to, or provisions for the attachment of same to the equipment has been made by the manufacturer.

2.1.5 VFD'S for DIV15M HVAC EQUIPMENT (ONLY IF SPECIFIED): (Provided By Div15M Mechanical)

All Variable Frequency Drives (VFD's) type motor starters & controllers as MAY BE called for and specified and listed shall be supplied with and/or for the Division 15M supplied HVAC Equipment shall be provided by the Div15M Contractor and such VFD's shall be installed by the Div. 16-Electrical. All VFD's for all Contractor installations shall be in accordance with the Electrical and HVAC Controls drawings.

2.2 FOUNDATIONS, CURBS AND MISCELLANEOUS STEEL SUPPORTS:

- 2.2.1 <u>Foundations and Curbs:</u> All concrete foundations anchor forms, or pads indicated on the drawings that may be necessary and required for the installation of equipment specified under this contract, shall be furnished and installed by this Division 15M. Provide anchor bolts for the equipment foundations/pads. Roof curbs for all mechanical piping, duct and equipment, such as exhaust fans, HVAC units, air relief/intake ventilators, etc. shall be provided and installed by this Division 15M. As part of the integral construction, all roof curbs for any and all equipment shall be constructed of all metal or of the combined metal and wood type using only pressure treated wood with the curbs.
- 2.2.2 <u>Miscellaneous Steel Supports:</u> All supporting steel grillage, steel angles, channels, pipe or structural steel stands, and anchoring devices that may be required to adequately and rigidly support tract, shall be provided and installed by Division 15M. <u>STEEL FOR CONNECTION AND SUPPORT FOR MAJOR MECHANICAL EQUIPMENT SUCH AS HVAC UNITS AND FANS SHALL BE A PART OF THE STRUCTURE OR SECONDARY SUPPORT MEMBERS AND SHALL BE PROVIDED AND INSTALLED BY THE GENERAL CONSTRUCTION AND/OR BUILDING STRUCTURE OF OTHER TRADES.</u>

2.4 MECHANICAL SYSTEM IDENTIFICATION:

2.4.1 <u>Piping System:</u> All piping installed under this division of the specifications shall be identified as follows:

Method of Marking: Color coded plastic pipe markers by "Seton Nameplate Co." of Style No." RPM" for pressure sensitive markers or Style No. "PMR" for roll-cut type markers or equal. These shall be provided and installed with letters that designate the material being handled. Markers shall be applied at not more than 40 foot intervals on straight pipe runs, and adjacent to valves and where pipe passes through walls and floors. Piping shall be marked at all the equipment connections.

<u>Identification:</u> Plastic pipe markers' lettering shall be in block letters, size as scheduled below. Letters on covered (insulated) pipe shall be sufficient to wrap over 2/3 of insulated covering. On uncovered pipe, colored bands shall be wide enough (see Table 1) to accommodate required letters. Pipe markers shall be positioned so that it can be easily read by a man standing on the floor. Pipe markers on parallel groups of lines shall be neatly lined up. Surfaces of piping or insulation finished in dark colors shall be

lettered in black. Colors used for pipe service identified shall be standard ANSI/OSHA specified colors, as listed by "Seton" catalog; (tel. no. 1-800-243-6624).

<u>All lines</u> also shall be marked with plastic pipe flow arrows indicating the direction of flow, and of sizing according to Table 1 herein below:

TABLE 1 Markers Letter Sizes

Minimum Size of Letter

 Pipe or Covering
 Lett

 1/2 to 1-1/4
 1/2

 1-1/2 to 2-1/2
 3/4

(All dimensions are given in inches.)

Valve Identification:

Outside Diameter of

<u>Tags:</u> Polished brass tags by "Seton Nameplate Co." Style No. 250-BL, with black-filled letters or equal, shall be provided and installed with 1/4" high stamp-engraved lettering, different shapes for each generic piping service. ("Seton" Tel. No. 1-800-243-6624)

<u>Application:</u> Tag every valve, cock and control device in each mechanical-work piping system; exclude check valves, valves within equipment units, valves at HVAC heating/cooling units, etc.

<u>Valve Schedule:</u> Prepare and submit valve tag schedule (in duplicate), listing each tagged valve by location, service, and tag description. Install each page of one copy of the valve schedule in glazed frames, and mount where directed.

Equipment:

Signs: Provide engraved plastic laminate signs at locations of major equipment units, primary control devices, emergency equipment, dangerous elements of the mechanical work and similar places. Provide text of sufficient clarity and lettering, of sufficient size to convey adequate information at each location. Comply with recognized industry standards for color and design. Signage shall be by "Seton Nameplate Co." Style "EBS", with Gothic letter style, or equal.

Operational Tags: Where needed for proper and adequate information on operation and maintenance of mechanical systems, provide tags of plasticized card stock, either pre-printed or hand printed to convey the message; example: "DO NOT CLOSE THIS VALVE EXCEPT WHEN UNIT IS OFF."

<u>Selection:</u> Refer to instances where either a plastic-laminate sign or plasticized tag might be appropriate, to the Architect/Engineer for resolution.

2.5 V-BELTS, PULLEYS, AND GUARDS:

- 2.5.1 <u>Belt drives shall use V-belts.</u> Multiple belt drives shall be matched sets and be so marked at the factory. The V-belts shall be designated for 150% capacity.
- 2.5.2 Motors of 3 h.p. and less with not more than two belts shall be provided with adjustable pitch motor sheaves with the midpoint of the adjustment range equal to the specified RPM requirement of fan. Final adjustment of fan or blower RPM shall be accomplished to the scheduled air quantity CFM as designated on the drawings as may be required to the extent of changing sheave sizes to accomplish the scheduled air quantity. Changes in sheaves or drives shall not be an extra cost to this contract as a change-order to accomplish the balance and/or quantity required of each system.

2.5.3 <u>Safety Guards:</u> Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded. These guards shall be factory-built and furnished with the equipment. Guard sides shall be expanded metal.

2.6 ACCESSIBILITY:

- 2.6.1 <u>No valves, controls, unions, etc.</u>, shall be placed in any pipe line or electrical devices located at a location that will be inaccessible after the system is completed.
- 2.6.2 <u>Any controls or valves</u> and piping controls, electrical devices, expansion joints, or other apparatus which must be located in an inaccessible location shall be provided with suitable access doors (fitted in a framed hole) which will permit proper operation and servicing of the apparatus, all in accordance with governing codes.

2.7 PAINTING MECHANICAL WORK:

2.7.1 <u>General:</u> All painting of mechanical equipment (except exposed ductwork) shall be done under this Division. NO Painting shall be required for the Project except for touch-up Painting of equipment and for the sizing of the insulation jackets shall also be done under this Division, and see Section 15M180. Color stenciling of piping for identification, and touching up paint that is chipped or scratched from mechanical equipment supplied shall be done under this Division. Final colors shall be coordinated with the Owner & Engineer before final painting work is done.

2.8 CLEANING, TESTING, ADJUSTMENTS AND INSPECTIONS AND FILTER REQUIREMENTS:

- 2.8.1 <u>Cleaning, testing, adjustments and inspections</u> shall be accomplished in accordance with the following instructions and requirements. Provide temporary fill and drainage lines, wherever required, and connect them to the piping systems for these procedures and, finally, upon completion disconnect and remove these temporary lines.
- 2.8.2 <u>Cleaning and Oiling:</u> All piping systems shall be thoroughly cleaned of grease, iron cuttings, welding slag, loose scale and other refuse. Should any pipe, valves, traps, strainers, and other specialties, and equipment be stopped up by refuse, disconnect, clean and reconnect such pipe, equipment and material. All strainer baskets shall be removed, cleaned and replaced.
- 2.8.3 <u>Piping Systems</u> shall be filled and flushed with clean water for a period of not less than one hour. Automatic valves and specialties shall be disconnected, isolated or removed from piping systems during this cleaning period; otherwise, piping system shall be cleaned in sections before such equipment is installed.
- 2.8.4 Exterior surfaces of piping, materials, or equipment that is to be painted or insulated shall be cleaned to remove lint, grease and oil.
- 2.8.5 <u>Piping:</u> all strainers in all piping and all strainers integral with equipment shall be cleaned or replaced after system has been used for any purpose such as adjusting, testing or balancing.
- 2.8.6 <u>All components of the mechanical system</u> shall be cleaned on outside of dust, trash, paint and masonry dropping, and left in first class condition. Belt drives shall be adjusted for proper tension and sheaves aligned. All motor and equipment bearings shall be lubricated as recommended by the individual manufacturer and oil reservoir shall be left full.
- 2.8.7 Filter changes and "Filter Schedule" shall be provided by the Contractor. After start-up of system

and cleaning the Contractor shall provide extra sets of all filters for all units. Contractor and vendors shall provide a complete <u>"Filter Schedule"</u> for all equipment supplied and installed under this section of the specifications. <u>"Filter Schedule"</u> shall include filter type, size and ratings for performance per ASHRAE "MERV" rating.

- 2.9 <u>DIV-15M CONTRACTOR COORDINATION WITH CONTRACTOR FOR TESTS AND * TESTING</u> AND BALANCING OF HVAC SYSTEMS:
- 2.9.1 General and Affidavit Letter of Tests: Adjustments shall be coordinated with cleaning and testing to assure equipment performance as specified and shown on the drawings. See Section 15M925 for Test and Balancing Contractor assigned by the DIV-15M contractor and coordination requirements by Div15M Contractor. THE DIV-15M contractor shall PROVIDE A SEPARATE CONTRACT FOR ALL THE HVAC TESTING & BALANCE OF THE PROJECT UNDER A SEPARATE T&B CONTRACTOR. THE T&B CONTRACTOR WILL PROVIDE ALL LABOR TO ACCOMPLISH THE TESTING AND BALNCING OF THE SCHEDULED & SPECIFIED QUANTITIES AND IT SHALL BE THE RESPONSIBILITY OF THE DIV 15M CONTRACTOR TO COORDINATE HIS WORK WITH THE T&B CONTRACTOR. THE NEW CONTROLS SYSTEM SHALL BE ADJUSTED AND PLACED IN OPERATION BY THE DIVISION 15M CONTRACTOR. THE CONTROLS SHALL BE PROVIDED AND INSTALLED BY THE HVAC TEMPERATURE CONTROLS REPRESENTATIVE AND THE T&B CONTRACTOR.SHALL MAKE ALL READINGS & AJUSTMENTS NECESSARY TO ACCOMPLISH THE SPECIFIED RESULTS WHICH SHALL BE MADE. THE CONTRACTOR SHALL COORDINATE ALL THE HVAC CONTROLS TO ADJUST THE NEW SYSTEMS TO MAINTAIN THE PACKAGED TEMPERATURE CONTROL SEQUENCES FOR THE VENTILATION UNIT AND THE VRV SYSTEMS TERMINAL CONTROLS AS SO STATED AND INDICATED ON THE DRAWINGS. (SEE CONTROL DIAGRAMS FOR THIS REQUIREMENT).

All services tested for testing and balancing shall be done by the T&B contractor. The OWNER and the Engineer shall require the Test and Balancing results to be submitted in a report booklet with air flow results and letter of affidavit that all new systems have been tested and proven operable satisfactory to the herein requirements and codes governing such tests. This letter of submission shall be made to the Engineer, Owner, NOT LATER THAN FOURTEEN (14) CALENDAR DAYS PRIOR TO ENGINEER'S FINAL REVIEW of all systems. Final review for approval of Div15M Contractor's final payments shall NOT be given until such letter is received by the Engineer. The T&B Contractor shall record all T&B readings as listed herein after and as outlined in the specification section 15M925.

- 2.9.1.2 Record all pressures, equipment rpm's and ammeter readings at each motor.
- 2.9.1.3 <u>General.</u> Capacities of units, and other related equipment shall be determined by operating tests of not less than four hours duration, after stable conditions have been established.
- 2.9.1.4 <u>Temperature differences</u> required for determining capacities shall be measured by thermometers having graduations that permit interpolations having an accuracy of plus or minus one degree.
- 2.9.1.5 <u>Test instruments</u> shall be tested for accuracy by an approved laboratory or by the manufacturer, and certificates showing degree of accuracy shall be furnished to the Engineers.
- 2.9.1.6 <u>TABULATE THE FINAL READINGS AND ANALYSIS</u>, AND DELIVER FOUR TYPEWRITTEN COPIES OF THE COMPLETED REPORT TO THE ENGINEERS. THE CONTRACTOR SHALL ADVISE THE ENGINEERS IN WRITING NOT LESS THAN 10 DAYS IN ADVANCE OF WHEN FINAL TESTING AND BALANCING WILL BEGIN.
- 2.9.1.7 <u>All labor and technical personnel, instruments and appliances</u> for balancing and tests shall be furnished. If gauges, thermometers, etc., which are to be left permanently installed are used for tests,

they shall not be installed until just prior to the tests to avoid possible changes in calibration.

2.9.2 NOT USED

- 2.9.3 Water and electricity will be furnished by the Owner for final operating tests.
- 2.9.4 <u>All unfired pressure vessels</u>, furnished under this Division shall be constructed, inspected and stamped in accordance with applicable sections of the ASME Codes. Data shall include inspector's National Board registration number.
- 2.10 <u>OWNER DESIGNATED "SALVAGED" EQUIPMENT FOR DIV15M CONTRACTOR HANDLING, SHIPPING AND DELIVERY:</u>
- 2.10.1 Owner Designated Salvaged Equipment. The Contractor shall become totally familiar with the Owner Designated Salvaged HVAC Equipment unit(s) & all requirements. The Div15 Contractor shall be fully responsible for the protection, wrapping, covering, pick-up, loading, shipping and transferring handling, transportation of the Owner Designated Salvaged HVAC Equipment. The Owner Designated Salvaged HVAC Equipment shall be the ADD ALTERNATE OPTION for the removed existing "McQuay" air-cooled water chiller machine(s). The Contractor shall include all costs for salvaging the above existing equipment inclusive of all work & supplies required for removing and handling the same said owner's salvaged equipment. For additional data and information pertaining to Owner Designated Salvaged HVAC Equipment and labor and requirements necessary for said equipment, see the Contract Drawings ALL OWNER DESIGNATED SALVAGED EQUIPMENT SHALL BE VERIFIED WITH THE OWNER AND ENGINEER BEFORE ANY REMOVALS ARE MADE OR PROVIDED.
- 2.11 <u>MECHANICAL WORK CLOSEOUT AND DIV-15M CONTRACTOR COMMISSIONING OF NEW</u> SYSTEMS:
- 2.11.1 <u>General:</u> Refer to other sections for general closeout and commissioning requirements. Maintain a daily log of operational data on mechanical equipment and systems through the closeout period; record hours of operation, assigned personnel, fuel consumption and similar information; submit copy to Owner.
- 2.11.2 Record "As-Built" Drawings: The Contractor shall keep in his Electronic drawings file all changes to his Designs and Layouts. The Contractor shall maintain a set of "Field", "As-Built" drawings showing exact locations and sizes of all ductwork, piping, valves, and related items. Upon completion of work, record "As-Built" Electronic format drawings shall be turned over to the Design Engineer (Delta Engineering, Inc.) in the same PDF & "Auto Cad" format as he may have been provided originally by the Design Engineer. Drawings shall be titled "Record" and "As-Built" and completed with all drafting and details; provide two (4) sets of reproduced black & white printed drawing copies and four (4) sets of printed copies each of Record Drawings in "Black lined" printed sets to the Owner and Engineer for each school. Eight (8) total print sets.
- 2.11.3 <u>Closeout Equipment/Systems Operations:</u> Sequence operations properly so that work of project will not be damaged or endangered. Coordinate with seasonal requirements. Operate each item of equipment and each system in a test run of appropriate duration (with the Architect/Engineer present, and with the Owner's operating personnel present), to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance. Clean and lubricate each system, and replace dirty filters, excessively worn parts and similar expendable items of the work.
- 2.11.4 OPERATING INSTRUCTIONS: CONDUCT A TWO (2) DAY WALK- THROUGH INSTRUCTION SEMINAR FOR THE OWNER'S PERSONNEL TO BE INVOLVED IN THE CONTINUED OPERATION AND MAINTENANCE OF MECHANICAL EQUIPMENT AND SYSTEMS. EXPLAIN THE IDENTIFICATION SYSTEM, OPERATIONAL DIAGRAMS, EMERGENCY AND ALARM PROVISIONS, SEQUENCING REQUIREMENTS, SEASONAL PROVISIONS, SECURITY, SAFETY, EFFICIENCY, AND

SIMILAR FEATURES OF THE SYSTEM.

