



MISSOURI
HIGHWAYS and TRANSPORTATION
COMMISSION
JEFFERSON CITY, MISSOURI
SPECIFICATIONS
FOR
CONSTRUCTING OR IMPROVING

District – 4
Date Center UPS & Cooling Solution
Lee's Summit, Missouri

9-090825E

**INVITATION
FOR BID (IFB)
FORM**

**MISSOURI DEPARTMENT OF TRANSPORTATION
GENERAL SERVICES - FACILITIES
1320 CREEK TRAIL DRIVE – P.O. BOX 270
JEFFERSON CITY, MO 65102**

REQUEST NO.	9-090825E
DATE	August 18, 2009

SEALED BIDS, SUBJECT TO THE CONDITIONS ON ALL PAGES OF THIS IFB WILL BE RECEIVED AT THIS OFFICE LOCATED AT 1320 CREEK TRAIL DR., JEFFERSON CITY, MO 4:00 PM LOCAL TIME; August 25, 2009

**BIDS TO BE BASED F.O.B.
MISSOURI DEPARTMENT OF TRANSPORTATION**

F.O.B. Destinations

MoDOT, Kansas City Area District
600 NE Colbern Road
Lee's Summit, MO 64086

Facsimile or emailed bids may be accepted. Original signed docs from the lowest acceptable bidder shall be required before award.

SIGN AND RETURN BEFORE TIME SET FOR OPENING.

Attached and part of this IFB:

1. Solution Quantity and Item List (2-pages);
2. Guide Specifications (32-pages);
3. Modular Power Distribution (2-pages);
4. MHTC Terms & Conditions (5-pages);

BUYER: Clayton Hanks Clayton.Hanks@modot.mo.gov **BUYER TELEPHONE:** 573-522-9565

The purpose of this solicitation is to establish a contract to provide Data Center UPS & Cooling Solution as described herein.

1. The undersigned, having examined the proposed Contract Documents titled: "District 4, Lee's Summit – Data Center UPS & Cooling Solution" and having visited the sites and examined the conditions affecting the Work, hereby proposes and agrees to furnish all labor, materials, equipment, supplies, and everything which may be necessary or incidental thereto, as proposed by said Contract Documents, all to the satisfaction of the Chief Engineer of the Missouri Department of Transportation and the Missouri Highway and Transportation Commission, for the stipulated sum of:

_____ DOLLARS (\$_____).

2. The undersigned, acknowledges having examined and being familiar with the contract documents including the drawings, the Instructions to Bidders, General Conditions, Supplementary Conditions and the body of technical specifications.
3. The undersigned acknowledges receipt of Addenda number _____ through _____ inclusive.

Time of Completion - If this proposal is accepted, it is hereby agreed that work will begin not later than the date specified in the "Notice to Proceed" and will diligently be prosecuted in order to deliver all equipment in ready for installation condition no later than December 1, 2009. Final installation and startup services must be completed by December 18, 2009 Completion of work will be based on FINAL ACCEPTANCE of the building; "SUBSTANTIAL COMPLETION" will not be accepted as basis for completion. **Liquidated Damages** - It is agreed that time is of the essence. Because failure to complete the contract within the time fixed herein will cause serious inconvenience, loss, and damage to the state, liquidated damages will be assessed in the amount of \$750.00 per working day, for each working day after the agreed completion date that the Work is not fully completed.

Date: _____ **Firm Name:** _____

Telephone No.: _____ **Address:** _____

Fax No.: _____ **By (Signature):** _____

Federal I.D. No. _____ **Type/Print Name** _____

Email Address: _____

PREFERENCE IN PURCHASING PRODUCTS

DATE: _____

The bidders attention is directed to Section 34.076 RSMo 2000 which gives preference to Missouri corporations, firms, and individuals when letting contracts or purchasing products.

Bids/Quotations received will be evaluated on the basis of this legislation.

All vendors submitting a bid/quotation must furnish ALL information requested below.

FOR CORPORATIONS:

State in which incorporated: _____

FOR OTHERS:

State of domicile: _____

FOR ALL VENDORS:

List address of Missouri offices or places of business:

THIS SECTION MUST BE COMPLETED AND SIGNED:

FIRM NAME: _____

ADDRESS: _____

CITY: _____ **STATE:** _____ **ZIP:** _____

BY (signature required): _____

Federal Tax I.D. #: _____ **if no Federal Tax I.D. # - list Social Security #:** _____

NOTE: For bid/quotation to be considered, the "Preference in Purchasing Products" form must be on file in the General Services (Facilities Management) Division and must be dated in the current calendar year.

MISSOURI DOMESTIC PRODUCTS PROCUREMENT ACT

The bidder's attention is directed to the Missouri Domestic Products Procurement Act, Sections 34.350 to 34/359, RsMO, which requires all manufactured goods or commodities used or supplied in the performance of this contract or any subcontract to be manufactured or produced in the United States.

Section 34.355, RsMO, requires the vendor or contractor to certify his compliance with Section 34.353 and, if applicable, Section 34.359, RsMO, at the time of bidding **and** prior to payment. Failure to comply with Section 34.353, RsMO, during the performance of the contract **and** to provide certification of compliance prior to payment will result in nonpayment for those goods or commodities.

Section 34.353.2, RsMO, specifies that it does not apply where the total contract is less than Twenty-Five Thousand Dollars (\$25,000.00). If your total bid is Twenty-Five Thousand Dollars (\$25,000.00) or more, you **must** complete this form as directed below.

Failure to complete and return this document with this bid will cause the State to presume the manufactured goods or products listed in the bid are not manufactured or produced in the United States, and the bid will be evaluated on that basis. Please read the certification appearing below on this form.

- [] If all the goods or products specified in the attached bid which the bidder proposes to supply to the State shall be manufactured or produced in the "United States" as defined in Section 34.350, RsMO, check the box at left.

- [] If only one item of any particular goods or products specified in the attached bid is manufactured or produced in the "United States" as defined in Section 34.350, RsMO, check the box at left and list the items (or item number) here:

- [] If any or all of the goods or products specified in the attached bid which the bidder proposes to supply to the State are **not** manufactured or produced in the "United States" as defined in Section 34.350, RsMO, then: (a) check the box at left; (b) list below, by item (or item number), the country other than the United States where each good or product is manufactured or produced; and (c) check the boxes to the left of the paragraphs below if applicable and list the corresponding items (or item numbers) in the spaces provided.

Item (or item number)	Location Where Item Manufactured or Produced

(attach an additional sheet if necessary)

- [] The following specified goods or products cannot be manufactured or produced in the United States in sufficient quantities or in time to meet the contract specifications. Items (or item numbers): _____

- [] The following specified goods or products must be treated as manufactured or produced in the United States, in accordance with an existing treaty, law, agreement, or regulation of the United States, including a treaty between the United States and any foreign country regarding export-import restrictions or international trade. Items (or item numbers): _____

CERTIFICATION

By submitting this document, completed as directed above, with a bid, the bidder certifies under penalty of making false declaration (Section 575.060, RsMO) that the information contained in this document is true, correct and complete, and may be relied upon by the State in determining the bidders qualifications under and in compliance with the Missouri Domestic Products Procurement Act.

The bidder's failure to complete and return this document with the bid as directed above will cause the State to presume the manufactured goods or products listed in the bid are not manufactured or produced in the United States, and the bid will be evaluated on that basis pursuant to Section 34.353.3(2), RsMO.

MISSOURI SERVICE-DISABLED VETERAN BUSINESS PREFERENCE

By virtue of statutory authority, RSMo 34.074, a preference will be given all contracts for the performance of any job or service to service-disabled veteran business either doing business as Missouri firms, corporations, or individuals; or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less or whenever competing bids, in their entirety, are comparable.

Definitions:

Service-Disabled Veteran is defined as any individual who is disabled as certified by the appropriate federal agency responsible for the administration of veterans' affairs.

Service-Disabled Veteran Business is defined as a business concern:

- a. Not less than fifty-one (51) percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than fifty-one (51) percent of the stock of which is owned by one or more service-disabled veterans; and
- b. The management and daily business operations of which are controlled by one or more service-disabled veterans.

If an offeror meets the definitions of a service-disabled veteran and a service-disabled veteran business as defined in 34.074 RSMo and is either doing business as a Missouri firm, corporation, or individual; or maintains a Missouri office or place of business, the offeror **must** provide the following with the proposal in order to receive the Missouri service-disabled veteran business preference over a non-Missouri service-disabled veteran business when the quality of performance promised is equal or better and the price quoted is the same or less or whenever competing proposals, in their entirety, are comparable:

- a. A copy of a letter from the Department of Veterans Affairs (VA), or a copy of the offeror's discharge paper (DD Form 214, Certificate of Release or Discharge from Active Duty) from the branch of service the offeror was in, stating that the offeror has a service-connected disability rating ranging from 0 to 100% disability; and
- b. A completed copy of this exhibit

(NOTE: For ease of evaluation, please attach copy of the above-referenced letter from the VA or a copy of the offeror's discharge paper to this Exhibit.)

By signing below, I certify that I meet the definitions of a service-disabled veteran and a service-disabled veteran business as defined in 34.074 RSMo and that I am either doing business as a Missouri firm, corporation, or individual; or maintain Missouri offices or places of business at the location(s) listed below.

Veteran Information

Business Information

Service-Disabled Veteran's Name, (Please Print)

Service-Disabled Veteran's Signature

Service-Disabled Veteran Business Name

Missouri Address of Service-Disabled Veteran Business

SUBCONTRACTOR LISTING

1. For portions of the Work equaling or exceeding 1% of the total proposed Contract Sum, the undersigned proposes to use the following subcontractors. Except as otherwise approved by the Owner, the undersigned proposes to perform all other portions of the Work with his own forces.

2. Portion of the Work:	Subcontractor name and address:
_____	_____

_____	_____

_____	_____

_____	_____

USE ADDITIONAL SHEETS
IF REQUIRED

PROVIDE SIGNATURE
IDENTICAL TO THAT
SHOWN ON THE BID FORM

BIDDER:

by _____

Solution Quantity and Item List

Qty Item Description

Area name: Area 1
InfraStruXure Designer

Equipment

1	PDPM288G6H PDPM288G6H - 300MM RACK, 266kW, Auto Transformer, 72 poles, Modular Distribution
1	PDPM288G6H PDPM288G6H - 300MM RACK, 266kW, Auto Transformer, 72 poles, Modular Distribution
1	PDPM288G6H PDPM288G6H - 300MM RACK, 266kW, Auto Transformer, 72 poles, Modular Distribution
1	PDPM288G6H PDPM288G6H - 300MM RACK, 266kW, Auto Transformer, 72 poles, Modular Distribution
1	ACPCW40-150 InRoom Chilled Water Assemble to Order
1	ACPCW HEAT REJECTION ACPCW HEAT REJECTION
1	0M-61274 DOWNFLOW, CHILLED WATER, SIZE 2
1	ACP VOLTAGE ACP VOLTAGE
1	0M-61472 460V 60 HZ SIZE 1-5
1	ACPCW VALVE ACPCW VALVE
1	0M-61496 3-WAY CHILLED WATER CONTROL VALVE, SIZE 2
1	885-3499 LABEL NAMEPLATE
1	885-3547 LABEL NAMEPLATE
1	885-3546 LABEL - START-UP
1	885-7705D DECAL INSTALLER NOTICE
1	884-0700A TAG PRESSURE WARNING
1	885-7704 DECAL, GROUNDING NOTICE
1	0B1782 BEZEL ASSY - DISPLAY
1	870-80086 BEZEL -DISPLAY
1	0A-0486 ARTWORK - DISPLAY BEZEL
1	ACP HEAT AND HUMID ACP HEAT AND HUMID
1	0M-61475 HEAT AND HUMID 400-460V 50-60 HZ, SIZE 2
1	ACPCW40-150 InRoom Chilled Water Assemble to Order
1	ACPCW HEAT REJECTION ACPCW HEAT REJECTION
1	0M-61274 DOWNFLOW, CHILLED WATER, SIZE 2
1	ACP VOLTAGE ACP VOLTAGE
1	0M-61472 460V 60 HZ SIZE 1-5
1	ACPCW VALVE ACPCW VALVE
1	0M-61496 3-WAY CHILLED WATER CONTROL VALVE, SIZE 2
1	885-3499 LABEL NAMEPLATE
1	885-3547 LABEL NAMEPLATE
1	885-3546 LABEL - START-UP
1	885-7705D DECAL INSTALLER NOTICE
1	884-0700A TAG PRESSURE WARNING
1	885-7704 DECAL, GROUNDING NOTICE
1	0B1782 BEZEL ASSY - DISPLAY
1	870-80086 BEZEL -DISPLAY
1	0A-0486 ARTWORK - DISPLAY BEZEL
1	ACP HEAT AND HUMID ACP HEAT AND HUMID
1	0M-61475 HEAT AND HUMID 400-460V 50-60 HZ, SIZE 2
2	ACAC75108 InRoom, Condensate Pump 460-480/3/60
2	ACFS76006 InRoom Floorstand NAM Only, Size 2, Height ,12 inches
10	ACAC20003 CDU Flexible Fluid Piping - 100 Feet (30.4 Meters)
6	ACAC20006 CDU Flexible Fluid Piping Couplings (4 per pack)
2	ACAC20008 CDU Flexible Fluid Piping Clamp/Hanger (qty of 50)
7	ACAC20005 CDU Flexible Fluid Piping Insulation - 100 Feet (30.4 Meters)
10	ACAC20003 CDU Flexible Fluid Piping - 100 Feet (30.4 Meters)
6	ACAC20006 CDU Flexible Fluid Piping Couplings (4 per pack)
2	ACAC20008 CDU Flexible Fluid Piping Clamp/Hanger (qty of 50)
7	ACAC20005 CDU Flexible Fluid Piping Insulation - 100 Feet (30.4 Meters)
1	SY125K500DR-PD APC Symmetra PX 125kW Scalable to 500kW with Right Mounted Maintenance Bypass and Distribution
1	SYBFXR8S APC Symmetra PX 250/500kW Battery Enclosure for up to 8 Battery Modules & Start Up
1	PD3PADAPT1 Adaptor for T1 Type Circuit Breaker, 3 Pole
2	PD3PADAPT5 Adaptor for T5 Type Circuit Breaker, 3 Pole
1	PD3P70AT1B 3-Pole Circuit Breaker, 70A, T1 Type for Symmetra PX250/500kW
4	PD3P400AT5B 3-Pole Circuit Breaker, 400A, T5 Type for Symmetra PX250/500kW
1	PDM3520IEC309-320 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 320cm
1	PDM3520IEC309-380 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 380cm
1	PDM3520IEC309-500 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 500cm
2	PDM3520IEC309-560 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 560cm
1	PDM3520IEC309-620 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 620cm
2	PDM3520IEC309-680 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 680cm
1	PDM3520IEC309-740 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 740cm
3	PDM3520IEC309-800 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 800cm
3	PDM3520IEC309-920 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 920cm
1	PDM3520IEC309-1040 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 1040cm
7	PDM3520IEC309-1680 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 1680cm
1	PDM3520IEC309-260 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 260cm
2	PDM3520IEC309-860 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 860cm
2	PDM3520IEC309-980 APC IT Power Distribution Module 3 Pole 5 Wire 20A 240V IEC309 980cm
2	ACFD12-B Cooling Distribution Unit 12 Circuit, Bottom/Top Mains, Bottom Distribution Piping
12	ACRC103 In Row RC Chilled Water, 200-240V 50/60 Hz, IEC 309-16

Solution Quantity and Item List

Service

12	WSTRTUP7X24-AX-26 Start-Up Service 7x24 for InfraStruXure® InRow RC
4	WSTRTUP7X24-PD-30 Start-Up Service 7x24 for 1/2 Rack Remote Power Panel
2	WSTRTUP7X24-AX-25 Start-up Service 7x24 for InRoom Chilled Water 28-87kw
1	WASSEM1-3-AX-26 Scheduled Assembly Service for 1-3 InfraStruXure InRow RC
5	WASSEM1-2-AX-26 Scheduled Assembly Service for 1-2 Additional InfraStruXure InRow RC
4	WASSEMPDU-PD-30 Scheduled Assembly Service for (1) 1/2 Rack Remote Power Panel
12	WSPMV5X8-AX-26 Semi-Annual Preventative Maintenance 5x8 for InfraStruXure® InRow RC
14	WUPGPMV7X24-AX-00 7X24 Scheduling Upgrade from Existing Preventive Maintenance Service
4	WPMV7X24-PD-30 (1) Preventive Maintenance Visit 7x24 for (1) 1/2 Rack Remote Power Panel
1	WPMV7X24-NX-10 (1) Preventive Maintenance Visit 7X24 for (1) Symmetra 250kW UPS, First (2) XR Frames and PDU
2	WSPMV5X8-AX-25 Semi-Annual Preventative Maintenance 5x8 For InRoom Chilled Water 28-87kw
1	WSITECOORD Site Coordination Service

