

MECHANICAL SPECIFICATION CONTINUED

3.02 PIPING:

- A. CHILLED WATER PIPING: INSULATE WITH CELLULAR GLASS INSULATION, INSULATION THICKNESS SHALL BE 2 INCHES. PROVIDE PVC JACKET FOR EXPOSED PIPING IN MECHANICAL ROOMS. PROVIDE WITH VAPOR BARRIER.
- B. HOT WATER PIPING: INSULATE WITH PREFORMED FIBERGLASS PIPE INSULATION, INSULATION THICKNESS SHALL BE 2 INCHES. PROVIDE PVC JACKET FOR EXPOSED PIPING IN MECHANICAL ROOMS. PROVIDE WITH VAPOR BARRIER.
- C. CONDENSATE DRAIN PIPING: INSULATE WITH CELLULAR FOAM ELASTOMERIC PIPE INSULATION, SECURED WITH ADHESIVE. INSULATION THICKNESS SHALL BE THREE QUARTER INCH (3/4").

SECTION 23 09 23

HVAC CONTROLS

1.0 - GENERAL

A. THE CONTROL SYSTEM SHALL BE TIED-IN TO THE EXISTING KMC TOTAL CONTROL FRONT-END SERVER. PROVIDE GRAPHICS, TRENDDING, ALARMS AND PROGRAMMING MODIFICATION CAPABILITIES FROM THE EXISTING KMC SERVER LOCATED AT DPW FACILITIES AT CLARK AVENUE AND SPRUCE STREET TO THE NEW FIR STATION.

1.01 DESCRIPTION

A. THE HVAC CONTROLS SHALL BE COMPRISED OF A NETWORK OF INTEROPERABLE, STAND-ALONE DIGITAL CONTROLLERS. B. THE SYSTEM WILL DIRECTLY CONTROL EACH PIECE OF MECHANICAL EQUIPMENT AS INDICATED IN THE SCHEMATIC DRAWINGS AND SEQUENCE OF OPERATIONS.

B. FURNISH ALL LABOR, MATERIALS, EQUIPMENT, AND SERVICE NECESSARY FOR A COMPLETE AND OPERATING (BOS), UTILIZING DIRECT DIGITAL CONTROLS AS SHOWN ON THE DRAWINGS AND AS DESCRIBED HEREIN. DRAWINGS ARE DIAGRAMMATIC ONLY.

2.0 - PRODUCTS

2.01 MANUFACTURERS
A. KMC CONTROLS.

2.02 GENERAL

A. THE CONTROL SYSTEM SHALL TIE INTO EXISTING KMC TOTAL CONTROL FRONT END SERVER. PROVIDE GRAPHICS TRENDDING, ALARMS AND PROGRAMMING MODIFICATION CAPABILITIES FROM THE EXISTING KMC SERVER, LOCATED AT DPW FACILITIES AT CLARK AVE AND SPRUCE STREET TO THE FIRE STATION.
B. PROVIDE INTERFACE TO THE DIGITAL MASTER LIGHTING CONTROL PANEL.

2.03 CUSTOM APPLICATION CONTROLLERS

A. GENERAL: PROVIDE AN ADEQUATE NUMBER OF CUSTOM APPLICATION CONTROLLERS TO ACHIEVE THE PERFORMANCE SPECIFIED. EACH OF THESE PANELS SHALL MEET THE FOLLOWING REQUIREMENTS.

