

Operations Memorandum

To: New Haven Board of Education Finance and Operations Committee

From: Frank Fanelli, Director of Project Management

Date: September 25, 2023

Re: Award of Contract 21890 to Tucker Mechanical to remodel the Beecher

School Air Cooled Chiller Unit.

Answer all questions and have a representative ready to present the details of each question during the Finance & Operations meeting or this proposal may not be advanced for consideration by the full Board of Education.

Company Information						
Vendor Name: Tucker Mechanical						
Doing Business as:						
Vendor Address:	795 Brook Street, Rocky Hill CT 06067					
Vendor Contact Name:						
Vendor Contact Email:						
Is the contractor a minority	or women owned small business?					
Ag	reement/Contract Information					
New or Renewal Agreeme	nt/Contract? Contract					
Effective Dates: (mm/dd/yy) Multi-yrs, require Board of Aldermen approval	From 10/2/2023 To 06/30/2024					
Total Amount: If Multi-yr. include yr. to yr. breakdown	\$670,456.00					
Funding Source Name: Acct. #:	ARP ESSER III Carryover 2553-6399-56697-0474					
Contract #: (Local or State)	21890					



Key Questions:

1. What specific service will the contractor provide:
Firm with significant experience to remodel the Beecher Magnet School Air-Cooled Chiller Units; located at 10 Jewell St, New Haven, CT.
2. How was the contractor selected? *Attach appropriate supporting documents
☐ Quotes
⊠ Sealed Bid # 21890
□ Sole Source #
□ RFP#
☐ State Contract #
□ Exempt Professional □ Accountant □ Actuary □ Appraiser □ Architect □ Artist □ Dentist □ Engineer □ Expert Professional Consultant □ Land Surveyor □ Lawyer □ Physician/Medical Doctor
3. If the vendor was selected through Solicitation (Bid/RFQ/RFP) process; answer the following:
a. Please explain how the vendor was chosen? *Attach Vendor Proposal
Sealed Bid
b. Who were the members of the selection committee? (Minimum 3 members required)
N/A – Lowest Bidder



4.	If this is a renewal with a current vendor, has the vendor has met all obligations under the existing agreement/contract?
N/A	
5.	If this agreement/contract is a Renewal, has the cost increase? If yes, by how much? *Attach Renewal Letters
N/A	
6.	If this new agreement/contract, has cost for service increased from previous years? If yes, by how much?
There	is no previous financial comparison for project based work.
7.	Is this a service that existing staff could provide? Why or why not?
	is must be completed by a qualified company that has the necessary equipment and perform such a large scale task.

Specifications

Scope of Services – Beecher Chiller

The City of New Haven Public Schools (NHPS) is soliciting proposals from qualified HVAC Contracting firms with significant experience to remodel the Beecher Magnet School Air-Cooled Chiller Units; located at 10 Jewell St, New Haven, CT. The NHPS expects to select and contract with one company to provide the services listed in the scope of work below.

Pricing to include:
All labor and materials
Travel Charges
Mileage Charges
Disposal Charges
5 Year Warranty on all labor and installations
Permits
Misc. Fees

Additionally, all licensing and insurance requirements listed in this RFP must be met. It is the goal of the NHPS to enter into an agreement with a vendor that will provide services efficiently, will accurately bill, and will provide high-quality, flexible customer service to the NHPS. The Vendor will be expected to maintain expert knowledge of this service to ensure the NHPS is receiving the highest quality service at the most affordable rates while Maintaining quality and secure technology (See attached Construction Plans). Awarded Bidder will be responsible for holding the price (Lump Sum) through the entire duration of the project.

For background on NHPS go to: https://www.nhps.net/

Qualifications

Eligible vendors will be those individuals, businesses, and firms that meet the following qualifications:

Proposer must have demonstrated experience and expertise in Connecticut in the past (5) years regarding the types of or similar services as those outlined in the introduction.

Proposers must have a proven track record in providing these types of services for similarly sized municipal governments, preferably in Connecticut.

Proposer must be familiar with, qualified, and properly licensed in the State of Connecticut to perform its obligation under this proposal in compliance with all applicable Federal and State of Connecticut laws and regulations, statutes, and policies.

Expectations

Vendor is expected to provide industry standard or higher quality services while maintaining a focus on providing a cost-effective service to the NHPS. Vendor is expected to provide the highest quality customer service to the NHPS, not limited to, but particularly in the areas of reliability and billing.

The selected Company shall work with and cooperate with the Director of Project Management. Rendering services pursuant to this RFP shall be directed to the City of New Haven Finance Department.

Scope of Services

This project involves replacing the existing roof-mounted air-cooled chiller with the same make & manufacturer as the existing unit i.e., York/Johnson Controls. The existing chiller is a York/Johnson Controls 260-ton air-cooled chiller.

Primary and Secondary Chilled Water Pump and Accessory Replacements

This project involves replacing the existing primary and secondary chilled water pumps along with associated piping, valving, accessories, and controls.

The existing 15 HP Bell & Gossett Chiller pumps will be replaced with new pumps of the same capacity.

The existing 25 HP Bell & Gossett Chilled Water System pumps will be replaced with 20 HP pumps.

All the other ancillary equipment including VFDs, motor starters, expansion tanks, air separators, seismic restraints, pipes, valves, fittings, & piping specialties local to the chiller and pumps will also be replaced.

BMS Controls

Provide all temperature controls, low voltage control wiring, hardware, software, and accessories necessary to achieve a fully operational chilled water system. BMS controls by "Connecticut Controls Inc.". Controls will be upgraded to a new Tritium N4 control system, update graphics and controllers. The electrical contractor shall provide power wiring.

Notes

Electrical support work shall be included for the above-referenced upgrades. Refer to Contract document plans and specifications for details of the mechanical and electrical upgrades.



TYPES: IL = IN-LINE PUMP FM = FLOOR MOUNTED

- LOW NOISE CONDENSER FANS.
 SINGLE POINT POWER CONNECTION WITH INDIVIDUAL SYSTEM CIRCUIT BREAKERS.
 FACTORY DISCONNECT SWITCH.
- 4. FACTORY VFC FOR EACH COMPRESSOR.5. FACTORY PROTECTIVE LOUVERED/WIRE PANELS.
- FACTORY PROTECTIVE LOUVERED/WIRE PANELS.
 FACTORY COMPRESSOR BLANKETS.
 CHILLER CONTROLS PROVIDE BACKNET COMPATIBLE.

. INTEGRAL STRAINERS

HYDRONIC PIPING SPECIALTIES EXPANSION TANK SCHEDULE							
ID TAG	MFG	MODEL	MINIMUM ACCEPTANCE (GALLONS)	DIAMETER	LENGTH	SERVES	REMARKS
EXP-1	BELL & GOSSETT	B-200	53	24"	38"	CHILLED WATER SYSTEM	-

AIR SEPARATOR SCHEDULE						
MANUFACTURER	MODEL	NOMINAL FLOW RATE	SERVES	NOTES		
BELL & GOSSETT	R-6	560	CHILLED WATER SYSTEM	1,2,3,4		
-	MANUFACTURER	MANUFACTURER MODEL	MANUFACTURER MODEL NOMINAL FLOW RATE	MANUFACTURER MODEL NOMINAL FLOW RATE SERVES BELL & COSSETT R—6 560 CHILLED WATER		

SUBMIT AIR ELIMINATION EFFICIENCY AND PRESSURE DROP FOR DESIGN FLOW RATE.

	PUMP SCHEDULE												
SYMBOL	MANUFACTURER	TYPE	SERIES/SIZE/ MODEL NUMBER	MINIMUM EFFICIENCY	GPM	FT OF HEAD (TDH)	RPM	MOTOR HP	VFC	SERVES	OPERATION	VOLTS/ PHASE	NOTES
CHWP-1	BELL & GOSSETT	BASE MOUNT	1510/3BD	81.9%	554	50	1750	15	NO	CHILLER CH-1	PRIMARY	460/3	1
CHWP-2	BELL & GOSSETT	BASE MOUNT	1510/3BD	81.9%	554	50	1750	15	NO	CHILLER CH-1	STAND-BY	460/3	1
CHWP-3	BELL & GOSSETT	BASE MOUNT	1510/3EB	80.3%	560	90	1750	20	YES	CILLED WATER SYSTEM	PRIMARY	460/3	1,2
CHWP-4	BELL & GOSSETT	BASE MOUNT	1510/3EB	80.3%	560	90	1750	20	YES	CHILLED WATER SYSTEM	STAND-BY	460/3	1,2

FM = FLOOR MOUNTED

NOTES:

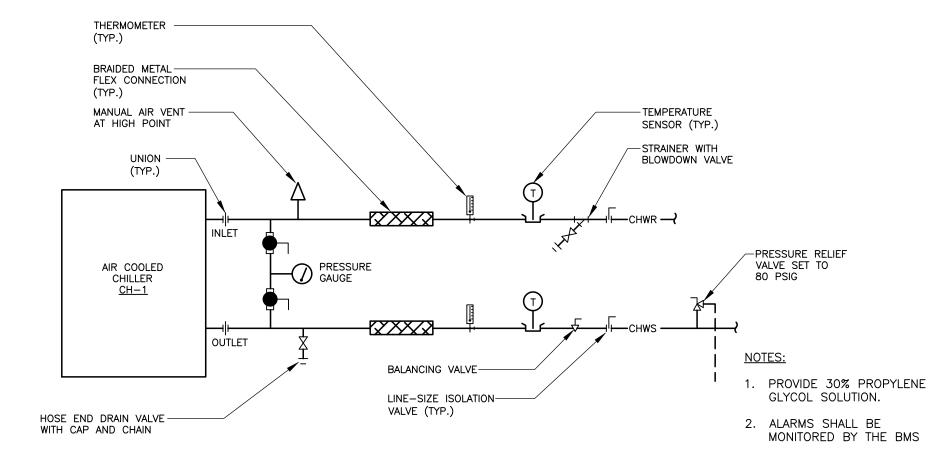
1. 30% PROPYLENE GLYCOL.

2. ABB VFD'S PUMP RATED FOR 480V, 20.HP PROVIDE WITH BYPASS.

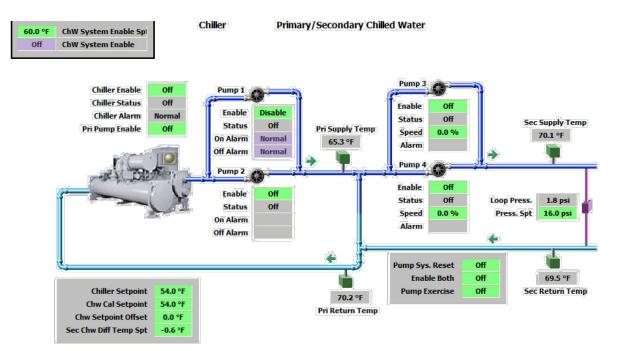
IL = IN-LINE PUMP

HOSE BIBB CONNECTION B & G MODEL #107 -HIGH CAPACITY AIR VENT PROVIDER BRASS TAG & CHAIN ON VALVE WITH ENGRAVED INSCRIPTION "CAUTION-GLYCOL CHARGED SYSTEM, DO NOT DILUTE BELOW xx% OR RISK - AIR SEPARATOR EQUIPMENT DAMAGE"-TO FLOOR DRAIN ---AUTOMATIC AIR VENT PUMP INLET B & G MODEL #87 ANTI-THERMO SYPHON LOOP 12" MINIMUM DROP BALL VALVE WITH HANDLE REMOVED BLADDER TYPE EXPANSION TANKS —DRAIN VALVE WITH CAPPED HOSE END

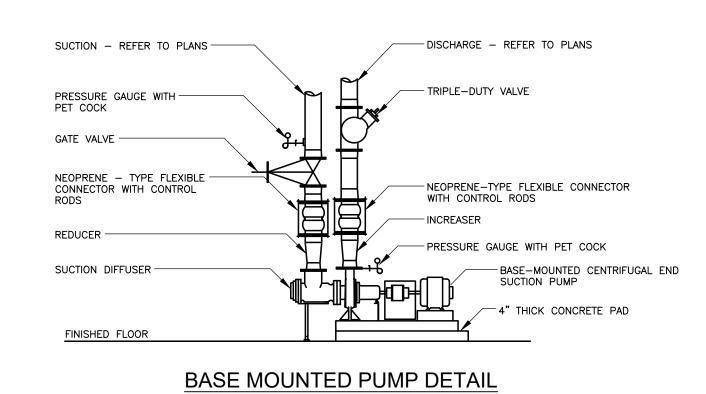
EXP TANK SCHEMATIC

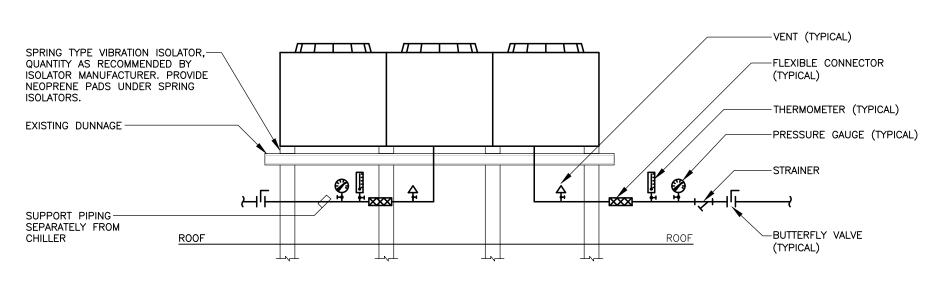


AIR-COOLED CHILLER PIPING SCHEMATIC



EXISTING CONTROL SET & MONITORY POINT





ROOF MOUNTED AIR COOLED CHILLER DETAIL

MECHANICAL GENERAL NOTES

- 1. THESE GENERAL NOTES ARE APPLICABLE TO ALL MECHANICAL DRAWINGS.
- DRAWINGS ARE DIAGRAMMATIC AND SHOW GENERAL INTENT OF WORK. SEE DETAILS, SCHEDULES AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- 3. MECHANICAL CONTRACTOR MUST REVIEW DRAWINGS OF THE OTHER TRADES AS PART OF THIS CONTRACT FOR ADDITIONAL WORK REQUIRED AND OR COORDINATION OF HIS WORK FOR OPERATIONS OR CONNECTIONS TO OTHER SYSTEMS.

SEQUENCE OF OPERATION

BEECHER SCHOOL CHILLER PLANT SEQUENCE OF OPERATION

THE CHILLED WATER PLANT IS ENABLED WHEN OUTDOOR AIR TEMPERATURE IS ABOVE 60 DEGREES (ADJUSTABLE).

WHEN THE PLANT IS ENABLED THE LEAD PRIMARY CHW PUMP STARTER IS ENABLED AND RUNS AT A CONSTANT SPEED TO PROVIDE THE GPM REQUIRED AS SET BY THE WATER BALANCER.

THE PRIMARY PUMPS P1 AND P2 ARE CONTROLLED IN AN AUTO — LEAD — LAG SEQUENCE. THE LEAD PUMP IS ALTERNATED EVERY WEEK. IF THE LEAD PUMP FAILS AS DETERMINED BY THE PUMP DIFFERENTIAL PRESSURE SWITCH, THEN THE LAG PUMP STARTER WILL BE ENABLED. A LEAD PUMP FAIL ALARM WILL BE SENT TO THE BMS FRONT END ALARM SCREEN.