2.11.5 TURN-OVER OF OPERATION WITH SIGNED AFFIDAVIT: AT THE TIME OF SUBSTANTIAL COMPLETION, TURN OVER THE PRIME RESPONSIBILITY FOR OPERATION OF THE MECHANICAL EQUIPMENT AND SYSTEMS TO THE OWNER'S OPERATING PERSONNEL. DIV-15M Contractor shall prepare a written "AFFIDAVIT OF COMPLETED TESTED AND BALNCED AND COMMISSIONING OF HVAC/MECH. SYSTEMS" and that he has complied with all the requirements of Paragraph No. 2.11 and such documents shall be signed by both the Division 15M Contractor of Record, and the Owner's Representative who has received from the Contractor all Training, OEM manuals, Data, and Information pertaining to the Mechanical Systems. The Engineer shall also sign the document AFTER both the Division 15M Contractor and Owner Representatives have completed and signed the Affidavit.

2.12 REQUIRED SUBMITTAL DATA SUMMARY:

The Contractor shall submit to the Engineer all data, tests, booklets, instructions, etc. as previously outlined herein <u>before</u> Engineer's Final Acceptance of the project is complete. All data shall be in accordance with the specific requirements outlined herein.

2.1.3 ELECTRICAL GUIDELINES FOR DIV15M EQUIPMENT STARTERS:

All individual motor starters & disconnects for mechanical equipment (all HVAC exterior & interior units, fans, etc.) shall be furnished and installed under Division 16 unless indicated as integral to the Div.15M equipment (such as all VFD's, and starter devices provided by Div. 15M), and the same such starters shall be individual or as a part of a motor controllers, centers, or individual devices as per the Div. 16 Electrical drawings and specifications and guidelines for all voltage and electrical characteristics.

*SUBMITTAL DATA

(An asterisk (*) indicates the paragraphs which require submittals.)

Referenced Section No./		Date Submitted
Paragraph No.	Description	By Contractor
1.1.1	Mechanical, Piping And Project Manager Affidavit	
1.4.2	HVAC Coordination Drawings & HVAC Shop Drawings	
1.6.2	Submittals- All Shop Drawings	
1.6.7	Maintenance Manuals	
1.7.1.1	Pre-Bid Prior Approval Requirements	
1.7.1.2	Product Listings and Substitute Product Approvals	
2.4.1	Valve Schedule	
2.9	Tests	
2.11.2	Record Drawings	
2.11.5	Affidavit of Completed Commissioning of Mech. HVAC	
	Systems (with all signatures)	

END OF SECTION 15M001

SECTION 15M925 - DIV-15M PROVIDED TESTING, ADJUSTING, BALANCING OF HVAC SYSTEMS

1. RELATED DOCUMENTS, RESPONSIBILITY & ACCOUNTABILITY:

The provisions of Division 1 and Sections 15M001, 15M013, 15M019, 15M050, 15M094, 15M652mun, 15M842, 15M850, 15M912ED and 15M950 shall apply to and shall also be governed in accordance with this section.

It shall be the responsibility of the General Contractor and the Div-15M contractor to coordinate with the Phased Test and Balancing Contractor for all coordination of new HVAC systems start-up and balancing for that of all the Phased HVAC installations. All T&B work for the new HVAC systems operational work shall be performed and coordinated with that of other trades. The General Contractor and the Div 15M Contractor shall be responsible for coordinating all efforts with that of the Div-15m contractor and that of all other trades and entities who affect & impact the T&B scope of work to be done under this Section. The Owner's T&B Contractor shall do all the Test & Balancing work and shall perform all duties as covered by this Section and as outlined as required for the Project. The Owner's T&B Contractor shall perform all his services under a separate Phase-3 Contract solely between himself and the Owner. All work of the Owner's T&B contractor shall be reported to both the owner and the Engineer. All work shall be fully coordinated with the Commissioning Agent and all his work.

2. GENERAL PROVISIONS:

2.1 Drawings and Specifications:

(A) The drawings and specifications made herein are a part of the contract documents prepared for the project.

2.2 General:

- (A) This Section shall provide for all air testing and balancing services for the heating, ventilating, and air conditioning (HVAC) systems of this project.
- (B) The Contractor shall be responsible for the satisfactory execution of testing and balancing the HVAC systems. The contractor shall have allowed sufficient time for the testing and balancing phases, as defined within Division 15M of the Specifications, and as may be necessary for the completion of the testing and balancing, as determined by the Contractor.
- (C) The Contractor shall be advised that all the Project Balancing Scope of work shall be completed within a minimum specified number of calendar days of 5 days or if not specifically stated, such balancing work shall be done and completed with all Reports submitted before a maximum of 21 days before the Owner's beneficial occupancy of the building project.

The overall total Schedule of time for Testing and Balancing of the HVAC systems shall be established by the T&B Contractor and coordinated with DIV-15M Contractor. The Testing & Balancing Schedule as coordinated by the T&B Contractor (shown on a critical path network) shall be submitted to the Owner & Engineer for approval within 30 days of the start of the Division 15M Contractor's Work. It is the Owner's T&B Contractor's responsibility to initiate and set the required Schedule of time needed for the test & balance scope of work. In addition, the T&B Contractor shall review & update the schedule in order to assure for a continuing coordination and update of the schedule. The updates & reviews will be periodically checked & monitored, but not less than every 30 days, in order to pre-determine any required changes to the schedule for final Testing and Balancing services and/or any periodic inspections required of the project due to any

changes that may be affected by delays or changes in the project's overall construction schedule.

2.3 Documents:

- (A) The Owner's T&B Contractor along with the Division 15M Contractor shall follow the following documents:
 - (1) Project drawings and specifications.
 - (2) Approved construction revisions pertaining to the HVAC systems.
 - (3) Approved submittal data on HVAC equipment and systems to be installed
 - (4) Approved HVAC shop drawings, (as may be required for balancing).
 - (5) Approved HVAC wiring diagrams, control diagrams, and equipment brochures applicable.

2.4 Coordination:

- (A) It will be necessary for the T&B Contractor to perform his services in close coordination with the completion of the new VRV & Air systems. The T&B Contractor shall verify and list in it's T&B Report all design air flow rates, capacities etc. in accordance with the design documents/specifications. He shall notify the Engineer & the Owner in writing of any actual operating flow/capacity deviations beyond that of the documented & engineered design rates, capacities and data as specified, especially any deviations beyond the acceptable industry standard of 5% (+ or -) the specified flow rates, capacities, etc. He shall offer any suggestions and observations of known or found deletions, variations, changes, or inadequacies of system components to prevent or affect the proper balancing of the specified design intents of the engineered systems covered by the documents.
- (B) The plans and specifications indicate some dampers, and other devices for the purpose of adjusting the air system to obtain optimum operating conditions. It will be the responsibility of the T&B Contractor to review the contract drawings and submit his "Design Review Report" to the Owner and Engineer, and inform the Engineer early on within the bid period of the project (prior to the Div15M mechanical contractors bidding the project) to include the requirement for any additional needed balance devices such as balance dampers, etc. to be included in the bidding documents either by revisions and or addendums during the bids. In addition to the above, should the installation of the duct systems vary and/or have to be changed within to accommodate installations and interferences, it will be the responsibility of the Owner's T&B Contractor to review such duct changes and inform the Engineer & the Div-15M contractor as early as possible to either delete and or change or add the requirement for any additional needed balance devices such as balance dampers, etc. to be included in the field. The Owner's T&B Contractor shall provide guidance if there is a questionable arrangement of a control or balancing device.
- (C) The Div-15M Contractor and the controls installers of the DDC temperature & control systems and the Suppliers of the HVAC equipment shall all fully cooperate with the Owner's T&B Contractor to provide all the necessary data on the design and proper application of the equipment provided and the installed system components. In addition, the Owner's T&B contractor shall furnish all labor and materials required to eliminate any system deficiencies.
- D) The Div. 15M Contractor shall provide a "Check-List for Submittals" on all contractor furnished equipment; this list shall be submitted to the Owner and Engineer.

2.5 Responsibilities of the Division 15M Contractor:

(A) The Division 15M Contractor shall complete the installation of and start all HVAC systems to ensure they are working properly, and shall perform all other items as described hereinafter to assist the Owner's T&B

Contractor in performing the air testing and balancing of the HVAC air systems.

(B) The Owner's T&B Contractor shall perform the following for the Air Distribution Systems:

- (1) Verify installation for conformity to design.
- (2) Terminate all supply-, return-, and exhaust ducts, and pressure test them for leakage, as required by specification.
- (3) Ensure that all volume-, splitter-, extractor-, and fire dampers are properly located and functional. Dampers serving requirements of minimum and maximum outside-, return-, relief-, and exhaust air shall provide tight closure and full opening, with a smooth and free operation.
- (4) Verify that all supply-, return-, exhaust-, and transfer grilles; registers; diffusers; and high-pressure terminal units are installed and operational.
- (5) Ensure that air-handling systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., are blanked and/or sealed to eliminate excessive bypass or leakage of air.
- (6) Ensure that all fans (supply, return, relief, and exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.
- (7) Make any necessary changes to the sheaves, belts, and dampers, as required by the Contractor, at no additional cost.
- (8) Install clean filters before balancing begins.

2.6 Responsibilities of the Div-15M DDC Temperature Controls Contractor Installer:

- (A) The Div-15M DDC Temperature Controls Contractor Installer shall complete the installation of the DDC and temperature control system, and operate and test all DDC control systems to ensure they are functioning properly as designed. The Div-15m DDC Temperature Controls Contractor Installer shall assist the Contractor in testing and balancing the HVAC systems, as described hereinafter.
 - (1) Verify that all control components are installed in accordance with project requirements are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze stats.
 - (2) Verify that all controlling instruments are calibrated and set for design operating conditions.
 - (3) Calibrate room thermostats after installation, and before the thermostat control verification tests are performed. The Contractor shall prove the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.
 - (4) The contractor shall allow sufficient time in the project to provide assistance and instruction to the Contractor in the proper use and setting of control components such as, but not limited to, computers, static pressure controllers, or any other device that may need set points changed so that the testing and balancing work can be performed.

2.7 Notification for Testing and Balancing Work to Begin:

- (A) The Div-15M Contractor and the Div-15m DDC Temperature Controls Contractor shall notify the T&B Contractor in writing when all heating, ventilating, and air conditioning systems are complete and ready for T&B Contractor testing and balancing. The T&B Contractor shall attest that he has completed all items as described in Section 2.0 of these specifications.
- (B) If, upon commencing the work, the T&B Contractor finds that the systems are not ready, or if a dispute occurs as to the readiness of the systems, the T&B Contractor shall request an inspection to be made by the

Engineer. This Engineer inspection shall establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for testing and balancing. Should the inspection reveal the notification to have been premature, all costs for the Engineer's inspection and the work previously accomplished by the T&B Contractor shall be paid for by the Div-15M contractor. Furthermore, such items that are not ready for testing and balancing shall be completed and placed in operational readiness before testing and balancing services shall again be requested.

2.8 Quantities:

(A) In all cases where a device, operation, procedure, tool, equipment, or part of the equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many such devices, as are required to complete the testing and balancing specified herein.

2.9 Storage:

(A) In coordination with the agency, the T&B Contractor shall arrange for an area of ample size and convenient location for storage of tools, equipment, and other items as required.

3.0 BALANCING SPECIFICATIONS AND RESPONSIBILITIES:

3.1 <u>Scope:</u> In accordance with Drawings and Specifications and as specified herein, the T&B Contractor shall provide all supervision, personnel, instruments, calibration equipment, and all other materials and services necessary to perform all testing and balancing of the heating, ventilating, and air conditioning systems. All test data including all pertinent calculations shall be reported on appropriate forms.

3.2 General:

- (A) The testing and balancing of the air ventilation heating, ventilating, and air conditioning system shall be performed by the T&B Contractor and shall be approved by the Engineer. The T&B Contractor shall have a minimum of five years' specialized experience in air- and hydronic system balancing, and possess calibrated instruments, qualified test-and-balance engineers, and skilled technicians to perform all required tests.
- (B) The tests shall demonstrate the specified capacities and operation of all equipment and materials comprising the systems.
- (C) Any proposed changes or revision in the work shall be submitted to the Engineer in writing. The Engineer shall process the proposal of changes as appropriate.

3.3 Services:

- (A) During construction, the T&B Contractor shall inspect the installation of sheet metal work, DDC and temperature controls work and other component parts of the heating, ventilating, and air conditioning systems. The T&B Contractor inspections shall be performed periodically as the work progresses. A minimum of two inspections are required as follows: (1) when 50% of the duct work is installed; (2) when 90% of the equipment is installed. The T&B Contractor shall submit a brief written report of each inspection to the Engineer, and such report shall then be submitted to the Owner within one (1) week of the T&B Contractor Report visit.
- (B) Upon completion of the installation and start-up of the mechanical equipment by the Div-15M contractor, the T&B Contractor shall test and balance the system components to obtain optimum conditions in each

conditioned space in the building. If construction deficiencies are encountered that preclude obtaining optimum conditions, and the deficiencies cannot be corrected by the contractor within a reasonable period of time, the contractor shall advise the Engineer in writing of the deficiencies.

3.4 Air System:

- (A) The T&B Contractor shall perform the following testing and balancing functions in accordance with the Associated Air Balance Council National Standards:
 - 1) Fan Speeds: Test and adjust fan RPM to achieve design CFM requirements.
 - (2) Current and Voltage: Measure and record motor current and voltage.
 - (3) <u>Pitot-Tube Traverse</u>: Perform a Pitot-tube traverse of main supply and return ducts to obtain total CFM. If a Pitot-tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation why a traverse was not made must appear on the appropriate data sheet.
 - (4) <u>Outside Air:</u> Test and adjust system minimum outside air by Pitot-tube traverse. If a Pitot-tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and mixed air temperatures. Make allowances for heat of compression and motor heat where applicable.
 - (5) <u>Static Pressure</u>: Test and record system static pressures, including suction and discharge static pressure of each fan.
 - (6) <u>Air Temperature:</u> Take wet-bulb and dry-bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.
 - (7) <u>Zone Ducts:</u> Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
 - (8) <u>Main Ducts:</u> Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
 - (9) <u>Branch Ducts:</u> Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 - (10) <u>Tolerances:</u> Test and balance each diffuser, grille, and register to within 10% of design requirements.
 - (11) <u>Identification:</u> Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.
 - (12) <u>Description:</u> Record the size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
 - (13) <u>Air Delivery Terminal:</u> Set volume regulators on all terminal air devices to meet design maximum and minimum CFM requirements. All associated temperature controls shall be checked for proper operation and calibration. If the terminals have single settings for both heating and cooling CFM, the CFM quantities for each shall be recorded on air outlet data sheets. All diffusers connected shall be read and their readings recorded on air outlet data sheets.
 - (14) Minimizing Drafts: Adjust all diffusers, grilles, and registers to minimize drafts in all areas.

3.5 Test and Balance Report:

- (A) The test-and-balance report shall be complete with logs, data, and records as required herein. All logs, data, and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the T&B Contractor certified test-and-balance engineer.
- (B) Six (6) copies of the test-and-balance report are required and shall be submitted to the Engineer.
- (C) The report shall contain the following general data in a format selected by the Contractor.

- (1) Project number
- (2) Contract number
- (3) Project title
- (4) Project location
- (5) Project architect
- (6) Project mechanical engineer
- (7) Test and balance agency
- (8) Test and balance engineer
- (9) General contractor
- (10) Div-15M Mechanical subcontractor
- (11) Dates tests were performed
- (12) Certification
- (D) The T&B Contractor's Test-and-Balance Report shall be recorded on report forms conforming to the recommended forms in the AABC National Standards format.
- 3.6 Final Acceptance:
- (A) At the time of final inspection, the T&B Contractor shall recheck, in the presence of the Owner's representative, specific and random selections of data recorded in the certified test-and-balance report.
- (B) Points and areas for recheck shall be selected by the Owner's representative.
- (C) Measurements and test procedures shall be same as the original test and balance.
- (D) Selections for recheck, specific plus random, shall not normally exceed 5 percent of the total number tabulated in the report, except where special air systems require a complete recheck for safety reasons.
- (E) If random tests demonstrate a measured flow deviation of 10% or more from that recorded in the certified test-and-balance report, the report shall automatically be rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, a new certified test-and-balance report submitted, and a new inspection test made, all at no additional cost.

