AC Project Boone County IT Department

Bid Number: **47-19MAY06**

CONSTRUCTION BID REQUEST

Contract Documents,
Technical Specifications, and
General Specifications

BOONE COUNTY COMMISSION

Keith Schnarre, Presiding Commissioner
Karen M. Miller, District I Commissioner
Skip Elkin, District II Commissioner

PUBLIC WORKS

Ken Roberts, Manager Facility Maintenance
David Mink, P.E., Public Works Director

Boone County Purchasing
601 E. Walnut Street, Room 209
Columbia, Missouri 65201

Heather Turner, CPPB, Buyer
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INDEX - CONTRACT DOCUMENTS

***For the successful Bidder, Performance Bond and Labor and Material Payment Bond must be submitted on forms provided at the time of the contract award.**

NOTICE TO BIDDERS

Boone County, Missouri is accepting sealed bids for

AC Project Boone County IT Department

Scope of Project Construction: Installation of new AC unit to supply air to the Boone County IT department server room located at the Boone County Government Center. This unit will also be capable of running on emergency power supplied by the existing generator.

Sealed bids will be accepted until 10:30 am on May 19, 2006 at the Boone County Purchasing Office, 601 E. Walnut, Room 209, Columbia, Missouri, 65201. Bids received after the above specified time for acceptance will be returned to the sender unopened.

Bids will be publicly opened after 10:30 am on May 19, 2006 in the Boone County Johnson Building Conference room 213, 601 E. Walnut, Columbia, MO 65201.

The County reserves the right to select and award the bid item or items which best suit its needs, whether the price is the lowest or not; and also reserves the right to reject any and all bids or waive informalities or irregularities.

Not less than the prevailing hourly rate of wages, as found by the Department of Labor and Industrial Relations of Missouri, shall be paid to all workers performing work under this Contract. The Contractor's bond shall include such provisions as will guarantee the faithful performance of the prevailing hourly wage rate as provided by the Contract.

Boone County notifies all Bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, religion, creed, sex, age, ancestry, or national origin in consideration for an award. The Bidder will insure that Disadvantage Business Enterprises will have the opportunity to participate in the performance of this contract or any subcontracts.

Proposals must be on forms provided and all unit price bids, extensions, and totals provided thereon shall be completed fully.

Construction Bid Request and Plans may be obtained from Boone County Purchasing, 601 East Walnut, Room 209, Columbia, Missouri 65201, Telephone: (573) 886-4392. The current Prevailing Wage Statement can be viewed and downloaded from www.showmeboone.com/purchasing. Click on Current Prevailing Wage. If you can not view/download this bid, tabulation, and/or current prevailing wage, contact Boone County Purchasing, located at 601 E. Walnut, Room 209, Columbia, Missouri 65201, telephone (573) 886-4392, or fax (573) 886-4390 for copies.

BID RESPONSE

TO: COUNTY OF BOONE, MISSOURI

SUBJECT: **AC Project Boone County IT Department**

THE UNDERSIGNED BIDDER, having examined all specifications, and other proposed contract documents, and all addenda thereto; and being acquainted with and fully understanding (a) the extent and character of the work covered by this proposal; (b) the location, arrangement, and specified requirements of the proposed work; (c) local conditions relative to labor, transportation, hauling, and delivery facilities; and (d) all other factors and conditions affecting or which may be affected by the work.

HEREBY PROPOSES to furnish all required materials, supplies, equipment, tools, and plant; to perform all necessary labor and supervision; and to install, erect, equip, and complete all work stipulated in, required by, and in accordance with the proposed contract documents, specifications, and other documents referred to herein (as altered, amended, or modified by all addenda hereto) for and in consideration of the prices stated herein. All prices stated herein are firm and include Missouri Sales and Use Tax and all other taxes which might be lawfully assessed against or in connection with the work proposed herein.

SECTION I

THE UNDERSIGNED BIDDER UNDERSTANDS that the quantities given in the following itemized proposal are not guaranteed by the Owner, but are used for the purpose of comparing bids and awarding the Contract, and may or may not represent the actual quantities encountered on the job; and that the sum of the products of the quantities listed in the following itemized proposal, multiplied by the unit price bid shall all constitute the gross sum bid.

THE UNDERSIGNED BIDDER submits the following itemized proposal and hereby authorizes the Engineer to correct any multiplication of “Unit Price” by “Quantity” as shown under “Extended Total”.

SECTION II

Acknowledgment of receipt of any and all Addenda, if applicable, shall be included with the bid documents at the time of the submittal to Boone County for consideration.

SECTION III

The undersigned agrees and understands that the County has the right to reject any and all bids, to waive informalities or other requirements for its benefit, and to accept such proposal as it deems to its best interest.

SECTION IV

If this proposal is accepted, the undersigned hereby agrees that work will begin no later than the date specified in the Notice to Proceed and will be diligently prosecuted at such a rate and in such manner as is necessary for the completion of the work herein specified before the completion date.

Accompanying this proposal is a certified check, treasurer's check or cashier's check, or a bidder's bond payable to the Owner for five percent of AMOUNT OF BID. If this proposal is accepted and the undersigned fails to execute the Contract and furnish a contract bond as required, then the proposal guaranty shall be forfeited to the Owner.

Firm Name: _____

By: _____
(Signature)

_____
(Print or Type Name)

Title: _____

Address: _____

City, State, Zip: _____

Phone: _____

Fax: _____

Date: _____

STATEMENT OF BIDDER'S QUALIFICATIONS

Each bidder for the work included in the specifications and plans and the Contract Documents shall submit with their bid the data requested in the following schedule of information. This data must be included in and made a part of each bid document and be contained in the sealed envelope. Failure to comply with this instruction may be regarded as justification for rejecting the Contractor's proposal.

1. Name of Bidder: _____

2. Business Address: _____

_____

3. When Organized: _____

4. When Incorporated: _____

5. If not incorporated, state type of business and provide your federal tax identification number:

_____

6. Number of years engaged in contracting business under present firm name:

_____

7. If you have done business under a different name, please give name and location:

_____

8. Percent of work done by own staff: _____

9. Have you ever failed to complete any work awarded to your company? If so, where and why?: _____

10. Have you ever defaulted on a contract? _____

11. List of contracts completed within the last four years, including value of each: _____

_____

12. List of projects currently in progress: _____

_____

* Attach additional sheets as necessary *

INSTRUCTIONS TO BIDDERS

The purpose of the attached specifications is to give detailed information on the conditions under which the **AC Project Boone County IT Department** will be constructed, Scope of Contract, quality of material and equipment required, standards used in determining its acceptability, and similar data. Each Bidder shall carefully check all requirements herein set forth and shall offer material and construction which fully complies with these requirements.

All bids shall be submitted on the bid forms hereto attached. Copies of Addenda if any, shall be signed and attached to the proposal submitted and considered a part of the contract.
Bidders shall furnish all information requested herein by filling in the blanks in the submitted copy of these specifications.

Bidders shall visit the site of the work and become familiar with the condition under which the work is to be performed, concerning the site of the work, the nature of the equipment, the obstacles which may be encountered, the work to be performed, and if awarded the Contract, shall not be allowed any extra compensation by reason of any matter or thing concerning which such Bidder might have fully informed himself, because of their failure to have so informed themselves prior to the bidding. The successful Contractor must employ, so far as possible, such methods and means in the carrying out their work as will not cause any interruption or interference with any other contractors.

Bidders shall not include sales or use taxes in their bid for materials incorporated or used in the work or for rentals subject to sales tax.

The Contractor assumes responsibility for all loss or damage caused by fire, windstorm, cyclone, tornado, flood, or freezing to the materials and equipment with which the work of the contract is to be done. The Contractor has the privilege of insuring in full or in part against such loss or damage, responsibility for which is here assumed. The County will not carry insurance against such loss or damage until the acceptance of Project.

Bidders shall visit the site of the work and completely inform themselves relative to construction hazards and procedure, the availability of lands, the character and quantity of surface and subsurface materials, and utilities to be encountered, the arrangement and condition of existing structures and facilities, the procedure necessary for maintenance of uninterrupted operation of existing facilities, the character of construction equipment and facilities needed for performance of the work, and facilities for transportation, handling, and storage of materials and equipment. All such factors shall be properly investigated and considered in the preparation of the bid.

Bids of an incomplete nature, or subject to multiple interpretation may at the option of the County, be rejected as irregular.

Bids will be evaluated by the County based on, but not limited to, the following criteria: cost, bidder's qualifications and experience, and time required for completion.

Upon award of the Contract, the successful Contractor shall furnish a Performance Bond and a Labor and Material Payment Bond, each in an amount equal to the full Contract price, guaranteeing faithful compliance with all requirements of the Contract Documents and complete fulfillment of the Contract, and payment of all labor, material, and other bills made in carrying out this Contract.

When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within fifteen days thereafter Contractor shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner with the required Bonds. Within ten days thereafter Owner shall deliver one fully signed counterpart to Contractor.

If any person submitting a bid for this Contract is in doubt as to the true meaning of any part of the plans, specifications, or any other proposed Contract documents, they may submit to the County a written request for an interpretation thereof seven working days prior to the submittal of bid. The person submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by addendum duly issued or delivered to each person receiving a set of such documents. The County will not be responsible for any other explanation or interpretation of the proposed documents.

Each set of bids shall be plainly headed with the name of the Bidder and post office address. In case the bid is made by a firm or corporation, the same shall be signed by a legally authorized agent of the firm or corporation. The envelope containing the bids shall be sealed and plainly marked as a bid for this particular Contract.

The Contractor should be sure to complete the following forms and attach the bid security. Omissions or irregularities may cause bid rejection.

1. Bid Response,
2. Statement of Bidder's Qualifications,
3. Bidding Forms,
4. Anti-Collusion Statement,
5. Signature and Identity of Bidder,
6. Bidder's Acknowledgment,
7. *Performance Bond, and
8. *Labor and Material Payment Bond.

*FOR THE SUCCESSFUL BIDDER, PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND MUST BE SUBMITTED ON FORMS PROVIDED AT THE TIME OF CONTRACT AWARD.

BID FORM

AC Project Boone County IT Department.

All items shown on the project plan sheets and not included in the bid items shall be deemed incidental to the project and included in the unit prices given. In case of error in the extension, the unit price times the estimated quantity will govern.

Bidder agrees to perform all the work described in the specifications and shown on the plans, for the following prices:

AC Project Boone County IT Department	
Description	**Price**
Install 5 ton unit to serve Boone County IT server room	$
Install emergency power to serve 5 ton unit in IT	$
Install alarm points to existing building automation system. **	$
Total install completed price	**$**
After Notice to Proceed is issued, contractor will begin work on this project within_____ days.	_____ **days**
Project will be completed within _____ business days after first day of work commencement.	_____ **days**

**

- **The successful contractor shall provide the following alarm points to be connected to the Building Automation System.**

1. **Server room space temperature.**
2. **Server room space humidity.**
3. **Hi water alarm on safety pan.**
4. **Unit's run state.**
5. **Units discharge temperature**

- **The building automation system is proprietary and will require working with our authorized service company. That company is C and C Sales-Invensys. Located in Jefferson City, MO 65101. Phone (573) 632-4247**

BIDDER has examined copies of all the Bidding Documents and of the following Addenda (receipt of all which is hereby acknowledged):

DATE	ADDENDUM NUMBER

COMPANY NAME: _____

ADDRESS: _____

CITY, STATE, ZIP _____

PHONE NUMBER: _____

AUTHORIZED REPRESENTATIVE: _____

TITLE: _____

SIGNATURE: _____

ANTI-COLLUSION STATEMENT

STATE OF MISSOURI

COUNTY OF _____

_____, being first duly sworn, deposes and

says that he is _____
(Title of Person Signing)

of _____
(Name of Bidder)

that all statements made and facts set out in the proposal for the above project are true and correct; and the bidder (person, firm, association, or corporation making said bid) has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with said bid or any contract which may result from its acceptance.

Affiant further certifies that bidder is not financially interested in, or financially affiliated with, any other bidder for the above project

By _____

By _____

By _____

Sworn to before me this _____ day of _____ , 20 _____

_____
Notary Public

My Commission Expires _____

SIGNATURE AND IDENTITY OF BIDDER

The undersigned states that the correct LEGAL NAME and ADDRESS of (1) the individual Bidder, (2) each partner or joint venture (whether individuals or corporations, and whether doing business under fictitious name), or (3) the corporation (with the state in which it is incorporated) are shown below; that (if not signing with the intention of binding himself to become the responsible and sole Contractor) he is the agent of, and duly authorized in writing to sign for the Bidder or Bidders; and that he is signing and executing this (as indicated in the proper spaces below) as the proposal of a:

( ) sole individual ( ) partnership ( ) joint venture
( ) corporation, incorporated under laws of the state of _____

Dated , 20

Name of individual, all partners, or joint ventures:	Address of each:
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

doing business under the name of:	Address of principal place of business in Missouri:
_____	_____

(If using a fictitious name, show this name above in addition to legal names.)

_____ _____
(If a corporation - show its name above)

ATTEST:

_____ _____
(Secretary) (Title)

NOTE: If the Bidder is doing business under a FICTITIOUS NAME, the Proposal shall be executed in the legal name of the individual, partners, joint ventures, or corporation, with the legal address shown, and the REGISTRATION OF FICTITIOUS NAME filed with the Secretary of State, as required by Section 417.200 to 417.230, RS Mo. shall be attached. If the Bidder is a CORPORATION NOT ORGANIZED UNDER THE LAWS OF MISSOURI, it shall procure a CERTIFICATE OF AUTHORITY TO DO BUSINESS IN MISSOURI, as required by Section 351.570 and following, RS Mo. A CERTIFIED COPY of such Registration of Fictitious Name or Certificate of Authority to do Business in Missouri shall be filed with the Engineer.

BIDDER'S ACKNOWLEDGMENT

(Complete and fill out all parts applicable, and strike out all parts not applicable.)

State of _____

County of _____

On this _____ day of _____ , 20 _____

before me appeared _____ to me personally known, who, being by me first duly sworn, did say that he executed the foregoing Proposal with full knowledge and understanding of all its terms and provisions and of the plans and specifications; that the correct legal name and address of the Bidder (including those of all partners of joint ventures if fully and correctly set out above; that all statements made therein by or for the Bidder are true; and

(If a sole individual) acknowledged that he executed the same as his free act and deed.

(If a partnership or joint venture) acknowledged that his executed same, with written authority from, and as the free act and deed of, all said partners or joint ventures.

(if a corporation) that he is the _____
President or other agent

of _____ ; that the above Proposal was signed and sealed In behalf of said corporation by authority of its board of directors; and he acknowledged said proposal to be the free act and deed of said corporation.

Witness my hand and seal at _____, _____ The day and year first above written.

(SEAL) _____ Notary Public

My Commission expires _____, 20 ____.

INSURANCE REQUIREMENTS

CONTRACTOR'S INSURANCE: The Contractor shall not commence work under this Contract until they have obtained all insurance required under this paragraph and such insurance has been approved by the County. All policies shall be in amounts, form, and companies satisfactory to the County which must carry an A-6 or better rating as listed in the A.M. Best or Equivalent Rating Guide.

COMPENSATION INSURANCE: The Contractor shall take out and maintain during the life of this Contract, Employee's Liability and Worker's Compensation Insurance for all of their employees employed at the site of the work. In case any class of employees engaged in hazardous work under this Contract at the site of the work is not protected under the Worker's Compensation Statute, the Contractor shall provide Employee's Liability Insurance for the protections of their employees not otherwise protected.

COMPREHENSIVE GENERAL LIABILITY INSURANCE: The Contractor shall take out and maintain during the life of this Contract such comprehensive general liability insurance as shall protect them from claims for damages for personal injury including accidental death, as well as from claims for property damages, which may arise from operations under this Contract, whether such operations be by themselves or by anyone directly or indirectly employed by them. The amounts of insurance shall be not less than $2,000,000.00 combined single limit for any one occurrence covering both bodily injury and property damage, including accidental death.

OWNER'S CONTINGENT OR PROTECTIVE LIABILITY AND PROPERTY DAMAGE: The Contractor shall provide the County with proof of Owner's Protective Liability and Property Damage Insurance, which shall protect the County against any and all claims which might arise as a result of the operations of the Contractor in fulfilling the terms of this contract during the life of the Contract. It is preferred that this policy include a provision for alleged assault and battery. The minimum amounts of such insurance will be $2,000,000.00 per occurrence, combined single limits. Should any work be subcontracted, these limits will also apply.