WHEN THE PRIMARY PUMP FLOW IS PROVEN POSITIVE, THE CHILLER IS ENABLED AND RUNS BY THE ONBOARD CHILLER CONTROLS. THE BMS CONTROLS THE CHILLER SET POINT WITH A 0-10V CONTROL SIGNAL. THE CHILLER SET POINT IS RESET FROM OUTDOOR AIR TEMPERATURE SUCH THAT WHEN THE OUTDOOR AIR TEMPERATURE IS 60 DEGREES THE SET POINT IS 50 DEGREES (ADJUSTABLE) AND WHEN THE OUTDOOR AIR TEMPERATURE IS 80 DEGREES THE CHILLER SET POINT IS 44 DEGREES (ADJUSTABLE) WITH LINEAR SETPOINT BETWEEN THOSE OUTDOOR AIR TEMPERATURES. THE CHILLER STATUS AND ALARM POINTS FROM THE ONBOARD CHILLER CONTROLS WILL BE MONITORED BY THE BMS AND THE ALARMS REPORTED ON THE ALARM SCREEN. PRIMARY CHILLED WATER SUPPLY AND RETURN TEMPERATURES WILL BE MONITORED, TRENDED EVERY 10 MINUTES AND ALARMED WHEN THE CHILLED WATER TEMPERATURE IS HIGHER 5 DEGREES ABOVE SETPOINT FOR MORE THAN 30 MINUTES.

THE SECONDARY CHILLED WATER PUMPS P3 AND P4 WILL ALSO BE CONTROLLED IN AN AUTO- LEAD -LAG SEQUENCE. THE LEAD PUMP IS ENABLED 5 MINUTES AFTER THE CHILLER IS ENABLED AND THE CHILLER RUN STATUS PROVEN POSITIVE. THE LEAD PUMP SPEED WILL BE ADJUSTED BY THE PUMP VFD AND WILL BE CONTROLLED TO MAINTAIN THE SECONDARY LOOP DIFFERENTIAL PRESSURE WHICH SENSOR IS LOCATED 2/3 DOWN THE CHILLED WATER PIPING. THE DIFFERENTIAL PRESSURE SET POINT IS 16 PSI (ADJUSTABLE). THE LEAD CHILLED WATER PUMP STATUS IS PROVEN BY A PUMP DIFFERENTIAL PRESSURE SWITCH. IF THE LEAD PUMP STATUS IS NOT PROVEN AFTER IT HAS BEEN ENABLED FOR 5 MINUTES THEN THE LAG PUMP WILL BE ENABLED AND MODULATE TO MAINTAIN THE CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SETPOINT OF 16 PSI. WHEN THE LEAD PUMP FAILS AN ALARM WILL BE SENT TO THE BMS FRONT END ALARM PAGE. THE LEAD PUMP SELECTION SHALL CHANGE EVERY WEEK. IF THE LEAD PUMP CANNOT MAINTAIN THE 16 PSI SET POINT WHEN OPERATING AT 100% SPEED, AN ALARM WILL BE SENT TO THE BMS FRONT END ALARM PAGE AND THE LAG PUMP WILL BE ENABLED IN ADDITION TO THE LEAD PUMP AND BOTH PUMPS WILL RUN IN UNISON TO MAINTAIN THE CHILLED WATER DIFFERENTIAL PRESSURE. SECONDARY CHILLED WATER SUPPLY AND RETURN TEMPERATURES WILL BE MONITORED AND TRENDED,

THE FOLLOWING SEQUENCE WILL BE POSSIBLE IF THE SCHOOL BMS IS UPGRADED TO THE NIAGARA N4 LEVEL OF CONTROL.

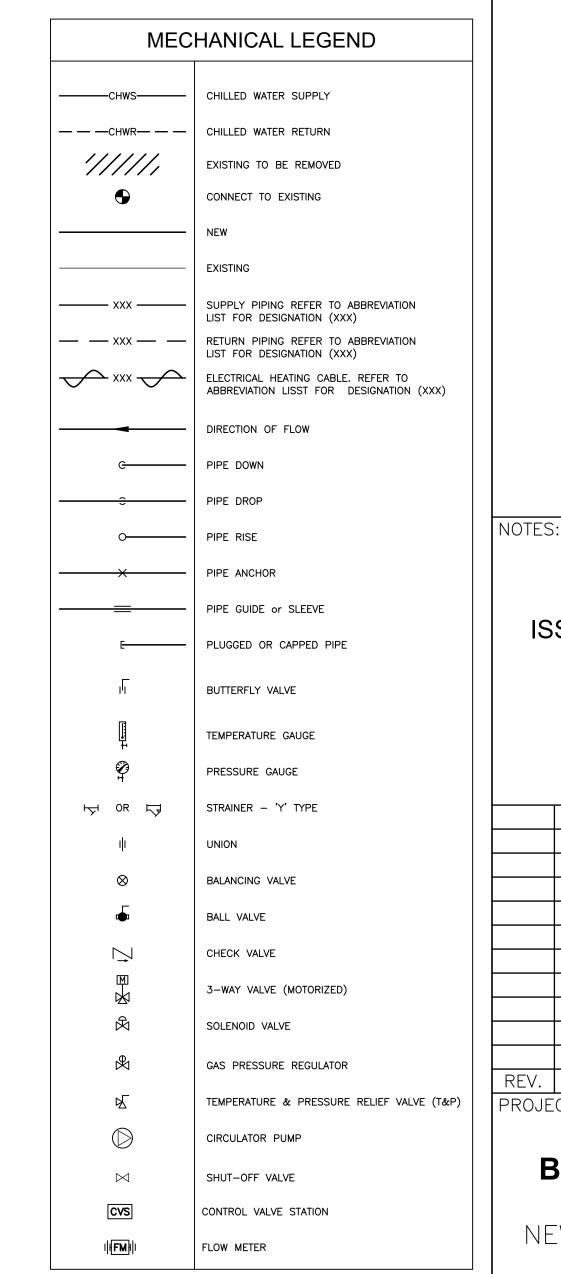
THE CHILLED WATER PLANT WILL BE ENABLED DURING THE SCHOOL OCCUPIED SCHEDULE WHEN THE OUTDOOR AIR TEMPERATURE IS ABOVE 60 DEGREES (ADJUSTABLE). WHEN THE SCHOOL IS UNDER THE UNOCCUPIED SCHEDULE, THE CHILLER PLANT WILL BE ENABLED WHEN ANY ZONE EXCEEDS IT UNOCCUPIED COOL SET POINT. WHEN THE CHILLER PLANT IS ENABLED, IT WILL RUN FOR A MINIMUM OF 3 HOURS AND UNTIL ALL UNOCCUPIED COOLING CALLS ARE SATISFIED. ALL UNOCCUPIED COOL SET POINTS WILL HAVE A MINIMUM 3 DEGREES DIFFERENTIAL.

MECHANICAL DEMOLITION NOTES

- THE MECHANICAL CONTRACTOR SHALL REMOVE ALL MECHANICAL EQUIPMENT, ACCESSORIES, CONTROLS AND ASSOCIATED PIPING AS SHOWN OR INDICATED ON THE DRAWINGS.
- 2. NO EQUIPMENT OR DEVICES THAT HAVE BEEN DISCONNECTED AND OR
- THE MECHANICAL CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIAR WITH THE EXISTING SYSTEMS AND CONDITIONS IN AREAS OF
- 4. ANY SYSTEMS OR EQUIPMENT TO REMAIN ACTIVE DURING RENOVATION SHALL BE KEPT IN OPERATION BY PROVIDING TEMPORARY CONNECTIONS AS REQUIRED UNTIL NEW SYSTEMS ARE INSTALLED AND
- OPERATIONAL.

 5. THE MECHANICAL CONTRACTOR SHALL COORDINATE WITH THE OWNER,
- CM, AND OR GENERAL CONTRACTOR ANY AND ALL PHASING OF THE MECHANICAL DEMOLITION WORK IN ORDER TO SATISFY THE CONSTRUCTION SCHEDULE AND OWNERS OCCUPANCY REQUIREMENTS.

 6. ANY MECHANICAL EQUIPMENT TO BE REMOVED AND REUSED OR
- TURNED OVER TO THE OWNER, AT OWNERS REQUEST, OR AS INDICATED ON THE DRAWINGS SHALL BE CAREFULLY REMOVED AND STORED TO PREVENT DAMAGE.
- 7. THE MECHANICAL CONTRACTOR SHALL ALSO REVIEW THE ARCHITECTURAL DEMOLITION DRAWINGS AS PART OF THIS CONTRACT FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
- 8. ALL SERVICE INTERRUPTIONS SHALL BE COORDINATED AND APPROVED WITH THE OWNER IN ADVANCE PRIOR TO COMMENCEMENT OF ANY
- 9. THE MECHANICAL CONTRACTOR SHALL COORDINATE HIS DEMOLITION WORK WITH THAT OF OTHER TRADES IN ORDER TO AVOID CONFLICTS.



INNOVATIVE ENGINEERING
SERVICES, LLC

AN INTEGRATED ENGINEERING + DESIGN FIRM

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WALLINGFORD, CT 06492
TEL: 203.467.4370
WEB: WWW.IESLLC.BIZ

ISSUED FOR PROGRESS

<u>-</u> ۷.	DATE	DESCRIPTION
OJE	CT·	

DJECT:

NEW HAVEN, CT 06515

BEECHER SCHOOL

MECHANICAL NOTES,
LEGEND, SCHEDULE & DETAIL

PROJECT NUMBER:

ISSUED: 04/05/23

DRAWN BY:

CHECKED BY:

SCALE: AS NOTED

M-2

SHEET:

THE WORK TO BE DONE UNDER THIS DIVISION OF THE SPECIFICATIONS INCLUDE $^{ au}$ FURNISHING OF ALL EQUIPMENT, SUPPLIES, LABOR, SUPERVISION AND ALL MATERIALS NOT SPECIFICALLY MENTIONED BUT NECESSARY OR REQUIRED TO PROVIDE COMPLETE AND FULLY OPERATIONAL HVAC SYSTEMS. IT IS THE INTENTION OF THE SPECIFICATIONS AND DRAWINGS TO CALL FOR FINISHED WORK TESTED AND READY FOR OPERATION

IT IS THE INTENT THAT ALL MECHANICAL WORK AND MATERIALS NECESSARY TO COMPLETE THE ENTIRE PROJECT IN ACCORDANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS, WHETHER SPECIFICALLY MENTIONED HERE OR NOT, SHALL BE FURNISHED. ALL WORK AND MATERIALS NECESSARY TO FULFILL THIS INTENT SHALL BE SUPPLIED UNDER THE MECHANICAL SPECIFICATIONS WITHOUT ADDITIONAL COST TO THE OWNER.

<u>'FURNISH' OR 'PROVIDE'</u> — TO FURNISH, ERECT, INSTALL AND CONNECT UP COMPLETE AND READY FOR OPERATION PARTICULAR WORK REFERRED TO, UNLESS SPECIFICALLY INDICATED OR SPECIFIED OTHERWISE.

WORK' - LABOR, MATERIALS, EQUIPMENT, APPARATUS, CONTROLS, ACCESSORIES AND ALL OTHER ITEMS CUSTOMARILY FURNISHED AND/OR REQUIRED FOR PROPER AND COMPLETE

'EXPOSED' - NOT INSTALLED UNDERGROUND OR 'CONCEALED' AS DEFINED ABOVE. <u>'INDICATE' OR 'SHOWN'</u> — AS INDICATED OR SHOWN ON DRAWINGS OR SPECIFIED WITH SPECIFICATIONS.

- PIPE, FITTINGS, FLANGES, VALVES, CONTROLS, HANGERS, TRAPS, DRAIN NSULATION AND ITEMS CUSTOMARILY OR REQUIRED IN CONNECTION WITH OR RELATING TO

'SUPPLY' - TO PURCHASE, PRODUCE, ACQUIRE AND DELIVER COMPLETE WITH ALL RELATED

- TO ERECT, MOUNT AND CONNECT UP COMPLETE WITH ALL RELATED

'NOTED' - AS INDICATED ON DRAWINGS AND/OR SPECIFIED.

THIS CONTRACTOR SHALL GIVE ALL NECESSARY NOTICES, OBTAIN ALL PERMITS AND PAY ALL STATE AND LOCAL TAXES, FEES AND OTHER COSTS IN CONNECTION WITH HIS WORK; FILE ALL NECESSARY PLANS, PREPARE ALL DOCUMENTS AND OBTAIN ALL NECESSARY APPROVALS OF ALL STATE AND LOCAL DEPARTMENTS HAVING JURISDICTION; OBTAIN AL REQUIRED CERTIFICATES OF INSPECTION FOR HIS WORK AND DELIVERY OF SAME TO THE OWNER BEFORE REQUEST FOR ACCEPTANCE AND FINAL PAYMENT FOR THE WORK.

THIS CONTRACTOR SHALL INCLUDE IN THE WORK, WITHOUT EXTRA COST TO THE OWNER ANY LABOR, MATERIALS, SERVICES, APPARATUS, DRAWINGS (IN ADDITION TO CONTRACT DRAWINGS AND DOCUMENTS). IN ORDER TO COMPLY WITH ALL APPLICABLE LAWS ORDINANCES, RULES AND REGULATIONS WHETHER OR NOT SHOWN ON THE DRAWINGS

THIS CONTRACTOR SHALL PERFORM AND FILE ALL TESTS IN ACCORDANCE WITH THE CURRENT REGULATIONS OF THE STATE AND LOCAL AUTHORITIES. HE SHALL FURNISH AND INSTALL SIGNS REQUIRED BY THE STATE AND LOCAL AUTHORITIES.

ALL MATERIALS FURNISHED AND ALL WORK INSTALLED SHALL COMPLY WITH THE RULES AND RECOMMENDATIONS OF THE NATIONAL BOARD OF FIRE UNDERWRITERS, WITH ALI REQUIREMENTS OF LOCAL UTILITIES COMPANIES, WITH THE RECOMMENDATIONS OF THE FIRE INSURANCE RATING ORGANIZATION HAVING JURISDICTION.

ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE CURRENT CONNECTICUT STATE BUILDING CODE, INCLUDING THE MOST CURRENTLY ADOPTED CONNECTICAL SUPPLEMENT AND APPLICABLE AMENDMENTS, STATE FIRE SAFETY CODE, NATIONAL BUILDING CODE, (INTERNATIONAL RESIDENTIAL CODE, INTERNATIONAL MECHANICAL CODE, INTERNATIONAL PLUMBING CODE, N.F.P., A.D.A., UL., NEMA, O.S.H.A. AND WITH ALL REQUIREMENTS OF ALL GOVERNMENTAL DEPARTMENTS HAVING JURISDICTION.

REQUIREMENTS OF THE ABOVE SHALL TAKE PRECEDENCE OVER PLANS AND SPECIFICATIONS.

THE MECHANICAL CONTRACTOR SHALL FURNISH STATUTORY COMPENSATION INSURANCE CERTIFICATES FOR PERSONAL AND PROPERTY DAMAGE DISABILITY/LIABILITY AS REQUIRED BY THE OWNER AND/OR AS HEREINBEFORE DESCRIBED. GUARANTEE AND SERVICE

THE CONTRACTOR SHALL GUARANTEE ALL MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF ACCEPTANCE OF THE INSTALLATION. IN ADDITION, THE CONTRACTOR SHALL PROVIDE, FREE OF CHARGE, ONE YEAR'S MAINTENANCE GUARANTEE ON MAINTAINED SERVICE AND ADJUSTMENT OF ALL EQUIPMENT IN THIS CONTRACT.

ALL COMPRESSORS TO HAVE (5) FIVE YEAR EXTENDED WARRANTEES.

DRAWINGS AND INTENT

DRAWINGS ARE INTENDED AS WORKING DRAWINGS FOR GENERAL LAYOUT OF THE VARIOUS HVAC SYSTEMS. HOWEVER, LAYOUT OF EQUIPMENT, ACCESSORIES, SPECIALTIES, DUCTWORK, AND PIPING SYSTEMS ARE DIAGRAMMATIC UNLESS SPECIFICALLY DIMENSIONED, AND DO NOT NECESSARILY INDICATE EVERY REQUIRED PIPE, VALVE, FITTINGS, TRAP, ELBOW, TRANSITION, OFFSETS, OR SIMILAR ITEMS REQUIRED FOR A COMPLETE INSTALLATION.