Area name: Area 2

Additional Parts and Accessories

Equipment

2	ACAC30005 Wind baffle for chiller size 200 to 220kW
6	PDM1320IEC-3P-2 APC IT Power Distribution Module 3x1 Pole 3 Wire 20A 240V IEC309 680cm 860cm 1040cm
2	PDM1320IEC-3P-3 APC IT Power Distribution Module 3x1 Pole 3 Wire 20A 240V IEC309 1680cm 1680cm 1680cm
2	ACCH200N-AKA-D10S Air Cooled Chiller 200 kW, 460-480V/60hz, R410A, 10HP Pump, single feed

Service

2	WSTRTUP7X24S-AX-53 Start Up Service, Air Cooled Chiller 200-220 kW, Standard
2	WSPMV7X24-AX-53 Semi-Annual Preventative Maintenance 7X24, Air Cooled Chiller 200-220 kW

Area name: Area 3

Custom Solution

Equipment

2	QCRAC-MISC-QDM80168-62 Remote Temperature sensor for APC-Carrier Chiller
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Area name: Area 4

Custom Solution

Equipment

1	QCRAC-MISC-QDM3454-03 CW Storage Tank, 1040 Gal, Insulated with 1" thick Armaflex and White Vinyl Coating
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APC Symmetra PX250/500kW
480V Systems only

GUIDE SPECIFICATIONS FOR
25kW-500kW
Uninterruptible Power System

PART 1 - GENERAL

- A. This specification describes the operation and functionality of a continuous duty, three-phase, solid-state, on-line double conversion static Uninterruptible Power System (UPS) hereafter referred to as the UPS. The UPS shall utilize a rack-mounted N+1 redundant, scalable array architecture. The system power train shall be comprised of 25kVA/25kW power modules and be capable of being configured for N+X redundant operation at the rated system load. In systems operating at a load where the system is N+1 or greater, the UPS shall facilitate the replacement of power modules while the system remains in normal operation, without the requirement to transfer to bypass (hot swappable).
- B. Each 25kVA/25kW power module contains a fully rated, power factor corrected input rectifier / boost converter hereafter referred to as the PFC input stage, a fully rated output inverter, and battery charging, circuit. The system shall also be comprised of a hot swappable continuous duty bypass static switch module, redundant control modules, redundant logic power supplies, and touch screen user interface/display. Hot swappable / user replaceable battery modules shall be available as an option. All of the above system components are housed in a standard APC Netshelter SX Racks and SX half rack with the following dimensions, 600mm (W) x 1070mm(D) x 2000mm(H), 750mm (W) x 1070mm(D) x 2000mm(H) and 300mm (W) x 1070mm(D) x 2000mm(H).
- C. In addition, this specification describes the performance, functionality, and design of the UPS Maintenance Bypass Cabinet with output distribution, hereafter referred to as the MBwD and the Battery System.
- D. The UPS and associated equipment shall operate in conjunction with a primary power supply and an output distribution system to provide quality uninterrupted power for mission critical, electronic equipment load.
- E. D. All programming and miscellaneous components for a fully operational system as described in this specification shall be available as part of the UPS.

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1.2 STANDARDS

- A. UL 1778 (cUL) EN/IEC 60950-1
- B. UL60950 Information Technology Equipment
- C. EN50091-2 / IEC62040-2 (class A), FCC15A
- D. EN/IEC62040-3
- E. EN/IEC 61000-4-2 level 3, performance criteria A
- F. EN/IEC 61000-4-3 level 2, performance criteria A
- G. EN/IEC 61000-4-4 level 2, performance criteria A
- H. EN/IEC 61000-4-5 Level 3 criteria A
- I. VFI-SS-112
- J. VFI-SS-111

Where applicable, the UPS shall also be designed in accordance with publications from the following organizations and committees

- A. NFPA- National Fire Protection Associations
- B. NEMA - National Electrical Manufacturers Association
- C. OSHA - Occupational Safety and Health Administration
- D. IEEE 519-1992 Standard Practices and Requirements for Harmonic Control in Electrical Power Systems.
- E. ISO 9001
- F. ISO 14001

1.3 MODES OF OPERATION

- A. Normal: The PFC Input stage and output inverter shall operate in an on-line manner to continuously regulate power to the critical load. The input and output converters shall be capable of full battery recharge while simultaneously providing regulated power to the load for all line and load conditions within the range of the UPS specifications.
- B. Battery: Upon failure of the AC input source, the critical load shall continue being supplied by the output inverter, which shall derive its power from the battery system. There shall be no interruption in power to the critical load during both transfers to battery operation and retransfers from battery to normal operation. Upon restoration of utility power to the UPS input, the UPS shall recharge the battery

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- C. Static Bypass: The static bypass shall be used to provide controller transfer of critical load from the inverter output to the bypass source. This transfer, along with its retransfer, shall take place with no power interruption to the critical load. In the event of a UPS output fault or significant output overload emergency, this transfer shall be an automatic function. Manual transfer to Static Bypass (called "Requested bypass") shall be available in order to facilitate a controlled transfer to Maintenance Bypass.
- E. Maintenance Bypass: The system can be equipped with an optional integrated, bus connected external make-before-break Maintenance Bypass Cabinet (MBwD) to electrically isolate the UPS during routine maintenance and service of the UPS. The MBwD shall allow for the completely electrical isolation of the UPS. An option for an external make-before-break external maintenance bypass panel shall be available

1.4 SUBMITTALS

A. Proposal Submittals:

1. A bid system bill of materials.
2. Product catalog sheets or equipment brochures.
3. Product guide specifications.
4. System single-line operation diagram.
5. Installation information, including weights and dimensions.
6. Information about terminal locations for power and control connections.
7. Drawings for requested optional accessories.

B. Delivery Submittals:

1. Installation manual, which includes instructions for storage, handling, examination, preparation, installation, and start-up of UPS.
2. User manual, which includes operating instructions.

PART 2 – PRODUCT

2.1 DESIGN REQUIREMENTS

- A. The UPS shall be sized for _____ kVA and _____ kW load.
- B. The UPS battery shall be sized for _____ kW at a Power Factor of _____ for _____ minutes.

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2.2 SYSTEM CHARACTERISTICS

A. System Capacity: The system shall be rated for full kW output in the following frame sizes:

1. 250 kVA/kW- Can be configured with up to ten, 25kW power modules for 250 kW or 225 kW N+1
2. 500 kVA/kW - Can be configured with up to twenty, 25 kW modules for 500kW or 475 kW N+1

B. Input:

The system input shall be configurable as either single or dual mains derived from a three phase Wye source. Standard cable entry is through the top. Bottom cable entry can also be facilitated. Depending on the specific configuration, the use of the optional Bottom Feed Enclosure may be required.

An option shall be available to facilitate the connection of NEMA 2 compression lugs for main input, bypass input, DC input and output cable connections

1. AC Input Nominal Voltage:

System voltage shall be selectable at the front panel by service personnel with the following options:

380V , 400V, 415V and 480 V

2. AC Input Voltage Window:

+/-15% for full performance (340 - 460V at 400V, 408 - 552V at 480V)
-50% for reduced load (200V at 400V, 240V at 480V)

3. UPS Short Circuit Withstand Rating: 65,000 Symmetrical Amperes (50,000 Symmetrical Amperes with standard MBwD)

4. Maximum Frequency Range: 40-70Hz

Frequency is synchronized to bypass input when available over the standard range of 57 to 63Hz. Optional frequency tolerance range is configurable from 0.5% to 8% from front panel.

5. Input Power Factor:

Greater than 0.995 with load at 100%
Greater than 0.99 with loads above 50%

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Greater than 0.97 with loads above 25%

6. Input current limit as a percentage of output current in Normal operation, with no charging shall be limited to a maximum of 118% of the system capacity.

7. Input current Distortion with no additional filters:

less than 5%

8. Soft-Start: Shall be linear from 0-100% input current and shall not exhibit inrush. This shall take place over a user selectable 1- 60 second time period with a factory default of 10 seconds.

C. UPS Output:

1. AC Output Nominal Output:

System voltage shall be selectable at the graphical user interface by service personnel with the following options:

380V, 400V, 415V and 480 V

2. AC Output Voltage Distortion: Less than. 2% @ 100% Linear Load. Less than 6% for SMPS load as defined by EN50091-3/IEC 62040-3

3. AC Output Voltage Regulation: +/- 1% For 100 % Linear or Nonlinear Load

4. Voltage Transient Response: +/-5% maximum RMS change in a half cycle at load step 0% to 100% or 100% to 0%.

5. Voltage Transient Recovery within <50 milliseconds

6. Output Voltage Harmonic Distortion:

a. <2% THD maximum and 1% single harmonic for a 100% linear load

7. Phase Angle Displacement:

a. 120 degrees +/-1 degree for balanced load

b. 120 degrees +/-1 degrees for 50% imbalanced load

c. 120 degrees +/-3 degrees for 100% imbalanced load

8. Overload Rating:

a. Normal Operation:

1) 150% for 30 seconds before transfer to Bypass

or

2) 125% for 10 minutes before transfer to bypass

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b. Battery operation

- 1) 125% for 30 seconds

c. Bypass Operation:

- 1) 125% continuous at 480V
- 2) 1000% for 100 milliseconds

9. System AC-AC Efficiency:

Normal operation > 96% at 40% - 100% load

Battery operation > 96% at 40% to 100% load

10. Output Power Factor Rating:

0.5 leading to 0.5 lagging without any derating

2.3 ENVIRONMENTAL

A. Storage Ambient Temperature: -15 to 40C (-30 to 70C without batteries)

B. Storage relative Humidity: 0-95%

C. Operating Ambient Temperature: +32°F to 104°F (0°C to 40°C). (77°F is ideal for most battery types).

D. Operating Relative Humidity: 0 to 95% Non-condensing

E. Altitude: Maximum installation with no derating of the UPS output shall be 3,000 feet (1000m) above sea level. The UPS capacity shall be derated for altitude as follows:

1500 m / 4500 ft.95% Load

2000 m / 6000 ft.91% Load

2500 m / 8000 ft.86% Load

3000 m / 10000 ft.82% Load

F. Audible Noise (as measured three feet from surface)

At 480V Operation (at 25°C):

54 dBA at 100% load

45 dBA at 70% load

2.4 PFC Input stage

A. The PFC Input stage converters of the system are housed within the removable power modules, and shall constantly control the power imported from the mains input

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of the system, to provide the necessary UPS power for precise regulation of the DC bus voltage, battery charging, and Main Inverter regulated output power. These power modules are connected in parallel within the UPS frame.

B. Input Current Total Harmonic Distortion: The input current THDI shall be held to less than 5% at system load greater than 50% while providing conditioned power to the critical load bus, and charging the batteries under steady-state operating conditions. This shall be true while supporting both a linear or non-linear loads. This shall be accomplished without the requirement for additional or optional filters, magnetic devices, or other components.

C. Soft-Start Operation: As a standard feature, the UPS shall contain soft-start functionality, capable of limiting the input current from 0-100% of the nominal input over a default 10 second period, when returning to the AC utility source from battery operation. The change in current over the change in time shall take place in a linear manner throughout the entire operation.

D. Magnetization Inrush Current: The UPS shall exhibit zero (0) inrush current.

E. Input Current Limit:

1. The PFC Input stage shall control and limit the input current draw from utility to 137% of the UPS output. During conditions where input current limit is active, the UPS shall be able to support 100% load, charge batteries at 10% of the UPS output rating, and provide voltage regulation with mains deviation - 15%
2. In cases where the source voltage to the UPS is nominal and the applied UPS load is equal to or less than 100% of UPS capacity, input current shall not exceed 116% of UPS output current, while providing full battery recharge power and importing necessary power to account for system losses.

F. Redundancy: The UPS shall be capable of being configured with redundant PFC Input stages, each with semiconductor fusing, and logic controlled contactors to isolate a failed module from the input bus.

G. Charging:

1. The battery charging shall keep the DC bus float voltage of +/- 327v, +/-1%
2. The battery charging circuit shall contain a temperature compensation circuit, which will regulate the battery charging to optimize battery life.
3. The battery charging circuit shall remain active when in Static Bypass and in Normal Operation.
4. The UPS shall be capable of reducing the battery charging current under low input voltage conditions
5. Battery charge shall be limited to 10% of the system capacity.

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H. Back-feed Protection: The above-mentioned logic controlled contactor also provides the back-feed protection required by UL1778.

2.6 OUTPUT INVERTER

A. The UPS output inverter shall constantly develop the UPS output voltage waveform by converting the DC bus voltage to AC voltage through a set of IGBT driven bi-directional power converters. In both normal operation and battery operation, the output inverters shall create an output voltage independent of the mains input voltage. Input voltage anomalies such as brown-outs, spikes, surges, sags, and outages shall not affect the amplitude or sinusoidal nature of the output voltage sine wave of the inverters.

B. Overload Capability: The output power converters shall be capable of 230% for short circuit clearing. Steady-state overload conditions, of up to 150% of system capacity shall be sustained by the inverter for 30 seconds in normal operation. Overloads persisting past the outlined time limitation the critical load will be switched to the automatic static bypass output of the UPS.

C. Output Contactor: The output inverter shall be provided with an output mechanical contactor to provide physical isolation of the inverter from the critical bus. With this feature a failed inverter shall be isolated from the critical bus.

D. Battery Protection: The inverter shall be provided with monitoring and control circuits to limit the level of discharge on the battery system.

E. Redundancy: The UPS shall be capable of being configured with redundant output inverters, each with semiconductor fusing, and logic controlled contactors to remove a failed component from the input, DC and output critical bus.

2.7 STATIC BYPASS

A. As part of the UPS, a system static bypass switch shall be provided. The system static bypass shall provide no break transfer of the critical load from the Inverter output to the static bypass input source during times where maintenance is required, or the inverter can not support the critical bus. Such times may be due to prolonged or severe overloads, or UPS failure. The UPS and static bypass switch shall constantly monitor the auxiliary contacts of their respective circuit breakers, as well as the bypass source voltage, and inhibit potentially unsuccessful transfers to static bypass from taking place.

B. The design of the static switch power path shall consist of Silicon Controlled Rectifiers (SCR) with a continuous duty rating of 125% of the UPS output rating at 480V

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C. Automatic Transfers: An automatic transfer of load to static bypass shall take place whenever the load on the critical bus exceeds the overload rating of the UPS. Automatic transfers of the critical load from static bypass back to normal operation shall take place when the overload condition is removed from the critical bus output of the system. Automatic transfers of load to static bypass shall also take place if for any reason the UPS cannot support the critical bus.

D. Manual Transfers: Manually initiated transfers to and from static bypass shall be initiated through the UPS graphical user interface.

E. Overloads: The static bypass shall be rated and capable of handling overloads equal to or less than 125% at 480V of the rated system output continuously. For instantaneous overloads caused by inrush current from magnetic devices, or short circuit conditions, the static bypass shall be capable of sustaining overloads of 1000% of system capacity for periods of up to 100 milliseconds.

F. Modular: The static bypass switch shall be of a modular design.

G. System Protection:

As a requirement of UL1778, back-feed protection in the static bypass circuit shall also be incorporated in the system design. To achieve back-feed protection, a mechanical contactor in series with the bypass SCR(s) shall be controlled by the UPS/static switch, to open immediately upon sensing a condition where back-feeding of the static switch by any source connected to the critical output bus of the system is occurring. One such condition could be a result of a shorted SCR.

2.8 DISPLAY AND CONTROLS

A. Control Logic: The UPS shall be controlled by two fully redundant, user-replaceable / hot-swappable Intelligence modules (IM). These modules shall have separate, optically isolated, communication paths to the power and static switch modules. Logic power for the control modules shall be derived from redundant power supplies, each having a separate AC and DC input and output. The communication of the control modules shall be of Controller Area Network (CAN Bus) and EIA485.

B. Graphical User Interface: A microprocessor controlled user interface/display unit shall be located on the front of the system. The display shall consist of a 10.4 inch multicolor graphical display with 800x600 resolution.