END OF SECTION 15M925

SECTION 15M013 - CONTRACTOR STARTUP AND TESTING

- 1. PART 1 GENERAL:
- 1.1 RELATED DOCUMENTS:
- 1.1.1 The provisions of Division 1 and Sections 15M001, 15M002, 15M019, and 15M050 and any General Conditions and Supplementary Conditions of the Specifications shall apply to and shall govern the work under this Division and this Section the same as if incorporated herein. Contractor shall refer to all listed sections for requirements specific to each Section. This section shall be coordinated with the Commissioning of all Mechanical Systems as provided by the DIV-15M Commissioning representative.
- 1.2 COORDINATION:
- 1.2.1 This Section requires Contractor to coordinate both the timing of activities required by provisions of this and other sections, so as to provide consistency and logical simultaneous coordination between all Contractors and Sub-Contractors, and the Owner provided personnel and other Owner Contractors.
- 1.3 STARTUP COORDINATION AND COMMISSIONING MEETING: The Contractor shall be required to hold, 2 weeks prior to the project's startup of systems, a "Start-Up Coordination and Commissioning Meeting" for the project, to be held at the job site in an Owner designated meeting space. THE PURPOSE OF THIS MEETING IS TO ASSURE THAT ALL CONTRACTORS, SUB-CONTRACTORS, SUB-CONTRACTORS, SUB-CONTRACTORS, AND COMMISSIONING AGENT AND OTHER CONTRACTORS AND OWNER'S CONSTRUCTING PERSONNEL IS TOTALLY INFORMED OF THE TIMELY COMPLETION OF ALL CONSTRUCTION TRADES, INSTALLATION OF EQUIPMENT AND SYSTEM AND ALL HVAC & ELECTRICAL SYSTEMS BEFORE THE CALLED START-UP OF ALL SYSTEMS, INCLUDING SAME. IT IS IMPERATIVE AND MANDATORY THAT STARTUP BE COORDINATED WITH THE NEW EQUIPMENT AND THE ELECTRICAL SYSTEMS STARTUP OCCURS PRIOR TO OR SIMULTANEOUSLY WITH ALL CONTRACTORS AND SUB-CONTRACTORS SUPERVISORY PERSONNEL PRESENT ON THE JOB AT THE SAME DAY AND HOUR OF START-UP AND CHECKOUTS.
- 1.4 Contractor Punch Lists/Scheduled Start-Up Meeting:
- 1.4.1 The Contractor shall provide to the Owner's Representatives a complete "Punch List No.1" (typed) showing all unfinished, incomplete work and systems, etc. no later than ten (10) calendar days after the "Start-Up Coordination Meeting." The Contractor shall meet in person with the Owner Representative and all supervisory sub-contractor personnel three (3) calendar days after the submission of Punch List No. 1 to review the list and negotiate the timed completion of the work on the list. The Contractor shall provide and meet with (as stated above) "Punch List No. 2" (typed) no later than FIVE (5) calendar days prior to "Scheduled Startup Meeting." All work shall be reviewed with the above mentioned personnel at the time of the submission of the listing. All work on this list shall be completed and negotiated for startup prior to the "Scheduled Startup Meeting."
- 1.5 Contractor "All Systems Phasing & Startup Meetings":
- 1.5.1 The Contractor shall hold an "All Systems Start-Up Meeting" two (2) weeks after the "Start-Up Coordination Meeting" (see para.1.3 above) and a maximum of ten (10) calendar days prior to the final closeout and turnover to the Owner of the project site prior to Owner occupancy and acceptance. This meeting shall require all personnel simultaneously start-up all systems of the work being done.

1.6 <u>Filter Cleaning after Startup and "Filter Schedule":</u> Filter changes and "<u>Filter Schedule"</u> shall be provided by the Contractor. After start-up of system and cleaning the Contractor shall provide extra sets of all filters for all units. Contractor and vendors shall provide a complete "<u>Filter Schedule"</u> for all equipment supplied and installed under this section of the specifications. "<u>Filter Schedule"</u> shall include filter type, size and ratings for performance per ASHRAE "MERV" rating.

END OF SECTION 15M013

SECTION 15M050 - BASIC MATERIALS AND METHODS

1. RELATED DOCUMENTS:

The provisions of Division 1 and Section 15M001, 15M002, 15M013, and 15M019 shall govern this section. Contractor shall refer to all listed sections for requirements specific to each Section.

1.1 GENERAL:

- 1.1.1 <u>All material and equipment</u> shall be new, unless otherwise shown or called for, and shall be furnished in accordance with the standard mentioned throughout this section.
- 1.1.2 Pipe and Pipe fittings. PVC Piping shall be permitted on the project only for the new interior new HVAC condensate drains portions of the HVAC systems in the Building. The arrangement, general location and size of all new brazed refrigerant & drain piping is clearly shown. Install all piping to a clear level and or sloped drain condition and install piping accurately to building lines & grade and in proper alignment. Should structural or other conditions require installation of ductwork or pipe mains or any of the piping differently from the manner shown, the Contractor shall consult with the Engineer and obtain written approval for all changes before proceeding with the work. All piping shall be installed to allow for seismic supports, piping expansion using offsets, expansion bends or expansion joints as may be required, to prevent undue strain on the piping. All refrigerant piping to and from inlet and outlet connections to any HVAC piece of equipment (such as outdoor & indoor units, etc.) and coils shall have inlet refrigerant type zero-leak type refrigerant valves w/Schrader screw type ported connections, and inline sight glasses for observing refrigerant flow and inlet/outlet tee fittings for insertion & connection of field connected refrigerant pressure gages on each of the inlet and outlet piping to the units and coils to permit HVAC servicing by mechanics for maintenance.

1.2 PIPE AND PIPING ACCESSORIES & PIPE SPECIALTIES:

1.2.1 <u>Steel Pipe</u> shall be Schedule 40, or Schedule 80, black or galvanized as required, conforming to ASTM No. A120. Pipe Sizes 12" and above shall be "Standard Pipe" of standard wall thicknesses.

1.2.1.1 Fittings for Black Steel pipe shall be:

Screwed Fittings - 125 lb. gray cast iron conforming to ANSI No. B16.4 air and Steam - 250 lbs.

Flanged Fittings - 125 lb. gray cast iron conforming to ANSI No. B16.1 Air & Steam - 250 lbs.

Unions - 250 lb. malleable iron ground joints with brass-to-iron seats conforming to ANSI No. B16.3.

Flanges - 150 lb. steel welding neck with raised face conforming to ASTM No. A181, except for matching flanges required at equipment and valves.

Welding fittings, including elbows, reducing ells, caps, straight tees, reducing tees, straight and reducing laterals and reducers shall be "standard weight," Grade B fittings, meeting ASTM A234, as produced by Crane, Tube-Turns, Taylor Forge or approved equal. Furnish long radius 90 degree elbows.

Complete ASTM specification information shall be stamped on each fitting.

Standard Weight Weldolets or Threadolets may be used in lieu of welding tees only where the branch line is at least two pipe sizes smaller than main. Under no circumstances will it be permissible for one pipe line to be welded directly into another, regardless of size.

Manufacture/Welding fittings and flanges which have been machined, remarked, painted, or otherwise produced from forgings will not be acceptable. Fittings and flanges shall have the manufacturer's trademark permanently identified.

1.2.1.2 Fittings for Galvanized Steel Pipe shall be:

Screwed fittings - 150 lb. galvanized malleable iron banded type conforming to ANSI No. B16.3.

Flanged fittings and Screwed flanges - 125 lb. galvanized cast iron conforming to ANSI No. B16.2.

Unions - 250 lb. galvanized malleable iron, ground joint with brass-to- iron set conforming to ANSI No. B16.3.

Steel Pipe Nipples shall be of the same material and finish as the lines in which they are installed. No all-thread (close) nipples will be permitted.

Joints in steel pipe shall be in accordance with the following:

Screwed Piping - Joints shall be made with a non-hardening pipe joint or teflon tape compound applied to the male thread only.

Welded Piping - Joints shall be made as specified in ASTM B31 "Power Piping Code".

Gasket Material for Flanged Joints shall be similar in all respects to Style D, 150 lb. Series, as produced by Flexitallic Gasket Company. Comparable material by Garlock, Akron Metallic Gasket Company or approved equal will be acceptable.

- 1.2.2 <u>Copper Piping:</u> Copper piping shall be hard-drawn straight sections only of seamless Type "K" and/or "L", refrigerant service rated capped and labeled as required, equal to & conforming to ASTM No. B-88 or B-819 for gas pressurized service piping. Copper piping shall be ASTM No. B88 or b-819 for use on all refrigerant gas type piped systems and shall be dehydrated and capped type copper piping specifically designed and labeled for refrigerant service only. Copper piping shall be conforming to ASTM B-88 or B-819 and fittings of matching conformance used for all HVAC Condensate drainage service only. All condensate drains shall be sweat joints.
- 1.2.2.1 <u>Fittings for Refrigerant piping copper piping</u> shall be wrought copper conforming to ANSI No. B16.22 for brazed type joints only, in hard temper piping. Copper piping fittings shall ASTM No. B-88 or B-819 for gas pressurized service piping for use on all refrigerant type piped systems and shall be dehydrated and capped type copper piping specifically designed and labeled for refrigerant service only using only brazed jointed connections. All condensate drain piping shall be sweat joints connections.

Brazed Joints in refrigerant copper piping shall be socket type and Filler metals shall comply with ANSI/AWS A.5.8, Specification for Brazing Filler Metal, also in accordance with the following:

All Pipe sizes 1-1/2" and Smaller - Joints shall be made with specified brazing materials.

1.2.3 VALVES:

1.2.3.1 Valves for general water and drainage serve of butterfly, globe, check, ball and plug body valves shall be furnished and installed at all points specified and indicated on the drawings. Provide identification discs under valve handle nut. Valves in steel pipe of size 2" and under shall be screwed type. Valves of equal design by "Crane", "Stockham," "Milwaukee," "Jamesbury," "Powell," and "Walworth" are acceptable for approved use. Valves shall be as listed below:

	Crane	Jenkins	Nibco	Hammond
A. GATE VALVES:	(Gate valves shall no	t be permitted	I for use any w	here on the project).
B. GLOBE VALVES: 2" & Smaller Screwed Ends Solder Ends	1703 1703-S	106-A 1200	T-211 S-235	IB413T IB423
2 1/2" & Larger Flanged Ends	351	613	F-718	IR116
C. <u>CHECK VALVES</u> 2" & Smaller Screwed Ends Solder Ends	5 <u>:</u> 1707 1707-S	92-A 1222	T-413 S-413	IB938 IB941
2 1/2" & Larger Flanged Ends	373	624	F-918	IR1124
D. <u>BALL VALVES:</u> 2" & Smaller Screwed Ends Solder Ends	9302 9322	30-A 30-A	T-590-W S-580	BV-711-T 806

Note: Gate valves shall not be permitted for use any where on the project.

- 1.2.3.2. <u>Plug and Butterfly Valves:</u> Valves shall be 150 lb. rated, (220 degrees F. rated for B.F.V.) and (350 degrees F. rated for plug) as follows or equal to:
 - (a) <u>2" and Smaller</u>: Powell No. 1558, threaded ends, bolted bonnet, ANSI B16.5, cast steel lubricated type plug valve.

Screwed Ends: Screwed gland type.

- (b) 2-1/2" and Larger: Powell No. 1559, flanged ends, bolted bonnet, ANSI B16.5, cast steel, lubricated type plug valve. Flanged Ends: Bolted gland type.
- (c) 2-1/2" and Larger: "Crane" No. 12F, 42F, or 22F, full-lug, wafer type, carbon steel, ASTM A536, bronze or ductile iron disc, Type 410, 304 S/S stem E.P.T. rubber liner (or equal.), 10 pos/lever w/lock & memory stop, per MSS-SP-67.
- 1.2.3.2. <u>Refrigerant Valves:</u> Refrigerant valves shall be "Sherwood Valve" shut off type refrigerant valves. All sizes shall incorporate dual stem seal design w/teflon packing internal primary seal. Valve shall permit

operation w/out removal of seals or teflon gaskets, provide w/internal ball type relief port for dual directional shut-off provide full flow ports on all sizes 1/4" through 3-1/8". (Note: All Shut-off valves shall be zero-clearance type, all-bronze, brazed connection with 1/4" Schrader type service fitting in valve. See the drawings for some locations shown on certain equipment.

1.2.4 UNIONS/NIPPLES:

1.2.4.1 <u>Unions</u> shall be installed at all equipment, regulators, etc., to facilitate repair and/or replacement, as specified for piping materials. (Note: <u>Dielectric Couplings and Connectors</u>: Use dielectric couplings or connectors where connections between dissimilar materials occur; dielectric nipples are permitted).

1.2.5 VENTS/COCKS/RELIEFS/GAUGES:

- 1.2.5.1 Manual Air Vents: _Manual Air vents as may be applicable, shall be provided at all high points of the hydronic piping systems and where indicated on the drawings. Vents that require pipe discharge to drains or to the outside of the building shall be 1/4" Crane No. 17 angle valves. All other manual vents shall be 1/2" all bronze ball valves or 3/8" Crane No. 734 bronze tri-cocks with stuffing boxes. comparable equipment as manufactured by Walworth, or Fairbanks, or approved equal, will be acceptable. Automatic Air Vents are not permitted anywhere.
- 1.2.5.2 <u>Drain Cocks</u> shall be Wolverine 1/2" No. 667 W.S.A. with stuffing box. Comparable cocks as manufactured by Nibco, Crane, or approved equal, will be acceptable.
- 1.2.5.3 <u>Water Temperature and Pressure Relief Valves</u> shall bear the ASME stamp. Valves shall be as manufactured by Leslie, Kunkle, Taco, Watts, B&G, Fisher, Armstrong, Consolidated or approved equal.
- 1.2.5.4 Pressure and Temperature Gauges: Install pressure and digital type temperature gages on inlets and outlets of pipe connections as stated in para. 1.2.1. Pressure gauges shall be of the stainless steel polished case, stainless closed type ring, white background dial with embossed jet black numbers and markings, clear glass face cover, stainless steel black finished red tipped adjustable pointer 3 1/2" diameter (minimum) utilizing the Bourdon type bronze system and shall be all bronze movement and pipe fitting socket connection with standard tapered or fine threaded connection, 1% over mid-half scale and 1-1/2 percent accuracy over balance of scale (0-100 psig): "Trerice No. 890 Series" or approved equal by "Weksler", "Palmer", "Marshalltowne", "Hersey", "Uehling", "Ashcroft", or "Powers". Temperature gauges shall be all angle type Digital Type (solar or light activated type) of die cast aluminum metallic black finish case, with "LED" displays, brass stems with union connection, with bulb chambers of tapered fit sockets, temp. range of: (HW 30 240 degrees F.; CHW 0 100 degrees F). "Trerice" or approved equal by "Weksler", "Palmer", "Marshalltowne", "Hersey", "Uehling", "Ashcroft", or "Powers". Thermometer wells shall be by same manufacturer as gauge of length and material to suit service and gauge.

1.2.6 PIPING SPECIALTIES:

- 1.2.6.1 <u>Strainers</u> to have semi-steel or iron bodies with Type 302 s.s. screens. Size for type of service intended (water, condensate, etc.). Size 2-1/2" and below screwed connections. Size 3" and above flanged connections.
- 1.2.6.2 <u>Escutcheons</u> shall be heavy chrome plated brass of sufficient depth to cover any connection between copper or steel pipe and chrome plated pipe or piping.
- 1.2.6.3 Floor, Wall and Ceiling Plates shall be chromium plated, either self- locking or set screw secured type, of sufficient width and securely fastened to piping or sleeves as required. Plates shall be

comparable in all respects to Beaton & Caldwell Mfg. Co., products, No. 40 thru size 4" and No. 2 above size 4". Products manufactured by Beaton & Corbin Mfg. Co., Fee & Mason, or approved equal will be acceptable.

- 1.2.6.4 <u>Sleeves/Firestopping:</u> Where pipes pass through aboveground floors, walls, roofs or partitions, sleeves shall be provided. Sleeves shall be schedule 40 galvanized steel pipe or minimum 10 gauge galvanized steel round sleeve with integral flashing ring flange (for flush mount to finished surfaces) of sufficient annular size to clear pipe by a minimum of 1/2" on all sides. The sleeves shall be installed on form before floor slabs are poured, and through walls as the walls are constructed. Insulated pipe services passing through sleeves shall have the pipe insulation stop up to the outside finished surface of the sleeves. All sleeves shall have complete annular space between pipe and sleeves filled with non-asbestos fire-retardant "U.L." approved sealant foam firestopping equal to "Dow-Corning" "Fire-stop" TM, meeting U.L. No. 1479 testing requirements for the entire firestop system assembly.
- 1.2.6.5 <u>Dielectric Couplings and Connectors.</u> Use only dielectric couplings or connectors where connections between any and all dissimilar materials occur such as between copper & steel and/or between galvanized steel piping.
- 1.2.6.6 <u>Refrigerant Dryers & Sight glasses.</u> Use only refrigerant grade and type dryers and sight glasses for refrigerant piping systems rated for temperature and pressures of the systems served; "Sporlan" type or equal.

1.2.7 MECHANICAL SUPPORTING DEVICES:

A) Pipe Hangers and Supports:

- 1) <u>Steel Pipe Insulation Protection Saddles:</u> For all insulated water service piping and condensate drain piping; install protection saddles at each hanger location. Saddles shall be "Grinnell" Fig. 160, 161, 162, 163, 164, or 165; "B-Line" Fig. B3160, B3161, B3162, B3163, B3164, or B3165; or "Fee & Mason" Fig. 171, 1710, 1712, 172, 173, or 1732 (as applicable for insulation thickness).
- 2) <u>Steel Pipe Insulation Support Inserts:</u> For all insulated service piping; install rigid calcium silicate, cellular glass (min. 8 PCF), or molded glass fiber (min. 8 PCF) insulation support inserts at each hanger location. Insulation support inserts shall be the same length as the protection shields, the same thickness as adjacent piping insulation, and shall cover the bottom (180 degree) half of the pipe.
- 3) <u>Insulation Protection Shields:</u> For all piping services which are insulated, furnish protection shield between all supports and insulated pipes. Shields shall be "Grinnell" Fig. 167, "B-Line" Fig. B3151 or "Fee & Mason" Fig. 81.