PROOF OF CARRIAGE OF INSURANCE: The Contractor shall furnish the County with Certificate(s) of Insurance which name the County as additional insured in an amount as required in this Contract and requiring a 30-day mandatory cancellation notice. In addition, such insurance shall be on an occurrence basis and shall remain in effect until such time as the County has made final acceptance of the project.

INDEMNITY AGREEMENT: To the fullest extent permitted by law, Contractor shall indemnify, hold harmless and defend the County of Boone, its directors, officers, agents, and employees from and against all claims arising by reason of any act or failure to act, negligent or otherwise, of Contractor, (meaning anyone, including but not limited to consultants having a contract with Contractor or subcontractor for part of the services), of anyone directly or indirectly employed by contractor, or of anyone for whose acts the Contractor may be liable, in connection with providing these services. This provision does not, however, require Contractor to indemnify, hold harmless or defend the County of Boone from its own negligence.

CONTRACT CONDITIONS

GENERAL: The following provisions are agreed to by and between the Contractor and the County:

DEFINITIONS: "Party of the First Part" or "County" or "Owner" shall mean the County of Boone, Missouri, acting through its authorized County Officials, or appointed representatives.

"Contractor" or "Party of the Second Part" shall mean the party having entered into contract to perform the work herein specified.

"Department" shall mean the Boone County Facility Maintenance Department.

"Director" shall mean the Director of Boone County Public Works or his/her designated representative.

"Engineer" shall mean the Director or the authorized representative of the Department for whom the work is to be performed.

"Work" of the Contractor includes labor or material, or both.

"As directed", "as required", "as permitted", "acceptable to" and words of like import shall mean that the direction, requirement or permission of the Engineer is intended.

"Or equal" is not intended to impose limitations preventing the free exercise of the Contractor's skill or to exclude products which are satisfactory. Materials and workmanship shall be of the best of their respective kinds. Trade or manufacture's names where used in these specifications are intended to fix the standards of workmanship and materials. Any article or material equaling the standards fixed may be used in place of that mentioned by the specifications provided that the material or article proposed is submitted to and approved by the Engineer. No substitution shall be made unless this definite approval has been obtained in advance.

PAYMENTS: The successful Contractor will be allowed payment in accordance with the following schedule:
No later than 30 days after receipt of invoice from the Contractor, the County will make partial payment to the Contractor on the basis of a duly certified approved estimate of the cost of materials delivered to the site and work performed at the site during the preceding calendar month by the Contractor, but the County will retain 10 percent of the amount of each such estimate. No later than 45 days after final tests and acceptance final payment shall be due.

The Contractor shall, by affidavit, submit to the Engineer a sworn certification to the County that all bills and claims properly due and chargeable against the work have been satisfied and that the laws relating to the payment of prevailing wage rates have been complied with and shall release the County of Boone from all further claims, which certificate must bear the written endorsement of the Surety on the bond. The acceptance by the Contractor of the final payment shall constitute a release and waiver of any and all rights and privileges under the terms of the Contract; further, the acceptance by the Contractor of final payment shall relieve the County from any and all claims or liabilities on part of the County relating to or connected with the Contract.

The cost of all licenses and permits and other expenses and costs incidental to the fulfillment of this Contract will be paid by the Contractor, and the total amount of such costs will be included in the total cost of the work.

Assignments: No money due at the time or which may become due, and no claim of any character because of any performance or breach of the Contract shall be assigned or transferred to any other person so as to bind or affect the County without the written consent of the Surety and the County.

The Contractor shall pay for all materials, supplies, services, and equipment as follows:

1. For all transportation and utility service not later than the 20th day of the calendar month following that in which the services are rendered, and
2. For all materials, tools, and other expendable equipment to the extent of 90 percent of the cost thereof, not later than the 20th day of the calendar month following that in which such materials, tools, and equipment are delivered at the site of the project, and the balance of the cost thereof not later than the 30th day following the completion of that part of the work in or on which such materials, tools, and equipment are incorporated or used.

EXTRA AND/OR ADDITIONAL WORK AND CHANGES: If any extra and/or additional work is to be done or any change in the plans and specifications is deemed necessary, the County may issue to the Contractor a written change order directing that such extra and/or additional work be done or that such change be made, and the Contract shall be modified accordingly. Compensation to the Contractor will be calculated as an addition to or deduction from the Contract price, based upon such written terms as may be established by the owner, either (a) by an acceptable lump sum proposal of the Contractor, (b) on a cost-plus limited basis not to exceed a specified limit, or (c) on basis of bid or mutually agreed upon unit prices. In the event that none of the foregoing methods are agreed upon with the Contractor, the County may perform the work with its own forces or under separate contract with another contractor.

COUNTY'S RIGHT TO WITHHOLD CERTAIN AMOUNTS AND MAKE APPLICATION THEREOF: The County shall have the right to withhold from payments due to the Contractor, in addition to the retained percentages herein elsewhere provided for, such amount or amounts as may be necessary to pay just claims against the Contractor for labor and services rendered and materials furnished in or about the work covered by this Contract. The County is by this Contract appointed the agent of the Contractor to apply such retained amounts to the payment of any of the foregoing.

PATENTS: The Contractor shall protect the County against suits for patent infringement on material, equipment, and methods used.

DISCHARGE OF EMPLOYEES: Any employee of the Contractor who is stationed at the site of the work and should prove to be quarrelsome, dishonest, incompetent or inexperienced, or should not work for the good of the job shall, upon written notice from the County, be removed by the Contractor and replaced by an employee with proper qualifications.

ASSIGNMENT OF CONTRACT: No assignment by the Contractor of any principal construction contract or any part thereof or of the funds to be received there under by the Contractor, will be recognized unless such assignment has had the approval of the County and the Surety has been given due notice of such assignment in writing. In addition to the usual recitals in assignment contracts, the following language must be set forth:
"It is agreed that the funds to be paid to the assignee under this assignment are subject to a prior lien for services rendered or materials supplied for the performance of the work called for in said Contract in favor of all persons, firms, or corporations rendering such services or supplying such materials."

ACCIDENT PREVENTION: Precaution shall be exercised at all times for the protection of persons (including employees) and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery, equipment, and all hazards shall be guarded or eliminated in accordance with the safety provisions of the Manual of Accident Prevention in Construction, 8th Edition, 1999, published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable laws. Current standards of the Occupational Safety and Health Act shall be applied.

LEGAL REQUIREMENTS: The Contractor shall do all work in such manner as to comply with all County ordinances, and laws of the County, State, and Nation as apply to the work herein outlined. The Contractor shall also obtain all necessary licenses and permits and keep necessary records as required.

EQUAL OPPORTUNITY: The County of Boone is an equal opportunity affirmative action employer, pursuant to federal and state law, and all respondents submitting bids shall be considered to be EEO/AA employers in compliance with federal and state laws, unless otherwise stipulated by the bidders herein.

DOMESTIC PURCHASING POLICY: Contractors are encouraged to select and use materials manufactured, assembled, or produced in the United States in the performance of this contract whenever the quality and price are comparable with other goods.

By submission of this bid, the vendor certifies that they are in compliance with section 34.353 and, if applicable, section 34.359 (“Missouri Domestic Products Procurement Act”) of the Revised Statutes of Missouri, 1987.

SALES/USE TAX EXEMPTION

SALES TAX EXEMPTION PROCEDURE: County will provide the Contractor with a completed Missouri Project Exemption and Missouri Tax Exemption letter for Boone County, Missouri and the Contractor shall be responsible for furnishing the exemption certificate and tax exemption letter to all authorized sub-contractors and suppliers providing materials incorporated in the work. All invoices issued for purchases for such materials, supplies, and taxable rentals shall be in the name of Boone County and contain the project number assigned by Boone County for the contract awarded. It shall be the responsibility of the Contractor to insure that no sales or use taxes are included in the invoices and that the County pays no sales/use taxes from which it is exempt. The Contractor shall be responsible for obtaining revised exemption certificates and revised expiration dates if the work extends beyond the estimated the project completion date or a certificate expiration date. The Contractor shall also be responsible for retaining a copy of the project exemption certificate for a period of five years and for compliance with all other terms and conditions of section 144.062 RSMo. not otherwise herein specified. The Contractor agrees not to use or permit others to use the project exemption certificate for taxable purchases of materials or rentals and supplies not directly incorporated into or used in the work to which it applies and agrees to indemnify and hold the County harmless from all losses, expenses and costs including litigation expenses and attorney fees resulting from the unauthorized use of such project exemption certificates.

WARRANTY AND GUARANTEE

Contractor warrants and guarantees to Owner and Engineer that all work will be in accordance with the Contract Documents and will not be defective. All materials provided by Contractor shall be new material of high quality which shall give long life and reliable operation. The workmanship shall be of high quality in every detail. Prompt notice of all defects shall be given to Contractor. All defective work, whether or not in place, may be rejected, corrected, or accepted as follows:

Correction or Removal of Defective Work

If required by Engineer, Contractor shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or if the Work has been rejected by Engineer, remove it from the site and replace it with non-defective Work. Contractor shall bear all direct, indirect, and consequential costs of such correction or removal (including but not limited to fees and charges of engineers, architects, attorneys, and other professionals made necessary thereby).

One Year Correction Period

If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, either correct such defective Work, or if it has been rejected by Owner, remove it from the site and replace it with non-defective Work. If Contractor does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work removed and replaced and all direct, indirect, and consequential costs of removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys, and other professionals) will be paid by the Contractor. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

SUBCONTRACTORS, SUPPLIERS AND OTHERS

Contractor shall not employ any Subcontractor, Supplier, or other person or organization (including those acceptable to Owner and Engineer as indicated below), whether initially or as a substitute, against whom Owner or Engineer may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other person or organization to furnish or perform any of the Work against whom the Contractor has a reasonable objection.

If the Owner requires identity of certain Subcontractor, Suppliers, or other persons or organizations (including those who are to furnish the principal items of material and equipment) to be submitted to Owner in advance of the specified date prior to the Effective Date of the Agreement for acceptance by Owner and Engineer and if Contractor has submitted a list thereof in accordance with the project Specifications, Owner's or Engineer's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the bidding documents or the Contract Documents) of any such Subcontractor, Supplier, or other person or organization so identified may be revoked on the basis of reasonable objection after due investigation, in which case Contractor shall submit an acceptable substitute, the Contract Price will be increased by the difference in the cost occasioned by such substitution and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by Owner or Engineer of any such Subcontractor, Supplier, or other person or organization shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

CONTRACT AGREEMENT

THIS AGREEMENT, made and entered into by and between the Boone County Commission of **Columbia, Missouri,** (hereinafter referred to as the Owner), and
_____ (hereinafter referred to as the Contractor).

WITNESSETH: That for and in consideration of the acceptance of Contractor's bid and the award of this contract to said Contractor by the Owner and in further consideration of the agreements of the parties herein contained, to be well and truly observed and faithfully kept by them, and each of them, it is agreed between the parties as follows, to wit:

The Contractor at his own expense hereby agrees to do or furnish all labor, materials, and equipment called for in the proposal designated and marked:

AC Project Boone County IT Department

and agrees to perform all the work required by the Contract as shown on the plans and specifications.

The following Contract documents and all addenda (if applicable), are made a part hereof as fully as if set out herein: Change orders issued subsequent to this Contract shall be subject to the terms and conditions of the agreement unless otherwise specified in writing.

1. Notice to Bidders,
2. Bid Response,
3. Statement of Bidder's Qualifications,
4. Instructions to Bidders,
5. Bid Form,
6. Anti-Collusion Statement,
7. Signature and Identity of Bidder,
8. Bidder's Acknowledgment,
9. Insurance Requirements,
10. Contract Conditions,
11. Contract Agreement,
12. Performance Bond,
13. Labor and Material Payment Bond,
14. General Specifications,
15. Technical Specifications,
16. Special Provisions,
17. Affidavit--Prevailing Wage,
18. State Prevailing Wage Rates,
19. Notice to Proceed,

The Contractor further agrees that he is fully informed regarding all of the conditions affecting the work to be done, and labor and materials to be furnished for the completion of this Contract, and that his information was secured by personal investigation and research and not from any estimates of the Owner; and that he will make no claim against the Owner by reason of estimates, tests, or representation of any officer, agent, or employees of the Owner.

The said Contractor agrees further to begin work not later than the authorized date in the Notice to Proceed, and to complete the work within the time specified in the proposal or such additional time as may be allowed by the Engineer under the Contract.

The work shall be done to complete satisfaction of the Owner, and in the case the Federal Government or any agency thereof is participating in the payment of the cost of construction of the work, the work shall also be subject to inspection and approval at all times by the proper agent or agents of such government agency.

The parties hereto agree that this Contract in all things shall be governed by the laws of the State of Missouri.

Contractor agrees it will pay not less than the prevailing hourly rate of wages to all workmen performing work under the Contract in accordance with the prevailing wage determination issued by the Division of Labor Standards of the Department of Labor and Industrial Relations for the State of Missouri and as maintained on file with the Boone County Purchasing Department. The Contractor further agrees that it shall forfeit as a penalty to the County of Boone the sum of $10.00 for each workman employed for each calendar day or portion thereof such workman is paid less than the stipulated rates set forth in the prevailing wage determination for the project for any work done under this contract by the Contractor pursuant to the provisions of Section 290.250 RSMo. The Contractor further agrees that he will abide by all provisions of the prevailing wage law as set forth in Chapter 290 RSMo. and rules and regulations issued there under and that any penalties assessed may be withheld from sums due to the Contractor by the Owner.

The Contractor agrees that he will comply with all federal and state laws and regulations and local ordinances and that he will comply and cause each of his subcontractors, and directives pertaining to nondiscrimination against any person on the grounds of race, color, religion, creed, sex, age, ancestry, or national origin in connection with this Contract, including procurement of materials and lease of equipment; therefore, in accordance with the special provisions on that subject attached hereto, incorporated in and made a part of the Contract.

The Contractor expressly warrants that he has employed no third person to solicit or obtain this Contract in his behalf, or to cause or procure the same to be obtained upon compensation in any way contingent, in whole or in part, upon such procurement. Also, that he has not paid, or promised or agreed to pay to any third person, in consideration of such procurement, or in compensation for services in connection therewith, any brokerage, commission or percentage upon the amount receivable by he hereunder; and that he has not, in estimating the Contract price demand by he, included any sum by reason of any such brokerage, commission, or percentage; and that all moneys payable to he hereunder are free from obligation of any other person for services rendered, or supposed to have been rendered, in the procurement of this Contract. Contractor further agrees that any breach of this warranty shall constitute adequate cause for the annulment of this Contract by the Owner, and that the Owner may retain to its own use from any sums due to or to become due hereunder an amount equal to any brokerage, commission, or percentage so paid, or agreed to be paid.

The Owner agrees to pay the Contractor in the amount of

$_____
as full compensation for the performance of work embraced in this Contract, subject to adjustment as provided for changes in quantities and approved change orders.

DATE OF AGREEMENT:

IN WITNESS WHEREOF, the parties hereto have signed and entered this agreement on _____ at Columbia, Missouri.

(Date)

ATTEST:

OWNER:
BOONE COUNTY, MISSOURI

By: _____
Keith Schnarre, Presiding Commissioner

_____
Wendy Noren, County Clerk

CONTRACTOR:

_____

By: _____
Authorized Representative (Signature)

ATTEST:

By: _____
Authorized Representative (Print or Type Name)

Title: _____

_____
Secretary

Approved:

_____
David Mink, P.E., Public Works Director

Approved as to Legal Form:

_____
John L. Patton, County Counselor

Certification
I certify that this contract is within the purpose of the appropriation to which it is to be charged and there is an encumbered balance to the credit of such appropriation sufficient to pay therefore.

_____
Auditor

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENT, that we,

_____

_____

as Principal, hereinafter called Contractor, and _____

_____

a Corporation, organized under the laws of the State of _____

and authorized to transact business in the State of Missouri, as Surety, hereinafter called Surety, are held and firmly bound unto the County of Boone, Missouri, as Obligee, hereinafter called Owner, in the amount of _____ Dollars, for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents:

WHEREAS, Contractor has, by written agreement dated _____ entered into a Contract with Owner for:

AC Project Boone County IT Department

in accordance with plans and specifications prepared by the County of Boone Public Works Department, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, and shall faithfully perform the prevailing hourly wages and comply with all prevailing wage requirements as provided by such Contract and applicable prevailing wage laws, rules, and rates specified by regulation there under, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be, in default under the Contract, the Owner having performed Owner's obligations there under, the Surety may promptly remedy the default, or shall promptly:

1) Complete the Contract in accordance with its terms and conditions, or

2) Obtain a bid for submission to Owner for completing the Contract in accordance with its terms and conditions, and upon determination by Owner and Surety of the lowest responsible bidder, arrange for a Contract between such bidder and Owner, and make available as work progresses (even though there should be a default of a succession of defaults under the Contract or Contracts of completion arranged under this paragraph) sufficient fund to pay the cost of completion less the balance of the Contract price, but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Contract price", as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of two years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators, or successors of Owner.