C. Metered Data: the following data shall be available on the Graphical User Interface/display:

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Input\Output Voltages, Currents, Frequencies
Breaker & Switch Status
Battery Status
Event Log

D. Event log: The display unit shall allow the user to display a time and date stamped log.

E. Alarms: The display unit shall allow the user to display a log of all active alarms. The following minimum set of alarm conditions shall be available:

1. Input Frequency outside configured range
2. AC adequate for UPS but not for Bypass
3. Low/No AC input, startup on battery
4. Intelligence Module inserted
5. Intelligence Module removed
6. Redundant Intelligence Module inserted
7. Redundant Intelligence Module removed
8. Number of Batteries changed since last ON
9. Number of Power Modules changed since last ON
10. Number of Batteries increased
11. Number of Batteries decreased
12. Number of Power Modules increased
13. Number of Power Modules decreased
14. Number of External Battery Cabinets increased
15. Number of External Battery Cabinets decreased
16. Redundancy Restored
17. Need Battery Replacement
18. The Redundant Intelligence Module is in control
19. UPS Fault
20. On Battery
21. Shutdown or unable to transfer to battery due to overload
22. Load Shutdown from Bypass. Input Frequency Volts outside limits
23. Fault, Internal Temp exceeded system normal limits
24. Input Circuit Breaker Open
25. System level fan failed
26. Bad Battery Module
27. Bad Power Module
28. Intelligence Module is installed and failed
29. Redundant Intelligence Module is installed and failed
30. Redundancy has been lost
31. Redundancy is below alarm threshold
32. Runtime is below alarm threshold
33. Load is above alarm threshold
34. Load is no longer above alarm Threshold
35. Minimum Runtime restored

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36. Bypass is not in range (either frequency or voltage)
37. Backfeed contactor stuck in OFF position
38. Backfeed contactor stuck in ON position
39. UPS in Bypass due to Internal Fault
40. UPS in Bypass due to overload
41. System in Forced Bypass
42. Fault, Bypass Relay Malfunction
43. Q001 open/closed
44. Q002 open/closed
45. Q003 open/closed
46. Q005 open/closed
47. High DC Warning
48. High DC Shutdown
49. Low Battery Shutdown
50. Low Battery Warning
51. MBwD door open

F. Controls: The following controls or programming functions shall be accomplished by the use of the user interface/display unit. The touch screen display shall facilitate these operations:

1. Silence audible Alarm
2. Display or set the date and time
3. Enable or disable the automatic restart feature
4. Transfer critical load to and from static bypass
5. Test battery condition on demand
6. Set intervals for automatic battery tests
7. Adjust set points for different alarms
8. Potential Free (Dry) Contacts

G. The following potential free contacts shall be available on an optional relay interface board:

- a. Normal Operation
- b. Battery Operation
- c. Bypass Operation
- d. Common Fault
- e. Low Battery
- f. UPS Off

H. Communication Interface Board: A communication interface board shall provide the following communication ports which can be used simultaneously:

1. Ethernet
2. Ethernet Interface port for a Remote Display

2.9 BATTERY

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A. The UPS battery shall support an optional battery plant of modular construction made up of user replaceable, hot swappable, fused, battery modules. Each battery module shall be monitored for voltage and temperature for use by the UPS battery diagnostic. Battery charging current shall be temperature compensated.

B. The battery jars housed within each removable battery module shall be of the Valve Regulated Lead Acid (VRLA) type.

C. The UPS shall incorporate a battery management system to continuously monitor the status of each removable battery module. This system shall notify the user in the event a failed or weak battery module is found.

D. The Batteries shall be long life batteries (5-8year) and the battery casing shall be flame retardant type.

PART 3 – ACCESSORIES

3.1 BATTERY BREAKER CABINET

A. To facilitate third party battery configuration, a battery breaker cabinet in a line up netshelter enclosure shall be available. Each cabinet will monitor breaker status and battery temperature. Each circuit breaker shall be equipped shunt trip mechanisms and 1A/1B auxiliary contacts. The Battery Breaker Cabinet shall accommodate top or bottom entry for cables.

3.2 MAINTENANCE BYPASS CABINET (MBwD)

A. The maintenance bypass cabinet shall provide power to the critical load bus from the bypass source, during times where maintenance or service of the UPS is required. The MBwD shall provide a mechanical means of complete isolation of the UPS from the electrical wiring of the installation and will be mounted to the systems I/O frame.

B. As a minimum, the MBwD shall contain the following features and accessories:

1. Circuit breakers of the appropriate size, withstand rating (50kAIC rating), and trip rating for the system.
2. Minimum 1A/1B auxiliary contacts for the purpose of relaying status information of each circuit breaker / switch actuator to the UPS and static bypass.
3. Plated copper bus bar (where applicable), braced for the appropriate withstand rating (50 kAIC rating) of the system.

C. The following minimum options shall also be available for the MBC:

1. Mimic label with light indications for power flow.

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D. The MBC shall carry one of the following agency listings:

1. UL 891 Dead-Front Switchboards
2. UL1778 Uninterruptible Power Systems
3. UL60950 Information Technology Equipment

3.3 REMOTE BATTERIES

The modular batteries shall have the capability to be located remote to the UPS. In such installations, an optional side car shall be used to connect the batteries by cables to the UPS. The battery side car shall accommodate top or bottom cable entry. The side car will have over current fuses to protect the cables. The fuse status shall be monitored by the UPS.

3.4 BOTTOM FEED ENCLOSURE

For installations greater than 250kW, a bottom feed enclosure shall provide the mechanical means necessary to support bottom feeds for specific system configurations.

3.5 RELAY BOARD

A relay boards shall be provided for customer connections to external alarms or to activate external customer circuits.

3.6 SOFTWARE AND CONNECTIVITY

A. Network Adaptor: The Ethernet Web/SNMP Adaptor shall allow one or more network management systems (NMS) to monitor and manage the UPS in TCP/IP network environments. The management information base (MIB) shall be provided in DOS and UNIX "tar" formats.

B. Unattended Shutdown

1. The UPS, in conjunction with a network interface card, shall be capable of gracefully shutting down one or more servers when the UPS is operating from the battery and available runtime has reached a user defined level.

3.7 REMOTE UPS MONITORING

A. The following three methods of remote UPS monitoring shall be available:

1. Web Monitoring: Remote monitoring shall be available via a web browser such as Internet Explorer.
- 2 Simple Network Management Protocol (SNMP): Remote UPS Monitoring shall be possible through a standard MIB II compliant platform

3.8 SOFTWARE COMPATIBILITY

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A. The UPS manufacturer shall have available software to support remote monitoring and initiate the graceful shutdown for the following systems:

- a. Microsoft Windows 95/98/XP
- b. Microsoft Windows NT 4.0 SP6/2000
- c. OS/2
- d. Netware 3.2 – 5.1
- e. MAC OS 9.04, 9.22, 10
- g. Digital Unix/True 64
- h. SGI 6.0-6.5
- j. SCO UNIX
- k. SVR4 2.3, 2.41
- m. SCO Unix Ware 7.0 - 7.11
- n. SUN Solaris 2.6-2.8
- o. SUN OS 4.13, 4.14
- p. IBM AIX 4.3x-4.33g, 5.1
- q. HP-UX 9.x-11.i

Part 4 - EXECUTION

4.1 FACTORY ASSISTED START-UP

Factory startup shall be included, factory trained service personnel shall perform the following inspections, test procedures, and on-site training:

A. Visual Inspection:

- 1. Inspect equipment for signs of damage.
- 2. Verify installation per manufacturer s instructions.
- 3. Inspect cabinets for foreign objects.
- 4. Inspect Battery Units.
- 5. Inspect Power Modules.

B. Mechanical Inspection:

- 1. Check all UPS and external maintenance bypass cabinet internal control wiring connections.
- 2. Check all UPS and external maintenance bypass cabinet internal power wiring connections.
- 3. Check all UPS and external maintenance bypass cabinet terminal screws, nuts, and/or spade lugs for tightness.

C. Electrical Inspection:

- 1. Verify correct input and bypass voltage.
- 2. Verify correct phase rotation of all mains connections.

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3. Verify correct UPS control wiring and terminations.
4. Verify voltage of all battery modules.
5. Verify neutral and ground conductors are properly landed.
6. Inspect external maintenance bypass switch for proper terminations and phasing.

D. Site Testing:

1. Ensure proper system start-up.
2. Verify proper firmware control functions.
3. Verify proper firmware bypass operation.
4. Verify proper maintenance bypass switch operation.
5. Verify system set points.
6. Verify proper inverter operation and regulation circuits.
7. Simulate utility power failure.
8. Verify proper charger operation.
9. Document, sign, and date all test results.

E. On-Site Operational Training: During the factory assisted start-up, operational training for site personnel shall include touch screen operation, LED indicators, start-up and shutdown procedures, maintenance bypass and AC disconnect operation, and alarm information.

4.2 MANUFACTURER'S FIELD SERVICE

A. Worldwide service: The UPS manufacturer shall have a worldwide service organization Available, consisting of factory trained field service personnel to perform start-up, preventive maintenance, and service of the UPS system and power equipment. The service organization shall offer 24 hours a day, 7 days a week, 365 days a year service support.

B. Replacement parts: Parts shall be available through the worldwide service organization 24 hours a day, 7 days a week, 365 days a year. The worldwide service organization shall be capable of shipping parts within 4 working hours or on the next available flight, so that the parts may be delivered to the customer site within 24 hours.

4.3 MAINTENANCE CONTRACTS

A complete offering of preventative and full service maintenance contracts for the UPS system and the battery system shall be available. All contract work shall be performed by APC factory trained service personnel.

4.4 TRAINING

UPS service training workshop: A UPS service training workshop shall be available from the UPS manufacturer. The service training workshop shall include a combination of lecture and practical instruction with hands-on laboratory sessions. The service training workshop shall include instruction about safety procedures, UPS

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operational theory, sub-assembly identification and operation, system controls and adjustment, preventive maintenance, and troubleshooting and trainer user level repair.

End of Section 16611

Cooling Distribution Unit (CDU)

GUIDE SPECIFICATIONS

1.0 GENERAL

1.01 Summary

1. These specifications describe requirements for a system designed for cooling distribution to modular In-Row RC air conditioners. The system shall be designed to distribute and balance the chilled water / glycol in flexible jointless piping to the air conditioners. The manufacturer shall design and furnish all the piping and fittings required for cooling distribution from the distribution unit to the In-Row RC's.

1.02 Design Requirements

1. The cooling distribution unit shall be APC, shall include a supply and return distribution manifold. Each manifold should include 12 pipe branches with shut-off and balancing valves. The unit shall be as described in the following specification as manufactured by APC.

1. Model number: _____.
2. Total number of In-Row RC's: _____.
3. Flow per circuit _____ gpm(l/s)
4. Water pressure drop thru the CDU: _____ ft. (kPa)

2. The unit shall be factory-assembled with isolation and balancing valves and shall be designed to be used with jointless flexible piping.

1.03 Submittals

1. Submittals shall be provided with the proposal and shall include: overall dimensions of the unit, total of circuits used, maximum chilled water/glycol flow per circuit, calculated run of flexible piping per circuit and piping connection drawings at the CDU and at the In-Row RC.

1.04 Quality Assurance

1. The unit shall be factory tested prior to shipment. Testing shall include complete pressure and leak testing to ensure system integrity. The system shall be inspected for quality control before shipment.
2. The unit shall be UL Listed to UL 1995 and CSA C22.2 No. 236

1.05 Warranty

The system parts shall be provided with a warranty against defects for a period of 12 months from date of shipment from factory.

2.01 Standard Components

A. Cabinet Construction

1. The frame shall be 16 gauge formed steel and bolted together.
2. The front and back exterior panels shall be 18 gauge steel and the side exterior panels shall be 20 gauge steel.
3. All exterior panels and corner posts on the frame shall be powder coated black. The unit shall include front removable panels for system balancing and service and side removable panels to allow for main piping connections.
4. The front panels shall have provisions to be locked with a key.
5. The unit shall include casters for easy installation and leveling feet at each corner.
6. All piping including headers and distribution lines shall be insulated with ½-inch (12.7 mm) closed cell insulation

B. Connections

1. The unit shall include either top connections to be piped overhead attached thru the ceiling structure or bottom connections to be piped thru the raised floor. The main supply and return connection shall be 3 inches (76.2 mm) NPT each.

C. Valves

1. Each supply branch shall be 1 inch (25.2 mm) I.D. and shall include a balancing & shut-off valve to provide a single point of balancing at the distribution unit.
2. Each return branch shall be 1 inch (25.2 mm) I.D. and it shall include a ball valve for isolation.
3. A ¼" (6.35 mm) male flare port with Schrader valve shall be include in each supply and return branch for pressure test and drain.

D. Drain Pan

1. A drain pan with a ¼" (6.35 mm) plastic tube connection shall be included at the bottom of the unit.

E. Flexible Piping

1. Jointless flexible piping shall be used for chilled water/glycol distribution from the CDU to the In-row RC's.
2. The piping shall be crosslinked polyethylene/aluminum/crosslinked polyethylene tubing (PEX-AL-PEX) manufactured by PEX-b method.

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3. The temperature and pressure ratings of the piping shall be: 200°F (93.3°C) at 100 psi (689.5 kPa), 180°F (82.2°C) at 125 psi (861.8 kPa), and 73°F (22.8°C) at 200 psi (1378.9 kPa).
 4. Piping shall conform with ASTM Standard: ASTM E814, ASTM F1281 and NSF Standard: NSF-PW 14 and 61
 5. Piping length shall not exceed 150 feet (45.72 m) from the CDU to the air conditioner and it shall only include fittings at the CDU and at the In-Row RC.
 6. Pipe connections to the CDU and In-Row RC shall be made with multipress couplings that are crimped at each connection to ensure no leakage in the system.
 7. All PEX-AL-PEX piping shall be insulated in the field with ½-inch (12.7 mm) closed cell insulation.

F. Pipe Clamps

1. Pipe clamps shall be factory provided and field installed at least every 32 inches (812.8 mm) when piping is installed overhead to properly secure the PEX piping to the ceiling. (Refer to local codes for exact spacing requirements)
2. The clamps shall include a center hole that permits the use of a 3/8" (9.5 mm) threaded rod for anchoring.

G. Pipe Shroud

1. A pipe shroud constructed of the same material and finish than the CDU shall be shipped loose for installation at the top of the CDU.

H. Insulation

1.38-inch x ½-inch (35.05 mm x 12.7 mm) closed cell insulation

3.0 IMPLEMENTATION

A. Installation

1. Installation of the system shall be in accordance to the Guidelines for Installation by the manufacturer.
2. Installation shall be performed by the manufacturer or supervised by the manufacturer service representative.
3. Installation of piping and connections from the Cooling Distribution Unit to the Inrow RC's shall be performed by the manufacturer or supervised by the manufacturer service representative.

Note: Minimum clearance for overhead piping is 18 inches (457.2 mm) from top of the CDU to Ceiling (not top of shroud). Minimum raised floor height for bottom piping is 12 inches (304.8 mm)

B. Startup

1. Start up of the Cooling Distribution Unit shall be performed by the manufacturer.

Guide Specifications

PART 1 —

1.01 STANDARD COMPONENTS

A. CABINET CONSTRUCTION

- 1 Exterior panels shall be 18 gauge metal with 5 lb/ft³ (80 kg/m³) density foam insulation. Insulation complies with UL94-5VA ASTM E84 flame spread and smoke developed rating of 25/50. Front and rear exterior panels shall be 18 gauge perforated steel with 69.5% open free area, and equipped with a keyed lock to provide a means of securing access to the internal components of the unit.
- 2 The frame shall be constructed of 16 gauge formed steel welded for maximum strength. All units shall provide full service from the front and rear, allowing units to be placed within a row of racks.
- 3 All exterior panels and frame shall be powder coated for durability and attractive finish. Exterior frame and panel color shall have color values: L = 74.50, a = -.53, b = +8.20.
- 4 Units shall include casters and leveling feet to allow ease of installation in the row and provide a means to level the equipment with adjacent IT racks.

B. VARIABLE SPEED DIRECT DRIVE MIXED FLOW DC FAN ASSEMBLY

- 1 Fan: The unit shall be configured for draw-through air pattern to provide uniform air flow over the entire face of the coil. Each unit shall include eight 200 mm mixed flow direct drive DC axial fans. Each fan assembly should be designed to provide 362.5 CFM (171.1 l/s) for total unit airflow of 2900 CFM (1368.6 l/s).
- 2 Variable Speed Fans: Fans shall be variable speed capable of modulating from 30-100%. Fans shall soft start to minimize in-rush current when starting.
- 3 Fan Protection: Each fan assembly shall consist of a plastic injection molded bezel with integral fan discharge finger guard. Inlet of the fan should include a cage type finger guard.
- 4 Operation and Service: The unit should be capable of operation in the event of a fan failure. Fans shall be replaceable while the unit is in operation.

C. DUAL POWER SUPPLIES AND A-B POWER INPUT

- 1 Input Power Feeds: Dual A-B power inputs should be a locking NEMA or IEC plug connection suitable for the input power selected.
- 2 Power Supplies: The unit shall include two power supplies, each capable of running the unit at 60% capacity in the event of a single power supply failure. Unit power consumption is not to exceed 1100 watts during normal operation.
- 3 Operation and Service: Power supply shall be user replaceable.

D. MICROPROCESSOR CONTROLLER

- 1 Monitoring and Configuration: The master display shall allow monitoring and configuration of the air conditioning unit through a menu-based control. Functions include status reporting, set-up, and temperature set points. Four LEDs report the operational status of the connected air conditioning unit.
- 2 Controls: The microprocessor controller shall come equipped with control keys to allow the user to navigate between menus, select items, and input alpha numeric information.