4) Piping Hanger Clamps:

<u>Riser Clamps:</u> Steel Piping Clamps shall be "Grinnell" Fig. 261, "B- Line" Fig. B3373 or "Fee & Mason" Fig. 241. Copper piping clamps shall be "Grinnell" Fig. CT-121, "B-Line" Fig. B3373 CT or "Fee & Mason" Fig. 368.

<u>Beam Clamps:</u> Shall be "Grinnell" Fig. 86 or Fig. 131, "B-Line" Fig. B3036L or Fig. B3050, or "Fee & Mason" Fig. 255L or Fig. 249.

Rod couplings and straight rods to extend eye rods shall be HSES where required. Machine bolts and hexagon nuts shall be standard.

- 5) <u>Single Pipe Off-Set "J" Hooks:</u> Shall be "B-line" Fig. B3190 or "Fee & Mason" Fig. 267 or Fig. 110 and shall not be used for piping larger than 4".
- 6) Steel Pipe Support Hangers Shall be as Follows:
- a. Water Service Piping (Max. 210 degrees F.)

Pipe Size Hanger Type

2" and Below Grinnell Fig. 104 (Swivel Ring)

Grinnell Fig. 108 (Split Ring) B-Line Fig. B3173 (Split Ring) Fee & Mason Fig. 212 (Split Ring)

2-1/2" thru 8" Grinnell Fig. 260 (Clevis)

B-Line Fig. B3100 (Clevis) Fee & Mason Fig. 239 (Clevis)

10" thru 20" Grinnell Fig. 171 (Pipe Roll)

Grinnell Fig. 181 (Yoke Pipe Roll)
B-Line Fig. B3114 (Pipe Roll)
B-Line Fig. B3110 (Yoke Pipe Roll)
Fee & Mason Fig. 170 (Pipe Roll)
Fee & Mason Fig. 272 (Yoke Pipe Roll)

- 7) Copper Piping Support Hangers Shall be as Follows:
- a. Insulated Copper Piping:

Pipe Size Hanger Type

2" and Below Grinnell Fig. 104 (Swivel Ring)

Grinnell Fig. 108 (Split Ring) B-Line Fig. B3173 (Split Ring) Fee & Mason Fig. 212 (Split Ring)

Piping Covering Protectors for insulated copper piping shall be 18 gauge semicylindrical galvanized sheet steel shields 18" long installed between the hanger and the bottom of the insulation.

b. Bare Copper Piping:

Pipe Size Hanger Type

2" and Below Grinnell Fig. CT-109 (Split Ring)

Grinnell Fig. CT-99 (Adj. Ring)

B-Line Fig. B3173CT (Split Ring) Fee & Mason Fig. 360 (Split Ring)

3" and 4" Grinnell Fig. CT-65 (Clevis)

B-Line Fig. B3104CT (Clevis) Fee & Mason Fig. 364 (Clevis)

All hanger rods for bare copper piping shall be copper plated.

B) **EQUIPMENT SUPPORTS**:

Equipment, pipe and duct hangers within the building shall be supported from the building structure only (not from other pipe, conduit, etc.) by the most suitable method without putting undue stress on the building structure. Any miscellaneous structural steel that may be required for supporting pipe, ductwork and equipment, shall be provided and installed by this Contractor.

1.3 INSULATION MATERIALS:

- 1.3.1 All insulation materials shall be received new, boxed, packaged, and kept dry while stored until use by the Contractor. Any damaged, crushed, broken, separated or cut damaged insulation shall not be used on any pipe or equipment.
- 1.3.2 All insulation materials shall be of the listed maximum fire hazard classifications for services of the type specified in Section 15M180 and as listed for the specified service on piping, equipment, etc. All materials shall be installed by insulating trade type personnel and in accordance with the manufacturers' recommendations for the material used.
- 1.3.3 Insulation for piping services shall not be installed until piping has been tested I.A.W. Section 15ME001. Insulation shall not be installed on wet, or dirty surfaces of any pipe or equipment. All materials receiving insulation shall be prepared, cleaned and surfaces prepared for per the manufacturer's recommendations and/or per the specifications Section 15M180.
- 1.3.4 All insulated piping services and equipment shall be properly identified with pipe and material markers as specified in Section 15ME001.
- 1.3.5 All insulated metal pipe penetrated through rated walls and floors shall not have insulation continuous through sleeves but insulation shall be omitted within the sleeved annular spaces and filled with "U.L." No. 1479 approved fire-stopping sealant foam, equal to "Dow-Corning" "Firestop System."

END OF SECTION 15M050

SECTION 15M704 – INTERIOR LOW PRESSURE HVAC PUMPED & GRAVITY FLOW CONDENSATE PIPE DRAINAGE SYSTEM & ACCESSORIES

1. PART 1 - GENERAL

RELATED DOCUMENTS

The provisions of Division 1 and Section 15M001, 15M002, 15M020, 15M050, 15M094, 15M099 and 15M701R shall also govern and apply to this Section specified herein. The Div15M Mechanical Contractor shall provide and install all materials and labor for the below specified low pressure HVAC pumped and gravity flow condensate piping drainage system from new interior and exterior HVAC cooling equipment.

- 1.1 <u>General:</u> Low pressure HVAC pumped and gravity flow condensate piping drainage system from new interior and exterior HVAC cooling equipment shall be as follows:
 - For new interior VRV-DX and Mini-Split Refrigerant Heat Pump Split System type (a) HVAC units: HVAC cold condensate drainage piping shall be sized as indicated on the drawings or minimally sized as listed hereinafter. Drains shall not be less than 1/2" diameter pipe sizes for any single individual HVAC unit drain serving 1-2 tons HVAC cooling unit sizes, and not less than 3/4" diameter pipe sizes for any single individual HVAC unit drain serving 3-4 tons HVAC cooling unit sizes. Where two or more individual 1/2" drains are connected into one condensate drain line, the combined connected drain line size shall not be less than 3/4" diameter for up to (4) individual 1/2" drains served. Where (5) or more individual 1/2" drains are connected into one condensate drain line, the combined connected drain line size shall not be less than 1-1/4" diameter for up to (7) individual 1/2" drains served. Where (8) or more individual 1/2" drains are connected into one condensate drain line, the combined connected drain line size shall not be less than 1-1/2" diameter for up to (14) individual 1/2" drains served. Where (15) or more individual 1/2" drains are connected into one condensate drain line, the combined connected drain line size shall not be less than 2" diameter for up to (22) individual 1/2" drains served. All such above drains shall be of materials as specified in Section 15M050 and 15M701R.

All such above ground interior main condensate collected drains shall be insulated complete in accordance with Section 15M180, and all main condensate drain piping shall be carried overhead in between existing concrete tees and over interior corridors and shall be terminated to the exterior of the existing building at discrete selected exterior wall and ground locations. The main collected condensate drain piping terminations shall be dropped inside the new furred metal stud walls at any exterior furred walls and penetrate the existing exterior masonry walls for final drain termination onto a dedicated concrete slash blocks set on existing grade at the exterior faces of the building. Where using concrete slash blocks set on grade is not acceptable, the Div15M contractor shall terminate the exterior drain into a buried 2'x2'x 3' deep buried French-drain in the underground filled with crushed stone.

(b) For new Exterior Roof Mounted "RTU-1" Outside Air Ventilation type HVAC Unit: HVAC cold condensate drainage piping from this unit shall be sized as indicated on the drawings or minimally sized as listed hereinafter. Drains shall not be less than 1-1/2" diameter pipe sizes for any single individual HVAC unit drain serving the HVAC cooling units. All such above drains shall be of materials as specified in Section 15M050 and 15M701R.

All such above ground exterior rooftop HVAC units condensate drains shall not be insulated and shall be field routed supported on pre-manufactured roof pipe rail supports equal to "Roof Products Inc." specifically designed for pipe supports routed over the new roof areas of the building and terminate the drains to within 12" away from existing roof drains on the roof.

All HVAC Condensate drain piping shall be as specified in Section 15M050 and 15M701R.

END OF SECTION 15M704

SECTION 15M020 - MECHANICAL HVAC DEMOLITION

1. PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

The provisions of Division 1 and Sections 15M001, 15M002, 15M013, 15M019, 15M050 and 15M950 relate to and shall govern this section of the project specifications.

1.2 SCOPE:

- 1.2.1 The Division 15M Contractor's selective demolition and miscellaneous openings work covered by this section of the specifications consists of furnishing all plant, labor, equipment, materials and appliances, and performing all Div15M-Mechanical HVAC operations in connection with the required Demolition of ALL existing Mechanical HVAC systems within the existing project building. Requirements for temporary removal and relocation, reuse, abandonment, etc. and any temporary and permanent demolition of and by any other documentation of the specifications and the applicable drawings, are governed by and subject to the terms and conditions of the Contract. Temporary shutdown, HVAC phased removals, drainage, relocations and/or reconnections of equipment and/or piping systems and equipment to facilitate phases of construction dictated by the General Conditions Contract provisions shall be a part of this section of work by the Div 15M-Mechanical Contractor at no additional costs to the Owner.
- 1.2.2 The Division 15M Contractor shall carefully check and layout all required openings through all existing floors, walls, ceilings, and roof. The openings required for new ducts and/or piping holes/penetrations needed through the existing structure shall be verified with the existing building's drawings available from the Owner and any known information on reinforcing members, etc, prior to cutting these openings. All openings shall be referred to by the limited Architectural and/or Mechanical drawings and/or details of same before cuttings are made.
- 1.2.3 The Division 15M Contractor shall fully coordinate and fire-stop/caulk all his openings made for the work of this division including new all new opening at ducts and piping. See other Div. 15M sections of the specifications, such as 15M00, requiring such fire-stopping and caulking requirements.
- 1.3 <u>SUBMITTALS</u>: The Div15M Contractor shall submit, for review by the Owner, his proposed schedule and procedures for the accomplishment of all salvage and all demolition work for either temporary and/or permanent systems demolition and abandonment work. These submittals shall also be submitted for approval to the Engineer before any work begins. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.
- 1.4 <u>GENERAL PROVISIONS:</u> The work includes demolition, abandonment and/or the temporary relocations, etc., and recommendations, removal of all construction indicated, called for by notation, or specified. All materials resulting from demolition work, except as indicated, called for by notation or specified otherwise to be turned over to the Owner, shall become the property of the Contractor and shall be removed from the property. <u>RUBBISH AND DEBRIS SHALL BE REMOVED FROM PROPERTY DAILY UNLESS OTHERWISE DIRECTED SO AS TO NOT ALLOW ACCUMULATION INSIDE OR</u>

OUTSIDE THE BUILDING. Materials that cannot be removed daily shall be stored in approved areas specified by the Owner or His representative. Removal of any and all materials shall be by mechanics skilled in the trade of demolition and/or erection of materials removed. Removal of materials containing asbestos shall not be a part of this contract work. The Contractor shall notify immediately the Owner if identification and required removal of asbestos materials are found on the project. IT IS THE OWNER'S SOLE RESPONSIBILITY TO REMOVE ANY AND ALL ASBESTOS MATERIALS DISCOVERED DURING THE PROJECT DURATION.

1.5 <u>DUST CONTROL</u>: The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the building and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, water damage, flooding or pollution.

1.6 PROTECTION:

- 1.6.1 <u>Protection of Existing Work</u>: Before beginning any cutting or demolition work, the Contractor shall carefully survey the existing work, work conditions, and examine the drawings and specifications to determine the extent of the work. The Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the Owner, and any damage to such work shall be repaired or replaced at no additional cost to the project. The Contractor shall carefully coordinate the work of this section with all other work and construct and maintain shoring, bracing and supports, as required. The Contractor shall insure that structural elements are not over-loaded and be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this contract.
- 1.6.2 <u>Protection of Buildings from the Weather</u>: The interior of the building and all materials and equipment shall be protected from the weather at all times. This shall include protection sufficient to prevent rain water, drainage, dirt, snow, or any weather from entering any part of the building.
- 1.6.3 <u>Protection of Trees and/or Shrubs, Etc.</u>: Trees, shrubs, etc. within the project site which might be damaged during demolition and which may be indicated to be left in place shall be protected by a 6-foot high fence. The fence shall be securely erected a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any shrubs, or tree designated to remain that is damaged during the work under this contract shall be replaced, of a mature size as close to that of the original plant.
- 1.7 <u>BURNING:</u> The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- 1.8 <u>USE OF EXPLOSIVES</u>: Use of explosives will not be permitted for any demolition work at the project site.
- 1.9 <u>AVAILABILITY OF WORK AREAS</u>: Areas in which salvage and demolition work is to be accomplished shall be made available for observation by authorized governing code officials, fire department personnel, contracting personnel, and the Engineer personnel or any of their authorized representative. The areas shall be made safe at all times, in accordance with OSHA requirements.

2. PART 2 - EXECUTION

2.1 EXISTING FACILITIES:

- 2.1.1 <u>Structures, Walls, and Partitions</u>: Existing structures indicated shall be protected and remain intact to facilitate operations.
- 2.1.2 <u>Ceilings</u>: Existing ceilings as noted shall remain intact unless noted otherwise, to facilitate the removal of existing ductwork systems, piping, conduit, etc. Ceilings shall be replaced to the existing good conditions after work is completed.

2.2 Utilities:

- 2.2.1 <u>Utility Services</u>: Temporary and permanent disconnections of utility services, with related meters and equipment shall be removed up to the point of demolition and capped for connection to the new work as applicable.
- 2.2.2 <u>Removal of Utilities</u>: Existing utilities shall be removed as may be required or as indicated. When any unknown or known utility lines are encountered that are not indicated on the drawings the Engineer shall be notified by the Contractor.
- 2.3 <u>FILLING</u>: Holes, opening in walls, ceilings, floors, etc. and other hazardous openings shall be filled with safe acceptable materials, and made permanent for security and strength.

2.4 DISPOSITION OF MATERIAL:

- 2.4.1 <u>Title to Materials</u>: Title to all materials and equipment to be demolished, including salvaged items, is to remain the property of the Contractor, unless noted by the drawings or other direction, that the salvaged items shall remain the property of the Owner. Title to all Owner designated materials and any historical items shall remain the Property of the Owner. The Owner will not be responsible for the condition, loss or damage to such property after beginning of work to proceed; it shall remain the responsibility of the Contractor for all materials until either removed or turned over to the Owner.
- 2.4.2 <u>Material for Salvage</u>: Material for salvage shall be stored as approved by the Owner. Salvaged materials shall be stored, and/or removed from the property before completion of the Contract. Material for salvage for the Owner shall be turned over to the Owner's Facilities Operations department. Contractor shall verify with Owner the proper entity, contact and personnel for turning over salvaged property to Owner.
- 2.4.2.1 Owner Designated Salvaged Equipment. The Contractor shall become totally familiar with the Owner Designated Salvaged HVAC Equipment unit(s) & all requirements. The Div15 Contractor shall be fully responsible for the protection, wrapping, covering, pick-up, loading, shipping and transferring handling, transportation of the Owner Designated Salvaged HVAC Equipment. The Owner Designated Salvaged HVAC Equipment shall be the removal of the existing "McQUAY" Air-Cooled water chiller machine. The Contractor shall include all costs for salvaging the above existing equipment inclusive of all work & supplies required for removing and handling the same said owner's salvaged equipment. For additional data and information pertaining to Owner Designated Salvaged HVAC Equipment and labor and requirements necessary for said equipment, see the Contract Drawings ALL OWNER DESIGNATED SALVAGED EQUIPMENT SHALL BE VERIFIED WITH THE OWNER AND ENGINEER BEFORE ANY REMOVALS ARE MADE OR PROVIDED.
- 2.4.3 <u>Unsalvageable Materials</u>: Concrete, masonry, and other noncombustible materials other than concrete such as valves, piping, piping specialties, etc. permitted to either be removed or remain in place,

shall be disposed of off the property.

2.4.4 <u>Designated Materials for Owner Salvaged Items</u>: Salvaged items shall be removed in a manner to prevent damage and packed or crated to protect the items from damage. Containers shall be properly identified as to contents. Items damaged during removal or storage shall be repaired or replaced to match existing.

2.5 CLEANUP:

- 2.5.1 <u>Debris and Rubbish</u>: Debris and rubbish shall be removed from property.
- 2.5.2 <u>Debris Control</u>: Debris shall be removed and transported in a manner as to prevent spillage on streets or adjacent areas.
- 2.5.3 <u>Regulations</u>: All Local regulations governing and regarding hauling and disposal of demolished materials, trash and rubbish shall apply.

2.6 SUBMITTALS/APPROVAL:

2.6.1 Submittal of Proposed "<u>Demolition and Removal Procedures</u>" listed herein before shall be submitted for approval to the Owner and the Engineer before any work is begun.

