December 05, 2014 10:32:27 a.m.
Drawing: H:\PROJ2013\20130113 VA Fresno Chilled Water System\DRAWINGS\LNA-FILS\LNA-FILS Chiller Plant Upgrade\Phase A and C - DD\22-MH-102.DWG
Xrefs: MAS-BORD-PHA.DWG,

SEQUENCE OF CONSTRUCTION

1. RELOCATE SANI-PAK AND EXTEND SEWER, WATER AND STEAM TO SANI-PAC, PLACE BACK IN SERVICE.
2. INSTALL TEMPORARY PIPE STANDS; INSTALL TEMPORARY STEAM AND CONDENSATE PIPING TO (E) BLDG 31 (1)
   - POC IN (E) BUILDING 22 CHILLER ROOM FOR STEAM AND POC FOR CHILLED WATER IS ON (E) CHILLER BLDG 22 ROOF. AFTER TIE OVER, REMOVE TEMPORARY FLEXIBLE HOSE ON CANOPY ROOF.
3. DISCONNECT AND CAP EXISTING UTILITIES ROUTING INTO PIPE TRENCH FROM PIPE TUNNEL. REROUTE LOW-VOLTAGE WIRING CURRENTLY ROUTING THROUGH TRENCH TO OVERHEAD AND RECONNECT TO LOW-VOLTAGE IN REMAINING TRENCH. DEMOLISH (E) TUNNEL BELOW NEW BUILDING FOOTPRINT
4. RELOCATE (E) RO TANK TO NORTH PART OF PARKING AREA, EXTEND RO WATER LINES AND PLACE BACK INTO SERVICE.
5. REMOVE (E) CANOPY ADJACENT TO BUILDING FOOTPRINT
6. REMOVE (E) HEAT EXCHANGER AND ASSOCIATED EQUIPMENT FROM INSIDE EXISTING EQUIPMENT ROOM INSIDE BUILDING 22
7. RELOCATE WATER SOFTENING EQUIPMENT TO NEW LOCATION IN (E) EQUIPMENT ROOM INSIDE BUILDING 22, PLACE BACK IN SERVICE
8. CONSTRUCT NEW BUILDING (INCLUDES POURING OF HOUSEKEEPING PADS)
9. INSTALL NEW COOLING TOWERS AND OTHER ROOF MOUNTED GFCI EQUIPMENT
10. INSTALL INTERIOR EQUIPMENT IN BUILDING 22A (PUMPS, PIPING, FAN COILS, SYSTEM COMPONENTS, ETC.)
    - INCLUDES NEW CHILLER CH-3
    - LEAVE (E) TOWER CHEMICAL TREATMENT SYSTEM IN CURRENT LOCATION AT BUILDING 22
11. CONNECT NEW CH-3 TO NEWLY INSTALLED CHILLED WATER PIPING SYSTEM
12. TEST NEW CH-3, PUMPS, COOLING TOWER AND ALL RELATED COMPONENTS IN THE NEW CHILLER ROOM
13. COMMISSION CONTROL SYSTEM AND CONTROL INTERFACE
14. RUN NEW CH-3 SYSTEM AS PRIMARY CHILLER BY OPENING VALVE TO MAIN SYSTEM AT BOILER PLANT TIE POINT
15. RELOCATE (E) CH-4 TO NEW LOCATION INSIDE BUILDING 22A
16. CONNECT (E) CH-4 TO NEW PIPING SYSTEM INSIDE BUILDING 22A
17. REMOVE (E) CH-3 AND ALL RELATED COMPONENTS IN BUILDING 22. CAP LINES.
18. DEMO (E) COOLING TOWERS THAT SERVED (E) CH-4 AND (E) CH-3
19. REMOVE (E) DUCTWORK IN CHILLER ROOM (BUILDING 22) THAT WAS FOR PREVIOUS REFRIGERANT MONITORING SYSTEM (BELOW THE ROOF ONLY), ROOFTOP FANS TO REMAIN

NOTE: SEE DRAWING 22A-MS-503 FOR CONTROL SYSTEM ARCHITECTURE AND SEQUENCE OF OPERATION.