IN TESTIMONY WHEREOF, the Contractor has hereunto set his hand and the Surety has caused these presents to be executed in its name, and its corporate seal to be affixed by its Attorney-In-Fact at _____ on this _____ day of _____ ,20 ____.

_____
(Contractor)

(SEAL)

BY: _____

_____
(Surety Company)

(SEAL)

BY: _____
(Attorney-in-Fact)

BY:
(Missouri Representative)

(Accompany this bond with Attorney-in-Fact's authority from the Surety Company certified to include the date of this bond).

LABOR AND MATERIAL PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENT, that we,

_____

_____

as Principal, hereinafter called Contractor, and _____

_____

a Corporation, organized under the laws of the State of _____

and authorized to transact business in the State of Missouri, as Surety, hereinafter called Surety, are held and firmly bound unto the County of Boone, Missouri, as Obligee, hereinafter called Owner, in the amount of _____ Dollars, ($_____), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents:

WHEREAS, Contractor has, by written agreement dated _____ entered into a Contract with Owner for:

AC Project Boone County IT Department

in accordance with drawing and specifications prepared by the County of Boone which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that the Contractor shall promptly make payments to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise, it shall remain in full force and effect, subject, however, to the following conditions.

A. A claimant is defined as one having a direct contract with the Contractor or with a subcontractor of the Contractor for labor, material, or both, used or reasonably required for use in the performance of the Contract; labor and material being construed to include the part of water, gas, power, light, heat, oil, gasoline, telephone service, rental, or equipment directly applicable to the Contract.

B. The above named Contractor and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of 90 days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The owner shall not be liable for the payment of any costs or expenses of any such suit.

C. No suit or action shall be commenced hereunder by any claimant:

1. Unless claimant, other than one having a direct Contact with the Contractor, shall have given written notice to any two of the following: The Contractor, the Owner, or the Surety above named, within 90 days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Contractor, Owner, or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

2. After the expiration of one year following the date on which Contractor ceased work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

3. Other than in a state court of competent jurisdiction in and for the County or other political subdivision of the state in which the project, or any part thereof, is situated or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.

D. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of Mechanic's Liens which may be filed on record against said improvement, whether or not claim for the amount of such lien be presented under or against this bond.

IN TESTIMONY WHEREOF, the Contractor has hereunto set their hand and the Surety caused these present to be executed in its name and its corporate seal to be affixed by its Attorney-in-Fact at

_____

_____ ,on this _____ day of _____ ,20 _____.

CONTRACTOR: _____ (Seal)

BY: _____

SURETY COMPANY _____

BY: _____
(Attorney-in-Fact)

BY: _____
(Missouri Representative)

(Accompany this bond with Attorney-In-Fact's authority from the Surety Company certified to include the date of this bond).

TECHNICAL SPECIFICATIONS

DIVISION15000

SECTION 15050
BASIC MECHANICAL MATERIALS & METHODS

PART I - GENERAL

1.01 SUMMARY

A. The entire set of bid documents including plans & specifications applies to this section.

1.02 DRAWINGS AND SPECIFICATIONS

A. All drawings and specifications on the project are complementary, each to all other sets, and they shall be used in combination for the execution of this work. Mechanical work shown on any of the contract drawings or any section of the contract specifications shall be considered as included in this work unless specifically excluded by inclusion in some other branch of the work. This shall include roughing-in for connections and equipment as called for or inferred. The Contractor shall check all drawings and specifications for the project and shall be responsible for the installation of all electrical work.

B. The contract drawings for mechanical work are in part schematic, intended to convey the scope of work and indicate the general layout, design and arrangement. The Contractor shall follow these drawings in the layout of his work and shall consult general construction drawings, electrical drawings and all other drawings for this project to determine all conditions affecting the mechanical work. The contract drawings are not to be scaled and the Contractor shall verify spaces in which the mechanical work is to be installed.

C. Where specific details and dimensions for mechanical work are not shown on the drawings, the Contractor shall take measurements and make layouts as required for the proper installation of the work and coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications that have not been clarified by addendum prior to bidding, it shall be assumed by the signing of the contract that the higher cost (if any difference in costs) is included in the contract price, and the Contractor shall perform the work in accordance with the drawings or with the specifications, as determined and approved by the Architect, and no additional costs shall be allowed by the contract price.

1.03 DEMOLITION

A. See drawings for mechanical demolition required.

1.04 WORK INCLUDED

A. This work shall include all plant, labor, material and equipment as required to furnish and install mechanical work including demolition as shown on drawings and as hereinafter specified. Work shall also include all labor, material and equipment not shown on drawings and not specified but necessary and reasonably incidental to comply with the intent of contract to provide first class and complete installations of mechanical work. Furnish and install all materials, equipment, devices, and accessories not specifically called for by item but that are necessary to provide the requirements in operation and function that is established by the design and by the equipment specified.

B. Work shall also include: (1) All hoists, scaffolds, staging, runways, and equipment required for the performance of the work; (2) All job measurements and shop layouts required for the proper installation of material and equipment included in the work; (3) All lights, guards, and signs as required by safety regulations applicable to the work; (4) The removal from the premises, as it accumulates, of all dirt and refuse resulting from the performance of the work; and (5) Modifications to existing structure, equipment and installations required in order to install new work; (6) Demolition Work, (7) Dust Control.

C. Work shall include providing labor and equipment for adjustments required on mechanical equipment for testing and balancing of mechanical systems as specified in Section Division 15 of this specification.

1.05 EXISTING CONDITIONS

A. Each bidder shall inspect the site as required for knowledge of existing conditions and failure to obtain such knowledge shall not relieve the successful bidder of the responsibility to meet existing conditions in performing the work under the contract.

B. Where new work cannot be installed without changes in existing work or where it is indicated on drawings to rework an existing installation, this contract shall include alterations to existing work as required to install new work. Additions to the contract cost will not be allowed because of this Contractor's failure to inspect existing conditions.

C. Where existing domestic or hydronic piping is broken by removal of existing devices, equipment, or fixtures, or by demolition work, cutting or removal of existing building construction, and where the existing piping is required by remaining fixtures, or equipment to stay in service, then the piping shall be completed as required by job conditions. All existing piping not required to be reused shall be removed, unless indicated other wise on drawings, and piping embedded in the building structure that remains shall be cut flush with the building surface and plugged. This work shall be performed at no addition to the contract price.

D. Existing conditions indicated on the drawings are taken from the best information available on previous contract drawings and from visual site inspection and are not to be construed as "As-Built" conditions, but are to indicate the intent of this work. It shall be the responsibility of the Contractor to verify all existing conditions and the intent of this work indicated.

1.06 CONDUCT AND SEQUENCE IN PERFORMING WORK

A. The Contractor shall be responsible for a scheduled sequence in performing the work so that it will not interfere with the Owner's operation in the existing building. Before any work is started, the Contractor shall consult with the Owner's Representatives and arrange a satisfactory schedule. Make temporary alterations as required to execute work so that all operations and services in the existing building are maintained with the minimum possible interruption. Temporary shut-downs shall be segregated and shall be of the shortest possible duration. All facilities shall be kept in continuous operation unless specific permission to the contrary is arranged by the Owner's Representative. Scheduling of work shall best suit the owner.

1.07 EXISTING MATERIAL AND EQUIPMENT

A. Existing material and equipment removed from existing construction and not shown or required to be reused shall become the property of the Owner, if he so elects. The Contractor shall present the equipment and materials removed to the Owner's Representative and he shall select the equipment and materials which he elects to retain. Equipment and materials selected shall be delivered to space on the site as designated by the Owner's Representative. Material and equipment not retained shall become the property of the Contractor and shall be promptly removed from the site and disposed of in a legal manner.

B. Any existing material or equipment which is to be reused or left in place and is damaged by performance of work under this contract shall be repaired satisfactorily or shall be replaced with new equipment and material at the expense of the Contractor.

1.08 DUST CONTROL

A. The computer equipment must stay “on” continuously, including during all demolition and all construction. Provide all materials, equipment, and labor as required to positively prevent any dust from entering (1) computer equipment or (2) HVAC air stream in computer room. Notify Owner’s Representative 48 hours in advance of any dust producing activity to (1) obtain Owner’s Representative’s advance approval of the dust containment method, and (2) allow observation of the actual procedure by Owner’s Representative. Owners Representative shall have authority to stop demolition and/ or construction for non-compliance with this specification.

1.09 MATERIAL AND MANUFACTURER

A. All material and equipment shall be new except as stated otherwise; shall be of the best quality and design; shall be free from defects and imperfections and shall have markings or a nameplate identifying the manufacturer and providing sufficient reference to establish quality, size and capacity. As possible, all material and equipment of the same type shall be of the same manufacturer. Equipment shall function and perform efficiently and quietly at the required capacity without producing objectionable noise within the occupied areas of the building; if not, the Contractor shall remedy the condition or replace the equipment at no additional cost to the contract.

1.10 SUBSTITUTIONS

A. Reference in the specifications to any article, device, product, material, fixture, equipment, form or type of construction by name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Any article, device, product, material, fixtures, equipment, form or type of construction other than those specified may be substituted for consideration, in accordance with the preliminary matters, general conditions, and supplemental conditions as applicable unless otherwise specified.

1.11 LABOR, WORKMANSHIP AND SUPERVISION

A. All labor for the installation of material and equipment furnished under the mechanical work shall be done by experienced mechanics of the proper trade and all workmanship shall be first class and in compliance with the specific requirements of drawings and specifications.

B. All material and equipment for the mechanical work shall be installed under competent supervisory service furnished by the Contractor. Where necessary, this shall include the services of special technicians and operation personnel.

1.12 SAFETY REGULATIONS

A. All work shall be performed in compliance with all applicable and governing safety regulations including the regulations of the Occupational and Safety Health Act. All safety lights, signs and guards required for performance of mechanical work shall be provided by the Contractor.

1.13 CODES, ORDINANCES, REGULATIONS AND U.L. APPROVAL

A. See General Conditions

B. Laws, codes, ordinances and regulations shall take precedent excepting only where the work called for by the drawings and specifications exceeds by quality and quantity.

C. Fixtures, appliances, equipment and materials which are subject to Underwriter's Laboratory tests shall bear such approval.

1.14 CONTRACTOR'S EQUIPMENT

A. All hoists, scaffolds, staging, runways, tools, machinery and equipment required for the performance of the mechanical work shall be furnished by the Contractor.

1.15 STORAGE AND PROTECTION

A. Material and equipment for the mechanical work shall be protected from dirt and damage and maintained in a clean condition during the performance of the work. This shall include adequate protection from the weather if storage is outside. All parts of material and equipment that have become rusted or damaged shall be replaced or restored to an acceptable condition as approved by the Owner's Representative. This shall include factory finishes damaged during construction.

1.16 CLEANING

A. See “DUST CONTROL” paragraph above. (1.08)

B. Dirt and refuse resulting from the performance of the work shall be removed from the premises as required to prevent accumulation and the Contractor shall cooperate in the maintenance of reasonably clean premises at all times.

C. Immediately prior to the final inspection, Contractor shall clean all material and equipment. Dirt, refuse and stains shall be removed from all surfaces and damaged finishes restored to original condition.

1.17 OPERATION AND MAINTENANCE INSTRUCTION

A. This Contractor shall furnish all services as required for adequate verbal and printed instructions the Owner's operating and maintenance personnel for operation and maintenance of all equipment and systems installed under this Division. Three complete copies of service manuals in hardback binders shall be furnished at the end of the project in accordance with the General Conditions of the specifications. The manuals shall include warranties, printed operating and maintenance instructions for systems and equipment specified under this Division, all approved shop drawings, all manufacturer's printed data, parts lists control diagrams, valve schedules, parts lists, list of equipment suppliers, list of Contractors & Subcontractors, balancing reports, test reports.

B. When the work is complete and at a time designated by the Owner's Representative, the Contractor shall furnish the services of a qualified instructor to instruct Owner's operating and maintenance personnel in the operation and maintenance of the systems and equipment furnished and installed under this Division.

C. The bound copies of the operating and maintenance manuals shall be used during the verbal instructions.

1.18 ADJUSTING, ALIGNING AND TESTING

A. All mechanical equipment furnished under this Division shall be adjusted and tested by this Contractor. Motors and other equipment furnished by others, to which electrical connections are made under this Division, shall be checked for short circuit and open circuits before energizing. Motors shall be checked for proper phasing and rotation. The thermal overload protection shall be checked in all motor starters, and any protector heaters found to be of improper size as required by the motor name plate full load amperage and voltage rating for protection of the motor shall be listed (include equipment designation, rating of heater, motor nameplate horsepower, full load amps and voltage) and 4 copies of list shall be submitted to the Owner's Representative.

1.19 CLEARANCES

A. Provide adequate clearance in accordance with all codes and regulations, 3 feet minimum, for the proper installation of this work. Cooperate with all other Contractors whose work is in the same space, and advise the General Contractor of mechanical requirements.

B. Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from drawings may be made in order to allow for better accessibility. The Contractor shall ascertain from his examination of the Architectural and Structural Drawing whether any special temporary or permanent openings in the building for the admission or installation of apparatus furnished under this Contract will be necessary and he shall notify the General Contractor accordingly. He shall pay all cost of making such openings in case of failure to give this notification in time for the General Contractor to arrange for same during construction.

C. Where valves, traps, fire dampers, control damper, controls, and other equipment are installed in concealed spaces, access panels shall be installed in ceilings or furring to provide for operation, service, inspection and maintenance.

D. Access panels in non-fire rated construction shall be Milcor, style K, M, DW, or AT as required for wall ceiling construction materials, equivalent Zurn or Wade, flush type steel units with frames. Construction shall be of not less than 16- gauge leveled stock, and fitted with pivot hinges and screw-driver coin type lock and finished with prime coat of paint.

Access panels in acoustical tile ceilings shall be style AT recessed type fitted with acoustical tile to match ceiling tile. Panels shall have a minimum size of 18" x 18" for handholes and 24" x 24" for manholes.

E. Access panels in fire rated construction shall be Underwriter's Laboratories rated and labeled assemblies (frame and door) for 1-1/2 hour, "B" label. Each panel assembly shall bear the U.L. Label. Each assembly shall have steel frame and anchors designed for the type construction steel door; continuous steel hinges with stainless steel pin; automatic closing mechanism on door; self-latching latch-bolt assembly with knob operator on outside and with latch-bolt release on inside; and shall be phosphate treated and have factory prime coat of baked white finish. Assemblies shall be installed in accordance with the instructions furnished by the manufacturer for the U.L. labeling.

F. Accessible ceilings with removable type ceiling tiles do not require access panels to be installed.

1.20 CUTTING AND PATCHING

A. The Contractor shall coordinate with the Owner's Representative before any cutting and obtain approval from the Owner's Representative prior to any cutting. All patching and finishing shall be by the Contractor.

B. Cutting shall be done with extreme care and in such a manner that the strength of the structure will not be endangered. Wherever possible, openings in concrete or masonry construction shall be by concrete saw or rotary core drill. Openings in any construction shall be cut the minimum size required for the installation of the work. Adequate protection shall be provided to prevent damage to adjacent areas and to prevent dust from spreading to adjacent areas.

C. Where openings or holes are cut in existing construction and the cutting breaks existing electrical circuitry or control circuitry conduit and wiring, then it shall be the responsibility of the Contractor to reroute the circuitry conduit and requiring and to complete the circuitry as required and as approved by the Architects. Temporary completion shall be provided where necessary before the permanent rerouting and completion work is finished.

D. Before any cutting, patching, or finishing work is started, dust and moisture protection shall first be installed as required in these specifications.

E. Openings cut in floor shall be cut by core drilling where possible. After work is installed through any opening in floor, the opening around the work shall be patched and sealed watertight with epoxy or silicone based, non-cracking elastomeric sealant.

F. Where existing work is removed from sleeves or openings through floor and the sleeve or opening is not to be reused, patch the hole or opening by filling with shrink epoxy cement grout, in strict accordance with the grout manufacturer's instructions and recommendations and as required to make completely watertight and fireproof. Finish the floor surface as directed by the Owner's Representative.