1. CUSTOM APPLICATION CONTROLLERS SHALL BE PROVIDED FOR AIR HANDLING UNITS. CONTROLS SHALL BE MICROPROCESSOR BASED INTEROPERABLE LONWORKS DIGITAL CONTROLLERS, PROVIDING INTEROPERABILITY WITH ALL LONMARK AND LONWORKS DEVICES THE APPLICATION CONTROL PROGRAM SHALL BE RESIDENT WITHIN THE SAME ENCLOSURE AS THE INPUT/OUTPUT CIRCUITRY, WHICH TRANSLATES THE SENSOR SIGNALS.
2. ALL INPUT/OUTPUT SIGNALS SHALL BE DIRECTLY HARDWIRED. ALL CONTROLLERS SHALL EMPLOY A UNIVERSAL INPUT CONFIGURATION THAT ALLOWS FOR FLEXIBILITY IN APPLICATION RANGING FROM DRY CONTACT, RESISTIVE AND VOLTAGE CURRENT SOURCES. IF UNIVERSAL POINTS ARE NOT AVAILABLE, A MINIMUM OF ONE SPARE INPUT POINT (EACH) OF THE DRY CONTACT, RESISTIVE AND ANALOG VOLTAGE/CURRENT TYPES MUST BE PROVIDED FOR EACH INPUT POINT UTILIZED. CONTROLLERS SHALL PROVIDE DIGITAL AND ANALOG OUTPUT TYPES AND QUANTITIES CONSISTENT WITH THE REQUIREMENTS OF THE APPLICATION REQUIREMENTS.
3. THE CUSTOM APPLICATION CONTROLLER SHALL HAVE SUFFICIENT MEMORY TO SUPPORT ITS OPERATING SYSTEM, DATABASE, AND PROGRAMMING REQUIREMENTS. ALL CONTROLLERS SHALL BE FULLY APPLICATION PROGRAMMABLE UTILIZING GRAPHICAL OBJECTS. ALL CONTROL SEQUENCES PROGRAMMED SHALL BE STORED IN NON-VOLATILE MEMORY WHICH IS NOT DEPENDENT UPON THE PRESENCE OF A BATTERY, TO BE RETAINED, SYSTEMS THAT ONLY ALLOW SELECTION OF SEQUENCES FROM A LIBRARY OR TABLE ARE NOT ACCEPTABLE.
4. DATA SHALL BE SHARED BETWEEN NETWORKED CUSTOM APPLICATION CONTROLLERS.
5. THE OPERATING SYSTEM OF THE CONTROLLER SHALL MANAGE THE INPUT AND OUTPUT COMMUNICATION SIGNALS TO ALLOW DISTRIBUTED CONTROLLERS TO SHARE REAL AND VIRTUAL OBJECT INFORMATION, AND ALLOW CENTRAL MONITORING AND ALARMS.
6. CONTROLLERS THAT PERFORM SCHEDULING SHALL HAVE A REAL-TIME CLOCK.
7. THE CUSTOM APPLICATION CONTROLLER SHALL CONTINUALLY CHECK THE STATUS OF ITS PROCESSOR AND MEMORY CIRCUITS. IF AN ABNORMAL OPERATION IS DETECTED, THE CONTROLLER SHALL:

- A. ASSUME A PREDETERMINED FAILURE MODE.
- B. GENERATE AN ALARM NOTIFICATION.
- C. ENVIRONMENT: CONTROLLER HARDWARE SHALL BE SUITABLE FOR THE ANTICIPATED AMBIENT CONDITIONS.
8. CONTROLLERS USED IN CONDITIONED SPACE SHALL BE MOUNTED IN DUST-PROOF ENCLOSURES, AND SHALL BE RATED FOR OPERATION AT 0°C TO 50°C [32°F TO 120°F].

C. KEYPAD: A LOCAL KEYPAD AND DISPLAY SHALL BE PROVIDED. THE KEYPAD SHALL BE PROVIDED FOR INTERROGATING AND EDITING DATA. AN OPTIONAL SYSTEM SECURITY PASSWORD SHALL BE AVAILABLE TO PREVENT UNAUTHORIZED USE OF THE KEYPAD AND DISPLAY.

D. SERVICEABILITY: PROVIDE DIAGNOSTIC LED'S FOR POWER, COMMUNICATION, AND PROCESSOR. ALL WIRING CONNECTIONS SHALL BE MADE TO FIELD-REMOVABLE, MODULAR TERMINAL STRIPS--OR TO A TERMINATION CARD CONNECTED BY A RIBBON CABLE.

E. MEMORY: THE CUSTOM APPLICATION CONTROLLER SHALL MAINTAIN ALL LOGS AND PROGRAMMING INFORMATION IN THE EVENT OF A POWER LOSS FOR AT LEAST 10 HOURS.

F. IMMUNITY TO POWER AND NOISE: CONTROLLER SHALL BE ABLE TO OPERATE AT 90% TO 110% OF NOMINAL VOLTAGE RATING AND SHALL PERFORM AN ORDERLY SHUTDOWN BELOW 90% NOMINAL VOLTAGE. OPERATION SHALL BE PROTECTED AGAINST ELECTRICAL NOISE OF 5 TO 120 HZ AND FROM KEYED TONES UP TO 5 W AT FT.