ABBREVIATIONS

A/E ARCHITECT / ENGINEER
AAHX AIR TO AIR HEAT EXCHANGER
AB AIR BLENDER
AAV AUTOMATIC AIR VENT
ACC AIR COOLED CONDENSER
ACCH AIR COOLED CHILLER
ACCU AIR-COOLED CONDENSING UNIT
ACU AIR CONDITIONING UNIT
ACD AUTOMATIC CONTROL DAMPER,MODULATING
ACD-TP AUTOMATIC CONTROL DAMPER,TWO POSITION
AD ACCESS DOOR
AF AFTER FILTER
AFCV AIR FLOW CONTROL VALVE
AFF ABOVE FINISHED FLOOR
AFMD AIR FLOW MEASURING DEVICE
AFW AIR FOIL WHEEL (FAN)
AHU AIR-HANDLING UNIT
AMP AMPERGE
AP ACCESS PANEL
APD AIR PRESSURE DROP
ARI AIR CONDITIONING AND REFRIGERATION INSTITUTE
AS AIR SEPARATOR
ASME AMERICAN SOCIETY OF MECHANICAL ENGINEERS
AW AIR WASHER
AXF AXIAL FLOW

B BOILER
BD BUTTERFLY DAMPER
BDD BACKDRAFT DAMPER
BDR BASE BOARD RADIATOR
BFP BACKFLOW PREVENTER
BFT BOILER PLANT FIRE TUBE
BG BOTTOM GRILLE
BHP BRAKE HORSEPOWER
BHW HOT WATER HEATING BOILER
BHX BOILER BLOWDOWN HEAT EXCHANGER
BIW BACKWARD INCLINED WHEEL (FAN)
BMT BONE MARROW TRANSPLANT
BR BOTTOM REGISTER
BSC BIOLOGICAL SAFETY CABINETS
BT BLOWOFF TANK
BTC BLOWOFF TANK CONTROL VALVE
BTU BRITISH THERMAL UNIT
BTUH BRITISH THERMAL UNIT PER HOUR
BWT BOILER PLANT WATER TUBE
CD-2 CONSTRUCTION DOCUMENTS (SUBMISSION2)
CFH CUBIC FEET PER HOUR
CFM CUBIC FEET PER MINUTE
CFT CUBIC FEET
CFP CHEMICAL FEED PUMP
CG CEILING GRILLE
CH CHILLER
CHP CHILLED WATER PUMP
CHW CHILLER WATER
CHR CHILLED WATER RETURN
CHS CHILLED WATER SUPPLY
CI CAST IRON
CM CARBON MONOXIDE
CO CLEAN OUT
CO2 CARBON DIOXODE
COP COEFFICIENT OF PERFORMANCE
CP CONDENSATE PUMP
CR CEILING REGISTER
CS CONDENSATE STORAGE TANK
CT COOLING TOWER
CU CONDENSING UNIT
CUH CABINET UNIT HEATER
CV CONSTANT VOLUME
CW COLD WATER (POTABLE)
CWCC CHILLED WATER COOLING COIL
CWP CONDENSER WATER PUMP
CWR CONDENSER WATER RETURN (TO COOLING TOWER)
CWS CONDENSER WATER SUPPLY (FROM COOLING TOWER)
D DAMPER - AUTOMATIC
D-1 OUTDOOR AIR DAMPER
D-2 RETURN AIR DAMPER
D-3 RELIEF AIR DAMPER
DB DECIBELS
Db DRY-BULB TEMPERATURE
DD-1 DESIGN DEVELOPMENT (SUBMISSION1)
DD-2 DESIGN DEVELOPMENT (SUBMISSION2)
DDC DIRECT DIGITAL CONTROLS
DEG DEGREE
DF DIFFUSER
DIA DIAMETER
DIW DEIONIZED WATER
DP DEW POINT TEMPERATURE
DPA DIFFERENTIAL PRESSURE ASSEMBLY
DPS DIFFERENTIAL PRESSURE SENSOR
DX DIRECT EXPANSION
DXCC DIRECT EXPANSION COOLING COIL
EA EXHAUST AIR
EAT ENTERING AIR TEMPERATURE
EC EVAPORATIVE COOLER
ECU EVAPORATIVE CONDENSER UNIT
EER ENERGY EFFICIENCY RATIO
EF EXHAUST FAN
EG EXHAUST GRILLE
EGS EMERGENCY GAS SHUTOFF
EGT ENTERING GLYCOL TEMPERATURE
EH EXHAUST HOOD
EJ EXPANSION JOINT
ENT ENTERING
ER EXHAUST REGISTER
ERC ELECTRIC REHEAT COIL
ESP EXTERNAL STATIC PRESSURE
ET EXPANSION TANK
EUH ELECTRIC UNIT HEATER
EWC EVAPORATIVE WATER COOLER
EWT ENTERING WATER TEMPERATURE
EX. EXISTING
F FAHRENHEIT
F&T FLOAT AND THERMOSTATIC
F/SDPR COMBINATION FIRE SMOKE DAMPER
FA FREE AREA
FC FLEXIBLE CONNECTION
FCU FAN COIL UNIT (4 PIPE)
FCUC FAN COIL UNIT COOLING ONLY
FCUH FAN COIL UNIT HEATING ONLY
FCW FORWARD CURVED WHEEL (FAN)
FD FLOOR DRAIN
FD FIRE DAMPER
FF FINAL FILTER
FHX FLUE GAS/FEEDWATER HEAT EXCHANGER
FM FLOW METER
FOP FUEL OIL PUMP
FOT FUEL OIL TANK
FOHX FUEL OIL HEAT EXCHANGER
FPM FEET PER MINUTE
FPS FEET PER SECOND
FPTU FAN POWERED TERMINAL UNIT
FR FLOOR REGISTER
FRP FIBER REINFORCED POLYESTER
FS FLOW SWITCH
FSTAT FREEZESTAT