G. See “DUST CONTROL” paragraph above. (1.08)

1.21 SHOP DRAWINGS AND SAMPLES

A. Acceptance of the work shall be subject to the Architects approval of shop drawings, product data and samples, as specified in the "General Conditions" of these specifications.

B. Submittals shall include the manufacturer's model number, capacity, performance data, electrical characteristics, etc., all clearly shown and marked for the specific item of equipment to be furnished on this project. General catalog data that does not indicate the specifics for the item to be furnished for this project will not be accepted. Performance data shown or marked on the submittals shall be at the actual specified operating conditions for this project.

1.22 IDENTIFICATION, INSTALLATION AND USE OF MECHANICAL EQUIPMENT

A. All mechanical equipment shall be furnished with factory identification for the suitability of use and installation, either by a description marked on the equipment, permanently attached label, or printed description packed with the equipment. If a printed description is packaged with the equipment, this shall be bound in the Operation and Maintenance Manuals.

1.23 NOISE AND VIBRATION

A. Contractor shall be responsible for the installation of all equipment in such a manner as to control the transmission of noise and vibration for many installed equipment or system, so the sound level shall not exceed NC35, in any occupied space. Contractor shall be responsible for the correction of any objectionable noise in any occupied area due to improperly installed equipment.

1.24 EQUIPMENT IDENTIFICATION AND LABELS

A. All mechanical equipment, such as pumps, air-handling units, and other similar items shall be adequately identified with labels. Labels shall clearly designate name and use of equipment. Labels shall be laminated plastic with 1/4" white letters on a black background. Labels shall be attached with pop-rivets or permanent adhesive. "Dymo" type labels not acceptable.

1.25 WARRANTIES

A. Warranties shall be provided for all equipment in accordance with the requirements of the General Conditions, except that all warranties shall be non-prorated for one year.

B. Acceptance of the work under this Division shall be subject to the conditions that all installed systems, equipment, apparatus, and appliances included in the work shall operate and perform as designed, including code clearances, and as selected with respect to efficiency, capacity and quietness and shall operate and perform without producing objectionable noise within occupied areas of the building.

C. Acceptance of the work shall also be subject to the conditions that any time within one year after date of acceptance final payment, any defective part of the work resulting from the supply of faulty workmanship or material shall be immediately amended, required or replaced as a part of the contract work without cost to the contract.

PART II - PRODUCTS

2.01 NONE

PART III - EXECUTION

3.01 NONE

END OF SECTION

15080
MECHANICAL INSULATION

GENERAL

SUMMARY

The entire set of bid documents including plans & specifications applies to this section.

QUALITY ASSURANCE

Fire Performance Characteristics: Provide composite mechanical insulation (insulation, facings, jacketings, coverings, sealers, mastics, cements, and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, when tested according to ASTM E 84 (NFPA 255), UL 723, by UL or other testing or inspecting organization acceptable to the Owner. Label insulation with appropriate markings of testing laboratory.

PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide products from one of the following manufacturers:

Armstrong

Johns Manville

Owens-Corning

R-Control

Approved Equal

GENERAL

Insulation materials, except as otherwise specified, shall be for the specific type as herein specified. Insulation shall not be applied until all piping has been tested and approved and thoroughly cleaned. All insulation work shall present a neat appearance with smooth and uniform surfaces. Work done in a slovenly manner will not be acceptable. All insulation joints shall be carefully fitted and tightly butted. All jacket materials shall be neatly applied with smooth surfaces and shall be securely adhered or pasted in place. All seams and joints shall be located so that they are as inconspicuous as possible. Exposed edges and ends of all insulation shall be sealed and finished.

Systems shall be completely covered throughout, including valves, steam traps, fittings and accessories. Strainer covers and valve bonnets shall be accessible for maintenance. Unless specified otherwise, insulation shall extend continuous through sleeves. Where pipe covering terminates at floors, ceilings, wall and equipment, furnish and install covering protector cups fastened to covering. Cups shall be Zeston Polyvinyl chloride (PVC), or approved equal.

All adhesives, tape and any other material used for sealing shall be applied in strict accordance with manufacturer's instructions covering rate of application, method of application, temperature limits for application of said materials, or any other condition affecting efficiency or permanence of the installation.

Failure, due to faulty workmanship or material, of any portion of the installed insulation to perform the function as intended by these specifications, either stated or implied, for a period of one (1) a year after acceptance of the project by the Owner, shall be the responsibility of the Contractor and shall be rectified at no additional cost to the Owner. This shall include the loosening of any jacket material, the appearance of condensation on the outside for the insulation, or any other mechanical or thermal failure which effects either appearance or efficiency of the installation.

DUCT INSULATION

Shall be 1-½ " thick fiberglass duct wrap insulation with aluminum or vinyl vapor barrier jacket. All supply and return ductwork shall be insulated.

EXECUTION

INSTALLATION OF DUCTWORK INSULATION

Apply insulation continuously over system piping, fittings, and components including valves, unions, strainers, devices, and specialties, except as otherwise indicated. Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Use same material and thickness as adjacent pipe insulation. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

INSTALLATION OF DUCTWORK INSULATION

Items Not Insulated: Unless otherwise indicated do not apply insulation to:

Factory-insulated flexible ducts

Flexible connectors

Vibration control devices

Access panels and doors in air distribution systems.

END OF SECTION

15100
BUILDING SERVICES PIPING

GENERAL

SUMMARY

The entire set of bid documents including plans & specifications applies to this section.

QUALITY ASSURANCE

American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

WORK INCLUDED

The extent of work is shown on drawings, and includes but is not necessarily limited to the following:

Demolition See Section 15050

Cold Water Piping

Vent Piping

A/C Condensate Piping

PRODUCTS

PIPING MATERIALS

A/C condensate and vent piping may be Schedule 40 PVC solvent weld pipe and fittings.

All domestic cold water piping shall be Type L copper hard temper with wrought copper fittings. Unions in copper tube shall be cast bronze solder-end ground joint type, Nibco 733 or equal. Manufactured by Jenkins, Nibco-Scott, Hammond or equal. Solder shall be 95% tin/5% silver, no-lead 450 degrees F. Manufactured by J.W. Harris, Handy and Harman, Divco, Hercules or equal.

VALVES AND SPECIALTIES

Valves shall be installed within each system to provide the required flow control and to provide isolation for inspection, maintenance and repair of each piece of equipment and each main and branch service loop as shown and specified. Each valve shall be installed so as to be easily accessible for operation and visual inspection after construction is complete. A union connection shall be installed within two feet on each screw end valve. Valves shall be Crane, Conbraco, Nibco, Jenkins, Stockham, Powell, Walworth, Hammond, Centerline, Milwaukee, Norris, Fisher, Rockwell or approved equal.

Unless noted otherwise, shut-off valves shall be ball valves.

Ball valves, unless specified otherwise, shall be Conbraco Industries "Apollo" Series 70, or approved equal, all bronze for not less than 400 psi non-shock W.O.G. pressure with replaceable Teflon Seats, blow-out proof stem, 1-1/4" high extended stem to provide for insulating, lever type handle with vinyl grip and 90 degree stop on the extended stem.

Unions for use in ferrous pipe shall be malleable iron with brass to iron ground joint spherical seat and screwed ends. Union for use with copper piping shall be cast brass or cast bronze with ground joint spherical seat and with cast brass or bronze or wrought copper sweat ends. Unions shall be installed wherever necessary for replacement or repair of equipment, valves, strainers, etc. Right and left hand coupling are not acceptable. EPCO, or approved equal, dielectric isolating type union shall be installed wherever ferrous piping is connected to copper or copper alloy equipment or copper piping.

Wherever exposed pipes pass thru floor, walls, ceiling, and partitions, cover plates shall be installed around pipes and against finished wall, ceiling and floor surfaces. Plates shall be installed on un-insulated piping and around pipe insulation where pipe are insulated. Plates shall be chromium plated cast or stamped brass. Secure plates so that they will not pull away from construction when pipe expands and contracts.

EXECUTION

DEMOLITION

See drawings for demolition work. All removed materials shall be removed from site and disposed of legally.

INSTALLATION OF PIPING

All pipe, fittings, valves, etc., shall be cleaned of grease, dirt, scale and foreign materials before installation. All temporary pipe openings shall be kept closed during the performance of the work. The ends of the pipe shall be reamed smooth and all burrs removed before installation.

All pipe shall be cut accurately to measurements taken on job. Offset connections shall be installed for alignment of vertical to horizontal piping and where required to make a true connection and to provide for expansion. Bent or sprung pipe shall not be acceptable.

Expansion joints or expansion loops and offsets shall be installed where shown on plans and where necessary to provide for expansion of piping. Suitable pipe anchors shall be installed at expansion joints, loops and offsets. Piping connections shall have unions where necessary for replacement and repair of equipment. Shut-off valves, flow control valves and control valves shall be installed where shown and where necessary for proper operation and service. Vertical piping shall be plumb, horizontal piping shall be run as high as possible and all piping shall be run parallel to or at right angles with lines and surfaces of the building. Piping shall be supported as required to prevent transmission of noise and vibration. Vertical pipe shall be adequately supported to prevent lateral movement.

Final connections to all equipment and fixtures shall be made in a manner that will permit the complete removal of any fixtures or any piece of equipment without cutting pipe lines.

Piping in finished rooms shall be installed concealed behind wall furring or above suspended ceiling wherever possible. Work shall include all pipe, fittings, offsets, etc., as required for the installation of piping to meet all construction conditions and allow for the installation of other work including ducts and conduit. All changes in direction of pipe shall be made with fittings; bending of pipe will not be allowed. Reducing fittings shall be used where pipe changes size. The use of reducing bushings will not be allowed. All piping shall be installed with ample clearance for installation of covering. All piping shall be installed to center accurately in sleeves through floors, walls and partitions.

A/C condensate and cold water piping shall be insulated with ½" Armaflex or approved equal.

PIPE CLEANING

Thoroughly clean all piping prior to putting into operation.

TEST OF PIPING SYSTEMS

All piping systems shall be pressure tested for leaks as herein specified. Test pressure shall remain on each system for not less than 8 hours. If leaks develop, test shall be repeated after leaks are corrected. The Owner's representative shall be notified at least 48 hours prior to the scheduled test of piping system so that arrangements can be made for the Owner's representative to observe the test.

No part of the piping systems shall be covered or concealed until it has been tested, tests observed and system approved by the Owner's representative. All tests performed shall be confirmed in writing and signed by Architect or Owners Representative.

All equipment, materials, temporary installations, connections, by-passes, and instruments required for the testing shall be furnished and installed by the Contractor. After testing has been completed and the system has been approved by the Architect, the Contractor shall remove all temporary equipment, materials and connections.

END OF SECTION

15000

15530
COMPUTER ROOM AIR CONDITIONER

GENERAL

RELATED DOCUMENTS

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

Related Sections: The following Division 15 Sections contain requirements that relate to this Section:

“Basic Mechanical Requirements.”

“Basic Mechanical Materials and Methods.”

“Condensing Units” for condensing units used with cooling coils provided in furnaces.

SUMMARY

This Section includes furnaces and accessories complete with controls.

This Section includes furnaces and accessories with the following additional components:

Direct-expansion cooling coils.

SUBMITTALS

General: Submit each item in this Article according to the Conditions of the Contract and Division 15 Section “Basic Mechanical Requirements.”

Product Data: For each furnace. Include rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories. Include plan and elevation views of units, minimum clearances, and data on ratings and capacities.

Shop Drawings: Diagram power and control wiring and differentiate between manufacturer-installed and field-installed wiring.

Maintenance data for each furnace to include in the Operation and Maintenance Manual specified in Division 15 Section “Basic Mechanical Requirements.”

QUALITY ASSURANCE

Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

WARRANTY

General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

Disposable Air Filters: Furnish 2 complete sets.

PRODUCTS

MANUFACTURERS

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

Computer room air conditioner

Liebert

Approved equal

COMPUTER ROOM AIR CONDITIONER, GENERAL

Model Number: MMD60E-AHEH0 Qty: 1

Condensing Model Number: PFH067A-AL3 Qty: 1

ELECTRICAL SUPPLY REQUIREMENTS

Module: 460 Volts, 3 Phase, 60 Hertz, 19.9 Full Load Amps, 24.9 Wire Sizing Amps

Condensing Module: 460 Volt, 3 Phase, 60 Hertz, 11.4 Full Load Amps, 13.9 Wire Sizing Amps

NET CAPACITY DATA

72ºF DB, 60ºF WB, 50% RH

Total Capacity: 58,700 BTUH

Sensible Capacity: 51,800 BTUH

EVAPORATOR FAN

Fan Motor Horsepower: 2.0

Air Volume - High Speed: 2,500 CFM

External Static Pressure: 0.7 to 1.5 Inches of Water (standard 1.5 HP fan is capable of .9” ESP)

REHEAT SECTION

Electric Reheat: 39,110 BTUH (11.5 kW) Includes Fan Motor (one stage)

HUMIDIFIER SECTION

Steam Generator – Capacity: 8 lbs/hr (3.6 kg/hr)

2.8 kW

CONDENSING SECTION

Design Ambient: 95ºF (35ºC)

Outdoor Lee-Temp Propeller Condensing Unit

OPTIONAL EQUIPMENT

Sweat Adapter Kit

Filter Box with 4” 20% Filters

Disconnect Switch

Hot Gas Bypass

2.0 HP Fan Motor

6 Relays for connection to owner’s status panel

Finish of External Casings and Cabinets: Baked enamel over corrosion-resistant-treated surface.

Fan: Centrifugal, factory balanced, resilient mounted, direct drive.

Fan Motors: Multitapped, multispeed, with internal thermal protection and permanent lubrication.

GAS-FIRED FURNACES, CONDENSING

Comply with AGA Z21.47, "Gas-Fired Central Furnaces"; and NFPA 54, "National Fuel Gas Code."

AGA Approval: Bear label of American Gas Association.

Efficiency: 93 percent AFUE, minimum.

Heat Exchanger: Aluminized-steel welded construction with aluminum-finned, stainless-steel tube condensing coil.

Burner Controls: Solid state; control gas valve and ignition.

Gas Valve: 24 V, 100 percent safety gas shutoff; pressure regulator and manual shutoff.

Ignition: Electronic pilot ignition, with electric spark igniter.

Automatic Controls: Solid-state board delays fan start and fan shutdown.

ELECTRIC FURNACES

Comply with NFPA 70, "National Electric Code."

Heaters: Helix-wound, nickel-chromium wire heating elements in ceramic insulators mounted on steel supports.

Heater Control: Sequencer relay with relay for each element; switches elements on and off, with delay between each increment; and initiates, stops, or changes fan speed.

Summer Fan Switch: Connected to permit independent ON-OFF switching of unit fan.

CONTROLS

Furnace Controls: Include components required for satisfactory operation of furnaces and auxiliary equipment in all seasons.

EXECUTION

INSTALLATION

Install computer room air conditioner and accessories according to manufacturer's written instructions.

Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is plumb and level.

CONNECTIONS

Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

Install piping adjacent to machine to allow service and maintenance.

Refrigerant Tubing: Conform to applicable requirements of Division 15 Section "Refrigerant Piping." Connect refrigerant tubing to coils and condensing units.

Connect ducts according to Division 15 Sections "Metal Ductwork" and “Ductwork Accessories.”

Electrical: Refer to Section 15010 “Basic Mechanical Requirements” for electrical connections to mechanical equipment.

ADJUSTING AND CLEANING

Set controls, and other adjustments for optimum performance and efficiency.

CLEANING

After completing system installation, inspect associated components. Repair scratches and mars of finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

Install new filters within 14 days after substantial completion.

SYSTEM START-UP

Startup Services: Provide factory startup service, as specified below.

Start each system and operate controls.

Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

Test functions, operations, control sequences, and protective features. Adjust to ensure operation is as specified.

Correct deficiencies identified by tests and observations and retest until specified requirements are met.

END OF SECTION

15671
CONDENSING UNITS

GENERAL

RELATED DOCUMENTS

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

Related Sections: The following Division 15 Sections contain requirements that relate to this section:

“Basic Mechanical Requirements.”

“Basic Mechanical Materials and Methods.”

Refrigerant Piping" for valves and accessories for piping connections to units.

SUMMARY

This Section includes the following:

Air-cooled condensing units.

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 15 Section “Basic Mechanical Requirements.”