ALL EXISTING CONDITIONS ARE NOT INDICATED ON THE DOCUMENTS AND THOSE SHOWN ARE APPROXIMATIONS. THE CONTRACTOR IS TO VERIFY, IN THE FIELD, ALL EXISTING CONDITIONS

EXAMINATION OF PREMISES - SPECIAL NOTE: NO CONSIDERATION OR ALLOWANCE WILL BE GRANTED FOR FAILURE TO VISIT SITE, OR ANY ALLEGED MISUNDERSTANDING OF MATERIAL TO BE FURNISHED, OR WORK TO BE DONE; IT BEING THAT TENDER OF PROPOSAL INDICATED WITH ITS AGREEMENT TO ITEMS AND CONDITIONS REFERRED TO HEREIN OR INDICATED ON AFOREMENTIONED DRAWINGS.

MEASUREMENTS ALL MEASUREMENTS TAKEN AT THE BUILDING SHALL TAKE PRECEDENCE OVER SCALE DIMENSIONS. EVERY PART OF THE PLANS SHALL BE FITTED TO THE ACTUAL CONDITIONS AT THE BUILDING. IF IN CONFLICT WITH SCALE DIMENSIONS, CONTACT ARCHITECT FOR

TEMPORARY SERVICES

THE HVAC CONTRACTOR IS TO COORDINATE WITH THE GENERAL CONTRACTOR, PRIOR TO PERFORMING WORK REQUIRING INTERRUPTION OF EXISTING SERVICES, THE CONTRACTOR SHALL SECURE FROM THE OWNER, APPROVAL OF THE PROPOSED OPERATION.

WORK SHALL BE ARRANGED FOR CONTINUOUS PERFORMANCE WHENEVER POSSIBLE. THE MECHANICAL CONTRACTOR SHALL PROVIDE TEMPORARY SERVICES AND/OR CONNECTIONS WHERE REQUIRED AND/OR SCHEDULE AND PERFORM OVERTIME WORK FOR ANY OPERATION WHICH REQUIRED SHUTDOWN OF THE FACILITIES AT NO ADDITIONAL COST TO THE OWNER.

THE AREA OF CONSTRUCTION AND/OR ADJACENT SPACES MAY BE OCCUPIED DURING THE CONSTRUCTION PERIOD. THE CONTRACTOR IS TO TAKE ALL NECESSARY MEASURES AND PROVIDE ALL MATERIALS TO ENSURE A SAFE ENVIRONMENT FOR THE FACILITY'S

CONTINUITY OF EXISTING SYSTEMS

WHEREVER AN EXISTING SYSTEM IS REMOVED, PARTIALLY REMOVED, OR MODIFIED THE REMAINING SYSTEM IS TO FUNCTION FULLY AS BEFORE. MAINTAIN CONTINUITY OF THE EXISTING AIR SYSTEMS, HYDRONIC SYSTEMS, AND CONTROL

SYSTEMS TO THE AREAS NOT AFFECTED BY THIS ALTERATION.

SCAFFOLDING, RIGGING AND HOISTING UNLESS OTHERWISE SPECIFIED, CONTRACTOR SHALL FURNISH ALL SCAFFOLDING, RIGGING HOISTING AND SERVICES NECESSARY FOR ERECTION AND DELIVERY INTO THE PREMISES OF ANY EQUIPMENT AND APPARATUS FURNISHED.

THE CONTRACTOR SHALL REMOVE SAME FROM PREMISES WHEN NO LONGER REQUIRED.

<u>HOUSEKEEPING</u>

THIS CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING STOCK OF MATERIALS AND EQUIPMENT STORED ON PREMISES, AT LOCATIONS DESIGNATED FOR SUCH USE, IN A NEAT

THIS CONTRACTOR SHALL AT ALL TIMES, KEEP THE PREMISES FREE FROM ACCUMULATION F WASTE MATERIAL OR RUBBISH CAUSED BY HIS EMPLOYEES AT WORK. HE SHALL REMOVE HIS RUBBISH AND SURPLUS MATERIALS FROM THE JOB SITE AT THE END OF EACH WORK DAY AND SHALL LEAVE THE PREMISES AND HIS WORK IN A CLEAN AND ORDERLY CONDITION.

ALL MATERIAL SCHEDULED FOR REMOVAL IS TO BE DISPOSED OF IN A MANNER MEETING ALL FEDERAL, STATE, AND LOCAL REGULATIONS. PROTECTION OF MATERIALS AND EQUIPMENTS

CLOSE PIPE OPENINGS WITH CAPS OR PLUGS DURING INSTALLATION.

PROVIDE TEMPORARY CLOSURES ON OPEN ENDED DUCTS DURING CONSTRUCTION PERIOD. TIGHTLY COVER AND PROTECT FIXTURES AND EQUIPMENT AGAINST DIRT, WATER AND CHEMICAL OR MECHANICAL INJURY.

AT COMPLETION OF ALL WORK, FIXTURES, EXPOSED MATERIALS AND EQUIPMENT SHALL BE THOROUGHLY CLEANED.

WORK NOT INCLUDED ALL ELECTRICAL WOR LINTELS AND STRUCTURAL FRAMING

ALL CONCRETE WORK

ALL PAINTING THIS CONTRACTOR SHALL FURNISH THE GENERAL CONTRACTOR WITH THE SIZES AND LOCATIONS OF CHASES AND OPENINGS WHICH OCCUR IN WALLS, PARTITIONS, FLOORS, ROOFS, FTC., REQUIRED FOR THE INSTALLATION OF THE WORK CALLED FOR UNDER THIS

PRIOR TO DELIVERY TO THE JOB SITE, BUT SUFFICIENTLY IN ADVANCE OF REQUIREMENTS NECESSARY TO ALLOW ENGINEER AMPLE TIME FOR REVIEW, CONTRACTOR SHALL SUBMIT FOR APPROVAL, FIVE (5) COPIES OF EACH SHOP DRAWING.

CONTRACT. THIS WORK WILL BE DONE BY THE GENERAL CONTRACTOR, EXCEPT CUTTING

PROJECT NAME AND LOCATION ARCHITECT AND ENGINEER

INDICATE ON EACH SUBMISSION:

ITEM IDENTIFICATION . APPROVAL STAMP OF PRIME CONTRACTOR

REQUIRED FOR THE INSTALLATION OF HANGERS.

ALL DUCTWORK SHOP DRAWINGS AND COORDINATION DRAWINGS SHALL BE SUBMITTED ON 3/8 IN SCALE DRAWINGS AND SHALL INCLUDE LOCATIONS AND SIZES OF EXISTING EQUIPMENT ALONG WITH NEW WORK. DRAWINGS SHALL INDICATE LOCATIONS OF HANGERS, SUPPORTS, EXPANSION JOINTS, GUIDES, ANCHORS AND ANCHOR LOADS.

COORDINATION DRAWINGS SHALL INDICATE ALL MEP EQUIPMENT, DUCTS AND PIPES AND PERTINENT ARCHITECTURAL ITEMS. MOUNTING HEIGHTS SHALL BE NOTED.

PRIOR TO DELIVERY TO THE JOB SITE, BUT SUFFICIENTLY IN ADVANCE OF REQUIREMENTS NECESSARY TO ALLOW ENGINEER AMPLE TIME FOR REVIEW, CONTRACTOR SHALL SUBMIT FOR APPROVAL, FIVE (5) COPIES OF EACH SHOP DRAWING.

INDICATE ON EACH SUBMISSION:

PROJECT NAME AND LOCATION ARCHITECT AND ENGINEER

ITEM IDENTIFICATION 4. APPROVAL STAMP OF PRIME CONTRACTOR

SUBMIT SUBMITTALS ON THE FOLLOWING: PIPING MATERIALS

PIPING INSULATIONS

AIR CONDITIONING EQUIPMENT, PUMP. CONTROLS 6. HYDRONIC SYSTEMS BALANCING REPORTS

<u>EQUIPMENT DEVIATION</u>

THE PLANS AND/OR SPECIFICATIONS INDICATE THE NAME MODEL NUMBER OR TYPE OF EQUIPMENT OR MATERIALS SPECIFIED TO SET THE STANDARD OF THE EQUIPMENT FOR THE PROJECT THE ENGINEER WILL ENTERTAIN THE LISE OF OTHER MANUFACTURER'S FOLLIPMENT OF LIKE FUNCTIONS AND EQUAL QUALITY. FINAL ACCEPTANCE OF SUBSTITUTES IS AT THE ENGINEER'S DISCRETION. SHOULD THE BIDDER DESIRE TO USE EQUIPMENT OR MATERIALS OR A MANUFACTURER OTHER THAN THOSE SPECIFIED OR SHOWN. HE SHALL ATTACH A RIDER TO THE BID FORM LISTING THE DEDUCTIONS AND/OR ADDITIONS TO HIS BASE BID. TOGETHER WITH THE MANUFACTURE'S NAME AND MODEL NUMBERS OF THE EQUIPMENT OR MATERIALS HE PROPOSED TO FURNISH AS 'SUBSTITUTES'. IF NO SUBSTITUTE INFORMATION IS FURNISHED, IT WILL BE EXPRESSLY UNDERSTOOD THAT ALL EQUIPMENT AND MATERIALS NAMED WILL BE FURNISHED IN FULL ACCORDANCE WITH THE PLANS AND/OR

SPECIFICATIONS. RECORD DRAWINGS

CONTRACTOR SHALL KEEP ACCURATE RECORD OF ALL DEVIATIONS IN WORK AS ACTUALLY INSTALLED FROM WORK INDICATED PAYING PARTICULAR ATTENTION TO DIMENSIONING OUTSIDE UNDERGROUND UTILITY LINES, THEIR OFFSETS AND VALVES.

AT THE CLOSE-OUT OF THE PROJECT THE CONTRACTOR IS TO DELIVER TO THE OWNER TWO SETS OF "AS-BUILT" DRAWINGS COPIES OF ALL APPROVED SHOP DRAWINGS.

OWNER'S INSTRUCTIONS AND SYSTEM OPERATION

THE CONTRACTOR IS TO INSTRUCT THE OWNER, OR HIS REPRESENTATIVE, ON THE OPERATION AND MAINTENANCE PROCEDURES FOR ALL OF THE INSTALLED SYSTEMS AND EQUIPMENT. IN ADDITION TO THE VERBAL INSTRUCTIONS, THESE INSTRUCTIONS SHALL BE WRITTEN IN LAYMAN'S LANGUAGE AND SHALL BE INSERTED IN VINYL-COVERED THREE-RING LOOSE LEAF BINDER. THIS INFORMATION IN BINDER SHALL BE FIRST SENT TO AND APPROVED BY THE ARCHITECT/ENGINEER BEFORE TURNING OVER TO OWNER.

<u>INSTALLATIONS</u> <u>SLEEVES</u>

PROVIDE NO. 22 GA. GALVANIZED IRON SLEEVES EXTENDED THROUGH CONSTRUCTION AT ALL PENETRATIONS THROUGH CEILINGS, WALLS AND PARTITIONS.

FOR INSULATED PIPING THE SLEEVE IS TO BE SIZED TO ALLOW INSULATION TO PASS THROUGH SLEEVE, PROVIDE 1/2 INCH SPACE BETWEEN PIPE AND/OR INSULATION AND

FIRE SEAL ALL SLEEVES IN ACCORDANCE WITH BUILDING CODE AND APPLICABLE SECTIONS **EXPANSION ANCHORS**

SUSPEND HANGERS FROM EXPANSION ANCHORS IN SOLID CONCRETE SLABS SIMILAR TO HILTI HDI. PROVIDE HANGER IN PLACE WITH DOUBLE NUTS. PROVIDE PROTECTION SHIELDS IN INSULATED PIPING. INSTALL HANGERS OVER INSULATION

WHERE OVERHEAD CONSTRUCTION DOES NOT PERMIT FASTENING HANGER RODS IN REQUIRED LOCATIONS, PROVIDE ADDITIONAL STEEL FRAMING AS REQUIRED AND REVIEWED.

HANGERS AND SUPPORTING PIPE HANGING AND SUPPORTING - PIPING SHALL NOT BE SUPPORTED BY OTHER PIPING, BUT SHALL BE SUPPORTED WITH PIPE HANGERS SUITABLE FOR THE SIZE OF PIPE AND PROPER STRENGTH AND QUALITY AT PROPER INTERVALS SO THAT THE PIPING CANNOT BE MOVED ACCIDENTALLY FROM THE INSTALLED POSITION AS FOLLOWS:

PROVIDE CLEVIS HANGERS

1-1/4 INCH OR LARGER (HORIZONTAL)

1-1/4 INCH OR LARGER (VERTICAL)

AT CENTER OF CENTER SPACING (UNLESS OTHERWISE NOTED) 1/2 INCH PIPE OR TUBING 3/4 INCH OR 1 INCH PIPE OR TUBING

8 FEET 10 FEET EVERY FLOOR LEVEL <u> /IBRATION AND SEISMIC CONTROL</u>

QUIET OPERATION — ALL WORK SHALL OPERATE UNDER ALL CONDITIONS OF LOAD WITHOUT ANY SOUND OR VIBRATION WHICH IS OBJECTIONABLE IN THE OPINION OF THE ENGINEER. IN CASE OF MOVING MACHINERY, SOUND OR VIBRATION NOTICEABLE OUTSIDE OF ROOM IN WHICH IT IS INSTALLED, OR ANNOYING INSIDE ITS OWN ROOM, WILL BE CONSIDERED OBJECTIONABLE BY THE ENGINEER AND SHALL BE REMEDIED IN APPROVED MANNER BY THE CONTRACTOR AT HIS EXPENSE.

PROVIDE FLEXIBLE PIPE CONNECTIONS AT ALL PIPING CONNECTED TO MOVING EQUIPMENT. PROVIDE FLEXIBLE DUCT CONNECTIONS AT ALL DUCTWORK CONNECTED TO MOVING EQUIPMENT. FLEXIBLE CONNECTIONS SHALL BE 29 OZ. NEOPRENE COATED FIBERGLASS, 6" WIDE. BURNING PROPERTIES SHALL CONFORM TO NFPA 90A, FASTEN TO DUCTWORK PER MANUFACTURER'S RECOMMENDATIONS. FABRIC SHALL NOT BE STRESSED OTHER THAN BY

AIR PRESSURE. ALLOW AT LEAST ONE INCH SLACK TO INSURE THAT NO VIBRATION IS

PROVIDE VIBRATION ISOLATION SPRINGS OR PADS AT MOUNTING AND SUPPORTS FOR ALL EQUIPMENT CAPABLE OF TRANSMITTING VIBRATIONS.

SEISMIC RESTRAINTS DESIGNED AND CONSTRUCTED FOR LATERAL FORCES IN ANY DIRECTION SHALL BE PROVIDED FOR ALL MECHANICAL EQUIPMENT IN ACCORDANCE WITH THE STATE BUILDING CODE.

SEISMIC RESTRAINTS SHALL NOT BE REQUIRED FOR THE FOLLOWING: 1. PIPING IN BOILER AND MECHANICAL ROOMS LESS THAN 1-1/4 INCH INSIDE DIAMETER. ALL OTHER PIPING LESS THAN 2-1/2 INCH INSIDE DIAMETER. RECTANGULAR AIR-HANDLING DUCTS LESS THAN 6 SQUARE FEET IN CROSS-SECTIONAL

4. ROUND AIR-HANDLING DUCTS LESS THAN 28 INCHES IN DIAMETER. 5. PIPING SUSPENDED BY INDIVIDUAL HANGERS 12 INCHES OR LESS IN LENGTH FROM THE TOP OF THE PIPE TO THE BOTTOM OF THE SUPPORT FOR THE HANGER 6. DUCTS SUSPENDED BY HANGERS 12 INCHES OR LESS IN LENGTH FROM THE TOP OF

SEISMIC RESTRAINT FOR DUCTWORK; PROVIDE REQUIRED BRACING MATERIAL. DUCTWORK SHALL BE SUPPORTED AND BRACED TO RESIST ALL DIRECTIONAL (TRANSVERSE, LONGITUDINAL AND VERTICAL) FORCES EQUAL TO 10 PERCENT OF THE WEIGHT OF THE DUCT SYSTEM.