END OF SECTION 15M020

SECTION 15M180 - MECHANICAL SYSTEMS INSULATION

1.0 PART 1 - GENERAL

- 1.1 <u>RELATED DOCUMENTS:</u> The provisions of Division 1 and Sections 15M001, 15M002, 15M019, 15M050, and 15M850 shall also apply to and shall govern this section. Contractor shall refer to all these listed sections for requirements specific to each Section requiring insulating materials.
- 1.1.1 <u>All insulated surfaces</u> shall be protected from damage. Where pipes rest on rollers or hangers, furnish pipe covering protection saddles tack-welded to pipe and fill inside of saddles with insulation. Refer to piping specialties for descriptions, and details.
- 1.1.2 <u>Hangers</u> for all lines shall be installed on the outside of the insulation with 18 gauge semi-circular insulation sleeves of galvanized sheet steel sleeves 12" long used between the hangers and the bottom of the insulation. These shall be used to protect the insulation from bearing pressures and damage from the pipe hangars.
- 1.1.3 <u>NO PIPE INSULATION</u> SHALL BE APPLIED UNTIL THE PIPE WORK HAS BEEN THOROUGHLY PRESSURE TESTED FOR TIGHTNESS AND ALL PRIMED/PAINTED CHILLED WATER PIPING HAS BEEN COMPLETED.
- 1.1.3.1 Prior to the insulation of any water piping system piping, the Div.15M Contractor shall assure and verify that any piping insulation being applied on the job is in conformance to these specification, and after the verification has been verified, THE DIV. 15M CONTRACTOR AND THE DIV. 15M-INSULATING SUBCONTRACTOR SHALL PROVIDE A SIGNED & TYPE WRITTEN AFFIDAVIT LETTER TO THE ENGINEER THAT THE INSULATION FOR ALL DUCS AND PIPING IS IN COMPLIANCE WITH THE SPECIFICATION, and such notice letter shall be sent direct to the ENGINEER. BOTH THE DIV.15M CONTRACTOR AND THE DIV. 15M-INSULATING SUB-CONTRACTOR SHALL SIGN THE AFFIDAVIT LETTER. After the above notification has been done, the Div.15M- Insulating Sub-Contractor shall begin his insulation of all the pipe systems as listed in paragraphs 1.2.1, 1.2.2, and 1.2.3 below.
- 1.1.4 <u>All insulation work</u> shall be done by mechanics skilled in its application and regularly employed by the Insulation Contractor who shall be a subcontractor to this Division 15M Contractor. Special care shall be given to the covering of irregular fittings in order to obtain an even surface resulting in a neat and workmanlike appearance.
- 1.1.5 Acceptable Maximum Limits: Fire hazard classification shall be in accordance with the following:

	Equipme	ent & Duct	Pipe Insulation	
	Insulation System		System	
	Hot	Cold	Hot	Cold
	Service	Service	Service	Service
	0.5	05	0.5	25
Flame Spread	25	25	25	25
Fuel Contributed	50	50	50	50
Smoke Developed	50	50	50	50

These ratings are for the complete system which includes the composite insulation and jacket or facing, vapor barrier, joint sealing tapes, mastics, and fittings. Materials must be listed by UL and acceptable under applicable N.B.F.U. and N.P.H.A.

1.2 PIPE INSULATION:

ALL EXTERIOR & INTERIOR ABOVEGROUND HVAC Refrigerant Piping: Piping as designated below shall be insulated with one-piece flexible closed cell Elastomeric insulation, equal to "Armaflex" insulation, with specifications of any equal meeting the exact same Federal Spec. No. as for "Armaflex". All exterior closed cell insulation shall be coated with "UV", ultraviolet resistant clear coating material, field applied by spray or brush. All EXTERIOR EXPOSED AND CONCEALED ABOVEGROUND HVAC Refrigerant Piping insulation for hot & cold gas supply and return refrigerant piping SHALL BE FINAL WRAPPED WITH A SMOOTH OR CORRUGATED ALL ALUMINUM JACKET ("CHILDERS CO." = 0.016 IN. GAUGE SECURED IN PLACE OVER ALL EXTERIOR EXPOSED INSULATED PIPING. (NOTE: FIBERGLAS PIPE INSULATION IS NOT PERMITTED ON THE PROJECT.)

- 1.2.1 Final finish all exterior piping with touch-up paint of the same type paint and paint color used above. Pipe insulation thickness shall comply with Table 803.3.7 in the 2003 IECC.
- a) All of hot & cold gas refrigerant pipes sizes:

1" insulation thickness.

- 1.2.2. <u>Fittings, valve bodies, unions, and flanges</u> shall be vapor seal insulated with molded pipe fittings of same material, thickness and workmanship as adjoining insulation, with final covering same as for piping.
- 1.2.3 <u>ALL INTERIOR ABOVEGROUND HVAC Cold Condensate Drain/Vent piping:</u> Piping as designated below shall be insulated with flexible closed cell Elastomeric insulation as manufactured by "Armaflex" w/vapor barrier, of thickness listed as follows:

All INTERIOR ABOVEGROUND HVAC condensate drain piping (EXCEPT REFRIGERANT PIPING LISTED ABOVE) as indicated/listed above:

- a. All pipe sizes 2" and smaller 1" thick
- 1.2.3.1 Prior to the insulation of any piping system, the Div.15M Contractor shall assure that All EXTERIOR & INTERIOR ABOVEGROUND building piping insulations conform to the above specified. Furnish and install all interior adjoining insulation sections shall be butted firmly together and the butt ends shall be sealed to pipe with a thick coating of vapor seal mastic at 21 feet intervals and at each fitting. Longitudinal seams of the vapor barrier jacket shall be sealed with Foster "Spark-Fas" No. 85-20 adhesive, or manufacturer's recommended adhesive. End joints shall be sealed with 4" factory furnished vapor barrier strips applied with the above adhesive. All piping below 10 feet above finished floors and contained within all Mechanical Rooms shall be final finished with "Childers Co." corrugated 0.016 in. GA aluminum jacketing.
- 1.2.3.2 Fittings, valve bodies, unions, and flanges shall be vapor seal insulated with molded pipe fittings of same material and thickness to adjoining insulation, wired on with two (2) #14 copper wires and vapor sealed by applying a 1/8" thick vapor barrier mastic recommended by insulation manufacturer. While the mastic is tacky, embed a layer of glass fabric lagging tape in the mastic. After the initial master coat has dried, finish the surface with an additional 1/8" thick mastic coat, troweled on with a finished smooth and neat contour. Finally, cover with all aluminum jacketing as listed in 1.2 above, secured as specified in preceding paragraph above. Pre-molded PVC covers may be used in lieu of aluminum covered elbows and fittings. Finish all fittings below 10 feet above finished floors of all Mechanical Rooms shall be finished with "Childers Co." corrugated 0.016 in. GA aluminum jacketing.

1.3 HVAC DUCT INSULATION:

- 1.3.1. GENERAL: (See Sections 15M850 for all Duct Descriptions & Service)
- 1.3.1.1 INTERIOR CONCEALED HVAC DUCTS- Duct-Wrap Insulation: Interior concealed HVAC ducts shall be sealed with mastic on all joints prior to insulating ducts. Interior Ducts concealed above ceilings or contained within chases, walls, etc. shall be insulated using duct wrap insulation; insulation shall be external type foil faced 1-1/2" thick duct-wrap insulation by "O.C.F.", duct-wrap insulation (foil-faced) shall be as specified herein for ductwork systems; see para. 1.3.2 herein. All supply and return duct plenums shall be internally lined with "OCF" faced duct liner with integral coating over inside exposed face of liner material; submit shop drawings for approval.
- 1.3.1.2 INTERIOR & EXTERIOR EXPOSED HVAC DUCTS: All Interior exposed HVAC ducts shall be sealed with mastic on all joints of ductwork. All interior exposed HVAC ducts shall not be insulated. Exterior exposed ducts shall be all "Double-Walled" duct with integral insulation and shall be sealed with mastic on all joints of ductwork. All exterior exposed ducts that are not specified to or listed on the drawings shall be "double-walled" and shall be "double-walled" insulated type using closed cell type insulation designed for use for externally and shall be a minimum of 2" thickness insulation. (duct-wrap insulation (foil-faced) shall NOT BE USED and it is not the intended type specified herein for any exterior ductwork systems shall not be used). Double-walled ductwork shall be "metal double walled" insulated acoustical duct with perforated interior metal wall with integral PVC interior liner as manufactured by "Eastern Sheet Metal, Inc." of Cincinnati, OH or Dothan, AL, per requirements of Section 15M851, or by a manufacturer who has been prior approved equal by the Engineer in accordance with Sections 15M001, per para. 1.7. All supply and return duct plenums shall be internally lined with "OCF" faced duct liner with integral coating over inside exposed face of liner material; submit shop drawings for approval.

1.3.2 INTERIOR DUCT SYSTEMS:

- 1.3.2.1 All designated concealed only interior duct systems (such as above new ceilings or chases) for interior concealed round, and rectangular/square Supply, Return, Exhaust duct systems, (See Section 15M850) (except exterior exposed to weather ducts), shall receive 1-1/2" thick foil faced ASJ "Duct-wrap" insulation required over the exterior surfaces of interior ductwork, of all round, rectangular or square ducts. Duct-wrap Insulation shall be Owens-Corning "Ductwrap" insulation with ASJ faced jacket (NFPA 90 approved), or approved equal. All such duct insulation shall meet the requirements of Para. 803.2.8 of the IECC code.
- 1.3.2.2 All interior concealed round metal ductwork shall be externally insulated with duct wrap, equal to "Owens-Corning," 1-1/2" thick, all-service faced duct wrap, with inorganic blanket glass-fiber, factory laminated to a reinforced foil kraft (FRK) vapor barrier facing, meeting NFPA 90 standards. See Section 15M850 for requirements of all duct systems receiving mastic sealed joints and insulation per this specification. All such duct insulation shall meet the requirements of Para. 803.2.8 of the IECC code.
- 1.3.2.3 All Interior exposed HVAC ducts shall not be insulated.
- 1.3.3 <u>ACCESS PANELS</u> shall all be insulated in such manner to preclude interference in readily removing and replacing such panels. (For any Double-Walled Duct Systems, provide matching Double-Walled Access Panels by duct manufacturer).

- 1.4 RIGID FIBERGLASS DUCT SYSTEMS:
- 1.4.1 RIGID FIBERGLASS DUCT SYSTEMS SHALL NOT BE PERMITTED OR ACCEPTED FOR USE ANYWHERE ON THE PROJECT IN LIEU OF INSULATED METAL DUCTWORK.
- 1.5 <u>EQUIPMENT INSULATION</u>: Hot cold equipment such as cold condensate pipe, etc. shall be insulated with curved-segmented sections of closed-cell type or heavy-density board type fiberglass type insulation, wired in place and/or cemented and covered with vapor-barrier and/or finished with canvas jacket, all in accordance with the manufacturers recommendations. All finished canvas jacketing shall be sealed with a waterproof lagging sealant coating as recommended by the manufacturer.
- 1.5.1 <u>For Interior Aboveground Cold Equipment Surfaces:</u> (-30 degrees F. to 400 degrees F.) Provide Owens-Corning, Fiberglass 700, Type 703, 704, 705 with ASJ-25 integral jacketing, of 2" thickness, installed per manufacturer's recommendations.
- 1.6 <u>EXTERIOR DUCT SYSTEMS:</u>: Any and all exterior exposed duct systems exposed to the aboveground exterior shall not be allowed; all exterior ducts shall be "double-walled" only as listed hereinbefore and as below. All exterior exposed ducts shall be all galvanized or all aluminum smooth face type; see sub-paragraphs below. (Note: Exterior Double-walled ductwork shall not be externally insulated, and ducts shall be "metal double walled" insulated acoustical duct with perforated interior metal wall with integral PVC interior liner as manufactured by "Eastern Sheet Metal, Inc." of Cincinnati, OH or Dothan, AL, per requirements of Section 15M851, or by a manufacturer who has been prior approved equal by the Engineer in accordance with Sections 15M001, per para. 1.7).

END OF SECTION 15M180

SECTION 15M850 - AIR DISTRIBUTION AND ACCESSORIES

1. RELATED DOCUMENTS:

The provisions of Division 1 Sections 15M001, 15M002, 15M019, 15M050 and 15M180 apply to and shall govern this section. Refer to these sections before quoting, bidding or supplying the equipment, materials and/or services of this section.

1.1 General:

1.1.1 General HVAC Air Distribution Duct System:

Contractor shall provide installation duct shop drawings per Section 15M001, Para. 1.4, (all). All General HVAC Duct Systems shall be sheet metal only and shall be sealed with mastic on all joints for all ductwork systems as specified herein. "PAINT-GRIP" TYPE DUCTWORK SHALL BE USED FOR ALL INTERIOR EXPOSED TO VIEW VISIBLE DUCT SYSTEMS. FIBERGLASS DUCT SYSTEMS WILL NOT BE PERMITTED ANYWHERE ON THE PROJECT. LOW AND MEDIUM PRESSURE METAL DUCTS (BELOW 3" W.G) DUCT SYSTEMS, CONCEALED SINGLE-WALLED AND DOUBLE-WALLED INSUSLATED DUCTS, SHALL BE RECTANGULAR OR ROUND DUCT AS SPECIFIED HEREIN. ALL CONCEALED SINGLE WALLED DUCT SYSTEMS ABOVE CONTAINED CEILING AREAS SHALL BE EXTERNALLY INSULATED WITH 1-1/2" THICK DUCT WRAP INSULATION AS LISTED IN SECTION 15M180, (ALL AS SPECIFIED HEREIN AND OF INSULATED MATERIALS PER SECTION 15M180). CONCEALED OR EXPOSED INTERIOR OR EXTERIOR DOUBLE-WALLED INTEGRAL INSULATED DUCTS DO NOT REQUIRE EXTERIOR INSULATION. ALL EXPOSED DUCTS SHALL BE CONSTRUCTED OF "PAINT-GRIP" TYPE SHEET METAL ON ALL EXTERIOR SURFACES OF FINISHED DUCT WORK.

THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE AND INSTALL ANY AND ALL MATERIALS, LABOR, ETC. FOR INSTALLATION OF CODE REQUIRED FIRE/SMOKE, OR FIRE, OR SMOKE, OR RADIANT CEILING/DIFFUSER DAMPERS, AS INDICATED ON THE DRAWINGS. REQUIREMENTS FOR THESE DAMPERS SHALL BE IAW THE GOVERNING OSF CODE OFFICIAL AND THE LOCAL GOVERNING CODES, AT ANY LOCATION. REFER TO ARCHITECTURAL DWGS FOR RATINGS OF ALL WALL, CEILINGS, CEILING-ROOF, ROOFS, AND FLOOR ASSEMBLIES.

ANY DUCTWORK PENETRATING EXISTING OR NEW WALLS ADJACENT TO BUILDING SPACES, INCLUDING MECHANICAL ROOMS, WHERE ANY DUCTWORK PENETRATING 1-Hr. RATED WALLS OR OF GREATER RATING FOR PARTITIONS SHALL BE PROVIDED WITH A U.L. LABELED FIRE DAMPER. FOR ANY DUCT PENETRATING A RATED CEILING, FLOOR, OR CEILING/STRUCTURE OR FLOOR ASSEMBLY, FOR CONTINUED AIR SERVICE TO DUCTS, CEILING DIFFUSERS GRILLES, ETC., IT SHALL BE PROVIDED WITH A U.L. RATED FIRE DAMPER, AND OR CODE APPROVED RADIANT DAMPER AT THE CEILING DIFFUSER. CONSULT THE LATEST GOVERNING CODES.

Where the radiant damper is of a size to accommodate neck size of diffuser or grille for protection only, an additional fire rated U.L. approved fire blanket shall be provided over all other diffuser areas for protection.

1.1.2 <u>All General Sheet Metal Work</u> shall comprise furnishing and installing all air ducts, R/A plenums, risers, branches, collars, adapters, dampers (automatic or manual), connections, splitters to complete systems <u>in accordance with the intent of the plans and specifications.</u> No duct sizes shall be changed from these general specifications without prior written approval by the Architects/Engineers, (refer to Section 15M001 listing responsibility of installing Contractor) or by reviews marked as "changed" in the Duct Shop Drawings as reviewed by the Engineer. All ducts shall be air tight, rigid and free from vibration, noise and rattles, and all lap joints shall be made in direction of air flow and shall be sealed with mastic on all joints for all ductwork

systems as specified herein. Ductwork must present a smooth interior surface. <u>ALL DUCTS 18" AND LARGER SHALL BE CROSS-BROKEN.</u> All exposed exterior surfaces of interior exposed ductwork shall be <u>"Paint-Grip"</u> type only; concealed and insulated ducts do not require exterior surfaces of duct to be "Paint-Grip" type.

