CANYON DEL ORO HIGH SCHOOL

25 W Calle Concordia, Oro Valley, AZ 85704

MAIN CENTRAL PLANT
REPLACE COOLING TOWER & PIPING MODIFICATIONS

Construction Documents
DECEMBER 01, 2021

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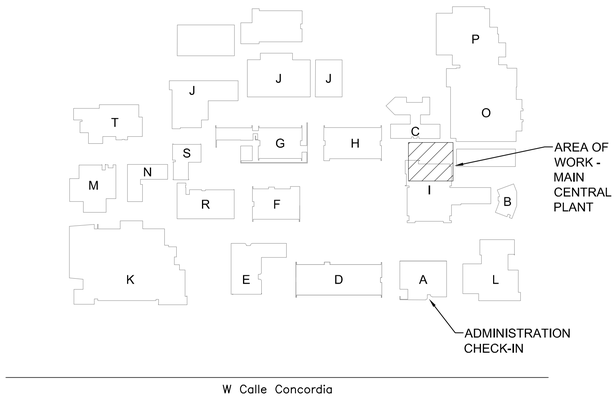
ADD ALTERNATES

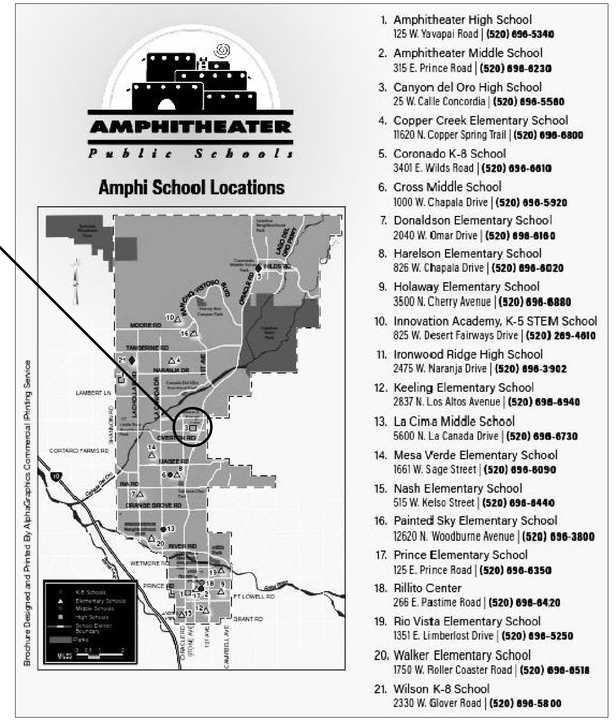
NUMBER	DESCRIPTION	ABBREVIATED SCOPE (SEE PLANS FOR DETAILS)
1	REPLACE EXISTING DOMESTIC WATER HEATERS	INCLUDES FLUE PIPING, PIPING NEAR WATER HEATERS
2	REPLACE EXISTING AIR SEPARATOR AND UNUSED PIPING	NEW LOCATION, PIPING TO PUMP INLETS, INCLUDES BYPASS.
3	INSTALL REMOVABLE GRATES & STRAINER BASKETS IN EXISTING FLOOR SINKS	REQUIRES FIELD VERIFICATION PRIOR TO ORDERING.
4	DEMO UNUSED ITEMS IN BASEMENT	



CAMPUS SITE PLAN

NOT TO SCALE

NORTH



LOCATION MAP (AMPHI SCHOOLS)

NOT TO SCALE

NORTH

OWNER

AMPHITHEATER PUBLIC SCHOOLS
701 W. WETMORE ROAD
TUCSON, ARIZONA 85705
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CDO HIGH SCHOOL
MAIN CENTRAL PLANT - REPLACE COOLING TOWER & PIPING UPGRADES
CONSTRUCTION DOCUMENTS

GENERAL STRUCTURAL NOTES

(APPLY UNLESS NOTED OTHERWISE)

1. ALL WORK SHALL CONFORM TO THE 2018 INTERNATIONAL BUILDING CODE.

2. NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS. WHERE NO SPECIFIC DETAILS ARE SHOWN, CONSTRUCTION SHALL CONFORM TO SIMILAR WORK ON THE PROJECT.

3. VERIFY ALL DIMENSIONS WITH MECHANICAL DRAWINGS PRIOR TO START OF CONSTRUCTION – RESOLVE ANY DISCREPANCY WITH MECHANICAL ENGINEER. DO NOT SCALE DRAWINGS.

4. VERIFY ALL SIZES, WEIGHTS, AND LOCATIONS OF MECHANICAL AND ELECTRICAL EQUIPMENT, DUCTS, ETC. WITH MECHANICAL AND ELECTRICAL ENGINEERS THROUGH THE ARCHITECT.

5. THE CONTRACTOR SHALL TAKE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION INCLUDING, BUT NOT LIMITED TO, BRACING, SHORING, ETC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF ALL SCAFFOLDING, BRACING, AND SHORING. OBSERVATION VISITS TO THE SITE BY THE STRUCTURAL ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS. THE STRUCTURAL ENGINEER WILL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OF CONSTRUCTION. NOR WILL THE STRUCTURAL ENGINEER BE RESPONSIBLE FOR CONSTRUCTION SITE SAFETY, OR THE SAFETY PRECAUTIONS AND THE PROGRAMS INCIDENT THERETO.

6. THE CONTRACT STRUCTURAL DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION.

7. MATERIALS OF CONSTRUCTION:

EPOXY –	SIMPSON SET 3G
STRUCTURAL STEEL –	ASTM A992 (Fy = 50 KSI) FOR W–SHAPE ASTM A36 (Fy = 36 KSI) FOR ALL OTHER SHAPES AND PLATES
BOLTS –	ASTM A325 N, TYPE 1
WELDING –	E70 SERIES LOW HYDROGEN RODS
PAINTING STRUCTURAL STEEL –	1. SURFACE PREPARATION: SSPC–SP6, "COMMERCIAL BLAST". 2. PRIMER: ONE COAT 3 MILS MIN. DRY FILM THICKNESS OF WATER BASED EPOXY PRIMER– FRAZEE C309 OR EQUAL. 3. FINISH PAINT: 2 COATS OF 2 MILS DRY FILM THICKNESS OF WATER BASED 100% ACRYLIC LOW LUSTER LATEX– FRAZEE 215 ROYAL SUPREME OR EQUAL.
CONCRETE –	COMPRESSIVE STRENGTH OF 3000 PSI
DRYPACK –	COMPRESSIVE STRENGTH OF 5000 PSI

REINFORCING STEEL – ASTM A615, FY = 60 KSI

8. EXISTING STRUCTURES:

a. THESE PLANS HAVE BEEN PREPARED BASED ON LIMITED VISUAL OBSERVATIONS AND/OR LIMITED "AS–BUILT" DOCUMENTS. CERTAIN CHANGES MAY BE REQUIRED BECAUSE OF POSSIBLE AMBIGUITIES OR INCONSISTENCIES IN RECORD DRAWINGS.

b. IF FIELD CONDITIONS DIFFER FROM THOSE DEPICTED, NOTIFY THE STRUCTURAL ENGINEER THROUGH THE MECHANICAL ENGINEER PRIOR TO PROCEEDING. THE CONTRACTOR (INCLUDING ALL SUBCONTRACTORS) SHALL REPORT ALL DIFFERENCES AND DEFECTS PROMPTLY TO THE MECHANICAL ENGINEER.

c. VERIFY EXISTING CONDITIONS PRIOR TO CONSTRUCTION.

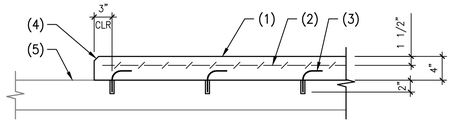
d. THE CONTRACTOR SHALL HAVE APPROPRIATE CONTINGENCIES TO ACCOUNT FOR BOTH DESIGN AND CONSTRUCTION CONDITIONS ARISING FROM THE DISCOVERY OF CONCEALED OR UNKNOWN CONDITIONS IN THE EXISTING STRUCTURE.

9. SPECIAL INSPECTION:

PERIODIC SPECIAL INSPECTION OF EPOXY ANCHORING SHALL BE PROVIDED.

NOTES:

1. CONCRETE HOUSEKEEPING PAD.
2. W.W.F. 6x6–W1.4xW1.4.
3. #3 DOWELS AT 16" O.C. EACH WAY AND AT PERIMETER.
4. CHAMFER EDGE.
5. EXISTING CONCRETE SLAB.

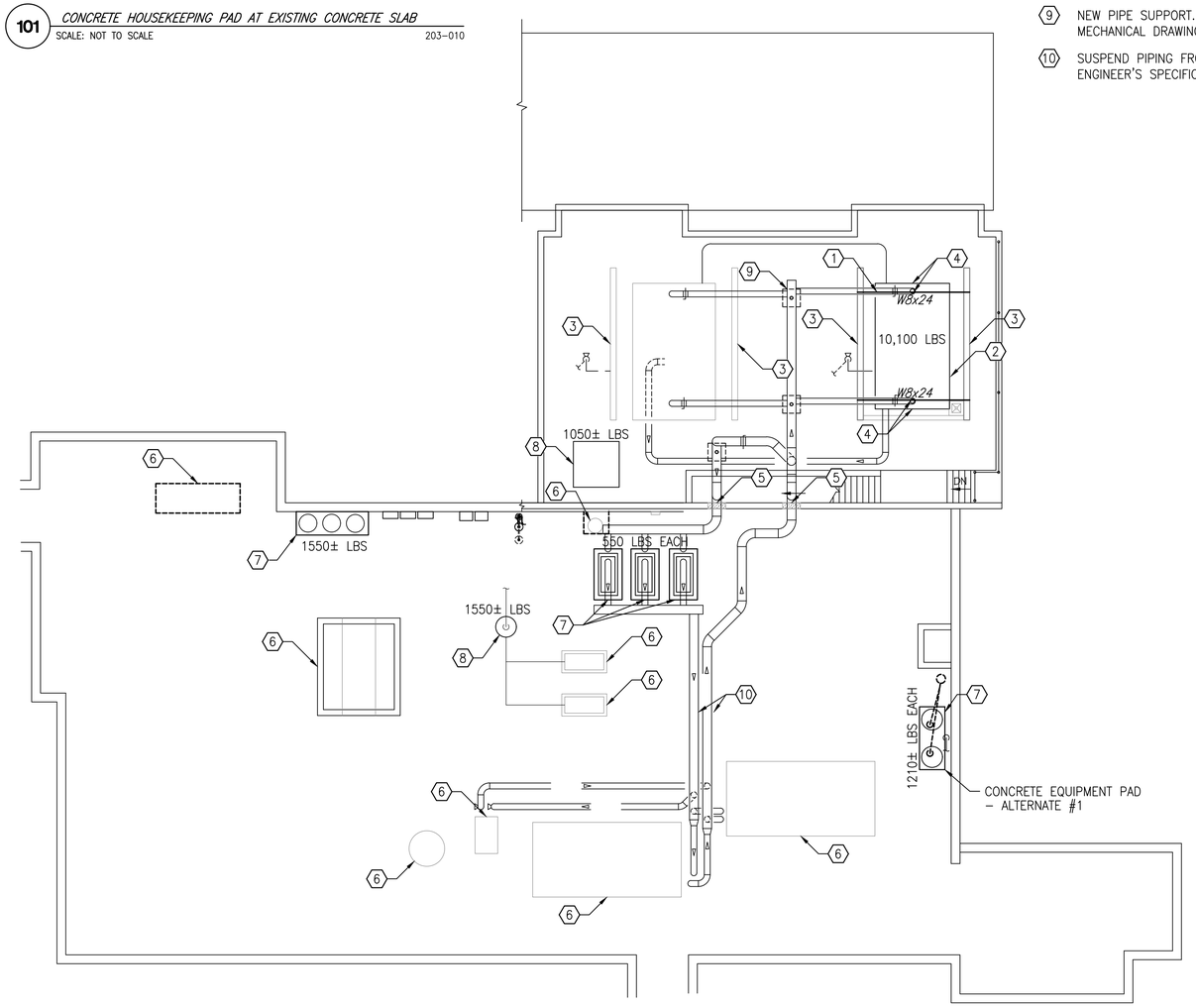


NOTE:
SEE MECHANICAL DRAWINGS FOR SIZE AND LOCATION OF PAD.

101 *CONCRETE HOUSEKEEPING PAD AT EXISTING CONCRETE SLAB*
SCALE: NOT TO SCALE 203–010

FRAMING KEYNOTES:

1. 3/4" DIA. MOUNTING HOLES FOR 5/8" DIA. THREADED RODS (PER MFR), (4) TOTAL HOLES PER BEAM UPPER FLANGE. COORDINATE DIAMETER AND LOCATIONS WITH TOWER MANUFACTURER.
2. NEW COOLING TOWER UNITS MARLEY–NC8402PANI WITH MAXIMUM OPERATING WEIGHT OF 10,100 LBS.
3. (E) CONCRETE SUPPORT WALLS.
4. FOR BEAM LOCATION IN RELATION TO THE COOLING TOWER, REFERENCE MANUFACTURER'S DRAWINGS. FOR THE ELEVATION OF THE TOP OF STEEL, REFERENCE MECHANICAL ENGINEERS DRAWINGS. CONNECT BEAMS AT ENDS WITH (2) 3/4" x 6" EMBED EPOXY ANCHORS ON A BEAM GAGE OF 4". DRYPACK OR SHIMMING OF UP TO 4" ABOVE THE TOP OF THE EXISTING CONCRETE WALL IS ALLOWABLE.
5. CORING THROUGH EXISTING CONCRETE STAIR AND EXISTING BASEMENT WALL TO BE COORDINATED WITH STRUCTURAL ENGINEER OF RECORD THROUGH THE MECHANICAL ENGINEER. VERTICAL REINFORCING IN THE WALL SHALL NOT BE CUT AND CORES SHALL NOT EXCEED 16" IN DIAMETER.
6. EXISTING MECHANICAL EQUIPMENT AND ITS SUPPORTS/PADS TO REMAIN AS IS. COORDINATE LOCATION WITH MECHANICAL DRAWINGS.
7. CONCRETE EQUIPMENT PAD. COORDINATE SIZE AND LOCATION WITH MECHANICAL DRAWINGS. SEE DETAIL 101.
8. NEW MECHANICAL EQUIPMENT TO REST ON EXISTING CONCRETE SLAB. COORDINATE LOCATION WITH MECHANICAL DRAWINGS.
9. NEW PIPE SUPPORT. COORDINATE LOCATIONS AND CONSTRUCTION WITH MECHANICAL DRAWINGS.
10. SUSPEND PIPING FROM EXISTING STEEL FRAMING PER MECHANICAL ENGINEER'S SPECIFICATIONS.



1 **FOUNDATION PLAN**
SCALE: 1/8"=1'-0" 0 1' 4' 16' .5' 2' 8' NORTH

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Project Number: 121196

UNLESS THIS DRAWING IS SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER, IT IS A PRELIMINARY DESIGN AND SHALL NOT BE USED FOR CONSTRUCTION.

Canyon Del Oro High School
Main Central Plant
Canyon Del Oro High School
25 W Calle Concordia
Oro Valley, AZ 85704

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SEAL:
Registered Professional Engineer (Structural)
CERTIFICATE NO.
45715
DAVID N. GIBBENS
DATE SIGNED 11/29/21
ARIZONA U.S.A.
THIS ELECTRONIC SIGNATURE HAS BEEN AUTHORIZED BY ME THIS 29th DAY OF NOVEMBER 2021

KELLY WRIGHT & ASSOCIATES • PC
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KWA PROJECT NO:	21014
DATE:	NOV. 29, 2021
DRAWN BY:	RR
DESIGNED BY:	RR
CHECKED BY:	DG

REVISIONS:
1

SHEET CONTENTS:
FOUNDATION AND FRAMING PLANS

SHEET
S1.0
OF
CDO CENTRAL PLANT

MECHANICAL SYMBOLS AND ABBREVIATIONS

ABV	–	ABOVE
AFF	–	ABOVE FINISHED FLOOR
AHJ	–	AUTHORITY HAVING JURISDICTION
BFP	–	BACKFLOW PREVENTER
BLW	–	BELOW
CONN	–	CONNECTION
CONT	–	CONTINUATION
COORD	–	COORDINATE
DCW	–	DOMESTIC COLD WATER
DEMO	–	DEMOLITION / DEMOLISH
DN	–	DOWN
DOM	–	DOMESTIC
(E)	–	EXISTING
EPO	–	EMERGENCY POWER OFF
ETR	–	EXISTING TO REMAIN
EQUIP	–	EQUIPMENT
FD / FS	–	FLOOR DRAIN / FLOOR SINK
FLR	–	FLOOR
G.C.	–	GENERAL CONTRACTOR
GPM	–	GALLONS PER MINUTE
MIN	–	MINIMUM
OH	–	OVERHEAD
PL	–	PLACES
POC	–	POINT OF CONNECTION
POD	–	POINT OF DISCONNECTION
REF	–	REFERENCE
REQD	–	REQUIRED
SA	–	SUPPLY AIR
SFRO	–	SHOWN FOR REFERENCE ONLY
SIM	–	SIMILAR
SS	–	STAINLESS STEEL
TAB	–	TEST AND BALANCE
TRANS	–	TRANSITION
TYP	–	TYPICAL
VFD	–	VARIABLE FREQUENCY DRIVE
– – – – – – – – –	–	DEMO PIPING / DUCTWORK
— — — HWS/R — — —	–	(E) HEATING WATER SUPPLY & RETURN
— — — CHWS/R — — —	–	(E) CHILLED WATER SUPPLY & RETURN
— — — CWS/R — — —	–	(E) CONDENSER WATER SUPPLY & RETURN
——— CWS/R ———	–	CONDENSER WATER SUPPLY & RETURN
——— CHWS/R ———	–	CHILLED WATER SUPPLY & RETURN
———o———	–	DRAIN PIPING
———○	–	PIPE RISE
———◑	–	PIPE DROP
	–	BRANCH–BOTTOM CONNECTION
	–	PIPE CONTINUATION.
	–	CAP
	–	EXISTING VALVE
	–	SOV – ISOLATION BUTTERFLY VALVE
	–	SOV – ISOLATION BALL VALVE

SITE VISIT COORDINATION

ENGINEER WILL INSPECT WORK AT PROJECT MILESTONES DEFINED BELOW. CONTRACTOR SHALL INFORM ENGINEER A MINIMUM OF 2 WEEKS PRIOR TO EACH PROJECT MILESTONE BEING COMPLETE AND READY FOR INSPECTION. MILESTONES BELOW ARE FOR REFERENCE AND THE ORDER OF EVENTS IS THE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR MAY ONLY COMBINE MILESTONES INTO A SINGLE INSPECTION WITH PRIOR APPROVAL OF THE ENGINEER.

MILESTONES FOR THIS PROJECT:

1. INITIAL INSPECTION TO OBSERVE EXAMPLES OF ALL INSTALL DETAILS THAT ARE TYPICAL FOR THE PROJECT (PIPING, SUPPORTS, INSULATION, ETC); HVAC EQUIPMENT SET OR AT LEAST LOCATIONS FINALIZED FOR ENGINEER APPROVAL; EXAMPLES OF PIPING, PUMPS, PIPE INSULATION AND SUPPORT.
2. SUBSTANTIAL COMPLETION INCLUDING PIPING NEAR TOWERS AND CHILLERS TO CONFIRM CLEARANCES, INSULATION, CONTROLS DEVICES, ETC.
3. FINAL / BACKCHECK

SUBMITTALS

MULTIPLE SUBMITTALS ARE REQUIRED FOR THIS PROJECT. REFER TO SPECIFICATIONS. IN AN EFFORT TO PROVIDE A STREAMLINED PROCESS THE FOLLOWING IS REQUIRED:

1. CONTRACTOR TO CALL ENGINEER PRIOR TO CREATING THE FIRST SUBMITTAL PACKAGE. CONTACT MANNY AT 520–887–1919. INTENT IS TO DISCUSS ANY QUESTIONS ABOUT THE PROCESS, CONTENT AND FORMATTING REQUIREMENTS, SCHEDULE CONCERNS, PRODUCT SPECS, ETC.
2. SUBMIT ALL REQUIRED ITEMS IN ONE PACKAGE.
   - 2.1. INTENT IS TO PROVIDE ONE REVIEW OF ALL REQUIRED ITEMS THEN ONE SUBSEQUENT SUBMITTAL FOR ITEMS WHICH WERE NOT APPROVED.
   - 2.2. ONE PACKAGE FOR EACH DISCIPLINE IS ALLOWED. I.E. HVAC, PLUMBING, FIRE PROTECTION.
   - 2.3. CONTROLS MAY BE A SEPARATE SUBMITTAL PACKAGE.
   - 2.4. CLOSE OUT DOCUMENTS ARE A SEPARATE SUBMITTAL.
3. THE RESUBMITTAL PACKAGE MUST NOT INCLUDE ITEMS WHICH HAVE BEEN PREVIOUSLY APPROVED.
4. SUBMITTALS SHALL BE MOST CURRENT MANUFACTURER'S DATA.
5. PDFs SHOULD BE COMPRESSED TO MINIMIZE FILE SIZE.
6. DO NOT SUBMIT CATALOG DATA WHICH IS NOT SPECIFIC TO THE SUBMITTED ITEM OR DOES NOT CONTAIN ENGINEERING INFORMATION.

PIPE CLEANING AND WATER TREATMENT NOTES

GENERAL:

A. WATER TREATMENT PROVIDER MUST BE EXCLUSIVELY ENGAGED IN WATER TREATMENT OF SYSTEMS FOR THE PREVENTION OF SCALE, CORROSION AND BIOLOGICAL ACTIVITY. MINIMUM 3 YEARS EXPERIENCE IN ARIZONA WITH SIMILAR PROJECTS.

B. PRODUCTS MUST CONFORM TO ALL EPA, STATE, FEDERAL AND LOCAL DISCHARGE RESTRICTIONS.

C. INSOMUCH AS POSSIBLE, ISOLATE THE EXISTING PORTIONS OF THE SYSTEM NOT AFFECTED BY THIS PROJECT. MINIMIZE THE AMOUNT OF DRAIN AND FILL.

D. ENSURE EACH EXISTING OPEN AND CLOSED LOOP SYSTEM CHEMISTRY IS MAINTAINED THROUGHOUT CONSTRUCTION PERIOD.

E. ALL SYSTEMS SHALL BE CHEMICALLY TREATED AND PURGED OF AIR PRIOR TO VALVING–IN EQUIPMENT AND ANY EQUIPMENT START–UP.

F. WORK SEQUENCE:

F.1. FLUSHING AND CLEANING OF PIPE.
F.2. AFTER THE SUCCESSFUL COMPLETION OF THE FLUSHING, THE NEW PIPING SHALL BE PASSIVATED.
F.3. AFTER SUCCESSFUL PASSIVATION OF THE SYSTEM, SYSTEM SHALL BE FILLED, PURGED OF AIR, AND CHEMICALLY TREATED.

G. PRIOR TO DEMO, COORDINATE WITH THE CHEMTEX.

H. PROVIDE DOCUMENTATION VERIFYING THE COMPLETION OF THE CLEANING AND FLUSHING PROCESS. CERTIFICATION RECORDS COVERING THE CLEANING SHALL BE SUBMITTED TO THE GENERAL CONTRACTOR. RECORDS SHALL INCLUDE SYSTEM VOLUME, CLEANER CONCENTRATION, CIRCULATION TIME, AND FINAL CHEMICAL READING.

SYSTEM CLEANING:

1. ALL DEBRIS SHALL BE FLUSHED FROM THE SYSTEM. ALL DEAD LEGS, BOTTOM VALVE CONNECTIONS, ETC. SHALL BE THOROUGHLY FLUSHED TO REMOVE ACCUMULATED DEBRIS.
2. ADD APPROPRIATE MULTI–PURPOSE CLEANER AT THE DOSAGE RATE SPECIFIED BY THE MANUFACTURER. THE CHEMICAL TREATMENT CONTRACTOR SHALL VERIFY CLEANER STRENGTH.
3. WHEN CLEANING PERIOD IS COMPLETE, THE SYSTEM SHALL BE DRAINED AND FLUSHED WITH FRESH WATER TO REMOVE THE CLEANING SOLUTION. FLUSHING SHALL CONTINUE UNTIL THE CLEANER CHEMICAL CONTENT OF THE SYSTEM WATER IS AT THE MANUFACTURER'S LOWER LIMIT, INDICATING IT IS SAFE TO ADD CHEMICALS.