- 3 Alarms: The microprocessor controller shall activate a visible and audible alarm in the occurrence of the following events:
 - a. Internal Communications Fault
 - b. Link Isolation Relay Fault
 - c. Cooling Failure
 - d. Rack Inlet High Temperature
 - e. Air Filter Clogged
 - f. Lower Return Air Sensor Fault
 - g. Upper Return Air Sensor Fault
 - h. Lower Supply Air Sensor Fault
 - i. Upper Supply Air Sensor Fault
 - j. Rack Inlet Temperature Sensor
 - k. Coil Fluid Valve Actuator Fault
 - l. Fan Fault
 - m. Water Detection Fault
 - n. Condensate Pump Fault
 - o. Fluid Flow Meter Failure
 - p. Entering Fluid High Temperature
 - q. Entering Fluid Temperature Sensor
 - r. Leaving Fluid Temperature Sensor
 - s. Condensate Pan Full Alarm
 - t. Power Feed Failure
 - u. Fan Power Supply Fault
 - v. Air Filter Run Hours Exceeded
 - w. RACS Air Pressure High
 - x. Supply Air High Temperature
 - y. Return Air High Temperature
 - z. Group Communications Lost
 - aa. Filter Sensor Fault
 - ab. RACS Pressure Sensor Fault
- 4 Logging: The microprocessor controller shall log and display all available events. Each alarm log shall contain time/date stamp as well as operating conditions at the time of occurrence. Controller shall display the run time hours for major components.

E. NETWORK MANAGEMENT CARD

The unit shall include a network management card to provide management through a computer network through TCP/IP. Management through the network should include the ability to change set points as well as view and clear alarms.

F. COOLING COIL AND CONDENSATE PAN

- 1 Cooling coil shall use raised lance type aluminum fin and 3/8 inch OD (9.5 mm) copper tube coils. Coil end supports shall be a minimum 18 gauge galvanized steel. Coil shall be rated for a maximum pressure of 400 psig (2757.9 kPa).
- 2 The unit shall consist of a primary and secondary drain pan. Secondary drain pan shall be piped to primary pan for removal of condensate. Primary drain pan shall include a condensate pump and dual floats for control and overflow protection. Condensate pans are V-0 thermal formed, anti-fungal, non-ferrous material for higher indoor air quality.

G. 2-WAY/3-WAY FLOATING POINT VALVE

- 1 Chilled water system shall utilize a three-way valve to regulate the amount of chilled water to the cooling coil to maintain desired conditions. Unit shall be equipped with a manual shut-off to close the by-pass leg for field configuration of 2-way or 3-way operation. Valve shall be piped internally with unions to allow for easy replacement in the field. The standard valve pressure rating shall be 600 psig.
- 2 Valve Actuator: Actuator shall be direct connect rotary floating point style actuator and should be capable of being replaced without disconnecting piping from the valve.

H. CONDENSATE PUMP

Factory Installed and wired condensate pump shall pump 1.3 gal/h (5.9 liters/hour) at 16 ft (4.9 m) of lift and a 50 ft (15.2 m) horizontal run.

I. FILTERS

- 1 Standard Air filter: <20% efficient per ASHRAE 52.1, MERV 1 per ASHRAE 52.2, 1/2" washable mesh filter
- 2 Optional Air filter: High capacity 2" pleated, UL 900 Class 2, Moisture with average atmospheric dust spot efficiency of 30% per AHRAE Standard 52.1, MERV 8 per ASHRAE 52.2

J. SELECTABLE TOP OR BOTTOM PIPING

- 1 Pipe connections for field connection from either the top or bottom of the unit. Unit connections shall be made internal to the unit.
- 2 Pipe adapter: The unit shall include two pipe adapters that convert a 1 in (25.4 mm) NPT to a 1 in (25.4 mm) BSPT (manufactured in accordance with BS21). Pipe adapters shall ship loose with the unit for field installation where applicable.

K. REMOTE TEMPERATURE SENSOR

Remote temperature sensor shall ship factory wired to the unit for placement in the field to provide control input based on rack inlet temperature.

L. FLOW METER

Flow meter shall be factory piped inside the unit and connected to microprocessor controls to provide water flow rate through the unit. The microprocessor controller shall also use this information to provide total unit capacity out of the unit while in operation.

M. CABLE WATER DETECTOR (OPTIONAL)

- 1 A leak detection sensing cable shall be shipped loose with the unit. If water or other conductive liquids contact the cable anywhere along its length, the main controller visually and audibly annunciates the leak.
- 2 The detector shall be provided with a 20 ft (6.1 m) of cable. Cable may be cascaded up to 80 ft (24.4 m).

N. BRIDGE POWER CABLE TROUGH

Overhead power distribution bridge between adjacent NetShelter racks that allows for removal of the unit without disrupting the overhead power cabling.

O. BRIDGE DATA PARTITION

Overhead cable distribution between adjacent racks that allows for removal of the unit without disrupting overhead cabling.

1.02 CHILLED WATER

The unit shall be piped in accordance with the highest commercial quality procedures. All pipe forming shall be tool bent with the proper bend radii to prevent flattening in the curve. The chilled water piping shall be insulated with closed neoprene thermal insulation. All piping connections should be made at the rear of the unit for top or bottom accessibility.

Guide Specifications

PART 1 – GENERAL

1.01 SYSTEM DESCRIPTION

Microprocessor controlled, air-cooled liquid chiller utilizing scroll compressors, low sound fans, hydronic pump system and optional fluid storage tank (sizes 050 – 167).

1.02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standard 550/590, latest revision (U.S.A.).
- B. Unit construction shall comply with ASHRAE 15 Safety Code, NEC, and ASME applicable codes (U.S.A. codes).
- C. Unit shall be manufactured in a facility registered to ISO 9001:2000 Manufacturing Quality Standard.
- D. Unit shall be full load run tested at the factory.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Unit controls shall be capable of withstanding 150°F (66°C) storage temperatures in the control compartment.
- B. Unit shall be stored and handled per unit manufacturer's recommendations.

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. General:

Factory assembled, single-piece chassis, air-cooled liquid chiller. Contained within the unit cabinet shall be all factory wiring, piping, controls, refrigerant charge (R-22 sizes 050 – 167 and R-410A size 200 and 220), and special features required prior to field start-up.

B. Unit Cabinet:

1. Frame shall be of heavy-gage galvanized steel.
2. Cabinet shall be galvanized steel casing with a baked enamel powder or pre-painted finish.
3. Cabinet shall be capable of withstanding 500-hour salt spray test in accordance with the ASTM (U.S.A.) B-117 standard.

C. Fans:

1. Condenser fans shall be direct-driven, 11-blade (sizes 050-167) and 9-blade (sizes 200 and 220) airfoil cross-section, reinforced polymer construction, shrouded-axial type, and shall be statically and dynamically balanced with inherent corrosion resistance.
2. Two-speed (size 050) or single fan operation shall allow reduced sound levels during scheduled unoccupied operating periods. Manufacturers without unoccupied reduced sound capability shall submit 1/3 octave band data and sound power data as measured by ARI 370 as confirmation of unit sound characteristics.
3. Air shall be discharged vertically upward.
4. Fans shall be protected by coated steel wire safety guards.

D. Compressors:

1. Fully hermetic scroll type compressors.
2. Direct drive, 3500 rpm (60 Hz), protected by either line break device or discharge gas thermostat, depending on motor, suction gas cooled motor.
3. External vibration isolation – rubber in shear.
4. Each compressor shall be equipped with crankcase heaters to minimize oil dilution.

E. Cooler (sizes 050 – 167):

1. Cooler shall be rated for a refrigerant working side pressure of 450 psig (3103 kPa) and shall be tested for a maximum fluid-side pressure of 150 psig (1034 kPa) (in Canada, 250 psig (1724 kPa) per Canadian National Registry requirements).
2. Cooler shall be single-pass, ANSI type 316 stainless steel, brazed plate construction.

3. Cooler shell shall be insulated with $\frac{3}{4}$ -in. (19 mm) closed-cell, polyvinylchloride foam with a maximum K factor of 0.28.
4. Cooler shall Incorporate 2 independent refrigerant circuits on sizes 120 & 167; sizes 050 & 084 shall have one independent refrigerant circuit.
5. Cooler shall have factory-installed heater, to protect cooler from ambient temperature freeze down to -20°F (-29°C).

F. Cooler (size 200 and 220)

1. Cooler shall be tested and stamped in accordance with ASME Code for a refrigerant working pressure of 445 psig (3068 kPa). Cooler shall have a maximum fluid-side pressure of 300 psig (2068 kPa).
2. Cooler shall be shell-and-tube type, direct expansion
3. Tubes shall be internally enhanced seamless copper type rolled into tube sheets.
4. Cooler shall be equipped with Victaulic -type fluid connections.
5. Cooler shell shall be insulated with $\frac{3}{4}$ -in. (19 mm) PVC foam (closed-cell) with a maximum K factor of 0.28.
6. Design shall incorporate a minimum of 2 independent direct-expansion refrigerant circuits.
7. Cooler shall have factory-installed heater, to protect cooler from ambient temperature freeze down to -20°F (-29°C).

G. Condenser:

1. Coil shall be air-cooled with integral subcooler, and shall be constructed of aluminum fins mechanically bonded to seamless copper tubes.
2. Tubes shall be cleaned, dehydrated, and sealed.
3. Assembled condenser coils shall be leak tested and pressure tested at 450psig (3103 KPa) on sizes 050 – 167; and 656 psig (4522 kPa) on sizes 200 and 220.

H. Refrigeration Components (sizes 050 – 167):

Refrigerant circuit components shall include filter drier, moisture indicating sight glass, thermal expansion device, and complete operating charge of both refrigerant R-22 and mineral compressor oil.

I. Refrigeration Components (sizes 200 and 220):

Refrigerant circuit components shall include replaceable -core filter drier, moisture indicating sight glass, electronic expansion device, discharge service valve and liquid line service valves, and complete operating charge of both refrigerant R-410A and POE compressor oil.

J. Controls, Safeties, and Diagnostics:

1. Unit controls shall include the following minimum components:
 - A. Microprocessor with non-volatile memory. Battery backup system shall not be accepted.
 - B. Separate terminal block for power and controls.

- C. Control transformer to serve all controllers, relays, and control components.
 - D. ON/OFF control switch
 - E. Replaceable solid-state controllers.
 - F. Pressure sensors installed to measure suction and discharge pressure. Thermistors installed to measure cooler entering and leaving fluid temperatures. Provision for field installed of accessory sensor to measure compressor return gas temperature.
2. Unit controls shall include the following functions:
- A. Automatic circuit lead/lag for dual circuit chillers.
 - B. Capacity control based on leaving chilled fluid temperature and compensated by rate of change of return-fluid temperature with temperature set point accuracy to 0.1°F (0.06°C).
 - C. Limiting the chilled fluid temperature pull down rate at start-up to an adjustable range of 0.2°F to 2°F (0.11°C to 1.1°C) per minute to prevent excessive demand spikes at start-up.
 - D. Seven-day time schedule.
 - E. Leaving chilled fluid temperature reset from return fluid.
 - F. Chiller water pump start/stop control and primary/standby sequencing to ensure equal pump run time.
 - G. Dual chiller control for parallel chiller applications without addition of hardware modules, control panels, thermometer wells.
 - H. Unoccupied low sound operation to limit condenser fan sound during scheduled periods.
 - I. Timed maintenance scheduling to signal maintenance activities for pumps, condenser coil cleaning, strainer maintenance and user defined maintenance activities.
 - J. Low ambient protection to energize cooler and hydronic system heaters.
 - K. Periodic pump start to ensure pump seals are properly maintained during off-season periods.
3. Diagnostics
- A. The control panel shall include, as standard, a Scrolling Marquee display capable of indicating the safety lockout condition by displaying a code for which an explanation may be scrolled at the display.
 - B. Information included for display shall be:
 - 1) Compressor lockout.
 - 2) Loss of charge.
 - 3) Low fluid flow.
 - 4) Cooler freeze protection
 - 5) Thermistor malfunction.
 - 6) Entering and leaving-fluid temperature.
 - 7) Evaporator and condenser pressure.
 - 8) Time of Day:
 - a) Display module, in conjunction with the microprocessor, must also be capable of displaying the output (results) of a service test. Service test shall verify operation of every switch, thermistor, fan, and compressor before chiller is started.
 - b) Diagnostics shall include the ability to review a list of the 20 most recent alarms with clear language descriptions of the alarm

event. Display of alarm codes without the ability for clear language descriptions shall be prohibited.

- c) An alarm history buffer shall allow the user to store no less than 20 alarm events with clear language descriptions, time and date stamp event entry.
- d) The chiller controller shall include multiple connection ports for communicating with the local equipment network and the ability to access all chiller control functions from any point on the chiller.
- e) The control system shall allow software upgrade without the need for new hardware modules.

4. Safeties

- A. Unit shall be equipped with thermistors and all necessary components in conjunction with the control system to provide the unit with the following protections:
 - 1) Loss of refrigerant charge.
 - 2) Reverse rotation.
 - 3) Low chilled fluid temperature.
 - 4) Thermal overload.
 - 5) High pressure.
 - 6) Electrical overload.
 - 7) Loss of phase.
- B. Condenser fan and factory pump motors shall have external overcurrent protection.

K. Operating Characteristics:

- 1. Unit shall be capable of starting and running at outdoor ambient temperatures from 45°F to 120°F (7°C to 50°C) for size 050 or 32°F to 125°F (0°C to 52°C) for sizes 084 – 220.
- 2. Unit shall be capable of starting up with 95°F (35°C) entering fluid temperature to the cooler.

L. Motors:

Condenser fan motors shall be totally enclosed single speed, 3-phase type with permanently lubricated bearings and Class F insulation.

M. Electrical Requirements:

- 1. Unit primary electrical power supply shall enter the unit at a single location (some units have multiple poles).
- 2. Primary electrical power supply shall be rated to withstand 120°F (50°C) sizes 050 – 167 and 125°F (52°C) sizes 200 and 220 operating ambient.
- 3. Unit shall operate on 3-phase power at the voltage shown in the equipment schedule.
- 4. Control points shall be accessed through terminal block.
- 5. Unit shall be shipped with factory installed control and power wiring installed.
- 6. Accessory storage tank cooler heater requires a separate power source.

N. Chilled Water Circuit (sizes 050 – 167):

1. Field pipe connections shall be copper NPT and shall be extended to the outside of the unit chassis.
2. Primary / Stand-by operation pump systems shall have pump discharge check valves.
3. Pumps shall be single stage design for installation in vertical or horizontal position and capable of being serviced without disturbing piping connections.
 - A. Pump casing shall be of class 30 cast iron.
 - B. The impeller shall be of cast bronze, closed type, dynamically balanced, keyed to the shaft and secured by locking cap screw.
 - C. The liquid cavity shall be sealed off at the motor shaft by an internally flushed mechanical seal with ceramic seal seat and carbon seal ring
 - D. Pump shall be rated for 150 psig working pressure.
 - E. The pump case shall have gauge tappings at the suction and discharge nozzles and include drain ports.
 - F. Motors shall be totally enclosed 3-phase type with grease lubricated ball bearings.
 - G. Each pump shall be factory tested per Hydraulic Institute Standards
4. Fluid expansion tank shall be factory installed within the chiller cabinet insulates, pre-charged and rated for a maximum working pressure of 150 psig.
5. Water pressure gages (2) shall be factory installed across the cooler and rated for 150 psi.
6. Proof-of-flow switch shall be factory installed and rated for 150 psig.
7. Balancing valve shall be factory installed to set flow gage ports shall be factory installed and rated for 300 psig.
8. Hydronic assembly shall have factory supplied electric freeze protection to -20°F (-29°C).
9. Piping shall be type-L seamless copper tubing.
10. Copper body strainer with 20 mesh screen and ball type blow down.

O. Chilled Water Circuit (sizes 200 and 220):

1. Chilled water circuit shall be rated for 150 psig (1034 kPa) working pressure.
2. Proof-of-flow switch shall be factory installed and wired.
3. Hydronic package:
 - A. Field pipe connections shall be Victaulic type.
 - B. Primary / Stand-by operation pump systems shall have a pump discharge check valve.
 - C. Pumps shall be single stage design, for installation in vertical position and capable of being serviced without disturbing piping connections.
 - 1) Pump casing shall be of class 30 cast iron.
 - 2) The impeller shall be of cast bronze, closed type, dynamically balanced, keyed to the shaft and secured by locking cap screw.
 - 3) The liquid cavity shall be sealed off at the motor shaft by an internally flushed mechanical seal with ceramic seal seat and carbon seal ring.
 - 4) Pump shall be rated for 150 psig (1034 kPa) working pressure.
 - 5) The pump case shall have gage tappings at the suction and discharge nozzles and include drain ports.

- 6) Dual pumps shall allow for the servicing of one pump without draining the chilled water loop.
- 7) Motors shall be totally enclosed 3-phase type with grease lubricated ball bearings.
- 8) Each pump shall be factory tested per Hydraulic Institute Standards.
- D. Pressure/temperature taps (3) shall be factory installed to measure the pressure differential across the pump and across the strainer.
- E. Triple-duty valve shall be factory installed.
- F. Hydronic assembly shall have factory supplied electric freeze protection to -20°F (-29°C).
- G. Piping shall be type-L seamless copper tubing.
- H. Cast iron body strainer with 20 mesh screen.