SEISMIC RESTRAINTS

ALL IDENTIFICATION LABELING IS TO COMPLY WITH ASME A13.1

ALL PIPING IS TO BE LABELED WITH INDICATIONS OF SERVICE AND DIRECTION OF FLOW. ALL DUCTWORK IS TO BE LABELED WITH INDICATIONS OF SERVICE, DIRECTION OF FLOW AND ASSOCIATED SYSTEM DESIGNATION.

ALL EQUIPMENT IS TO HAVE PERMANENT LABELS INDICATING EQUIPMENT DESIGNATION.

SIZES AND APPROXIMATE LOCATION OF PIPING SYSTEMS ARE SHOWN ON THE DRAWINGS. CHECK CAREFULLY WITH THE ARCHITECTURAL DRAWINGS. DRAWINGS SHOWING WORK OF OTHER TRADES. AND EXISTING FIELD CONDITIONS TO MAKE SURE THAT THERE WILL BE NO ONFLICT BETWEEN THESE TRADES AND THE PIPING SYSTEMS. PIPES SHALL BE OFFSET AS REQUIRED TO CLEAR STRUCTURAL MEMBERS AND EXISTING FIELD CONDITIONS

PIPING TO BE INSTALLED WITH PROPER PITCH TO LOW POINTS. PROVIDE DRAIN VALVES AT ALL LOW POINTS AND AIR VENTS AT ALL HIGH POINTS OF THE PIPING SYSTEM. INSTALL PIPING TO ALLOW FOR PIPE EXPANSION.

<u>MATERIALS</u>

WHENEVER DISSIMILAR PIPING MATERIALS ARE CONNECTED THE TWO SHALL BE SEPARATED WITH AN 'INSULATION' CONNECTION (DIELECTRIC) FITTING.

PIPE, VALVES & FITTINGS

TYPE BCS, BLACK CARBON STEEL PIPE 1/8 THROUGH 10 INCHES SHALL BE SCHEDULE 40 BLACK CARBON STEEL,

CONFORMING TO ASTM A53/A53M. PIPE 12 THROUGH 24 INCHES SHALL BE 0.375-INCH WALL BLACK CARBON STEEL, CONFORMING TO ASTM A53/A53M, TYPE E, GRADE B (ELECTRIC-RESISTANCE

WELDED) OR TYPE S (SEAMLESS). FITTINGS 2 INCHES AND UNDER SHALL BE 150-POUNDS PER SQUARE INCH, GAGE (PSIG) WORKING STEAM PRESSURE (WSP) BANDED BLACK MALLEABLE IRON SCREWED, CONFORMING TO ASTM A197/A197M AND ASME B16.3.

UNIONS 2 INCHES AND UNDER SHALL BE 250 POUNDS PER SQUARE INCH, WSP FEMALE, SCREWED, BLACK MALLEABLE IRON WITH BRASS-TO-IRON SEAT, AND GROUND JOINT, CONFORMING TO ASME B16.39. FITTINGS 2-1/2 INCHES AND OVER SHALL BE STEEL BUTT WELD, CONFORMING TO

FLANGES 2-1/2 INCHES AND OVER SHALL BE 150-POUND FORGED-STEEL CONFORMING

ASTM A234/A234M AND ASME B16.9 TO MATCH PIPE WALL THICKNESS.

ASME B16.5, WELDING NECK TO MATCH PIPE WALL THICKNESS. GROOVED PIPING COUPLINGS AND FITTINGS ARE AN ACCEPTABLE CONTRACTOR ALTERNATE TO WELDED AND FLANGED PIPING ONLY FOR ABOVE GROUND, INDOOR CHILLED WATER AND CONDENSER WATER PIPING LOCATED IN THE CHILLER MECHANICAL

"GROOVED PIPE COUPLINGS AND FITTINGS."

EQUIPMENT ROOM.

TYPE CPR, COPPER TYPE CPR-A, COPPER ABOVE GROUND

TUBING 2 INCHES AND UNDER SHALL BE SEAMLESS COPPER TUBING, CONFORMING TO ASTM B88. TYPE L (HARD-DRAWN FOR ALL HORIZONTAL AND ALL EXPOSED VERTICAL LINES, ANNEALED FOR CONCEALED VERTICAL LINES). FITTINGS 2 INCHES AND UNDER SHALL BE 150-PSIGWSP WROUGHT-COPPER SOLDER

JOINT FITTINGS CONFORMING TO ASME B16.22. PROVIDE HOUSING FOR ALL COUPLINGS, FABRICATED IN TWO OR MORE PARTS, OF BLACK, UNGALVANIZED MALLEABLE IRON CASTINGS. COUPLING GASKET SHALL BE

BE OVAL-NECK, TRACK-HEAD TYPE, WITH HEXAGONAL HEAVY NUTS CONFORMING TO ASTM A183. FABRICATE ALL PIPE FITTINGS USED WITH COUPLINGS OF BLACK, UNGALVANIZED MALLEABLE IRON CASTINGS. WHERE A MANUFACTURER'S STANDARD-SIZE MALLEABLE

MOLDED SYNTHETIC RUBBER, CONFORMING TO ASTM D 2000. COUPLING BOLTS SHALL

FABRICATE FITTINGS FROM SCHEDULE 40 OR 0.75-INCH WALL ASTM A53/A53M, GRADE B SEAMLESS STEEL PIPE; LONG RADIUS SEAMLESS WELDING FITTINGS WITH WALL THICKNESS TO MATCH PIPE, CONFORMING TO ASTM A234/A234M AND ASME B16.9.

IRON FITTING PATTERN IS NOT AVAILABLE, APPROVED FABRICATED FITTINGS MAY BE

CHILLED WATER PIPING

PE L COPPER TUBING WITH SWEAT FITTINGS WITH 95-5 SOLDER OR STANDARD WEIGHT, SCHEDULE 40, OPEN HEARTH STEEL, NATIONAL OR EQUAL. FITTINGS FOR STEEL PIPE SHALL BE AS FOLLOWS: GENERALLY, BUTT WELDING FITTINGS OVER TWO INCHES SHALL BE USED AND EITHER SOCKET-WELD OR SCREWED FOR TWO INCHES AND UNDER, WELDING TTINGS SHALL BE STANDARD FORGED STEEL WITH CHAMFERED ENDS. ALL BRANCHES SHALL BE WELDED WITH EITHER WELDOLETE OR TEES, OR MATCH EXISTING MATERIALS.

	MAX			ER SERVICE	G (12"-24")			
SPECIALITY	APPLICATION	TYPE	SIZE (INCHES)	BODY/SEAT BODY/TRIM	CONNECTION	MINIMUM RATING (12)		
BALL VALVE	ISOLATION (WITH LOCKING	FULL PORT 3-PC.	1/2 - 2	BRONZE/TEFLON	SWEAT ①	400 PSIG WOG		
1.	HANDLE) AND MODULATION	FULL PORT 2-PC.	1/2 - 2	BRONZE/ TEFLON	THREADED	400 PSIG WOG		
GATE VALVE	ISOLATION	RISING STEM	1/2-12	STEEL	THD/FLG'D	125 WOG		
GLOBE VALVE	ATC MODULATION	CONTROL VALVE	1/2 - 2	BRONZE/METAL	THREADED	400 PSIG WOG		
			2-1/2 - 6	BRONZE/METAL	FLANGED	400 PSIG WOG		
BUTTERFLY VALVE	ISOLATION AND MODULATION	HIGH PREFORMANCE	2-1/2 - 24	CARBON STEEL/PTFE	THREADED LUG	285 PSIG CWP		
PLUG VALVE	MANUAL BALANCING	NON-LUBRICATED	3 - 12	STEEL/IRON	FLANGED	CLASS 125		
CHECK VALVE	PUMPS	SILENT	1/2 - 2	BRONZE/BRONZE	THREADED	200 PSIG WOG		
		to common to the	SILENT GLOBE	2-1/2 - 24	IRON/BRONZE	FLANGED	CLASS 125	
	PIPING	PIPING	PIPING	Y-PATTERN SWING	1/2 - 2	BRONZE/BRONZE	THREADED	200 PSIG WOG
			2-1/2 - 24	IRON/BRONZE	FLANGED	CLASS 125		
STRAINER	CONTROL	CONTROL VALVES AND	Y-TYPE	1/2 - 2	BRONZE/STAINLESS (1/16 INCH DIA.)	THREADED	200 PSIG WOG	
	FLOW METERS	<u> </u>	2-1/2 - 4	IRON/STAINLESS (1/16 INCH DIA.)	FLANGED	CLASS 125		
			5 - 24	IRON/STAINLESS (1/8 INCH DIA.)	FLANGED	CLASS 125		
	PUMP SUCTION	IN-LINE	1/2 - 2	BRONZE/STAINLESS (1/16 INCH DIA.)	THREADED	200 PSIG WOG		
		Y-TYPE	2-1/2 - 4	IRON/STAINLESS (3/16 INCH DIA.)	FLANGED	CLASS 125		
			5 - 24	(1/4 INCH DIA.)	FLANGED	CLASS 125		
		ANGLE SUCTION DIFFUSER END SUCTION PUMPS	2 - 12	IRON/STAINLESS (3/16 INCH DIA.) START UP STRAINER = 16 MESH BRONZE	FLANGED	CLASS 125		

(1) THESE ARE MINIMUM RATINGS FOR ASTM A126, CLASS B AND ASTM B-61 AND 62. FOR HIGHER PRESSURES AND TEMPERATURES, ADJUST THESE VALUES TO INCLUDE STATIC HEAD PLUS 1.1 TIMES PRESSURE RELIEF VALVE SETTINGS PLUS PUMP SHUTOFF HEAD PRESSURE. FOR ACTUAL MAXIMUM ALLOWABLE VALVE AND STRAINER RATINGS, REFER TO "PRESSURE TEMPERATURI RATINGS-NON SHOCK" TABLES AND "ADJUSTED PRESSURE RATINGS" FOR COPPER TUBE, SOLDERED END VALVES (STRAINERS)

2 SWP = STEAM WORKING PRESSURE CWP = COLD WATER WORKING PRESSURE WOR = WATER, OIL OR GAS CLASS = ANSI STANDARD

PIPE INSULATION

THE FOLLOWING PIPING SYSTEMS ARE TO BE INSULATED:

3 USE 1/8 INCH DIA. FOR PLATE HEAT EXCHANGER APPLICATION.

CHILLED WATER SUPPLY AND RETURN PIPING

CHILLED WATER PIPING INSULATION

INSULATE WITH RIGID PREFORMED FIBERGLASS WITH AP-T PLUS JACKET, SCHULLER MICRO-LOK OR EQUAL. INSULATION THICKNESS SHALL BE 1" THICK FOR BELOW 1 1/2" OR SMALLER PIPING, 1-1/2" THICK FOR 2" TO 3" PIPING AND 2" THICK FOR PIPING 4" AND LARGER. PROVIDE ZESTON COVERS ON ALL FITTINGS.

PIPING SPECIALTIES

<u>VALVES</u>

BALL AND BUTTERFLY VALVES BALL VALVES SHALL CONFORM TO MSS SP-72 FOR FIGURE 1A, THREE PIECE BODY AND SHALL BE RATED FOR SERVICE AT NOT LESS THAN 175 PSIG AT 200 DEGREES F. VALVE BODIES IN SIZES 2 INCHES AND SMALLER SHALL BE SCREWED-END CONNECTION—TYPE CONSTRUCTED OF CLASS A COPPER ALLOY. VALVE BODIES IN SIZES 2-1/2 INCHES AND LARGER SHALL BE FLANGED-FND CONNECTION TYPE CONSTRUCTED OF CLASS D, E, OR F MATERIAL AS REQUIRED. BALLS AND STEMS OF VALVES 2 INCHES AND SMALLER SHALL BE MANUFACTURER'S STANDARD WITH HARD CHROME PLATING FINISH. BALLS AND STEMS OF VALVES 2-1/2 INCHES AND LARGER SHALL BE MANUFACTURER'S STANDARD CLASS C CORROSION-RESISTANT STEEL ALLOY WITH HARD CHROME PLATING. BALLS OF VALVES 6 INCHES AND LARGER MAY BE CLASS D WITH 900 BRINELL HARD CHROME PLATING. VALVES SHALL BE SUITABLE FOR FLOW FROM EITHER DIRECTION AND SHALL SEAL EQUALLY TIGHT IN EITHER DIRECTION. VALVES WITH BALL SEALS HELD IN PLACE BY SPRING WASHERS ARE NOT ACCEPTABLE. ALL

VALVES SHALL HAVE ADJUSTABLE PACKING GLANDS. SEATS AND SEALS SHALL BE TETRAFLUOROETHYLENE. BUTTERFLY VALVES SHALL CONFORM TO MSS SP-67. VALVES SHALL BE WAFER TYPE FOR MOUNTING BETWEEN SPECIFIED FLANGES AND SHALL BE RATED FOR 150-PSIG SHUTOFF AND NONSHOCK WORKING PRESSURE. BODIES SHALL BE CAST FERROUS METAL CONFORMING TO ASTM A126, CLASS B, AND TO ASME B16.1 FOR BODY WALL THICKNESS. SEATS AND SEALS SHALL BE OF THE RESILIENT ELASTOMER TYPE

DESIGNED FOR FIELD REMOVAL AND REPLACEMENT. HIGH PERFORMANCE BUTTERFLY VALVES SHALL COMPLY WITH MSS SP-68 AND PROVIDED WITH CARBON STEEL BODY, THREADED LUG WITH REINFORCED TEFLON SEATS, STAINLESS STEEL STEM, OFFSET FROM SEAT PLANE, INSULATION STAND-OFF, AND 316 STAINLESS STEEL DISC. 17-4 STAINLESS STEEL STEM, BIDIRECTIONAL, AND

DRAIN, VENT, AND GAGE COCKS DRAIN, VENT, AND GAGE COCKS SHALL BE T-HEAD OR LEVER HANDLE, GROUND KEY TYPE, WITH WASHER AND SCREW, CONSTRUCTED OF POLISHED ASTM B62 BRONZE, AND RATED 125-PSI WSP. END CONNECTIONS SHALL BE RATED FOR SPECIFIED SERVICE

BEACON INDICATOR ON ALL ACTUATORS (MANUAL AND AUTOMATIC TYPE).

PUMP VENT COCKS, AND WHERE SPRAY CONTROL IS REQUIRED, SHALL BE UL UMBRELLA-HOOD TYPE, CONSTRUCTED OF MANUFACTURER'S STANDARD POLISHED BRASS. COCKS SHALL BE 1/2-INCH IPS MALE, END THREADED, AND RATED AT NOT LESS THAN 125 PSI AT 225 DEGREES F.

GATE VALVES (GAV) GATE VALVES 2 INCHES AND SMALLER SHALL CONFORM TO MSS SP-72. VALVES LOCATED IN TUNNELS, EQUIPMENT ROOMS, FACTORY—ASSEMBLED EQUIPMENT, AND WHERE INDICATED SHALL BE UNION-RING BONNET, SCREWED-END TYPE. MAKE PACKING OF NON-ASBESTOS TYPE MATERIALS. VALVES SHALL BE RISING STEM TYPE GATE VALVES 2-1/2 INCHES AND LARGER, SHALL BE TYPE I, (SOLID WEDGE DISC, TAPERED SEATS, STEAM RATED); CLASS 125 (125-PSIG STEAM-WORKING PRESSURE AT 353 DEGREES F SATURATION); AND 200-PSIG, WOG (NONSHOCK), CONFORMING TO MSS SP-70 AND TO REQUIREMENTS SPECIFIED HEREIN. VALVES SHALL BE FLANGED, WITH BRONZE TRIM AND OUTSIDE SCREW AND YOKE (OS&Y) CONSTRUCTION. MAKE

PACKING OF NON-ASBESTOS TYPE MATERIALS.