SYSTEM CHEMICAL WATER TREATMENT:

1. IT IS ASSUMED THAT THE EXISTING WATER TREATMENT EQUIPMENT WILL REMAIN AND BE RE–USED TO TREAT THE CONDENSER WATER AND CHILLED WATER LOOP.
2. SYSTEM SHALL BE CUSTOM–DESIGNED FOR THIS PROJECT TO PROVIDE CORROSION & SCALE PROTECTION AND CONTROL OF MICROBIOLOGICAL GROWTH AND SUSPENDED SOLIDS, MINIMIZE WATER CONSUMPTION. ENSURE WATER CHEMISTRY COMPLIES EQUIPMENT MANUFACTURER GUIDELINES. DOCUMENT IN CLOSE–OUT SUBMITTALS.
3. VERIFY EXISTING HYDRONIC WATER SYSTEM CHEMICAL BALANCE PRIOR TO WORK AND REPLENISH CHEMICALS AS REQUIRED TO TREAT ANY ADDED WATER – RETURN SYSTEM TO EXISTING CHEMICAL BALANCE SETTINGS PRIOR TO START–UP.
4. PASSIVATION:
   - 4.1. VALVE OFF & BYPASS ALL EQUIPMENT TO PREVENT CONTAMINATION FROM DEBRIS THAT MAY BE PRESENT IN THE PIPING.
   - 4.2. ALL DEBRIS SHALL BE FLUSHED FROM THE SYSTEM AND ALL STRAINERS CLEANED.
   - 4.3. NEW PIPING SHALL BE PASSIVIZED (CLEANED AND SURFACES TREATED VIA FILM FORMATION) PRIOR TO FINAL FILL AND CHEMICAL TREATMENT. CONDITION PIPING SYSTEM BY ADDING APPROPRIATE CLEANING AND PASSIVATING CHEMICALS TO REMOVE OILS IN PIPING AND FORM A FILM ON THE PIPING.
   - 4.4. WHEN PASSIVATION PERIOD IS COMPLETE, THE SYSTEM SHALL BE DRAINED AND FLUSHED WITH FRESH WATER TO REMOVE THE CLEANING SOLUTION. FLUSHING SHALL CONTINUE UNTIL THE CLEANER CHEMICAL CONTENT OF THE SYSTEM WATER IS AT THE MANUFACTURER'S LOWER LIMIT, INDICATING IT IS SAFE TO ADD CHEMICALS.
   - 4.5. ALL STRAINERS, DEAD LEGS, AND AREAS OF LOW FLOW SHALL BE THOROUGHLY FLUSHED TO REMOVE ACCUMULATED DEBRIS.
   - 4.6. INSTALL FINAL STRAINER BASKETS IF TEMPORARY BASKETS WERE USED.
   - 4.7. AFTER THE SUCCESSFUL COMPLETION OF THE FINAL FLUSHING, THE SYSTEM SHALL BE FILLED WITH CLEAN POTABLE WATER, PURGED OF AIR, AND CHEMICALLY TREATED.
   - 4.8. PROVIDE CERTIFICATION RECORDS DOCUMENTING THE PASSIVATION, FLUSHING AND CHEMICAL TREATMENT PROCEDURES. RECORDS SHALL DATES, PERSONNEL WHO PERFORMED THE WORK, FINAL CHEMICAL BALANCE AND ANY TECHNICIAN'S OBSERVATIONS.

PROJECT MECHANICAL COMMISSIONING NOTES

THIS PROJECT IS REQUIRED TO BE COMMISSIONED BY A REGISTERED DESIGN PROFESSIONAL IN ACCORDANCE WITH THE REQUIREMENTS OUTLINED IN SECTION C408 OF THE 2018 IECC. THE COMMISSIONING AGENT IS REFERRED TO AS CxA. EQUIPMENT SHALL BE TESTED TO CONFIRM ALL CONTROLS AND SEQUENCES WORKING AS INTENDED. MULTIPLE CONSTRUCTION TEAM MEMBERS AND OWNER STAFF WILL BE REQUIRED TO PARTICIPATE IN THE Cx PROCESS.

COMMISSIONING PROCESS OVERVIEW:

1. THE CxA WILL PROVIDE A Cx PLAN AFTER PROJECT CONSTRUCTION AWARD. THE Cx PLAN WILL DOCUMENT THE Cx ACTIVITIES INCLUDING DETAILS ON WHICH EQUIPMENT WILL BE TESTED AND FOR WHAT IN WHICH MODES, ETC.
   - 1.1. IN GENERAL ALL HVAC EQUIPMENT WHICH IS PART OF THIS PROJECT IS EXPECTED TO BE TESTED TO PROVE ALL SEQUENCE OF OPERATIONS FUNCTION AS INTENDED.
2. TEAM MEETING WITH CONTRACTORS, OWNER REPRESENTATIVE(S) AND CxA.
3. TEAM SCHEDULING
4. CONTRACTOR START UP
5. Cx WEB MEETING TO REVIEW SEQUENCE OF OPERATIONS
6. CONTRACTOR VERIFICATION OF FUNCTIONAL PERFORMANCE TESTING (FPT) READINESS
7. TAB & Cx REVIEW OF TAB REPORT
8. Cx FUNCTIONAL PERFORMANCE TESTING (FPT)
   - 8.1. A MAXIMUM OF TWO FPT EFFORTS WILL BE PROVIDED BY THE CxA AT NO ADDITIONAL CHARGE. ADDITIONAL FPT AS A RESULT OF THE CONTRACTOR'S LACK OF READINESS WILL BE BILLED TO THE CONTRACTOR.
9. CxA REVIEW PROPOSED TRAINING PLAN AND ACCEPT PRIOR TO ANY INSTRUCTION.
10. FINAL REPORT

CONTRACTOR RESPONSIBILITIES ARE HIGHLIGHTED IN THE FOLLOWING TABLE.

TRAINING:
TRAINING IS REQUIRED AS PART OF THE Cx PROCESS. CONTRACTOR IS RESPONSIBLE FOR CREATING THE TRAINING PLAN, SUBMITTING IT FOR APPROVAL, SCHEDULING WITH THE OWNER, AND PROVIDING TRAINING. TRAINING SHALL COVER ALL MECHANICAL AND CONTROLS AND INCLUDE, AT A MINIMUM: OVERVIEW, MAINTENANCE, TROUBLESHOOTING & DIAGNOSTICS. SUBMIT TRAINING REPORTS AND RECORDS TO SHOW THAT TRAINING WAS CONDUCTED.

Cx RESPONSIBILITIES MATRIX

TEAM MEMBER	GENERAL DESCRIPTION OF TASKS
GENERAL / PROJECT MANAGER / SUPERINTENDENT	• ENSURES ACCESS TO AREAS OF WORK • COORDINATES CONSTRUCTION TEAM SCHEDULES AND ATTENDANCE • ENSURE FPT PREP IS COMPLETE PRIOR TO CxA FPT ACTIVITY • OWNER TRAINING OVERSIGHT AND DOCUMENTATION
CONTROLS	• VERIFY UNDERSTANDING OF SEQUENCE OF OPS WITH CxA PRIOR TO FINAL PROGRAMMING • ENSURES PRE–FTP REQUIREMENTS ARE MET • PARTICIPATE IN FTP • PROVIDES OWNER TRAINING. • MODIFY PROGRAMMING AND/OR INSTALLATION TO CORRECT DEFICIENCIES • COORDINATE WITH EQUIPMENT FACTORY INSTALLED CONTROLS
MECHANICAL	• OPENS EQUIPMENT. • MAKE CORRECTIONS ASSOCIATED WITH NON–CONTROL ITEMS. • PROVIDES OWNER TRAINING • ENSURES PRE–FTP REQUIREMENTS ARE MET
ELECTRICAL	ENSURE POWER AND CONDUIT INSTALL IS COMPLETE PRIOR TO START–UP.
MANUFACTURER'S REPRESENTATIVE	• ASSISTS CONTROLS CONTRACTOR TO ACHIEVE SEQUENCE OF OPERATIONS WHERE EQUIPMENT HAS FACTORY CONTROLS. • ASSIST WITH OWNER TRAINING MATERIALS AND/OR PRESENTATION
OWNER	• REVIEW Cx PLAN PRIOR TO Cx PLAN BEING ISSUED TO CONSTRUCTION TEAM • APPROVE OWNER TRAINING PLAN ALONG WITH CxA • SCHEDULE OWNER TRAINING • ACCEPT FINAL REPORT

Replace Tower & Modify Piping - Main Central Plant

Canyon Del Oro High School
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Oro Valley, AZ 85704

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Registered Professional Engineer (Mechanical) CERTIFICATE NO. 35960 DONOVAN F. KELLY DATE SIGNED DEC 2021 ARIZONA U.S.A.

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KWA PROJECT NO: 21014
DATE: December 1, 2021
DRAWN BY: MB
DESIGNED BY: MB
CHECKED BY: DFK

REVISIONS:

1

SHEET CONTENTS:

MECHANICAL NOTES AND LEGEND

SHEET

M0.1

2 OF 12

CDO CENTRAL PLANT

MECHANICAL SPECIFICATIONS

1. ALL WORK SHALL BE INSTALLED IN ACCORDANCE WITH ALL CODES, LAWS, RULES, AND REGULATIONS OF ALL NATIONAL, COUNTY, STATE AND LOCAL AUTHORITIES HAVING JURISDICTION OVER THE PREMISES. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO THE 2018 INTERNATIONAL CODES (ICC), "COPPER PIPE INSTALLATION STANDARDS", NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARDS. IN CASE OF DIFFERENCES, THE MOST STRINGENT SHALL GOVERN. HOWEVER, THIS SHALL NOT BE CONSTRUED TO RELIEVE THIS CONTRACTOR FROM COMPLYING WITH REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS WHICH MAY BE IN EXCESS OF CODE REQUIREMENTS.
2. EXISTING CONDITIONS SHOWN ARE BASED ON LIMITED OBSERVATIONS AND EXISTING DRAWINGS. THIS INFORMATION IS SHOWN FOR REFERENCE ONLY. EXISTING CONDITIONS HAVE NOT BEEN THOROUGHLY VERIFIED. PRIOR TO ANY WORK, FIELD VERIFY ALL EXISTING CONDITIONS. INCLUDING BUT NOT LIMITED TO: SIZES & LOCATIONS OF ALL EQUIPMENT, UTILITIES, PIPING, DUCTWORK, CONTROLS. FIELD VERIFY ALL STRUCTURAL, ARCHITECTURAL, AND SPATIAL CONDITIONS. DOCUMENT ANY FOUND CONFLICTS TO THE ENGINEER IN WRITING.
   2.1. FLOOR PLANS PROVIDED BY THE OWNER AND HAVE NOT BEEN VERIFIED FOR DIMENSIONAL ACCURACY.
3. ALL ITEMS SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S INSTALLATION REQUIREMENTS. INSTALL ITEMS PLUMB, LEVEL, SQUARE, AND FREE FROM WARP AND TWIST. MAINTAIN DIMENSIONAL TOLERANCES AND ALIGNMENT WITH SURROUNDING CONSTRUCTION AND ADJACENT SURFACES.
4. ASBESTOS CONTAINING BUILDING MATERIAL (ACBM) SHALL NOT BE USED.
5. ANY PRODUCT, PIPE, EQUIPMENT, ETC. DESIGNED FOR OR INTENDED TO HAVE CONTACT WITH POTABLE WATER SHALL BE COMPLIANT WITH NSF-61-G AND NSF-372 (LEAD FREE REQUIREMENTS) VIA THIRD-PARTY TESTING AND CERTIFICATION.
6. THE DRAWINGS ARE DIAGRAMMATIC AND ARE INTENDED TO SHOW THE APPROXIMATE LOCATION OF OUTLETS, FIXTURES, DUCTWORK, CONTROL DEVICES, EQUIPMENT AND PIPING. FINAL CONNECTION LOCATIONS SHALL BE COORDINATED WITH ACTUAL FIELD CONDITIONS.
7. NOT ALL DISCIPLINES TO BE INSTALLED IN THE BUILDING HAVE BEEN DEPICTED WITH SPECIFIC LOCATION OR ELEVATION INFORMATION IN THE CONSTRUCTION DOCUMENTS AND THEREFORE COORDINATION WITH ALL THE TRADES WILL BE NECESSARY AND IS REQUIRED.
8. PROVIDE MATERIALS, CONNECTORS, FITTINGS, ETCETERA, SPECIFICALLY MENTIONED OR NOT, AS REQUIRED TO RENDER A COMPLETE INSTALLATION. TRANSITION TO EXISTING AS REQUIRED. UTILIZE MATERIALS COMPATIBLE WITH EXISTING.
9. THE CONTRACTOR IS RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, SAFETY PRECAUTIONS AND PROCEDURES.
10. FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT, FEES, PERMITS, CERTIFICATES OF INSPECTION, ETC., NECESSARY OR REASONABLE, REQUIRED FOR THE COMPLETE INSTALLATION OF ALL WORK. NOTE THAT THE DISTRICT WILL PAY FOR SPECIAL INSPECTIONS NOTED ON THE STRUCTURAL DRAWINGS. COORDINATE COSTS WITH THE OWNER.
11. PRIOR TO ANY WORK, EXAMINE THE PREMISES AND EXISTING CONDITIONS. DETERMINE, IN ADVANCE, THE METHODS OF INSTALLING AND CONNECTING THE APPARATUS AND BE FULLY INFORMED AS TO THE SCOPE OF WORK. COORDINATE WITH OTHER DISCIPLINES AS REQUIRED INCLUDING, BUT NOT LIMITED TO:
   11.1. VERIFY MEANS AND METHODS OF INSTALLING ALL NEW WORK.
   11.2. ENSURE ADEQUATE SPACE IS PROVIDED FOR ROUTINE MAINTENANCE & ALL REQUIRED CLEARANCES.
   11.3. COORDINATE LOCATIONS OF ACCESS TO OVERHEAD EQUIPMENT WITH FIXED BUILDING AND FURNITURE ITEMS THAT MAY PREVENT SET UP OF A LADDER.
   11.4. COORDINATE ALL UNIT LOCATIONS, DUCT & PIPE ROUTING WITH STRUCTURE & WORK OF OTHER TRADES.
   11.5. COORDINATE WITH STRUCTURAL, THE LOCATIONS AND WEIGHTS OF ALL EQUIPMENT.
   11.6. COORDINATE THE POWER REQUIREMENTS OF ALL EQUIPMENT WITH ELECTRICAL.
   11.7. COORDINATE LOCATIONS OF ALL WALL MOUNTED MECHANICAL ITEMS (INCLUDING BUT NOT LIMITED WALL SENSORS AND THERMOSTATS) WITH WALL FINISHES AND FURNITURE.
   11.8. IF CONFLICTS ARE FOUND, THE CONTRACTOR SHALL NOTIFY THE ENGINEER, IN WRITING
12. UTILIZE MACHINE SAW CUTTING FOR CUTTING OF CONCRETE AND MASONRY.
13. REPAIR AREAS DAMAGED OR AFFECTED BY THIS SCOPE OF WORK. RESTORE ALL AREAS TO THE ORIGINAL CONDITION.
   13.1. SLOPE REPAIRED AREAS TO ENSURE POSITIVE DRAINAGE TO EXISTING DRAINAGE POINTS.
14. STORE MATERIALS PER MANUFACTURER'S REQUIREMENTS. AT A MINIMUM PRODUCTS SHALL BE STORED ON A SOLID, LEVEL AND FLAT AREA, WELL SUPPORTED ABOVE GRADE AND PROTECTED FROM SUNLIGHT AND ENTRY OF DEBRIS.
15. CONNECTIONS TO UTILITIES SHALL BE MADE WITH MINIMAL SHUT-DOWN TIME. SCHEDULE ALL SHUT-DOWNS WITH OWNER.
16. THE SYSTEMS IN THIS CONSTRUCTION DOCUMENT HAVE BEEN DESIGNED AROUND THE MAKES AND SIZES OF THE PRODUCTS NAMED ON THE DRAWINGS OR ELSEWHERE IN THE SPECIFICATIONS. OTHER MAKES OF PRODUCTS NAMED IN THE SPECIFICATIONS, SHOWN ON THE DRAWINGS, OR APPROVED BY THE OWNER, MAY BE FURNISHED AT THE CONTRACTOR'S OPTION. ALTERNATE EQUIPMENT FURNISHED MUST HAVE EQUIVALENT CAPACITY, THE SAME ELECTRICAL CHARACTERISTICS, SUBSTANTIALLY THE SAME PHYSICAL DIMENSIONS, AND CAN BE INSTALLED IN THE SPACE AVAILABLE WITH AMPLE WORKING SPACE AROUND IT. ANY EXTRA COSTS (INCLUDING BUT NOT LIMITED TO DESIGN FEES) RESULTING FROM PRODUCT SUBSTITUTION SHALL BE PAID BY THE CONTRACTOR – AT NO COST TO THE OWNER. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ANY NECESSARY CHANGES/FIELD MODIFICATIONS AS A RESULT OF SUBSTITUTION OF SPECIFIED EQUIPMENT OR MATERIALS.
17. PRIOR APPROVALS. PRIOR TO THE END OF THE PRIOR APPROVAL PERIOD DURING THE BIDDING PHASE, PRIOR APPROVALS MAY BE SUBMITTED. PRIOR APPROVALS SHALL BE SUBMITTED NO LATER THAN 10 DAYS (UNLESS A LONGER PERIOD IS STATED IN THE IFB DOCUMENTS) PRIOR TO THE BID DATE. SUBMITTALS RECEIVED AFTER THE DEADLINE MAY NOT BE REVIEWED. PRIOR APPROVAL ITEMS INCLUDE: PRODUCT, MATERIAL, SYSTEM, PIECE OF EQUIPMENT, OR SERVICE FROM A SOURCE DIFFERENT FROM THOSE SOURCES IDENTIFIED IN THE CONSTRUCTION DOCUMENTS. THE APPLICATION FOR APPROVAL OF A PROPOSED SOURCE MUST BE ACCOMPANIED BY TECHNICAL DATA WHICH THE APPLICANT DESIRES TO SUBMIT IN SUPPORT OF THE APPLICATION.
   17.1. ALTERNATE SELECTIONS SHALL MEET OR EXCEED CRITERIA DEFINED IN THE CONSTRUCTION DOCUMENTS AND BID DOCUMENTS. SEE PLANS
   17.2. THE APPLICATION FOR APPROVAL OF A PROPOSED SOURCE MUST BE ACCOMPANIED BY A SCHEDULE OR OTHER MEANS TO CLEARLY DEFINE ANY DIFFERENCES, DEFICIENCIES, OR BENEFITS THE SUBMITTED ITEM FOR CONSIDERATION DIFFER FROM THE REQUIREMENTS DEFINED IN THE CONSTRUCTION DOCUMENTS AND/OR BID DOCUMENTS. IT IS THE RESPONSIBILITY OF THE SUBMITTER TO ILLUSTRATE ALL DIFFERENCES. SUBMITTALS WITH INSUFFICIENT INFORMATION TO PROVIDE COMPARISON MAY BE RETURNED WITHOUT REVIEW. THE BURDEN OF PROOF OF THE MERIT OF THE PROPOSED SUBSTITUTION IS UPON THE PROPOSER.
   17.3. APPROVAL, IF GRANTED, SHALL NOT BE EFFECTIVE UNTIL PUBLISHED IN AN ADDENDUM TO THE BID DOCUMENTS.
18. SUBMITTALS: DESIGN BASED ON MANUFACTURERS LISTED IN SCHEDULES. PROVIDE SCHEDULED MAKE AND MODEL OR APPROVED EQUIVALENT. SUBMITTALS SHALL BE ELECTRONIC AND FREE OF VIRUSES. SUBMIT FOR APPROVAL COPIES OF SHOP DRAWINGS AND/OR CURRENT MANUFACTURER'S LITERATURE TO ILLUSTRATE COMPLIANCE WITH THE SPECIFICATIONS. EACH SUBMITTAL SHALL INCLUDE ANNOTATIONS BY THE CONTRACTOR TO TAG EACH ITEM TO MATCH THE DRAWINGS AND HIGHLIGHT WHICH SPECIFIC ITEMS / FEATURES ARE BEING SUBMITTED. PDFs SHALL BE CLEAR AND MINIMAL IN FILE SIZE. DO NOT SUBMIT THE ENTIRE CATALOG – ONLY RELEVANT INFORMATION SHALL BE SUBMITTED. <u>SUBMIT ALL PRODUCT DATA IN ONE SUBMITTAL</u> – DO NOT SUBMIT IN BATCHES. ONLY 2 SUBMITTAL REVIEWS WILL BE PROVIDED AT NO ADDITIONAL COST TO THE CONTRACTOR. CONTRACTOR WILL BE INVOICED FOR ADDITIONAL REVIEWS. PROVIDE SUBMITTALS FOR REVIEW ON THE FOLLOWING PRIOR TO ANY WORK:
   18.1. PRE-DEMO WATER CHEMISTRY TESTING REPORT – SUBMIT REPORT AT TIME OF TESTING AND INCLUDE COPY IN O&M BINDER.
   18.2. EQUIPMENT WITH OPTIONS & ACCESSORIES
   18.3. PLUMBING FIXTURES AND EQUIPMENT
   18.4. PIPING, FITTINGS AND JOINING METHODS.
   18.5. VALVES AND ACTUATORS
   18.6. INSULATION AND JACKETING, INCLUDING NARRATIVE CONFIRMING SCOPE
   18.7. PIPING ACCESSORIES SUCH AS STRAINIERS, FLEX CONNECTORS, METERS, BACKFLOW, GAUGES, THERMOMETERS, ETC. PROVIDE PROJECT-SPECIFIC DETAILED ASSEMBLY SCHEMATICS FOR GROOVED COUPLING TYPE FLEX CONNECTORS.
   18.8. IDENTIFICATION PRODUCTS, INCLUDING NARRATIVE CONFIRMING SCOPE FOR BOTH PAINTING AND IDENTIFICATION
   18.9. TAB CONTRACTOR CREDENTIALS & SCOPE OF WORK
   18.10. CONTROLS SCHEMATICS, DATA SHEETS, ETC. – REFER TO CONTROLS DRAWING
   18.11. SUBMIT CLOSE-OUT DOCUMENTS PER THE CLOSE OUT PARAGRAPH OF THESE SPECIFICATIONS
19. <u>PIPING:</u>
   19.1. PIPING SHALL BE DOMESTIC OR CERTIFIED BUY AMERICA OR BUY AMERICAN COMPLIANT.
   19.2. VALVES AND UNIONS SHALL BE NO SMALLER THAN LINE-SIZES SHOWN ON PLANS UNLESS SPECIFICALLY NOTED OTHERWISE.
   19.3. HVAC DRAIN PIPING: TYPE 'DWV' OR MINIMUM TYPE 'M' WALL THICKNESS COPPER.
      19.3.1. PROVIDE THREADED TEES WITH REMOVABLE PLUGS AT CHANGES IN DIRECTION FOR CLEAN-OUTS. LOCATE IN ACCESSIBLE LOCATIONS. MALE THREADS ON PLUGS SHALL BE WRAPPED WITH TEFLON TAPE PRIOR TO THREADING INTO TEES.
      19.3.2. SLOPE AT A MINIMUM 1/8" PER FOOT SLOPE TO APPROVED DRAINAGE LOCATION.
      19.3.3. DRAIN PIPING TERMINATING OVER PLUMBING FIXTURES (FLOOR DRAINS, ETC.) SHALL DO SO WITH AN AIR GAP OF NOT LESS THAN 2X THE DIAMETER OF THE DRAIN PIPE. ENSURE GRATES HAVE ADEQUATE OPEN AREA TO PREVENT SPLASHING
   19.4. GAS PIPING: SHALL BE SCHEDULE 40 BLACK STEEL. JOINTS SHALL BE THREADED. REFER TO "METAL PIPING JOINTS" SECTION.
      19.4.1. THREAD / JOINT COMPOUND SHALL COMPLY WITH CGA STANDARDS FOR FUEL GAS PIPING.
      19.4.2. PROVIDE LISTED SHUT-OFF VALVE, UNION AND MINIMUM 4" DIRT LEG UPSTREAM OF EACH APPLIANCE CONNECTION.
      19.4.3. FLEX HOSE CONNECTIONS TO STATIONARY APPLIANCES ARE NOT ALLOWED. TRANSITION TO APPLIANCE CONNECTION SIZE AFTER VALVE, UNION AND DIRTLEG.
      19.4.4. COORDINATE ALL WORK AND CHANGES IN TOTAL LOAD WITH SW GAS CORP.
20. HYDRONIC (CHILLED AND CONDENSER WATER) PIPING: ASTM A53 TYPE E OR S, GRADE B SCHEDULE 40 BLACK STEEL (2–18"). PIPE AND FITTINGS SHALL BE SUITABLE FOR WELDING, THREADING AND/OR GROOVING AS SPECIFIED.
      20.0.1. CONDENSER WATER PIPING SHALL BE WELDED. INTERIOR CONDENSER WATER PIPING MAY BE GROOVED.
      20.0.2. CHILLED WATER PIPING SHALL BE WELDED OR GROOVED.
      20.0.3. ALL ELBOWS SHALL BE LONG RADIUS TYPE.
      20.0.4. INSTALL PIPING AT A UNIFORM GRADE TO DRAINAGE POINTS AND HIGH POINT AIR VENTS.
      20.0.5. PROVIDE FITTINGS, ADAPTERS, VALVES, ETC. AS REQUIRED TO RENDER A COMPLETE AND FULLY FUNCTIONAL SYSTEM. THIS INCLUDES TEMPORARY CONNECTIONS THAT MAY BE REQUIRED TO ENSURE MINIMAL DOWN-TIME.
      20.0.6. ALL ELBOWS SHALL BE LONG RADIUS TYPE.
      20.0.7. INSTALL PIPING AT A UNIFORM GRADE TO DRAINAGE POINTS AND HIGH POINT AIR VENTS
      20.0.8. PROVIDE FITTINGS, ADAPTERS, VALVES, ETC. AS REQUIRED TO RENDER A COMPLETE AND FULLY FUNCTIONAL SYSTEM. THIS INCLUDES TEMPORARY CONNECTIONS THAT MAY BE REQUIRED TO ENSURE MINIMAL DOWN-TIME.
   20.1. DOMESTIC WATER PIPING: ABOVE GROUND WATER PIPING SHALL BE TYPE 'L' COPPER WITH WROUGHT COPPER FITTINGS.
   20.2. METAL PIPING JOINTS
      20.2.1. <u>THREADED</u>: PIPE THREADS SHALL CONFORM TO ASTM B16.3. THREAD TAPE, JOINT COMPOUND, ETC. SHALL BE APPLIED TO MALE THREADS AND COMPATIBLE WITH FLUID CONVEYED, OPERATING TEMPERATURES, & INSTALL CONDITIONS.
      20.2.2. <u>GROOVED (INTERIOR)</u>: PROVIDE FLEXIBLE OR RIGID TYPE COUPLINGS AS REQUIRED TO SUIT EACH APPLICATION AND TO COMPLY WITH COUPLING MANUFACTURER'S REQUIREMENTS. PROVIDE MANUFACTURER'S FITTINGS AND GASKETS APPROPRIATE FOR THE APPLICATION. SYSTEM SHALL BE VICTAULIC, GRUVLOK OR APPROVED EQUIVALENT. VICTAULIC "QUICKVIC" OR GRUVLOK "SLIDE LOK" PRE-LUBRICATED TYPE ARE PREFERRED WHERE SUITABLE TO THE APPLICATION. GASKET LUBRICANT SHALL BE EQUIVALENT TO GRUVLOK "XTREME" WATERPROOF SILICONE BASED, -65°F TO 400°F.
      20.2.3. <u>STEEL, WELDED:</u> PROVIDE A MINIMUM OF THREE PASSES ON WELD JOINTS (ROOT, FILLER, CAP). WELDING SHALL BE PERFORMED BY WELDERS CERTIFIED IN THE STATE OF ARIZONA. WELDERS MUST HAVE PROOF OF CERTIFICATION IN THEIR POSSESSION.
      20.2.4. <u>COPPER SOLDER & BRAZE</u>: COPPER PIPING JOINTS IN PIPING UP TO AND INCLUDING 2" SHALL BE SOLDERED USING ASTM B813 WATER FLUSHABLE LEAD FREE FLUX, LEAD FREE 6% SILVER SOLDER, AND ASTM B828 PROCEDURE. JOINTS IN PIPING 2-1/2" AND LARGER SHALL BE BRAZED WITH LEAD FREE 15% SILVER SOLDER AND COMPLY WITH CODE REQUIREMENTS AND COPPER PIPE STANDARDS.
      20.2.5. <u>COPPER PRESS</u>: EQUIVALENT TO NIBCO PRESS SYSTEM: WROT COPPER PRESS FITTINGS SHALL BE MADE FROM COMMERCIALLY PURE COPPER MILL PRODUCTS PER ASTM B 75 ALLOY C12200. CAST COPPER ALLOY PRESS FITTINGS SHALL BE MADE FROM MATERIALS WITH A MINIMUM OF 78% COPPER AND A MAXIMUM OF 15% ZINC. THE PRESS FITTINGS CONNECTIONS SHALL BE COMPATIBLE WITH SEAMLESS K, L OR M COPPER TUBE MADE TO ASTM B 88. FITTINGS SHALL HAVE A MAXIMUM NON-SHOCK WORKING PRESSURE OF 200 PSI BETWEEN THE TEMPERATURES OF -20°F AND +250°F. ELASTOMERIC SEALS SHALL BE MADE OF EPDM MATERIAL, AND THE FITTINGS SHALL BE MANUFACTURED WITH AN INBOARD BEAD DESIGN. PRESS FITTINGS SHALL HAVE AN O-RING LEAK DETECTION FEATURE. NIBCO PRESS FITTINGS MEET ALL PERFORMANCE REQUIREMENTS OF ASME B16.22 AND B16.18. ALL FITTINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND ACCORDING TO LOCAL PLUMBING AND MECHANICAL CODES. THE PRESS-TO-CONNECT JOINT SHALL BE MADE WITH PRESSING TOOLS AND JAW SETS RECOMMENDED AND AUTHORIZED BY NIBCO. ALL FITTINGS, VALVES AND TOOLS SHALL BE PROVIDED BY SAME MANUFACTURER.
   20.3. COPPER PIPING INSTALLATION SHALL COMPLY WITH COPPER PIPE STANDARDS (COPPER.ORG).
   20.4. PROVIDE UNIONS FOR EACH THREADED VALVE AND AT ALL CONNECTIONS TO EQUIPMENT, APPLIANCES, ETC.
      20.4.1. PROVIDE DIELECTRIC UNIONS OR FLANGES WHERE JOINING DISSIMILAR METALS. PROVIDE ACCESS TO ALL UNIONS.
   20.5. PIPING SHALL NOT BE EMBEDDED IN CONCRETE OR MASONRY CONSTRUCTION.
   20.6. UN-INSULATED COPPER TUBING & PIPING SHALL BE ISOLATED FROM CONTACT WITH STEEL CLAMPS AND HANGERS, CONCRETE, MASONRY, ETC. THROUGH USE OF HALF-LAPPED 10 MIL. TAPE, FACTORY PLASTIC HANGER INSERTS, OR 20 MIL PLASTIC SLEEVE. NOTE THAT COPPER-PLATED SUPPORTS SHALL NOT BE CONSIDERED AS APPROVED SUBSTITUTES FOR TAPE, INSERTS OR SLEEVE TYPE ISOLATION.
21. <u>VALVES:</u> UNLESS NOTED OTHERWISE, VALVES 2" AND SMALLER SHALL BE BALL VALVES. VALVES 2-1/2" AND LARGER SHALL BE BUTTERFLY TYPE.
   21.1. APPROVED BALL VALVE MANUFACTURERS: APOLLO/CONBRACO, JOMAR, NIBCO OR APPROVED EQUIVALENT.
   21.2. APPROVED BUTTERFLY VALVE MANUFACTURERS: APOLLO/CONBRACO, CENTERLINE, JOMAR, MILWAUKEE, NIBCO, NORRIS, VICTAULIC "761 VIC-300 MASTERSEAL", OR APPROVED EQUIVALENT.
   21.3. VALVES SHALL HAVE A 5 YEAR MANUFACTURER'S WARRANTY.
   21.4. BRONZE VALVES SHALL BE CONSTRUCTED OF DEZINCIFICATION RESISTANT BRONZE.
   21.5. SOLDER, FLUX MATERIALS AND INSTALLATION METHOD SHALL BE COMPATIBLE WITH THE VALVE PER MANUFACTURER'S RECOMMENDATIONS.
   21.6. VALVES SHALL UTILIZE COMPONENTS COMPATIBLE WITH AND LISTED FOR THE FLUIDS BEING CONVEYED.
   21.7. VALVES, UNIONS, ETC. SHALL BE NO SMALLER THAN LINE SIZE UNLESS SPECIFICALLY NOTED OTHERWISE.
   21.8. VALVES INSTALLED IN INSULATED PIPING SHALL BE COMPLETE WITH EXTENDED NECKS TO ALLOW HANDLE TO CLEAR PIPE INSULATION.
   21.9. INSTALL BALL VALVES WITH STEMS IN VERTICAL UPRIGHT POSITION. WHERE FIELD CONDITIONS DICTATE AN ALTERNATE POSITION, DO NOT GO BELOW HORIZONTAL WITH VALVE STEM.
   21.10. INSTALL BUTTERFLY VALVES WITH HANDLE AT 3-O'CLOCK OR 9'-O'CLOCK POSITION IF POSSIBLE.
   21.11. PROVIDE THREADED VALVES WITH A DOWNSTREAM UNION FOR SERVICE OR FLANGED OR 3-PIECE VALVE.
   21.12. <u>CHECK VALVES</u>: DEZINCIFICATION RESISTANT BRONZE, STAINLESS STEEL, OR BRONZE FITTED CAST IRON, BOLTED BONNET, 175 PSI WORKING PRESSURE, 250°F OPERATING TEMPERATURE, BRONZE SEAT & DISC. SWING, GLOBE OR WAFER STYLE AS REQUIRED FOR THE APPLICATION.
   21.13. <u>BALL VALVES</u> SHALL BE TWO PIECE, FULL PORT ON ALL SIZES, BRONZE BALL VALVES WITH CHROME PLATED BALL, THREADED ENDS, 600 PSI COLD NON-SHOCK RATED, ASTM B-61 AND MSS SP-110 COMPLIANT.
   21.14. <u>BUTTERFLY VALVE OPERATORS</u>: PROVIDE MINIMUM 10-POSITION LOCKABLE LEVER HANDLE TYPE HANDLE FOR VALVES UP TO 6". ALL SIZES OF VALVES LOCATED HIGHER THAN 6 FEET ABOVE GROUND / STANDING LEVEL SHALL HAVE GEAR OPERATORS WITH CHAIN.
   21.15. <u>BUTTERFLY VALVES</u> 200 PSI, SHALL BE LUG STYLE OR GROOVED ENDS, EPOXY OR ALKYD ENAMEL COATED ASTM A536 DUCTILE IRON BODY WITH MOLDED IN SEAT, ALUMINUM BRONZE OR STAINLESS STEEL DISK, STAINLESS STEEL STEM. SEATS AND SEALS: <u>CONDENSER WATER = NITRILE, AKA: BUNA-N OR NBR (10°F-150°F)</u>.
   21.16. <u>DRAIN VALVES</u>: FULL PORT BALL WITH HOSE THREAD END WITH CAP AND CHAIN EQUAL TO APOLLO MODEL 70-104-HC. PROVIDE AT HYDRONIC SYSTEM LOW POINTS AND WHERE INDICATED ON DRAWINGS.
   21.17. 3-WAY VALVES: PAIR OF BUTTERFLY VALVES WITH COMMONE LINKAGE AND CONNECTING TEE. VALVES SHALL COMPLY WITH BUTTERFLY VALVE SPECIFICATIONS HEREIN.
   21.18. <u>ACTUATORS, VALVE, OUTDOORS:</u> SHALL BE 120V ELECTRICALLY DRIVEN AND CONTROLLED BY THE EMCS. COORDINATE WITH CONTROLS CONTRACTOR AND EXISTING ELECTRICAL CONDITIONS. ACTUATORS SHALL BE SELECTED WITH APPROPRIATE TORQUE AS REQUIRED FOR EACH INSTALLATION CONDITION. OBTAIN SELECTIONS FROM VALVE MANUFACTURER. ACTUATORS SHALL BE COMPLETE WITH MOUNTING HARDWARE FOR DIRECT ATTACHMENT TO DEVICES. ASSEMBLIES SHALL BE NEMA-4 OR 4X (IP 66/67) RATED AS NECESSARY FOR EACH INSTALLATION CONDITION; FOR ACTUATORS INSTALLED OUTDOORS AND/OR IN WET LOCATIONS SHALL BE UV RESISTANT. UL CERTIFIED; COMPLETE WITH EXTERNAL VISUAL INDICATOR OF VALVE POSITION; MANUAL OVERRIDE CLUTCH AND OPERATOR; MECHANICAL TRAVEL STOPS; UV RESISTANT POWDER COATED OR EPOXY PAINTED FINISH; THERMAL OVERLOAD PROTECTION; -20°F TO 122°F AMBIENT TEMPERATURE RATED. PROVIDE SPRING RETURN WHERE REQUIRED.
22. <u>BACKFLOW PREVENTERS</u>: NSF-61, ASSE-1013, AWWA STANDARD C5111, LEAD-FREE BRONZE EQUIVALENT TO WATTS #LF009-QT-S REDUCED PRESSURE ZONE ASSEMBLY WITH 1/4-TURN BALL VALVES, BRONZE INLET STRAINER AND AIR-GAP DRAIN ACCESSORY
23. <u>WATER METERS</u>: NSF-61, AWWA STANDARD C700, LEAD-FREE BRONZE BODY POSITIVE DISPLACEMENT DISC METER EQUIVALENT TO RECORDALL BADGER METER (±1.5% ACCURACY; ±0.5% REPEATABILITY; MAX. OPERATING PRESSURE 150 PSI).
24. <u>FLEXIBLE PIPING CONNECTORS</u>: PIPING CONNECTIONS TO EQUIPMENT SHALL BE MADE WITH MULTIPLE PRE-LUBRICATED GROOVED COUPLINGS CONFIGURED PER MANUFACTURER DETAILS TO PROVIDE VIBRATION ISOLATION. COMPLY WITH MANUFACTURER'S DESIGN AND INSTALLATION REQUIREMENTS.
   24.1. SIZE TO MATCH THE LARGER OF THE EQUIPMENT CONNECTION SIZES OR PIPE SIZE, UNLESS NOTED OTHERWISE.
   24.2. INSTALL ALL CONNECTORS WITH THE MINIMUM STRAIGHT PIPE LENGTHS UPSTREAM AND DOWNSTREAM AS REQUIRED BY THE MANUFACTURER.
   24.3. ENSURE PIPING IS ADEQUATELY SUPPORTED SO FLEXIBLE JOINTS DO NOT CARRY ANY PIPE WEIGHT.
   24.4. GROOVES SHALL BE CUT UNLESS OTHERWISE SPECIFICALLY APPROVED BY COUPLING MANUFACTURER.
   24.5. LUBE, IF REQUIRED SHALL BE EQUIVALENT TO GRUVLOK "XTREME" WATERPROOF SILICONE BASED, -65°F TO 400°F.
   24.6. PROVIDE VICTAULIC OR APPROVED EQUIVALENT.
25. <u>SUCTION DIFFUSERS</u>: FULL-LINE SIZE ANGLE PATTERN, CAST-IRON BODY, FLANGED, RATED FOR 175 PSI WORKING PRESSURE, WITH INLET VANES, CYLINDER STRAINER WITH 3/16 INCH DIAMETER OPENINGS, DISPOSABLE 5/32 INCH MESH STRAINER TO FIT OVER CYLINDER STRAINER FOR STARTUP, 20 MESH SCREEN FINAL, AND PERMANENT MAGNET LOCATED IN FLOW STREAM AND REMOVABLE FOR CLEANING. PROVIDE ADJUSTABLE FOOT SUPPORT, BLOWDOWN TAPPING IN BOTTOM, GAGE TAPPING IN SIDE AND THREADED BALL VALVE BLOW-DOWN VALVE WITH HOSE THREAD ENDS AND CAP WITH CHAIN. VICTAULIC OR APPROVED EQUIVALENT.
26. <u>PRESSURE GAUGES:</u> SHALL BE MINIMUM 3" DIAL SIZE WITH AN ALUMINUM CASE, STAINLESS STEEL FRICTION TYPE RING AND GLASS WINDOW. MOVEMENT SHALL BE BRASS WITH A BRONZE BOURDON TUBE AND BRASS SOCKET. DIAL FACE SHALL BE WHITE WITH BLACK FIGURES; POINTER SHALL BE FRICTION ADJUSTABLE TYPE. ACCURACY SHALL BE ±1% OF SCALE RANGE, ASME B40.1 GRADE 1A. COMPLETE WITH PRESSURE SNUBBER. UNITS LOCATED OUTDOORS SHALL BE UV RESISTANT AND RATED FOR OUTDOOR INSTALLATION.
27. <u>PRESSURE & TEMPERATURE TEST PORTS (PETE'S PLUG)</u>: PROVIDE TEST PORTS ON THE INLET AND OUTLET OF ALL EQUIPMENT. EQUAL TO PETE'S PLUG WITH EXTENDED NECK (XL SERIES). CONTRACTOR'S OPTION TO PROVIDE STD. SIZE WITH LONGER WELD-O-LET NECK TO CLEAR INSULATION.
28. <u>CHEMICAL INJECTION QUILLS</u>: CORPORATION STOP TYPE WITH 3/4" BRASS OR STAINLESS STEEL BALL VALVE, INJECTION TUBE WITH 1/2" NPT INLET AND RETAINING CHAIN. EQUIVALENT TO NEPTUNE "CORPORATION STOP WITH QUILL". COORDINATE WITH PIPING INSTALLER FOR WELD-O-LET SIZES AND COORDINATE QUILL LENGTH WITH PIPE SIZE. PROVIDE PLASTIC BALL VALVE ON QUILL CONNECTION
29. <u>THERMOMETERS</u>: STICK TYPE, ADJUSTABLE ANGLE, 9" SCALE, CAST ALUMINUM CASE WITH POLYESTER POWDER COATING, HEAVY TEMPERED CRYSTAL GLASS LENS SECURELY MOUNTED TO PREVENT RATTLING AND BRASS SEPARABLE THERMOWELL. SCALE SHALL BE WHITE COATED ALUMINUM WITH PERMANENT BOLD BLACK MARKINGS LOCKED IN PLACE AND ADJUSTED THROUGH A DEVICE AT TOP OF SCALE. THERE SHALL BE NO MOUNTING SCREWS TO COVER UP THE SCALE MARKINGS. EXTENDED NECK TO CLEAR INSULATION THICKNESS. ACCURACY SHALL BE 1% OF SCALE RANGE. COMPLETE WITH THERMOWELL SIZED FOR PIPING, MINIMUM 2" INSERTION. UNITS LOCATED OUTDOORS SHALL BE UV RESISTANT AND RATED FOR OUTDOOR INSTALLATION.
30. <u>PIPE AND EQUIPMENT INSULATION</u>: COMPLETELY INSULATE THE PIPING SYSTEMS AND EQUIPMENT PER THESE SPECIFICATIONS AND SCHEDULE BELOW. DO NOT INSULATE UNTIL PIPING HAS PASSED ALL QUALITY CONTROL REVIEWS AND TESTS. ALL INSULATION SHALL COMPLY WITH THE SPECIFICATIONS BELOW.
   30.1. VAPOR-RESISTANT, MAX 0.08 PERM IN PER ASTM E 96. WATER ABSORPTION LESS THAN 0.5% BY VOLUME PER ASTM C209.
   30.2. PLENUM RATED PER ASTM E84.
   30.3. SERVICE TEMPERATURES: MINIMUM -200°F, MAXIMUM +220°F.
   30.4. ASTM C518 CERTIFIED THERMAL CONDUCTIVITY VALUE NOT EXCEEDING 0.24 BTU-IN/(HxFT2x°F) AT 100°F MEAN TEMPERATURE.
   30.5. <u>PIPE INSULATION</u>: FIBERGLASS WITH ALL-SERVICE JACKETING EQUAL TO JOHNS MANVILLE "MICRO-LOK" OR ELASTOMERIC EQUAL TO ARMACELL "AP ARMAFLEX BLACK LAPSEAL". REFER TO SCHEDULE BELOW FOR APPLICATION
   30.6. <u>HIGH DENSITY PIPE INSULATION</u> SHALL BE CFC & HCFC FREE, RIGID, PHENOLIC FOAM; EQUIVALENT TO RESOLCO 'INSUL-PHEN' INSULATION WITH ASJ & FACTORY FABRICATED FITTING COVERS.
      30.6.1. VAPOR SEAL JOINTS WITH CHILDERS "CP-76" OR EQUIVALENT.
      30.6.2. MAKE ASSEMBLY VAPOR TIGHT WITH FAB CLOTH EMBEDDED IN FOSTERS "30-80AF" OR EQUIVALENT.
      30.6.3. PROVIDE ASJ FOR INDOOR SERVICE: ALUMINUM FOIL LAMINATED TO 30# KRAFT PAPER, FLAME RETARDANT, EQUIVALENT TO COMPAC CORP OR LAMTEC CORP PER INSULATION MFGR'S LISTINGS.
      30.6.4. PROVIDE ASJ FOR OUTDOOR SERVICE: RUBBERIZED BITUMEN ADHESIVE LAMINATED TO 4MIL POLYETHYLENE FILM, 30MIL TOTAL THICKNESS, EQUIVALENT TO POLYGUARD "INSULRAP 30".
      30.6.5. SECURE WITH MINIMUM 1/2" WIDE FIBERGLASS FILAMENT TAPE.
      30.6.6. DENSITY: 3.75 LB/CUBIC FT MINIMUM PER ASTM D1622.
      30.6.7. MINIMUM COMPRESSIVE STRENGTH (LB/SQ.IN.): 58 PARALLEL TO RISE; 43 PERPENDICULAR TO RISE; PER ASTM D 1623.
   30.7. FIBERGLASS INSULATION JOINTS SHALL BE MADE VAPOR TIGHT THRU USE OF APPROPRIATE VAPOR BARRIER MASTIC.
   30.8. ELASTOMERIC INSULATION SHALL BE JOINED USING MFGR'S LOW VOC CONTACT ADHESIVE – TAPE IS NOT ALLOWED.
   30.9. ELASTOMERIC PIPE INSULATION SHALL INCLUDE FACTORY INSERTS EQUAL TO "ARMAFLEX IPH" AT PIPE HANGERS AND CLAMPS TO MAINTAIN A CONTINUOUS VAPOR BARRIER. JOIN ENDS OF INSERTS TO INSULATION WITH MFGR'S ADHESIVES.
   30.10. MAINTAIN CONTINUOUS INSULATION WITH VAPOR BARRIER (THRU SUPPORTS, WALLS, ETC.) ON SYSTEMS WHICH MAY CONDENSE (CONVEY FLUIDS BELOW DEWPOINT).
   30.11. FIBERGLASS INSULATION SHALL UTILIZE PVC FITTING COVERS. EXCEPT FOR SYSTEMS LOCATED IN AREAS EXPOSED TO THE WEATHER – SEE NOTES BELOW.
   30.12. PIPE FITTINGS: PROVIDE DOUBLE LAYER OF SPECIFIED INSULATION PRODUCT, WITH JACKETING, AT EACH LOCATION.
   30.13. FIBERGLASS INSULATION SHALL INCLUDE VAPOR-TIGHT JACKET AND MASTIC COATINGS.
   30.14. INSULATION SHALL BE APPLIED IN A NEAT AND WORKMANLIKE MANNER. CONTRACTOR SHALL BE REQUIRED TO REMOVE AND REPLACE ALL INSULATION NOT APPLIED IN STRICT ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS, NAIMA STANDARDS, AND/OR NOT PRESENTING A NEAT APPEARANCE.
   30.15. DO NOT INSTALL INSULATION ON OPERATING SYSTEMS WHICH CREATE COLD SURFACES – SUBJECT TO CONDENSATION.
   30.16. ANY INSULATION WHICH HAS BEEN WET OR SHOWING SIGNS OF MOLD SHALL BE DISCARDED IN AN APPROVED MANNER AND REPLACED WITH NEW.
   30.17. DO NOT EXPOSE INSULATION TO THE WEATHER. PROTECT DURING STORAGE AND INSTALL AS REQUIRED.
   30.18. LOCATE INSULATION AND COVER SEAMS IN LEAST VISIBLE LOCATIONS. INSTALL TO SHED WATER FROM ABOVE – LAP OVER.
   30.19. WHEREVER POSSIBLE, LOCATE JOINTS IN HORIZONTAL INSULATION AT 3 AND / OR 9 O'CLOCK (HORIZONTAL) WITH SEAM LAP FROM TOP OVER LOWER PORTION.
   30.20. THE INNER DIAMETER OF ALL INSULATION PRODUCTS SHALL MATCH THE OUTSIDE DIAMETER OF THE PIPING IT COVERS (I.E. INSULATION COVERING STEEL PIPE SHALL BE MADE TO FIT STEEL PIPE NOT COPPER).
   30.21. <u>PVC JACKETING</u>: 20 MIL THICK. GLOSS FINISH, 150°F RATED, WHITE. EQUIVALENT TO JOHNS MANVILLE "ZESTON".
   30.22. PROVIDE HIGH DENSITY PIPE INSULATION OR CALICIUM SILICATE PIPE INSULATION INSERTS AT ALL SUPPORT LOCATIONS. SELECT INSERTS TO SUIT APPLICATION. VERIFY LISTING & MANUFACTURER'S RECOMMENDATIONS ARE APPROPRIATE FOR ANTICIPATED USE.
   30.23. PROVIDE GALVANIZED STEEL SADDLES ON OUTSIDE OF INSULATION JACKET AT ALL SUPPORT LOCATIONS.
   30.24. REPLACE INSULATION ON EXISTING PIPING WITHIN 4 FEET OF NEW WORK THAT IS MISSING INSULATION OR DAMAGED. NEW WORK SHALL COMPLY WITH THESE SPECIFICATIONS, TRANSITION THICKNESS TO MATCH EXISTING
   30.25. INSULATED PIPING EXPOSED TO THE WEATHER SHALL BE COMPLETELY COVERED WITH 0.016" THICK EMBOSSED ALUMINUM JACKETING SECURED WITH ALUMINUM OR STAINLESS STEEL BANDS INSTALLED OVER THE INSULATION. FITTING COVERS SHALL BE ALUMINUM OR STAINLESS STEEL. FLASH EDGES TO MAKE WEATHERTIGHT. SEAL JOINTS & SEAMS WITH 25 YEAR CLEAR SILICONE. ENTIRE ASSEMBLY SHALL BE WEATHER-TIGHT. RIVETS, SCREWS AND SIMILAR FASTENERS THRU THE ALUMINUM JACKET ARE NOT ALLOWED.
      30.25.1. CONTRACTOR OPTION: SELF-ADHERING RUBBERIZED BITUMEN MEMBRANE WITH ALUMINUM WEATHERING SURFACE INTENDED TO BE APPLIED COMPLETELY OVER INSULATION ON EXTERIOR PIPING. PEEL-AND-STICK, SELF HEALING, THIN ALUMINUM FOIL JACKET, UV STABLE, EXPANDS AND CONTRACTS WITH THE MECHANICAL SYSTEM. THICKNESS: 40 MILS MINIMUM. WATER VAPOR TRANSMISSION: 0.0022 GRAINS/HR-FT^2 PER ASTM E 96-00. PERMEANCE: 0.0053 US PERMS PER ASTM E 96-00. NO CRACKS AT -31 DEGF PER ASTM D 146 (MODIFIED). ELONGATION AT BREAK: 400% PER ASTM D 882. TENSILE STRENGTH OF BACKING: 5000 PSI PER ASTM D 882 (METHOD B). MANUFACTURERS (OR APPROVED EQUAL): MFM BUILDING PRODUCTS CORP, FLEX CLAD 400 (WWW.FLEXCLAD.COM); POLYGUARD PRODUCTS, ALUMAGUARD OR ALUMAGUARD EE (WWW.POLYGUARDPRODUCTS.COM).
   30.26. <u>PIPING AND EQUIPMENT INSULATION APPLICATION AND THICKNESS REQUIREMENTS:</u>
      30.26.1. REPLACE INSULATION ON EXISTING PIPING WITHIN 4 FEET OF NEW WORK THAT IS MISSING INSULATION OR DAMAGED. NEW WORK SHALL COMPLY WITH THESE SPECIFICATIONS, TRANSITION THICKNESS TO MATCH EXISTING.
      30.26.2. PIPING SUBJECT TO DAMAGE AND WHERE INDICATED ON PLANS: HIGH DENSITY INSULATION, THICKNESS AS SPECIFIED BELOW
      30.26.3. INSULATED PIPING EXPOSED TO VIEW, BELOW 10 FEET IN MECHANICAL ROOMS, AND AS NOTED ON DRAWINGS: INSULATION THICKNESS AS SPECIFIED BELOW AND PVC JACKET OVER INSULATION AND FITTINGS
      30.26.4. COLD AND DUAL TEMPERATURE SYSTEMS: MAINTAIN CONTINUOUS VAPOR BARRIER. INSULATE OVER VALVES, STRAINERS, PUMP BODIES, SUCTION DIFFUSERS, ETC. WITH REMOVABLE FORMED INSULATION SHEETS INSTALLED TO MAKE A VAPOR-TIGHT INSTALLATION. PROVIDE FACTORY FABRICATED SYSTEMS OR REUSABLE STRAPS, VELCRO, ETC
      30.26.5. DOMESTIC COLD WATER OUTDOORS: 2" THICK HIGH DENSITY PIPE INSULATION.
      30.26.6. CHILLED WATER SUPPLY & RETURN PIPING: 1" FIBERGLASS (INSIDE BUILDING)
         30.26.6.1. INSULATE MINIMUM 10 FEET OF MAKE-UP WATER LINE CONNECTION TO EXPANSION TANK.
      30.26.7. 2-PIPE HYDRONIC SUPPLY & RETURN PIPING CONVEYING BOTH TEMPS UP TO 1-1/2" DIA = 1-1/2" THICK FIBERGLASS; LARGER PIPING = 2" THICK FIBERGLASS
      30.26.8. HYDRONIC SMALL DIAMETER PIPING SUCH AS GAUGE LINES AND POT FEEDER SUPPLY / RETURN MAY UTILIZE ¾" THICK ELASTOMERIC INSULATION
      30.26.9. AIR SEPARATOR: 1" FIBERGLASS WITH PVC OR METAL JACKETING.
31. <u>PIPE SUPPORTS:</u> PIPING ON GRADE SHALL BE SUPPORTED USING FACTORY FABRICATED ASSEMBLIES OF SOLID BASE POLYCARBONATE, HIGH DENSITY POLYPROPYLENE PLASTIC, RECYCLED TIRE RUBBER, GALVANIZED, OR STAINLESS STEEL. SUPPORT ASSEMBLIES SHALL BE VERTICALLY ADJUSTABLE TO ACCOMMODATE SLOPE AND REQUIREMENTS OF THE PROJECT. COORDINATE WITH MANUFACTURER'S REPRESENTATIVE FOR SELECTIONS. FIELD VERIFY PIPING MATERIALS, SIZES, DUTY, LOCATIONS, AND ROOF TYPE. PROVIDE LOOSE-FITTING PIPE CLAMPS AT EACH PIPE SUPPORT; CLAMPS SHALL NOT RESTRICT MOVEMENT OF PIPING. SPACING SHALL BE IN ACCORDANCE WITH NOTES ON THESE DRAWINGS, CODE, AND AHJ REQUIREMENTS (WHICHEVER IS MORE STRINGENT). APPROVED MANUFACTURERS: C-PORT/MIFAB (MIFAB.COM), MAPA (MAPAPRODUCTS.COM), MIRO (MIROIND.COM), PPH (PORTABLEPIPEHANGERS.COM). WOOD SUPPORTS, ERICO "PIPE PIER" (OR SIMILAR FOAM CONSTRUCTION SUPPORTS), DURA-BLOK ARE NOT ACCEPTABLE.
32. <u>EQUIPMENT TAGS</u>: PROVIDE ENGRAVED UV-RESISTANT NAMEPLATES OR UTILIZE OUTDOOR-RATED PAINT AND FACTORY FABRICATED STENCILS FOR EACH PIECE OF EQUIPMENT. NAMEPLATES MINIMUM 4x6 WITH 1/4" TALL LETTERING. STENCILS MINIMUM 2" TALL. INCLUDE MARK, INSTALL DATE AND SAFETY OR EMERGENCY PRECAUTIONS. PERMANENTLY FASTEN TO UNIT. COORDINATE IDENTIFICATION REQUIREMENTS AND NUMBERING SEQUENCE WITH EXISTING CONDITIONS, OWNER AND EMCS CONTRACTOR. LOCATE ON NORTH SIDE OF OUTDOOR EQUIPMENT WHENEVER PRACTICAL.
   32.1. <u>PUMPS:</u> PROVIDE ENGRAVED NAMEPLATE WHICH INCLUDES A COPY OF ALL DATA ON FACTORY PUMP TAG. THIS NAMEPLATE SHALL BE ATTACHED TO THE OUTSIDE OF INSULATION ON THE PUMP OR NEAR THE PUMP ON SUCTION OR DISCHARGE PIPING. THIS ALLOWS FOR THE FACTORY TAG TO BE COVERED WITH INSULATION. TYPICAL FOR EACH PUMP
33. <u>PIPE IDENTIFICATION</u>: PROVIDE PIPE IDENTIFICATION ON ALL PIPING. UTILIZE FACTORY FABRICATED STENCILS & CONTRASTING OUTDOOR-RATED PAINT OR PROVIDE PRE-MANUFACTURED SNAP-ON PLASTIC WRAP-AROUND TYPE SIZED TO COVER THE ENTIRE CIRCUMFERENCE OF PIPING AND INSULATION. EACH IDENTIFICATION LOCATION SHALL INCLUDE ARROWS INDICATING FLOW POINTING AWAY FROM THE TEXT. COLORS AND INSTALL PER ANSI STANDARD A13.1. LOCATE AT MAXIMUM 20 FOOT CENTERS, AT PENETRATIONS THRU WALLS, AND CHANGES IN DIRECTION.
34. <u>PAINTING</u>: ALL ITEMS WHICH REQUIRE PAINTING SHALL BE PREPPED AND PRIMED IN ACCORDANCE WITH THE PAINT MANUFACTURER'S INSTRUCTIONS. OBTAIN COLOR REQUIREMENTS FROM OWNER IN WRITING.
   34.1. TOUCH UP DAMAGED FACTORY FINISHES WITH FACTORY APPROVED PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
   34.2. PAINT NON-GALVANIZED STEEL PIPING SYSTEMS. INCLUDES ALL EXISTING.
   34.3. PAINT STEEL PIPE SUPPORTS / STANDS. INCLUDES EXISTING REUSED SUPPORTS. OBTAIN COLOR APPROVAL FROM OWNER.
   34.4. PAINT EDGE OF CONCRETE PADS BRIGHT YELLOW. ALL SIDES AND WRAP OVER TOP 4" IF POSSIBLE – COORDINATE WITH EQUIPMENT MOUNTING. UTILIZE EPOXY PAINT RATED FOR OUTDOOR INDUSTRIAL FLOOR APPLICATIONS.
35. <u>TESTING AND BALANCING</u>: HVAC SYSTEMS SHALL BE TESTED, ADJUSTED AND BALANCED BY A CERTIFIED TEST AND BALANCE CONTRACTOR. TESTING AND BALANCING SHALL BE PER AABC STANDARDS. SUBMIT COPIES OF FINAL REPORTS, COMPLETE WITH TECHNICIAN'S OBSERVATIONS, FOR APPROVAL. COORDINATE QUANTITY AND SUBMITTAL FORMAT REQUIREMENTS WITH GENERAL CONTRACTOR.
   35.1. BALANCE WATER FLOW RATES TO + OR – 10% OF THE SCHEDULED VALUES.
   35.2. TAB EACH TOWER WITH EACH CHILLER. ASSUMING ALL PUMPS ARE BALANCED TO THE SAME FLOW RATE, THIS TAB WILL ENSURE THE VARYING PIPE AND CHILLER PRESSURE DROPS ARE ACCOUNTED FOR TO ENSURE MINIMUM AND MAXIMUM CONDENSER WATER FLOWS ARE PROVIDED FOR EACH CHILLER AND TOWER.
   35.3. TEST BYPASS FLOW RATE AND ESTABLISH % OPEN SETTING OF BYPASS VALVE TO MINIMIZE STREAKING (NOT FULLY WETTED MEDIA) OF WORST CASE TOWER (EACH WILL NEED TO BE TESTED). DOCUMENT FLOW RATE AND COORDINATE FINAL SETTING OF VALVE WITH CONTROLS CONTRACTOR. COORDINATE ACCEPTABLE FLOW OVER MEDIA WITH EACH TOWER MANUFACTURER.
   35.4. PUMPS:
      35.4.1. PUMPS WITH SEPARATE VFD'S: BALANCE DISCHARGE BALANCING VALVE TO ENSURE NON-OVERLOADING CONDITION WHEN VFD IS IN BYPASS MODE. MARK VALVE SETTING. VFD IS INTENDED TO BE USED TO BALANCE THE PUMP. BALANCING VALVE IS ONLY PROVIDED TO ENSURE NON-OVERLOADING MOTOR CONDITION AND IS EXPECTED TO BE OPEN OR NEARLY OPEN FOR A MINIMAL PRESSURE DROP.
36. <u>PIPING TESTING</u>: TEST ALL NEW PIPING INSTALLATIONS. VALVE OFF EXISTING SECTIONS OF PIPING TO REMAIN AS NECESSARY. TEST USING CALIBRATED GAUGES WITH APPROPRIATE SCALES IN ACCORDANCE WITH IPC, IMC, IFGC AS APPLICABLE OR AS INDICATED HEREIN – MOST STRINGENT REQUIREMENT APPLIES. ALL TESTS SHALL BE HELD TO A MINIMUM OF 30 MINUTES AND WITNESSED BY THE AUTHORITY HAVING JURISDICTION. NO DROP IN PRESSURE ALLOWED. NO PIPING SHALL BE INSULATED, COVERED OR CONCEALED UNTIL TESTED AND TEST IS ACCEPTED BY WITNESS(ES). REPAIR ANY LEAKING SECTIONS OF PIPE BY REPLACING THE LEAKING SECTION OR PART WITH NEW.
   36.1. DOMESTIC WATER PIPING SHALL BE HYDROSTATICALLY TESTED TO 1.5 TIMES THE OPERATING PRESSURE OR 100 PSIG WHICHEVER IS GREATER.
      36.1.1. BACKFLOW PREVENTERS SHALL BE TESTED AT TIME OF INSTALLATION PER 2018 IPC, SECTION 312.10. DEVICES REQUIRED, BUT NOT LIMITED TO, TO BE TESTED INCLUDE: HOSE CONNECTION BACKFLOW PREVENTERS.
   36.2. HYDRONIC WATER PIPING SHALL BE HYDROSTATICALLY TESTED TO 1.5 TIMES THE OPERATING PRESSURE OR 150 PSIG WHICHEVER IS GREATER.
37. <u>HYDRONIC PIPING CLEANING AND TREATMENT</u>: REFER TO SEPARATE NOTES ON SHEET M0.1. SUBMIT PRE-DEMO TEST.
38. <u>CLEAN-UP & STORAGE:</u> MAINTAIN THE AREA OF WORK AND STORAGE IN AN ORGANIZED AND TIDY CONDITION AT ALL TIMES.
   38.1. ALL INSTRUCTIONS ISSUED BY THE OWNER IN REGARD TO STORAGE OF MATERIALS, PROTECTIVE MEASURES, CLEANING OF DEBRIS ETC., SHALL BE EXPLICITLY FOLLOWED.
   38.2. AT THE COMPLETION OF EACH DAY'S WORK, LEAVE AREAS DIRECTLY AFFECTED BY WORK.
   38.3. UPON COMPLETION OF THE WORK, THOROUGHLY CLEAN ALL MACHINERY, PIPING, ETC. TURN OVER TO OWNER IN A LIKE-NEW CONDITION.
39. <u>FACTORY START-UP:</u> FACTORY TRAINED PERSONNEL SHALL PROVIDE COMPLETE FACTORY START-UP AND ASSISTANCE WITH CONTROLS INTEGRATION OF VFD'S INTO EXISTING SYSTEM. PROVIDE COMPLETE REPORT TO OWNER AND ENGINEER FOR REVIEW AND APPROVAL. NOTIFY OWNER MINIMUM 2 WEEKS IN ADVANCE OF START-UP SO THAT THE OWNER HAS THE OPPORTUNITY TO WITNESS THE FACTORY START-UP.
40. <u>O&M</u>: SUBMIT OPERATION AND MAINTENANCE MANUALS PER OWNER AND AHJ REQUIREMENTS.
   40.1. INCLUDE MANUFACTURER'S OPERATION, MAINTENANCE, WIRING AND WARRANTY INFORMATION AS WELL AS SUGGESTED WEEK, MONTH AND YEARLY SCHEDULED MAINTENANCE ITEMS FOR EACH PIECE OF EQUIPMENT.
   40.2. MANUFACTURER'S EQUIPMENT MANUALS SHALL INCLUDE THE EQUIPMENT TAGS USED ON THIS PROJECT AS WELL AS BE EDITED AND HIGHLIGHTED SO AS TO INDICATE WHICH MODEL WAS INSTALLED, WHICH FACTORY OPTIONS WERE USED (STRIKE-THRU ANY THAT WERE NOT USED); INCLUDING VOLTAGE.
   40.3. MANUALS SHALL INCLUDE COMPANY NAMES, PHONE NUMBERS, ADDRESSES, ETC. FOR EACH CONTRACTOR AND SUPPLIERS OF MANUFACTURERS USED.
   40.4. MANUALS SHALL INCLUDE ALL EQUIPMENT FACTORY START-UP REPORTS; SIGNED AND DATED BY THE MANUFACTURER'S TRAINED REPRESENTATIVE AND CONTACT INFORMATION.
41. <u>WARRANTY</u>: PARTS AND LABOR SHALL BE GUARANTEED FOR THE PERIOD REQUIRED BY THE OWNER, MINIMUM OF 2 YEARS. PROVIDE NOTARIZED WARRANTY LETTER. INCLUDE COPIES OF ALL WARRANTIES IN O&M MANUALS.
   41.1. PROVIDE WARRANTY CERTIFICATES FOR ALL ITEMS WITH WARRANTIES THAT ARE IN EXCESS OF THE PROJECT GUARANTEE.
42. <u>AS-BUILTS</u>: DOCUMENT ALL CHANGES ON "AS-BUILT" DRAWINGS MAINTAINED AT THE PROJECT SITE. MAKE NOTE OF ANY CHANGES MADE IN LAYOUT, ALL FOUND CONDITIONS, RFI'S, ADDENDUMS, ETC. UNDERGROUND ITEMS SHALL BE NOTED WITH DEPTH AND REFERENCED FROM AT LEAST THREE PERMANENT ABOVE GROUND REFERENCE POINTS. INCORPORATE ALL INFORMATION INTO ONE CLEAN SET OF DRAWINGS AND MARK "AS-BUILT" WITH CONTRACTOR NAME AND DATE ON EACH. ALL CHANGES SHALL BE CLOUDED AND DATED. SUBMIT FINAL COPIES TO THE OWNER AT THE CLOSE OF THE PROJECT. COORDINATE QUANTITY AND FORMAT REQUIREMENTS WITH OWNER.
43. <u>CLOSE-OUT DOCUMENTATION</u>: SUBMIT PDF ELECTRONIC FORMAT, CLOSE-OUT DOCUMENTS PER OWNER AND AHJ REQUIREMENTS; PROVIDE HARD COPIES, USB DRIVE AND/OR DVD AS REQUIRED BY OWNER. QUANTITIES AS SPECIFIED BY OWNER. ASSEMBLE INTO A SINGLE ELECTRONICALLY INDEXED FILE. CLOSE-OUT DOCUMENTATION SHALL INCLUDE, BUT NOT LIMITED TO, THE FOLLOWING DOCUMENTS. REFER TO SPECIFICATIONS ABOVE FOR REQUIREMENTS.
   43.1. ALL TESTING REPORTS SUCH AS WATER CHEMISTRY, WATER SANITIZING, PRESSURE TESTS, ETC.;
   43.2. EQUIPMENT START UP LOGS
   43.3. PROJECT AND EQUIPMENT WARRANTIES. INCLUDE WARRANTIES IN EXCESS OF THE PROJECT LIMITS;
   43.4. OPERATION AND MAINTENANCE MANUALS;
   43.5. CONTROLS POINT-TO-POINT VERIFICATION LOGS AND COMMISSIONING WITH TECHNICIAN'S NOTES – REFER TO EMCS NOTES;
   43.6. AS-BUILT DRAWINGS;
   43.7. TEST AND BALANCE REPORTS WITH TECHNICIAN'S NOTES;
   43.8. COPIES OF FIELD OBSERVATION REPORTS WITH WRITTEN RESPONSES FROM THE CONTRACTOR.