Product Data: Include rated capacities; shipping, installed, and operating weights; dimensions; required clearances; methods for assembling components; furnished specialties; accessories; and installation and startup instructions for each model indicated.

Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

Operation and Maintenance Data: Submit maintenance data and parts list for each condensing unit, control, and accessory; including “trouble shooting” maintenance guide; plus servicing, and preventative maintenance procedures and schedule. Include this data and product data in maintenance manual; in accordance with requirements of Division 15 Section “Basic Mechanical Requirements.”

QUALITY ASSURANCE

Listing and Labeling: Provide electrically operated equipment specified in this Section that is listed and labeled.

The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

Fabricate and label refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."

Fabricate and label water-cooled condensers according to ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

Comply with NFPA 70.

Comply with UL 303, "Refrigeration and Air-Conditioning Condensing and Compressor Units."

COORDINATION

Coordinate size and location of concrete housekeeping bases. Cast anchor-bolt inserts into pad. Concrete, reinforcement, and formwork requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

Coordinate installation of equipment supports, and roof penetrations.

WARRANTY

General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

Special Warranty: A written warranty, executed by Contractor and signed by manufacturer, agreeing to replace components that fail in materials and workmanship within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.

Warranty Period: Manufacturers standard, but not less than 5 years from date of Substantial Completion.

PRODUCTS

MANUFACTURERS

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

Condensing Units, Air Cooled

Liebert

Approved Equal

CONDENSING UNITS, AIR COOLED,

Description: Factory assembled and tested, air cooled; consisting of condenser coils, fans, motors, refrigerant reservoirs, and operating controls.

Condenser: Copper-tube, aluminum-fin coil, with liquid subcooler.

Condenser Fan: Direct-drive, aluminum propeller fan; with permanently lubricated fan motor with thermal-overload protection.

Casing: Steel, finished with baked enamel; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gage ports on exterior of casing.

EXECUTION

INSTALLATION

Install condensing units according to manufacturer's written instructions.

Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.

Install roof-mounted units on approved equipment supports. Anchor unit to supports with removable fasteners.

Install units on spring isolators specified in Division 15 Section "Mechanical Vibration Controls and Seismic Restraints."

CONNECTIONS

Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories.

Electrical: Refer to Section 15010 “Basic Mechanical Requirements” for electrical connections to mechanical equipment.

FIELD QUALITY CONTROL

Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks and replace lost refrigerant and oil.

Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Remove and replace malfunctioning units with new units and retest.

SYSTEM START-UP

Verify that units are installed and connected according to the Contract Documents.

Complete installation and startup checks according to manufacturer's written instructions and do the following:

Inspect for physical damage to unit casing.

Verify that access doors move freely and are weathertight.

Clean units and inspect for construction debris.

Check that all bolts and screws are tight.

Adjust vibration isolation and flexible connections.

Verify that controls are connected and operational.

Lubricate bearings on fans.

Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.

Adjust fan belts to proper alignment and tension.

Start unit according to manufacturer's written instructions.

Complete manufacturer's starting checklist.

Measure and record airflow over coils.

Check operation of condenser capacity control device.

Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

After startup and performance test, lubricate bearings and adjust belt tension.

DEMONSTRATION

Startup Services: Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

Review data in the Operating and Maintenance Manuals. Refer to Division 15 Section "Basic Mechanical Requirements."

Schedule training with Owner, through Architect, with at least 7 days' advance notice.

END OF SECTION

15800
AIR DISTRIBUTION

GENERAL

SUMMARY

The entire set of bid documents including plans and specifications applies to this section.

QUALITY ASSURANCE

The following publications of the issues below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto;

National Environmental Balancing Bureau (NEBB)Publications:

Procedural Standards for Testing-Balancing-Adjusting of Environmental Systems.

National Fire Protection Association (NFPA) Standards:

90A Air Conditioning and Ventilating Systems.

91 Blower and Exhaust Systems.

Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Publications:

HVAC Duct Construction Standard.

Manual for the Balancing and Adjustment of Air Distribution Systems.

Underwriters' Laboratories, Inc. (UL) Publications:

181. Factory-Made Duct Materials and Duct Connectors.

214. Flame Tests of Flame-Resistant Fabrics.

WORK INCLUDED

The extent of work is shown on drawings, and includes but is not necessarily limited to the following:

Ductwork

Dampers

Access Doors

PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide products from one of the following manufacturers:

Ruskin

Approved Equal

DUCTWORK AND FITTINGS

Fittings and ductwork shall be constructed of galvanized sheet metal in accordance with Federal Spec. QQ-S-775, Type I, Class D, ASTM A525. All edges, slips, etc. shall be worked to leave a smooth interior duct finish. Items not shown in detail or described herein shall be set forth in SMACNA publication "HVAC Duct Construction Standards". Ductwork shall be two inch pressure class construction. Ductwork material shall be a specified hereinafter and suitable for the service intended. All ductwork and fittings shall be constructed and installed in accordance with SMACNA.

Branch Take-offs shall be designed, constructed and installed as recommended in SMACNA publication "HVAC Duct Construction Standards". The rectangular branch take-offs shall be a 45 degree entry type as noted in Figure 2-8 of SMACNA "HVAC Duct Construction Standards" manual. The rectangular-to-round branch take-offs shall be a spin-in type as noted in Figure 2-8 of the SMACNA manual, and as herein specified.

Turning Vanes for Square Elbows: Square elbows shall have turning vanes assembled with Elgen Mfg.Company's Duro-Dyne, equivalent Aero-Dyne, or approved equal, vane runner. Blades shall be tightly locked to vane runner and securely installed in ductwork for a rattleproof installation.

DUCTLINER INSULATION

None Required

ACCESS DOORS IN DUCTS AND HOUSINGS

All ducts and housing shall have hinged access doors for access to all automatic dampers, temperature sensing or control devices, fire dampers, damper motors, air filters and all other items within the ductwork or housing which require inspection, service or adjustment. Doors with height and width dimensions of 24" or less, in low velocity ducts or housing, shall be constructed and installed as per details for hinged access doors shown on Figure 2-14, Doors A, B and C, of SMACNA Manual "Low Pressure Duct Construction Standards". Doors with either the height or width dimension greater than 24" shall be constructed and installed as per details for hinged casing access doors shown on Figure 3-17 of SMACNA Manual "Low Pressure Duct Construction Standards". Doors with either the height or width dimension greater than 24" shall be constructed and installed as per details for hinged casing access doors shown in Figure 3-17 of SMACNA Manual "Low Pressure Duct Construction Standards". Doors shall be gasketed with neoprene or sponge rubber gaskets. Foam plastic gaskets will not be accepted. The Contractor shall be responsible for the location of all doors, regardless of notations on drawings. Existing access doors may be reused as indicated on drawings.

Hardware shall be Ventfabrics, Inc. "Ventlok", or approved equal. At the Contractor's option, doors 24" x 24" or smaller may be Air Balance, Inc. "Fireseal", equivalent Ventfabrics, Inc., Cesco, or approved equal, sandwich construction panel door with continuous hinge and camlock latches.

Access doors in ductwork shall be of size shown on drawings and where size is not shown shall be 12" x 18" minimum, except where ductwork dimensions will not accept this size, the door shall be as large as the ductwork dimensions will accept.

Existing access doors may be reused where shown on drawings.

DAMPERS

Dampers up to 14" may be single blade. Dampers in ducts over 14" shall be opposed multiblade with maximum 8" wide blades. Quadrants shall be Duro-Dyne #KP-20 series, or approved equal.

EXECUTION

GENERAL

Conformance with Agency Requirements: The system installation shall conform to the requirements of the National Fire Protection Association, Standard No. 90A.

Verification of Dimensions: The Contractor shall visit the premises to thoroughly familiarize himself with all details of the work and working conditions and verify all dimensions in the field, and shall advise the Owner of any discrepancy before performing any work. The Contractor shall be specifically responsible for the coordination and proper relation of his work to the building structure and to the work of all trades.

Division 16000 of the Specification requires the electrical contractor to make one power connection to each exhaust fan, roof top unit, chiller, pump, etc. Any parts furnished loose that require electrical wiring to main unit shall be wired by electrical contractor at mechanical contractors' expense, and shall not be an extra cost to the owner.

Workmanship: All ductwork shall be mechanically tight and constructed to withstand the pressures involved. Ductwork shall be so constructed and installed as to be completely free from vibration under all conditions of operation.

Leak testing for the ductwork shall be in accordance with SMACNA "Leak Test" for the pressures stated.

END OF SECTION

15810
SHEET METAL DUCTWORK

GENERAL

SUMMARY

The entire set of bid documents including plans & specifications applies to this section.

DUCTWORK SIZES

Ductwork sizes indicated on the drawings are “air flow” actual sheet metal dimensions, unless duct is indicated to be lined, and then they are the free area dimensions.

DEFINITIONS

Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:

Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.

Joints: Joints include girth joints; branch and sub-branch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures.

SYSTEM PERFORMANCE REQUIREMENTS

The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

This Contractor will be held responsible for the coordination between himself and the other contractors for locating and marking of openings for all ductwork, outlets, etc.

All air outlets and other openings of ductwork shall be kept tightly closed during construction to keep the system free of dust and debris.

QUALITY ASSURANCE

SMACNA Standards: Comply with SMACNA's “HVAC Duct Construction Standards, Metal and Flexible” “Rectangular Industrial Duct Construction Standards,” Round Industrial Duct Construction Standards, for fabrication and installation of metal ductwork. Comply with SMACNA's “HVAC Air Duct Leakage Manual” for sealing and testing of metal ductwork ASHRAE Standards: Comply with ASHRAE Handbook, Equipment Volume, Chapter “Duct Construction,” for fabrication and installation of metal ductwork. Where ASHRAE standards conflict with SMACNA standards; SMACNA shall prevail.

NFPA Compliance: Comply with NFPA 90A “Standard for the Installation of Air Conditioning and Ventilating Systems,” NFPA 90B “Standard for the Installation of Warm Air Heating and Air Conditioning Systems,” and NFPA 45" Standard for Laboratory Exhaust Systems.

PRODUCTS

DUCTWORK MATERIALS

GG General: Provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discoloration’s, and other imperfections.

Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lock forming quality; with G 90 zinc coating in accordance with ASTM A 525.

Construct and reinforce ductwork as indicated in SMACNA's Standards.

Fittings: Unless specifically detailed otherwise, use 45° laterals and 45° elbows for branch takeoff connections.

Fabricate duct fittings to match adjoining ducts, or equipment and to comply with duct requirements as applicable to fittings. Fabricate radius elbows with center-line radius equal to associated duct width; and include turning vanes in shorter radius elbows are necessary.

Material: Galvanized sheet steel, Stainless steel sheet. Fabricated to the following gauges, sizes being the longest side of duct.

Length. (inches)	Gauge
3-12	24
13-30	22
31-54	22
55-84	20
85-134	18

Single Wall Ductwork - ROUND OR FLAT OVAL DUCTWORK

Ductwork shall be rated for 2" w.g. positive and negative static pressure. All ductwork and fittings shall be factory fabricated by a single manufacturer and supplied by a single company.

Duct Construction: Duct of up to 60" diameter shall be spiral wound lock-seam cons provided in continuous, unjoined lengths to a maximum of 20'-0". All joints unless otherwise indicated up to 36" diameter shall be tight fitting slip type joints with a minimum of 2" insertion length. All joints 36" diameter and above shall be flange connection joints.

Material Galvanized sheet, Stainless steel.

Dia. (inches)	Gauge
3-8	24
9-14	24
15-26	22
37-50	20

Joints: Provide beaded sleeve connections, and couplings up to 36" diameter, unless otherwise indicated.

Fittings and Couplings: Provide continuous welds along seams.

Elbow Fittings: Unless specifically detailed otherwise, use long radius 45°, 5 gore, and long radius 90° 7 gore fittings. Elbow fitting construction, different than those specified, and having lower pressure drop losses as indicated by SMACNA or ASHRAE are acceptable.

Take-off Fittings: Unless specifically detailed otherwise, use 45° laterals for branch takeoff connections, and 45° WYE fittings.

Increasing or reducing fittings shall be constructed with a maximum angle of 15° on increasers and 30° on reducers.

Couplings: Provide all couplings to connect sections of ductwork, fittings to fittings, and other components together, and to complete the installation of the ductwork system shown.

All non-elbow fittings shall be of the following gauges:

Dia. (inches)	Gauge
3-14	22

15-26	20
27-36	20
37-50	18

Manufacturers: Subject to compliance with requirements, provide factory-fabricated ductwork, fittings, and couplers of one of the following:

Semco

United-McGill

The Wagner Group Inc.

FLEXIBLE DUCTWORK

Flexible ducts shall be round, insulated duct, factory fabricated of a spring steel wire helix or flat steel spiral covered by and bonded to a polymeric or vinyl-coated fiberglass fabric for leak-tight air seal, covered with 1" thick glass fiber insulation and an outside flexible, puncture-resistant and scuff resistant vapor barrier jacket. Duct shall be UL 181 listed, Class I, and shall conform to the requirements of NFPA 90A. Maximum length shall not exceed 5 ft.

Acceptable Manufacturers:

Thermaflex

Genflex

Wiremold

Ducts shall be rated for not less than 1" w.g. static pressure and for air velocities up to 1,500 fpm.

MISCELLANEOUS DUCTWORK MATERIALS

General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size to comply with ductwork system requirements including proper connection of ductwork and equipment.

Duct Insulation: Insulation of ductwork shall be as indicated in Section 15080 - “Mechanical Insulation.”

Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657, Type I; formulated with a minimum of 75 percent solids. Sealant shall be Hardcast, Inc. “Sure-Grip 404” duct sealer. Sealant shall be used on all shop fabrication and field seams, joints, fastener penetrations, and connections.

Duct Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use 0. Mastic shall be used on all flanged field joints. Flange gasketing tape shall be Hardcast, Inc. “1902-FR” flange gasketing tape.

Duct Taping: Ductwork shall not be sealed or installed using duct tape. Duct tape is not allowed for any purpose.

Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel hangers, brackets, fasteners, anchors, rods, straps, trim and angle iron for support of ductwork. Supports for stainless steel ductwork in exposed areas shall be stainless steel. Support spacing and installation shall be in accordance with applicable SMACNA Standards. Screws into ductwork at supports shall not be used, unless prior approval from Owner or Owner's Representative is given, and then they shall be sealed airtight.

FIRE-STOPPING

Refer to Section “Basic Mechanical Materials and Methods” for fire-stopping.

EXECUTION

INSTALLATION OF DUCTWORK

General: Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth.

B. Field Fabrication: Coordinate field fabrication of round, and rectangular ductwork at project as necessary to match shop-fabricated work and accommodate installation requirements.

Control Components: Install all control components in sheet metal equipment or ductwork as shown and/or indicated, including but not limited to automatic and manual control dampers, fire dampers, smoke dampers, temperature sensors or indicators, humidity sensors or indicators, flow sensors, switches, or indicators, freeze stats, static pressure sensors, and end position switches.

Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work. Coordinate with insulator to prevent installation of duct in such a way, that insulator cannot apply insulation.

Penetrations: Where ducts pass through interior partitions and exterior walls, seal space between construction opening and duct or duct insulation with sealant and sheet metal flanges of two gauges heavier than duct. Overlap opening on 4 sides by at least 1-1/2". Fasten to duct and substrate.

Where ducts pass through fire rated floors, walls, or partitions, provide fire dampers, or fire/smoke dampers if indicated and provide firestopping between duct and substrate, as specified in Section “Basic Mechanical Materials and Methods.”

Duct Supports: Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts straight, plumb, free of sags and vibration, and to prevent buckling. Support ductwork from building structure where not otherwise indicated, anchor with bolts, concrete inserts, welded studs, C-clamps, or special beam clamps with support as indicated in the SMACNA Standards. Anchor methods other than listed shall receive prior approval from Owner before using. Support vertical ducts, at every floor, 12 foot maximum spacing, by attachment to adjacent vertical structural surfaces or by direct bearing at floor penetrations and similar locations.

Turning Vanes: Rectangular tees, bends and elbows shall be provided with turning vanes as specified in Section “Ductwork Accessories.”

Balancing Dampers: Provide manually operated volume dampers, as indicated, to ensure proper balancing and control of air systems, as specified in Section “Ductwork Accessories.”

METAL DUCTWORK

Sealing: All duct systems shall be sealed and leak tested with the total allowable leakage not to exceed three (3) per cent of the total system design air flow rate. This is an exception to the SMACNA manual, and shall be complied with. SMACNA reference is for testing method and not acceptability of test leakage results. All supply and return air ductwork shall have all joints hardcast.