FT FEET
FT-LB FOOT-POUND
FTR FIN TUBE RADIATION
FV FACE VELOCITY

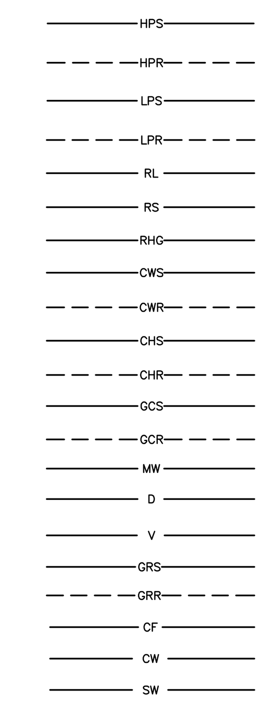
GA GAUGE
GAL GALLONS
GFCI GOVERNMENT FURNISHED CONTRACTOR INSTALLED
GFF GOVERNMENT FURNISHED (FUTURE CONTRACTOR INSTALLED)
GH GRAVITY HOOD
GPD GALLONS PER DAY
GPH GALLONS PER HOUR
GPM GALLONS PER MINUTE
GPR GAS PRESSURE REGULATOR
GS GALVANIZED STEEL

H HUMIDIFER
H&CW HOT & COLD WATER
HB HOSE BIBB
HC HEATING COIL
HD HEAD
HD HOOD
HP HEAT PUMP
HP HORSEPOWER
HPDT HIGH PRESSURE DRIP TRAP
HPR HIGH PRESSURE RETURN (STEAM CONDENSATE)
HPS HIGH PRESSURE SUPPLY (STEAM)
HRC HEAT RECOVERY COIL
HRD HEAT RECOVERY DEVICE
HSTAT HUMIDISTAT
HTM HUMIDIFIER TERMINAL
HUM HUMIDIFIER UNIT MOUNTED
HVU HEATING AND VENTILATING UNIT
HW HOT WATER
HWC HOT WATER COIL
HWHC HOT WATER HEATING COIL
HWP HEATING HOT WATER PUMP
HWR HEATING HOT WATER RETURN
HWS HEATING HOT WATER SUPPLY
HWUH HOT WATER UNIT HEATER
HX HEAT EXCHANGER
HZ HERTZ