NOTE: SOME OF THE SPECIFICATIONS ARE PART OF ADD ALTERNATES. REFERENCE MECHANICAL AND PLUMBING FLOOR PLANS FOR ADD ALTERNATES #1, #2, #3 AND #4

Replace Tower & Modify
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KWA PROJECT NO:	21014
DATE:	December 1, 2021
DRAWN BY:	MB
DESIGNED BY:	MB
CHECKED BY:	DFK

REVISIONS:

SHEET CONTENTS:
MECHANICAL SPECIFICATIONS

SHEET
M0.2

GENERAL DEMOLITION NOTES

1. DEMO ALL UNUSED MECHANICAL ITEMS, INCLUDING BUT NOT LIMITED TO: EQUIPMENT, PIPING, DUCTWORK, CONTROLS AND ASSOCIATED ACCESSORIES IN AREA OF WORK AS REQUIRED TO ACCOMMODATE THE NEW-WORK DESIGN.
   1.1. DEMO SHALL INCLUDE ALL SUPPORTS, HANGERS, RODS, ETC.
2. FIELD VERIFY STATUS PRIOR TO REMOVAL.
3. PIPING DEMO: REMOVE ALL UNUSED ACCESSIBLE PIPING. DEMO PIPING TO WITHIN WALLS, FLOORS, AND/OR CEILINGS THAT ARE SHOWN TO REMAIN. CAP IN WALL, ABOVE CEILING, AND/OR BELOW FLOOR AS REQUIRED – COORDINATE PATCHING REQUIREMENTS WITH ARCHITECTURAL DOCUMENTS AND GENERAL CONTRACTOR.
   3.1. DEMOLISHED PIPING BRANCHES OFF MAINS THAT WILL REMAIN SHALL BE CAPPED AS CLOSE AS POSSIBLE TO MAINS – MINIMIZE ANY DEAD-LEGS.
   3.2. CAP, DRAIN AND ABANDON PIPING THAT IS 6" AND BELOW FINISHED GRADE.
   3.3. COORDINATE SALVAGE OF ALL DEMOLISHED AND REMOVED ITEMS WITH OWNER. OWNER SHALL HAVE FIRST RIGHT OF REFUSAL ON ALL ITEMS. IF OWNER ACCEPTS ANY ITEM(S), RELOCATE TO OWNER SPECIFIED LOCATION AT NO COST TO OWNER. IF OWNER DOES NOT DESIRE ANY ITEM(S), DISPOSE OF PROPERLY OFF SITE AND PAY ALL ASSOCIATED FEES.
4. REMOVED ITEMS THAT WILL BE RE-USED SHALL BE STORED IN A SECURE LOCATION AND PROTECTED FROM MOISTURE, DAMAGE, AND THE ENTRY OF DIRT AND DEBRIS.
5. COORDINATE ALL REQUIRED UTILITY SHUT-DOWNS WITH OWNER. PROVIDE MINIMUM 5 WORKING DAYS NOTICE – OR AS REQUIRED BY THE PROJECT GENERAL CONDITIONS OR OWNER.

REFURBISH EXISTING COOLING TOWER NOTES

GENERAL:

- SURVEY EXISTING CONDITIONS PRIOR TO ANY WORK & EVALUATE MEANS AND METHODS FOR REFURBISHING EQUIPMENT PER THE NOTES BELOW. FOUND DEFICIENCIES IN ADDITION TO THE REFURBISH LIST (WARN-OUT PARTS, DAMAGED, OR INOPERATIVE ITEMS) SHALL BE REPORTED TO THE ENGINEER IN WRITING.
- ALL WORK AND REPLACEMENT PARTS SHALL PROVIDED BY AND BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
- SERVICEABLE BEARINGS SHALL BE LUBED BY INJECTING FRESH NEW GREASE UNTIL THE OLD HAS BEEN FORCED OUT OF DRAIN FITTING.
- EQUIPMENT SHALL BE TURNED OVER TO OWNER IN PROPER WORKING ORDER.
- REFURBISHMENT SHALL INCLUDE, BUT NOT LIMITED TO THE LIST PROVIDED HEREIN: MANUFACTURER'S REQUIREMENTS SHALL TAKE PRECEDENCE
- T.A.B. TO REBALANCE TOWERS AND PUMPS TO ORIGINAL DESIGN VALUES – REFER TO SCHEDULES.