Sealing: Ductwork shall be sealed in accordance with SMACNA.

FLEXIBLE DUCTS

Flexible duct shall only be used where shown on the drawings. The inner liner shall be secured in place to the round duct with nylon or steel draw-bands and sealed for an airtight connection, and then the insulation and outer vapor barrier jacket shall be drawn up to completely cover the connection and shall be secured in place with a second nylon or steel draw-band for a vapor tight connection.

Flexible ducts shall be supported with 2" wide, 20 gauge steel straps, the use of wire for the support of flexible ducts is not acceptable. Where flexible duct is used as a bend or elbow, the included angle or the bend shall not exceed 90 degrees in any plane.

Maximum Length: For any duct run using flexible ductwork, do not exceed 5'-0" extended length.

EQUIPMENT CONNECTIONS

General: Connect metal ductwork to equipment as indicated, provide flexible connection or rubber gasket at flanged joints for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery.

B. Provide access doors as indicated.

Furnish and install all materials and equipment for connection to hood systems. Ductwork shall be pitched to provide ample and free drainage of condensate and liquids from ductwork.

TESTING

Leakage Tests: After each duct system or portion of a duct system is completed, this contractor shall test the section in accordance with the SMACNA HVAC Air Duct Leakage Test Manual. The tests shall verify that the entire duct system for each air handling unit has a total leakage rate of 3% or less of the total system design cfm. Leakage from non-duct components (fire dampers, smoke dampers, volume control boxes, etc.) are an integral part of overall system leakage, and these components shall be included in duct leakage tests. Contractor shall be responsible for any remedial efforts directed at products in order to bring the system or section into compliance with the leakage rate specified.

Provide all blank off covers, fan connection points, and test holes required. Seal up of all test holes and removal of all covers after section of duct or entire duct system has been tested and approved as acceptable.

By means of a suitable fan and test manometers, the systems shall be pumped up to approximately 2" w.g. of static pressure and held for a period of ten (10) minutes. After this period the pressure shall be reduced to 1" w.g. of static pressure and the duct systems shall be visually and audibly inspected to determine that all joints are tight. After all leaks are properly sealed, the duct shall be re-pressurized to 2" w.g. of static pressure and held for 10 minutes and then reduced again to 2" and all leaks rechecked. Contractor shall repair leaks and repeat tests until total leakage is less than 3% of total system design air flow.

Contractor is responsible for the costs associated with any retests required due to total system duct leakage greater than the 3% of total cfm value.

Contractor is responsible for submitting copies of certified calibration data for leakage test apparatus and the reports on the leakage tests. The report shall give an accurate description of the test procedure and results including any remedial action that was needed to obtain an acceptable test. Owner or Owner's Representative may be present for tests at Owner's discretion.

ADJUSTING AND CLEANING

Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

Balancing: All final testing and balancing will be by a testing and balancing contractor. This contractor shall assist during the final balancing and testing. Refer to Specification Section - “Testing, Adjusting, and Balancing” for air distribution balancing of metal ductwork. Seal any leaks in ductwork that become apparent in the balancing process.

END OF SECTION

15820
DUCTWORK ACCESSORIES

GENERAL

SUMMARY

The entire set of bid documents including plans & specifications applies to this section.

QUALITY ASSURANCE

SMACNA Compliance: Comply with SMACNA “HVAC Duct ConstructionStandards, Metal and Flexible”.

Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.

UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 “Fire Dampers and Ceiling Dampers.” Leakage labeled under UL 555S.

NFPA Compliance: Comply with applicable provisions of NFPA 90A “Air Conditioning and Ventilating Systems,” NFPA92A pertaining to installation of ductwork accessories.

PRODUCTS

ACCEPTABLE MANUFACTURERS

General: Ductwork Accessories are specified by manufacturer's numbers as to type and quality required. Subject to compliance with requirements, provide manufacturer's or approved equivalent manufacturer products as indicated.

MANUAL VOLUME DAMPERS

Provide on all supply ductwork, manual volume dampers on all take-offs at mains and branches. Dampers shall be opposed blade. Damper frame and blades shall be field fabricated and constructed of the same material as the duct in which it is installed.

Rectangular ductwork dampers: Damper blades with crimped leaf edges. 10 gauge minimum blades for ductwork having an equivalent diameter greater than 26”; 16 gauge minimum for ductwork having an equivalent diameter less than 26.” ½" square or equivalent diameter minimum cold rolled shaft spot or tack welded to damper. Provide Ventlock 635 manual locking dial regulator with tamper-resistant hexagonal lock nut, or approved equivalent.

Round or flat oval ductwork dampers: 10 gauge minimum blades for ductwork with a diameter greater than 26";16 gauge minimum for ductwork with a diameter less than 26." ½" square or equivalent diameter minimum cold rolled shaft spot or tack welded to damper. Provide Ventlock 635 manual locking dial regulator with tamper-resistant hexagonal lock nut, or approved equivalent.

BEARING SEALS

Provide and install Ventlok, Inc. damper end bearing No. 609, or other approved device, on the ends of all damper rods where they penetrate the duct, to seal and prevent air leakage.

REMOTE DAMPER OPERATORS

Provide and install Young Regulator damper adjustment device, including rod, steel gear operator (Model 927-B), recessed access regulator (Model 301CDS) for dampers located above all non lay-in ceilings. Seal airtight around recessed operator to prevent air leakage.

RECTANGULAR CONTROL DAMPERS

Dampers shall be airfoil blade with silicone rubber seals, opposed-blade, motor-operated, ready for final connection. Extruded aluminum or galvanized steel, 14 gauge (min.) thick blades, and 12 gauge minimum damper frame with bolt holes in flange. Stainless steel bearings pressed into frame. Include closures and sealing to ensure air does not bypass damper frame. Provide extension shaft for each damper section or assembly located within duct where motor is mounted externally. Side linkage out of airstream, 10 gauge mill finished galvanized steel clevis type arms. Control damper shall be installed so the damper frame is not in the airsteam. Actuators by Belimo, or approved equivalent.

Acceptable Manufacturers:

Cook

Greenheck, Model HCD-240

Ruskin, CD 60 with T-flange frame option

Air Balance

Arrow United Industries

Penn Ventilator

TURNING VANES

Provide acoustic turning vanes where shown on the drawings. Vanes shall be constructed of airfoil shaped aluminum extrusions with perforated faces and fiberglass fill.

Acceptable Manufacturers:

Air Devices

Duro Dyne

DUCT ACCESS DOORS

Provide for access to all automatic dampers, temperature sensing or control devices, fire dampers, damper motors, plenums, air filters, and all other items within the ductwork or housing which require inspection, service or adjustment, or where indicated.

Access doors in round ductwork shall be 12" x 16" minimum, for ductwork 14" diameter and larger; and shall be 8" x 12" for ductwork 12" diameter or less. Rectangular ductwork and plenum doors shall be a 12" x 16" minimum; and shall be 8" x 12" for ductwork with 12" dimension or less.

Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Constructed of ribbed covers of G60 minimum galvanized steel, with forged galvanized steel bolt, star polyimide grip, conical springs and manufactured such that sealant is not required for air tight seals. Doors shall be gasketed with polyethylene foam gaskets, factory installed on inner edge of inner cover.

Acceptable Manufacturers:

Nexus, PDQ

Air Balance

Milcore

FLEXIBLE CONNECTIONS

Provide flexible duct connections wherever ductwork connects to vibration isolated equipment, or where shown. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make duct connection with flanges and neoprene gaskets for airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

Acceptable Manufacturers:

Duro Dyne, Metalfab Canvas

Flow-Flex, Fabric Connections

Ventfabrics, Ventfab Metaledge

EXECUTION

INSTALLATION OF DUCTWORK ACCESSORIES

Controls: Install all control devices, sensors, etc. in ductwork or AHU systems where shown on drawings.

Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of construction details as shown in SMACNA standards, and with recognized industry practices to ensure that products serve intended function.

Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

Install concealed damper regulators in for manual volume dampers located above hard ceilings.

Install access doors for access to all automatic dampers, temperature sensing or control devices, fire dampers, damper motors, plenums, air filters, humidifiers, and all other items within the ductwork or housing which require inspection, service or adjustment. Where items are installed in ductwork and located behind a removable air grille or register, an access door is not required in the ductwork.

Label access doors to indicate purpose.

Label exposed side of lay-in ceilings where access doors occur.

All required testing and demonstration per NFPA-90A shall be documented and reported to owners representative.

Install turning vanes in all square or rectangular bends, elbows, and tees in supply, return, and exhaust air systems.

FIELD QUALITY CONTROL

Operate installed ductwork accessories to demonstrate compliance w leakage while system is operating to obtain a total system leakage of one percent total design airflow. Repair or replace faulty accessories, to obtain proper operation and leakproof performance.

ADJUSTING AND CLEANING

Adjusting: Adjust ductwork accessories for proper settings, and adjust for proper action.

END OF SECTION

16050
BASIC ELECTRICAL MATERIALS & METHODS

GENERAL

SUMMARY

The entire set of bid documents including plans & specifications applies to this section.

DRAWINGS AND SPECIFICATIONS

All drawings and specifications on the project are complementary, each to all other sets, and they shall be used in combination for the execution of this work. Electrical work shown on any of the contract drawings or any section of the contract specifications shall be considered as included in this work unless specifically excluded by inclusion in some other branch of the work. This shall include roughing-in for connections and equipment as called for or inferred. The Contractor shall check all drawings and specifications for the project and shall be responsible for the installation of all electrical work.

The contract drawings for electrical work are in part schematic, intended to convey the scope of work and indicate the general layout, design and arrangement. The Contractor shall follow these drawings in the layout of his work and shall consult general construction drawings, mechanical drawings and all other drawings for this project to determine all conditions affecting the electrical work. The contract drawings are not to be scaled and the Contractor shall verify spaces in which the electrical work is to be installed.

Where specific details and dimensions for electrical work are not shown on the drawings, the Contractor shall take measurements and make layouts as required for the proper installation of the work and coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications that have not been clarified by addendum prior to bidding, it shall be assumed by the signing of the contract that the higher cost (if any difference in costs) is included in the contract price, and the Contractor shall perform the work in accordance with the drawings or with the specifications, as determined and approved by the Architect, and no additional costs shall be allowed by the contract price.

DEMOLITION

See drawings for electrical demolition required.

In areas where the removal of ceiling materials will be required to facilitate the work of the mechanical contractor, the electrical contractor shall be responsible for the removal, storage and reinstallation of existing lighting fixture. Prior to reinstallation the electrical contractor shall clean fixtures and provide new lamps (match existing) to replace defective lamps.

Existing conduit may be reused in place. Do not remove and reinstall existing conduit.

WORK INCLUDED

This work shall include all plant, labor, material and equipment as required to furnish and install electrical work including demolition as shown on drawings and as hereinafter specified. Work shall also include all labor, material and equipment not shown on drawings and not specified but necessary and reasonably incidental to comply with the intent of contract to provide first class and complete installations of electrical work. Furnish and install all materials, equipment, devices, and accessories not specifically called for by item but that are necessary to provide the requirements in operation and function that is established by the design and by the equipment specified.

Work shall also include: (1) All hoists, scaffolds, staging, runways, and equipment required for the performance of the work; (2) All job measurements and shop layouts required for the proper installation of material and equipment included in the work; (3) All lights, guards, and signs as required by safety regulations applicable to the work; (4) The removal from the premises, as it accumulates, of all dirt and refuse resulting from the performance of the work; and (5) Modifications to existing structure, equipment and installations required in order to install new work; (6) Demolition Work, (7) Dust Control.

Work shall include providing labor and equipment for current and voltage readings, and adjustments required on electrical equipment for testing and balancing of mechanical systems as specified in Section Division 15 of this specification.

EXISTING CONDITIONS

Each bidder shall inspect the site as required for knowledge of existing conditions and failure to obtain such knowledge shall not relieve the successful bidder of the responsibility to meet existing conditions in performing the work under the contract.

Where new work cannot be installed without changes in existing work or where it is indicated on drawings to rework an existing installation, this contract shall include alterations to existing work as required to install new work. Additions to the contract cost will not be allowed because of this Contractor's failure to inspect existing conditions.

Where existing power, lighting, or control circuitry is broken by removal of existing devices, equipment, or fixtures, or by demolition work, cutting or removal of existing building construction, and where the existing circuitry is required by remaining devices or equipment to stay in service, then the circuitry shall be completed as required by job conditions. All existing wire, and existing exposed conduit and boxes that are not required to be reused shall be removed, unless indicated other wise on drawings, and concealed conduits that remain shall be plugged. This work shall be performed at no addition to the contract price.

Existing conditions indicated on the drawings are taken from the best information available on previous contract drawings and from visual site inspection and are not to be construed as "As-Built" conditions, but are to indicate the intent of this work. It shall be the responsibility of the Contractor to verify all existing conditions and the intent of this work indicated.

CONDUCT AND SEQUENCE IN PERFORMING WORK

The Contractor shall be responsible for a scheduled sequence in performing the work so that it will not interfere with the Owner's operation in the existing building. Before any work is started, the Contractor shall consult with the Owner's Representatives and arrange a satisfactory schedule. Make temporary alterations as required to execute work so that all operations and services in the existing building are maintained with the minimum possible interruption. Temporary shut-downs shall be segregated and shall be of the shortest possible duration. All facilities shall be kept in continuous operation unless specific permission to the contrary is arranged by the Owner's Representative.

EXISTING MATERIAL AND EQUIPMENT

Existing material and equipment removed from existing construction and not shown or required to be reused shall become the property of the Owner, if he so elects. The Contractor shall present the equipment and materials removed to the Owner's Representative and he shall select the equipment and materials which he elects to retain. Equipment and materials selected shall be delivered to space on the site as designated by the Owner's Representative. Material and equipment not retained shall become the property of the Contractor and shall be promptly removed from the site.

Any existing material or equipment which is to be reused or left in place and is damaged by performance of work under this contract shall be repaired satisfactorily or shall be replaced with new equipment and material at the expense of the Contractor.

MATERIAL AND MANUFACTURER

All material and equipment shall be new except as stated otherwise; shall be of the best quality and design; shall be free from defects and imperfections and shall have markings or a nameplate identifying the manufacturer and providing sufficient reference to establish quality, size and capacity. As possible, all material and equipment of the same type shall be of the same manufacturer. Equipment shall function and perform efficiently and quietly at the required capacity without producing objectionable noise within the occupied areas of the building; if not, the Contractor shall remedy the condition or replace the equipment at no additional cost to the contract.

SUBSTITUTIONS

Reference in the specifications to any article, device, product, material, fixture, equipment, form or type of construction by name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Any article, device, product, material, fixtures, equipment, form or type of construction other than those specified may be substituted for consideration, in accordance with the preliminary matters, general conditions, and supplemental conditions as applicable unless otherwise specified.

LABOR, WORKMANSHIP AND SUPERVISION

All labor for the installation of material and equipment furnished under the electrical work shall be done by experienced mechanics of the proper trade and all workmanship shall be first class and incompliance with the specific requirements of drawings and specifications.

All material and equipment for the electrical work shall be installed under competent supervisory service furnished by the Contractor. Where necessary, this shall include the services of special technicians and operation personnel.

SAFETY REGULATIONS

All electrical work shall be performed in compliance with all applicable and governing safety regulations including the regulations of the Occupational and Safety Health Act. All safety lights, signs and guards required for performance of electrical work shall be provided by the Contractor.

CODES, ORDINANCES, REGULATIONS AND U.L. APPROVAL

See General Conditions

Laws, codes, ordinances and regulations shall take precedent excepting only where the work called for by the drawings and specifications exceeds by quality and quantity.

Fixtures, appliances, equipment and materials which are subject to Underwriter's Laboratory tests shall bear such approval.

All work of this Division shall be installed in strict accordance with the latest addition of NFPA 70, The National Electric Code. (NEC)

CONTRACTOR'S EQUIPMENT

All hoists, scaffolds, staging, runways, tools, machinery and equipment required for the performance of the electrical work shall be furnished by the Contractor.

STORAGE AND PROTECTION

Material and equipment for the electrical work shall be protected from dirt and damage and maintained in a clean condition during the performance of the work. This shall include adequate protection from the weather if storage is outside. All parts of material and equipment that have become rusted or damaged shall be replaced or restored to an acceptable condition as approved by the Owner's Representative. This shall include factory finishes damaged during construction.

CLEANING

Dirt and refuse resulting from the performance of the work shall be removed from the premises as required to prevent accumulation and the Contractor shall cooperate in the maintenance of reasonably clean premises at all times.