- 1.1.3 <u>Duct construction</u> shall include all ducts openings, diffusers, registers, grilles, louvers, plenums, dampers and equipment, and shall be constructed in accordance with the latest IBC Standard Mechanical Code and SMACNA "HVAC Duct Construction Standards, Metal and Flexible" (1985 Edition), and as listed additionally herein. All exposed exterior surfaces of interior exposed ductwork shall be "Paint-Grip" type only; concealed and insulated ducts do not require exterior surfaces of duct to be "Paint-Grip" type. <u>All ductwork elbows, including double-walled ducts shall be full radius elbows with no turning vanes; square elbows will not be permitted anywhere unless space restriction is problem with fitting ells into spaces, of which such cases shall be reviewed with the Engineer on the job.</u>
- 1.1.4 <u>Ductwork receiving registers</u>, grilles and diffusers shall be flanged in or out to receive same and installed flush with finished walls or ceilings. On exposed ductwork a collar will be necessary and shall be used to install the register or diffuser to the side or bottom of the duct and also to provide space for the air device's O.B. volume control damper and the air deflector device in the duct and shall be sealed with mastic on all joints for all ductwork systems as specified herein. Horizontal ducts connecting to outside air intakes shall be pitched to drain outside and shall be soldered watertight. Where ductwork passes through floors, ceilings, and walls the space around ducts shall be fire-stopped and sealed in an approved manner with an approved non-asbestos fire retardant caulking material and in areas exposed to view finished with a suitable metal collar. This includes openings into mechanical rooms. Support vertical ducts by angle iron frame riveted to ductwork on four sides. No pipes or conduit shall be run through ducts without the Architects/Engineers' approval. Vertical duct risers passing through horizontal floors and ceilings shall be provided with horizontal mounted fire dampers at each floor/ceiling position. Each damper shall be provided with access door in side of duct to permit re-setting of dampers.
- 1.1.5 <u>Provide adjustable splitters and branch dampers/and air volume extractors</u> in all branch takeoffs from main ducts where indicated and as may be required to balance the system. Extractors shall be Metal and Aire Model 102 or approved equal linkage equipped with an external operating knob. Provide opposed blade volume dampers in all branch mains and splitters at main branch split takeoffs.
- 1.1.6 <u>Internal Duct Liner for Duct Systems:</u> Internal duct liner shall be provided where indicated or specified on the drawings and/or the specifications.
- 1.1.7 All duct and plenum connections to fans at both inlets and outlets shall be provided with heavy prefabricated closely woven 30 oz. glass fabric flexible duct connector, double coated with Neoprene and secured by double lock seams to 26 gauge galvanized steel connectors on sides and shall be sealed with mastic on all joints for all ductwork systems as specified herein. All duct plenums shall be internally lined with a vinyl coated liner material of anti-microbial material (IAW ASHRAE Standards). See Section 15M180.
- 1.1.8 <u>Duct Sleeves</u> shall be not less than 6" long. Material shall be UL approved and similar in all respects to "Ventglas" manufactured by Ventfabrics, Inc. Penetrations through all partitions, floors, ceilings, etc. shall be flashed and sealed with fire stopping U.L. sealant.
- 1.1.9 <u>Mastic Sealing of All Ducts:</u> All ducts with a cross sectional area of less than 150 square inches shall have all seams and joints sealed airtight with "Benjamin-Foster" 30-02 sealant and 3" wide 3M No. 474 tape, or "United Sheet Metal Inc." duct sealant applied by hand per manufacturers instructions. TDC/TDF Neoprene gaskets shall be used on all TDC/TDF joint systems as previously listed and shall be sealed with mastic on all joints for all ductwork systems as specified herein.

- 1.1.10 <u>All Sheet Metal Work Ductwork</u> shall be constructed, installed, insulated and fire safe accessories provided all in accordance with the requirements stipulated in the current issue of NFPA pamphlet No. 90, 90A and in accordance with latest edition of IBC Standard Mechanical Code.
- 1.1.11 <u>Painting of Duct Systems:</u> All exterior and interior exposed to view duct systems shall be painted under Section 09900 by the sub-contractors responsible for all painting; the Div. 15M Contractor shall not be responsible for painting duct systems.

1.2 GENERAL HVAC SHEET METAL DUCT SYSTEMS AND ACCESSORIES (FABRICATED):

1.2.1 <u>General Sheet Metal Duct Construction.</u> All ductwork, all duct plenums risers and branch run-outs, and all double-walled duct, etc., shall be constructed of either smooth "Paint-Grip" or type galvanized steel metal. All interior exposed ductwork shall be constructed for exterior "Paint-Grip" finish only. See Section 15M851 for Acoustical Insulated Double-Walled Duct requirements. NO DUCT OR FITTINGS SHALL BE BUILT OF A GAUGE METAL LESS THAN 26 GAUGE. Gauges (U.S. Standard) of metal which shall be used, together with the type of joints and methods of stiffening and bracing, for the single and double walled duct types of the various size ducts shall be as follows:

Rectangular	Ducts	Round Ducts	All Ducts Types (Single & Double-Walled), Joints shall have Min. Connection Type & Seals Of (see below)
Size	Min.	Min.	
(Longest Side Dim.)	Gage	Diameter / Gage	
Up thru 12"	26	Up thru 13"/ 26	"S" and Drive Joint w/Duct Sealant TDC/TDF Formed-on Flanges with TDC Neoplene Gaskets
13" thru 30"	24	14" thru 22"/ 20	
31" thru 54"	22		TDC/TDF Formed-on Flanges with TDC Neoplene Gaskets

- 1.2.1.1 Required TDC/TDF Formed on Flanges: For all duct systems listed above by sizes and shapes designated for use of TDC/TCF formed on flanges (TDC/TDF/T25A/T25B) shall be used. Formed on flanges will be constructed as SMACNA T-25 flanges whose limits are defined on Page 1.36, 1995 SMACNA Manual, Second Edition. Formed on flanges are not allowed beyond 54" sized ductwork. No other duct construction pertaining to formed on flanges will be accepted. All TDC/TDF flanged duct joints shall be provided with full-faced total perimeter, proper-fitted "TDC/TDF" neoprene gaskets made for the duct connection system and size of the joints. See Section 15M851 for Acoustical Insulated Double-Walled Duct requirements.
- 1.2.2 <u>Ductwork Functional Criteria:</u> Fabrication of all duct shall be in accord with Tables 10 & 11 on page 45 of Chapter 3 of 1967 edition of ASHRAE Guide, and latest edition of SMACNA Duct Manual, to meet all functional criteria defined in Section VII, of the SMACNA "HVAC Duct Construction Standards, Metal and Flexible" <u>1985 First Edition</u>. All ductwork must comply with all local, state and federal code requirements. See Section 15M851 for Acoustical Insulated Double-Walled Duct requirements.
- 1.2.3 <u>Access Doors.</u> Provide access doors in ducts at each splitter and balancing damper and fire damper. Doors shall have hinges, latches, gaskets and frames, and be constructed according to SMACNA Duct manual. On insulated duct systems, access doors shall be double-walled insulated type only. Access doors shall be labeled per the requirements of Paragraph 607.4 in the 2003 IMC.
- 1.2.4 Round or Rectangular Curved Elbows: All duct systems shall have radius elbows only, and shall not have a throat center radius of less than 1-1/2 times the duct width at the turn unless indicated otherwise. Do not use square throat or heel ended turned partial or full 90° elbows, unless shown on the drawings, such as return duct. See Section 15M851 for Acoustical Insulated Double-Walled Duct requirements. Square heel

and throat duct elbows are not permitted unless field approved by the Engineer on-site. <u>Air foil turning</u> vanes shall not be used unless shown on the drawing or field approved by the Engineer.

- 1.2.5 <u>Volume Splitters Manual Dampers</u>, Fire or Smoke Dampers shall be installed where shown on the drawings or as required for proper regulation of air distribution, and as required by code requirements for fire and smoke partitions, wall, floors, ceilings assemblies. Generally, splitters and dampers shall be placed at the junction of each branch and main duct and at all points necessary to properly balance the systems. Splitters shall be air foil design, sufficiently stiffened to prevent noise or vibrations, and in no case constructed of lighter than 20 gauge galvanized steel. A quadrant and set screw equal to Ventlock No. 641 shall be installed for all dampers which are accessible, for dampers which are concealed above plaster or sheet rocked ceiling or behind masonry or any furred construction, furnish and install concealed regulators (Ventlock No. 666) with chrome cover plate, or equal.
- 1.2.6 <u>Duct Sealants/Gaskets:</u> All ducts with a cross sectional area of less than 150 square inches shall have all seams and joints sealed airtight with "Benjamin-Foster" 30-02 sealant and 3" wide 3M No. 474 tape, or "United Sheet Metal Inc." duct sealant applied by hand per manufacturers instructions. TDC/TDF Neoprene gaskets shall be used on all TDC/TDF joint systems as previously listed.
- 1.2.7 <u>Insulation of ducts</u> shall be provided in accordance with Section 15M180. <u>Note:</u> On all drawings, the duct sizes shown do not include thickness for exterior duct insulation material. Overall space for duct and insulation shall be increased to permit the free area of ducts to be equal to the sizes indicated on the drawings plus the duct insulation. <u>See Section 15M851 for Acoustical Insulated Double-Walled Duct requirements.</u>
- 1.2.7.1 <u>Duct Systems Insulation Requirements: (Includes Above All Ceilings & In Chases, etc.)</u>
 The following listing gives the schedule of requirements for concealed and exposed duct systems:
- A) Concealed Metal Duct Systems (Above ceilings & in enclosed duct chases or rooms).
 - 1) Single-Wall Rectangular/Square Duct & Plenums:
 Supply Air, Return Air/Transfer Ducts
 Outside Air & Relief/Exhaust Air
 (See Sec

Ductwrap Insulation

(See Sect. 15M180 for specific requirements)

 Single-Wall Round Duct and Plenums: Supply Air, Return Air Duct/Transfer Air Outside Air & Relief Air/Exhaust Air

Exterior Ductwrap Insulation (All) (See Sect. 15M180 for specific requirements)

3) Exhaust Duct Systems (All): (All sizes) The Same insulation as listed in A-2 above (See Sect. 15M180 for specific requirements)

- 4) <u>Double-Walled Insulated Duct & Plenums</u>: Supply, Return & Return/Exhaust, (see the drawings) (See Sect. 15M851 for specific requirements)
- B) Exposed Metal Duct Systems: (Ducts exposed to view in the conditioned space/rooms). (Note: All exposed metal ducts shall be "Paint-Grip" type for all exterior duct surfaces.)
 - 1) Single-Wall Round & Rectangular/Square Duct & Plenums:
 Supply Air, Return & Relief/Exhaust No duct insulation (See Section 15M180)
 - 2) <u>Double-Walled Rectangular & Round Duct & Plenums</u>:
 Where noted on "OAHRU" units interior ducts and on "OAHRU-2" unit ducts and as noted for duct risers and plenums in the Conference Center at Interior & thru Exterior Walls & In Mech. Room

Chase) Supply Air, Return & Relief/Exhaust Dbl-Wall internally insulated 1-1/2" thick w/polyvinyl liner and w/perforated interior metal duct liner

- 3) <u>Double-Walled Insulated Duct & Plenums</u>: Supply, Return & Return/Exhaust, (see the drawings) (See Sect. 15M851 for specific requirements)
- C) Exterior Metal Duct Systems: (Exterior Ducts exposed to outside).
 - Double-Walled Rectangular & Round Duct & Plenums:
 All exterior Supply Air, Return & Relief/Exhaust ducts shall be Double-Wall internally insulated 2" thick w/polyvinyl liner & w/perforated interior metal duct liner. See section 15M851 of Specifications.

NOTE: Refer to Sections 15M180, for insulation materials and requirements for all duct insulation.

- 1.3 <u>FLEXIBLE ROUND INSULATED DUCT</u>, <u>AIR DUCT CONNECTORS AND DUCT MOUNTED DUCT SOUND ATTENUATORS:</u>
- 1.3.1 <u>Flexible duct</u> shall be fully insulated acoustically transparent CPE inner film liner mechanically locked with galvanized steel helical banding; and shall be manufactured by Flexmaster (Type 8M), class 1, flexible air duct of sizes shown on the drawings. All sizes shall meet the standards of NFPA Pamphlet 90A and 90B, UL 181, shall be UL Labeled, and meet all governing codes. All duct connections shall be made with clamps on both the duct and the duct insulation. Tape all connections. Maximum length of any flexible duct connector shall not exceed five (5) feet in length.
- 1.3.2 <u>Connections</u> shall be made onto terminals only with short sections of a maximum of 4 feet, and only at the approval of the Engineer. Duct connections shall be Flexmaster model STO-B03 lateral take-off with damper using solid axle and 2" build out for external duct insulation. Connections cannot be made and shall not be made or used in systems, which are governed by IBC-IMC, Mechanical Code when all duct systems must be all metal as dictated by Code. When these connections are used, they shall be made by thoroughly coating the interior of the duct to a depth of three inches with 3M-EC-800 compound mechanically fastened with at least three sheet metal screws equally spaced around the circumference, and additionally secured with 1/2" wide locking steel strap. Seal all ducts with mastic sealant as listed in Para. 1.2.6. hereinbefore.
- 1.3.3 <u>Flexible Insulated duct (when permitted by Code only</u> shall be installed in a fully extended condition free of sags and kinks, using only the minimum length required to make the connection; the maximum length shall not exceed five (5) feet in length.
- 1.3.4 <u>Duct Mounted Sound Attenuators</u>: Duct mounted sound attenuators shall be either of the round or square/rectangular configuration type and shall be manufactured by Price Industries, Inc.. The round configuration type duct mounted sound attenuators shall be "Price" Series CM Double Walled type w/perforated liner panel and integral interior sound dampening acoustical material. The square/rectangular configuration type duct mounted sound attenuators shall be "Price" Series RL Double Walled type w/perforated liner panel and integral interior sound dampening acoustical material. Refer to the drawings for sizes, capacities and sound attenuating performance criteria.

1.4 DAMPERS:

1.4.1 <u>Unit or Duct Mounted/Wall Mtd. Motor Operated and Manual Balancing Dampers</u> shall be Ruskin Model CD-36 single blade or CD-60 airfoil type where indicated on drawings. Dampers shall be galvanized steel, interlocking multiple, opposed-blade type furnished with locking quadrants. Leaves shall not exceed 6" width. Louvers shall be aluminum construction, architectural-storm proof design with integral interior bird

screens, as shown on the drawings and provided by others. (See Architectural drawings). All ducts receiving dampers and duct devices shall be seated in accordance with Para. 1.2.6 listed previously.

Motor operated dampers shall be provided with electrical motor operators sized for full-face damper areas. Coordinate motor operators with HVAC Controls Contractor.

- 1.4.2 <u>Damper Blades:</u> shall be 16 gauge steel with 1/2" diameter shafts set in brass trunion bearings. Dampers shall be mounted in 2" x 1/2" x 1/8" galvanized steel channel frames with solid stops at bottom and top of frames.
- 1.4.3 Louvers and Dampers: shall be Ruskin Model ELF, CD or Prior Approved Equal.

1.5 DIFFUSERS, REGISTERS AND GRILLES:

1.5.1 <u>Diffusers and Registers</u> shall be sized and located as shown and scheduled on drawings. Equipment produced by Price Industries or Prior Approved Equal, will be acceptable provided it meets all specification requirements, and all components are of the one manufacture. Types of equipment shall be furnished and installed as specified on drawings. All supply and return diffusers and registers shall have integral volume control/shut-off/balance damper. Provide accessory radiant dampers and fire-blankets for diffusers as scheduled and listed or required.

1.6 FIRE/SMOKE DAMPERS:

- 1.6.1 <u>Combination Fire/Smoke Dampers</u> and/or Fire Dampers and/or Smoke Dampers and ceiling radiant dampers shall be provided in ducts, openings, walls, and floors ceiling diffusers in rated ceilings as required by the governing codes. Dampers shall be UL listed, approved, and labeled. Smoke dampers shall comply with UL 555S. Dampers shall be of the self-acting, spring-activated type with either replaceable fusible link, or reusable link type, and automatic release resetable type connectors. Dampers shall be suitable and approved for horizontal and/or vertical application depending on the mounting position of the damper. Dampers shall be "Type B," of the retractable blade type with minimum blade interference in air stream with integral 16" 20 gauge galvanized sealed sleeve and pre-made one-piece mounting angles for each side of damper. Where possible, utilize a type to allow concealed blades into a recessed housing. Dampers shall be by "Ruskin" or "Price", or "Metalaire", or approved equal:
 - A. Fire Dampers: "Ruskin" Model DIBD60, 1-1/2 hour fire rated, UL, 165 degrees F. fusible link.
 - B. <u>Combination Fire/Smoke Dampers:</u> "Ruskin" Model FSD-60, 2 hour smoke, 1-1/2 hour fire rated, UL Leakage Class I, 165 degrees F. fusible link, with 24 VAC damper motor operator.
 - C. Ceiling Radiation Dampers: "Ruskin" Model CFD.
- 1.6.2 <u>Requirements for Fire/Smoke, Fire, Smoke, or Radiant Dampers:</u> Requirements for these devices shall be stipulated herein and as shown on the drawings. All dampers shall be U.L. listed and labeled and tested I.A.W. "U.L." 1989, STD.555, tested under operating air pressure and max S.P.
- 1.6.3 Furnish and install, at locations shown on plans, fire/smoke dampers constructed and tested in accordance with the proposed UL Safety Standard 555 dated June 1988, which includes testing to close under dynamic air-flow conditions and UL labeled as a dynamic rated fire damper (static rated dampers are not allowed). Each fire/smoke damper shall have a 1-1/2 hour fire protection rating, 212 degrees F fusible link, and shall include a UL label in accordance with established UL labeling procedures. Damper manufacturer's literature submitted for approval prior to installation shall include comprehensive performance data developed from testing in accordance with the proposed UL555 Standard and shall illustrate maximum allowed CFM at 8" static pressure for in-duct mounting and maximum allowed CFM at 4" static pressure for unducted, in-wall mounting. Fire dampers shall be equipped for vertical or horizontal installation as required

by the location shown. Fire dampers shall be installed in wall and floor openings using steel sleeves, angles, other materials, and practices required to provide an installation equivalent to that used by the manufacturer when dampers were tested at U.L. Installation shall be in accordance with the damper manufacturer's instructions.