GLOBE AND ANGLE VALVES (GLV-ANV) GLOBE AND ANGLE VALVES 2 INCHES AND SMALLER, SHALL BE 125-POUND, 125-PSI CONFORMING TO MSS SP-85 AND TO REQUIREMENTS SPECIFIED HEREIN. VALVES LOCATED IN TUNNELS, EQUIPMENT ROOMS, FACTORY—ASSEMBLED EQUIPMENT, AND WHERE INDICATED SHALL BE UNION-RING BONNET, SCREWED-END TYPE. DISC SHALL BE FREE TO SWIVEL ON THE STEM IN ALL VALVE SIZES. COMPOSITION SEATING-SURFACE DISC CONSTRUCTION MAY BE SUBSTITUTED FOR ALL METAL-DISC CONSTRUCTION. MAKE PACKING OF NON-ASBESTOS TYPE MATERIALS. DISK AND PACKING SHALL BE SUITABLE FOR PIPE SERVICE INSTALLED.

GLOBE AND ANGLE VALVES 2-1/2 INCHES AND LARGER, SHALL BE CAST IRON WITH BRONZE TRIM. VALVE BODIES SHALL BE CAST IRON CONFORMING TO ASTM A126, CLASS A, AS SPECIFIED FOR CLASS 1 VALVES UNDER MSS SP-70. VALVE ENDS SHALL BE FLANGED IN CONFORMANCE WITH ASME B16.1. VALVE CONSTRUCTION SHALL BE OUTSIDE SCREW AND YOKE (OS&Y) TYPE. MAKE PACKING OF NON-ASBESTOS TYPE MATERIALS.

STANDARD CHECK VALVES (SCV)
STANDARD CHECK VALVES IN SIZES 2 INCHES AND SMALLER SHALL BE 125-PSI SWING CHECK CONFORMING TO MSS SP-71, EXCEPT AS OTHERWISE SPECIFIED. PROVIDE LIFT CHECKS WHERE INDICATED. SWING-CHECK PINS SHALL BE NONFERROUS AND SUITABLY HARD FOR THE SERVICE. DISCS SHALL BE COMPOSITION TYPE. SWING-CHECK ANGLE OF CLOSURE SHALL BE MANUFACTURER'S STANDARD UNLESS A SPECIFIC ANGLE IS

CHECK VALVES IN SIZES 2-1/2 INCHES AND LARGER SHALL BE CAST IRON, BRONZE TRIM, SWING TYPE. VALVE BODIES SHALL BE CAST IRON, CONFORMING TO ASTM A126, CLASS A. VALVE ENDS SHALL BE FLANGED IN CONFORMANCE WITH ASME B16.1. SWING-CHECK PIN SHALL BE AISI TYPE OR APPROVED EQUAL CORROSION-RESISTANT STEEL. ANGLE OF CLOSURE SHALL BE MANUFACTURER'S STANDARD UNLESS A SPECIFIC ANGLE IS NEEDED. VALVES SHALL HAVE BOLTED AND GASKETED COVERS. PROVIDE CHECK VALVES WITH , POSITIVE-CLOSURE DEVICES AND VALVE ENDS SHALL BE MECHANICAL JOINT OR FLANGED.

NONSLAM CHECK VALVES (NSV) CHECK VALVES AT PUMP DISCHARGES IN SIZES 2 INCHES AND LARGER SHALL BE NONSLAM OR SILENT-CHECK TYPE CONFORMING TO MSS SP-125. VALVE DISC OR PLATE SHALL CLOSE BEFORE LINE FLOW CAN REVERSE TO ELIMINATE SLAM AND WATER-HAMMER DUE TO CHECK-VALVE CLOSURE. VALVE SHALL BE CLASS 125 RATED FOR 200-PSI MAXIMUM, NONSHOCK PRESSURE AT 150 DEGREES F IN SIZES TO 12 INCHES. VALVES SHALL BE FITTED WITH FLANGES CONFORMING TO ASME B16.1. VALVE BODY MAY BE CAST IRON, CONFORMING TO ASTM A278/A278M, CLASS 40 OR EQUIVALENT STRENGTH DUCTILE IRON. DISKS SHALL BE MANUFACTURER'S STANDARD BRONZE, ALUMINUM BRONZE, OR CORROSION-RESISTANT STEEL. PINS, SPRINGS, AND MISCELLANEOUS TRIM SHALL BE MANUFACTURER'S STANDARD CORROSION—RESISTANT STEEL. DISK AND SHAFT SEALS SHALL BE BUNA-N ELASTOMER TETRAFLUOROETHYLENE

BALANCING FITTINGS

PROVIDE "B & G" CIRCUIT SETTER BALANCING FITTINGS ON ALL WATER SYSTEMS WHENEVER REQUIRED FOR BALANCING OF SYSTEMS.

SHALL BE TRERICE UNIVERSAL ANGLE TYPE #L80732, SOLID LIQUID FILLED, 4 ½" DIAL SIZE. FURNISH WITH SEPARABLE SOCKET WITH 2" EXTENSION NECK.

FLEXIBLE HOSES

FLEXIBLE PIPE VIBRATION AND PIPE-NOISE ELIMINATORS SHALL BE CONSTRUCTED OF WIRE—REINFORCED, RUBBER—IMPREGNATED CLOTH AND CORD MATERIALS AND SHALL BE FLANGED. FLANGES SHALL BE BACKED WITH FERROUS-METAL BACKING RINGS. SERVICE PRESSURE-RATING SHALL BE MINIMUM 1.5 TIMES ACTUAL SERVICE. SURGE

UNIT PIPE LENGTHS, FACE-TO-FACE, SHALL BE NOT LESS THAN THE FOLLOWING: INSIDE DIAMETER UNIT PIPE LENGTI TO 2-1/2 INCHES, INCLUSIVE 12 INCHES

PRESSURE SHALL BE AT 180 DEGREES F.

3 TO 4 INCHES, INCLUSIVE 18 INCHES 5 TO 12 INCHES, INCLUSIVE 24 INCHES TO 3 INCHES, INCLUSIVE 18 INCHES

4 TO 10 INCHES, INCLUSIVE 24 INCHES

12 INCHES AND LARGER 36 INCHES CONTROLS

PROVIDE ALL TEMPERATURE, OPERATION AND SAFETY CONTROLS, LOW VOLTAGE CONTROL WIRING, HARDWARE, SOFTWARE, AND ACCESSORIES NECESSARY TO ACHIEVE A FULLY OPERATIONAL HVAC CONTROL SYSTEM BY "CONNECTICUT CONTROLS INC." PROVIDE NEW TRITIUM CONTROL, UPDATE GRAPHICS AND CONTROLLERS. POWER WIRING SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

PROVIDE A PROGRAMMABLE THERMOSTAT(S) IN COMPLIANCE WITH THE INTERNATIONAL ENERGY CONSERVATION CODE INCLUDING SETBACK (55°F HEAT, 85° COOL) DEADBAND (5°F COMMERCIAL) AND TIMECLOCK (7 DAY COMMERCIAL)

TESTING AND BALANCING

COMPLETELY TEST AND BALANCE HOT AND CHILLED WATER SYSTEMS AND ALL SUPPLY, RETURN AND EXHAUST AIR SYSTEMS AND PROVE THE CAPACITIES OF THE SYSTEM AND THE SYSTEM COMPONENTS. SUBMIT RESULTS TO ENGINEER FOR APPROVAL

GENERAL PIPE TEST UNLESS OTHERWISE NOTED, TEST ALL PIPING HYDROSTATICALLY AT NOT LESS THAN 200 PSIG (# PER SQUARE INCH PRESSURE) FOR TWO HOURS AND ALL DEFECTIVE MATERIAL SHALL"BE REPLACED. BEFORE MAKING FINAL APPROVAL, THE SUBCONTRACTOR SHOULD PRODUCE A WRITTEN STATEMENT, SIGNED BY A REPRESENTATIVE OF THE OWNER'S UNDERWRITER, THAT THE WORK HAS BEEN COMPLETED AND TESTED IN ACCORDANCE WITH APPROVED SPECIFICATIONS AND PLANS. UNLESS OTHERWISE NOTED, PERFORM PRESSURE TESTS AND OBTAIN APPROVAL OF TEST RESULTS BEFORE STARTING CLEANING OR CONCEALING OF PIPE UNDER INSULATION OR OTHER FINISH. INSULATION REMOVAL AND REINSTALLATION WHICH IS REQUIRED BECAUSE INSULATION WAS INSTALLED PRIOR TO

TESTING SHALL BE DONE BE THE CONTRACTOR AT NO EXTRA COST. TESTS ARE SATISFACTORY ONLY WHEN JOISTS SHOW NO VISIBLE LEAKS AND TEST PRESSURE REMAINS CONSTANT AFTER CONTINUOUS TEST PERIOD, REPAIR LEAKS, AND REMOVE AND REPLACE DEFECTIVE PIPE. FITTINGS AND JOISTS WITH NEW MATERIAL. UNTIL ACCEPTED BY ARCHITECT AND INSPECTING AUTHORITY. WICKING, CAULKING, COMPOUNDING, PEENING, OR OTHER MAKESHIFT TYPE OF REPAIRS ARE NOT PERMITTED. REPEAT TESTS AFTER REPAIRS UNTIL SYSTEMS ARE PROVEN TIGHT.

CHILLED WATER PIPE TEST

TESTS SHALL BE MAINTAINED AS LONG AS NECESSARY TO COMPLETELY INSPECT PIPING (MINIMUM 4 HOURS).

TEST WATER PIPING BY APPLYING HYDROSTATIC PRESSURE USING PUMP; ENSURE THAT LINES ARE VENTED OF ALL AIR. FOLLOWING PRECAUTIONS SHALL BE TAKEN DURING PRESSURE TESTS:

1. HOT WATER SYSTEM RELIEF VALVE SHALL BE REMOVED. 2. SYSTEM PRESSURE GAUGES WITH SCALE RANGES LOWER THAN TEST PRESSURE SHALL BE REMOVED OR ISOLATED.

BALANCING OF THE WATER SYSTEMS.

WATER CONTROL VALVES SHALL BE REMOVED WATER SYSTEMS BALANCING PROCURE THE SERVICES OF A CERTIFIED BALANCING CO. TO PERFORM THE TESTING AND

COMPLETELY TEST AND BALANCE ALL SUPPLY AND RETURN PIPING SYSTEMS. BALANCE FLOWS TO DESIGN/SCHEDULED LISTING FOR EACH PIECE OF EQUIPMENT (PUMP, COIL, TERMINAL UNIT, ETC.). INCLUDE SIZE, CV VALUE OF EACH CONTROL VALVE, AND EQUIPMENT SERVED IN THE FINAL BALANCING REPORT. SUBMIT THE REPORT TO THE ENGINEER FOR APPROVAL.

INNOVATIVE ENGINEERING SERVICES, LLC — AN INTEGRATED ENGINEERING + DESIGN FIRM -33 N PLAINS INDUSTRIAL RD WALLINGFORD, CT 06492 TEL: 203.467.4370 WEB: WWW.IESLLC.BIZ

ISSUED FOR PROGRESS

REV.	DATE	DESCRIPTION

BEECHER SCHOOL

NEW HAVEN, CT 06515

SHEET TITLE:

CHECKED BY:

SCALE:

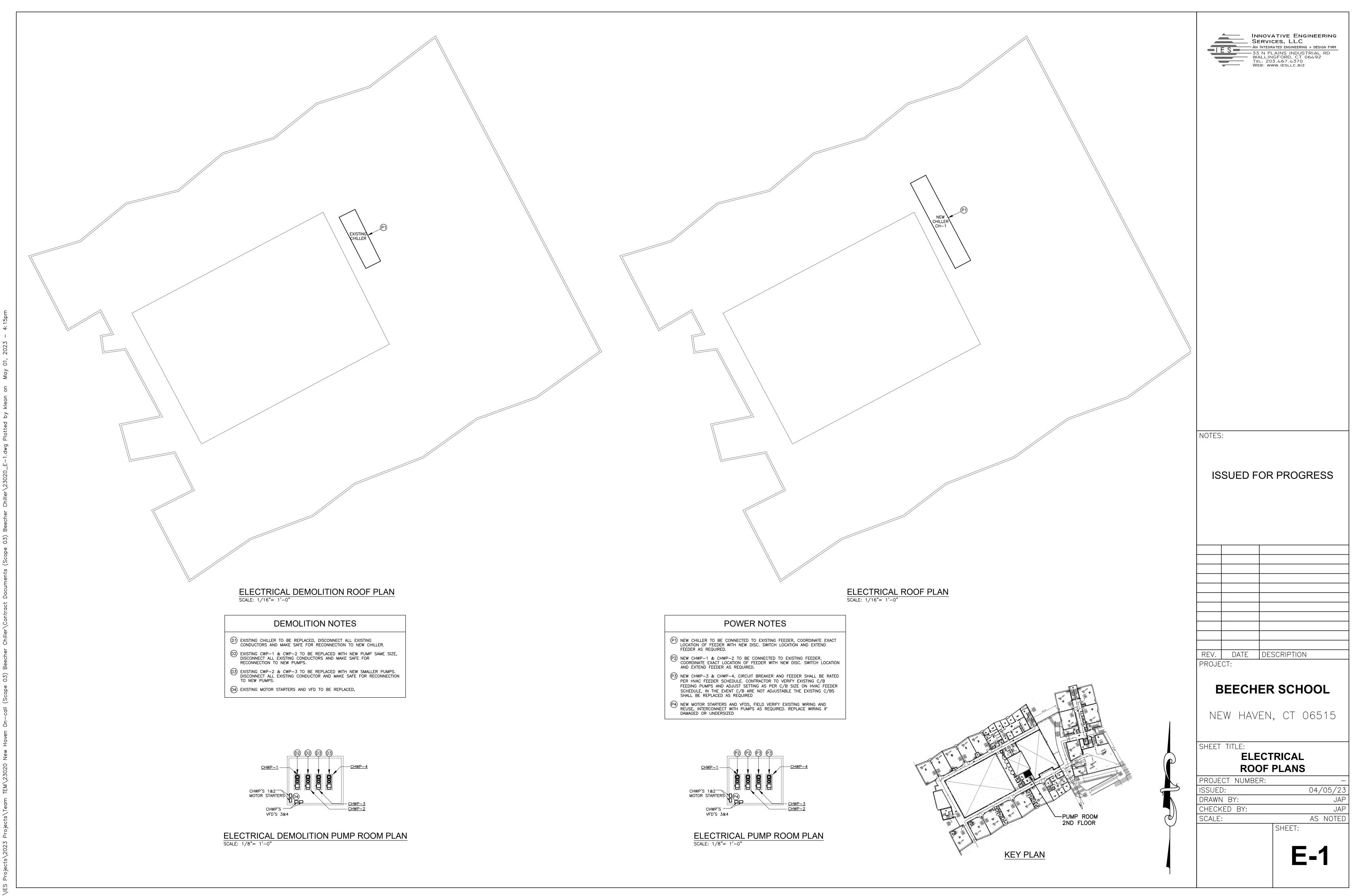
PROJECT:

MECHANICAL **SPECIFICATIONS**

PROJECT NUMBER: ISSUED: 04/05/23 DRAWN BY:

SHEET:

AS NOTED



ELECTRICAL SPECIFICATIONS

PART 1 - GENERAL PROVISIONS FOR ELECTRICAL WORK

REFERENCES

THIS SECTION COVERS THE GENERAL REQUIREMENTS FOR ELECTRICAL WORK: EXAMINE ALL CONTRACT DRAWINGS AND ALL OTHER SECTIONS OF THE SPECIFICATIONS FOR ADDITIONAL WORK RELATED TO THE WORK OF THIS DIVISION.