Immediately prior to the final inspection, Contractor shall clean all material and equipment. Dirt, refuse and stains shall be removed from all surfaces and damaged finishes restored to original condition.

OPERATION AND MAINTENANCE INSTRUCTION

This Contractor shall furnish all services as required for adequate verbal and printed instructions the Owner's operating and maintenance personnel for operation and maintenance of all equipment and systems installed under this Division. Three complete copies of service manuals in hardback binders shall be furnished at the end of the project in accordance with the General Conditions of the specifications. The manuals shall include warranties, printed operating and maintenance instructions for systems and equipment specified under this Division, all approved shop drawings, all manufacturer's printed data, parts lists control diagrams, valve schedules, parts lists, list of equipment suppliers, list of Contractors & Subcontractors, balancing reports, test reports.

When the work is complete and at a time designated by the Owner's Representative, the Contractor shall furnish the services of a qualified instructor to instruct Owner's operating and maintenance personnel in the operation and maintenance of the systems and equipment furnished and installed under this Division.

The bound copies of the operating and maintenance manuals shall be used during the verbal instructions.

MOTORS, CONTROLS, AND OTHER EQUIPMENT

Except as otherwise specified electrical contractor shall make one power connection to each piece of equipment, ie, exhaust fan, rooftop unit, chiller, pump, etc. Any parts furnished loose by mechanical contractor that require wiring to the main unit shall be wired by electrical contractor at mechanical contractors expense, and shall not be an extra cost to the owner.

Except as otherwise specified, the electrical work shall include receiving, installing and mounting all detached motors, switches, motor control equipment and other control devices furnished under other divisions or work. Contractor shall check all headings of specifications for equipment to be installed. Work shall include overload heater for motor starters, mountings and supports as required for all equipment, including angle frames, steel plates, bars, bolts, etc., and all conduit, wire, etc., as required to connect all equipment including motors, disconnect switches, starters, controls, pushbuttons, etc. Detached motors shall be set and aligned with coupling or drive. Motor connections shall be terminated with unexposed leads in suitable condulet and cover. Conduit shall terminate close to motor with a minimum of 12" of flexible liquid tight conduit between rigid conduit or EMT and motor.

Unless specified otherwise, perform all work required to rough-in and connect to all equipment requiring electrical connections. This work shall be as indicated on drawings, by approved equipment shop drawings and by direction on the job.

All equipment, materials or devices furnished by others including that furnished by the Owner or under any other division which require electrical connections shall be roughed-in and connected under this division, unless specified otherwise. It shall be the Contractor's responsibility to verify exact requirements for rough-in and connection of equipment furnished by others prior to installation. Extras will not be allowed for failure to verify same.

The Contractor shall run feeders to starters, disconnects, control panels and motors as shown on drawings, make connections, furnish overload heaters for motor starters, and install and wire all mechanical components in accordance with wiring diagrams furnished under mechanical work. The Contractor shall coordinate with any other trades involved for the proper coil voltages for control of magnetic starters and contactors.

ADJUSTING, ALIGNING AND TESTING

All electrical equipment furnished under this Division shall be adjusted and tested by this Contractor. Motors and other equipment furnished by others, to which electrical connections are made under this Division, shall be checked for short circuit and open circuits before energizing. Motors shall be checked for proper phasing and rotation. The thermal overload protection shall be checked in all motor starters, and any protector heaters found to be of improper size as required by the motor name plate full load amperage and voltage rating for protection of the motor shall be listed (include equipment designation, rating of heater, motor nameplate horsepower, full load amps and voltage) and 4 copies of list shall be submitted to the Owner's Representative.

Mechanism of all electrical equipment shall be checked, adjusted and tested for proper operation. Protective devices and parts shall be checked and tested for specified and required application and adjusted as required. Adjustable parts of all lighting fixtures and electrical equipment shall be checked, tested and adjusted as required to produce the intended performance.

Completed wiring systems shall be free from short circuits and after completion, perform tests for insulation resistance in accordance with the requirements of the National Electrical Code.

The Contractor shall be held responsible for the operation, service and maintenance of electrical equipment during construction and prior to acceptance by the Owner. All electrical equipment shall be maintained in the best operating condition. Operational failure caused by defective material and/or labor furnished under this Division shall be immediately corrected. Owner's Representative shall be immediately notified of any operational failures caused by defective material and/or labor covered under other Divisions or furnished by others.

ELECTRICAL CIRCUITRY FOR EQUIPMENT

The electrical circuits, components, and controls for all equipment are selected and sized, based on the equipment as furnished. It shall be the responsibility of all parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the electrical characteristics and requirements of that furnished to that specified and/or shown. If greater capacity or more materials or labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then it shall be the responsibility of the parties involved in providing the substitute and/or equivalent items of equipment to provide all compensation for additional charges made for the proper rough-in, circuitry and connections for the equipment furnished. No additional charges shall be made to the Base Bid price or to the Owner.

Before rough-in of circuitry or connecting to equipment, the Contractor shall verify the electrical characteristics and requirements of the equipment being furnished, and for that specified and shown on drawings.

CLEARANCES

All electrical equipment shall be so installed to maintain proper clearance and headroom as required by the National Electrical Code. (NEC)

CUTTING AND PATCHING

The computer equipment must stay “on” continuously, including during all demolition and all construction. Provide all materials, equipment, and labor as required to positively prevent any dust from entering (1) computer equipment or (2) HVAC air stream in computer room. Notify Owner’s Representative 48 hours in advance of any dust producing activity to (1) obtain Owner’s Representative’s advance approval of the dust containment method, and (2) allow observation of the actual procedure by Owner’s Representative. Owners Representative shall have authority to stop demolition and/ or construction for non-compliance with this specification.

The Contractor shall coordinate with the Owner's Representative before any cutting and obtain approval from the Owner's Representative prior to any cutting. All patching and finishing shall be by the Contractor.

Cutting shall be done with extreme care and in such a manner that the strength of the structure will not be endangered. Wherever possible, openings in concrete or masonry construction shall be by concrete saw or rotary core drill. Openings in any construction shall be cut the minimum size required for the installation of the work. Adequate protection shall be provided to prevent damage to adjacent areas and to prevent dust from spreading to adjacent areas.

Where openings or holes are cut in existing construction and the cutting breaks existing electrical circuitry or control circuitry conduit and wiring, then it shall be the responsibility of the Contractor to reroute the circuitry conduit and requiring and to complete the circuitry as required and as approved by the Architects. Temporary completion shall be provided where necessary before the permanent rerouting and completion work is finished.

Before any cutting, patching, or finishing work is started, dust and moisture protection shall first be installed as required in these specifications.

Openings cut in floor shall be cut by core drilling where possible. After work is installed through any opening in floor, the opening around the work shall be patched and sealed watertight with epoxy or silicone based, non-cracking elastomeric sealant.

Where existing work is removed from sleeves or openings through floor and the sleeve or opening is not to be reused, patch the hole or opening by filling with shrink epoxy cement grout, in strict accordance with the grout manufacturer's instructions and recommendations and as required to make completely watertight and fireproof. Finish the floor surface as directed by the Owner's Representative.

SHOP DRAWINGS AND SAMPLES

Acceptance of the work shall be subject to the Architects approval of shop drawings, product data and samples, as specified in the "General Conditions" of these specifications.

Submittals shall include the manufacturer's model number, capacity, performance data, electrical characteristics, etc., all clearly shown and marked for the specific item of equipment to be furnished on this project. General catalog data that does not indicate the specifics for the item to be furnished for this project will not be accepted. Performance data shown or marked on the submittals shall be at the actual specified operating conditions for this project.

IDENTIFICATION, INSTALLATION AND USE OF ELECTRICAL EQUIPMENT

All electrical equipment shall be furnished with factory identification for the suitability of use and installation, either by a description marked on the equipment, permanently attached label, or printed description packed with the equipment, in accordance with article 110 of the National Electrical Code (NEC). If a printed description is packaged with the equipment, this shall be bound in the Operation and Maintenance Manuals.

NOISE AND VIBRATION

Contractor shall be responsible for the installation of all equipment in such a manner as to control the transmission of noise and vibration for many installed equipment or system, so the sound level shall not exceed NC35, in any occupied space. Contractor shall be responsible for the correction of any objectionable noise in any occupied area due to improperly installed equipment.

EQUIPMENT IDENTIFICATION AND LABELS

All electrical equipment, such as disconnect switches, motor starters, controls, push-button, panel boards, and other similar items shall be adequately identified with labels. Labels shall clearly designate name and use of equipment, and panel and circuit number or power source, Labels shall be laminated plastic with 1/4" white letters on a black background. Labels shall be attached with pop-rivets or permanent adhesive. "Dymo" type labels not acceptable.

WARRANTIES

Warranties shall be provided for all equipment in accordance with the requirements of the General Conditions, except that all warranties shall be non-prorated for one year.

Acceptance of the work under this Division shall be subject to the conditions that all installed systems, equipment, apparatus, and appliances included in the work shall operate and perform as designed, including code clearances, and as selected with respect to efficiency, capacity and quietness and shall operate and perform without producing objectionable noise within occupied areas of the building.

Acceptance of the work shall also be subject to the conditions that any time within one year after date of acceptance final payment, any defective part of the work resulting from the supply of faulty workmanship or material shall be immediately amended, required or replaced as a part of the contract work without cost to the contract.

PRODUCTS

NONE

EXECUTION

NONE

END OF SECTION

16060
GROUNDING AND BONDING

GENERAL

SUMMARY

The entire set of bid documents including plans & specifications applies to this section.

Related Sections: The following Division 16 Sections contain requirements that relate to this Section.

“Basic Electrical Requirements.”

“Basic Electrical Materials and Methods.”

This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

SUBMITTALS

Product Data: For each type of product indicated.

Product Data: For the following:

Ground conductor

Qualification Data: For firms and persons specified in "Quality Assurance" Article.

Field Test Reports: Submit written test reports to include the following:

Test procedures used.

Test results that comply with requirements.

Results of failed tests and corrective action taken to achieve test results that comply with requirements.

QUALITY ASSURANCE

Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

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

Comply with UL 467.

PRODUCTS

MANUFACTURERS

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

Grounding Conductors, Cables, Connectors, and Rods:

Apache Grounding/Erico Inc.

Chance/Hubbell.

Copperweld Corp.

Harger Lightning Protection, Inc.

Heary Brothers Lightning Protection Co.

O-Z/Gedney Co.; a business of the EGS Electrical Group.

Raco, Inc.; Division of Hubbell.

Robbins Lightning, Inc.

Salisbury: W. H. Salisbury & Co.

Superior Grounding Systems, Inc.

Thomas & Betts, Electrical.

GROUNDING CONDUCTORS

For insulated conductors, comply with Division 16 Section "Conductors and Cables."

Material: Aluminum, copper-clad aluminum, and copper.

Equipment Grounding Conductors: Insulated with green-colored insulation.

Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

Grounding Electrode Conductors: Stranded cable.

Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

Bare Copper Conductors: Comply with the following:

Solid Conductors: ASTM B 3.

Assembly of Stranded Conductors: ASTM B 8.

Tinned Conductors: ASTM B 33.

Copper Bonding Conductors: As follows:

Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch (6.4 mm) in diameter.

Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

Aluminum Bonding Conductors: As follows:

Bonding Cable: 10 strands of No. 14 AWG aluminum conductor, 1/4 inch (6.4 mm) in diameter.

Bonding Conductor: No. 4 or No. 6 AWG, stranded aluminum conductor.

Bonding Jumper: Aluminum tape, braided bare aluminum conductors, terminated with aluminum ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

CONNECTOR PRODUCTS

Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

Bolted Connectors: Bolted-pressure-type connectors, or compression type.

Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

EXECUTION

APPLICATION

Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

In raceways, use insulated equipment grounding conductors.

Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.

At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

Underground Grounding Conductors: Use [tinned-] copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches (300 mm) above duct bank when installed as part of the duct bank.

EQUIPMENT GROUNDING CONDUCTORS

Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

Install equipment grounding conductors in all feeders and circuits.

Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

Feeders and branch circuits.

Three-phase motor and appliance branch circuits.

Flexible raceway runs.

Armored and metal-clad cable runs.

Bussway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on bussway.

Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panel board grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

INSTALLATION

Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

CONNECTIONS

General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

Make connections with clean, bare metal at points of contact.

Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A [and UL 486B].

Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

FIELD QUALITY CONTROL

Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing:

Testing: Engage a qualified testing agency to perform the following field quality-control testing:

Testing: Perform the following field quality-control testing:

After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

16100
WIRING METHODS

GENERAL

SUMMARY

The entire set of bid documents including plans & specifications applies to this section.

PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide products from one of the following manufacturers:

Hubbell

Arrow-Hart

General Electric

Sierra

Circle F

Bryant

Pass & Seymour

CONDUIT AND INSTALLATION

Rigid threaded conduit, threaded intermediate conduit and electrical metallic tubing shall be standard size of approved manufacturer and shall be galvanized or sherardized on inside and outside, including with water-tight compression fittings or with concrete-tight, pressure cast set screw type fittings. Rigid threaded conduit and threaded intermediate conduit shall be installed with threaded couplings and fittings.

All conduits may be electrical metallic tubing (E.M.T.), except conduit larger than 4", conduit in wet or damp locations, conduit in hazardous locations, conduit in earth or below grade, and except as otherwise noted on drawings or specified other wise. Conduit shall be minimum 3/4" dia., except switch legs and control wiring may be minimum ½" size.

Galvanized steel rigid or intermediate grade (I.M.C.) conduit shall be used in wet or damp locations, in NEC classified hazardous locations and for conduit sizes larger than 4" except below grade outside of building. Aluminum conduit may not be used.

Short sections of flexible conduit may be used from junction or outlet boxes to lighting fixtures as permitted by the National Electrical Code. Connections from outlet boxes above ceilings to fluorescent fixtures recessed in ceiling shall be made with flexible steel conduit not to exceed 6 ft. in length.

Short sections of flexible watertight (Sealtite) conduit shall be used for connections to motors, transformers and vibrating type equipment.

Unless specified or noted on drawings otherwise, conduit shall be installed concealed, excepting in areas where concealment of conduit is not possible or practicable and is approved by the Architect. Conduits shall be installed continuous between outlets, boxes, cabinets, etc.

Conduits installed exposed to view (not concealed by finish) shall be run parallel and perpendicular to building lines and shall be run against the structure in a neat workmanlike manner with conduit offsets neatly formed around all structure offsets and obstructions.

Conduits shall be securely fastened in place with approved type hangers, clamps and supports. Conduit shall not be fastened to or supported from ductwork, piping, lay in ceiling support wires or mechanical equipment. Conduit ends shall be reamed before installation and all conduit shall be thoroughly cleaned before installation and kept clean after installation. All conduit shall be fished clean before pulling of wires. Plug ends of conduits, with temporary plugs, where conduits are open to weather and before concrete is poured to keep inside of conduit free of water and concrete.

Exposed conduits shall be securely fastened in place on intervals in accordance with the NEC, and hanger's supports and fastenings shall be provided at each elbow, at the end of each straight run terminating at a box or cabinet, and adjacent to each outlet.

Horizontal and vertical conduit runs 2-1/2" and smaller may be supported by one hole malleable straps, clamp backs or devices with suitable bolts, expansion shields or beam-clamps for mounting to building structure.

Adjustable hangers may be used to suspend 3" or larger conduits when separately located.

Hangers shall be suitable for the application involved. Where excessive corrosive conditions are encountered, hanger assemblies shall be protected after fabrication by sherardizing or galvanizing, special paint or other suitable preservative methods.

Use of perforated iron strap, cord or wire for supporting conduits will not be permitted.

The required strength of the supporting equipment, size and type of anchors shall be based on the combined weight of conduit, hanger and cables.

Install pull wire or pull string in all unused empty conduits.

OPENINGS AND SLEEVES

The Contractor shall furnish and install all box-outs and sleeves for openings required to install this work. Openings through structural members shall be only as approved by the Architect or as shown on the structural drawings. Openings through concrete walls and floors shall be core drilled. Openings through masonry walls shall be galvanized steel conduit sleeves.

ACCESS DOORS

Where junction boxes and equipment are installed in concealed spaces, access doors shall be installed infurring to provide for operation, service, inspection, and maintenance.

Access doors shall be Milcor style K, M, DW, or AT as required by construction, equivalent Zurn or Wade, flush type steel units with frames. Construction shall be of #14 gauge level stock, cadmium plated and fitted with pivot hinges and screw driver coin type lock and finished with prime coat of paint. Panels shall have a minimum size of 12" x 12" for hand holes and 18" x 18" for manholes.