1.7 <u>Duct mounted Smoke Detectors</u>:

- 1.7.1 Duct mounted Smoke Detectors shall be installed on all main supply air and air main return air duct systems leaving and entering air handling systems; such as the "OAHRU" ventilation systems. All duct mounted smoke detectors shall be provided under Div. 16 Electrical, and installed under Div. 15M Mechanical and wired by Div. 16 Electrical.
- 1.7.2 Refer to the Mechanical and Electrical Drawings for locations and requirements for duct mounted Smoke Detectors and see Div. 16 Electrical Specifications, Section 16E720, Fire Alarm, for descriptions of all smoke detectors.

END OF SECTION 15M850

SECTION 15M002 - SCOPE OF WORK - MECHANICAL SYSTEMS

1. RELATED DOCUMENTS:

The provisions of Division 1 and Sections 15M001, 15M013, 15M019, 15M020, 15M050SV, 15M094, 15M099, 15M180, 15M700, 15M701, 15M701R, 15M704, 15M850, 15M925 and 15M950 shall all apply to this section and shall also be governed in accordance with this section. Contractor shall refer to all listed sections for requirements specific to each Section.

GENERAL:

- 2.0 The General descriptions of the work includes the following:
- 2.0.1 <u>Specifications & Drawings</u>: Refer to all contract drawings and specification sections of Division 15M-Mechanical for the primary technical specifications and the technical design drawings of all the Div15M mechanical, mechanical controls and & mechanical supported electrical work. Contractor shall provide his own installation coordination shop drawings for all new Div15M Mechanical HVAC systems in accordance with Section 15M001. Contractor shall provide <u>"To-Scale"</u> ductwork shop drawings for all ductwork installation (See Section 15M001, Para. 1.4 (all).
- 2.0.2 <u>General Outline of Div15M Scope of Systems and Work</u>: The facilities and systems of the existing and new mechanical work can be described (but not by way of limitation) as follows:
- 2.0.2.1 <u>General Description:</u> This section specifies the general description and not the details for the several categories of provisions for all work, including all mechanical materials and labor work which is all inclusive of including "Proposed Phasing of the Work", and "Add Alternate Bid Items" as listed in Division 1 and Division 15M for the PhaseD Construction Work; the following is applicable but not limited to:
- 1) Certain adaptive special and limited connections to existing systems for some new portions of the Phased HVAC VRV terminal equipment & devices, including new refrigerant piping connections, wiring and controls connections. These limited connections, as designated on the drawings, are within the new Phased construction areas of the building and are designated to be connected to certain portions the existing mechanical HVAC systems with all VRV refrigerant systems and controls systems of the new project upgrades.
- 2) See Section 15M001 for descriptions of the general Scope of Work and and the Bid Documents for the rquirements of all work intended for the Project for each of the two (2) schools.
- 2.1 <u>Related Work & Other Sections</u>: This specification serves to supplement other Divisions and other Div15M Sections and as listed in "Related Documents" above; and to describe in general the materials and installation procedures to be followed for furnishing all new systems, and installing completely all Mechanical HVAC Systems including the new HVAC Systems for all areas, as outlined and described by the descriptive contract specifications and drawings provided to the Contractor and as noted in this part of the specification, for the Contract. Where any discrepancy or conflict occurs in this section with the referenced "Related Document," the "Related Documents" shall govern.
- 2.2 Where the word Contractor appears in these specifications, it applies to the Division 15M Contractor performing the Mechanical Systems including all demolition of Mechanical Systems, piping, HVAC controls and wiring, and HVAC portions of the work.
- 2.3 The Div15M Contractor shall provide his Phased Construction Work plan & schedule as he/she proposes to "Phase" the demolition and installation of the multiple new systems as may be specified herein and/or stipulated on the drawings; and furnish all labor, material, tools, hangers, supports,

scaffolds, erection equipment, services, and other items of expense as specified as a part of this Contract. It further includes placing the systems into operation and proper coordination with the T&B Contractor for HVAC Systems Testing & Balance and adjustment on all systems and items of equipment as installed and/or connected to or modified by this work, including all portions of work approved by the Engineers.

- 2.4 The installation shall conform to all local & state governing codes, laws, and requirements in force at the job site, and the Contractor at his expense shall obtain all permits, licenses and inspection certificates required for the installation of the project.
- 2.5 IN THE EVENT ADDITIONAL DRAWINGS OR SPECIFICATIONS ADDENDA, SKETCHES, ETC. ARE FURNISHED, SUCH DOCUMENTS AND DRAWINGS SHALL BE OF EQUAL FORCE WITH THOSE FIRST FURNISHED WITH THESE SPECIFICATIONS, AND SHALL BECOME A PART OF THE AWARDED TOTAL BID CONTRACT INCLUSIVE OF AND AS IN TOTAL PART OF THE CONTRACT ("CGMP") GUARANTEED MAXIMUM PRICE FOR THE PROJECT.
- 2.6 The Contractor shall give his personal superintendence and direction to the work and maintain and supply complete supervision over all subcontractors that may be employed by him. He shall be held responsible for all legal violations, and shall give the proper authorities all notices required by law, paying at his expense all proper legal fees and charges. He shall hold the Owner and Engineer harmless for any damage or expense arising from his Sole Actions in the fulfillment of the Division 15M work under this Contract and at the completion of the work he shall repair at his expense all errors and omissions, damages done created by his sole acts alone. He shall not be responsible for acts, errors, omissions, and damages caused by others. He shall remove from the premises all rubbish and waste materials resulting from his work, or his sub-contractor's work.
- 2.7 THIS SPECIFICATION SHALL APPLY TO ANY CONTRACT OR SUBCONTRACT THAT THE DIVISION 15M CONTRACTOR HAS EMPLOYED FOR, OR MAY ENTER INTO FOR THE SUPPLYING OF EQUIPMENT, MATERIALS, LABOR OR CONSTRUCTION FOR VARIOUS PARTS OF THE WORK AS SHOWN ON THE DRAWINGS OR SPECIFIED HEREIN, AND IT SHALL HEREBY BE UNDERSTOOD THAT THE DIVISION 15M CONTRACTOR SHALL INFORM ALL SUBCONTRACTORS OF THESE SAME REQUIREMENTS.
- 2.8 The Div15M Contractor shall provide for the salvage of "Owner designated/specified equipment for salvage" that has been removed under the demolition portion of the Div15M work. Such "Owner designated/specified equipment for salvage" shall be protected from all weather, damage and/or improper containment, vandelism, etc. and shall be properly covered, wrapped and contained as valuable equipment for slavage to the Owner.

3. CODES AND STANDARDS

3.1 Various nationally recognized codes and standards shall be referred to by their abbreviated names as listed below. Reference to these standards and any standard number of such shall be understood to mean the latest published edition with all requirements set forth by the latest edition as applicable to the work to be performed:

AGA

- American Gas Association

AGMA

- The American Gear Manufacturer's Association

AIA AMCA - American Institute of Architects

AIVICA

- Air Moving and Conditioning Association

ANSI

- American National Standards Institute

ASHRAE

- American Society of Heating, Refrigerating and Air Conditioning

Engineers

ASME

- American Society of Mechanical Engineers

ASTM

- American Society of Testing and Materials

FIA

- Factory Insurance Association

FM

- Factory Mutual

HEPA

- High Efficiency Particulate Air - Clean Room Specification Federal

Standard 209

NEMA

- National Electrical Manufacturers Association

NFPA

- National Fire Protection Association

SMACNA

- Sheet Metal & Air Conditioning Contractors National Association

SSPC

- Steel Structures Painting Council

UL

- Underwriters' Laboratories

IRM

- Improved Risks Mutuals

4. MATERIALS:

4.1 The Contractor shall furnish and install Owner furnished equipment (if any) and all Div15M supplied items of equipment an materials as shown on the drawings, and/or specified, and/or as required to complete the work in a complete acceptable manner.

- 4.2 For equipment specified to be provided by the Div15M Contractor, the major equipment and materials have been shown on the drawings and/or specified by manufacturer and model number in order to establish a minimum quality, performance, and minimum physical limitations. This does not limit the Contractor to the specific manufacturers noted; however, any equipment or materials proposed shall be equal in quality, performance, arrangement, and space requirements to that specified and such shall be prior reviewed and prior approved by the Engineer and Owner before purchase and use by the Contractor for the project; see Section 15M001, Prior Approval and substitutions requirements. All specified and and/or prior approved equipment and materials shall be submitted for approval to the Engineers, before purchase or use for the project. Submissions for approvals shall be done in accordance with all portions of Section 15M001, and the Owner's General Conditions of the Contract as may be applicable.
- 4.3 All equipment and materials shall be new and of the quality noted or specified. All new equipment shall be manufactured within 12 months of the installation of the equipment in this project. All equipment and materials of later manufacturer beyond 12 months or are of inferior quality or not meeting the intents of the specifications shall be rejected and replaced with new. Rejected equipment and materials shall be removed from the job site and immediately replaced.
- 4.4 The Engineers will decide upon the quality and the suitability and the prior approval of equipment and materials furnished and also upon all questions arising from the specifications and plans.
- 4.5 The Contractor shall pay all royalties and license fees, and shall defend all suits or claims for infringement of any patent rights on account of the use of any patented invention, process, article, or appliance, and save the Owner and Engineer harmless from loss on account thereof; except that the Owner shall be responsible for all such loss when he or his representatives has entered into the approval of a particular patented process and/or system and/or a particular patented product or system that has been approved by the Owner, of a particular process, system or product of a manufacturer or manufacturers as is, or as not having been specified herein; but, however, if the Contractor has information that the process, system or product or article specified is an infringement of a patent he shall be responsible for such loss unless he promptly gives such information prior to the Owner and to the Architects-Engineers.
- 4.6 No substitutions or deviations of the specifications of products and materials, and/or any specified/named product/model number/system type, size, or capacity, or characteristic shall be allowed in this project for contract except for very special reasons which shall be given in writing by the Engineers

and/or the Owner; such reasons shall be documented and submitted for the project record in a formal document of writing to and/or by the Engineers and/or the Owner, and such written approval must be obtained from the Engineer and/or the Owner before such deviations are made. Such deviations shall in no way be a cause for delay in completion of the project.

5. INSTALLATION RESPONSIBILITY, WORKMANSHIP, AND EMPLOYEES

- 5.1 The Contractor is responsible for the proper and acceptable installation of all equipment and materials he furnishes and all equipment and materials furnished to him by the Owner, or others.
- 5.2 THE CONTRACTOR SHALL COORDINATE THE INSTALLATION OF ALL THE ABOVE EQUIPMENT AND MATERIALS WITH OTHER CONTRACTORS AND WORKERS, I.E., THE GENERAL CONTRACTOR, ELECTRICAL CONTRACTOR, ETC. All work shall be completed within the contractual allocated time. The Contractor shall keep up with the work by other Contractors. The Contractor shall report any foreseeable delays in the completion of his work to the Architect/Engineer as soon as the delay is recognized by the Contractor.
- 5.3 Any questions arising over work, equipment, and materials furnished by other contractors or the Owner that is necessary for proper installation and operation of the Mechanical Systems and the HVAC equipment, shall be referred to the Engineer for determination of responsibility and correction.
- 5.4 The Contractor's workmen shall be skilled in the work to which they are assigned and all work shall be performed under the direct supervision of an experienced and competent foreman.
- 5.5 Before commencing work on this project, the Contractor shall verify in writing to the Engineers that his project manager, superintendents, foremen, and others of his personnel responsible for this project have read these specifications, reviewed the drawings and understand what is required for proper completion of the systems.
- 5.6 The Contractor shall keep sufficient workmen on the work at all times, and shall enforce strict discipline and good order among his employees.
- 5.7 The Contractor shall not employ on the work any person, in any capacity, who may be unskilled in or incompetent for his position, intemperate, disorderly, or otherwise objectionable. The Contractor, if requested in writing by the Engineers or Owner, shall dismiss any such objectionable persons from the work.
- 5.8 All work, including ductwork and piping, shall be constructed true to lines and surfaces indicated in a neat, substantial, and workmanlike manner and in such a way as to properly serve the purpose intended. Equipment shall be plumb and level. All members and parts, upon installation, shall be properly framed, secured together and anchored in place.
- 5.9 The Contractor shall visit the job site, obtain measurements required and make mechanical HVAC installation shop drawings (See Section 15M001) of all items he intends to fabricate and/or install as part of the HVAC and piping systems inclusive of all ductwork and piping systems. These drawings shall be submitted to the Architects-Engineers for approval and/or corrections and comments before actual fabrication and erection of duct, casings, piping, and related accessories.
- 5.10 The Contractor shall provide the Engineers with prints of Record Drawings of all installations and deviations from the Contract Drawings. (See Section 15M001).
- 6. OTHER CONTRACTS AFFECTING THIS WORK:

- 6.1 All service piping work associated with this part of the specifications shall be performed under this contract.
- 6.2 The Mechanical HVAC specialty brazed refrigerant copper piping and all piping specialty equipment devices of HVAC instrumentation work allied with this part of the specifications shall be performed under this Div15M contract work.
- 6.3 All piping and duct Insulation work pertaining to all new duct and service piping systems of the specialty brazed refrigerant copper piping and all piping specialty equipment devices of HVAC shall be performed under this contract.
- 6.4 Provide and install all HVAC equipment concrete pads, all HVAC rooftop equipment curbs, rooftop piping curbs, rooftop duct curbs shall be of the insulated type and constructed of either all metal construction or of the combination treated wood and metal covered construction for the project. Provide and install all HVAC wall and roof openings, pipe supports & equipment support steel and all required labor for such openings and supports shall be performed under this Div. 15M contract, unless noted otherwise on the drawings, but all requirements shall be set by the Division 15M Contractors for all it's own work. All such pads, openings, supports etc. shall be fully and completely coordinated with all other trades by the Div.15M Contractor.

7. SHOP DRAWINGS:

7.1 The Contractor shall submit shop drawings of certified equipment drawings and data that clearly indicate the dimensional and capacity data etc. for the equipment furnished by him. Submittals shall be governed by Division 1, and Section 15M001.

8. DESCRIPTION OF SYSTEMS:

The facilities and systems of the mechanical & electrical work can be described (but not by way of limitation) shall be as hereinbefore listed under paragraph 2.0.2.

9. WORK UNDER CONTRACT FOR ALL SYSTEMS:

9.1 It is not the intent of this section of the specification to give explicitly every detail as to the requirements of all work intended relative to each above mentioned system description. Rather, the combined interpretation of the entire set of specifications and contract drawings should explain the necessary new work requirements for the systems described.

END OF SECTION 15M002

SECTION 15M701R - PIPING TRANSFER, CONDENSATE TRANSFER PUMPS & ACCESSORIES

1. RELATED DOCUMENTS

The provisions of Division 1 and Sections 15M001, 15M002, 15M019, 15M050 and 15M180 apply to and shall govern this section. Contractor shall refer to all listed sections for requirements specific to each Section. Condensate Transfer Pumps shall be as specified herein.

- 1.2 <u>HVAC VARIABLE REFRIGERANT VOLUME (VRV)- HOT & COLD REFRIGERANT GAS SUPPLY AND RETURN PIPING (INCLUDING HOT-GAS BY-PASS REFRIGERANT PIPING):</u>
- 1.2.1 Pipe/Tubing: Refrigerant piping/tubing shall be all hard-drawn copper tubing and shall be for "Refrigerant Service" type only, fully dehydrated, capped and sealed in straight tubes only. All copper tubing shall be wrought copper conforming to ANSI No. B16.22 for brazed type joints only, in hard tempered tubing only; roll-copper shall not be used. Copper piping fittings shall ASTM No. B-88 or B-819 for gas pressurized service tubing for use on all refrigerant type piped systems and shall be dehydrated and capped type copper tubing specifically designed and labeled for refrigerant service only using only brazed jointed connections.