I/O INPUT /OUTPUT
IAQ INDOOR AIR QUALITY
ID INSIDE DIAMETER
IN INCHES
IN WC INCH WATER COLUMN
IN WG INCH WATER GAUGE
kW KILOWATI
kWh KILOWATI HOUR
LAT LEAVING AIR TEMPERATURE
LBS/HR POUNDS PER HOUR
LF LINEAR FOOT (FEET)
LGT LEAVING GLYCOL TEMPERATURE
LH LATENT HEAT
LPG LIQUID PROPANE GAS
LPR LOW PRESSURE RETURN (STEAM CONDENSATE)
LPRC LOW PRESSURE STEAM RETURN (CLEAN)
LLHX LIQUID TO LIQUID HEAT EXCHANGER
LPS LOW PRESSURE STEAM
LPSC LOW PRESSURE STEAM (CLEAN)
LSD LINEAR SLOT DIFFUSER
LTCP LOCAL TEMPERATURE CONTROL PANEL
LVG LEAVING
LVR LOUVER
LWT LEAVING WATER TEMPERATURE
MA MIXED AIR
MAT MIXED AIR TEMPERATURE
MAU MAKE-UP AIR UNIT
MAV MANUAL AIR VENT
MAX MAXIMUM
MB MIXING BOX
MBH 1000 BTUH
MCA MINIMUM BRANCH CIRCUIT AMPACITY
MER MECHANICAL EQUIPMENT ROOM
MERV MINIMUM EFFICIENCY REPORTING VALUE
MH MANHOLE
MHP MOTOR HORSEPOWER
MIN MINIMUM
MOV MOTOR OPERATED VALVE
MPR MEDIUM PRESSURE RETURN (STEAM CONDENSATE)
MPS MEDIUM PRESSURE STEAM
MRI MAGNETIC RESONANCE IMAGING
MTD MEAN TEMPERATURE DIFFERENCE
MVD MANUAL VOLUME DAMPER
MZ MULTI-ZONE
NA NOT APPLICABLE
NC NOISE CRITERIA
NC NORMALLY CLOSED
NG NATURAL GAS
NGFM NATURAL GAS FLOWMETER
NO NORMALLY OPEN
NOM NOMINAL
NPLV NON-STANDARD PART LOAD VALUE
NPSH NET POSITIVE SUCTION HEAD
NTS NOT TO SCALE
OA OUTSIDE AIR
OAG OUTSIDE AIR GRILLE
OAI OUTSIDE AIR INTAKE
OD OUTSIDE DIAMETER
OFM OIL FLOWMETER
OR OPERATING ROOM
P PUMP
PC PUMPED CONDENSATE
PCF POUNDS PER CUBIC FOOT (FEET)
PD PRESSURE DROP
PF PRE-FILTER
PG PRESSURE GAGE
PHC PREHEAT COIL
PPM PARTS PER MILLION
PRS PRESSURE REGULATING (VALVE) STATION
PRV PRESSURE REGULATING VALVE
PSI POUNDS PER SQUARE INCH
PSIA POUNDS PER SQUARE INCH - ABSOLUTE
PSIG POUNDS PER SQUARE INCH - GAGE
PSS PRIMARY SECONDARY SYSTEM
PSV PRESSURE SAFETY VALVE
PTAC PACKAGED TERMINAL AIR CONDITIONER
R/E RETURN OR EXHAUST
RA RETURN AIR
RAD REFRIGERANT AIR DRYER
RAF RADIO FREQUENCY
RAT RETURN AIR TEMPERATURE
RCCH REMOTE CONDENSER CHILLER
RCU RECIPROCATING CHILLER UNIT
RD REFRIGERANT DISCHARGE
REA RELIEF AIR
RF RETURN FAN
RG RETURN GRILLE
RH RELATIVE HUMIDITY
RHC REHEAT COIL
RHG REFRIGERANT HOT GAS
RL REFRIGERANT LIQUID LINE
RLA RUN LOAD AMPERE
RO REVERSE OSMOSIS
RPM REVOLUTIONS PER MINUTE
RR RETURN REGISTER
RS REFRIGERANT SUCTION
RTU ROOF TOP UNIT
RV RELIEF VALVE