P. Standard Features

- 1. Low-Ambient Operation:
Unit shall be capable of starting and running at outdoor ambient temperatures down to -20°F (-29°C) with the addition of antifreeze in the cooler circuit, wind baffles, and field installed or factory installed solid-state Motormaster control with condenser coil temperature sensor.
- 2. Unit-Mounted Non-Fused Disconnect:
Unit shall be supplied with factory-installed, non-fused electrical disconnect for main power supply.
- 3. Minimum Load Control:
Unit shall be equipped with factory installed, microprocessor-controlled, minimum load control that shall permit unit operation down to a minimum of 15% capacity (varies with unit size).
- 4. Coil Protection Grilles:
Unit shall be supplied with factory (or field) installed, PVC-coated grilles to protect the condenser coil from physical damage.
- 5. Vibration Isolation:
Vibration isolation pads shall be supplied for field installation at unit mounting points. Pads shall help to reduce vibration transmission into the occupied space.

Q. Optional Features

- 1. Wind Baffles: (factory supplied and installed)
Required if wind velocity is anticipated to be greater than 5 mph (8 km/h) in low ambient operation
- 2. Chilled Water Storage Tank (field supplied on ACCH200 and ACCH220):
 - A. Fluid storage tank shall be rated for a maximum of 150 psig.
 - B. Tank shall provide a minimum 6 gallon per ton fluid storage capacity.
 - C. Tank shall fit under the chiller to minimize system footprint requirements. Tanks fitted outside of the chiller footprint shall not be acceptable.
 - D. Tank shall be constructed with a cold rolled carbon steel shell.

- E. Tank shall be insulated with $\frac{3}{4}$ -in. (19mm) closed-cell, poly vinyl-chloride foam with a maximum K factor of 0.28
 - F. Tank shall be baffled to prevent temperature stratification.
 - G. Tank shall have NPT threaded connections.
 - H. Tank shall have vent and drain plugs accessible from outside tank enclosure.
 - I. Internal heaters shall provide freeze protection to -20°F (-29°C).
3. Modbus LEI Bacnet Protocol
- A Modbus communication card shall be installed at the chiller and set up to interface with a secondary controls system.

InfraStruXure®

Modular Power Distribution

Modular Scalable Ultra-High Efficiency Power Distribution for Data Centers

480:415V Power Distribution Unit
400V Remote Power Panel



High Performance
3 Phase Modular,
Scalable Power
Distribution with
Industry Leading
Efficiency, Capacity
and Performance for
Medium to Large Data
Centers and Mission
Critical Environments

- Innovative Autotransformer Technology
- 10X Efficiency over legacy distribution methods
- Modular and Scalable
- The safest method to ensure moves adds and changes are accomplished without down time or hot-work
- High Density distribution in a sleek 12" wide cabinet design
 - PDU - 266kW
 - RPP - 277kW
- Low first cost, low TCO
- Circuit breaker modules include cord-set, branch circuit monitoring, breaker position monitoring, and pre-terminated IEC Connector
- Rack based for agility and aesthetics

InfraStruXure® Modular Power Distribution

Safe, Efficient, Scalable, 3-Phase Power Distribution with industry leading availability, agility and performance for any size data center or high density power zone

The APC InfraStruXure® Modular Power Distribution line is the world's first fully scalable and hot-swap 3-Phase power distribution system. Through the innovative use of autotransformer technology, a tenfold increase in efficiency yields greater density, reduced floor space, and much lower heat impact on today's power hungry datacenter. A fully scalable power distribution system now provides cost effective high levels of availability, while enabling addition of circuits and cord-sets without scheduling outages or conducting dangerous hot work. Seamlessly integrating into today's state-of-the-art data center designs, the InfraStruXure PDU and RPP are true modular systems. Comprised of a UL listed "touch-safe" backplane with 72 poles of 3-phase power and hot-swappable circuit breaker modules, all engineered into the worlds smallest footprint for power distribution units, this architecture can scale power distribution circuits as demand grows or as new equipment is required to be provisioned without the headache of scheduling outages, or risking hot-work.



266kW Modular PDU



3Phase, 1Phase Circuit breaker modules; C-19 Splitter assembly

The Modular PDU delivers the highest efficiency while also greatly decreasing the floor-space required for high availability applications. With industry leading power density, the InfraStruXure® Modular PDU can distribute 11.5 kW per circuit while only consuming 20 Amperes. This innovative approach for utilization of all available electricity means more power per whip at the same amperage. Other features include circuit breaker modules providing branch current and breaker positioning monitoring, pre-terminated cord-sets, and quick status LEDs. Use of higher distribution voltage also brings smaller diameter cord-sets, further reducing first costs.

The safest method to bring ultra-high efficiency and scalability to power distribution for demanding business critical applications

Modular Power Distribution

Features & Benefits



- 266kW output in a sleek, 300mm Half-rack design**
Slimmest, most space-conscious design translates to a 60% floor-space savings over traditional PDUs, with up to 80% greater power output - the same form-factor rack houses the transformerless RPP, and serves 277kW at 400V
- Innovative Autotransformer Technology brings a tenfold increase in efficiency**
At one tenth the loss of traditional dual winding isolation transformers, the electric usage saves money, and the heat penalty to existing cooling systems is greatly reduced.
- Integrated Monitoring Solution**
While the legendary PowerView display provides information locally at the PDU, a Network Management Card relays vital information to the monitoring platform of choice.
- 20A 3-Phase Circuit Breaker Modules**
A hot-swap module houses the standard 3Phase circuit breaker, current transducers and position sensors. The entire assembly is attached to a pre-terminated cord-set with multiple length options - each module is programmed to know how long it's whip is!
- IEC Connectors improve availability and safety**
A time tested approach in other parts of the world, positive locking mechanism, complete isolation at all touch-points, and robust interoperability enables standardization across all corporate locations.
- 20A 1-Phase Circuit Breaker Modules**
The same hot swap module technology is terminated with 3 individual 1Phase IEC connectors, perfect to power InRow RC modular cooling units.
- IEC connector to triple C19 "Calamari Plug"**
Another industry first from APC - directly power multiple high density rack-based network gear and servers. Bypassing a rack PDU to provide up to 20A per phase, directly attaching servers to the PDU provides even better visibility into power usage at the server level.
- Traditional Rack PDU with C13/C19 outlets**
Not every application is strictly C-19 based, so the AP7557NA basic rack PDU provides the same flexibility and features as all our rack PDUs.

Technical Characteristics

Enclosure Electrical Ratings	PDPM288G6H - PDU	PDPM277H - RPP	
Input voltage	480Y/277 V	400Y/230 V	
Wiring	3W + N + G	3W + N + G	
Conductors	5	5	
Input current	320	400	
KAIC	65	10	
Input wiring - phase (min.)	Cu : 1x 500 MCM (rated at 380A); Cu : 2x 4/0 MCM (rated at 230A) Al : 2x 250 MCM (rated at 205A)		
Input wiring - ground (min.)	Cu : #3 (400A rating); Cu : #6 if 2x (200A rating) Al : #4 if 2x (200A rating)		
Input wiring - GEC (min.)	Cu : 1/0 if 1x 500 MCM; #2 if 2x 4/0 MCM Al : #2 if 2x 250 MCM	N/A	
Input phase terminals - MCCB	Mechanical lug : 1 X #2 awg - 500MCM	Mechanical lug : 1 x 600MCM / 2 x 250MCM	
Input terminals - N, G & GEC	Mechanical lug : 1 x 600MCM / 2 x 250MCM		
Input wiring location	Top	Top or Bottom	
Cable voltage rating	600	600	
Cable temperature rating (degrees C)	90		
Input conduit size (North America)	Cu : 3" min. (1x 500 MCM); Cu : 2-12/" min. (2x 4/0 MCM) Al : 2-1/2" min. (2x 250 MCM)		
Suggested upstream breaker	320A (100% rated), 400A (80% rated)	400A (100% rated), 500A (80% rated)	
System output to distribution	415Y/240 V	400Y/230 V	
Conductors	3W + N + G		
Transformer size, type	288kVA, Autotransformer	Transformerless	
Transformer input voltage, current	480Y/277 V, 346A		
Transformer output voltage, current	415Y/240 V, 400A		
Transformer Thermal sensing	180C (NC)		
Transformer Weight	506 lbs		
Transformer Efficiency (@35% load)	99.81%		
Transformer Frequency	60hZ		
Transformer noise	<50db @ 1m		
Circuit Breaker Modules	20A 3 Phase		20A 1 Phase
Breaker type, rating, protection	20A		16A
Input current (nominal)	20A	16A	
Output voltage	240V	240V	
Connector type	IEC 309 5wire	IEC 309 3 wire	
Cord-set Lengths (CM)	80,140, 200, 260, 320, 380, 440, 500, 560, 620, 680, 740, 800, 860, 920, 980, 1080	260, 380, 500 680, 860, 1040 1680, 1680, 1680 <i>Triple 1 phase outputs</i>	

Missouri Highways and Transportation Commission
Standard Bid/Proposal Provisions, General Terms and Conditions and Special Terms and Conditions

STANDARD SOLICITATION PROVISIONS

- a. The Missouri Department of Transportation (MoDOT) reserves the right to reject any or all bids/quotes/proposals, and to accept or reject any items thereon, and to waive technicalities. In case of error in the extension of prices in the bid/quote/proposal, unit prices will govern.
- b. All bids/quotes/proposals must be signed with the firm name and by a responsible officer or employee. Obligations assumed by such signature must be fulfilled.
- c. By virtue of statutory authority, a preference will be given to materials, products, supplies, provisions and all other articles produced, manufactured, made or grown, within the State of Missouri.
- d. Time of delivery is a part of the consideration and, if not otherwise stated in the solicitation documents, must be stated in definite terms by the Bidder/Offeror and must be adhered to. If time varies on different items, the Bidder/Offeror shall so state.
- e. If providing bids/quotes/proposals for commodities, the Bidder/Offeror will state brand or make on each item. If bidding or proposing other than the make, model or brand specified, the manufacturer's name, model number or catalog number must be given.
- f. **For bids/proposals of \$25,000 or more, no bids/proposals by telephone, telegram or telefax will be accepted. Due to the urgent nature of the needed items, this provision is hereby waived.**
- g. The date specified for the returning of bids/quotes/proposals is a firm deadline and all bids/quotes/proposals must be received at the designated office by that time. The Department does not recognize the U.S. Mail, Railway Express Agency, Air Express, or any other organization, as its agent for purposes of accepting proposals. All proposals arriving at the designated office after the deadline specified will be rejected.

GENERAL TERMS AND CONDITIONS

General Performance

- a. This work is to be performed under the general supervision and direction of the Missouri Department of Transportation (MoDOT) and, if awarded any portion of the work, the Contractor agrees to furnish at his own expense all labor and equipment required to complete the work, it being expressly understood that this solicitation is for completed work based upon the price(s) specified and is not a solicitation for rental of equipment or employment of labor by MoDOT, and MoDOT is to have no direction or control over the employees used by the Contractor in performance of the work.

Deliveries

- a. Unless otherwise specified on the solicitation documents or purchase order, suppliers shall give at least 24 hours advance notice of each delivery. Delivery will only be received between the hours of 8:00 a.m. to 3:00 p.m., Monday through Friday. Material arriving after 3:00 p.m. will not be unloaded until the following workday. No material will be received on Saturday, Sunday or state holidays.
- b. If the prices bid herein include the delivery cost of the material, the Contractor agrees to pay all transportation charges on the material as FOB - Destination. Freight costs must be included in the unit price bid and not listed as a separate line item.
- c. Any demurrage is to be paid by the Contractor direct to the railroad or carrier.

Nondiscrimination

- a. The Contractor shall comply with the Regulations relative to nondiscrimination in federally-assisted programs of the Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.
- b. All solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials or leases of the Contractor's obligations under this contract and the Regulations, will be relative to nondiscrimination on the grounds of race, color, or national origin.
 - 1) Sanctions for Noncompliance: In the event of the Contractor's noncompliance with the nondiscrimination provisions of this contract, MoDOT shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:
 - i. withholding of payments to the Contractor under the contract until the Contractor complies, and/or,
 - ii. cancellation, termination or suspension of the contract, in whole or in part.

Contract/Purchase Order

- a. By submitting a bid/quote/proposal, the Bidder/Offeror agrees to furnish any and all equipment, supplies and/or services specified in the solicitation documents, at the prices quoted, pursuant to all requirements and specifications contained therein.
- b. A binding contract shall consist of: (1) the solicitation documents, amendments thereto, and/or Best and Final Offer (BAFO) request(s) with any changes/additions, (2) the Contractor's proposal and/or submitted pricing, and (3) the MHTC's acceptance of the proposal and/or bid by purchase order or post-award contract.
- c. A notice of award does not constitute an authorization for shipment of equipment or supplies or a directive to proceed with services. Before providing equipment, supplies and/or services, the Contractor must receive a properly authorized purchase order and/or notice to proceed.
- d. The contract expresses the complete agreement of the parties and performance shall be governed solely by the specifications and requirements contained therein. Any change, whether by modification and/or supplementation, must be accomplished by a formal contract amendment signed and approved by and between the duly authorized representative of the Contractor and the duly authorized representative of the MHTC, by a modified purchase order prior to the effective date of such modification. The Contractor expressly and explicitly understands and agrees that no other method and/or no other document, including correspondence, acts, and oral communications by or from any person, shall be used or construed as an amendment or modification.

Missouri Highways and Transportation Commission
Standard Bid/Proposal Provisions, General Terms and Conditions and Special Terms and Conditions

Subcontracting

- a. It is specifically understood that no portion of the material or any interest in the contract, shall be subcontracted, transferred, assigned or otherwise disposed of, except with the written consent of MoDOT. Request for permission to subcontract or otherwise dispose of any part of the work shall be in writing to MoDOT and accompanied by documentation showing that the organization which will perform the work is particularly experienced and equipped for such work.
- b. Consent to subcontract or otherwise dispose of any portion of the work shall not be construed to relieve the Contractor of any responsibility for the production and delivery of the contracted work and the completion of the work within the specified time.
- c. All payments for work performed by a subcontractor shall be made to the Contractor to whom the contract was awarded and the purchase order issued.

Invoicing and Payment

- a. MoDOT is exempt from paying Missouri Sales Tax, Missouri Use Tax and Federal Excise Tax. However, the Contractor may themselves be responsible for the payment of taxes on materials they purchase to fulfill the contract. A Project Tax Exemption Certificate will be furnished to the successful Bidder/Offeror upon request if applicable.
- b. Each invoice should be itemized in accordance with items listed on the purchase order and/or contract. The statewide financial management system has been designed to capture certain receipt and payment information. Therefore, each invoice submitted must reference the purchase order number and must be itemized in accordance with items listed on the purchase order. Failure to comply with this requirement may delay processing of invoices for payment.
- c. Unless otherwise provided for in the solicitation documents, payment for all equipment, supplies, and/or services required herein shall be made in arrears. The Missouri Highways and Transportation Commission (MHTC) shall not make any advance deposits.
- d. The MHTC assumes no obligation for equipment, supplies, and/or services shipped or provided in excess of the quantity ordered. Any authorized quantity is subject to the MHTC's rejection and shall be returned at the Contractor's expense.
- e. The MHTC reserves the right to purchase goods and services using the state-purchasing card.

Applicable Laws and Regulations

- a. The contract shall be construed according to the laws of the State of Missouri. The Contractor shall comply with all local, state, and federal laws and regulations related to the performance of the contract.
- b. The Contractor must be registered and maintain good standing with the Secretary of State of the State of Missouri and other regulatory agencies, as may be required by law or regulations. Prior to the issuance of a purchase order and/or notice to proceed, the Contractor may be required to submit to MoDOT a copy of their current Authority Certificate from the Secretary of State of the State of Missouri.
 - 1) Prior to the issuance of a purchase order and/or notice to proceed, all **out-of-state** Contractors **providing services** within the state of Missouri must submit to MoDOT a copy of their current Transient Employer Certificate from the Department of Revenue, in addition to a copy of their current Authority Certificate from the Secretary of State of the State of Missouri.
- c. The exclusive venue for any legal proceeding relating to or arising, out of the contract shall be in the Circuit Court of Cole County, Missouri.
- d. Pursuant to RSMo 285.530 (1), no business entity or employer shall knowingly employ, hire for employment, or continue to employ an unauthorized alien to perform work within the state of Missouri. As a condition for the award of any contract or grant in excess of five thousand dollars by the state or by any political subdivision of the state to a business entity, or for any business entity receiving a state-administered or subsidized tax credit, tax abatement, or loan from the state, the business entity shall, by sworn affidavit and provision of documentation, affirm its enrollment and participation in a federal work authorization program with respect to the employees working in connection with the contracted services. Every such business entity shall sign an affidavit affirming that it does not knowingly employ any person who is unauthorized alien in connection with the contracted services. [RSMO 285.530 (2)] A copy of the affidavit referenced above is provided within this document.