'PROVIDE' - TO FURNISH, INSTALL AND CONNECT UP COMPLETE AND READY FOR SAFE AND REGULAR OPERATION OF PARTICULAR WORK REFERRED TO UNLESS, SPECIFICALLY OTHERWISE

'INSTALL' - TO FRECT, MOUNT AND CONNECT COMPLETE WITH RELATED ACCESSORIES.

'WORK' - LABOR. MATERIALS. EQUIPMENT, APPARATUS. CONTROLS, ACCESSORIES AND OTHER ITEMS REQUIRED FOR PROPER AND COMPLETE. INSTALLATION.

'WIRING' - RACEWAY, FITTINGS, WIRE, BOXES, MOUNTING HARDWARE AND RELATED ITEMS. 'CONCEALED' - EMBEDDED IN MASONRY OR OTHER CONSTRUCTION CAVITY, INSTALLED IN

FURRED SPACES, WITHIN DOUBLE PARTITIONS OR HUNG CEILINGS. 'SIMILAR' OR 'EQUAL' - EQUAL MATERIALS, WEIGHT, SIZE, DESIGN AND EFFICIENCY OF SPECIFIED

'CONTRACTOR' - THE ELECTRICAL CONTRACTOR.

'NOTED' - AS INDICATED ON THE DRAWINGS AND/OR SPECIFICATIONS. <u>SCOPE</u>

THIS WORK SHALL CONSIST OF THE FURNISHINGS OF ALL LABOR, MATERIALS AND SERVICES REQUIRED COMPLETE, READY FOR CORRECT OPERATION FOR ALL ELECTRICAL WORK CALL FOR BY THE ACCOMPANYING DRAWINGS AND SPECIFICATIONS, ALL FLECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, STATE AND LOCAL CODES

THE DATA INDICATED IN THESE DRAWINGS AND SPECIFICATIONS ARE AS EXACT AS COULD BE SECURED. BUT THEIR ABSOLUTE ACCURACY IS NOT GUARANTEED. DO NOT SCALE DRAWINGS. EXACT LOCATIONS. DISTANCES, LEVELS AND OTHER CONDITIONS WILL BE GOVERNED BY THE BUILDING, USE THE DRAWINGS AND SPECIFICATIONS FOR GUIDANCE AND SECURE THE FNGINFER'S APPROVAL OF CHANGES IN LOCATIONS, CIRCUITS, WHERE SHOWN ON AN ELECTRICAL DRAWINGS, ARE SO INDICATED PRIMARILY FOR THE PURPOSE OF INDICATING THE GENERAL CIRCUIT PLAN AND DO NOT NECESSARILY INDICATE THE EXACT LOCATION OF ROUTING OF THE RACEWAYS UNLESS SPECIFICALLY INDICATED. CIRCUITS SHALL BE RUN IN SUIT CONDITIONS CONSIDERING STRUCTURAL FEATURES, OTHER TRADES, CONSTRUCTION METHODS AND GOOD INSTALLATION PRACTICE.

BEFORE SUBMITTING A BID, THE CONTRACTOR SHALL VISIT THE SITE AND BECOME THOROUGHLY FAMILIAR WITH ALL EXISTING CONDITIONS UNDER WHICH THE WORK AND WORK OF OTHER TRADES WILL BE INSTALLED. THIS CONTRACT INCLUDES ALL NECESSARY OFFSETS, TRANSITIONS, MODIFICATIONS AND RELOCATION REQUIRED TO INSTALL ALL NEW EQUIPMENT IN NEW OR EXISTING SPACES, CONTRACTOR SHALL INCLUDE ANY MODIFICATIONS REQUIRED IN EXISTING ELECTRICAL EQUIPMENT FOR INSTALLATION OF NEW ELECTRICAL EQUIPMENT AND NEW EQUIPMENT OF OTHER TRADES. (LIGHTING FIXTURES, DEVICES, CONDUIT WIRING, ETC.) ALL NEW AND EXISTING EQUIPMENT AND SYSTEMS SHALL BE FULLY OPERATIONAL UNDER THIS CONTRACT BEFORE THE PROJECT IS CONSIDERED COMPLETE. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY ASSUMPTIONS THAT ARE MADE, ANY OMISSIONS OR ERRORS MADE AS A RESULT OF FAILURE TO VISIT THE SITE AND BECOME THOROUGHLY FAMILIAR WITH THE EXISTING CONDITIONS AND THE CONTRACT DOCUMENTS OF ALL TRADES.

CODES, REGULATIONS AND STANDARDS

ALL ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING APPROVED

- STATE DEMOLITION CODE STATE BUILDING CODE
- STATE FIRE SAFETY CODE LOCAL BUILDING CODE
- BC INTERNATIONAL BUILDING CODE NFPA - NATIONAL FIRE PROTECTION CODE
- ANSI AMERICAN NATIONAL STANDARDS INSTITUTE ASTM - AMERICAN SOCIETY FOR TESTING AND MATERIALS OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
- U.I. UNDERWRITERS LABORATORIES NFPA 101 - LIFE SAFETY CODE
- NFPA 70 NATIONAL ELECTRICAL CODE NFPA 72 - NATIONAL FIRE ALARM CODE
- EPA ENVIRONMENTAL PROTECTION AGENCY IFFF - INSTITUTE OF FLECTRICAL AND FLECTRONIC ENGINEERS NEMA - NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

IECC - INTERNATIONAL ENERGY CONSERVATION CODE

PERMITS, FEES AND INSPECTIONS

THE CONTRACTOR SHALL GIVE ALL NECESSARY NOTICES OBTAIN ALL PERMITS PAY FOR ALL GOVERNMENT, STATE SALES TAXES AND APPLICABLE FEES. THE CONTRACTOR SHALL FILE ALL DRAWINGS, COMPLETE ALL DOCUMENTS AND OBTAIN ALL NECESSARY APPROVALS FROM THE PROPER AUTHORITY OR AGENCY HAVING JURISDICTION. OBTAIN ALL REQUIRED CERTIFICATES OF INSPECTION COVERING WORK. THE CONTRACTOR SHALL SEE THAT ALL REQUIRED INSPECTIONS AND TESTS ARE MADE AND SHALL COOPERATE TO MAKE THESE TESTS AS THOROUGH AND AS READILY MADE AS POSSIBLE.

MATERIALS AND WORKMANSHIP

ALL MATERIALS AND APPARATUS REQUIRED FOR THE WORK, EXCEPT AS OTHERWISE SPECIFIED, SHALL BE NEW AND OF FIRST-CLASS QUALITY. IT SHALL BE FURNISHED, DELIVERED, ERECTED, CONNECTED, FINISHED IN EVERY DETAIL AND SO SELECTED AND ARRANGED AS TO FIT PROPERLY INTO THE BUILDING SPACES. WHERE NO SPECIFIC KIND OR QUALITY MATERIAL IS GIVEN, A FIRST-CLASS STANDARD ARTICLE AS ACCEPTED BY THE ENGINEER SHALL BE FURNISHED.

ALL EQUIPMENT AND MATERIALS SHALL BE SPECIFICATION GRADE AND BEAR THE UNDERWRITER'S LABEL. NO SUBSTITUTE OR ALTERNATE EQUIPMENT, MATERIAL, ETC. WILL BE CONSIDERED FOR

ALL WORK SHALL BE OF A QUALITY CONSISTENT WITH GOOD TRADE PRACTICE AND SHALL BE INSTALLED IN A NEAT, WORKMANLIKE MANNER. THE ENGINEER/OWNER RESERVES THE RIGHT TO REJECT ANY WORK WHICH, IN HIS OPINION, HAS BEEN INSTALLED IN A SUBSTANDARD DANGEROUS OR IN A UNSERVICEABLE MANNER. THE CONTRACTOR SHALL REPLACE REJECTED WORK IN A SATISFACTORY MANNER AT NO EXTRA COST TO THE OWNER.

ALL WORKMANSHIP AND MATERIALS SHALL BE FULLY GUARANTEED FOR A PERIOD OF ONE YEAR AFTER ACCEPTANCE OF THE ENTIRE INSTALLATION COVERED BY THIS CONTRACT. SHOULD ANY DEFECTS OCCUR DURING THE GUARANTEED PERIOD, THE CONTRACTOR SHALL REPAIR AND/OR REPLACE ALL DEFECTIVE EQUIPMENT, MATERIAL AND/OR WORK AT NO EXTRA CHARGE TO THE

RECORD DRAWINGS

MAINTAIN, AT THE JOB SITE, A SET OF ELECTRICAL DRAWINGS INDICATING ALL CHANGES IN LOCATION AND CIRCUITING OF THE EQUIPMENT, PANELS, DEVICES, ETC. FROM THE ORIGINA LAYOUT. CLEARLY MARK IN RED ALL CHANGES ON THE DRAWINGS. AT THE COMPLETION OF THE PROJECT THE CONTRACTOR SHALL TURN OVER THE RECORD DRAWINGS TO THE ENGINEER/OWNER.

<u>COORDINATION</u>

ALL WORK SHALL BE COORDINATED AND CARRIED OUT IN CONJUNCTION WITH ALL TRADES AND FULL COORDINATION DRAWINGS SHALL BE CREATED IN ORDER THAT ALL WORK MAY PROCEED WITH A MINIMUM OF DELAY AND INTERFERENCE.

SHOP DRAWINGS

SUBMIT ELECTRONIC PDF FORMAT FOR REVIEW, DETAILED SHOP DRAWINGS OF ALL EQUIPMENT AND MATERIAL SPECIFIED. THE CONTRACTOR SHALL REVIEW ALL SHOP DRAWINGS PRIOR TO SUBMISSION TO THE ENGINEER FOR REVIEW. NO MATERIAL OR EQUIPMENT MAY BE DELIVERED) THE JOB SITE OR INSTALLED UNTIL CONTRACTOR HAS IN THEIR POSSESSION, APPROVED SHOP DRAWINGS FOR THE PARTICULAR MATERIAL OR EQUIPMENT. SHOP DRAWINGS SHALL BE SPECIFIC WITH ITEMS SUBMITTED FOR APPROVAL CLEARLY IDENTIFIED.

THE FOLLOWING IS A LIST OF ELECTRICAL ITEMS THAT MUST BE SUBMITTED FOR REVIEW:

- a. SAFETY/DISCONNECT SWITCHES b. CIRCUIT BREAKERS
- d. CONDUIT, WIRE AND CABLE

OPERATING INSTRUCTIONS

THE CONTRACTOR SHALL FURNISH TO THE ENGINEER, FOUR (4) COMPLETE BOUND SETS OF TYPEWRITTEN OR BLUEPRINTED INSTRUCTIONS FOR OPERATING AND MAINTAINING ALL SYSTEMS AND EQUIPMENT INCLUDED IN THIS DIVISION. MANUFACTURER'S ADVERTISING LITERATURE OR CATALOGS WILL NOT BE ACCEPTABLE FOR OPERATING AND MAINTENANCE INSTRUCTIONS.

THE CONTRACTOR, IN THE ABOVE-MENTIONED INSTRUCTIONS, SHALL INCLUDE THE MAINTENANCE SCHEDULE FOR THE PRINCIPAL ITEMS OF EQUIPMENT FURNISHED UNDER THIS DIVISION. AN AUTHORIZED MANUFACTURER'S REPRESENTATIVE SHALL ATTEST IN WRITING THAT HIS EQUIPMENT HAS BEEN PROPERLY INSTALLED PRIOR TO STARTUP. THESE LETTERS WILL BE

EQUIPMENT PROTECTION

PROPERLY AND COMPLETELY PROTECT AGAINST ALL DAMAGE, ALL APPARATUS, EQUIPMENT, ETC., INCLUDED IN THIS CONTRACT. THE CONTRACTOR WILL BE HELD RESPONSIBLE FOR ANY DAMAGE TO FURNISHED APPARATUS, EQUIPMENT, ETC., UNTIL FINAL ACCEPTANCE.

PROPERTY PROTECTION

THE CONTRACTOR SHALL TAKE WHATEVER MEANS NECESSARY AND/OR REQUIRED TO PROTECT OWNER'S PROPERTY WITHIN THE WORKING AREAS FROM DUST, DEBRIS AND OTHER MATTER GENERATED BY THE WORK. NO WORK SHALL COMMENCE IN AREAS WHERE PROTECTION IS REQUIRED UNTIL APPROVAL HAS BEEN GIVEN TO THE CONTRACTOR BY THE OWNER.

MANUFACTURER'S INSTRUCTION

INSTALL ALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS OR REQUIREMENTS FOR PROPER OPERATION AND MAINTENANCE.

BOUND INTO OPERATING AND MAINTENANCE BOOKS.

THOROUGHLY CLEAN ALL ELECTRICAL EQUIPMENT DEVICES AND ENCLOSURES UPON COMPLETION

OF ALL WORK. REPAINT ANY EQUIPMENT WHOSE FINISH IS DAMAGED OR RUSTED. MATCH MANUFACTURER'S ORIGINAL FINISH.

DEMOLITION/REMOVAL AND RECONNECTION

BEFORE SUBMITTING A BID, THE CONTRACTOR SHALL VISIT THE SITE AND BECOME THOROUGHLY FAMILIAR WITH ALL EXISTING CONDITIONS UNDER WHICH HIS WORK WILL BE INSTALLED. ALL MATERIAL CHOSEN TO BE RETAINED BY THE OWNER SHALL BE DELIVERED BY THE CONTRACTOR TO SUCH POINT AS DESIGNATED BY THE OWNER. DISCONNECT AND REMOVE ALL EXISTING ELECTRICAL WORK IN CONTRACT AREA AS INDICATED ON

WHERE NOTED ALL WIRING AND CABLING SHALL BE REMOVED BACK TO ORIGINATION PANEL, UNLESS OTHERWISE INDICTED. CONTRACTOR SHALL KEEP PREMISES FREE FROM ACCUMULATION OF WASTE MATERIAL AND RUBBISH. AND AT COMPLETION OF WORK DAY. SHALL REMOVE ALL RUBBISH AND IMPLEMENTS TO A DESIGNATED LOCATION, IF AVAILABLE, LEAVING WORK AREAS BROOM CLEAN, UNUSED OUTLET BOXES AND PLASTER RINGS SHALL BE PROVIDED WITH BLANK COVER PLATES AND MATCH DEVICE PLATES WITHIN THE ROOM.

PENETRATION SEALANT ALL PENETRATIONS SHALL BE SEALED WITH 3M INTUMESCENT FIRE BARRIER PENETRATION

CUTTING, PATCHING, REPAIRING AND PAINTING

SEALANT, APPLIED PER MANUFACTURER'S AND U.L. GUIDELINES.

THE GENERAL CONTRACTOR SHALL PERFORM ALL CUTTING, PATCHING, REPAIRING AND PAINTING FOR ALL ELECTRICAL ITEMS AND EQUIPMENT CALLED FOR UNDER THIS CONTRACT. FIRE STOPS AND SEALS

PENETRATIONS THROUGH FIRE-RATED WALLS, CEILING OR FLOORS IN WHICH CABLES OR CONDUITS PASS SHALL BE FILLED SOLIDLY BY U.L. APPROVED FIRE—STOP MATERIALS, CLASSIFIED FOR AN HOUR RATING EQUAL TO THE FIRE RATING OF THE WALL, CEILING OF FLOOR. PROVIDE TO 3M BRAND FIRE BARRIER CP25WB CAULK OR APPROVED EQUIVALENT THE INTRUSION OF WATER, A DAMP OR CORROSIVE ATMOSPHERE, DRAFT OR DUST.

PART 2 - PRODUCTS **DESCRIPTION**

ALL MATERIALS AND EQUIPMENT PROVIDED UNDER THIS SECTION SHALL BE NEW, FIRST GRADE. BEST OF THEIR RESPECTIVE KINDS AND IN NO WAY SHALL THEY BE LESS THAN THE QUALITY AND INTENT SET FOURTH UNDER THIS SECTION. THEY SHALL MEET THE REQUIREMENTS OF ALL STANDARDS SET UP TO GOVERN THE MANUFACTURER OF ELECTRICAL MATERIALS AND COMPLY WITH ALL APPLICABLE CODES AND STANDARDS.