G. DAMPER: THE CUSTOM APPLICATION CONTROLLER SHALL MAINTAIN ALL LOGS AND PROGRAMMING INFORMATION IN THE EVENT OF A POWER LOSS FOR AT LEAST 10 HOURS.

H. IMMUNITY TO POWER AND NOISE: CONTROLLER SHALL BE ABLE TO OPERATE AT 90% TO 110% OF NOMINAL VOLTAGE RATING AND SHALL PERFORM AN ORDERLY SHUTDOWN BELOW 90% NOMINAL VOLTAGE. OPERATION SHALL BE PROTECTED AGAINST ELECTRICAL NOISE OF 5 TO 120 HZ AND FROM KEYED TONES UP TO 5 W AT FT.

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SECTION 23 21 13

HYDRONIC PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. SECTION INCLUDES:
 1. CHILLED WATER PIPING.
 2. HOT WATER PIPING.
 3. CONDENSATE DRAINS.
 4. UNIONS.
 5. VALVES.

1.02 SYSTEM DESCRIPTION

- A. WHERE MORE THAN ONE PIPING SYSTEM MATERIAL IS SPECIFIED, PROVIDE COMPATIBLE SYSTEM COMPONENTS AND JOINTS. USE NON-CONDUCTING DIELECTRIC CONNECTIONS WHENEVER JOINTING DISSIMILAR METALS IN OPEN SYSTEMS.
- B. PROVIDE UNIONS AND COUPLINGS AT LOCATIONS REQUIRING SERVICING. USE UNIONS AND COUPLINGS DOWNSTREAM OF VALVES AND AT EQUIPMENT OR APPARATUS CONNECTIONS. DO NOT USE DIRECT WELDED OR THREADED CONNECTIONS TO VALVES, EQUIPMENT OR OTHER APPARATUS.
- C. USE BALL VALVES FOR SHUT-OFF AND TO ISOLATE EQUIPMENT.
- D. USE 3/4 INCH BALL VALVES WITH CAP FOR DRAINS AT EQUIPMENT.

1.03 SUBMITTALS

- A. PRODUCT DATA:
 1. PIPING: SUBMIT DATA ON PIPE MATERIALS, FITTINGS, AND ACCESSORIES. SUBMIT MANUFACTURERS CATALOG INFORMATION.
 2. VALVES: SUBMIT MANUFACTURERS CATALOG INFORMATION WITH VALVE DATA AND RATINGS FOR EACH SERVICE.

PART 2 PRODUCTS

2.01 CHILLED WATER PIPING

- A. STEEL PIPE: ASTM A53/A53M, SCHEDULE 40.
 1. FITTINGS: ASME B16.3, MALLEABLE IRON OR ASTM A234/A234M, FORGED STEEL WELDING TYPE.
 2. JOINTS: THREADED FOR PIPE 2 INCHES AND SMALLER; WELDED FOR PIPE 2-1/2 INCHES AND LARGER.

2.02 HOT WATER PIPING

- A. COPPER PIPE: TYPE K.
 1. FITTINGS: BRAZED.
 2. JOINTS: BRAZED.

2.03 CONDENSATE DRAIN

- A. COPPER TUBING: ASTM B88, TYPE L, HARD DRAWN.
 1. FITTINGS: ASME B16.18, CAST BRASS, OR ASME B16.22 SOLDER WROUGHT COPPER.
 2. JOINTS: SOLDER, LEAD FREE, 95-5 TIN-ANTIMONY, OR TIN AND SILVER, WITH MELTING RANGE 430 TO 535 DEGREES F.

2.04 UNIONS AND FLANGES

- A. UNIONS FOR PIPE 2 INCHES AND SMALLER:
 1. FERROUS PIPING: CLASS 150, MALLEABLE IRON, THREADED.
 2. COPPER PIPING: CLASS 150, BRONZE UNIONS WITH BRAZED JOINTS.
 3. DIELECTRIC CONNECTIONS: UNION WITH GALVANIZED OR PLATED STEEL THREADED END, COPPER SOLDER END, WATER IMPERVIOUS ISOLATION BARRIER.