Executive Order

- a. The Contractor shall comply with all the provisions of Executive Order 07-13, issued by the Honorable Matt Blunt, Governor of Missouri, on the sixth (6th) day of March, 2007. This Executive Order, which promulgates the State of Missouri's position to not tolerate persons who contract with the state engaging in or supporting illegal activities of employing individuals who are not eligible to work in the United States, is incorporated herein by reference and made a part of this Agreement.
 - 1) "By signing this Agreement, the Contractor hereby certifies that any employee of the Contractor assigned to perform services under the contract is eligible and authorized to work in the United States in compliance with federal law."
 - 2) In the event the Contractor fails to comply with the provisions of the Executive Order 07-13, or in the event the Commission has reasonable cause to believe that the contractor has knowingly employed individuals who are not eligible to work in the United States in violation of federal law, the Commission reserves the right to impose such contract sanctions as it may determine to be appropriate, including but not limited to contract cancellation, termination or suspension in whole or in part or both.
 - 3) The Contractor shall include the provisions of this paragraph in every subcontract. The Contractor shall take such action with respect to any subcontract as the Commission may direct as a means of enforcing such provisions, including sanctions for noncompliance.

Preferences

- a. In the evaluation of bids/quotes/proposals, preferences shall be applied in accordance with Chapter 34 RSMo. Contractors should apply the same preferences in selecting subcontractors.

Missouri Highways and Transportation Commission
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- b. By virtue of statutory authority, RSMo. 34.076 and 34.350 to 34.359, a preference will be given to materials, products, supplies, provisions and all other articles produced, manufactured, made or grown within the State of Missouri. Such preference shall be given when quality is equal or better and delivered price is the same or less.
 - 1) If attached, the document entitled **"PREFERENCE IN PURCHASING PRODUCTS"** should be completed and returned with the solicitation documents.
 - 2) If attached, the document entitled **"MISSOURI DOMESTIC PRODUCTS PROCUREMENT ACT"** should be completed and returned with the solicitation documents. **Applies if bid is Twenty-Five Thousand Dollars (\$25,000.00) or more.**
- c. By virtue of statutory authority, RSMo 34.074, a preference will be given all contracts for the performance of any job or service to service-disabled veteran business either doing business as Missouri firms, corporations, or individuals; or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less or whenever competing bids, in their entirety, are comparable.
 - 1) If attached, the document entitled **"MISSOURI SERVICE-DISABLED VETERAN PREFERENCE"** should be completed and returned with the solicitation documents.
- d. In the event of a tie of low bids, the MHTC reserves the right to establish the method to be used in determining the award

Remedies and Rights

- a. No provision in the contract shall be construed, expressly or implied, as a waiver by the MHTC of any existing or future right and/or remedy available by law in the event of any claim by the MHTC of the Contractor's default or breach of contract.
- b. The Contractor agrees and understands that the contract shall constitute an assignment by the Contractor to the MHTC of all rights, title and interest in and to all causes of action that the Contractor may have under the antitrust laws of the United States or State of Missouri for which causes of action have accrued or will accrue as the result of or in relation to the particular equipment, supplies, and/or services purchased or produced by the Contractor in the fulfillment of the contract with the MHTC.
- c. In the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the Contractor may request MoDOT to enter into such litigation to protect the interests of the MHTC, and, in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

Cancellation of Contract

- a. The MHTC may cancel the contract at any time for a material breach of contractual obligations or for convenience by providing the Contractor with written notice of cancellation. Should the MHTC exercise its right to cancel the contract for such reasons, cancellation will become effective upon the date specified in the notice of cancellation sent to the Contractor.
- b. If the MHTC cancels the contract for breach, the MHTC reserves the right to obtain the equipment, supplies, and/or services to be provided pursuant to the contract from other sources and upon such terms and in such manner as the MHTC deems appropriate and charge the Contractor for any additional costs incurred thereby.

Bankruptcy or Insolvency

- a. Upon filing for any bankruptcy or insolvency proceeding by or against the Contractor, whether voluntary or involuntary, or upon the appointment of a receiver, trustee, or assigned the benefit or creditors, the Contractor must notify MoDOT immediately. Upon learning of any such actions, the MHTC reserves the right, at its sole discretion, to either cancel the contract or affirm the contract and hold the Contractor responsible for damages.

Inventions, Patents, and Copyrights

- a. The Contractor shall defend, protect, and hold harmless the MHTC, its officers, agents, and employees against all suits of law or in equity resulting from patent and copyright infringement concerning the Contractor's performance or products produced under the terms of the contract.

Inspection and Acceptance

- a. No equipment, supplies, and/or services received by MoDOT pursuant to a contract shall be deemed accepted until MoDOT has had reasonable opportunity to inspect said equipment, supplies, and/or services.
- b. All equipment, supplies, and/or services which do not comply with the specifications and/or requirements or which are otherwise unacceptable or defective may be rejected. In addition, all equipment, supplies, and/or services which are discovered to be defective or which do not conform to any warranty of the Contractor upon inspection (or at any later time if the defects contained were not reasonably ascertainable upon the initial inspection) may be rejected.
- c. The MHTC reserves the right to return any such rejected shipment at the Contractor's expense for full credit or replacement and to specify a reasonable date by which replacements must be received.
- d. The MHTC's right to reject any unacceptable equipment, supplies, and/or services shall not exclude any other legal, equitable or contractual remedies the MHTC may have.

Warranty

- a. The Contractor expressly warrants that all equipment, supplies, and/or services provided shall: (1) conform to each and every specification, drawing, sample or other description which was furnished to or adopted by MoDOT, (2) be fit and sufficient for the purpose expressed in the solicitation documents, (3) be merchantable, (4) be of good materials and workmanship, and (5) be free from defect.
- b. Such warranty shall survive delivery and shall not be deemed waived either by reason of the MHTC's acceptance of or payment for said equipment, supplies, and/or services.

Status of Independent Contractor

- a. The Contractor represents itself to be an independent Contractor offering such services to the general public and shall not represent itself or its employees to be an employee of the MHTC. Therefore, the Contractor shall assume all legal and financial responsibility for taxes, FICA,

Missouri Highways and Transportation Commission
Standard Bid/Proposal Provisions, General Terms and Conditions and Special Terms and Conditions

employee fringe benefits, workers' compensation, employee insurance, minimum wage requirements, overtime, etc., and agrees to indemnify, save and hold the MHTC, its officers, agents and employees harmless from and against any and all losses (including attorney fees) and damage of any kind related to such matters.

Indemnification

- a. The Offeror shall defend, indemnify and hold harmless the Commission, including its members and department employees, from any claim or liability whether based on a claim for damages to real or personal property or to a person for any matter relating to or arising out of the Offeror's performance of its obligations under this Agreement.

SPECIAL TERMS AND CONDITIONS

Insurance

- (1) Prior to contract signing, the Offeror may be asked about its ability to provide certificates of insurance which meet, or approach, the following coverages:
 - a. General Liability Not less than \$500,000 for any one person in a single accident or occurrence, and not less than \$3,000,000 for all claims arising out of a single occurrence;
 - b. Automobile Liability Not less than \$500,000 for any one person in a single accident or occurrence, and not less than \$3,000,000 for all claims arising out of a single occurrence;
 - c. Missouri State Workmen's Compensation policy or equivalent in accordance with state law.

Permits, Licenses and Safety Issues

- a. The contract price shall include any necessary permits and licenses required by law incidental to the work. Local ordinances requiring building permits are not applicable to state agencies.
- b. The Contractor will comply with local laws involving safety in the prosecution of the work.

Proposal/Bid Guaranty/Contract Bond

- a. If awarded the contract, will furnish an acceptable performance and payment bond (Contract Bond) or a cashier's check, a bank money order or a certified check made payable to "Director of Revenue--Credit State Road Fund" in an amount equal to One Hundred (100%) of the contract price.
- b. If a BID BOND is used (in lieu of a certified check, cashier's check, or bank money order), it must be in the form provided and executed by the bidder as principal and by a surety company authorized to do business in the State of Missouri as surety. The agent executing the same on behalf of the surety company must attach a current Power of Attorney setting forth his authority to execute the bond involved.
- c. Certified Checks, Cashier's Checks or Bank Money Orders of unsuccessful bidders will be returned as soon as the award is made. The checks or bank money orders of the successful bidder(s) will be retained until the contract is executed and a satisfactory Performance and Payment (Contract Bond) is furnished. Bid Bonds will not be returned except on specific request of the bidder.

Information and Reports

- a. The Contractor shall provide all information and reports required by the Regulations, or Directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Missouri Department of Transportation or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations or Directives. Where any information required of a Contractor is in the exclusive possession of another who fails or refuses to furnish this information the Contractor shall so certify to the Missouri Department of Transportation, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.

Prevailing Wage

If the bid/quote/proposal is accepted, the vendor will be required to comply with the prevailing wages as fixed by the Missouri Department of Labor and Industrial Relations, in effect as of the date of the issuance of the solicitation, for each affected craft and type of workmen in the following county(ies): **Jackson**. The Annual Wage Order # **16** may be inspected at any District Office or at the Central Office in Jefferson City, MO.

Award

- a. Award of this bid/quote/proposal will be made on an "All Or Nothing" basis using the "lowest and best" principle of award.

Failure to Execute Contract

- a. Failure to execute the contract and file acceptable performance payment (Contract Bond) or cashier's check, bank money order or certified check within **15 days** after the contract has been mailed to the bidder shall be just cause for the cancellation of the award and the forfeiture of the proposal guaranty. Award may then be made to the next lowest responsible bidder, or the work may be re-advertised and performed under contract or otherwise, as the Commission may decide. No contract shall be considered effective until it has been executed by all parties thereto.

Temporary Suspension of Work

- a. The **District Engineer** shall have authority to suspend work wholly or in part for such period or periods as may be deemed necessary when weather or other conditions are such that in the opinion of the engineer, the work may be done at a later time with advantage to the Department or for failure on the part of the Contractor to comply with any of the provisions of the Contract.
- b. If the Department suspends the work for its own advantages and not because of the Contractor's failure to comply with the Contract, the Contractor will be allowed an equal number of calendar days after the completion date for the completion of the work. The Department may at its discretion give the Contractor an extension of time for completing the work where the Contractor incurs delays for causes beyond his control.

Missouri Highways and Transportation Commission
Standard Bid/Proposal Provisions, General Terms and Conditions and Special Terms and Conditions

Cancellation of Contract

- a. If the Contractor/supplier fails to carry out the performance of the work with sufficient workmen and equipment to insure the completion of the delivery within the time specified or becomes insolvent or is adjudicated a bankrupt or commits any act of bankruptcy or insolvency or allows any final judgment to stand against him for a period of ten (10) days, the Missouri Department of Transportation may give notice in writing by registered mail to the Contractor/supplier and the surety of such delay, neglect or default.
- b. If, within ten (10) days after such notice the Contractor/supplier does not proceed to remedy to the satisfaction of the Department's representatives the faults specified in said notice, or the surety does not proceed to take over the deliveries, the Department shall have full power and authority, without impairing the obligation of the Contractor/supplier under the contract or the surety under the bond, to take over the completion of the work and arrange for the shipment of any materials necessary to complete the work and the Contractor/supplier and the surety will be responsible for any additional costs incurred by the Department in obtaining the completion of the deliveries.

PRODUCT OPTIONS

All specifications that specify manufacture's brand name and/or model number are for reference purposes only. Contractors are encouraged to bid functional equivalents. MHTC evaluation of "functional equivalents" shall be final.

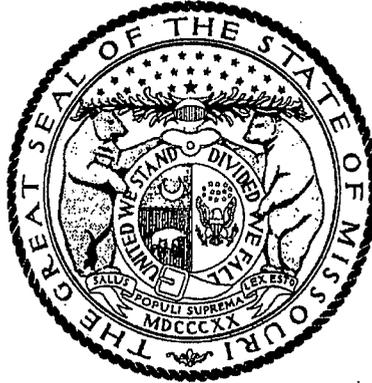
Environmental Issues

- a. Attention of the bidder is invited to the **Land Reclamation Act, Chapter 444, Laws of 1971, (House Bill 519)** and the necessity for compliance if applicable.
- b. The Contractor shall take necessary precautions and shall schedule and conduct his operations so as to avoid or minimize siltation of streams while removing gravel there from.

Missouri

Division of Labor Standards

WAGE AND HOUR SECTION



JEREMIAH W. (JAY) NIXON, Governor

Annual Wage Order No. 16

Section 048

JACKSON COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by _____

Carla Buschjost, Director
Division of Labor Standards

This Is A True And Accurate Copy Which Was Filed With The Secretary of State: March 10, 2009

Last Date Objections May Be Filed: April 9, 2009

Prepared by Missouri Department of Labor and Industrial Relations

Building Construction Rates for
JACKSON County

Section 048

OCCUPATIONAL TITLE	**Effective Date of Increase	*	Basic Hourly Rates	Over-Time Schedule	Holiday Schedule	Total Fringe Benefits
Asbestos Worker			\$32.04	52	53	\$20.48
Boilermaker			\$32.10	57	7	\$19.85
Bricklayers-Stone Mason			\$31.55	58	39	\$14.40
Carpenter			\$33.00	63	68	\$12.03
Cement Mason			\$24.47	65	4	\$17.06
Electrician (Inside Wireman)			\$33.33	13	72	\$14.20 + 10%
Communication Technician			USE ELECTRICIAN (INSIDE WIREMAN) RATE			
Elevator Constructor		a	\$38.380	26	54	\$19.635
Operating Engineer						
Group I			\$31.66	85	4	\$12.40
Group II			\$30.85	85	4	\$12.40
Group III			\$25.30	85	4	\$12.40
Group III-A			\$29.51	85	4	\$12.40
Group IV						
Group V			\$26.90	85	4	\$12.40
Pipe Fitter			\$36.73	2	33	\$17.04
Glazier			\$31.60	88	32	\$13.85
Laborer (Building):						
General			\$24.80	30	4	\$12.20
First Semi-Skilled			\$25.20	30	4	\$12.20
Second Semi-Skilled			\$25.60	30	4	\$12.20
Lather			USE CARPENTER RATE			
Linoleum Layer & Cutter			\$30.94	46	67	\$11.73
Marble Mason			\$30.49	25	4	\$11.60
Millwright			USE CARPENTER RATE			
Iron Worker			\$26.75	50	4	\$20.35
Painter			\$28.23	37	4	\$12.57
Plasterer			\$24.00	68	4	\$16.55
Plumber			\$36.13	45	33	\$16.33
Pile Driver			USE CARPENTER RATE			
Roofer			\$30.25	95	2	\$11.79
Sheet Metal Worker			\$37.35	17	22	\$14.94
Sprinkler Fitter			\$35.25	14	4	\$15.50
Terazzo Worker			\$30.49	25	4	\$11.60
Tile Setter			\$30.49	25	4	\$11.60
Truck Driver-Teamster						
Group I			\$28.39	100	4	\$9.65
Group II			\$28.39	100	4	\$9.65
Group III			\$28.59	100	4	\$9.65
Group IV			\$28.59	100	4	\$9.65
Traffic Control Service Driver			\$15.35	48	49	\$2.71
Welders-Acetylene & Electric		*				

Fringe Benefit Percentage is of the Basic Hourly Rate

Attention Workers: If you are not being paid the appropriate wage rate and fringe benefits contact the Division of Labor Standards at (573) 751-3403.

**JACKSON COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION**

FED: Minimum requirement per Fair Labor Standards Act means time and one-half (1 ½) shall be paid for all work in excess of forty (40) hours per work week.

NO. 2: Means the maximum of eight (8) hours shall constitute a day's work beginning at 8:00 a.m. to 12:00 noon, 12:30 p.m. to 4:30 p.m. The maximum work week shall be forty (40) hours beginning Monday at 8:00 a.m. and ending Friday at 4:30 p.m. Because of traffic, parking or other circumstances, the hours of work on any project may be any continuous 8½ hours period (8 hours of work plus 30 minutes for lunch) between 7:00 a.m. and 4:30 p.m. When circumstances warrant and when it is mutually beneficial and agreed to, the Employer may institute a work week consisting of four (4) consecutive ten (10) hour days, between the hours of 7:00 a.m. and 6:00 p.m. Monday through Thursday, with one-half (½) hour allowed for a lunch period each day. Friday may be used as a make-up day. After ten (10) hours in a workday, or forty (40) hours in a workweek, overtime shall be paid at a rate of one and one-half (1½) times the regular rate of pay. Overtime performed Monday through Saturday shall be paid at the rate of one and one-half (1½) times the regular rate of pay. Sundays and recognized holidays shall be paid at the double (2) time rate of pay. Labor Day shall be paid at triple (3) time. Shift work may be performed at the option of the Contractor. However, whenever shift work is performed it must cover a period not less than (5) consecutive working days. The day shift shall work a regular eight (8) hours shift as outlined above. Employees working a second shift shall receive an additional \$0.25 above the regular hourly rate and perform seven and one-half (7½) hours work for eight (8) hours pay. Third shift employees shall be paid an additional \$0.50 above the regular hourly rate and work seven (7) hours for eight (8) hours pay. In the event a first shift is not required, a second and third shift employee shall receive an additional 15% of the base rate and receive pay for actual hours worked.