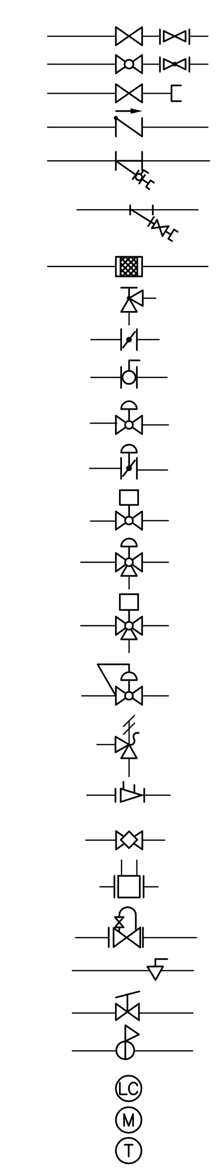
SA SUPPLY AIR
SAD SOUND ATTENUATING DEVICE
SAT SUPPLY AIR TEMPERATURE
SCFM STANDARD CUBIC FEET PER MINUTE
SD SMOKE DETECTOR
SD SUPPLY AIR DIFFUSER
SD-1 SCHEMATIC DESIGN (SUBMISSION1)
SD-2 SCHEMATIC DESIGN (SUBMISSION2)
SDPR SMOKE DAMPER
SDR SMOKE DAMPER (RETURN)
SDS SMOKE DAMPER (SUPPLY)
SEN SENSIBLE HEAT
SF SUPPLY FAN
SG SUPPLY AIR GRILLE
SI SQUARE INCHES
SP STATIC PRESSURE
SP GR SPECIFIC GRAVITY
SPD SUPPLY PROCESS AND DISTRIBUTION
SPS STATIC PRESSURE SENSOR
SQ FT SQUARE FOOT (FEET)
SR SUPPLY AIR REGISTER
SS STAINLESS STEEL
T & PCV TEMPERATURE AND PRESSURE CONTROL VALVE
TAB TESTING, ADJUSTING, BALANCE
TD TEMPERATURE DIFFERENCE
TDH TOTAL DYNAMIC HEAD
TG TRANSFER GRILLE
TP TRAP
TR TOP REGISTER
TSP TOTAL STATIC PRESSURE
TSTAT THERMOSTAT
UC UNDER CUT
UC UNIT COOLER
UH UNIT HEATER
UL UNDERWRITERS LABORATORY
URV UPBLAST UNIT VENTILATOR
V VALVE
VAF VANE-AXIAL FAN
VAV VARIABLE AIR VOLUME
VD VOLUME DAMPER (MANUAL OPPOSED BLADE)
VFD VARIABLE FREQUENCY DRIVE
VHA VETERANS HEALTH ADMINISTRATION
VI VIBRATION ISOLATOR
VSD VARIABLE SPEED DRIVE
W WATTS
Wb WET-BULB (TEMPERATURE)
WCCH WATER COOLED CHILLER
WCCU WATER COOLED CONDENSING UNIT
WCHP WATER COOLED HEAT PUMPS
WCPU WATER COOLED PACKAGED UNIT
WF WATER FILTER
WFM WATER FLOWMETER
WG WATER GAGE