Accessible ceilings with removable type ceiling tiles do not require access panels to be installed.

WIRES AND WIRING FOR 600 VOLT OR LESS

Wires and cables shall be insulated soft annealed copper conductors with 600 volt insulation unless noted or specified otherwise and shall be listed and approved by Underwriter's Laboratories and shall meet all specifications of the IPCEA and NEMA Standards. Gauge of wire shall be (AWG) gauge. No. 10 gauge and smaller shall be solid conductor or stranded conductor. No. 8 gauge and larger shall be stranded conductor, except all ground wires shall be stranded. Stranded conductors shall not be fastened directly under screw terminals that rotate against conductors (such as side screw terminals of wall switches and convenience receptacles). Wire smaller than No. 12 gauge, shall not be used unless specifically called for on drawings or in specifications. Aluminum wiring shall not be used.

Unless specified otherwise, 600 volt wires in general use shall be type "THHN".

Grounding wires shall be stranded copper with 75 degrees C. "THHN" insulation with green color or green tracer. Every branch & feeder conduit shall contain a code sized green insulated ground conductor.

Wire insulation shall be color coded as follows:

120/208 VOLT

Phase A - Black

Phase B - Red

Phase C - Blue

Neutral - White

Ground - Green

Control and indication wiring shall be #14 AWG type "THHN", except runs greater than 200 feet in length shall be #12 AWG unless noted otherwise on drawings.

Conductors used where low leakage type is required, such as for ground fault protected circuits, the insulation shall be type "XHHW".

All wires shall be run in conduit or surface raceway shall be continuous between outlets and boxes. At least 8" of wire shall be left at outlets for fixture connections.

All terminations and splices shall be made in accordance with proper methods and recommendations for the type of wire and devices used and as recommended by the manufacturers of material and equipment involved.

Splice and Terminal Materials: Splices for 600 volt conductors smaller than No. 8 AWG shall utilize twist type insulated spring connectors. Terminals or splices for stranded conductors No. 8 AWG and larger shall utilize indent, hex screw, or bolt clamp-type connectors, with or without tongue, properly taped, and approved for the particular application. Exposed splice connector device shall be insulated with a minimum of two half-lapped layers of specification grade rubber insulating type and a minimum of two half lapped layers of polyvinyl chloride electrical tape applied over the rubber tape. The polyvinyl chloride type shall extend a minimum of two cable diameters over the cable jacket. For cable size 250 MCM and larger, connectors shall have at least two clamping elements or compression indents, and shall have at least two clamping elements or compression indents, and shall have provision for at least two bolts for joining to apparatus terminals. All wire and cable connectors shall be of high conductivity corrosion resistant material and have actual contact area equal at least to the current carrying capacity of the wire or cable.

Crimping Hand Tools used in securing the conductor in the compression type connectors or terminal lugs shall be those made for the purpose and for the conductor sizes involved. The crimping tools shall be of the ratchet type which prevents the tool for opening until the crimp action is completed. Such tools shall be a product of the connector manufacturer.

Insulating Compounds and Tapes for splice and termination insulation shall be of a type approved by the cable manufacturer for the particular use, location, and voltage.

Where wire size is shown on drawings or specified it shall be the same size throughout the circuit.

OUTLET BOXES, JUNCTION BOXES, PULL BOXES AND LOCATION OF OUTLETS.

Outlet boxes shall be installed for all electrical service outlets, including plug receptacles, lamp receptacles, lighting fixtures, switches, etc. Boxes for concealed work shall be size 4" code gauge steel knockout boxes, galvanized or sherardized and of required depth for services and devices. Boxes installed for concealed work shall have code gauge galvanized raised plaster rings set to plaster ground or markers with outside edge flush with plaster or wall finish. Plaster rings shall be selected with proper opening for device installed in box. Thru-wall type box will not be permitted. Outlet boxes in un-plastered concrete block walls in finished rooms shall be masonry type and shall be set to line with wall joints.

Boxes for exposed work, where permitted or ap proved, shall be 4" square or 4" long by 2-1/8" wide standard utility boxes specifically designed for surface installation and as required by device, wiring, and number of conduits and all covers for devices and blank covers shall be stamped steel with turned down edges to fit with sides of box.

Pull and junction boxes shall be code gauge galvanized steel boxes of size shown or required and with bolted or screwed covers. Boxes shall be flush or surface mounted as shown or required and shall be finished with factory prime coat of paint.

All rigid threaded and intermediate threaded conduit shall be clamped to boxes and enclosures with bushing inside of box and locknut outside of box. Bushings and locknuts shall be galvanized malleable iron. EMT shall be clamped to boxes and enclosures with fittings designed for EMT connections to boxes, and the fittings shall be tightly secured to the EMT and shall be clamped to box with locknut inside of box. Open end of fitting inside of box shall be smooth to prevent damage to conductor insulation when pulling conductors.

Location of outlets on drawings is approximate and, except where dimensions are shown, exact location of outlets shall be as taken from plans and details on general drawings or as directed by the Engineer. Outlets shall be located generally from column centers and finished wall lines or to center of acoustical and decorative ceiling panels and to centers of joints of wall panels. Outlets shall be installed in accessible location and no outlets shall be installed above ducts, behind furring or other obstructions. Outlets below ducts shall be connected with extension connections to outlets in ceiling or slab above.

Switch outlets, convenience receptacle outlets and telephone outlets, unless shown otherwise or required otherwise by wainscots, counters, etc., shall be mounted at height as specified under the device heading in this specification. Each device shall be carefully aligned to center vertically on other devices that are installed in the same vicinity.

EXECUTION

ADDITIONAL WIRING

Division 16000 “electrical” calls for electrical contractor to make one power connection to each piece of HVAC equipment. Any parts furnished loose that require electrical wiring to main unit shall be wired by electrical contractor at mechanical contractor’s expense, and shall not be an extra cost to the owner.

WIRING

All wiring shall be installed in conduit.

END OF SECTION

16000

16400
LOW VOLTAGE DISTRIBUTION

GENERAL

SUMMARY

The entire set of bid documents including plans & specifications applies to this section.

PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide products from one of the following manufacturers:

Bussman

General Electric

Chase-Shawmut

Square D

Siemens

FUSES

Fuses of proper type and size as specified and shown on drawings shall be furnished and installed in all fused switches.

The Contractor shall submit the manufacturer's performance data on each type of fuse and the manufacturer's certification that fuses furnished will provide the protection and performance as specified.

Fuses shall be of type as follows:

TYPE LOAD SERVED	MAXIMUM VOLTAGE	BUSSMAN DESIGNATION	U.L. CLASS

Motors	480	FRN	K5
General	250	LPN-RK	RK1

DISCONNECT SWITCHES

The Contractor shall furnish and install NEMA type HD (Heavy Duty) quick-make, quick-break disconnect switches not furnished by others with equipment and where indicated on drawings or where required by Code. Switches shall be fusible or non-fusible as called for or as required. Switches shall have NEMA 1R or 3R enclosure unless otherwise specified or called for otherwise on drawings. Switches shall have door interlock and shall be pad lockable in "open" and "closed" position.

EXECUTION

INSTALLATION

All conduit systems, boxes, electrical equipment enclosures, motor frames, etc., shall be grounded in accordance with the requirements of the National Electrical Code, local authorities and as specified hereinafter.

Every branch & feeder conduit shall contain a green insulated code sized grounding conductor. Care shall be exercised to keep the system neutral conductor separate from the equipment ground except at the point of system derivation.

Where isolated grounds are called for on drawings the isolated ground shall be isolated (insulated) from equipment ground from the point of the derived system to its termination point and shall not make contact to any conduit, equipment enclosure box or any other grounded metallic object except at the point of the derived system and/or at isolated ground bars.

All grounding wires shall be copper and shall be sized in accordance with the latest edition of N.E.C.

No electrical system neutral shall be used for an equipment ground.

All outlet boxes and junction boxes, lighting fixtures, convenience receptacles, switches disconnects, etc. shall be grounded. The ground wire terminal of each convenience receptacle shall be connected to the grounding conductor.

END OF SECTION

16440
PANELBOARDS

GENERAL

SUMMARY

The entire set of bid documents including plans & specifications applies to this section.

Related Sections: The following Division 16 Sections contain requirements that relate to this Section:

“Basic Electrical Requirements.”

“Basic Electrical Materials and Methods.”

“Raceways and Boxes.”

QUALITY ASSURANCE

Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC Article 384 as applicable to installation and construction of electrical panel boards and enclosures.

UL Compliance: Comply with applicable requirements of UL 67, "Electric Panel boards", and UL's 50, 869, 486A, 486B, and 1053 pertaining to panel boards, accessories and enclosures. Provide panel board units which are UL listed and labeled.

NEMA Compliance: Comply with NEMA Stds Pub/No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)", Pub/No. PB 1, "Panel boards", and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panel boards Rated 600 Volts or Less".

PRODUCTS

ACCEPTABLE MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide panel board products of one of the following (for each type and rating of panel board and enclosure):

Square D
General Electric
ITE
Westinghouse

PANELBOARDS

General: Except as otherwise indicated, provide panel boards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; with the design and construction in accordance with published product information; equip with proper number of unit panel board devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for those applications indicated.

POWER DISTRIBUTION PANEL BOARDS

Provide dead-front safety type power distribution panel boards as indicated, with panel board switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solder-less pressure-type main lug connectors approved for use with copper conductors. Select unit with feeders connecting at top or bottom of panel as indicated on drawings. Equip with copper bus bars and with full-sized neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections. Provide molded-case main and branch circuit breaker types for each circuit indicated on drawings, with toggle handles that indicate when tripped. Where multiple-pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Provide panel boards with bare un-insulated grounding bars bolted to enclosures. Select enclosures fabricated by same manufacturer as panel boards, which mate and match properly with panel boards. Panels shall be Square D type I-LINE, or equivalent of manufacturer listed above.

PANEL BOARD ENCLOSURE

Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gauge, minimum 16 gauge thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with adjustable trim clamps, and doors with flush locks and keys, all panel board enclosures keyed alike, with concealed piano door hinges and door swings as indicated. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor coating. Design enclosures for recessed or surface mounting as indicated on drawings. Provide enclosures which are fabricated by same manufacturer as panel boards, which mate and match properly with panel boards to be enclosed.

MOLDED-CASE CIRCUIT BREAKERS

Provide factory-assembled, molded-case, bolt-in, circuit breakers of frame sizes, characteristics, and ratings including RMS symmetrical interrupting ratings indicated. Select breakers with permanent thermal and instantaneous magnetic trip, and with fault-current limiting protection, ampere ratings as indicated. Construct with overcenter, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Construct breakers for mounting and operating in any physical position, and operating in an ambient temperature of 40° C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated.

EXECUTION

INSTALLATION OF PANELBOARDS

Install panel boards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC Standards and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.

Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds. 486A and B.

Fasten enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically anchored.

Provide properly wired electrical connections for panel boards within enclosures.

Complete typewritten panel board circuit directory card upon completion of installation work.

Insert fuses, if any, of ratings indicated, within installed panel boards.

GROUNDING

Provide equipment grounding connections for panel board enclosures as indicated. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounds.

FIELD QUALITY CONTROL

Prior to energization of electrical circuitry, check all accessible connections to manufacturer's tightening torque specifications.

Prior to energization of panel boards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.

Prior to energization, check panel boards for electrical continuity of circuits, and for short circuits.

3.04 ADJUSTING AND CLEANING

Adjust operating mechanism for free mechanical movement.

Touch up scratched or marred surfaces to match original finishes.

TESTING - Subsequent to wire and cable hookups, energize panel boards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

END OF SECTION

AFFIDAVIT

COMPLIANCE WITH THE PREVAILING WAGE LAW

Before me, the undersigned Notary Public, in and for the County of _____

State of _____, personally came and appeared

_____ of the
(name and title)

_____ (a corporation) (a partnership) (a proprietorship)
(name of company)

and after being duly sworn did depose and say that all provisions and requirements set out in Chapter 290 Sections 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on public works projects have been fully satisfied and there has been no exception to the full and complete compliance with said provisions and requirements and with Wage Determination NO._____ issued by the Division of Labor Standards on the _____ day of _____ 20___, in carrying out the Contract and work in connection with

_____ located at
(name of project)

_____ in _____ County,
(name of institution)

Missouri and completed on the _____ day of _____,20 _____

_____
Signature

Subscribed and sworn to me this _____ day of _____,20 _____

My commission expires _____,20 _____

_____
Notary Public

APPENDIX A

STATE WAGE RATES

GENERAL: This Contract shall be based upon payment by the Contractor of wage rates not less then the prevailing hourly wage rate for each craft or classification of workers engaged on the work as determined by the Industrial Commission of Missouri on behalf of the Department of Labor and Industrial Relations.

The Contractor shall comply with all requirements of the prevailing wage law of Missouri, Revised Statutes of Missouri, Sections 290.210 to 290.340, including the latest amendments thereto.

The prevailing wage law does not prohibit payment of more than the prevailing rate of wages nor does it limit the hours of work which may be performed by any worker in any particular period of time.

RECORDS: The Contractor shall keep an accurate record showing the names, occupations, and crafts of all workers employed, together with the number of hours worked by each worker and the actual wages paid to each worker. At all reasonable hours, such records shall be open to inspection by the representatives of Industrial Commission of Missouri and the County. The payroll records shall not be destroyed or removed from the State for at least one year after completion of the work.

NOTICES: Throughout the life of this Contract, a copy of the wage determination and the rules promulgated by the Industrial Commission of Missouri shall be displayed in at least one conspicuous place on the project under a heading of NOTICE with the heading in letters at least one inch high.

PENALTY: Pursuant to Section 290.250 RSMo the Contractor shall forfeit to the County as penalty, ten dollars for each worker employed, for each calendar day, or portion thereof, such worker is paid less than the stipulated rates for any work done under the Contract, by them.

AFFIDAVIT OF COMPLIANCE: After completion of the work and before final payment can be made under this Contract, the Contractor must file with the County an affidavit stating that they have fully complied with the provisions and requirements of the prevailing wage law of Missouri, sections 290.210 to 290.340 RSMo.

WAGE DETERMINATION: During the life of this Contract, the prevailing hourly rate of wages is subject to change by the Department of Labor and Industrial Relations or by court decision as provided by law. Any such change shall not be the basis of any claim by the Contractor against the County, nor will deductions be made by the County against sums due the Contractor by reason of any such change.

The attached prevailing wage rate determination made by the Industrial Commission of Missouri is reproduced verbatim and is applicable to this Contract.

APPENDIX B

Boone County Purchasing
601 E. Walnut, 2nd Floor
Columbia, MO 65201

Melinda Bobbitt, Director
573/886-4391 - FAX 573/886-4402

Standard Terms and Conditions

1. Responses shall include all charges for packing, delivery, installation, etc., (unless otherwise specified) to the Boone County Department identified in the Request for Quotation and/or Proposal.

2. The Boone County Commission has the right to accept or reject any part or parts of all bids, to waive technicalities, and to accept the offer the County Commission considers the most advantageous to the County. Boone County reserves the right to award this bid on an item by item basis, or an "all or none" basis, whichever is in the best interest of the County.

3. Bidders must use the bid forms provided for the purpose of submitting bids, must return the quotation and bid sheets comprised in this bid, give the unit price, extended totals, and sign the bid.

4. When products or materials of any particular producer or manufacturer are mentioned in our specifications, such products or materials are intended to be descriptive of type or quality and not restricted to those mentioned.

5. Do not include Federal Excise Tax or Sales and Use Taxes in bid process, as the County is exempted from them by law.

6. The delivery date shall be stated in definite terms, as it will be taken into consideration in awarding the bid.

7. The County Commission reserves the right to cancel all or any part of orders if delivery is not made or work is not started as guaranteed. In case of delay, the Contractor must notify the Purchasing Department.

8. In case of default by the Contractor, the County of Boone will procure the articles or services from other sources and hold the Bidder responsible for any excess cost occasioned thereby.

9. Failure to deliver as guaranteed shall disqualify Bidder from future bidding.

10. Prices must be as stated in units of quantity specified and must be firm. Bids qualified by escalator clauses may not be considered unless specified in the bid specifications.

11. No bid transmitted by fax machine will be accepted.

12. The County of Boone, Missouri expressly denies responsibility for, or ownership of, any item purchased until same is delivered to the County and is accepted by the County.

APPENDIX C

Plan Sheets