NO. 13: Means a regular workday shall consist of eight (8) hours between 8:00 a.m. and 4:30 p.m. Forty (40) hours, within five (5) days -- Monday through Friday inclusive -- shall constitute the regular workweek. The Employer may alter the above stated hours by two (2) hours for an early starting and quitting time only, not to exceed eight (8) hours of work in any one day. When job conditions dictate and as required by the customer, the Employer shall be allowed to establish a four (4) day, ten (10) hour per day work week. This work week is defined as Monday through Thursday, with a Friday make-up day. The normal work day under a ten (10) hour four (4) day work week shall be from 7:00 a.m. to 6:00 p.m., with a one hour starting variance. The make-up day of Friday shall be instituted for specific reasons such as loss of production due to weather and/or holidays. All hours worked in excess of ten (10) hours per day or forty (40) hours per week or hours worked outside the normal work week shall be paid at the applicable overtime rate. The first four (4) hours of overtime after the normal workday, each day Monday through Friday and the first ten (10) hours of overtime on Saturdays shall be paid for at one and one-half (1½) times the regular straight time rate of pay. All other work performed outside of the regularly scheduled working hours and outside of the first ten (10) hours worked on Saturdays shall be paid for at double (2) the regular straight time rate of pay. Sundays and the recognized holidays shall be paid for at double (2) the regular straight time rate of pay, if worked. When so elected by the contractor, multiple shifts of at least five (5) days duration may be worked. When two (2) or three (3) shifts are worked: The first shift (day shift) shall be worked between the hours of 8:00 a.m. and 4:30 p.m. Workmen on the "day shift" shall receive eight (8) hours pay at the regular hourly rate for eight (8) hours work. The second shift (swing shift) shall be worked between the hours of 4:30 p.m. and 12:30 a.m. Workmen on the "swing shift" shall receive eight (8) hours pay at the regular hourly rate plus 10% for seven and one-half (7 ½) hours work. The third shift (graveyard shift) shall be worked between the hours of 12:30 a.m. and 8:00 a.m. Workmen on the "graveyard shift" shall receive eight (8) hours pay at the regular hourly rate plus 15% for seven (7) hours work. A lunch period of thirty (30) minutes shall be allowed on each shift. All overtime work required after the completion of a regular shift shall be paid at one and one-half (1½) times the "shift" hourly rate.

NO. 14: Means eight (8) hours per day shall constitute a day's work. The regular starting time shall be 8:00 a.m., and the regular quitting time shall be 4:30 p.m.; lunch time shall be twelve (12) o'clock noon to 12:30 p.m. The regular starting time may, by mutual consent of employees on the job site, and the employer, be between 7:00 a.m. and 9:00 a.m. with appropriate adjustments made to the regular quitting time and lunch time. All time worked before the regular starting time and after the regular quitting time, Monday through Friday, shall be paid at the rate of time and one-half (1½). All work commencing with the beginning of the established work day on Saturday shall be paid at the rate of time and one-half (1½). All work commencing with the beginning of the established work day on Sundays and/or Holidays shall be paid at the rate of double (2) time.

**JACKSON COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION**

NO. 17: Means the regular working day shall consist of eight (8) hours of labor between 7:00 a.m. and 3:30 p.m. and the regular work week shall consist of five (5) consecutive eight (8) hour days of labor beginning on Monday and ending with Friday of each week. All full-time or part-time labor performed during such hours shall be recognized as regular working hours and paid for at the regular hourly rate. Except as otherwise provided, all work performed outside of regular working hours during the regular work week, shall be at double (2) times the regular rate. Working hours may be varied by two (2) hours. When circumstances warrant and when it is mutually beneficial and agreed to by interested parties, the Employer may institute a work week consisting of four (4) consecutive ten (10) hour days, between the hours of five (5) a.m. and six (6) p.m., Monday through Thursday, with one-half (1/2) hour allowed for a lunch period each day. Friday may be used as a make-up day. The make-up day will be voluntary, and a decision not to work may not be held against the employee. When working four (4) ten (10) hour days overtime will be paid at the time and one-half (1½) rate for the eleventh (11th) and twelfth (12th) hour, all other work will be paid at the double (2) time rate of pay. The first two (2) hours of overtime, Monday through Friday, and the first eight (8) hours on Saturday shall be at time and one-half (1½) for all work. All other overtime shall be at double (2) time. The first two (2) hours of overtime must be concurrent with the regular work day, two (2) hours prior to or following the regular work day are at time and one-half (1½). The regular workday (as previously defined) on Saturday is paid at time and one-half (1½). Work performed outside of the regular Saturday work day is at double (2) time. All work performed on recognized holidays, or days locally observed as such, and Sundays shall be paid at the double (2) time rate of pay.

NO. 25: Means regular working hours of eight (8) hours shall constitute a working day between the hours of 8:00 a.m. to 4:30 p.m. in a forty (40) hour working week of Monday through Friday. Employment on Saturday, Sunday and legal holidays, and employment before or after the regular working hours shall be considered overtime. Employment on Saturday, Sunday and legal holidays shall be paid for at twice (2) the regular hourly rate. Employment from 4:30 p.m. to 12:00 midnight, Monday through Friday, shall be paid for at one and one-half (1½) times the regular hourly rate. From 12:00 midnight until 8:00 a.m. on any day shall be paid for at twice (2) the regular hourly rate.

NO. 26: Means that the regular working day shall consist of eight (8) hours worked between 6:00 a.m., and 5:00 p.m., five (5) days per week, Monday to Friday, inclusive. Hours of work at each jobsite shall be those established by the general contractor and worked by the majority of trades. (The above working hours may be changed by mutual agreement). Work performed on Construction Work on Saturdays, Sundays and before and after the regular working day on Monday to Friday, inclusive, shall be classified as overtime, and paid for at double (2) the rate of single time. The employer may establish hours worked on a jobsite for a four (4) ten (10) hour day work week at straight time pay for construction work; the regular working day shall consist of ten (10) hours worked consecutively, between 6:00 a.m. and 6:00 p.m., four (4) days per week, Monday to Thursday, inclusive. Any work performed on Friday, Saturday, Sunday and holidays, and before and after the regular working day on Monday to Thursday where a four (4) ten (10) hour day workweek has been established, will be paid at two times (2) the single time rate of pay. The rate of pay for all work performed on holidays shall be at two times (2) the single time rate of pay.

NO. 30: Means Monday through Sunday shall constitute the work week. Regular starting time shall be 8:00 A.M., except when the work week is scheduled as a week with starting time advanced or delayed. Starting time may be advanced or delayed by the employer up to two (2) hours from the regular starting time. Eight (8) hours shall constitute the work day. All work performed prior to or after the regular eight (8) hour work day, as described above, and all work performed on Saturday shall be paid at time and one-half (1½) the regular rate. In the event that a scheduled eight (8) hour work day is missed (not to include holidays) because of events out of the control of the contractor, then that missed work day may be made up at straight time the following Saturday. It is recognized that not all employees working on a Saturday make-up day will have worked the same number of hours during the regular work week. It is further recognized that any work after the forty (40) hours in a week must be paid at time and one-half (1½). Saturday make-up day shall not be used to make up for time lost due to recognized holidays. The employer may establish a 4-10's schedule on projects (4 days with 10 hours per day). If using a 4-10's schedule, a Friday make-up day is allowed. If using a 4 (10) schedule, any work more than ten (10) hours in a day or forty (40) hours in a work week shall be paid at the time and one-half (1½) rate. Friday make-up day shall not be used to make up for time lost due to recognized holidays. All work performed on Sundays or holidays shall be paid at the double (2) time rate.

JACKSON COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

NO. 37: The Employer may choose, at his discretion, to work five eight hour days or four ten hour days with a Friday make-up day, Monday through Friday at straight time. Overtime shall be paid after eight (8) hours when working "five eights" and after ten hours when working "four tens". All work performed on Sundays and recognized holidays shall be paid for at the rate of double (2) time. All Saturday work shall be paid for at the rate of time and one-half (1½) the regular wage rate. All night work during the regular work week other than the above-mentioned days shall be paid for at the rate of time and one-half (1½) the regular wage scale until midnight and double (2) time after midnight except make-up time will be allowed under the following condition: In the event of inclement weather on exterior projects which prevents working the full regular eight (8) hour day, forty (40) hour work week schedule, a Saturday make-up day can be granted. Then said work on Saturday shall be paid at the straight time rate of pay up to a maximum total of forty (40) hours per week.

NO. 45: Means eight (8) hours shall constitute a day's work, beginning at 8:00 a.m. and ending at 4:30 p.m. The regular work week shall be forty (40) hours, beginning Monday, 8:00 a.m. and ending at 4:30 p.m. Friday. Because of traffic, parking and other circumstances, the hours of work on any project may begin as early as 6:00 a.m. with eight (8) hours worked between 6:00 a.m. and 4:30 p.m. When circumstances warrant and when it is mutually beneficial and agreed to, the employer may institute a work week consisting of four (4) consecutive ten (10) hour days, between the hours of 7:00 a.m. and 6:00 p.m., Monday through Thursday. Friday may be used as a make-up day. After ten (10) hours in a workday, or forty (40) hours in a workweek, overtime shall be paid at a rate of one and one-half (1½) times the regular rate of pay. All overtime Monday through Saturday shall be paid at the rate of time and one-half (1½) the regular rate of pay. Sunday and recognized holidays shall be paid at double (2) time. Labor Day shall be paid at triple (3) time. Shift work may be performed at the option of the Contractor. However, whenever shift work is performed it must cover a period not less than (5) consecutive working days. The day shift shall work a regular eight (8) hours shift as outlined above. The hourly rate for second shift (seven and one-half hours worked for eight hours paid) shall be twenty-five cents (\$0.25) over and above the hourly rate. The hourly rate for third shift (seven hours worked, eight hours paid) shall be fifty cents (\$0.50) above the hourly rate. If no first shift is worked, second and third shift employees shall receive an additional fifteen percent (15%) over and above the hourly rate for actual hours worked.

NO. 46: Means the regular work day shall be eight (8) hours from 6:00 a.m. to 6:30 p.m. Starting time may be between 6:00 a.m. and 10:00 a.m. The regular work week shall be forty (40) hours, beginning between 6:00 a.m. and 10:00 a.m. on Monday and ending between 2:30 p.m. and 6:30 p.m. on Friday. All hours in excess of the regular work day and work week shall be considered overtime. Overtime on days recognized as regular work days and on Saturday shall be paid for at the rate of time and one-half (1½) the regular rate. Sunday and recognized holidays shall be paid for at the rate of double time (2) for time worked. The Employer may establish a work week consisting of four (4) days, Monday through Thursday, each day consisting of ten (10) hours at straight time rate of pay. The 4-10's must run for a period of at least four (4) days.

NO. 48: Means the regularly scheduled work week shall be five (5) consecutive days, Monday through Friday or Tuesday through Saturday. Eight (8) hours shall constitute a day's work. Starting time shall not be earlier than 7:00 a.m. nor later than 10:00 a.m. Forty (40) hours shall constitute a week's work. Overtime at the rate of time and one-half (1½) will be paid for all work in excess of forty (40) hours in any one work week. On the Monday through Friday schedule, all work performed on Saturday will be time and one-half (1½) unless time has been lost during the week, in which case Saturday will be a make up day to the extent of the lost time. On the Tuesday through Saturday schedule, all work performed on Monday will be time and one-half (1½) unless time has been lost during the week, in which case Monday will be a make-up day to the extent of the lost time. Any work performed on Sunday will be double (2) time. If employees work on any of the recognized holidays, they shall be paid time and one-half (1½) their regular rate of pay for all hours worked.

NO. 50: Means eight (8) hours constitute a normal day's work Monday through Friday. Any time worked over eight (8) hours will normally be paid at time and one-half (1½) except for exclusions stated in some following additional sentences. The Employer, at his discretion, may start the work day between 6:00 a.m. and 9:00 a.m. Any schedule chosen shall be started at the beginning of the work week (Monday) and used for at least five days. Work may be scheduled on a four (4) days a week (Monday through Thursday) at ten (10) hours a day schedule. If such a schedule is employed, then Friday may be used as a make-up day when time is lost due to inclement weather. Time and one-half (1½) shall be paid for any work in excess of eight (8) hours in any regular work day Monday through Friday unless working 4-10's, then time and one-half (1½) after ten (10) hours. All work performed on Saturday will be time and one-half (1½). Double (2) time shall be paid for all work on Sundays and recognized holidays.

**JACKSON COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION**

NO. 52: Means the regular workweek shall consist of five (5) eight (8) hour days, Monday through Friday. The regular workday shall consist of a eight (8) hour period, to be worked between the agreed upon starting time, and ending no later than 4:30 p.m. The agreed upon starting time shall be any time between the hours of 6:00 a.m. and 8:00 a.m. The option exists for the employer to use a four (4) day, ten (10) hour work week. Days worked shall be Monday through Thursday or Tuesday through Friday. If the job requires men on duty all five (5) days, then part of the crew may work the first four (4) days and the remainder of the crew may work the last four (4) days. Hours each day shall be from 7:00 a.m. to 5:30 p.m. Interested party's on the project must agree to this clause before it may be used. Once this clause has been put into effect, it shall remain as long as the majority of the Employees on the project and the Employer agree to keep it. The four (4) day clause shall not be used to circumvent a Holiday. Except as otherwise provided, all work performed outside the regular working hours and performed during the regular work week (Monday through Friday) shall be at the following rates of pay:

Holidays-New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, Christmas Day (or days observed as such) shall be recognized as Holidays that shall be paid at two (2) times the regular rate of pay.

Labor Day-No work shall be performed on Labor Day except in special cases of emergency. Rate of pay shall be at three (3) times the regular rate of pay.

Overtime-Work performed outside of the regular work day (the regular work day shall consist of an eight (8) hour period, to be worked between the agreed upon starting time, and ending not later than 4:30 p.m. The agreed upon starting time shall be any time between the hours of 6:00 a.m. and 8:00 a.m., by mutual consent of the interested party's.), shall be:

- A. Hours worked Monday through Friday, the first two (2) hours of overtime will be paid at time and one-half (1½). All other overtime will be paid at the double (2) time rate.
- B. The first ten (10) hours worked on Saturday will be paid at time and one-half (1½), with all other hours to be paid at the double (2) time rate.
- C. Sundays and Holidays (except Labor Day) shall be paid at the double (2) time rate.

NO. 57: Means eight (8) hours per day shall constitute a day's work and forty (40) hours per week, Monday through Friday, shall constitute a week's work. The regular starting time shall be 8:00 a.m. The above may be changed by mutual consent of authorized personnel. When circumstances warrant, the Employer may change the regular workweek to four (4) ten-hour days at the regular time rate of pay. It being understood that all other pertinent information must be adjusted accordingly. All time worked before and after the established workday of eight (8) hours, Monday through Friday, all time worked on Saturday, shall be paid at the rate of time and one-half (1½) except in cases where work is part of an employee's regular Friday shift. All time worked on Sunday and recognized holidays shall be paid at the double (2) time rate of pay.

NO. 58: Means eight (8) consecutive hours, between 6:00 a.m. and 5:30 p.m., shall constitute a days work. Five (5) days work, Monday through Friday, shall constitute a normal work week. Work performed in excess of eight (8) hours per day or eight hours beyond normal starting time for that project excluding lunch Monday through Friday, and all work performed on Saturday, shall be paid for the rate of time and one-half (1½). When Sundays and recognized holidays are worked, the worker(s) shall be paid at the rate of double (2) time. Work may be scheduled on a four (4) days a week (Monday through Thursday) at ten (10) hours a day schedule at straight time. A Friday make-up day is available if time is lost due to inclement weather and at least sixteen (16) hours, but not more than thirty (30) hours, were worked during the week.

NO. 63: Means eight (8) hours shall constitute the regular work day between time that may be advanced or delayed by two (2) hours on either side of 8:00 AM. The Employer may establish a work week consisting of four (4) days, Monday through Thursday, each day consisting of ten (10) hours straight time. The four (4) tens (10s) must run for a period of at least four (4) days, Monday through Thursday. All work on Friday on a four (4) tens (10) project will be paid at the rate of time and one-half (1½). All work performed on Saturday shall be paid at time and one-half (1½). All work performed on Sundays and recognized holidays must be paid at double (2) time. All work performed prior to or after the regular eight (8) hour work day, or ten (10) hour work day, as described above shall be paid at time and one-half (1½) the regular rate.