COOLING TOWER:

EXISTING TOWER (E)CT-2 IS MARLEY. COOLING TOWER; 1200 GPM OPEN TOWER. MARLEY FACTORY AUTHORIZED SERVICE CENTER = VARITEC (520) 352-5247

1. CLEAN WATER BASINS AND PATCH ANY THIN SPOTS WITH MANUFACTURER-APPROVED COATING;
2. REPLACE HEAT TRANSFER MEDIA (FILL);
3. REPLACE DRIFT ELIMINATORS, DISTRIBUTION SYSTEM AND ASSOCIATED SUPPORTS;
4. REMOVE THE FILL SUPPORT CHANNEL AND BRACES FROM THE UNIT AND PROVIDE NEW STRUCTURAL FIBERGLASS CHANNEL AND ANGLE TO ACT AS NEW FILL SUPPORTS. FINISHED PLATFORM TO BE ELEVATED 3" ABOVE BASIN FLOOR TO FACILITATE FUTURE BASIN CLEANING PROCEDURES. PLATFORM TO BE ASSEMBLED USING STAINLESS HARDWARE.
5. SUPPLY AND INSTALL NEW FLOAT VALVE ASSEMBLY COMPLETE WITH PLASTIC BALL – MATCH EXISTING SIZE.
6. PROVIDE MANUFACTURER'S INLET LOUVERS
7. LUBRICATE FAN SHAFT BEARINGS
8. REPLACE BELTS. MULTIPLE BELTS SHALL BE MATCHED SETS.
9. REPLACE DISTRIBUTION NOZZLES FOR WATER FLOW RATE RANGE OF 750 GPM TO 900 GPM.
10. REPLACE EXISTING 25 HP FAN MOTOR WITH VFD COMPATIBLE 15 HP MOTOR AND INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

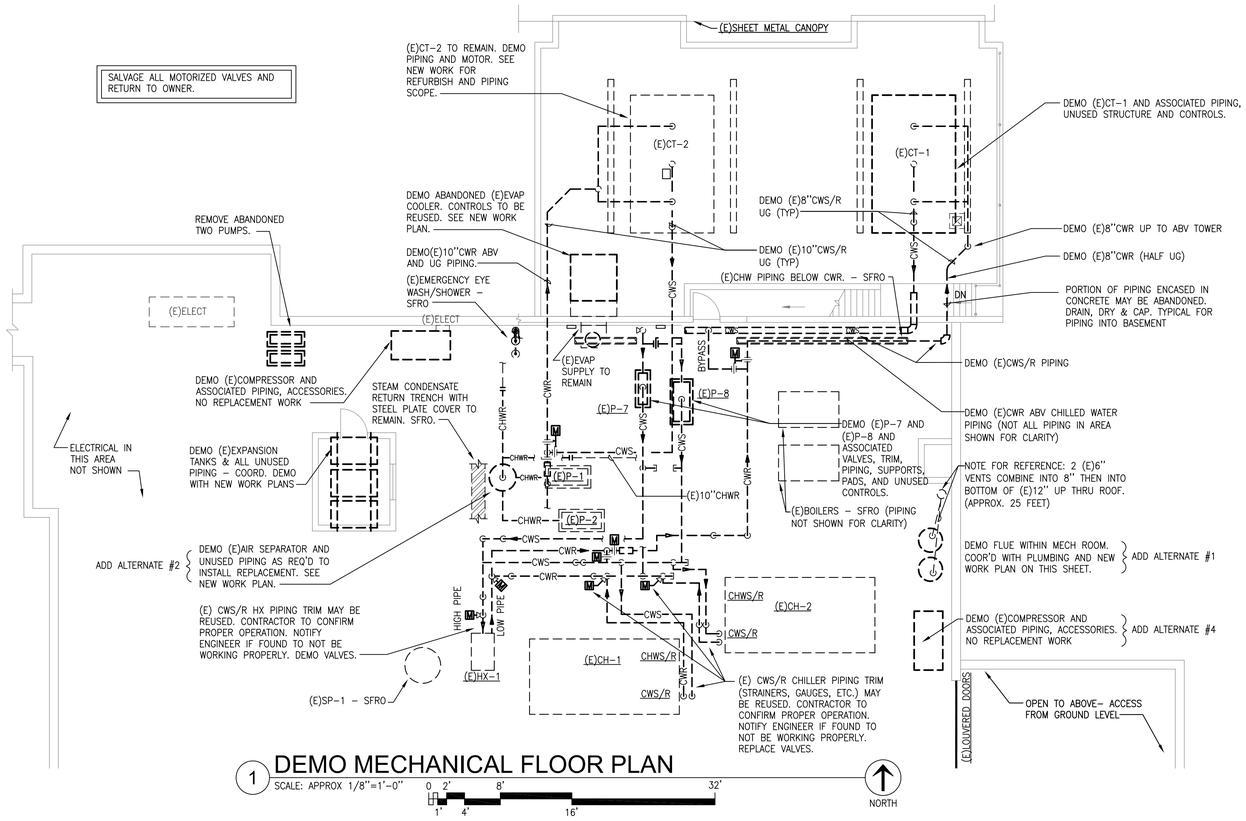
NEW WORK KEYNOTES (#)

1. 12" TOWER BYPASS 3-WAY VALVE. SEE SPECIFICATIONS.
2. 8" CWS TO TOWER CONNECTION. FIELD VERIFY EXISTING REQUIREMENTS.
3. NOT USED
4. COORDIANTE LOCATION OF AIR/DIRT SEPARATOR & ASSOCIATED PAD AND SUPPORTS WITH EXISTING TRENCH COVERED. DO NOT INSTALL OVER TRENCH.
5. CONNECT 10" CHWR TO (E)10". FIELD VERIFY EXACT LOCATIONS, SIZES, & MATERIALS. INSULATE PER THE SPECIFICATIONS.
6. PIPING ON POSITIVE PRESSURE SIDE OF PUMP NOT SHOWN FOR CLARITY. COOR'D AS REQ'D.
7. CAP ABANDONED PIPE THRU WALL AND LABEL "ABANDONED"

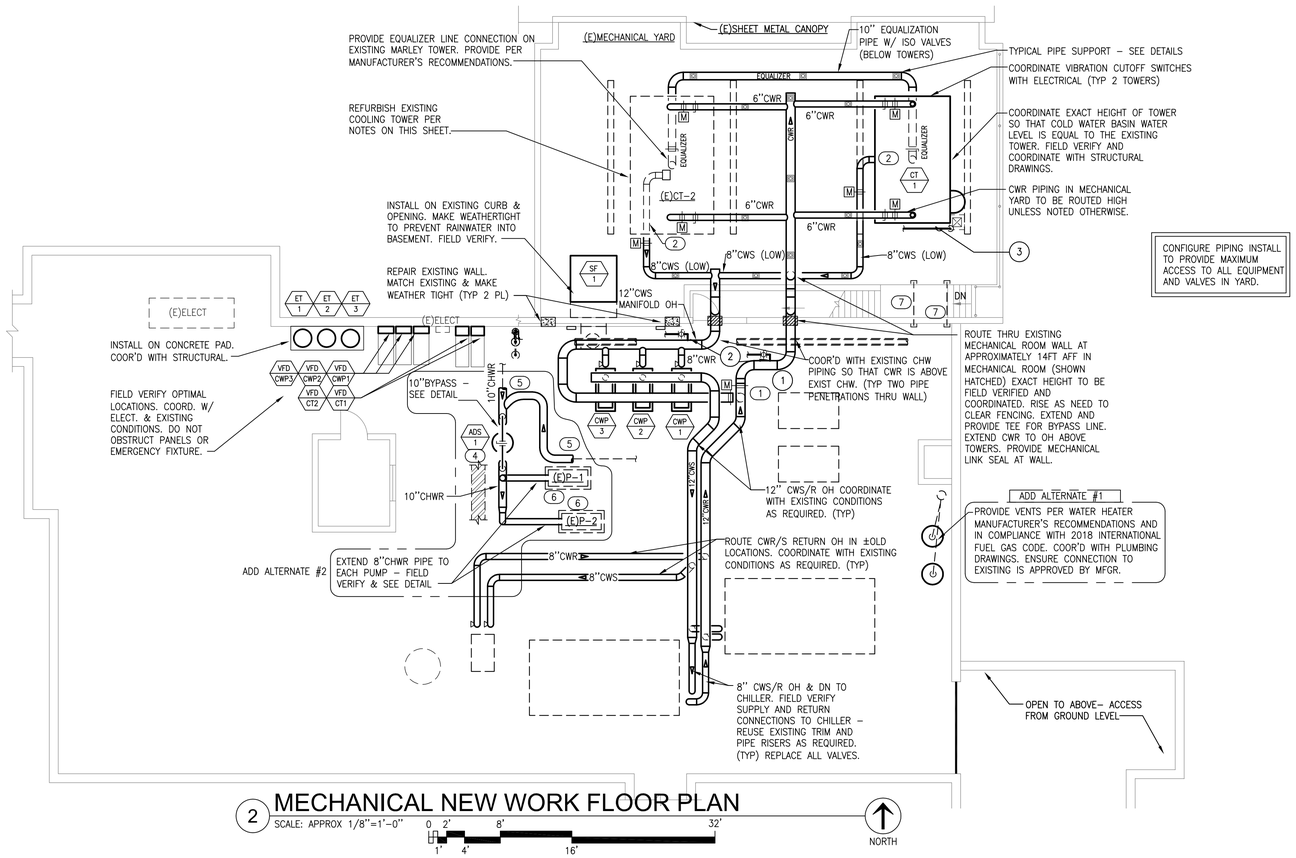
WATER TREATMENT KEYNOTES (#)

1. PROVIDE WELD-O-LETS & FOUR INJECTION QUILLS, EACH WITH ISOLATION VALVES, IN SIDE (3 OR 9 O'CLOCK) OF MAIN. PLUG UNUSED QUILL(S) FOR FUTURE. EXTEND APPROPRIATE UV PROTECTED CHEMICAL SUPPLY PIPING FROM WATER TREATMENT PUMP(S) TO CONDENSER RETURN WATER MAIN, UPSTREAM OF ANY CONNECTED OUTDOOR EQUIPMENT. (NOT SHOWN)
2. CONNECT ¾" WATER TREATMENT PIPING INTO CONDENSER WATER SUPPLY AND RETURN PIPING MAINS. PROVIDE UNION & ISOLATION VALVE FOR EACH. CONNECT INTO SIDE OF HORIZONTAL PIPING. EXTEND TO COUPON RACK / WATER TREATMENT CONTROLLER AS REQUIRED.
3. EXTEND MIN. 1" BLOW DOWN FROM CONDENSER WATER MAIN TO DRAIN. MAKE CONNECTION INTO SIDE OF MAIN. PROVIDE SOLENOID VALVE & UNION AND CONNECT VALVE TO WATER TREATMENT CONTROLLER AS REQ'D.

*** COORDINATE ALL WORK WITH WATER TREATMENT COMPANY. EQUIPMENT ASSUMED TO REMAIN.



1 DEMO MECHANICAL FLOOR PLAN
SCALE: APPROX 1/8"=1'-0" 0 2' 8' 32' (1" 4' 16')



2 MECHANICAL NEW WORK FLOOR PLAN
SCALE: APPROX 1/8"=1'-0" 0 2' 8' 32' (1" 4' 16')

Replace Tower & Modify Piping - Main Central Plant

Canyon Del Oro High School
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KWA PROJECT NO:	21014
DATE:	December 1, 2021
DRAWN BY:	MB
DESIGNED BY:	MB
CHECKED BY:	DFK

REVISIONS:

1

SHEET CONTENTS:

DEMO AND RENOVATON MECHANICAL FLOOR PLAN

SHEET

M1.0

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CDO CENTRAL PLANT

COOLING TOWER SCHEDULE

MARK	MANUFACTURER	MODEL	CONFIGURATION	# OF CELLS	DESIGN PARAMETERS			ELECTRICAL		OPERATING WEIGHT (LBS)	LOCATION	PROVIDE WITH / COMPLETE WITH:
					GPM	EWT/LWT	MAX. WB.	V/ϕ	MOTOR HP			
CT 1	MARLEY	NC8402PAN1	CROSSFLOW	1	900	95 / 85	76.0° F	460/3	1 MOTOR = 15 HP	10,100	MECHANICAL YARD	TYPE 304 STAINLESS STEEL HOT AND WELDED COLD WATER BASINS; 304 SS UPPER SECTION; FRP PANELS OR 301L STAINLESS STEEL; PVC FILL AND DRIFT ELIMINATORS; MECHANICAL WATER LEVEL / FILL; TWO 6" TOP INLET, 8" SIDE OUTLET, VIBRATION CUT-OUT SWITCH; BELT DRIVE; INVERTER DUTY TEAO MOTOR; EXTENDED LUBE LINES; INTERNAL WALKWAY; ALUMINUM LADDER WITH SAFETY CAGE & EXTENSION TO GRADE; HOT WATER BASIN WEIR DAMS; FULL TOP PERIMETER RAILING SYSTEM; 14 GA 304 STAINLESS STEEL HOT WATER BASIN COVERS WITH ADDITIONAL 14 GA STAINLESS STEEL CHANNEL BRACING IN THE MIDDLE OF THE PANELS FOR STIFFENING. 10" EQUALIZER PIPING. 5 YEAR BASIN LEAK WARRANTY + 5 YEAR ROTATING PARTS WARRANTY.
(E)CT-2	*MARLEY*	*EXISTING*	*INDUCED DRAFT CROSSFLOW*	*1*	900	*EXISTING*	*EXISTING*	*EXISTING*	CHANGE FROM (E)25 HP TO 15 HP	*EXISTING*		

NOTES:
1. UNIT SHALL COMPLY WITH ASHRAE 90.1 AND THERMAL RATINGS SHALL BE PER CTI AND SHALL BE FACTORY GUARANTEED TO PERFORM AS SPECIFIED WHEN INSTALLED ACCORDING TO PLAN.
2. MAXIMUM WB TEMPERATURE IS THE HIGHEST WB TEMPERATURE ALLOWABLE TO STILL MEET THE SCHEDULED CAPACITY.
3. THE VFDS SHALL BE PROGRAMMED TO SKIP THE FAN CRITICAL SPEED, OR MULTIPLES THEREOF, DURING NORMAL OPERATION. COORDINATE WITH TOWER MANUFACTURER.
4. PROVIDE MARLEY OR PRIOR APPROVED EQUIVALENT. ALTERNATES MUST INCLUDE ANY NECESSARY ITEMS SUCH AS STRUCTURAL, ELECTRICAL, PIPING, ETC. TO ALLOW FOR INSTALL WHICH IS SIMILAR TO THE BASIS OF DESIGN – SUBJECT TO APPROVAL BY THE OWNER AND ENGINEER.
5. FIELD VERIFY (E)CT-2 PIPING AND DRAIN CONNECTIONS. PROVIDE "MIRRORED" CONNECTIONS FOR CT-1. INTENT IS TO HAVE EQUAL LINE LENGTHS (BETWEEN TOWERS) FOR THE CONDENSER WATER SUPPLY AND CONDENSER WATER RETURN AND EQUALIZER LINES.

HYDRONIC PUMP SCHEDULE

MARK	MANUFACTURER	MODEL	TYPE	DUTY	PERFORMANCE DATA				ELECTRICAL			PIPE CONN. SIZES		OPERATING WEIGHT	SYSTEM SERVED	LOCATION	CONSTRUCTION NOTES:	REMARKS / SYSTEM COMPLETE WITH:
					GPM	HEAD FT. W.C.	NPSHR FT. W.C.	MIN. EFF.	V/ϕ	MOTOR HP	RPM	INLET	OUTLET					
CWP 1	ARMSTRONG	4030 – 6x5x10 – 4P	BASE MTD. CENTRIFUGAL	COOLING TOWER WATER	900	70 FT	9.96	83.09%	460/3	25	1745	6"	5"	700 LB	CT-1, (E)CT-2 & (E)HX	MECHANICAL ROOM	125# CONSTRUCTION; INVERTER DUTY OPEN DRIP PROOF MOTOR; BRONZE FITTED; SEALED BEARINGS; COUPLER GUARD; GAUGE TAPS; CERAMIC SEALS; INVERTER DUTY MOTOR; GAUGE TAPS; DRIP PAN.	SUCTION DIFFUSER WITH #20 MESH FINAL FILTER; REQUIRED PUMP ACCESSORIES PER TYP. PUMP PIPING INSTAL. DETAIL; COORD. MOTOR WITH VFD; COORD. CONTROLS WITH CONTROLS CONTRACTOR.
CWP 2																		
CWP 3																		

NOTES:
1. REFER TO PUMP PIPING DETAILS FOR ADDITIONAL PUMP TRIM AND ACCESSORIES
2. PROVIDE SPECIFIED OR EQUIVALENT BY ARMSTRONG, AURORA, BELL & GOSSETT (XYLEM), GRUNDFOS, PACO, PATTERSON, PEERLESS, OR APPROVED EQUAL.

AIR & DIRT SEPARATOR SCHEDULE

MARK	ITEM	MANUFACTURER	MODEL	SIZE	SYSTEM SERVED	GPM	MAX. HEAD LOSS	APPROX. WEIGHT	INSTALL CONDITION	REMARKS / SYSTEM COMPLETE WITH:
ADS 1	AIR/DIRT SEPARATOR	SPIROVENT	VDT1200	24" DIA x 80" H (SHELL) – 12" INLET/OUTLET	CHILLED WATER DISTRIBUTION SYSTEM	1440	2 FT.	1485 LBS. DRY WEIGHT	INDOORS, ON BASE RING ON FLOOR	ASME SECTION VIII, DIV1 RATED & STAMPED CARBON STEEL CONSTRUCTION WITH A COPPER CORE TUBE ELEMENT WITH CONTINUOUS WOUND COPPER WIRE MEDIUM PERMANENTLY ATTACHED AND FOLLOWED BY A SEPARATE CONTINUOUS WOUND COPPER WIRE PERMANENTLY AFFIXED OR PALL RINGS; 150 PSI AT 240°F WORKING PRESSURE & TEMP; FLANGED OR GROOVED CONNECTIONS; 2" BLOW DOWN VALVE; FLUSH VALVE; AUTOMATIC AIR VENT. PARTICLE REMOVAL DOWN TO 5 MICRONS. COMPLETE WITH OPTIONAL BASE RING.

NOTES:
1. FIELD VERIFY (E)PIPE SIZES.
2. PROVIDE SPECIFIED OR EQUIVALENT BY THRUSH, WESSELS, SPIROTHERM, TACO OR PRIOR APPROVED EQUAL.

VARIABLE FREQUENCY DRIVE SCHEDULE

MARK	MANUFACTURER	MODEL	DUTY	ENCLOSURE	COMPLETE WITH BYPASS?	MANUAL MOTOR PROTECTOR?	LOCATION	ELECTRICAL		CONTROLS PROTOCOL	REMARKS / COMPLETE WITH:
								V / ϕ	HP		
VFD CWP1 / VFD CWP2 / VFD CWP3	ABB	ACH580-VCR	CONDENSER WATER PUMP	NEMA 12 (INDOOR INSTALLATION)	✓	YES	INSIDE MECHANICAL ROOM REFER TO PLANS	460/3	25	BACnet	VARIABLE SPEED DRIVE ASSEMBLY DESIGNED FOR HVAC PUMPS AND FANS. COMPLETE WITH APPROPRIATE ENCLOSURE FOR THE INSTALLED CONDITION. INCLUDE HIGH AMBIENT AND/OR LONG LINE LENGTH DERATE AS NECESSARY. INTEGRAL INPUT REACTOR = 5% IMPEDANCE; AC TRANSIENT PROTECTION SYSTEM CONSISTING OF (4)MOV'S; INPUT EMI / RFI FILTER; 100,000 AIC RATING; 250MA 24VDC AUXILIARY POWER SUPPLY; REAL TIME CLOCK; BACNET INTERFACE; PROGRAMMABLE (2) ANALOG INPUTS, (6) DIGITAL INPUTS, (2) ANALOG OUTPUTS; (3) FORM C RELAYS, EXPANDABLE TO (6); 2-CONTACTOR ELECTRONIC BYPASS WITH DRIVE ONLY ISOLATION SERVICE FUSING; DOOR INTERLOCKED CIRCUIT BREAKER; ELECTRONIC MOTOR OVERLOAD SELECTABLE MANUAL OR AUTOMATIC TRANSFER BYPASS; COMMON START / STOP CIRCUIT FOR DRIVE & BYPASS FROM A REMOTE CONTACT; UNDERVOLTAGE PROTECTION CIRCUIT; DRIVE BYPASS KEYPAD AND LED INDICATING LIGHTS THAT INDICATE THE STATUS OF BOTH THE BYPASS AND THE DRIVE; HARMONIC MITIGATION BELOW IEEE519 LIMITS; COMPLETE WITH: FACTORY CERTIFIED START-UP INCLUDING LABOR, PARTS, AND TRAVEL; TRAINING (COORD. WITH Cx SCOPE); 40 MONTH WARRANTY. PROVIDE I/O EXTENSION MODULE AS REQUIRED. COORD. WITH CONTROLS.
VFD CT1 / VFD CT2		ACH580-BCR	(E)CT-1 AND (E)CT-2 TOWER FANS		✓	YES			15		

NOTES:
1. VERIFY HP RATINGS OF DRIVES WITH EQUIPMENT SCHEDULES. HP LISTED IN EQUIPMENT SCHEDULES TAKE PRECEDENCE TO THIS SCHEDULE.
2. VFDs SHALL BE PROGRAMMED TO SKIP THE FAN CRITICAL SPEED, OR MULTIPLES THEREOF, DURING NORMAL OPERATION. COORDINATE WITH TOWER MANUFACTURER.
3. COORDINATE SETTINGS WITH CONTROLS CONTRACTOR AND TAB FINAL SETTINGS.
4. ENSURE DRIVES ARE SIZED TO HANDLE AMPS IN ADDITION TO NOMINAL HORSEPOWER LISTED.
5. PROVIDE SPECIFIED ABB, EATON OR APPROVED EQUIVALENT. PROVIDE PRIOR APPROVALS PRIOR TO BIDDING.

EXISTING HX T.A.B. SCHEDULE

COLD SIDE GPM	HOT SIDE GPM
900	565

HYDRONIC WATER EXPANSION TANK SCHEDULE

MARK	MANUFACTURER	MODEL	MOUNTING POSITION	TANK VOL. (GAL.)		CONN. SIZE	SYSTEM SERVED	OPERATING WEIGHT	LOCATION	REMARKS / SYSTEM COMPLETE WITH:
				CAPACITY	MAX. ACCEPT.					
ET-1 ET-2 ET-3	WESSELS	NLA-300	VERTICAL	79	79	3/4"	CHILLED WATER	1150 LBS.	MAIN CENTRAL PLANT MECHANICAL ROOM	REMOVABLE BUTYL BLADDER; FABRICATED STEEL CONSTRUCTION – ASME SECTION VIII DIV. 1 CONSTRUCTION; 125 PSIG WORKING PRESSURE; MAX. 240° F OPERATING TEMP; HORIZONTAL OR VERTICAL MOUNTING

NOTES:
1. SIZES SHOWN TOTAL EQUIVALENT VOLUME TO MATCH EXISTING.
2. PROVIDE SPECIFIED OR EQUIVALENT BY TACO OR EQUIVALENT.

EVAPORATIVE COOLER SCHEDULE

MARK	MANUFACTURER	MODEL	STYLE	DISCHARGE CONFIGURATION	CFM	E.S.P.	ELECTRICAL				APPROX. OPERATING WEIGHT	CONTROLS	AREA SERVED	REMARKS / SYSTEM COMPLETE WITH:
							V/ϕ	HP	SPEED	AMPS				
SF 1	PHOENIX MANUFACTURING	PHOENIX MANUFACTURING FRIGIKING UD2231	ASPEN PAD	DOWN DISCHARGE	11800	0.2"	208/3	1-1/2	1	4.6	1050 LBS.	EXISTING	MECHANICAL ROOM	ASPEN PADS; SINGLE SPEED MOTOR; SHEAVE, BELT & PULLEY; L10 39,000 HOUR BEARINGS; AMCA CERTIFIED AIR DELIVERY; HOT DIPPED G40 OR G90 GALV STEEL; POLYESTER POWDER COATED FINISH; UL LISTED. 120V PUMP AND FLOAT VALVE: WATER WILL NOT BE UTILIZED ON THIS UNIT. PROVIDE UNUSED WATER ITEMS TO OWNER.

1. EVAP COOLER TO BE USED AS SUPPLY FAN. DO NOT CONNECT WATER SUPPLY AND/OR DRAIN.
2. PROVIDE PHOENIX MANUFACTURING OR APPROVED EQUIVALENT.

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KWA PROJECT NO:	21014
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1

SHEET CONTENTS:
MECHANICAL DETAILS

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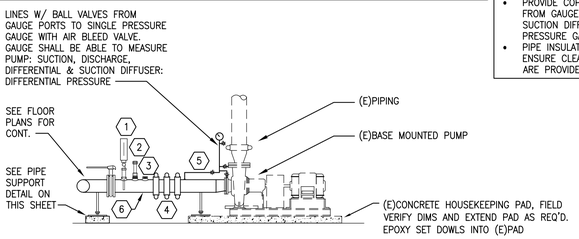
CDO CENTRAL PLANT

PUMP PIPING SCHEMATIC KEYNOTES (APPLIES TO ALL DETAILS):

1. ADJUSTABLE ANGLE THERMOMETER IN THERMOWELL WITH 2-1/2" LAGGING EXTENSION TO CLEAR INSULATION
2. P&T TEST PORT (PETE'S PLUG) WITH EXTENDED NECK (XL SERIES) TO CLEAR INSULATION – TYPICAL IN & OUT MAINS
3. PROVIDE PLUGGED WELD-O-LET, SPARE. TYPICAL EACH MAIN.
4. VICTUALIC GROOVE COUPLINGS PER SPECIFICATIONS.
5. PROVIDE MIN. 5 PIPE DIAMETERS OF STRAIGHT PIPE FROM PUMP TO NEAREST FITTING OR VALVE (TYP. INLET & OUTLET)
6. PROVIDE HIGH DENSITY PIPE INSULATION FOR PIPING LOW TO THE GROUND. SEE SPECIFICATIONS.