2.05 BALL VALVES

- A. 3 INCHES AND SMALLER: MSS SP 110, TWO PIECE BRONZE BODY, CHROME PLATED BRASS BALL, FULL PORT, TEFLON SEATS, BLOW-OUT PROOF STEM, SOLDER OR THREADED ENDS WITH UNION, LOCKING LEVER HANDLE WITH BALANCING STOPS.

PART 3 EXECUTION

3.01 PREPARATION

- A. REAM PIPE AND TUBE ENDS. REMOVE BURRS. BEVEL PLAIN END FERROUS PIPE.
- B. REMOVE SCALE AND DIRT ON INSIDE AND OUTSIDE BEFORE ASSEMBLY.
- C. PREPARE PIPING CONNECTIONS TO EQUIPMENT WITH UNIONS.

3.02 INSTALLATION

- A. INSTALL CHILLED WATER PIPING IN ACCORDANCE WITH ASME B31.1
- B. INSTALL PIPING TO CONSERVE BUILDING SPACE, AND NOT INTERFERE WITH USE OF SPACE.
- C. INSULATE PIPING.

SECTION 23 21 16

HYDRONIC PIPING SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

- A. SECTION INCLUDES:
 1. PRESSURE GAGES
 2. PRESSURE GAGE TAPS
 3. THERMOMETERS
 4. THERMOMETER SUPPORTS
 5. TEST PLUGS
 6. FLEXIBLE CONNECTORS
 7. DIAPHRAGM-TYPE EXPANSION TANKS.
 8. AIR VENTS.
 9. AIR SEPARATORS.
 10. STRAINERS.
 11. PUMP SUCTION FITTINGS.
 12. COMBINATION PUMP DISCHARGE VALVES.

1.02 PERFORMANCE REQUIREMENTS

- A. FLEXIBLE CONNECTORS: PROVIDE AT OR NEAR PUMPS.

1.03 SUBMITTALS

- A. PRODUCT DATA: SUBMIT FOR MANUFACTURED PRODUCTS AND ASSEMBLIES USED IN THIS PROJECT.
 1. MANUFACTURER'S DATA INDICATING USE, OPERATING RANGE, TOTAL RANGE, ACCURACY, AND LOCATION FOR MANUFACTURED COMPONENTS.
 2. SUBMIT PRODUCT DESCRIPTION, MODEL, DIMENSIONS, COMPONENT SIZES, ROUGH-IN REQUIREMENTS, SERVICE SIZES, AND FINISHES.
 3. SUBMIT SCHEDULE INDICATING MANUFACTURER, MODEL NUMBER, SIZE, LOCATION, RATED CAPACITY, LOAD SERVED, AND FEATURES FOR EACH PIPING SPECIALTY.

B. MANUFACTURER'S INSTALLATION INSTRUCTIONS: SUBMIT HANGING AND SUPPORT METHODS, JOINING PROCEDURES, APPLICATION, SELECTION, AND HOOKUP CONFIGURATION. INCLUDE PIPE AND ACCESSORY ELEVATIONS.

PART 2 PRODUCTS

2.01 PRESSURE GAGES

- A. GAGE: ASME B40.1, WITH BOURDON TUBE, ROTARY BRASS MOVEMENT, BRASS SOCKET, FRONT CALIBRATION ADJUSTMENT, BLACK SCALE ON WHITE BACKGROUND.
 1. CASE: CAST ALUMINUM BOURDON TUBE: TYPE 316 STAINLESS STEEL.
 2. DIAL SIZE: 3-1/2 INCH DIAMETER.
 3. MID-SCALE ACCURACY: ONE PERCENT.
 4. SCALE: PSI.

2.02 PRESSURE GAGE TAPS

- A. NEEDLE VALVE: BRASS 1/4 INCH NPT FOR MINIMUM 300 PSI.
- B. PULSATION DAMPER: PRESSURE SNUBBER, BRASS WITH 1/4 INCH NPT CONNECTIONS.
- C. SIPHON: BRASS 1/4 INCH NPT ANGLE OR STRAIGHT PATTERN.

2.03 STEM TYPE THERMOMETERS

- A. THERMOMETER: ASTM E1, ADJUSTABLE ANGLE, RED APPEARING MERCURY, LENS FRONT TUBE, CAST ALUMINUM CASE WITH ENAMEL FINISH, CAST ALUMINUM ADJUSTABLE JOINT WITH POSITIVE LOCKING DEVICE.
 1. SIZE: 7 INCH SCALE.
 2. WINDOW: CLEAR GLASS.
 3. STEM: BRASS, 3/4 INCH NPT, 3-1/2 INCH LONG.
 4. ACCURACY: 2 PERCENT.
 5. CALIBRATION: DEGREES F.