Rolled Copper is not permitted.

Brazed Joints in refrigerant copper tubing shall be socket type and Filler metals shall comply with ANSI/AWS A.5.8, Specification for Brazing Filler Metal, also in accordance with the following:

All Pipe sizes 1-1/2" and Smaller - Joints shall be made with specified brazing materials.

- 1.2.2 <u>Refrigerant Valves:</u> Refrigerant valves shall be "Sherwood Valve" shut off type refrigerant valves. All sizes shall incorporate dual stem seal design w/teflon packing internal primary seal. Valve shall permit operation w/out removal of seals or teflon gaskets, provide w/internal ball type relief port for dual directional shut-off provide full flow ports on all sizes 1/4" through 3-1/8". (Note: All Shut-off valves shall be zero-clearance type, all-bronze, brazed connection with 1/4" Schrader type service fitting in valve. See the drawings for some locations shown on certain equipment.
- 1.2.3 Fittings: Fittings brazed type as previously specified per Section 15M050 and indicated on drawings.
- 1.2.4 <u>Couplings & Dielectric Couplings:</u> As previously specified per Section 15M050, except where dissimilar metals join, isolated type dielectric couplings shall be used.
- 1.2.5 <u>Appurtenances and Accessories</u>, such as strainers, circuit balancing Venturi flow fittings, etc., shall be as previously specified per Section 15M050 and shown on drawings.

1.3 DOMESTIC WATER SYSTEMS:

- 1.3.1 Piping: Copper tubing type "L" rigid straight tube copper tubing only, with copper fittings, for fill and drain lines..
- 1.3.2 <u>Valves:</u> Gate, globe, shut-off, checks, cocks shall be as previously specified per Section 15M050 and related to those indicated on drawings.
- 1.4 HVAC EQUIPMENT DRAIN CONDENSATE PIPING SYSTEMS:

- 1.4.1. <u>Aboveground Interior and Exterior:</u> (Including all overhead piping in chases, walls, etc., including piping through fire-stopped penetrations and anywhere above ceilings systems.)
- 1.4.1.1 Pipe: Hard wrought copper piping, ASTM-B-88 or B-819 of sizes indicated, including appurtenant vent and drain lines. For any condensate drain piping in Mech. Rooms, or passing through fire stopped sleeves, pipe shall be of hard copper, sweated connections with all copper connections to pass completely through the fire-stopped sleeve and continued for a distance of a minimum of 12 inches long each side of sleeve. These systems shall not be provided with any PVC piping anywhere; exposed above any ceilings or duct shafts, vented shafts, ceilings or chases etc., as prohibitive by the SC-OSF Standards and per the building code as governed.
- 1.4.1.2 <u>Condensate Drain Traps:</u> Provide full-seal type condensate drain traps for any HVAC equipment creating cold condensate drainage; the drains as indicated on drawings.
- 1.4.1.3 <u>Fittings:</u> Fittings Copper soldered as previously specified herein for pipe used, and listed in Section 15M050 and indicated on drawings.
- 1.4.1.4 <u>Couplings (copper)</u>: As previously specified, and listed in Section 15M050, except where dissimilar metals join, isolated type dielectric couplings shall be used.
- 1.4.1.5 <u>Aboveground Exterior Drains:</u> All hard copper tubing, of sizes shown with fittings, etc., shall be as previously specified in Section 15M050, and shown on drawings. Any aboveground condensate drains shall be a minimum of 1 inch in size and shall be carried to the exterior with discharge of these lines to exterior above ground splash blocks as shown on the drawings. (See Drawings.)
- 1.5. CONDENSATE TRANSFER PUMPS (Field mounted):
- 1.5.1. Field installed HVAC Condensate Transfer Pumps for HVAC Condensate Drainage: Provide & install in the field overhead above ceiling mounted full-seal type condensate drain transfer pumps for collection of any overhead HVAC condensate drainage lines that cannot be gravity sloped and drained to the outside of the building as shown on the drawings. These condensate pumps shall collect into its reservoir tank any upstream sloped and/or pumped condensate drains as stated above. The Condensate Transfer Pumps shall be "Dayton" (or approved equal) of the Model no. 2HXZ7, 1/25 HP, 120/115volt/1ph/60Hz, Thermal overloads, 1.5 amps, 8.7 psi, 1 gallon receiver size, rated at 90 GPH at 5ft.TDH, w/integral check & shut-off valve; provide & install power wiring from an on-site 120/115volt/1ph/60Hz circuit provided and installed by the Div15M Controls. Provide these pump(s) and field locate as required for any HVAC equipment creating cold condensate drainage which requires pumping of condensate to the exterior; route HVAC condensate drains to the exterior and terminate as indicated on drawings.
- 1.5.2 <u>Field installed Interior Pumped and Gravity Type HVAC Condensate Piping</u>: See Section 15M704 for requirements of sizing all HVAC condensate piping drainage.

END OF SECTION 15M701

SECTION 15P099 - SEISMIC PROTECTION FOR PLUMBING SYSTEMS

1. RELATED DOCUMENTS:

The provisions of Division 1 and Sections 15P001, 15P050, and 15P099 shall govern and/or relate to this section.

1.1 GENERAL:

- 1.1.1 <u>All material and equipment</u> shall be new, unless otherwise shown or called for, and shall be furnished in accordance with the standard mentioned throughout this section. Seismic design shall be provided by the Vendor supplier and certified by a registered South Carolina Professional Engineer with all design submittals stamped with the Engineer's seal. All seismic design criteria shall be done in accordance with the IBC Code for category "C".
- 1.1.2 <u>Equipment, Pipe and Pipe Fittings.</u> The arrangement of equipment and general location and size of all and piping is clearly shown. Install all equipment, to clear level condition and piping accurately to grade and alignment. Should structural or other conditions require installation of or pipe mains or any of the piping differently from the manner shown, the Contractor shall consult with the Architect/Engineer and obtain written approval for all changes before proceeding with the work. All piping shall be installed to allow for expansion using offsets, expansion bends or expansion joints as may be required, to prevent undue strain on the piping.
- 1.1.3 <u>Seismic Requirements:</u> The requirements for seismic protection measures to be applied to plumbing piping systems specified herein are in addition to any other items called for in other sections of these specifications.
- 1.1.3.1 <u>Plumbing Piping/Equipment:</u> Plumbing Piping and/or equipment as applicable for the Scope of the plumbing work performed for the project shall include the following items to the extent required in other sections of these specifications:
 - a) Domestic Cold & Hot Water Piping
- 1.1.3.2 <u>Plumbing Systems:</u> Plumbing systems shall include the following items to the extent required in other sections of these specifications:
 - b) Domestic Water Distribution Systems, Sanitary Drainage Waste & Vent Piping, and Roof Drainage Piping Inside the Building
- 1.1.3.3 <u>Seismic Zone:</u> This facility project is located in old Seismic Zone 2, Greenville County, in accordance with the IBC Code for category "C".

2. BRACINGS & CONNECTIONS:

- 2.1 <u>Sway Brace:</u> Material used for members listed in Tables I and II, of this specification, except for pipes, shall be structural steel conforming with ASTM A 36. Steel pipes shall conform to ASTM A 501.
- 2.2 Flexible Couplings: Flexible couplings shall have same pressure ratings as adjoining pipe.
- 2.3 <u>Flexible ball joints</u> conforming to the following requirements may be employed on aboveground piping. Joints shall have cast or wrought steel casing and ball parts capable of 360-degree rotation plus not less than 15 degree angular movement. Joints shall be certified to be suitable for the service intended by the

manufacturer, based on not less than 2 years' satisfactory operation in a similar application.

- 2.3.1 <u>Flexible couplings and joints</u> of the mechanical joint type may be used for aboveground or underground piping.
- 2.3.1.1 <u>Mechanical couplings for steel or cast-iron pipe</u> shall be of the sleeve type and shall provide a tight flexible joint under all reasonable conditions, such as pipe movement caused by expansion, contraction, slight settling or shifting of the ground, minor variations in trench gradients, and traffic vibrations. Where permitted in other sections of these specifications, joints utilizing split-half couplings with grooved or shouldered pipe ends may be used.
- 2.3.1.2 <u>Sleeve-type couplings</u> shall be used for joining plain-end pipe sections. The coupling shall consist of one stee1 middle ring, two steel followers, two gaskets, and necessary steel bolts and nuts to compress the gaskets. Underground bolts shall be high-strength type as specified hereinbefore.

3.0 BRACING SUPPORTS:

3.1 <u>SWAY BRACES</u> shall be installed on piping not otherwise rigidly anchored to preclude damage during seismic activity. Bracing shall conform to approved arrangements. Provisions of this paragraph apply to all piping within a 5-foot line around outside of building unless buried in the ground.

Piping grouped for support on trapeze-type hangers shall be braced at the same intervals as determined by the smallest diameter pipe of the group.

Hanger rods shall be increased in cross-sectional area proportionate to the increased weight per linear foot of pipe and contents supported at each trapeze hanger. No trapeze-type hanger shall be secured with less than two 1/2 inch bolts. Bracing rigidly attached to pipe flanges, or similar, shall not be used where it would interfere with thermal expansion of piping.

- 3.2 Sway Braces for Piping:
- 3.2.1 <u>Transverse Sway Bracing:</u> Transverse sway bracing shall be provided at intervals not to exceed those given in Table I except for cast-iron soil pipe, which shall be braced at not more than 10-foot intervals.
- 3.2.2 Longitudinal Sway Bracing: Longitudinal sway bracing shall be provided at 40-foot intervals.
- 3.2.3 <u>Vertical Runs:</u> Vertical runs of piping shall be braced at not more than 10-foot vertical intervals. For smaller tubing, bracing shall be provided at no more than 4-foot spacing.
- 3.2.4 Anchor Rods, Angles, and Bars: Anchor rods, angles, and bars shall be bolted to either pipe clamps or pipe flanges at one end and cast-in-place concrete or masonry insert or clip angles bolted to the steel structure on the other end. Rods shall be solid metal or pipe as specified hereinafter. Anchor rods, angles, and bars shall not exceed lengths given in Table III.
- 3.2.5 <u>Clamps:</u> Clamps on uninsulated pipes shall be applied directly to pipe. Insulated piping shall have clamps applied over insulation vapor barrier with high-density inserts and metal protection shields under each clamp.
- 3.2.6 <u>Bolts</u>: Bolts used for attachment of anchors to pipe and structure shall be not less than 1/2 inch diameter.

4.0 <u>SPREADERS</u> shall be provided between racked or adjacent piping runs to prevent contact during seismic activity whenever pipe or insulated pipe surfaces are less than 4 inches apart or four times the maximum displacement due to seismic force. Spreaders to be applied at same interval as sway braces. Spreaders shall be applied to surface of bare or insulated hot pipe and over insulation utilizing high-density inserts and pipe protection shields where vapor-barrier type insulation is employed.

TABLE I

MAXIMUM SPAN FOR TRANSVERSE SWAY BRACES

	100000000000000000000000000000000000000						
Pipe Diameter (in.)	Std. Wgt. Steel Pipe - 40S			Ex. Strong Steel Pipe - 80S		Copper Tube Type L	
	*L(ft)	**F(lbs)		*L(ft)	**F(lbs)	*L(ft)	**F(lbs)
1	22	70		22	80	 11	17
1-1/2	25	140		26	180	12	35
2	29	220	92	30	290	14	70
2-1/2	32	380		33	460	15	110
3	34	550		35	710	17	150
3-1/2	36	730		38	930	18	220
4	39	960		40	1,200	19	300
5	41	1,440		44	1,900	20	470
6	45	2,120		46	2,750	22	730
8	49	3,740		54	5,150	26	1,550
10	54	6,080		59	7,670	28	2,630
12	58	8,560		61	10,350	31	3,950

^{*}L = Maximum span between lateral supports multiplied by 1.25 for Zone 2.

NOTE: Bracing shall consist of at least one vertical angle $2 \times 2 \times 16$ gage and one diagonal angle of the same size.

^{**}F = Horizontal force on the brace multiplied by 0.5 for Zone 2.

TABLE II

MAXIMUM LENGTH FOR ANCHOR BRACES

- Туре	Size	Maximum Length*	Allowable Loads* (kips)
Angles	1-1/2" x 1-1/2" x 1/4"	4'-10"	5.7
	2" x 2" x 1/4"	6'-6"	7.8
	2-1/2" x 1-1/2" x 1/4"	8'-0"	9.8
	3" x 2-1/2" x 1/4"	8'-10"	10.8
	3" x 3" x 1/4"	9'-10"	11.9
Rods	3/4"	3'-1"	3.7
	7/8"	3'-8"	5.0
Flat Bars	1-1/2" x 1/4"	1'-2"	3.1
	2" x 1/4"	1'-2"	4.1
	2" x 3/8"	1'-9"	6.2
Pipes 1" (40S) 1-1/4"	1-1/2" 2"	7'-0" 9'-0" 10'-4" 13'-1"	4.1 5.5 6.6 8.9

^{*}Based on the slenderness ratio of 1/r = 200 and ASTM A 36 steel.

5.0 FLEXIBLE COUPLINGS OR JOINTS:

- 5.1 <u>Building Piping:</u> Flexible couplings or joints in building piping shall be provided at bottom of all pipe risers 3-inch size and larger. Cast-iron waste and vent piping need only comply with these provisions when calked joints are used. Flexible bell and spigot pipe joints using rubber gaskets or no-hub fittings may be used at each branch adjacent to tees and elbows for underground waste piping inside of building to comply with these requirements.
- 5.2 <u>Underground Piping:</u> All underground piping shall have flexible couplings installed adjacent to building as shown. Additional flexible couplings shall be provided as follows:
 - a. On each side of the joints of demarkation between soils having widely differing degrees of consolidation.
 - b. At all points that can be considered to act as anchors.
 - c. On every branch of a tee and each side of an elbow.
- 6.0 <u>ANCHOR BOLTS:</u> All rigidly mounted equipment will have a minimum of four anchor bolts securely fastened through bases. Anchor bolts must conform to ASTM A 307. Anchor bolts shall have an embedded straight length equal to at least 12 times the nominal diameter of the bolt and shall conform to the following

table of sizes for various equipment weights.

20,000

30,000

50,000

100,000

Maximum	Zones					
Equipment						
Weight (Pounds)	4	3	2	1		
500	1/2	1/2	1/2	1/2		
1,000	1/2	1/2	1/2	1/2		
5,000	1/2	1/2	1/2	1/2		
10,000	1/2	1/2	1/2	1/2		

1/2 1/2

5/8 5/8

7/8 3/4

1-1/8 1

Minimum Bolt Sizes (Inches)*

1/2

1/2

1/2

3/4

1/2

1/2

1/2

1/2

When height-to-width ratio of the equipment exceeds 8.9 overturning must be investigated. Expansion anchors shall not be used to resist seismic or vibratory loads unless test data are provided to verify the adequacy of the specific anchor and application. In no case shall the expansion anchor size be less than that required for bolts in the preceding table.

- 7.0 <u>RESILIENT VIBRATION ISOLATION DEVICES</u>: Selection of anchor bolts for vibration isolation devices and/or snubbers to equipment base and foundations shall follow the same procedure as in paragraph ANCHOR BOLTS except that an equipment weight equal to five times the actual equipment weight shall be used.
- 7.1 <u>Resilient and Spring-Type Vibration Devices</u>: Vibration isolation devices shall be selected so that the maximum movement of equipment from the static deflection point shall be 0.5 inch.
- 7.2 <u>Multidirectional Seismic Snubbers:</u> Multidirectional seismic snubbers employing elastomeric pads shall be installed on all floor- or slab-mounted equipment. These snubbers shall provide 0.25 inch free vertical and horizontal movement from the static deflection point. Snubber medium shall consist of multiple pads of cotton duct and neoprene or other suitable materials arranged around a flanged steel trunnion so both horizontal and vertical forces are resisted by the snubber medium.
- 8.0 <u>EQUIPMENT SWAY BRACING</u> shall be provided for all items supported from overhead floor or roof structures. Braces shall consist of angles, rods, bars, or pipes run at a 45-degree angle from the equipment frame to the building structure secured at both ends with not less than 1/2 inch bolts. Braces shall conform to Table II. Bracing shall be provided in two planes of directions, 90 degrees apart, for each item of equipment. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45 degrees, provided that supporting members are properly sized to support operating weight of equipment when inclined at a 45-degree angle.

9.0 BRACINGS, SUPPORTS AND DETAILS:

9.1 <u>Details:</u> Refer to the attached herein details of sketches for seismic bracings of piping, duct, and equipment, referenced by this specification.

^{*} Based on four bolts per item, a minimum embedment of 12 bolts diameters, a minimum bolt spacing of 16 bolt diameters and a minimum edge distance of 12 bolt diameters. Use equivalent total cross-sectional areas when more than four bolts per item are provided. Anchor bolts that exceed normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths.

END OF SECTION 15P099