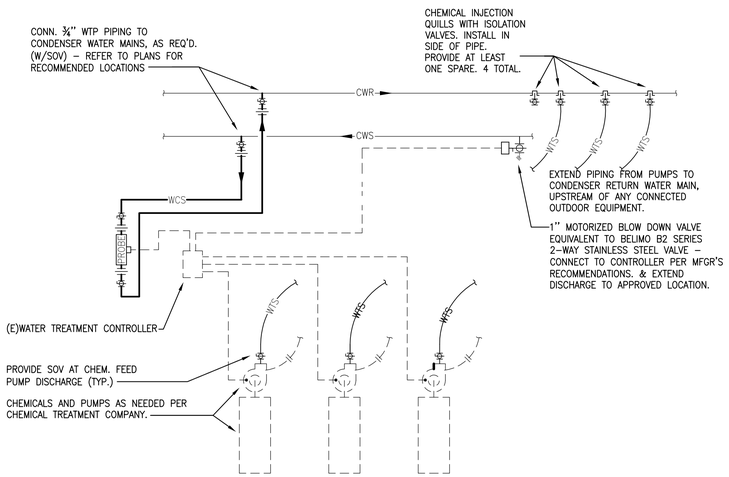
PUMP PIPING NOTES :

- ENSURE TO EXTEND VALVE STEMS AS REQUIRED TO ACCOMMODATE INSULATION THICKNESS.
- PROVIDE REMOVABLE INSULATION COVER OVER STRAINER ACCESS.
- PROVIDE COPY OF PUMP TAG TO FACE OF INSULATION.
- SUPPORT PIPING INDEPENDENT OF PUMP.
- PROVIDE COPPER PIPE & VALVES FROM GAUGE PORTS ON PUMP & SUCTION DIFFUSER TO SINGLE PRESSURE GAUGE
- PIPE INSULATION NOT SHOWN – ENSURE CLEARANCES FOR INSULATION ARE PROVIDED.



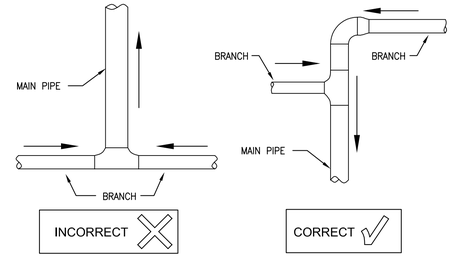
8 TYPICAL CHILLED WATER PUMP PIPING SCHEMATIC

SCALE: NONE



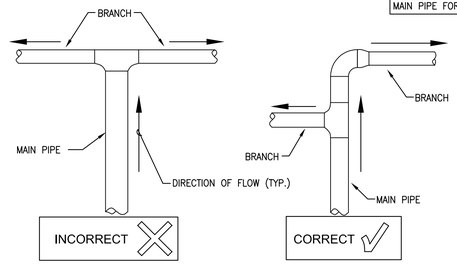
9 WATER TREATMENT PIPING SCHEMATIC

SCALE: NONE



RETURN FROM BRANCH PIPE(S) TO MAIN SCENARIO

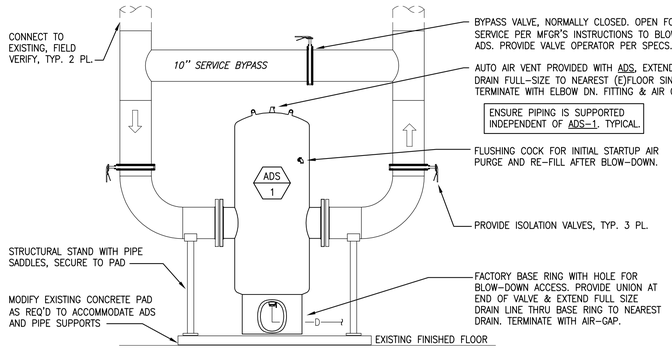
GENERAL NOTE:
SIZE OF BRANCH PIPING SHOULD BE LESS THAN OR EQUAL TO MAIN PIPE FOR EVERY CASE.



SUPPLY FROM MAIN TO BRANCH PIPE(S) SCENARIO

4 TYPICAL BULLHEAD TEE PIPING SCHEMATICS

SCALE: NONE

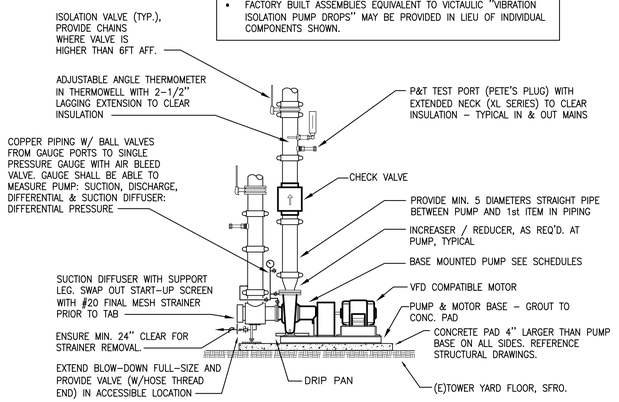


6 AIR / DIRT SEPARATOR PIPING SCHEMATIC

SCALE: NONE

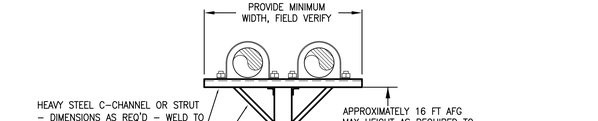
PUMP PIPING NOTES:

- SUPPORT PIPING INDEPENDENT OF PUMP.
- PROVIDE COPPER PIPE & VALVES FROM GAUGE PORTS ON PUMP & SUCTION DIFFUSER TO SINGLE PRESSURE GAUGE
- FACTORY BUILT ASSEMBLIES EQUIVALENT TO VICTAULIC "VIBRATION ISOLATION PUMP DROPS" MAY BE PROVIDED IN LIEU OF INDIVIDUAL COMPONENTS SHOWN.



7 TYPICAL CONDENSER WATER PUMP PIPING SCHEMATIC

SCALE: NONE



NOTES:

- ENTIRE ASSEMBLY SHALL BE WELDED AND PAINTED. REFER TO PAINT SPECIFICATION.
- ALL HARDWARE SHALL BE HOT DIPPED GALVANIZED OR STAINLESS STEEL.
- EACH SUPPORT SHALL ACCOMMODATE THE APPLICATION, # OF PIPES, MOMENT FORCES AND OPERATING WEIGHT AS REQ'D.

SINGLE OR MULTIPLE TALL PIPE SUPPORT

SUPPORT SPACING NOTES:
THE MIN. SUPPORT SPACING, AS REQ'D. PER CODE, IS PROVIDED HERE. HOWEVER, ADDITIONAL SUPPORT MAY BE REQ'D. FOR EVEN WEIGHT DISTRIBUTION DEPENDING ON PIPE LOCATION, SIZE, MATERIAL AND SERVICE.

PIPE SUPPORT SPACING	
PIPING MATERIAL	MAXIMUM HORIZONTAL SPACING
STEEL PIPE	12 FEET

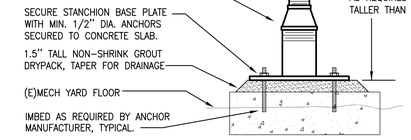
NOTE: SPACING PER 2018 IMC

1 TYP. ELEVATED PIPE SUPPORT (GROUND MOUNTED - MECHANICAL YARD) DETAIL

SCALE: NONE

NOTES:

- DETAIL BASED ON ANVIL ADJUSTABLE PIPE SADDLE SUPPORT WITH U-BOLT AND THREADED END STANCHION. PROVIDE ANVIL FIG. 265 (ZINC PLATED) WITH FIG. 63T (HOT DIPPED GALVANIZED) OR APPROVED EQUIVALENT ASSEMBLIES.
- EACH SUPPORT SHALL ACCOMMODATE APPLICATION, PIPE DIAMETER & OPERATING WEIGHT FOR EACH SYSTEM AS REQ'D. – COOR'D. WITH MANUFACTURER OF PIPE SUPPORT USED.
- ENSURE SUPPORT DOES NOT RESTRICT MOVEMENT OF PIPING AND SHALL BE INSTALLED SO THAT INSULATION IS NOT DAMAGED TO MAINTAIN A CONTINUOUS VAPOR BARRIER



PIPE SUPPORT SPACING	
PIPING MATERIAL	MAXIMUM HORIZONTAL SPACING
STEEL PIPE	12 FEET

NOTES:
1. SPACING SHOWN IN TABLE BASED ON 2018 IMC TABLE 305.4
2. ADDITIONAL SUPPORTS ARE REQ'D. AT ALL CHANGES IN DIRECTION AND AS REQUIRED TO ELIMINATE SAGGING.
3. ADDITIONAL SUPPORTS MAY BE REQ'D. FOR EVEN WEIGHT DISTRIBUTION DEPENDING ON PIPE LOCATION, SIZE, MATERIAL AND SERVICE.
4. PROVIDE SUPPORTS AT INTERVALS TO ENSURE MAX LOADING PER SUPPORT IS WITHIN MFGR'S ALLOWANCES
5. DO NOT EXCEED MAX SPACING AS DICTATED BY THE APPLICABLE CODES.
6. COORDINATE WITH THE MANUFACTURER FOR APPLICATION SPECIFIC PIPE SPACING REQUIREMENTS.

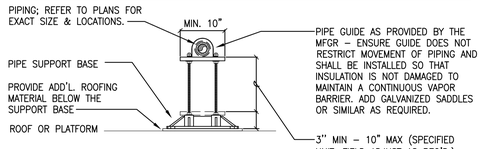
2 TYP. PIPE SUPPORT IN YARD DETAIL

SCALE: NONE

FOR HYDRONIC PIPING LOW TO FINISHED GROUND

PIPE SUPPORT SPECIFICATIONS:

- EQUIVALENT TO PORTABLE PIPE HANGERS MODEL #SS8C WITH STRUT AND PIPE GUIDE. UV RESISTANT, HIGH DENSITY, POST CONSUMER POLYPROPYLENE PLASTIC BASE WITH TWO 1/2" ALL-THREAD HOT DIPPED GALVANIZED ROD RISERS. USE MIN. 14 GA. STRUT AND MFGR. PROVIDED HARDWARE FOR FIELD ASSEMBLY. MAX. WEIGHT LOADING = 2.5 LBS. PER SQ. IN. OF BASE. 8x10 BASE SHOWN = 200 LBS. MAX. LOADING. PROVIDE SUBMITTAL – CONTACT: PHP 1.714.465.7606.
- EQUIVALENT MANUFACTURERS : CLEARLINE "C-PORT" MODEL #CE10-8; MIRO INDUSTRIES MODEL #2.5 CONDUIT SUPPORT-12



SUPPORT SPACING NOTES:
THE MIN. SUPPORT SPACING, AS REQ'D. PER CODE, IS PROVIDED HERE. HOWEVER, ADDITIONAL SUPPORTS ARE REQ'D. AT ALL CHANGES IN DIRECTION, NEAR ROOF PENETRATIONS & TERMINATION LOCATIONS, AND AS REQUIRED TO ELIMINATE SAGGING. ADDITIONAL SUPPORTS MAY BE REQ'D. FOR EVEN WEIGHT DISTRIBUTION DEPENDING ON PIPE LOCATION, SIZE, MATERIAL AND SERVICE. COORDINATE WITH THE MANUFACTURER FOR APPLICATION SPECIFIC PIPE SPACING REQUIREMENTS.

PIPE SUPPORT SPACING	
PIPING MATERIAL	MAXIMUM HORIZONTAL SPACING
COPPER TUBING 1-1/4" AND SMALLER	6 FEET
COPPER TUBING 1-1/2" AND 2"	10 FEET

NOTES:
1. SPACING BASED ON 2018 IMC TABLE 305.4

3 TYP. PIPE SUPPORT DETAIL

SCALE: NONE

WATER AND DRAIN PIPING (2" DIA. MAX PER MFGR)

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SHEET CONTENTS:

MECHANICAL DETAILS

SHEET

M3.0

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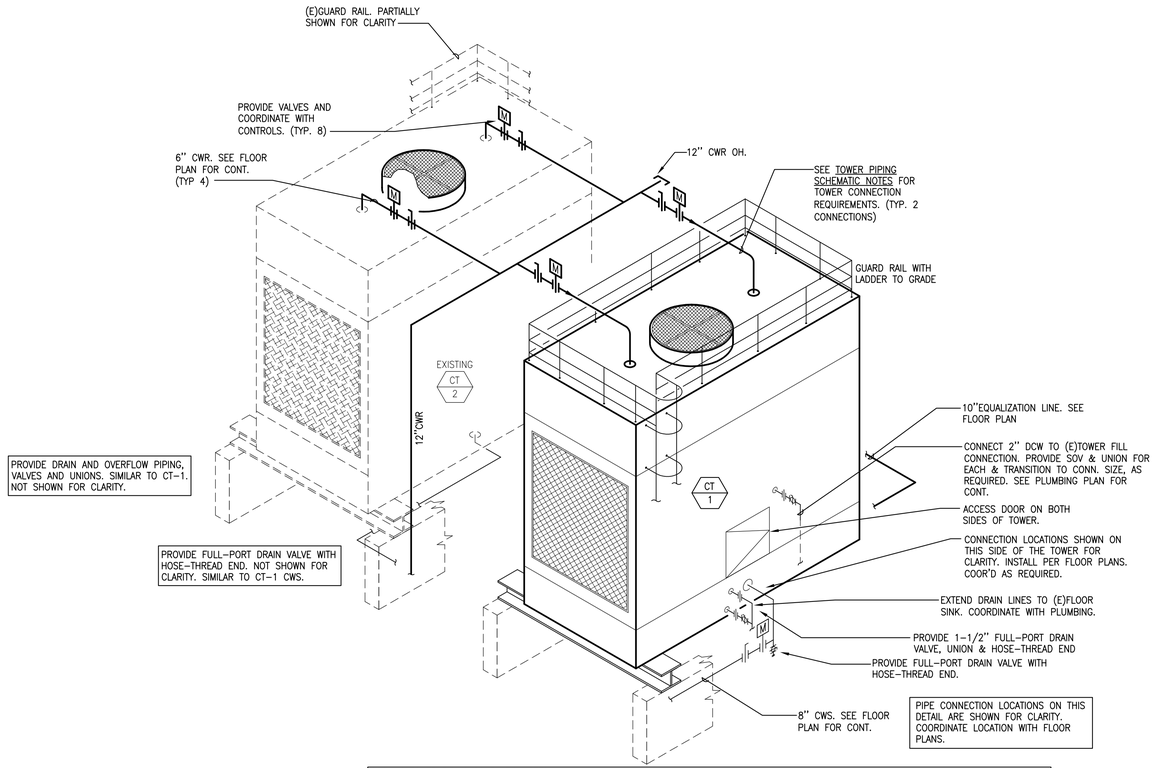
CDO CENTRAL PLANT



COOLING TOWER PIPING SCHEMATIC NOTES:

- CONNECTIONS SHOWN ARE DIAGRAMMATIC, COORDINATE CONNECTION CONFIGURATIONS WITH TOWER INSTALLATION REQUIREMENTS.
- PROVIDE MEANS FOR EQUIPMENT REMOVAL BY INSTALLING FLANGES, UNIONS OR GROOVED COUPLINGS AT ALL PIPE CONNECTIONS TO EQUIPMENT.
- TRANSITION FROM SIZES ON DRAWINGS TO CONNECTION SIZES AS CLOSE AS POSSIBLE TO EQUIPMENT, AS REQUIRED.
- ENSURE TRANSITION IS PROVIDED. IF TOWER CONNECTION SIZE MATCHES PIPING, PROVIDE "WATER LEG" TO ESTABLISH SIPHON DRAW.
- HORIZONTAL TRANSITIONS SHALL BE ECCENTRIC WITH FLAT TOPS.
- PIPE SUPPORTS NOT SHOWN. SUPPORT PIPING PER 2018 IMC REQUIREMENTS. ALSO REFER TO NOTES ON SHEET M1.1 AND DETAILS ON SHEET M3.0
- PROVIDE 10" EQUIALIZER LINE WITH ISOLATION VALVES TO CONNECT BOTH CT-1 AND (E)CT-2 AS REQUIRED..

1 COOLING TOWER PIPING SCHEMATIC

SCALE: NONE

Replace Tower & Modify Piping - Main Central Plant

Canyon Del Oro High School
25 W Calle Concordia
Oro Valley, AZ 85704

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KWA PROJECT NO:	21014
DATE:	December 1, 2021
DRAWN BY:	MB
DESIGNED BY:	MB
CHECKED BY:	DFK

REVISIONS:

1

SHEET CONTENTS:

MECHANICAL DETAILS

SHEET

M3.1

7 OF 12

CDO CENTRAL PLANT

SEQUENCE OF OPERATIONS

INTENT: MODIFY THE PLANT TO HAVE ROUND-ROBIN TOWER AND PUMPS TO SERVE THE EXISTING CHILLERS AND P&F HX. RE-USE EXISTING SEQUENCES INSOMUCH AS POSSIBLE FOR ITEMS NOT RELATED TO THIS PROJECT.

PLANT DESCRIPTION: TWO PIPE SYSTEM WITH PRIMARY / SECONDARY CHILLED WATER. 2 BOILERS, 2 CHILLERS, 2 TOWERS, PLATE AND FRAME HEAT EXCHANGER, 2 CONSTANT SPEED PRIMARY (CHILLER) PUMPS, 2 VARIABLE SPEED SECONDARY (SYSTEM) PUMPS, CONSTANT SPEED CONDENSER WATER PUMPS – 2 EXISTING BUT WILL BE REPLACED WITH 3 IN THIS PROJECT.

GENERAL: (APPLIES TO ALL SEQUENCES)

- ALL SCHEDULES, SETPOINTS AND ALARM SETTINGS ARE TO BE USER ADJUSTABLE, AND ALL START/STOP POINTS SHALL BE COMMANDABLE FROM THE WORKSTATION OR VIA INTERNET ACCESS.
- ALARMS SHALL BE PROVIDED AT THE WORKSTATION AND NOTIFY OWNER-DEFINED LIST VIA EMAIL OR SMS.
- DURING UNOCCUPIED PERIODS, IF SYSTEM IS COMMANDED TO RUN BY AUTOMATIC CONTROLS (SETPOINTS) OR AN OVERRIDE, THE SYSTEM SHALL RETURN TO NORMAL OCCUPIED MODE CONTROL SETTINGS AFTER COMMAND IS OVER.
- ITEMS IN [BRACKETS] SHALL BE USER ADJUSTABLE
- SCOPE RELATED TO "EMCS" REPRESENTS ITEMS INSTALLED AND PROGRAMMED INTO THE DISTRICT'S CENTRAL EMCS. THOSE ITEMS ARE INTENDED TO APPEAR ON AND BE CONTROLLED BY THE DISTRICT CENTRAL WORKSTATION.

CENTRAL PLANT CONTROLLER *** EXISTING SEQUENCE ASSUMED TO INCLUDE THE FOLLOWING – VERIFY ***

1. THE CENTRAL PLANT CONTROLLER STARTS AND STOPS THE CENTRAL PLANT EQUIPMENT BASED UPON OWNER'S SCHEDULE, WEATHER, AND SYSTEM LOAD.
2. SYSTEM SHALL TRACK OPERATING HOURS OF EACH PIECE OF EQUIPMENT IN THE CENTRAL PLANT AND AUTOMATICALLY ALTERNATE TO EQUALIZE RUN TIMES.

----

3. LEAD-LAG EQUIPMENT ALARMS
4. ALARM SHALL BE GENERATED AT THE EMCS WHENEVER THE LEAD TOWER OR PUMP IS COMMANDED TO RUN BUT DOES NOT PROVE FLOW. WHEN LEAD ITEM FAILS TO PROVE FLOW, LAG ITEM SHALL BE COMMANDED TO RUN.

CHILLERS *** EXISTING SEQUENCE ASSUMED TO INCLUDE THE FOLLOWING – VERIFY ***

5. CONTROLS CHILLERS (PARALLEL ARRANGEMENT) AND CHILLED WATER PRIMARY PUMPS AS NECESSARY TO PROVIDE THE REQUIRED CAPACITY TO MAINTAIN THE CHILLED WATER SETPOINT OF [44] °F. (FROM 1991 AS-BUILTS).
6. OPEN CHW ISOLATION VALVE FOR THE LEAD CHILLER AND ENABLE CHILLER. FLOW SWITCHES PROVE FLOW PRIOR TO STARTING CHILLER.
7. CHILLERS DETERMINE WHEN IT IS SAFE TO SHUT DOWN PUMPS. ISOLATION VALVES CLOSE AFTER PUMP FLOW HAS BEEN VERIFIED AS OFF.
8. CHILLER ISOLATION VALVES (CHILLED WATER AND CONDENSER WATER) CLOSED FOR NON-OPERATING CHILLERS.
9. RESETS CHW SUPPLY TEMPERATURE.
10. SYSTEM RAISES THE OPERATING CHILLER SETPOINT PRIOR TO STAGING ON THE NEXT CHILLER. SETPOINT OFFSET SHALL BE PROGRAMMED TO OCCUR [5] MINUTES PRIOR TO OPENING THE SECOND CHILLER'S ISOLATION VALVES AFTER THE SECOND CHILLER IS STAGED ON FOR [10] MINUTES, CHWS SETPOINT CAN BE RESET BACK TO ORIGINAL SETPOINT.
11. SYSTEM MODULATES CONDENSER WATER BYPASS VALVE AS REQUIRED TO SATISFY CHILLER ENTERING CONDENSER WATER LOW LIMIT SETPOINT [OBTAIN FROM FIELD] OR ABOVE.
12. "SOFT START" SEQUENCE WHENEVER THE SYSTEM CHILLED WATER TEMPERATURE EXCEEDS THE SPECIFIED CHILLED WATER SYSTEM SETPOINT BY [20] °F AT SYSTEM START-UP. ADD COOLING CAPACITY DURING SOFT START MODE ONLY IF RETURN WATER TEMPERATURE IS NOT DECLINING AT A RATE OF AT LEAST [0.5]°F PER MINUTE. THIS PREVENTS THE UNNECESSARY OPERATION OF CHILLERS AND LIMITS SYSTEM ELECTRICAL DEMAND DURING CHILLED WATER LOOP PULL DOWN.

PRIMARY AND SECONDARY PUMPS *** EXISTING SEQUENCE ASSUMED TO INCLUDE THE FOLLOWING – VERIFY ***

13. SECONDARY PUMP SPEED MODULATED BY EMCS TO MAINTAIN MINIMUM CHW PRESSURE SETPOINT.
14. PRIMARY PUMPS OPERATED ONE PER CHILLER. LEAD-LAG CONFIGURATION.

COOLING TOWER SYSTEMS

15. OPERATE TOWERS LEAD-LAG. ALTERNATE LEAD TOWER EVERY [14] DAYS – OBTAIN FINAL VALUE FROM OWNER. PROVIDE MANUAL "LEAD" SELECTION BUTTON ON FRONT END GRAPHIC.
16. OPEN LEAD COOLING TOWER ISOLATION VALVES. INLET & OUTLET VALVES SHALL BE MODULATED SIMULTANEOUSLY.
17. LEAD CONDENSER WATER PUMP SHALL BE COMMANDED TO RUN.
18. COOLING TOWER FAN SPEED SHALL BE MODULATED BY THE FAN VFD FROM OFF TO MAXIMUM SPEED AS REQUIRED TO MAINTAIN CWS SETPOINT OF [85°F].
19. FAN SHALL BE OFF WHEN BYPASS IS OPEN.
20. FAN SHALL HAVE A [5 MINUTE] MINIMUM ON, OFF, AND SPEED CHANGE RUN TIME.
21. RESET CONDENSER WATER SUPPLY TEMPERATURE DOWN WHEN OUTDOOR WETBULB TEMPERATURE IS LOWER THAN [60] °F. RESET SHALL BE CONTROLLED TO LIMIT THE RATE OF CHANGE IN TEMPERATURE AS REQUIRED TO SATISFY THE CHILLER MANUFACTURER'S RECOMMENDATIONS. CWS TEMP SHALL NOT BE ALLOWED TO DROP BELOW [60] °F WHEN IN CHILLER MODE (CONFIRM VALUE WITH CHILLER MANUFACTURER) AND NOT LESS THAN [45] °F IN HEAT EXCHANGER / ECONOMIZER MODE.
22. ADD LAG TOWER IF LAG CHILLER IS STARTED.
23. DISABLE TOWERS IN REVERSE SEQUENCE.