2.04 THERMOMETER SUPPORTS

- A. SOCKET: BRASS SEPARABLE SOCKETS FOR THERMOMETER STEMS WITH OR WITHOUT EXTENSIONS.
- B. FLANGE: 3 INCH OUTSIDE DIAMETER REVERSIBLE FLANGE, DESIGNED TO FASTEN TO SHEET METAL AIR DUCTS, WITH BRASS PERFORATED STEM.

2.05 TEST PLUGS

- A. 1/2 INCH NPT BRASS FITTING AND CAP FOR RECEIVING 1/8 INCH OUTSIDE DIAMETER PRESSURE OR TEMPERATURE PROBE WITH:
 1. NEOPRENE CORE FOR TEMPERATURES UP TO 200 DEGREES F.
 - B. TEST KIT:
 1. CARRYING CASE, INTERNALLY PADDED AND FITTED CONTAINING:
 - A. TWO 3-1/2 INCH DIAMETER PRESSURE GAGES.
 - 1) SCALE RANGE: 0 TO 100 PSI
 - B. ONE GAGE ADAPTERS WITH 1/8 INCH PROBES.
 - C. TWO 1 INCH DIAL THERMOMETERS.
 - 1) SCALE RANGE: 20 TO 180 DEGREES F.

2.06 FLEXIBLE CONNECTORS

- A. CORRUGATED STAINLESS STEEL HOSE WITH SINGLE LAYER OF STAINLESS STEEL EXTERIOR BRAIDING, MINIMUM 9 INCHES LONG WITH COPPER TUBE ENDS; FOR MAXIMUM WORKING PRESSURE 300 PSIG.
- 2.07 DIAPHRAGM-TYPE EXPANSION TANKS
 - A. CONSTRUCTION: WELDED STEEL, TESTED AND STAMPED IN ACCORDANCE WITH ASME SECTION VIII; SUPPLIED WITH NATIONAL BOARD FORM U-1, RATED FOR WORKING PRESSURE OF 125 PSIG, WITH FLEXIBLE BUTYL DIAPHRAGM SEALED INTO TANK, AND STEEL SUPPORT.
 - B. ACCESSORIES: PRESSURE GAGE AND AIR-CHARGING TUBE TANK DRAIN; PRE-CHARGE TO 12 PSIG AND STEEL; PRESSURE REDUCING VALVE, REDUCED CAPACITY COLD WATER FILL ASSEMBLY; PRESSURE REDUCING VALVE, REDUCED CAPACITY DOUBLE CHECK BACK FLOW PREVENTIVE DEVICE, TEST POINTS STRAINER, VACUUM BREAKER, AND BY-PASS VALVE.

2.08 AIR VENTS

- A. MANUAL TYPE: SHORT INCH SECTION OF 2 INCH DIAMETER PIPE TO FORM AIR CHAMBER, WITH 1 1/8 INCH BRASS NEEDLE VALVE AT TOP OF CHAMBER.

2.09 AIR SEPARATORS

- A. DIP TYPE FITTING: FOR 125 PSIG OPERATING PRESSURE; TO PREVENT FREE AIR COLLECTED IN BOILER FROM FINDING INTO SYSTEM.
- B. IN-LINE AIR SEPARATORS: BRASS OR IRON FOR SIZES 1-1/2 INCH AND SMALLER, OR FOR SIZES 2 INCH AND LARGER. TESTED AND STAMPED IN ACCORDANCE WITH ASME SECTION VIII; FOR 125 PSIG OPERATING PRESSURE.
- C. COMBINATION AIR SEPARATORS/STRAINERS: STEEL, TESTED AND STAMPED IN ACCORDANCE WITH ASME SECTION VIII; FOR 125 PSIG OPERATING PRESSURE, WITH INTERNAL BRASS STRAINER, TANGENTIAL INLET AND OUTLET CONNECTIONS, AND INTERNAL BRASS STEEL AIR COLLECTOR TUBE.