CONDUCTORS SHALL BE U.L. LISTED, 600 VOLTS, 90 DEG. C., SINGLE CONDUCTOR TYPE THWN/THHN. 98% CONDUCTIVITY, ANNEALED UNCOATED COPPER WITH PVC INSULATION COVERED WITH NYLON SHEATH JACKET. TESTED IN ACCORDANCE WITH THE REQUIREMENTS OF UNDERWRITERS LABORATORIES STANDARD 83. WIRE SHALL BE IDENTIFIED BY SURFACE MARKING INDICATING MANUFACTURER'S IDENTIFICATION CONDUCTOR SIZE AND METAL, VOLTAGE RATING, U.L. SYMBOL AND TYPE DESIGNATION. CONDUCTORS SHALL BE STRANDED. MINIMUM SIZE SHALL BE

#12 AWG UNLESS OTHERWISE INDICATED. MANUFACTURED BY ROME CABLE, TRIANGLE WIRE & CABLE, GENERAL CABLE OR ESSEX WIRE & CABLE. RIGID GALVANIZED STEEL CONDUIT (RGS)

RIGID STEEL CONDUIT SHALL BE FULL WEIGHT, HEAVY WALL STEEL PIPE WITH GALVANIZED PROTECTIVE COATING. MANUFACTURED BY TRIANGLE WIRE AND CABLE, ALLIED TUBE AND CONDUIT, REPUBLIC OR STEELDUCT. CONDUIT FITTINGS SHALL BE MALLEABLE IRON, CADMIUM PLATED WITH FULL THREADED HUBS.

RIGID POLYVINYL CHLORIDE CONDUIT (PVC)

RIGID POLYVINYL CHLORIDE CONDUIT SHALL BE TYPE DB, SCHEDULE 40, SUNLIGHT RESISTANT, RATED OR USE WITH 90 DEGREES C. CONDUCTORS, U.L. RATED. ALL PVC CONDUIT AND FITTINGS SHALL BE SOLVENT WELDED. MANUFACTURED BY CARLON, ELECTRI-FLEX OR

ELECTRIC METALLIC TUBING (EMT)

ELECTRICAL METALLIC TUBING SHALL BE GALVANIZED THIN WALL STEEL CONDUIT. MANUFACTURED BY TRIANGLE WIRE AND CABLE, ALLIED TUBE AND CONDUIT, REPUBLIC OR STEELDUCT. CONNECTORS AND COUPLINGS SHALL BE HEAVY DUTY, STEEL-ZINC PLATED, SET SCREW TYPE. FLEXIBLE METALLIC CONDUIT (FMC)

FLEXIBLE METALLIC CONDUIT SHALL BE OF HEAVY GALVANIZED SHEET METAL STRIP IN INTERLOCKED CONSTRUCTION. MANUFACTURED BY TRIANGLE WIRE AND CABLE, AMERICAN FLEXIBLE CONDUIT OR ELECTRIC-FLEX. THE CONNECTORS SHALL BE SQUEEZE TYPE MALLEABLE

LIQUID-TIGHT FLEXIBLE METAL CONDUIT (LFMC)

PHENOLIC INSULATION AND LAY-IN GROUNDING LUG.

LIQUID—TIGHT FLEXIBLE CONDUIT SHALL BE CONSTRUCTED OF HEAVY GALVANIZED SHEET METAL STRIP, SPIRALLY-WOUND INTERLOCK CONSTRUCTION WITH AN EXTRUDED POLYVINYL GRAY JACKET. CONDUIT SHALL BE U.L. LABELED AND CONFORMED TO THE APPLICATION AND ENVIRONMENT IN WHICH IT WILL BE USED. ALL CONNECTIONS, COUPLINGS AND FITTINGS SHALL BE OF HIGH QUALITY STEEL-ZINC RATED TYPE SPECIFICALLY DESIGNED FOR THIS PURPOSE. MANUFACTURED BY O/Z GEDNEY OR ELECTRI-FLEX.

CONDUIT BODIES FOR RIGID GALVANIZED STEEL CONDUIT (RGS) SHALL BE MALLEABLE IRON-ZINC PLATED WITH TAPERED HUBS AND GASKETED ALUMINUM COVER. CONDUIT BODIES FOR ELECTRICAL METALLIC TUBING (EMT) SHALL BE CAST ALUMINUM-ALUMINUM ENAMEL FINISH WITH SET SCREW HUBS AND ALUMINUM COVER INSULATION BUSHINGS SHALL BE HIGH IMPACT THERMOPLASTIC PHENOLIC WITH 150 DEG. C. UL TEMPERATURE RATING INSULATED GROUNDING BUSHINGS SHALL BE MALLEABLE IRON ZINC PLATED WITH MOLDED ON

CONDUIT LOCKNUTS SHALL BE HEAVY NUT STOCK STEEL-ZINC PLATED. OFFSET NIPPLES SHALL BE MALLEABLE IRON ZINC PLATED WITH RIGID CONDUIT THREADING AND CONNECTORS AND COUPLINGS FOR ELECTRICAL METALLIC TUBING (EMT) SHALL BE HEAVY

STEEL-ZINC PLATED WITH PRE-SET/PRE-SHAKED SET SCREWS.
CONDUIT STRAPS SHALL BE SNAP-TYPE, DOUBLE RIBBED STEEL-ZINC PLATED. CONDUIT FITTINGS SHALL BE MANUFACTURED BY O/Z GEDNEY, CROUSE-HINDS OR APPLETON.

SUPPORT CHANNEL SHALL BE ROLL—FORMED #12 GAUGE STEEL, SOLID BASE OR BOLT HOLE BASE — HOT DIP GALVANIZED FINISH. COMPLETE WITH ANGLE FITTINGS, SPRING NUTS, CONDUIT SUPPORTS, 3/8" OR 1/2" THREADED RODS (SIZE REQUIRED FOR LOAD), ETC.

CABLE TIES SHALL BE FABRICATED OF ONE-PIECE HALLAR WITH NO METAL PARTS.

MANUFACTURED BY BURNDY, T&B, PANDUIT OR BLACKBURN.

FUSES SHALL NOT BE INSTALLED UNTIL EQUIPMENT IS READY TO BE ENERGIZED. THIS MEASURE PREVENTS FUSE DAMAGE DURING SHIPMENT OF THE EQUIPMENT FROM THE MANUFACTURER TO

ALL FUSES SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. FUSES SHALL BE THE SAME MANUFACTURER, COPPER BUSSMAN, FERRAZ SHAWMUT OR LITTLEFUSE. FUSE TYPES DESCRIBE BELOW SHALL BE U.L. LISTED DUAL ELEMENT TIME DELAY TYPE. CIRCUIT 0 TO 600 AMPERE SHALL BE PROTECTED BY DUAL ELEMENT, TIME DELAY, CURRENT LIMITING FUSES WITH AN INTERRUPTING RATING OF 200,000 A.I.C. U.L. LISTED CLASS 'RK1' CIRCUITS 601 TO 3000 AMPERE SHALL BE PROTECTED BY TIME DELAY, CURRENT LIMITING FUSES WITH AN INTERRUPTING RATING OF 200,000 A.I.C. U.L. LISTED CLASS 'L', KLP-C. MOTOR CIRCUITS SHALL BE PROTECTED BY DUAL ELEMENT, TIME DELAY, CURRENT LIMITING FUSES WITH AN INTERRUPTING RATING OF 200,000 A.I.C. U.L. LISTED CLASS 'RK1'. LARGE MOTORS SHALL BE PROTECTED BY TIME DELAY, CURRENT LIMITING FUSES WITH AN INTERRUPTING RATING OF 200,000 A.I.C. U.L. LISTED CLASS 'L' KLP-C. CIRCUIT BREAKER PANELBOARDS SHALL BE PROTECTED BY DUAL ELEMENT, TIME DELAY

FUSES SHALL HAVE VOLTAGE RATING BASED ON DISTRIBUTION REQUIREMENT SYSTEMS. UPON COMPLETION OF THE WORK, THE CONTRACTOR SHALL PROVIDE THE OWNER WITH THE SPARE FUSES LISTED BELOW. 10% (MINIMUM OF THREE) OF EACH TYPE AND RATING INSTALLED, 0 TO 600 AMPERES. THREE FUSES OF EACH RATING INSTALLED, 601 AMPERE OR LARGER. SPARE FUSE CABINET, CATALOG NUMBER 'LSFCL, SHALL BE PROVIDED TO STORE THE ABOVE SPARES (SIZE 30"H \times 24"W \times 12"D).

CURRENT LIMITING FUSES WITH AN INTERRUPTING RATING OF 200,000 A.I.C. U.L. LISTED CLASS

BRANCH CIRCUIT BREAKERS SHALL MATCH TYPE, MANUFACTURER AND AIC RATING. ALL MULTI-POLE BREAKERS SHALL BE EQUIPPED WITH HANDLE TIES FOR MULTI-POLE USE. FOR CIRCUIT BREAKER SIZES 150 AMPS AND LARGER PROVIDE THE FOLLOWING. ELECTRONIC TRIP CIRCUIT BREAKERS WITH RMS SENSING; FIELD-REPLACEABLE RATING PLUG OR FIELD-REPLICABLE ELECTRONIC TRIP; AND THE FOLLOWING FIELD-ADJUSTABLE SETTINGS:

INSTANTANEOUS TRIP. LONG AND SHORT TIME PICKUP LEVELS. LONG AND SHORT TIME ADJUSTMENTS.

SAFETY/DISCONNECT SWITCHES

DISCONNECT/SAFETY SWITCHES SHALL BE MOTOR RATED, METAL ENCLOSED, INTERLOCKING, FUSIBLE OR NONFUSED AS INDICATED. HEAVY DUTY TYPE, WITH APPROPRIATE VOLTAGE RATINGS, QUICK-MAKE, QUICK-BREAK MECHANISMS, SOLID NEUTRAL AND U.L. LISTED. SWITCHES SHALL HAVE PROPER TYPE METAL ENCLOSURES; STANDARD, WEATHERPROOF, DUSTPROOF, ETC., SUIT THEIR SPECIFIC LOCATIONS. MANUFACTURED BY GENERAL ELECTRIC, SIEMENS, SQUARE 'D',

FURNISH AND INSTALL FRACTIONAL HORSEPOWER MANUAL MOTOR STARTERS WITH ON-OFF CONTROL, THERMAL OVERLOAD RELAY AND PILOT LIGHTS. MANUFACTURED BY GENERAL ELECTRIC, SIEMENS, SQUARE 'D', OR ALLEN BRADLEY.

		GENERAL ELECTRIC	SQUARE 'D'	ALLEN BRADLEY	SIEME
	SURFACE SURFACE	CR101Y11 CR101H11	2510FG1P 2510FG2P	600-TAX4 600-TAX5	SMFF SMFF

POWER AND CONTROL WIRING

FURNISH AND INSTALL ALL POWER WIRING, CONTROL WIRING (120VAC), CONDUIT AND FITTINGS FOR ALL PLUMBING, HEATING AND VENTILATING AND AIR CONDITIONING EQUIPMENT AND FINAL CONNECTIONS. MANUAL MOTOR STARTERS SHALL BE FURNISHED, INSTALLED AND WIRED BY THE LECTRICAL CONTRACTOR. EVERY MOTOR SHALL BE PROVIDED WITH RUNNING OVERLOAD PROTECTION. UPON COMPLETION OF WORK, CHECK OUT EACH ITEM. ITEMS TO BE CHECKED ARE VOLTAGE, ROTATION AND OVERLOAD PROTECTION.

PART 3 - EXECUTION

<u>INSTALLATION</u>

ALL WORK. MATERIALS AND MANNER OF INSTALLING SAME SHALL BE IN STRICT ACCORDANCE WITH THE LATEST REQUIREMENTS OF THE NATIONAL ELECTRIC CODE ALL CONDUIT AND WIRING SHALL BE INSTALLED CONCEALED UNLESS OTHERWISE NOTED. WIRING IN UNFINISHED AREAS SHALL BE INSTALLED EXPOSED USING EMT OR RGS CONDUIT. WIRING IN FINISHED AREAS SHALL BE INSTALLED IN WIREMOLD RACEWAY.

RACEWAYS, ENCLOSURES AND BOXES SHALL BE MECHANICALLY JOINED TO FORM A CONTINUOUS ELECTRICAL PATH. THE CONTRACTOR SHALL PROVIDE APPROVED TYPE PULL BOXES AS REQUIRED. MINIMUM SIZE CONDUIT SHALL BE 3/4" UNLESS OTHERWISE NOTED.

FURNISH LOCKNUTS AND BUSHINGS FOR ALL CONDUIT TERMINATIONS IN ALL OUTLET BOXES, PANELS, PULL BOXES, CONDUIT STUBS, ETC. RIGID GALVANIZED STEEL CONDUIT (RGS) SHALL BE USED FOR WIRING IN THE FOLLOWING

FURNISH NYLON PULL STRINGS IN ALL EMPTY CONDUIT RUNS.

1. BURIED UNDER GRADE 2. EXPOSED TO MOISTURE AND MECHANICAL DAMAGE

3. EXTERIOR INSTALLATIONS

ELECTRICAL METALLIC TUBING (EMT) SHALL BE USED FOR CONCEALED AND EXPOSED WIRING IN DRY LOCATIONS AS FOLLOWS:

1. INTERIOR PANEL FEEDERS RIGID POLYVINYL CHLORIDE (PVC) SHALL BE USED FOR WIRING IN THE FOLLOWING LOCATIONS:

EXTERIOR FEEDERS SHALL BE INSTALLED IN RGS CONDUIT. ALL CONDUIT SHALL BE INSTALLED IN PARALLEL AND PERPENDICULAR TO THE BUILDING LINES. ALL CONDUIT SHALL BE SUPPORTED USING CADMIUM PLATED CONDUIT STRAPS AND HANGERS. SEPARATE CONDUIT SYSTEMS SHALL BE INSTALLED FOR NORMAL AND EMERGENCY POWER.

PROVIDE WIRING TO ALL OUTLETS, EQUIPMENT, APPARATUS AND OTHER SPECIALTIES UNDER THIS DIVISION THAT WHICH FURNISHED OR PROVIDED UNDER OTHER DIVISIONS OR BY THE OWNER. THE TERM 'WIRING' SHALL BE CONSIDERED TO BE COMPRISED OF THE CONDUIT, CONDUCTORS, CONNECTIONS, ETC. ALL WIRING ON DRAWINGS IS SIZED FOR TYPE THWN/THHN COPPER CONDUCTORS. EXERCISE CAUTION IN PULLING CONDUCTORS INTO RACEWAYS SO AS NOT TO DAMAGE THE INSULATION. CABLE PULLING LUBRICANT SHALL BE USED TO ASSIST IN PULLING. CIRCUITS SHALL BE SO CONNECTED TO THE PANELBOARDS THAT THE TOTAL LOAD IS DISTRIBUTED AS NEATLY AS POSSIBLE, EQUALLY BETWEEN EACH LINE AND NEUTRAL. 10% WILL BE CONSIDERED A REASONABLE AND ALLOWABLE UNBALANCE. INSTALL COPPER GREEN INSULATED GROUNDING CONDUCTOR IN ALL CONDUITS AND RACEWAYS.