COOLING TOWER PUMPS

24. OPERATE PUMPS IN ROUND-ROBIN LEAD-LAG ARRANGEMENT. ALTERNATE LEAD PUMP EVERY [14] DAYS – OBTAIN FINAL VALUE FROM OWNER. PROVIDE MANUAL "LEAD" SELECTION BUTTON ON FRONT END GRAPHIC (FOR EACH PUMP).
25. CONDENSER WATER PUMP VFDs ARE TO BE USED FOR SOFT-START AND BALANCING ONLY – PUMPS SHALL RUN AT CONSTANT SPEED / CONSTANT FLOW RATE.

HEAT EXCHANGER – WHEN HX MODE IS ENABLED, THE SEQUENCE IS AS FOLLOWS: *** EXISTING SEQUENCE ASSUMED TO INCLUDE THE FOLLOWING – VERIFY ***

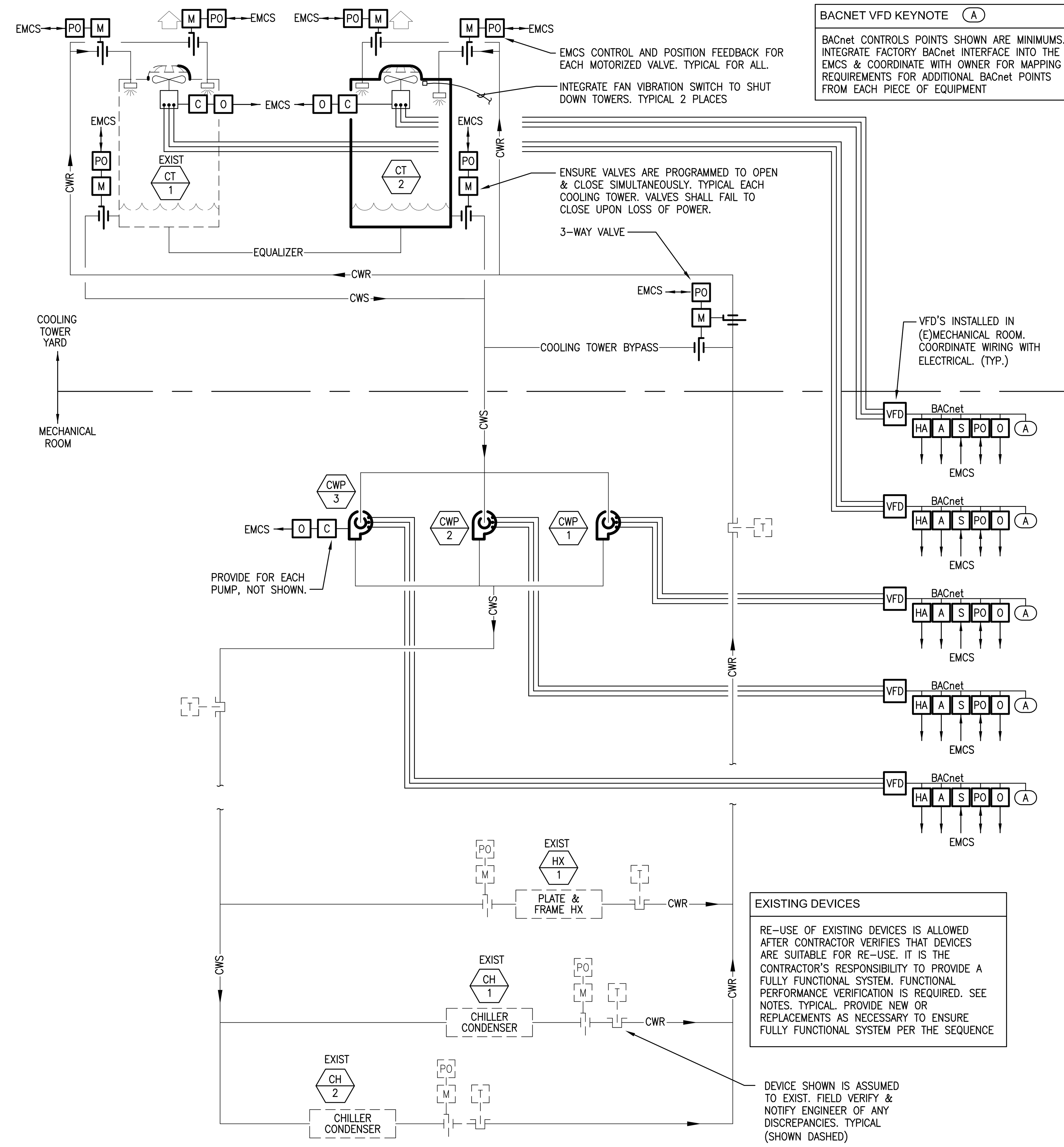
26. DISABLE CHILLERS AND CHILLED WATER PRIMARY PUMPS.
27. VERIFY CHILLED WATER AND CONDENSER WATER ISOLATION VALVES ARE CLOSED.
28. COMMAND HEAT EXCHANGER CHW AND CW ISOLATION VALVES OPEN;
29. OPERATE CHILLED WATER PUMPS PER EXISTING SEQUENCE.
30. ENABLE LEAD COOLING TOWER AND LEAD CONDENSER WATER PUMP. OPERATE PER COOLING TOWER SEQUENCE ABOVE.
31. MODULATE COOLING TOWER FAN SPEED TO MAINTAIN CWS SETPOINT OF [50] °F (PER 1991 AS BUILTS).
    31.1. RESET SETPOINT UP IF CHW TEMPERATURE DROPS BELOW SETPOINT

BOILERS:

32. NO SCOPE IN THIS PROJECT.

CONTROLS GENERAL NOTES

1. EXISTING CONDITIONS: THERE IS AN EXISTING BACnet KMC CONTROL SYSTEM (EMCS) SERVING THE CENTRAL PLANT EQUIPMENT AT THIS SITE.
   - 2.1. INTENT IS TO RE-USE SENSORS AND CONTROLS DEVICES THAT ARE SUITABLE FOR RE-USE AND COMPATIBLE WITH THE NEW SEQUENCE OF OPERATIONS.
   - 2.2. THE EXISTING SEQUENCE OF OPERATIONS SHALL BE MODIFIED WITH THE SEQUENCE NOTED HEREIN.
3. INTENT: THE GENERAL INTENT OF THIS PROJECT IS TO MODIFY THE EXISTING EMCS AND SEQUENCE OF OPERATIONS AS NECESSARY TO CONTROL NEW AND MODIFIED EQUIPMENT. EQUIPMENT SCOPE INCLUDES: REPLACE ONE COOLING TOWER, ADD A VFD TO THE OTHER TOWER, REPLACE CONDENSER WATER PUMPS, AND MODIFY CONDENSER WATER PIPING TO PROVIDE A HEADERED CONFIGURATION. INTEGRATE THE NEW EQUIPMENT CONTROLS INTO THE AMPHI CENTRAL EMCS AS REQUIRED TO RENDER A COMPLETE AND FULLY FUNCTIONAL NETWORKED DDC CONTROL SYSTEM.
   - 3.1. ALL CONTROLS SHALL BE VIEWED AND CAPABLE OF BEING ADJUSTED FROM THE DISTRICT CENTRAL EMCS.
   - 3.2. UTILIZE PROTOCOL COMPATIBLE WITH THE EXISTING EMCS. DEVICES SHALL BE BTL-LISTED.
   - 3.3. CONTRACTOR SHALL PROVIDE ALL NECESSARY HARDWARE, SOFTWARE, ENGINEERING, INSTALLATION, SUPERVISION, LABOR, CALIBRATIONS, PROGRAMMING, AND COMMISSIONING NECESSARY FOR A COMPLETE AND FULLY OPERATIONAL SYSTEM. INCLUDES PROVIDING NIAGARA JACE CONTROLLER(S) AS REQUIRED TO FULLY INTEGRATE NEW EQUIPMENT CONTROLS WITH THE DISTRICT CENTRAL EMCS.
   - 3.4. SCOPE OF CONTROLS WORK SHALL INCLUDE DE-COMMISSIONING OF EMCS DEVICES PRIOR TO DEMO AND RE-CONNECTION OF RE-USED DEVICES AFTER NEW EQUIPMENT AND PIPING INSTALL. PROTECT SALVAGED DEVICES AND EXISTING-TO-REMAIN ITEMS.
   - 3.5. ADD COMPONENTS, HARDWARE AND SOFTWARE AS NECESSARY TO ACCOMPLISH THE SEQUENCE OF OPERATIONS.
   - 3.6. REVIEW DRAWINGS FOR ADDITIONAL SCOPE / CLARIFICATIONS.
4. PROVIDE POWER AND TRANSFORMERS AS REQUIRED FOR ANY EMCS ITEM. POWER SHALL BE TAKEN FROM THE NEAREST ELECTRICAL PANEL WITH SPARE CAPACITY OR FROM THEIR RESPECTIVE UNIT'S POWER SUPPLY IF APPROVED BY THE MANUFACTURER AND ELECTRICAL. OBTAIN APPROVAL FROM ELECTRICAL PRIOR TO MAKING ANY CONNECTIONS. COORDINATE WITH ELECTRICAL FOR LINE VOLTAGE WIRING AND CONDUIT. PROVIDE TRANSFORMERS AND LOW VOLTAGE WIRING, CONDUIT, AND ENCLOSURES AS REQUIRED (TYPICAL).
5. PROVIDE ALL NECESSARY COMPONENTS, CONDUIT, PANELS, ENCLOSURES, J-BOXES, ETC. TO RENDER A COMPLETE INSTALLATION.
   - 5.1. CONTROL WIRING SHALL BE IN MINIMUM 3/4" CONDUIT WHERE CONCEALED ABOVE CEILINGS WITHOUT ACCESS (HARD-LID), EXPOSED IN MECHANICAL ROOMS, OR OTHER OWNER-APPROVED EXPOSED LOCATIONS.
   - 5.2. PROVIDE IMC OR RMC FOR ANY CONDUIT EXPOSED TO POTENTIAL DAMAGE.
   - 5.3. DO NOT EXPOSE CONDUIT IN FINISHED SPACES UNLESS SPECIFICALLY AUTHORIZED BY THE OWNER IN WRITING.
   - 5.4. CONTROL WIRING OUTDOORS BELOW 10 FEET ABOVE FINISHED FLOOR / FINISHED GRADE SHALL BE RIGID IMC TYPE CONDUIT.
   - 5.5. CONTROL WIRING ABOVE LAY-IN CEILINGS MAY BE PLENUM RATED CABLING NEATLY ATTACHED AT MAXIMUM 8 FT. CENTERS TO STRUCTURE.
   - 5.6. CONDUIT MAY BE RE-USED IF FOUND TO BE COMPATIBLE WITH NEW WORK AND SUITABLE FOR RE-USE.
6. IDENTIFICATION: PROVIDE PERMANENT IDENTIFICATION ON ALL EMCS PANELS, CONDUIT, AND CABLING. IDENTIFICATION SHALL BE WP & UV RESISTANT, ENGRAVED NAMEPLATES, FACTORY STICKERS, OR SIMILAR – HANDWRITTEN (SHARPIE) IDENTIFICATION IS NOT ACCEPTABLE.
7. ENCLOSURES SHALL BE RATED FOR THE ANTICIPATED WORST-CASE ENVIRONMENT OF THE INSTALLATION LOCATION. PROVIDE HEATING AND/OR AIR CONDITIONING SYSTEMS FOR ENCLOSURES PER THE MANUFACTURER'S REQUIREMENTS OF ITEMS CONTAINED WITHIN THE ENCLOSURE.
8. LOCATE CONTROLLERS & EQUIPMENT IN ACCESSIBLE LOCATIONS WITH ADEQUATE SPACE FOR MAINTAINING EQUIPMENT AND CONTROLS.
9. LOCATE CONTROLLERS, PANELS, INTERFACE DEVICES, ETC. THAT REQUIRE REGULAR INSPECTION OR THAT SERVE MULTIPLE HVAC SYSTEMS IN MECHANICAL ROOMS OR OTHER APPROVED LOCATIONS.
10. COORDINATE ALL SENSOR LOCATIONS WITH EXISTING CONDITIONS. ALL SENSORS SHALL BE LOCATED IN ACCESSIBLE LOCATIONS AWAY FROM HEAT SOURCES AND WINDOWS. COMPLY WITH ADA REQUIREMENTS FOR MOUNTING ELEVATIONS.
11. COORDINATE WITH OWNER'S IT PERSONNEL FOR CONNECTION OF EMCS TO THE INTERNET OR INTRANET AS DICTATED BY THE OWNER. THIS CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE CORRECT TERMINATION TYPE AND LOCATION AS DICTATED BY THE OWNER. CONTROL SYSTEM SHALL BE VERIFIED AS 100% COMPLETE AND FUNCTIONAL PRIOR TO REQUESTING CONNECTION TO THE OWNER'S NETWORK. COMPLY WITH ALL OWNER'S CYBER SECURITY REQUIREMENTS AT NO ADDITIONAL COST.
12. TEMPERATURE SENSORS: THERMISTOR TYPE WITH ACCURACY OF +/- 0.36 °F, PROBE LENGTH AS RECOMMENDED BY MFGR FOR PIPE DIAMETER, STAINLESS STEEL THERMOWELL WITH HEAT TRANSFER PASTE.
13. JACE: JACE HARDWARE AND SOFTWARE SHALL BE FULLY COMPATIBLE WITH EXISTING DISTRICT SYSTEMS. COORDINATE WITH DISTRICT EMCS DEPARTMENT. ALL LICENSES SHALL BE OPEN AND NON-BRAND SPECIFIC. THE DISTRICT SHALL BE NAMED AS THE LICENSE HOLDER.
14. FRONT END: MODIFY DISTRICT-WIDE FRONT-END GRAPHICS AND DATABASE AS NECESSARY FOR COMPLETE INTEGRATION OF THE NEW EQUIPMENT INTO THE CENTRAL EMCS. COORDINATE ALL WORK AT THE DISTRICT'S FRONT END WORKSTATION WITH THE OWNER AND, AS APPLICABLE, THE WORKSTATION SERVICE PROVIDER. GRAPHICS AND PAGE LAYOUT SHALL MATCH EXISTING EXAMPLES OF SIMILAR SYSTEMS – COORDINATE WITH OWNER PRIOR TO ANY WORK.
15. FUNCTIONAL PERFORMANCE TESTING: VERIFY BY TESTING THAT THE NEW AND EXISTING SEQUENCE PROGRAMS RELATED TO THE NEW EQUIPMENT ARE FUNCTIONING AS INTENDED. PERFORM POINT-TO-POINT COMMISSIONING OF ALL NEW AND EXISTING POINTS RELATED TO THE SYSTEM. VERIFY FUNCTION OF EACH STEP IN EACH SEQUENCE OF OPERATION. VERIFY TREND LOGS FUNCTION AS INTENDED. ALSO REFER TO COMMISSIONING REQUIREMENTS ON DRAWINGS.
   - 15.1. ISSUE SUMMARY OF TESTING PROCEDURE PRIOR TO TESTING.
   - 15.2. ISSUE REPORT OF COMPLETE TESTING FOR APPROVAL BY OWNER & ENGINEER.
   - 15.3. NOTE THAT THIS REQUIREMENT SHALL BE PROVIDED BY BOTH THE EQUIPMENT MANUFACTURER AND/OR THEIR LOCAL REPRESENTATIVE FOR ALL CONTROLS PROVIDED WITH EQUIPMENT AND BY THE CONTROLS CONTRACTOR PROVIDED ITEMS INCLUDING INTEGRATING ALL AVAILABLE POINTS INTO THE EXISTING DISTRICT'S FRONT-END.
16. TRAINING: PROVIDE FACTORY CERTIFIED INSTRUCTORS FOR 3 HOURS OF SITE-SPECIFIC TRAINING FOR OWNER PERSONNEL. PROVIDE OWNER WITH PROPOSED TOPICS OF DISCUSSION A MINIMUM 2 WEEKS PRIOR TO THE TRAINING SESSION. TRAINING SHALL BE HELD AT OWNER-SELECTED LOCATION (ASSUME ON-SITE) AT NO ADDITIONAL COST TO THE OWNER.
17. COMPLY WITH PROJECT SPECIFICATIONS INCLUDING BUT NOT LIMITED TO: WARRANTY, SUBMITTALS, AS-BUILTS, O&MS. IN ADDITION TO THESE REQUIREMENTS SUBMITTALS SHALL INCLUDE LOGIC DIAGRAMS / FLOW DIAGRAMS SHOWING EACH CONTROLLED EQUIPMENT WITH ALL CONTROL FEATURES INDICATING PARTS REQUIRED AND CONNECTIVITY.
18. DOCUMENTATION TO THE OWNER SHALL INCLUDE ALL PASSWORDS, ACCESS CODES, IP ADDRESSES RELEVANT TO THE SYSTEM, DEVICE ADDRESSES, SOFTWARE BACKUPS, LEGAL SOFTWARE LICENSES, OPERATING MANUALS, TRAINING GUIDES, ETC. CONTRACTOR SHALL PROVIDE THE APPROPRIATE QUANTITY OF LEGAL COPIES OF ALL SOFTWARE TOOLS, CONFIGURATION TOOLS, MANAGEMENT TOOLS, AND UTILITIES USED DURING SYSTEM COMMISSIONING AND INSTALLATION. ALL TOOLS SHALL BE GENERALLY AVAILABLE IN THE MARKET. NO CLOSED AND/OR UNAVAILABLE TOOLS WILL BE PERMITTED. CONTRACTOR SHALL CONVEY ALL SOFTWARE TOOLS AND THEIR LEGAL LICENSES AT PROJECT CLOSE OUT.



1 CONDENSER WATER CONTROLS SCHEMATIC
SCALE: NONE

CONTROLS SYMBOLS AND ABBREVIATIONS

CWR	CONDENSER WATER RETURN	A	ALARM INDICATION
CWS	CONDENSER WATER SUPPLY	C	CURRENT SENSOR (STATUS)
CHWR	CHILLED WATER RETURN	HA	HAND / AUTO MODE INDICATION
CHWS	CHILLED WATER SUPPLY	M	ELECTRIC VALVE OPERATOR
EMCS	ENERGY MONITORING & CONTROL SYSTEM	O	ON/OFF STATUS INDICATION
SCHEM	SCHEMATIC	PI	PRESSURE INDICATION (ANALOG)
SFRO	SHOWN FOR REFERENCE ONLY	PO	POSITION INDICATION AND ADJUSTMENT, INDICATE FREQUENCY FOR VFDs (ANALOG)
WB	WET BULB	R	TEMP RESET FOR CHILLED WATER (ANALOG)
— —	REPRESENTATION FOR WIRING / CABLING	S	START / STOP INTERFACE (ENABLE / DISABLE)
(symbol)	POWER CONNECTION, SFRO, REF. ELECTRICAL	T	TEMPERATURE INDICATION (ANALOG)
		VFD	VARIABLE FREQUENCY DRIVE, BACnet

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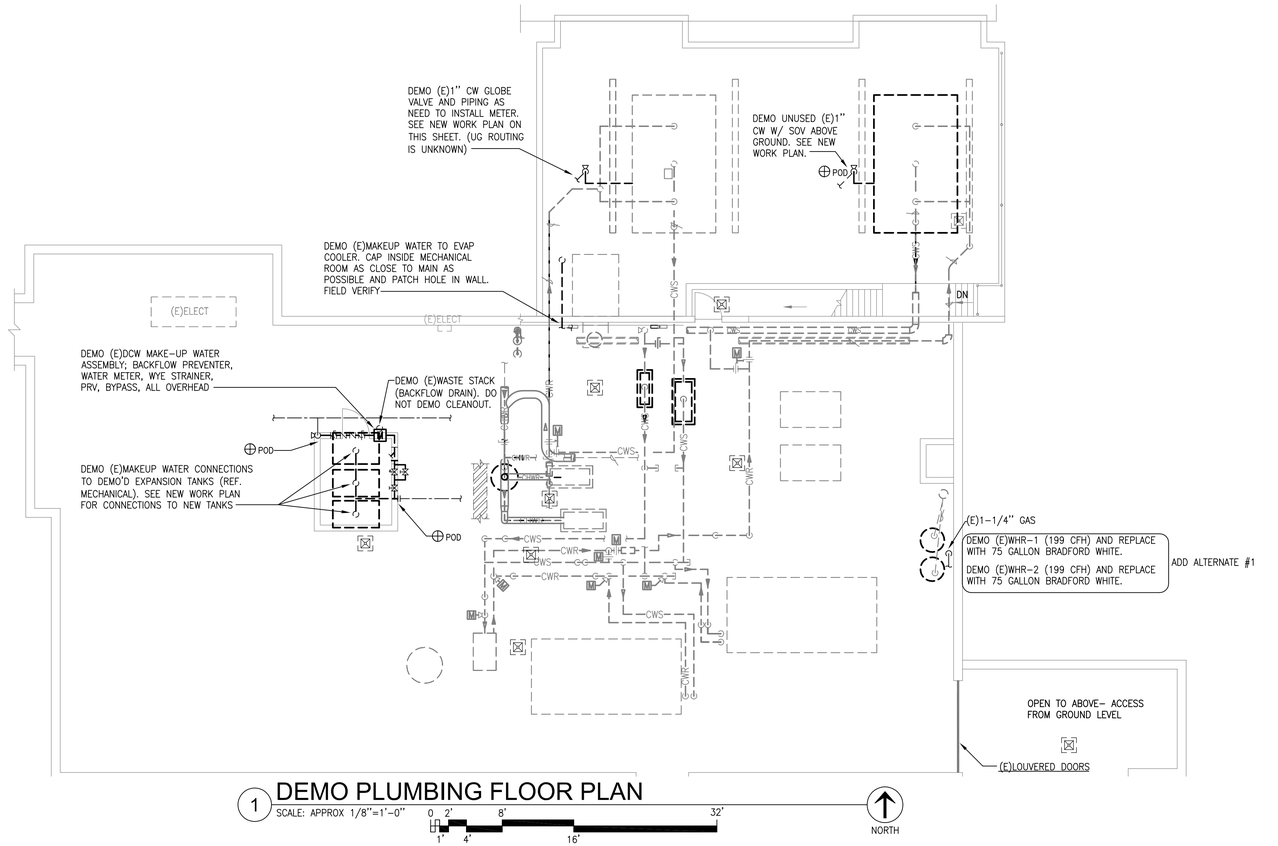
CHECKED BY:	DFK

REVISIONS:
#

SHEET CONTENTS:
HVAC CONTROLS

SHEET
M5.0



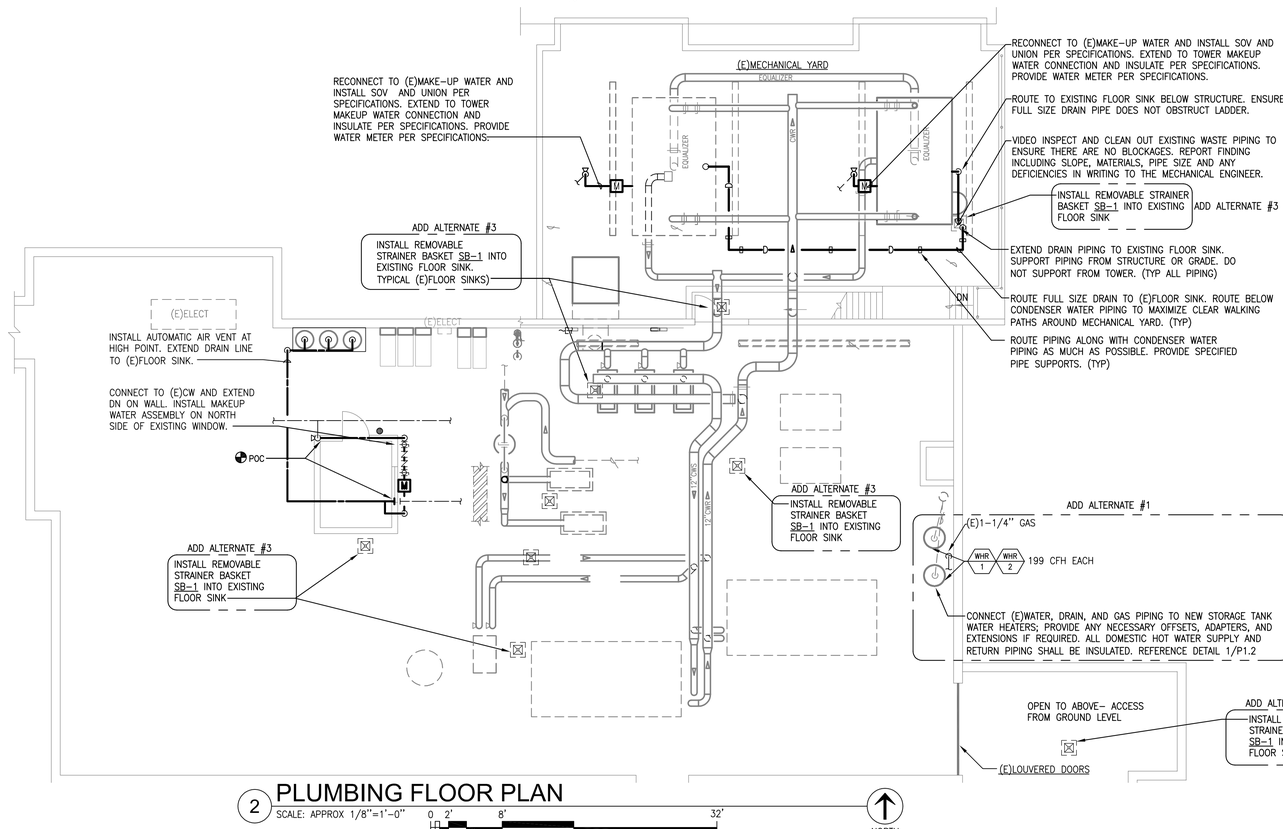
1 DEMO PLUMBING FLOOR PLAN

SCALE: APPROX 1/8"=1'-0"

0 2' 8' 32'

1" 4" 16"

NORTH



2 PLUMBING FLOOR PLAN

SCALE: APPROX 1/8"=1'-0"

0 2' 8' 32'

1" 4" 16"

NORTH

Replace Tower & Modify Piping - Main Central Plant

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CHECKED BY:	DFK

REVISIONS:

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SHEET CONTENTS:

DEMO AND RENOVATON PLUMBING FLOOR PLAN

SHEET

P1.0

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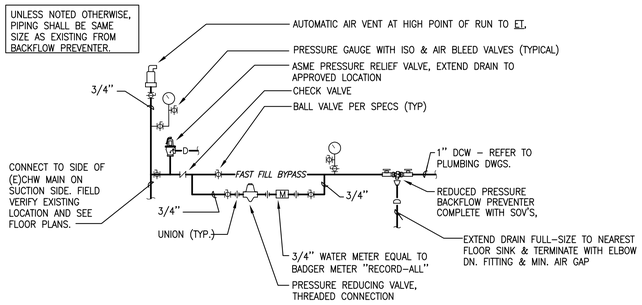
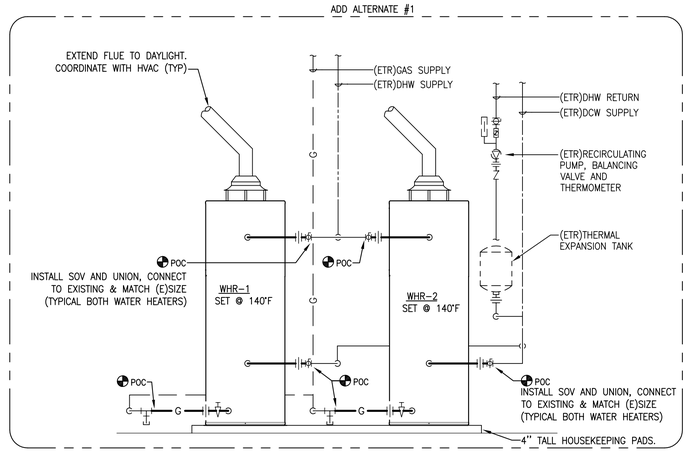
CDO CENTRAL PLANT



2 MAKE-UP WATER ASSEMBLY SCHEMATIC

SCALE: NO SCALE

ADD ALTERNATE #1



1 WATER HEATER SCHEMATIC

SCALE: NO SCALE

ADD ALTERNATE #1

DOMESTIC HOT WATER HEATER SCHEDULE

MARK	MANUFACTURER	MODEL	STORAGE CAPACITY	ELECTRICAL		OUTLET TEMP.	RECOVERY CAPACITY		CONNECTIONS		EFFICIENCY SL OR EF	LOCATION	REMARKS / SYSTEM COMPLETE WITH:
				INPUT	VOLTAGE		ΔT (°F)	GPH	CW	HW			
WHR-1	BRADFORD WHITE	D-80T-199-5N	80 GAL.	199 CFH	120V/1ph	140° F	100	194	1½"	1½"	MEETS OR EXCEEDS ASHRAE 90.1b	MECHANICAL ROOM	CERTIFIED AT 300 PSI TEST PRESSURE AND 150 PSI WORKING PRESSURE; INTEGRATED DIGITAL LCD DISPLAY SHALL BE INTEGRATED; ADJUSTABLE ELECTRONIC THERMOSTAT UP UP 180°F; AUTOMATIC RE-SET ENERGY CUT-OFF (E.C.O), WHICH SHUTS OFF ALL GAS IN AN EVENT OF A OVERHEAT CONDITION. MAGNESIUM ANODE RODS INSTALLED IN SEPARATE TANK HEAD COUPLINGS. NON-CFC FOAM INSULATION, ELECTRONIC IGNITION, ASME RATED T&P RELIEF VALVE, A COLD WATER INLET SEDIMENT REDUCTION SYSTEM; AUTOMATIC FLUE DAMPER (115V AC REQUIRED). CSA CERTIFIED; ANSI STANDARD Z21.10.3. 5 YEAR TANK WARRANTY; 1 YEAR WARRANTY ON PARTS
WHR-2	BRADFORD WHITE	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	

1. MANUFACTURERS: A.O. SMITH, BRADFORD WHITE, HUBBELL, LOCHINVAR, RHEEM
2. INSTALL TO ENSURE UNIT HAS SUFFICIENT MAINTENANCE ACCESS CLEARANCES. COORDINATE WITH OTHER TRADES.

ADD ALTERNATE #3

MARK	FIXTURE	QTY	GENERAL DESCRIPTION
SB-1	STRAINER BASKET	9	PROVIDE REMOVABLE, PERFORATED 20-GAGE 304 STAINLESS STEEL SQUARE BASKET: APPROXIMATELY 11"X11"X4" DEEP (VERIFY DIMENSIONS WILL FIT EXISTING FLOOR SINK BASINS). 5/32 HOLES ON 3/16" STAGGERED CENTERS (63% OPEN AREA), 1/4" DIAMETER ROD FRAME, RIGID SQUARE LOOP HANDLE WITH CENTER LIFTING "V", HANDLE HEIGHT = 1/2 BASKET WIDTH. 1. MANUFACTURER / MODEL: THREE M TOOL, PART #TMP-110110040-F156S (WWW.ANYSIZEBASKET.COM), OR EQUAL. 2. REMOVABLE TOPS

Replace Tower & Modify Piping - Main Central Plant

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KWA PROJECT NO:	21014
DATE:	December 1, 2021
DRAWN BY:	MB
DESIGNED BY:	MB
CHECKED BY:	DFK

REVISIONS:

1

SHEET CONTENTS:

PLUMBING DETAILS AND SCHEDULES

SHEET

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CDO CENTRAL PLANT

ELECTRICAL GENERAL NOTES

a. VERIFY EXACT LOCATIONS AND MOUNTING HEIGHTS OF ALL MECHANICAL EQUIPMENT PRIOR TO ROUGH IN. CAREFULLY REVIEW MECHANICAL DRAWINGS TO AVOID CONFLICTS.

b. VERIFY ELECTRICAL RATINGS AND LOCATIONS OF HVAC EQUIPMENT AND CONFIRM ALL REQUIRED CLEARANCES PRIOR TO START OF WORK. COMPLETELY CONNECT ALL EQUIPMENT FOR A COMPLETE FUNCTIONAL INSTALLATION.

c. ALL PIPING AND CONDUIT SHALL BE COORDINATED WITH MECHANICAL PIPING ROUTING PRIOR TO THE START OF ANY WORK. PIPING OR CONDUIT SHALL RUN PARALLEL TO MECHANICAL PIPING WHERE REQUIRED BY SPACE LIMITATIONS.

d. ALL PENETRATIONS THROUGH EXTERIOR WALL AND ROOFS SHALL BE SLEEVED, FLASHED AND SEALED WATERPROOF. PROVIDE ESCUTCHEON PLATES WHERE WALL PENETRATIONS ARE EXPOSED.

e. THE WORK COVERED ON THESE DRAWINGS SHALL INCLUDE THE FURNISHING OF ALL LABOR, MATERIALS, TRANSPORTATION, TOOLS, APPLIANCES, FEES, AND PERMITS REQUIRED FOR THE INSTALLATION OF A COMPLETE AND OPERATING ELECTRICAL SYSTEM. DRAWINGS ARE DIAGRAMMATIC IN NATURE AND ARE NOT INTENDED TO SHOW EVERY DETAIL. THE CONTRACTOR SHALL PROVIDE BOXES, ACCESS PANELS, ETC. AS REQUIRED BY CODE AND INDUSTRY PRACTICE.

f. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THIS PHASE OF THE WORK WITH ALL EXISTING CONDITIONS AND WITH OTHER TRADES.

g. ALL WORK SHALL COMPLY WITH THE APPLICABLE RULES OF THE NATIONAL ELECTRICAL CODE, LOCAL ELECTRICAL CODES AND ORDINANCES.

h. ALL MATERIALS SHALL BE NEW AND BEAR THE U.L. SEAL. MATERIALS SHALL CONFORM TO REQUIREMENTS OF THE 2017 N.E.C., WHERE APPLICABLE.

i. ALL CONDUCTORS SHALL BE STRANDED SOFT-DRAWN ANNEALED COPPER WITH XHHW INSULATION. MINIMUM WIRE SIZE SHALL BE #12 UNLESS OTHERWISE NOTED.

j. THE COMPLETE ELECTRICAL SYSTEM SHALL BE GROUNDED IN ACCORDANCE WITH N.E.C. ART. 250. PROVIDE GROUNDING WIRE IN ALL CONDUITS.

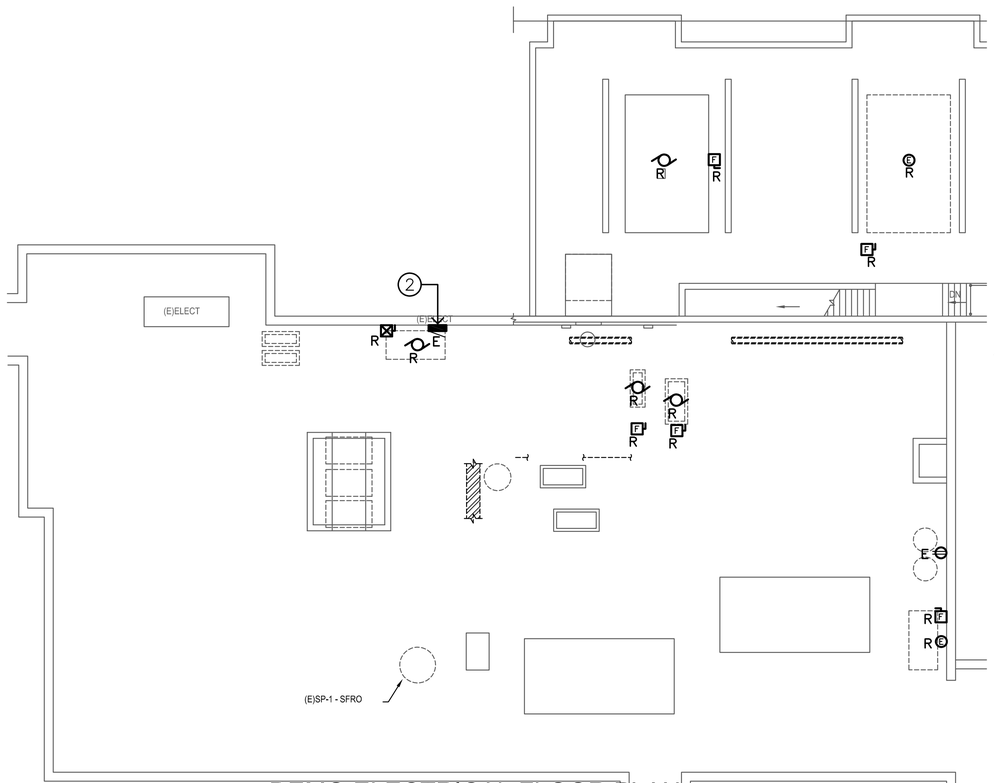
k. CONTRACTOR SHALL VISIT THE SITE AND FAMILIARIZE HIMSELF WITH ALL EXISTING CONDITIONS PRIOR TO SUBMITTAL OF BID. VERIFY ALL EXISTING CIRCUITS TO BE REUSED PRIOR TO CONNECTIONS.

l. THE ELECTRICAL CONTRACTOR SHALL GUARANTEE AGAINST DEFECTS IN MATERIALS, EQUIPMENT, OR WORKMANSHIP FOR A PERIOD OF TWO (2) YEARS UPON OWNER'S FINAL ACCEPTANCE. CONTRACTOR SHALL REPAIR OR REPLACE ANY DEFECTS TO THE SATISFACTION OF THE OWNER AT NO ADDITIONAL COST.

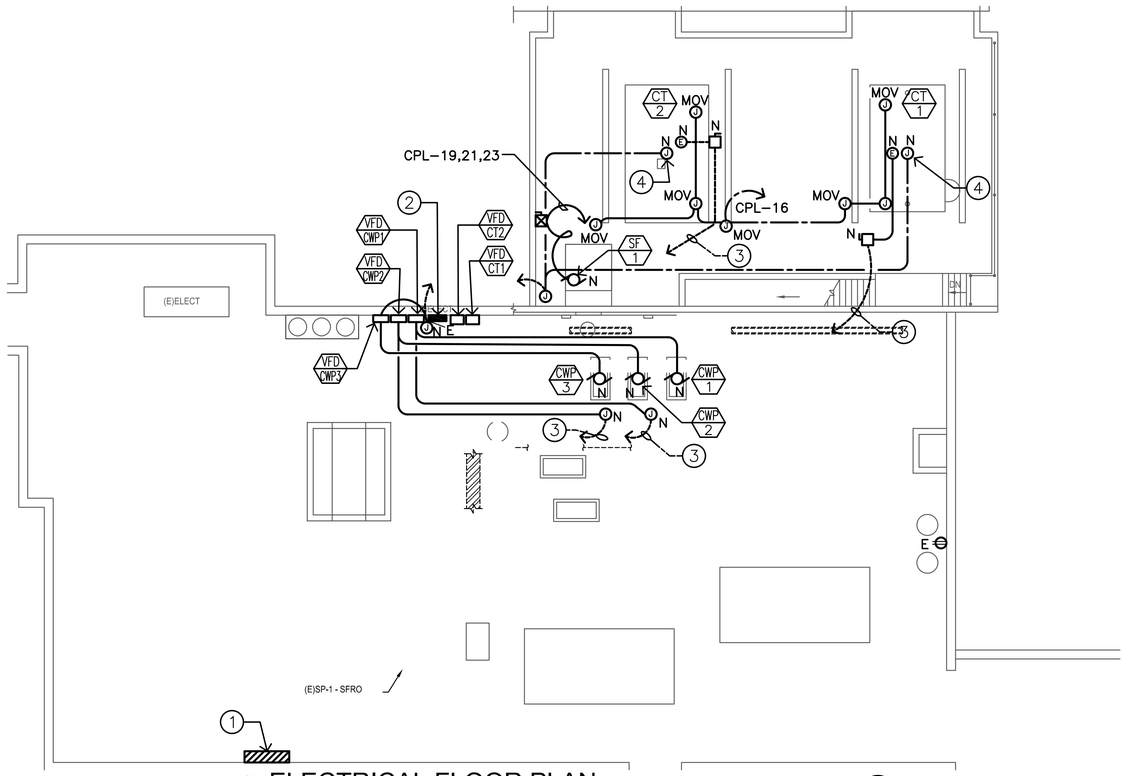
m. PROVIDE PERMANENT NAME PLATES TO ALL EQUIPMENT. EXTERIOR NAMEPLATES SHALL BE WP/UV PROOF TYPE.

○ KEYNOTES:

1. EXISTING SERVICE TO REMAIN.
2. EXISTING PANEL "CPC" TO REMAIN.
3. EXISTING FEEDER TO REMAIN.
4. VIBRATION SENSOR.



1 DEMO ELECTRICAL FLOOR PLAN
SCALE: APPROX 1/8"=1'-0"
0 2' 8' 32'
1' 4' 16'
NORTH



1 ELECTRICAL FLOOR PLAN
SCALE: APPROX 1/8"=1'-0"
0 2' 8' 32'
NORTH

ELECTRICAL SYMBOLS

E R	EXISTING ELECTRICAL CONNECTION TO BE REMOVED.
F R	EXISTING DISCONNECT SWITCH TO BE REMOVED.
R	EXISTING MOTOR CONNECTION TO BE REMOVED.
E	EXISTING PANELBOARD TO REMAIN.
E	EXISTING RECEPTACLE TO REMAIN.
R	EXISTING STARTER MOTOR SWITCH TO BE REMOVED.
	HOMERUN TO EXISTING PANEL
	RACEWAY CONCEALED IN WALL OR CEILING, (2) #12, (1) #12 GRD. IN 1/2"C. U.N.O.
N E	NEW ELECTRICAL CONNECTION.
N J	NEW JUNCTION BOX CONNECTION.
N	NEW NON-FUSED DISCONNECT SWITCH.
N F	NEW FUSED DISCONNECT SWITCH.
N	NEW MOTOR.
	NEW VFD.

LOCKOUT - TAGOUT - TESTOUT

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CERTIFICATE NO.
23911
FERNANDO GALVEZ
Date Signed 4/9/21
ARIZONA U.S.A.
EXPIRES 12-31-23

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KWA PROJECT NO:	21014
DATE:	NOVEMBER 12, 2021
DRAWN BY:	ND
DESIGNED BY:	ND
CHECKED BY:	FG

REVISIONS:
1

SHEET CONTENTS:
DEMO AND RENOVATON ELECTRICAL FLOOR PLAN

SHEET
E1.1
____ OF ____
CDO CENTRAL PLANT

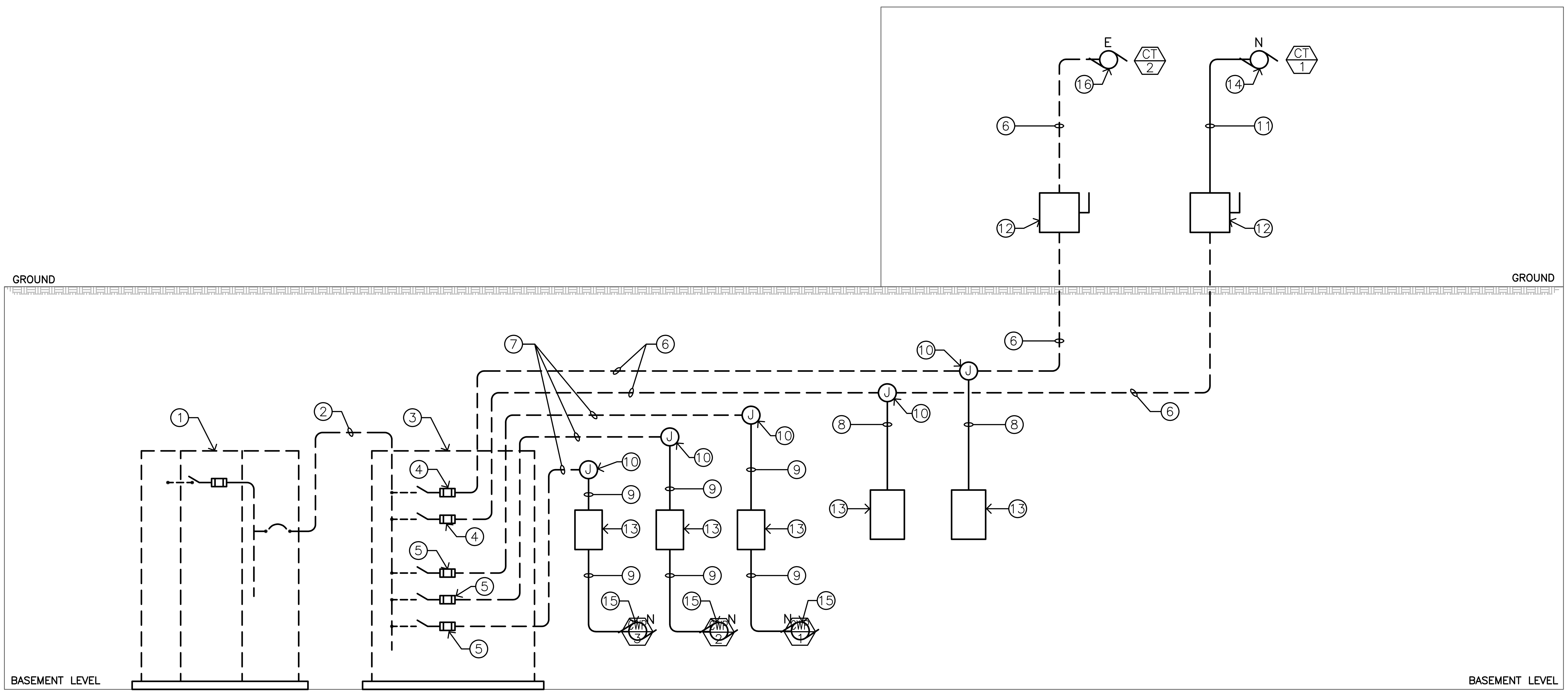
PANEL CPC	120 / 208 VOLTS,	3 PHASE,	4 WIRE
TYPE –	– MINIMUM A.I.C. RATING		
100 A. BUS	100 A. MAIN	LUGS ONLY	MOUNTING FLUSH ☐
LOCATION –			SURFACE ☒
–			ENCLOSURE: NEMA 1

		SERVES	BKR	WIRE	COND	LOAD KVA A	LOAD KVA B	LOAD KVA C	COND	WIRE	BKR	SERVES		
	1	EXIST EQ	20/1	–	–	0.5 1.5			–	–	20/	EXIST EQ	2	
	3			–	–		0.5 1.5		–	–	/2		4	
	5			–	–			0.5 1.5	–	–	20/1		6	
	7			–	–	0.5 1			–	–			8	
	9			–	–		0.5 1		–	–			10	
	11			–	–			0.5 1	–	–			12	
	13			–	–	0.5 1			–	–			14	
	15			–	–		0.5 1		1/2"	12		NEW MOV	16	*
**	17			–	–			0.5 –	–	–	–	SPACE	18	
*	19	NEW "SF-1"	20/	12	1/2"	0.8 0.8			–	–	20/	EXIST MAU	20	
	21						0.8 0.8		–	–			22	
	23		/3					0.8 0.8	–	–	/3		24	
	● CONTINUOUS LOAD X 1.25					–	–	–	REMARKS:					
	NON-CONTINUOUS LOAD X 1					7	7	6						
	#					–	–	–	TOTAL CONNECTED LOAD = 20 KVA					
	DEMAND KVA/PHASE					7	7	6						
	DEMAND AMPS/ PHASE					59	59	50	DEMAND LOAD = 20 KVA					

* INDICATES NEW CIRCUIT BREAKER, NEW WIRE, AND NEW CONDUIT.
** CIRCUIT BREAKER RELOCATED FROM 19 TO 17.

◯ KEYNOTES:

1. EXISTING 2500A, 480/277V-3ø-4W, SERVICE TO REMAIN.
2. EXISTING 600A FEEDER TO REMAIN.
3. EXISTING 600A, 480/277V-3ø-4W, MCC TO REMAIN.
4. EXISTING 60A/3P FUSED SWITCH TO REMAIN. REMOVE EXISTING STARTER AND PROVIDE NEW FUSES.
5. EXISTING 60A/3P FUSED SWITCH TO REMAIN. REMOVE EXISTING STARTER AND PROVIDE NEW FUSES.
6. EXISTING 1"C. PROVIDE NEW 3#6 CU. AND 1#10 CU. GRD.
7. EXISTING 1"C. PROVIDE NEW 3#10 CU. AND 1#10 CU. GRD.
8. NEW 6#6 CU., 2#10 CU. GRD., 1"C.
9. NEW 3#8 CU., 1#10 CU. GRD., 1"C.
10. NEW JUNCTION BOX.
11. NEW 3#6 CU., 1#10 CU. GRD., 1"C.
12. NEW 60A/3P, HD, NON-FUSED DISCONNECT SWITCH.
13. NEW VFD. REFER TO MECHANICAL DRAWINGS.
14. NEW COOLING TOWER. REFER TO MECHANICAL DRAWINGS.
15. NEW PUMP. REFER TO MECHANICAL DRAWINGS.
16. EXISTING COOLING TOWER.



PARTIAL ONE LINE DIAGRAM

SCALE: NTS

CANYON DEL ORO HIGH SCHOOL

LOCKOUT - TAGOUT - TESTOUT

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ELECTRICAL
PARTIAL ONE LINE DIAGRAM

SHEET

E5.0

____ OF ____

CDO CENTRAL PLANT