2.10 PUMP SUCTION FITTINGS

- A. ANGLE: ANGLE PATTERN, CAST-IRON BODY. THREADED FOR 2 INCH AND SMALLER, FLANGED FOR 2-1/2 INCH AND LARGER. RATED FOR 175 PSIG WORKING PRESSURE, WITH INLET VANES, CYLINDER STRAINER WITH 3/16 INCH DIAMETER OPENINGS, DISPOSABLE FINE MESH STRAINER TO FIT OVER CYLINDER STRAINER, AND PERMANENT MAGNET LOCATED IN FLOW STREAM AND REMOVABLE FOR CLEANING.
- B. ACCESSORIES: ADJUSTABLE FOOT SUPPORT, BLOW-DOWN TAPPING IN BOTTOM, GAGE TAPPING IN SIDE.

2.11 COMBINATION PUMP DISCHARGE VALVES

- A. VALVES: STRAIGHT OR ANGLE PATTERN, FLANGED CAST-IRON VALVE BODY WITH BOLT-ON BONNET FOR 175 PSIG OPERATING PRESSURE, NON-SLAM CHECK VALVE WITH SPRING-LOADED BRONZE DISC AND SEAT, STAINLESS STEEL STEM, AND CALIBRATED ADJUSTMENT PERMITTING FLOW REGULATION.

2.12 FLOW CONTROLS

- A. CONSTRUCTION: BRASS OR BRONZE BODY WITH UNION ON INLET AND OUTLET, TEMPERATURE AND PRESSURE TEST PLUG ON INLET AND OUTLET COMBINATION BLOW-DOWN AND BACK-FLUSH DRAIN.
- B. CALIBRATION: CONTROL WITHIN 5 PERCENT OF DESIGN FLOW OVER ENTIRE OPERATING PRESSURE.
- C. CONTROL MECHANISM: STAINLESS STEEL OR NICKEL PLATED BRASS PISTON OR REGULATOR CUP, OPERATING AGAINST STAINLESS STEEL HELICAL OR WAVE FORMED SPRING.
- D. ACCESSORIES: IN-LINE STRAINER ON INLET AND BALL VALVE ON OUTLET.

2.13 RELIEF VALVES

- A. BRONZE BODY, TEFLON SEAT, STAINLESS STEEL STEM AND SPRINGS, AUTOMATIC, DIRECT PRESSURE ACTUATED CAPACITIES ASME CERTIFIED AND LABELED.

3.01 INSTALLATION - THERMOMETERS AND GAGES

- A. INSTALL ONE PRESSURE GAGE FOR EACH PUMP. LOCATE TAPS BEFORE STRAINERS AND ON SUCTION AND DISCHARGE OF PUMP; PIPE TO GAGE.
- B. INSTALL GAGE TAPS IN PIPING
- C. INSTALL PRESSURE GAGES WITH PULSATION DAMPERS. PROVIDE NEEDLE VALVE TO ISOLATE EACH GAGE. EXTEND NIPPLES TO ALLOW CLEARANCE FROM INSULATION.
- D. INSTALL THERMOMETERS IN PIPING SYSTEMS IN SOCKETS IN SHORT COUPLINGS. ENLARGE PIPES SMALLER THAN 2-1/2 INCHES FOR INSTALLATION OF THERMOMETER SOCKETS. ALLOW CLEARANCE FROM INSULATION.
- E. INSTALL THERMOMETER SOCKETS ADJACENT TO CONTROLS SYSTEMS THERMOSTAT, TRANSMITTER, OR SENSOR SOCKETS. COIL AND CONCEAL EXCESS CAPILLARY ON REMOTE ELEMENT INSTRUMENTS.
- F. PROVIDE INSTRUMENTS WITH SCALE RANGES SELECTED ACCORDING TO SERVICE WITH LARGEST APPROPRIATE SCALE.
- G. INSTALL GAGES AND THERMOMETERS IN LOCATIONS WHERE THEY ARE EASILY READ FROM NORMAL OPERATING LEVEL. INSTALL VERTICAL TO 45 DEGREES OFF VERTICAL.
- H. ADJUST GAGES AND THERMOMETERS TO FINAL ANGLE, CLEAN WINDOWS AND LENSES, AND CALIBRATE TO ZERO.