**JACKSON COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION**

NO. 65: Means Monday through Sunday shall constitute the work week. Regular starting time shall be 8:00 a.m., with one half hour for lunch between three and one-half (3½) and five (5) hours after starting time. The starting time may be advanced by two (2) hours or delayed one (1) hour by the employer from the regular starting time. All work performed before the advanced starting time and during the half hour lunch shall be paid at the overtime rate of time and one-half (1½). Work performed outside these hours shall be paid at the overtime rate of time and one-half (1½), except as provided otherwise below. All work performed on Sundays or recognized holidays shall be paid at the double (2) time rate. When the start time is delayed past 9:00 a.m., the employee's pay shall start at 9:00 a.m. and all time, after the normal quitting time (5:30 p.m.), shall be paid at the overtime rate. Eight (8) hours shall constitute the work day. All work performed prior to or after the regular eight (8) hour work day, as described above, and all work performed on Saturday shall be paid at time and one-half (1½) the regular rate. In the event that a scheduled eight (8) hour work day is missed (not including recognized holidays) because of inclement weather, then that missed work day may be made up at straight time on the following Saturday. It is recognized that not all employees working on a Saturday make-up day will have worked the same number of hours during the regular work week. It is further recognized that any work after forty (40) hours must be paid at time and one-half (1½). The employer may establish a 4-10's schedule on projects (4 days with 10 hours per day at straight time). In order to use the 4-10's schedule, the employer must schedule the 4-10's for a minimum of one (1) week. If using a 4-10's schedule, a Friday make-up day is allowed.

NO. 68: Means Monday through Sunday shall constitute the work week. Regular starting time shall be 8:00 a.m., with one half hour for lunch between three and one-half and five hours after starting time. The starting time may be advanced or delayed by the employer up to one hour from the regular starting time. All work performed before the advance starting time and during the half hour lunch shall be paid at the overtime rate of time and one-half (1½). Work performed outside these hours shall be paid at the overtime rate of time and one-half (1½), except as provided otherwise below. All work performed on Sundays or holidays shall be paid at the double (2) time rate. Eight (8) hours shall constitute the work day. All work performed prior to or after the regular eight (8) hour work day, as described above, and all work performed on Saturday shall be paid at time and one-half (1½) the regular rate, except as hereinafter described. In the event that a scheduled eight (8) hour work day is missed (not including recognized holidays) because of inclement weather, then that missed work day may be made up at straight time on the Saturday in the week of the pay period. It is recognized that not all employees working on a Saturday make-up day will have worked the same number of hours during the regular work week. It is further recognized that any work after forty (40) hours must be paid at time and one-half (1½). The employer may establish a 4-10's schedule on projects (4 days with 10 hours per day at straight time). In order to use the 4-10's schedule, the employer must schedule the 4-10's for a minimum of one (1) week. If using a 4-10's schedule, a Friday make-up day is allowed.

NO. 85: Means the work week shall be Monday through Sunday. Eight (8) hours shall constitute a day's work to begin between 6:00 a.m. and 9:00 a.m. and end between 2:30 p.m. to 5:30 p.m. Employees required to work during their lunch period shall receive the overtime rate. Employees shall receive time and one-half (1½) for all time they are required to work prior to their normal starting time or after eight (8) hours or normal quitting time Monday through Friday, or all day on Saturday. If an Employer has started the work week on a five day, eight hours a day schedule, and due to inclement weather misses any time, then he may switch to a nine or ten hours a day schedule, at straight time, for the remainder of that work week in order to make up for the lost time (10-hour make-up day). All work over ten (10) hours a day or over forty (40) hours a week must be paid at time & one-half (1½). Sundays and recognized holidays shall be paid at the double (2) time rate of pay. A contractor may alter the regular work week to four (4) ten (10) hour days at straight time rate of pay. To do this the scheduled 4-10's must be worked at least one full week and the regular workweek shall be Monday through Thursday with Friday being a make-up day at straight time for days missed in the regular workweek due to inclement weather. If 5-8's are being worked, Saturday may be used as a make-up day at straight time if inclement weather prevents work during the normal work week.

NO. 88: Means the regular work week shall consist of five (5) eight (8) hour days, 8:00 a.m. to 4:30 p.m., Monday through Friday, except when the work week is scheduled as a 4-10's week or as a week with start time advanced or delayed as described below. The starting time may be advanced or delayed by one hour on either side of 8:00 a.m. The advanced or delayed starting time must run for a period of at least five (5) days. The Employer may establish a work week consisting of four (4) days, during the regular work week, each day consisting of ten (10) hours at straight time. The 4-10's must run for a period of at least four (4) days. Time and one-half (1½) shall be paid for any work in excess of eight (8) hours in any regular work day Monday through Friday (or ten hours in a 4-10's week), the first eight (8) hours of a Saturday, and it shall be at time and one-half (1½) for the Friday and Saturday following Thanksgiving. Double (2) time shall be paid for the following time worked on Sunday, New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day, as well as any work in excess of eight (8) hours on a Saturday and the Saturday of a three-day weekend (except the Saturday following Thanksgiving).

**JACKSON COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION**

NO. 95: Means a regular workday shall consist of eight and one-half (8½) hours elapsed time, including one-half hour for lunch. The crew starting times shall be flexible within the period of daylight to 8:00 a.m. Any work performed over ten (10) hours of elapsed time per day including one-half hour for lunch and/or any work performed over forty (40) hours at the straight time rate in one week shall be paid at time and one-half (1½) the straight time rate. Saturday shall be a voluntary make-up day at straight time at the discretion of the contractor and with the consent of the employees. Sunday and recognized holidays shall be paid for at double (2) time.

NO. 100: Means eight (8) hours shall constitute a day's work, and five (5) continuous eight-hour days shall constitute a week's work, Monday through Friday. Time and one-half (1½) the regular hourly rate shall be paid for all work performed in excess of eight (8) hours in any one day or forty (40) hours in any one week. Starting time shall be between 6:00 a.m. and 9:00 a.m. All work over eight (8) hours in a regular 5-day 8-hour schedule shall be at the appropriate overtime rate. All time worked before the regular scheduled starting time shall be paid for at the rate of time and one-half (1½) and shall not apply to regular shift. All time worked after eight (8) hours in any one day or after 5:30 p.m., whichever comes first, shall be paid at the time and one-half (1½) rate. An Employer, at his option, may elect to work four (4) ten (10) hour days, Monday through Thursday, at straight time. All such work must be done at least one week in duration. All work over ten (10) hours in one day or forty (40) hours in a week shall be at the overtime rate. Any employee who is scheduled to work on any regular work day but is prevented from working because of weather conditions, shall be permitted to work on Saturday (Friday if working 4-10's) as a make-up day at the straight time rate of pay. When an employee is required to work on any recognized holiday they shall receive the double (2) time rate for all time that they are required to perform work. All time worked from 12:00 Midnight Saturday to 12:00 Midnight Sunday shall be paid for at the rate of double (2) time on single shift.

**JACKSON COUNTY
HOLIDAY SCHEDULE – BUILDING CONSTRUCTION**

NO. 2: All work performed on New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Christmas Day, or the days observed as such, shall be paid at the double time rate of pay.

NO. 4: All work done on New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas Day shall be paid at the double time rate of pay. If any of the above holidays fall on Sunday, Monday will be observed as the recognized holiday. If any of the above holidays fall on Saturday, Friday will be observed as the recognized holiday.

NO. 7: All work done on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day shall be paid at the double time rate of pay. If a holiday falls on a Sunday, it shall be observed on the following Monday. If a holiday falls on a Saturday, it shall be observed on the preceding Friday.

NO. 22: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day, or days locally observed as such, and Sunday shall be recognized as holidays. If a holiday falls on Saturday, Friday shall be observed; if it falls on Sunday, Monday shall be observed. All work performed on holidays shall be paid at the double (2) time rate of pay.

NO. 32: All work performed for the Friday and Saturday following Thanksgiving shall be paid at the time and one-half (1½) rate of pay. All work performed on Sundays, New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day shall be paid at the double (2) time rate of pay. When one of the above holidays falls on Sunday, the following Monday shall be observed and when one of the above holidays falls on Saturday, the preceding Friday shall be observed.

NO. 33: All work done on New Year's Day, Memorial Day, Fourth of July, Thanksgiving Day and Christmas Day shall be paid at the double time rate of pay. Labor Day shall be paid at the triple (3) time rate of pay. If the holiday falls on Sunday, the following Monday will be observed; if the holiday falls on Saturday, the preceding Friday will be observed.

NO. 39: No work shall be done on the following holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas. Any of these holidays falling on Sunday, the following Monday shall be a holiday, and any of these holidays falling on Saturday, the preceding Friday shall be a holiday.

NO. 49: The following days shall be observed as legal holidays: New Year's Day, Decoration Day, July 4th, Labor Day, Thanksgiving Day, Christmas Day, Employee's birthday and two (2) personal days. The observance of one (1) of the personal days to be limited to the time between December 1 and March 1 of the following year. If any of these holidays fall on Sunday, the following Monday will be observed as the holiday and if any of these holidays fall on Saturday, the preceding Friday will be observed as the holiday. If employees work on any of these holidays they shall be paid time & one-half (1½) their regular rate of pay for all hours worked.

NO. 53: All work done on New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, Christmas Day or days observed as such for these holidays shall be paid at the double (2) time rate of pay. No work shall be performed on Labor Day except in special cases of emergency, and then the rate of pay shall be at three (3) times the regular rate of pay. When a holiday falls on a Sunday, the following Monday shall be observed as the holiday. When a holiday falls on Saturday, the preceding Friday shall be observed as the holiday.

NO. 54: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day shall be paid at the double (2) time rate of pay. When a holiday falls on Saturday, it shall be observed on Friday. When a holiday falls on Sunday, it shall be observed on Monday.

**JACKSON COUNTY
HOLIDAY SCHEDULE – BUILDING CONSTRUCTION**

NO. 67: All work performed on New Year's Day, Memorial Day, Christmas Day, Fourth of July and Thanksgiving Day, from midnight to midnight, shall be paid for at the rate of double time (2) the basic rate of pay if required to work in addition to any other pay otherwise required hereunder as holiday pay. Positively no work shall be performed on Labor Day. Martin Luther King's Birthday, Veteran's Day, and the day after Thanksgiving Day shall be considered optional holidays, and if the Employer and employees agree that work will be performed on that day, no premium pay will be required. Should any of the above holidays fall on Saturday, the holiday will be observed on Friday. Should any of the above holidays fall on Sunday, the holiday will be observed on Monday.

NO. 68: All work performed on New Year's Day, Decoration Day (Memorial Day), Independence Day (Fourth of July), Labor Day, Thanksgiving Day, Christmas Day, or days observed as such, shall be paid at the rate of double (2) time. When a holiday falls on a Saturday, Friday shall be observed. When a holiday falls on a Sunday, Monday shall be observed. No work shall be performed on the Fourth of July or Labor Day except to save life or property. Where one of the holidays specified falls or is observed during the work week, then all work performed over and above thirty-two (32) hours in that week shall be paid at the rate of time and one-half (1½).

NO. 72: All work performed on New Year's Day, Memorial Day (last Monday in May), Independence Day, Labor Day, Thanksgiving Day and Christmas Day shall be paid for at double (2) the regular straight time rate of pay. Any one of the above listed holidays falling on Sunday shall be observed on the following Monday and paid for at double (2) the regular straight time rate of pay, if worked. Any one of the above listed holidays falling on Saturday shall be observed on the prior Friday and paid for at double (2) the regular straight time rate of pay, if worked. No work shall be performed on Labor Day except in case of emergency.

Heavy Construction Rates for
JACKSON County

Section 048

OCCUPATIONAL TITLE	*Effective Date of Increase	Basic Hourly Rates	Over-Time Schedule	Holiday Schedule	Total Fringe Benefits
CARPENTER					
Journeyman		\$33.00	1	17	\$12.03
Millwright		\$33.00	1	17	\$12.03
Pile Driver Worker		\$33.00	1	17	\$12.03
OPERATING ENGINEER					
Group I		\$31.09	3	2	\$12.87
Group II		\$30.05	3	2	\$12.87
Group III		\$30.05	3	2	\$12.87
Group IV		\$25.58	3	2	\$12.87
Oiler-Driver		\$28.93	3	2	\$12.87
CEMENT MASON					
		\$24.02	3	2	\$16.38
LABORER					
General Laborer		\$26.03	3	2	\$11.14
Skilled Laborer		\$27.24	3	2	\$11.14
TRUCK DRIVER-TEAMSTER					
Group I		\$28.21	3	2	\$10.65
Group II		\$28.21	3	2	\$10.65
Group III		\$28.21	3	2	\$10.65
Group IV		\$28.21	3	2	\$10.65

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate sheet.

**JACKSON COUNTY
OVERTIME SCHEDULE – HEAVY CONSTRUCTION**

FED: Minimum requirement per Fair Labor Standards Act means time and one-half (1 ½) shall be paid for all work in excess of forty (40) hours per work week.

NO. 1: Means (8) hours shall constitute the regular work day between time that may be advanced or delayed by two (2) hours on either side of 8:00 AM. The Employer may establish a work week consisting of four (4) days, Monday through Thursday, each day consisting of ten (10) hours straight time. The four (4) tens (10s) must run for a period of at least four (4) days, Monday through Thursday. All work on Friday on a four (4) tens (10) project will be paid at the rate of time and one-half (1½). All work performed on Saturday shall be paid at time and one-half (1½). All work performed on Sundays and recognized holidays must be paid at double (2) time. All work performed prior to or after the regular eight (8) hour work day, or ten (10) hour work day, as described above shall be paid at time and one-half (1½) the regular rate.

NO. 3: Means a regular work week shall consist of not more than forty (40) hours of work and all work performed over and above ten (10) hours per day or forty (40) hours per week shall be paid at the rate of time & one-half (1½). Workers shall receive time and one-half (1½) for all work performed on Sundays and recognized holidays. Double (2) time shall be paid for work performed on Sundays or recognized holidays when and only if any other craft employees of the same employer at work on that same job site are receiving double (2) time pay for that Sunday or Holiday work. A work day is to begin between 6:00 a.m. and 9:00 a.m. at the option of the Employer except when inclement weather or other conditions beyond the reasonable control of the Employer prevents work, in which event, the starting time may be delayed, but not later than 12:00 noon. Where one of the recognized holidays falls or is observed during the work week, then all work performed over and above thirty-two (32) hours in that week shall be paid at the rate of time and one-half (1½).

**JACKSON COUNTY
HOLIDAY SCHEDULE – HEAVY CONSTRUCTION**

NO. 2: All work performed on New Year's Day, Decoration Day (Memorial Day), Independence Day (Fourth of July), Labor Day, Thanksgiving Day and Christmas Day, or days observed as such, and Sundays shall be paid at the rate of time and one-half (1½). Double (2) time shall be paid for work on Sundays or recognized holidays when and only if other craft employees of the same employer at work on that same job site are receiving double (2) time pay for that Sunday or holiday work. No work shall be performed on Labor Day, except in case of jeopardy of life or property. This rule is applied to protect Labor Day. When one of the above holidays falls on a Saturday, the preceding Friday shall be observed; when the holiday falls on a Sunday, the following Monday shall be observed. Where one of the specified holidays falls or is observed during the work week, then all work performed over and above thirty-two (32) hours in that week shall be paid at the rate of time and one-half (1½).

NO. 17: All work performed on New Year's Day, Decoration Day (Memorial Day), Independence Day (Fourth of July), Labor Day, Thanksgiving Day, Christmas Day, or days observed as such, shall be paid at the rate of double (2) time. When a holiday falls on a Saturday, Friday shall be observed. When a holiday falls on a Sunday, Monday shall be observed. No work shall be performed on the Fourth of July or Labor Day except to save life or property. Where one of the holidays specified falls or is observed during the work week, then all work performed over and above thirty-two (32) hours in that week shall be paid at the rate of time and one-half (1½).

OUTSIDE ELECTRICIAN

These rates are to be used for the following counties:

Bates, Benton, Carroll, Cass, Clay, Henry, Jackson, Johnson, Lafayette, Pettis, Platte, Ray and Saline

COMMERCIAL WORK

Occupational Title	Basic	Total
	Hourly	Fringe
	Rate	Benefits
Journeyman Lineman	\$36.19	\$4.75 + 34%
Lineman Operator	\$33.77	\$4.75 + 34%
Groundman	\$23.98	\$4.75 + 34%

UTILITY WORK

Occupational Title	Basic	Total
	Hourly	Fringe
	Rate	Benefits
Journeyman Lineman	\$33.45	\$4.75 + 34%
Lineman Operator	\$30.92	\$4.75 + 34%
Groundman	\$21.56	\$4.75 + 34%

OVERTIME RATE: Eight (8) hours of work between the hours of 8:00 a.m. and 4:30 p.m. shall constitute a work day. Forty (40) hours within the five (5) days, Monday through Friday inclusive, shall constitute the work week. Starting time may be adjusted not to exceed two (2) hours. Work performed outside of the aforementioned will be paid at the applicable overtime rate. When starting time has been adjusted, all other provisions concerning the work day shall be adjusted accordingly. The overtime rate of pay shall be one and one-half (1½) times the regular rate of wages, other than on Sundays, holidays and from Midnight until 6:00 a.m., which will be paid at double (2) the straight time rate.

HOLIDAY RATE: Work performed on New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Christmas Day, or days celebrated as such, shall be paid at the double time rate of pay. If the holiday falls on Saturday, it will be observed on Friday; if the holiday falls on Sunday, it will be observed on Monday, and shall be paid for at double (2) the regular straight time rate of pay.