PIPING SYMBOLS



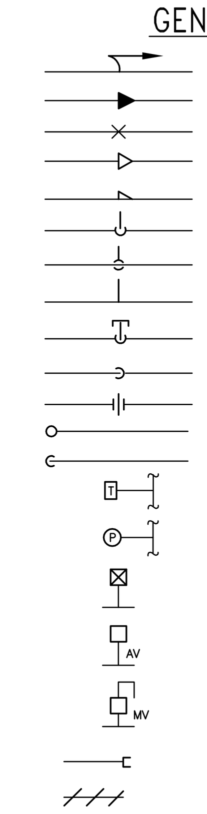
HIGH PRESSURE STEAM (60 PSIG AND ABOVE)
HIGH PRESSURE STEAM CONDENSATE RETURN
LOW PRESSURE STEAM (15 PSIG AND BELOW)
LOW PRESSURE STEAM CONDENSATE RETURN
REFRIGERANT LIQUID
REFRIGERANT SUCTION
REFRIGERANT HOT GAS
CONDENSER WATER SUPPLY (FROM TOWER)
CONDENSER WATER RETURN (TO TOWER)
CHILLED WATER SUPPLY
CHILLED WATER RETURN
CHILLED GLYCOL-WATER SUPPLY
CHILLED GLYCOL-WATER RETURN
MAKE-UP WATER
DRAIN LINE
VENT LINE
GLYCOL-WATER RUN AROUND SUPPLY
GLYCOL-WATER RUN AROUND RETURN
CHEMICAL FEED
COLD WATER (CITY WATER)
SOFTENED WATER

VALVE SYMBOLS



GATE VALVE - THREADED/FLANGED
GLOBE VALVE - THREADED/FLANGED
GATE VALVE WITH 3/4" HOSE ADAPTER
CHECK VALVE
WYE STRAINER (WITH BALL VALVE & HOSE CONNECTION)
WYE STRAINER WITH VALVED DRAIN AND QUICK-COUPLE HOSE CONNECTOR
FLEXIBLE CONNECTION
ANGLE GLOBE VALVE
BUTTERFLY VALVE
BALL VALVE
MODULATING CONTROL VALVE
MODULATING CONTROL BUTTERFLY VALVE
TWO POSITION CONTROL VALVE
THREE-WAY MODULATING CONTROL VALVE
THREE-WAY TWO POSITION CONTROL VALVE
PRESSURE REGULATING VALVE
PRESSURE SAFETY VALVE
AUTOMATIC BALANCING CONTROL VALVE
WATER BALANCE DEVICE
CIRCUIT SETTER VALVE
GATE VALVE WITH GLOBE-VALVED BYPASS
PLUG VALVE
CONTROL VALVE (CV) - FLOAT-OPERATED
PRESSURE REDUCING VALVE (PRV)
WATER LEVEL CONTROLLER
FLOW METER
TEMPERATURE SENSOR

GENERAL PIPING SYMBOLS



DIRECTION OF PIPE PITCH (DOWN)
DIRECTION OF FLOW
ANCHOR
REDUCER OR INCREASER
ECCENTRIC REDUCER
TOP CONNECTION, 45° OR 90°
BOTTOM CONNECTION, 45° OR 90°
SIDE CONNECTION
CAPPED OUTLET
RISE OR DROP IN PIPE
UNION
PIPE UP
PIPE DOWN
THERMOMETER
PRESSURE GAGE
TEST PLUG (PRESSURE/TEMPERATURE)
AUTOMATIC AIR VENT
MANUAL AIR VENT
QUICK-COUPLE HOSE CONNECTOR
PIPE, PIPING COMPONENTS, AND EQUIPMENT, DEMOLITION

100% CONSTRUCTION DOCUMENT SUBMITTAL

Revisions	Date
(1) Addendum 1	6/1/2015

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Drawing Title: SYMBOLS, ABBREVIATIONS AND NOTES MECHANICAL

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Location: FRESNO, CA.

Date: 5/08/2015 | Checked: WME | Drawn: CADD

Project Number: 570-13-300

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Drawing Number: 22A-MS-001

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Office of Construction and Facilities Management

Department of Veterans Affairs

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