3.02 INSTALLATION - HYDRONIC PIPING SPECIALTIES

- A. LOCATE TEST PLUGS AS INDICATED ON DRAWINGS.
- B. INSTALL MANUAL AIR VENTS AT SYSTEM HIGH POINTS.
- C. PROVIDE AIR SEPARATOR ON SUCTION SIDE OF SYSTEM CIRCULATION PUMP AND CONNECT TO EXPANSION TANK.
- D. PROVIDE DRAIN AND HOSE CONNECTION WITH VALVE ON STRAINER BLOW DOWN CONNECTION.
- E. PROVIDE PUMP SUCTION FITTING ON SUCTION SIDE OF BASE MOUNTED CENTRIFUGAL PUMPS. REMOVE TEMPORARY STRAINERS AFTER CLEANING SYSTEMS.
- F. PROVIDE COMBINATION PUMP DISCHARGE VALVE ON DISCHARGE SIDE OF BASE MOUNTED CENTRIFUGAL PUMPS.
- G. SUPPORT PUMP FITTINGS WITH FLOOR MOUNTED PIPE AND FLANGE SUPPORTS.
- H. PROVIDE RELIEF VALVES ON PRESSURE TANKS, LOW-PRESSURE SIDE OF REDUCING VALVES, HEAT EXCHANGERS, AND EXPANSION TANKS.
- I. SELECT SYSTEM RELIEF VALVE CAPACITY GREATER THAN MAKE-UP PRESSURE REDUCING VALVE CAPACITY.
- J. SELECT EQUIPMENT RELIEF VALVE CAPACITY TO EXCEED RATING OF CONNECTED EQUIPMENT.
- K. PIPE RELIEF VALVE OUTLET TO NEAREST FLOOR DRAIN.

3.03 PROTECTION OF INSTALLED CONSTRUCTION

- A. DO NOT INSTALL HYDRONIC PRESSURE GAUGES UNTIL AFTER SYSTEMS ARE PRESSURE TESTED.

SECTION 23 25 00

HVAC WATER TREATMENT EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. SECTION INCLUDES:

- 1. SYSTEM CLEANER.
- 2. CLOSED SYSTEM TREATMENT (WATER).
- 3. CHEMICAL FEEDER EQUIPMENT INCLUDING ASSOCIATED FEEDERS, PUMPS, TANKS, CONTROLS, METERS AND VALVES.
- 4. TEST EQUIPMENT.

1.02 PERFORMANCE REQUIREMENTS

- A. PROVIDE SYSTEM TO TREAT WATER AVAILABLE AT PROJECT SITE TO MAINTAIN THE FOLLOWING CHARACTERISTICS OF WATER IN CLOSED SYSTEMS:
 1. HARDNESS.
 2. IRON.
 3. TOTAL DISSOLVED SOLIDS.
 4. TOTAL ALKALINITY.
 5. SILICA.
 6. PH.

1.03 MANUFACTURERS

- A. NALCO

1.04 SUBMITTALS

- A. SHOP DRAWINGS: INDICATE SYSTEM SCHEMATIC, EQUIPMENT LOCATIONS, AND CONTROLS SCHEMATICS, INCLUDING CHARACTERISTICS AND CONNECTION REQUIREMENTS.
- B. PRODUCT DATA: SUBMIT CHEMICAL TREATMENT MATERIALS, CHEMICALS, AND EQUIPMENT INCLUDING ELECTRICAL CHARACTERISTICS AND CONNECTION REQUIREMENTS.
- C. MANUFACTURER'S INSTALLATION INSTRUCTIONS: SUBMIT PLACE OF EQUIPMENT IN SYSTEMS, PIPING CONFIGURATION, AND CONNECTION REQUIREMENTS.
- D. MANUFACTURER'S CERTIFICATE: CERTIFY PRODUCTS MEET OR EXCEED SPECIFIED REQUIREMENTS.
- E. MANUFACTURER'S FIELD REPORTS: INDICATE START-UP OF TREATMENT SYSTEMS WHEN COMPLETED AND OPERATING PROPERLY. INDICATE ANALYSIS OF SYSTEM WATER AFTER CLEANING AND AFTER TREATMENT.

1.05 CLOSEOUT SUBMITTALS

- A. PROJECT RECORD DOCUMENTS: RECORD ACTUAL LOCATIONS OF EQUIPMENT AND PIPING, INCLUDING SAMPLING POINTS AND LOCATION OF CHEMICAL INJECTORS.
- B. OPERATION AND MAINTENANCE DATA: SUBMIT DATA ON CHEMICAL FEED PUMPS, AGITATORS, AND OTHER EQUIPMENT INCLUDING SPARE PARTS LISTS, PROCEDURES, AND TREATMENT PROGRAMS. INCLUDE STEP BY STEP INSTRUCTIONS ON TEST PROCEDURES INCLUDING TARGET CONCENTRATIONS.

1.06 MAINTENANCE SERVICE

- A. FURNISH MONTHLY TECHNICAL SERVICE VISITS, FOR ONE YEAR STARTING AT DATE OF SUBSTANTIAL COMPLETION, TO PERFORM FIELD INSPECTIONS AND MAKE WATER ANALYSIS ON SITE. DETAIL FINDINGS IN WRITING ON PROPER PRACTICES, CHEMICAL TREATING REQUIREMENTS AND CORRECTIVE ACTIONS NEEDED. SUBMIT TWO COPIES OF FIELD SERVICE REPORT AFTER EACH VISIT.
- B. FURNISH LABORATORY AND TECHNICAL ASSISTANCE SERVICES DURING THIS MAINTENANCE PERIOD.
- C. FURNISH ON SITE INSPECTIONS OF EQUIPMENT DURING SCHEDULED OR EMERGENCY SHUTDOWN TO PROPERLY EVALUATE SUCCESS OF WATER TREATMENT PROGRAM, AND MAKE RECOMMENDATIONS IN WRITING BASED UPON THESE INSPECTIONS.

1.07 MAINTENANCE MATERIALS

- A. FURNISH CHEMICALS FOR TREATMENT AND TESTING DURING WARRANTY PERIOD.

PART 2 PRODUCTS

2.01 SYSTEM CLEANER

- A. PRODUCT DESCRIPTION: LIQUID ALKALINE COMPOUND WITH EMULSIFYING AGENTS AND DETERGENTS TO REMOVE GREASE AND PETROLEUM PRODUCTS; SODIUM TRI-POLY PHOSPHATE AND SODIUM MOLYBDATE.
- B. BIOCIDES: CHLORINE RELEASE AGENTS INCLUDING SODIUM HYPOCHLORITE OR CALCIUM HYPOCHLORITE, OR MICROBICIDES INCLUDING QUATERNARY AMMONIA COMPOUNDS, TRIBUTYL TIN OXIDE, METHYLENE BIS (THIOCYANATE), OR ISOTHIAZOLONES.

2.02 CLOSED SYSTEM TREATMENT (WATER)

- A. SEQUESTERING AGENT TO REDUCE DEPOSITS AND ADJUST PH: POLYPHOSPHATE.
- B. CORROSION INHIBITORS: LIQUID BORON-NITRIDE, SODIUM NITRITE, SODIUM BORAX, SODIUM TOTYLTRIAZOLE, LOW MOLECULAR WEIGHT POLYMERS, PHOSPHONATES, SODIUM MOLYBDATE, OR SULFITES.
- C. CONDUCTIVITY ENHANCERS: PHOSPHATES OR PHOSPHONATES.

PART 3 EXECUTION

3.01 PREPARATION

- A. OPERATE, FILL, START AND VENT SYSTEMS PRIOR TO CLEANING. USE WATER METER TO RECORD CAPACITY IN EACH SYSTEM. PLACE TERMINAL CONTROL VALVES IN OPEN POSITION DURING CLEANING.

3.02 CLEANING

- A. CONCENTRATION:
 1. AS RECOMMENDED BY MANUFACTURER.
- B. CHILLED WATER SYSTEMS:
 1. CIRCULATE FOR 48 HOURS, THEN DRAIN SYSTEMS AS QUICKLY AS POSSIBLE.
 2. REFILL WITH CLEAN WATER, CIRCULATE FOR 24 HOURS, THEN DRAIN.
 3. REFILL WITH CLEAN WATER AND REPEAT UNTIL SYSTEM CLEANER IS REMOVED.
- C. USE NEUTRALIZER AGENTS ON RECOMMENDATION OF SYSTEM CLEANER SUPPLIER AND ACCEPTANCE OF ARCHITECT/ENGINEER.
- D. REMOVE, CLEAN, AND REPLACE STRAINER SCREENS.