SPLICING SHALL BE DONE WITH INSULATED OR NON-INSULATED CONNECTORS OF APPROPRIATE TYPES AND CURRENT-CARRYING CAPACITY. NON-INSUALTED CONNECTORS SHALL BE WRAPPED WITH INSULATING TAPE TO THE THICKNESS OF THE INSULATION OF THE CONDUCTORS BEING SPLICED. ELECTRICAL TAPE SHALL BE 3M OR SUPER 88 SCOTCH VINYL FLAME-RETARDANT, COLD AND WEATHER RESISTANT

SPLICES FOR CONDUCTORS, SIZES #10 AWG OR SMALLER SHALL BE MADE WITH U.L. LISTED SPRING-TYPE CONNECTORS OR APPROPRIATE CURRENT CARRYING CAPACITY. SPLICES, TAPS AND TERMINALS FOR CONDUCTORS #8 AWG OR LARGER SHALL BE MADE WITH U.L. LISTED BOLTED PRESSURE CONNECTORS OF BRONZE OR COPPER CONSTRUCTION, OF APPROPRIATE CURRENT CARRYING CAPACITY. EQUAL TO O/Z GEDENY, BURNDY OR BLACKBURN. CONDUCTOR IDENTIFICATION

CONDUCTORS #8 AWG AND SMALLER SHALL HAVE A COLOR-CODED INSULATION. CONDUCTORS #6 AWG AND LARGER SHALL BE IDENTIFIED WITH TAPES APPLIED NEAR THE ENDS OF THE CONDUCTORS. FEEDERS AND BRANCH CIRCUIT CONDUCTORS SHALL BE IDENTIFIED FOR PHASE ROTATION.

480/277V/3PH

PHASE A BROWN PHASE C YELLOW NEUTRAL GROUND

ALL FEEDERS, MAINS AND BRANCH CIRCUIT CONDUCTORS SHALL BE TAGGED AT BOTH ENDS WITH WIRE MARKERS IN ALL PANELS, MOTOR CONTROLS, JUNCTION BOXES, OUTLET BOXES AND

FURNISH AND INSTALL NAMEPLATES FOR ALL ELECTRICAL EQUIPMENT, IDENTIFYING ITEMS BY NAME, FUNCTION AND/OR CONTROL. IDENTIFYING NAMEPLATES SHALL BE LAMINATED, PLASTIC TYPE, CONSISTING OF TWO BLACK PLASTIC SHEETS WITH ONE WHITE PLASTIC SHEET BONDED TO AND BETWEEN THE TWO OUTER BLACK SHEETS AND HAVING THE LETTERS ENGRAVED IN ONE BLACK TO THE DEPTH OF THE WHITE PLASTIC. FASTEN NAMEPLATES TO EQUIPMENT WITH SUITABLE ADHESIVES OR STAINLESS

STEEL SCREWS. ALL PANELS SHALL HAVE TYPEWRITTEN CIRCUIT DIRECTORIES IDENTIFYING ALL BRANCH CIRCUITS PROVIDE ADDITIONAL COPY OF COMPLETE UPDATED PANEL DIRECTORY TO FACILITY ENGINEERING. USE PLASTIC-COATED WIRE MARKERS OF THE SELF-ADHESIVE. WRAPAROUND TYPE WITH PERMANENT FACTORY-PRINTED NUMBER, LETTERS AND SYMBOLS. WIRE MARKERS SHALL BE SECURELY ATTACHED AT BOTH ENDS, IDENTIFYING PANEL AND CIRCUIT BREAKER NUMBERS. ALL CONDUCTORS SHALL BE PERMANENTLY TAGGED AT TIME OF INSTALLATION. LABELS SHALL BE EQUAL TO T&B, PANDUIT OR IDEAL.

ALL ELECTRICAL WORK SHALL BE GROUNDED AND BONDED IN FULL CONFORMANCE WITH THE LATEST APPROVED EDITION OF THE NATIONAL ELECTRICAL CODE AND LOCAL REQUIREMENTS. PROVIDE GROUNDING CONDUCTOR IN ALL RACEWAYS. GROUND CONNECTIONS WITH THE GROUNDING CONDUCTORS SHALL BE MADE AT EACH MOTOR ND OTHER EQUIPMENT COMPONENTS BY MEANS OF A POSITIVELY SECURED GROUNDING CLAMP SCREW OR CLIP. CONNECTIONS TO PIPES SHALL BE MADE WITH APPROVED BRONZE OR BRASS BONDING SHALL BE PROVIDED TO ASSURE ELECTRICAL CONTINUITY AND THE CAPACITY TO

SEISMIC LATERAL RESTRAINTS DESIGNED TO RESIST HORIZONTAL MOVEMENT IN ANY DIRECTIONS SHALL BE INSTALLED IN ALL SUSPENDED CONDUITS 2-1/2 INCHES IN DIAMETER OR GREATER. QUANTITY AND LOCATION OF THE LATERAL RESTRAINTS SHALL BE BASED ON THE CONDUIT SYSTEM LAYOUT AND IN GENERAL, SHALL BE INSTALLED AT CONDUIT BENDS, JUNCTION BOXES AND APPROXIMATELY EVERY 20 FEET ALONG CONDUIT RUNS. SEISMIC LATERAL RESTRAINTS ARE NOT REQUIRED FOR ANY PIPING SUSPENDED BY INDIVIDUAL HANGERS 12 INCHES OR LESS IN LENGTH FROM TOP OF PIPING TO THE BOTTOM OF THE SUPPORT FOR THE HANGER.

END OF ELECTRICAL SPECIFICATIONS

SAFELY CONDUCT ANY FAULT CURRENT LIKELY TO BE IMPOSED.

HVAC FEEDER SCHEDULE							
SYMBOL	V - PH	AMP	C/B	DISC SW/FUSE	STARTER NEMA SIZE	HP (KW)	NOTES
CH-1	480V-3ø	464	800A	BY MECHANICAL	_	-	4
CHWP-1	480V-3ø	32	50A	60A/32A	2	15	1,2
CHWP-2	480V-3ø	32	50A	60A/32A	2	15	1,2
CHWP-3	480V-3ø	55	70A	60A/55A	2	20	1,2,3
CHWP-4	480V-3ø	55	70A	60A/55A	2	20	1,2,3
NOTE: 1. VERIFY EXISTING C/B SIZE AND ADJUST SETTINGS OR REPLACE AS REQUIRED. 2. PROVIDE FUSED DISCONNECT SWITCH, COORDINATE TYPE WITH MECHANICAL CONTRACTOR.							

3. VFD PROVIDED BY MECH CONTRACTOR INSTALLED AND WIRED BY ELEC CONTRACTOR. 4. DISC SWITCH PROVIDED BY MECH CONTRACTOR, INSTALLED/WIRED BY ELEC CONTRACTOR

AMERICAN WIRE GAUGE CONDUIT CIRCUIT BREAKER MOUNTED IN CEILING CIRCUIT DISHWASHER DRAWING FI FCTRICAL EMERGENCY POWER CIRCUIT

ABBREVIATIONS

GROUND FAULT CIRCUIT INTERRUPTER JUNCTION BOX LIGHTING MOUNTED NOT IN CONTRACT NTS NOT TO SCALE OUTDOOR PHASE RFFRIGFRATOR RFLOCATED EXISTING

EXISTING TO REMAIN

AMERICANS WITH DISABILITIES ACT

ABOVE FINISHED FLOOR

ABOVE FINISHED GRADE

ADA

AFF

AFG

AWG

CLG

CKT

FLFC

E/EM

TO BE REMOVED AND RELOCATED UON UNLESS OTHERWISE NOTED WEATHERPROOF

ELECTRICAL LEGEND DESCRIPTION SYMBOL EXISTING PANELBOARD / LOAD CENTER CONDUIT AND WIRE CONDUIT AND WIRE, SWITCHED _____ HOMERUN TO PANELBOARD, NUMBERS/LETTERS INDICATE CIRCUIT **→** 1.LI & PANELBOARD TERMINATION UNLESS OTHERWISE INDICATED (J) JUNCTION BOX MOTOR \Box SAFETY DISCONNECT SWITCH FUSIBLE SAFETY DISCONNECT SWITCH

GENERAL NOTES

VARIABLE FREQUENCY DRIVE

THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK REQUIRED FOR A COMPLETE, FULLY OPERABLE INSTALLATION. ALL WORK TO BE DONE IN ACCORDANCE WITH THE LATEST APPROVED ISSUE OF THE NEC AND APPLICABLE LOCAL CODES.

PRIOR TO SUBMISSION OF BIDS GIVE WRITTEN NOTICE TO OWNER AND ENGINEER OF ANY MATERIAL OR APPARATUS THAT IS INADEQUATE, UNSUITABLE FOR THE USE, IN VIOLATION OF LAWS. ORDINANCES, RULES, CODES OR ANY REGULATIONS OF AUTHORITIES HAVING JURISDICTION OR ANY NECESSARY ITEMS OF WORK THAT HAS BEEN OMITTED. CONTRACTOR AFFIRMS THAT ABSENT SUCH

NOTICE, ALL SYSTEMS WILL FUNCTION SATISFACTORILY WITHOUT ADDITIONAL EXTRA COMPENSATION. THE ELECTRICAL CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND ADHERE TO THE CONTENTS OF THE BID DOCUMENTS. ANY DEVIATIONS FROM THE INFORMATION PROVIDED IN THE DOCUMENTS MUST BE LISTED IN WRITING. INNOVATIVE ENGINEERING SERVICES, LLC HAS THE RIGHT TO BE COMPENSATED FOR REVIEW OF VALUE ENGINEERING OR SUBSTITUTED MATERIALS AND

. ELECTRICAL CONTRACTOR SHALL RESTORE ALL AREAS DISTURBED TO THEIR ORIGINAL CONDITION. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING, PATCHING, PAINTING, CLEAN—UP, ELECTRICAL DEBRIS REMOVAL AND GENERAL COORDINATION OF THE WORK EFFORT AS REQUIRED FOR THE INSTALLATION OF THE ELECTRICAL ITEMS OF WORK.

THE DRAWINGS SHOW THE GENERAL LAYOUT AND SOME OF THE DETAIL, BUT THEY DO NOT SHOW EVERY FITTING, BEND, ... ETC. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL SUCH MATERIALS TO MAKE A COMPLETE INSTALLATION.

ALL PART NUMBERS ARE PROVIDED FOR THE CONVENIENCE OF THE CONTRACTOR. THEY ARE NOT TO BE CONSIDERED THE COMPLETE SPECIFICATION OF THE PRODUCT. THE PART NUMBER AND DESCRIPTION WILL BE THE COMPLETE SPECIFICATION IN THE EVENT OF A DISCREPANCY BETWEEN THE TWO, THE MORE STRINGENT, MORE COSTLY FEATURE/PERFORMANCE WILL BE REQUIRED.

DO NOT SCALE DRAWINGS; ACTUAL FIELD MEASUREMENTS AND DIMENSIONS TAKE PRECEDENCE IN

B. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT, AIA DOCUMENT 201, LATEST EDITION.

. ELECTRICAL CONTRACTOR SHALL INSTALL ALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS AND OR REQUIREMENTS FOR PROPER OPERATION AND MAINTENANCE. 10. ELECTRICAL CONTRACTOR SHALL WARRANT AND GUARANTEE ALL MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE OWNER.

1. ELECTRICAL CONTRACTOR SHALL GIVE OWNER 10 DAYS ADVANCE NOTICE OF SHUTDOWNS, OR AS DIRECTED BY THE OWNER. SHUTDOWNS TO BE KEPT TO A MINIMUM. AT NO TIME SHALL THE

BUILDING/SPACE BE LEFT WITHOUT COMMERCIAL POWER IN FULL OPERATING ORDER. 2. PROVIDE INDEPENDENT SEISMIC SUPPORT OF ALL ELECTRICAL EQUIPMENT PER THE LATEST ADOPTED

13. ALL ELECTRICAL PENETRATIONS TO BE FIREPROOFED TO MAINTAIN INTEGRITY OF FIRE

VERSION OF THE INTERNATIONAL BUILDING CODE

14. ALL THE WIRE SIZES ARE BASED ON COPPER, ALUMINUM IS NOT TO BE USED UNLESS NOTED 15. MINIMUM CONDUCTOR SIZE FOR A FULLY LOADED 20A CIRCUIT, UNLESS OTHERWISE NOTED, SHALL

BE #12 FOR ALL BRANCH CIRCUIT RUNS UP TO THE FIRST OUTLET; OVER 60 FEET, #10; OVER 105 FEET, #8; INCREASE CONDUIT SIZE TO SUIT. 16. CIRCUIT NUMBERS ARE INDICATED FOR INTENT ONLY. THE ELECTRICAL CONTRACTOR SHALL ADJUST

ACCORDINGLY IN THE FIELD, TO BALANCE CIRCUITS EVENLY ON ALL PHASES 7. ALL WIRING METHODS ARE TO BE IN ACCORDANCE WITH THE CURRENT ISSUE OF THE NATIONAL ELECTRICAL CODE, AND APPLICABLE LOCAL CODES. ALL WIRING IS TO BE IN CONDUIT, UNLESS SPECIFICALLY NOTED OTHERWISE. ALL WIRING IS TO BE CONCEALED.

18. NO LOW VOLTAGE WIRING SHALL BE PERMITTED IN THE SAME RACEWAY AS POWER WIRING.

19. COORDINATE EXACT PLACEMENT OF EQUIPMENT WITH MECHANICAL PLANS, MAKE FIELD ADJUSTMENTS AS REQUIRED TO AVOID CONFLICTS, VERIFY WITH OWNER. 20. ELECTRICAL CONTRACTOR TO COORDINATE WITH MECHANICAL CONTRACTOR FOR ITEMS SUPPLIED BY THE MECHANICAL/OTHER DIVISIONS BUT INSTALLED BY THE ELECTRICAL CONTRACTOR. ELECTRICAL

CONTRACTOR TO REVIEW ALL THE PLANS FOR THE PROJECT AND ASSIST IN PROVIDING COORDINATION DRAWINGS WITH OTHER TRADES. 21. ELECTRICAL CONTRACTOR TO VERIFY LOADS, SETTINGS, OVERCURRENT PROTECTION... ETC TO INSURE

22. PROVIDE LAMICOID NAMEPLATES AND TYPEWRITTEN PANEL SCHEDULES FOR ALL DISCONNECT EQUIPMENT, MODIFIED OR PROVIDED AS NEW AS PART OF THE SCOPE OF WORK. ALTERNATE LABELING PROVISIONS MUST BE APPROVED BY THE ENGINEER.

23. REFER TO MECHANICAL DRAWINGS FOR THE EXACT LOCATION AND MOUNTING HEIGHTS OF ALL 24. CONTRACTOR TO PROVIDE ALL COORDINATION FOR UTILITY SERVICES INCLUDING TEMPORARY SERVICE FOR THE PROJECT. THIS INCLUDES POWER UTILITY, TELEPHONE COMPANY AND CABLE TV OPERATOR.

25. DISCONNECT SWITCHES AND CIRCUIT BREAKER USED AS SWITCHES SHALL BE INSTALLED IN ACCORDANCE WITH ALL LOCAL CODES AND THE LATEST VERSION OF THE NATIONAL ELECTRICAL CODE "NEC" SECTION 110.26 TABLE 110.26(A)(1) AND SECTION 404.8. ALL DISCONNECT SWITCHES AND CIRCUIT BREAKERS SHALL BE LOCATED SO THAT THEY MAY BE OPERATED FROM A READILY ACCESSIBLE PLACE. THEY SHALL BE INSTALLED SUCH THAT THE CENTER OF THE GRIP OF THE OPERATING HANDLE OF THE SWITCH OR CIRCUIT BREAKER, WHEN IN ITS HIGHEST POSITION, IS NOT MORE THAN 6'-7" ABOVE THE FLOOR OR WORKING PLATFORM WITH 36" CLEAR IN FRONT.



NOTES:

ISSUED FOR PROGRESS

REV.	DATE	DESCRIPTION
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BEECHER SCHOOL

NEW HAVEN, CT 06515

SHEET TITLE: **ELECTRICAL NOTES, LEGEND SCHEDULES & SPECIFICATION**

PROJECT NUMBER: ISSUED: 04/05/23 DRAWN BY: CHECKED BY: SCALE: AS NOTED

SHEET: