

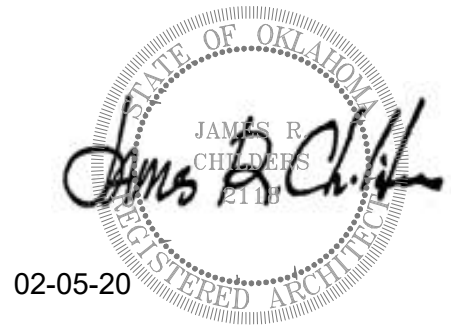


BID PACKAGE 02 – ADDENDUM 03

Date: February 05, 2020

Re: Wilma P Mankiller Health Center Expansion

From: James R Childers Architect, Inc.
45 South 4th Street
Fort Smith, Arkansas 72901



This addendum forms part of the Contract Documents, and modifies the documents as noted below. Acknowledge receipt of this addendum in the space provided on the bid form. Failure to do so may subject the bidder to disqualification.

Item 01 Benco/Adec Dental Equipment Drawings

Item 02 Updated table of contents and added sections listed below in volume 02
27 0000 – CNIS Network Construction Standards and Requirements



AIA[®] Document G710[™] – 2017

Architect's Supplemental Instructions

PROJECT: *(name and address)*
Wilma P. Mankiller Health Center
Expansion
Stilwell, OK

CONTRACT INFORMATION:
Contract For: CMAR

Date:

ASI INFORMATION:
ASI Number: Bid Package 02 - ASI 003

Date: 03-30-20

OWNER: *(name and address)*
Cherokee Nation Property Management
LLC.

ARCHITECT: *(name and address)*
James R. Childers Architect, Inc.
45 South 4th Street
Fort Smith, AR 72901

CONTRACTOR: *(name and address)*
M. Ross, Inc.

The Contractor shall carry out the Work in accordance with the following supplemental instructions without change in Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgment that there will be no change in the Contract Sum or Contract Time.

(Insert a detailed description of the Architect's supplemental instructions and, if applicable, attach or reference specific exhibits.)

See attached MEP Narrative.

ISSUED BY THE ARCHITECT:

James R. Childers Architect, Inc. _____

ARCHITECT *(Firm name)*

J. Breck Childers _____

SIGNATURE

J. Breck Childers, Architect _____

PRINTED NAME AND TITLE

03-30-20 _____

DATE



5214 W. Village Parkway, Suite 120, Rogers, AR 72758 | 479-899-6370

CHANGE NARRATIVE LETTER

TO: MATHEW THOMAS- CHILDERS ARCHITECTS
FROM: STEPHEN EDMONDSON, JAMISON MIRANDA, BETSY WELLS– HP ENGINEERING, INC.
DATE: 1/10/2020
PROJECT: WPMHC EXPANSION BID PACKAGE 02 ADDENDUM 01

MECHANICAL DESIGN ITEMS

1. M1.01
 - a. Item 1 Response: Outside air ductwork will only be lined if shown hatched on plans. There is not hatched outside air ductwork on plans.
 - b. Item 2 Response: Plans revised to have condensate neutralizer. Building controls sequence note for hot water temperature reset will vary the hot water temperature based on ambient outside air temperature
 - c. Item 3 Response: Plans revised to show pre-insulated piping below grade.
 - d. Item 4 Response: This is the primary heating coil and is located in the preheat position. Nomenclature will be changed on schedule.

- e. Item 5,6,7 Responses: The AHU coil size can be revised. This will change AHU1 & AHU-3 items below. This will add approx. \$4k-\$7k to each unit. This will be coordinated with the owner and design team to determine if they want to make the change.

	Old	New	Delta
Height	73.4	73.4	0
Width	100	112.5	12.5"
Length	295.6	300.6	5"
Weight	10381	10954	573 lbs
MCA	78.7	78.7	
MOP	90	90	
WPD	29.84	12.36	17.48
APD	1.325	0.869	0.456
Face Vel	522	454	68

- f. Item 8 Response: Although, not required, we were asked to design this building similar to healthcare requirements. This included the extra filtration.

- g. Item 9 Response: If power goes out or equipment goes down, there will be no freeze protection if there is no glycol in the system. We prefer to account for multiple points of failure.

2. M2.02

- a. Item 10 Response: Recirculating pump will be removed from detail. No recirculating pump will be required since we have glycol in the system.

3. M8.10

- a. Item 11 Response: Chilled water piping is not routed below the boilers.

4. M9.01

- a. Item 12 Response: Plans revised.

5. M9.02

- a. Item 13 Response: Plans revised.
- b. Item 14 Response: Coil is primary heating coil located in the preheat position.

ELECTRICAL DESIGN ITEMS

1. ELECTRICAL TYPICAL

- a. Noted on plans to coordinate mounting heights with all architect/owner.

2. ELECTRICAL TYPICAL

- a. Noted on plans to reference equipment plans.

3. ELECTRICAL TYPICAL

- a. This has been verified.

4. ELECTRICAL TYPICAL

- a. Circuit provided for automatic door.

5. E1.02

- a. Exterior receptacle circuit divided into 2 circuits.

6. E1.06

- a. Power added for automatic doors.

7. E1.07

- a. Latest Interior Logistics plans we have don't show 2 freezer. Will coordinate with ILO.

8. E1.14

- a. Power provided for VAV2.22. no changes required

9. E1.18

- a. Additional receptacles added to roof. Receptacles are provided with AHU.

10. E1.24

- a. Note added to provided smoke rated penetrations at all smoke walls.

11. E1.25

- a. Note added to provided smoke rated penetrations at all smoke walls.

12. E2.05

- a. Provided photometrics for fire lane. Site lights added to perimeter lot entrances.

13. E2.09

- a. Exit sign added in hallway.

14. E3.02

- a. Panel HE1 has 114 amps of spare capacity. We feel this will be sufficient.
- b. Circuit added for site lights.
- c. Chiller loads matches chiller MCA.

15. E3.04

- a. Future loads have been taken into account for panel L4B. no changes required

PLUMBING DESIGN ITEMS

1. P1.00:

- a. Note 7 & 8 have been added to the water heater schedule.
- b. The booster pump information was added to the schedule in Bid Package 02 – ADD 01 in January.
- c. Wall hung water closets are provided with 4” waste connection and floor mount are provided with 3” waste connection. This has been adjusted in the Rough-In Mounting Height Schedule.
- d. OHD-1 have been added to the Plumbing Equipment Schedule and the Rough-In Mounting Height Schedule.

2. P2.00:

- a. Sewer mains are sized according to code and DFU.

3. P2.11:

- a. Per table 709.1 of the 2015 IPC for water closets, note D “trap size shall be consistent with the fixture outlet size.” Floor mounted toilets are typically installed with 3” lines and wall hung toilets are typically installed with 4” lines due to the carrier. The toilets that are being used on this project are low flow type and do not exceed 1.6 GPF. Per table 709.2 of the 2015 IPC fixture drain or trap size for 4 drainage fixture units is 2-1/2” which we would never use for a toilet. Please indicate where in the 2015 IPC it specifically states that a 3” waste connection to a water closet is only allowed if it is the only fixture on the branch?

4. P2.12:

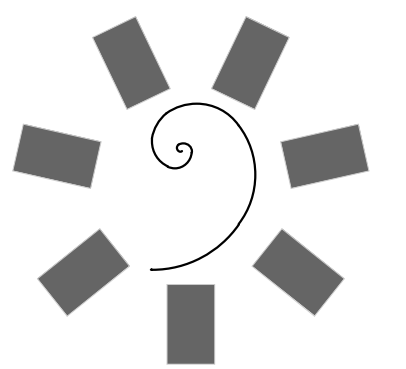
- a. Couldn’t find a 01-01-10 Storage room. Assumed that it was 01-07-10 Storage. A floor drain has been added.
- b. Note 22.39 has been added to this sheet stating, “PROVIDE OPEN HUB DRAIN WITH TRAP GUARD UNDER COUNTER FOR DRAIN FROM COUNTER MOUNTED ICE MACHINE. HUB DRAIN SHALL BE CONNECTED TO THE DRAIN LINE AT THE SINK NEAR BY.”

5. P2.14:
 - a. Per table 709.1 of the 2015 IPC for water closets, note D “trap size shall be consistent with the fixture outlet size.” Floor mounted toilets are typically installed with 3” lines and wall hung toilets are typically installed with 4” lines due to the carrier. The toilets that are being used on this project are low flow type and do not exceed 1.6 GPF. Per table 709.2 of the 2015 IPC fixture drain or trap size for 4 drainage fixture units is 2-1/2” which we would never use for a toilet. Please indicate where in the 2015 IPC it specifically states that a 3” waste connection to a water closet is only allowed if it is the only fixture on the branch?

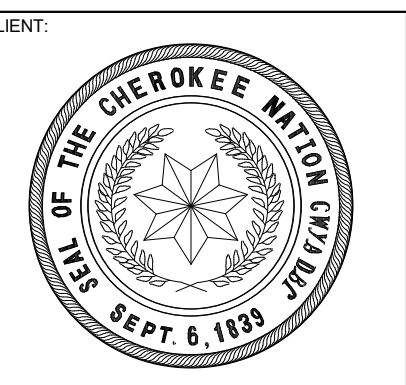
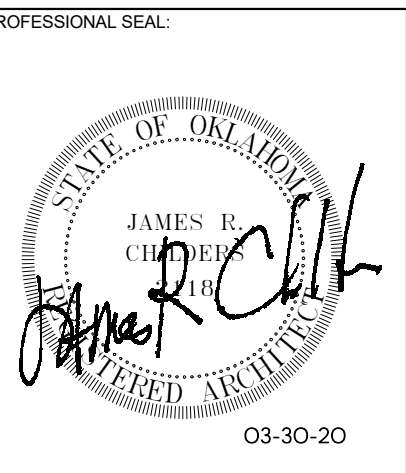
6. P3.11:
 - a. The keynotes have been added to this sheet.

7. P3.12:
 - a. TMV-1 is in the mechanical room. The TMV-2 at Group room 01-08-10 needs to stay a TMV-2. This room may be accessed by the public therefore requires no more than 110 degrees. All lavatories in restrooms and public access areas are marked with the TMV-2. Sinks (stainless steel) located in areas that are not accessed by the public do not
 - b. Equipment was shown to indicate spacing. Equipment with no connections have been hidden.
 - c. Note 22.38 has been added to the plans stating, “PROVIDE CW LINE TO LAUNDRY DETERGENT DISPENSER. PROVIDE BACKFLOW PREVENTER PRIOR TO SOAP DISPENSER CONNECTION. COORDINATE WITH EQUIPMENT SUPPLIER FOR EXACT LOCATION OF DETERGENT DISPENSER AND SIZE OF CONNECTION.”
 - d. Water line has been added at 01-07-13 Nourishment for the #3307 ice maker along with SB-1 & WHA-1.

END OF RESPONSES



James R. Childers
Architect, Inc.
45 South 4th Street
Fort Smith, AR 72901
479-783-2450
www.childersarchitect.com



WILMA P. MANKILLER HEALTH CENTER
EXPANSION
STILWELL, OKLAHOMA

KEY PLAN

PROJECT PHASE
BID PACKAGE 02

#	DATE	REVISIONS	DESCRIPTION
1	1/15/20	BID PACKAGE 02 - ADD 01	
2	2/18/2020	BID PACKAGE 02 - ADD 04	
3	3/30/2020	BID PACKAGE 02 - ASI 03	

DATE: 12-06-19 JOB NUMBER: 18-01.01

SHEET NUMBER: G0.02

COVER / INDEX

WILMA P. MANKILLER HEALTH CENTER EXPANSION

BID PACKAGE 02

(CIVIL / ARCHITECTURAL / STRUCTURAL / MEP)

SHEET NUMBER	SHEET NAME	12-06-19 - BID PACKAGE 02	01-08-20 - BID PACKAGE 02 - ADDENDUM 01	02-18-20 - BID PACKAGE 02 - ADDENDUM 04	03-30-20 - BID PACKAGE 02 - ASI 03
GENERAL					
G0.02	COVER / INDEX				
CIVIL					
C003	GENERAL NOTES				
C004	WALL GENERAL NOTES				
CS103	ENLARGED EXISTING SITE PLAN				
CS104	ENLARGED EXISTING SITE PLAN				
CH100	OVERALL PROPOSED SITE PLAN				
CH101	ENLARGED PROPOSED SITE PLAN				
CH102	ENLARGED PROPOSED SITE PLAN				
CP100	OVERALL PAVING AND STRIPING PLAN				
CP101	ENLARGED PAVING PLAN				
CP102	ENLARGED PAVING PLAN				
CP103	ENLARGED STRIPING PLAN				
CP104	ENLARGED STRIPING PLAN				
CP105	OVERALL JOINTING PLAN				
CP900	PAVING DETAILS				
CP901	STRIPING & HANDICAP DETAILS				
CP902	JOINTING DETAILS				
CG100	OVERALL GRADING PLAN				
CG101	ENLARGED GRADING PLAN				
CG102	ENLARGED GRADING PLAN				
CG103	ENLARGED GRADING PLAN				
CG104	ENLARGED GRADING PLAN				
CG105	ENLARGED GRADING PLAN				
CG106	ENLARGED GRADING PLAN				
CG107	ENLARGED GRADING PLAN				
CG300	RETAINING WALL PLAN				
CG301	RETAINING WALL PROFILES				
CG302	RETAINING WALL PLAN				
CG303	RETAINING WALL PROFILES				
CG304	RETAINING WALL PROFILES				
CG500	RAMP & STAIR WALL DETAILS				
CG501	STAIR DETAILS				
CG502	STAIRS & RAMP DETAILS				
CG503	DOCK WALL DETAILS				
CG504	WALLS A, B & C DETAILS				
CG505	WALLS A, B & C DETAILS				
CU100	UTILITY PLAN				
CU101	OVERALL STORM PLAN				
CU102	ENLARGED STORM PLAN				
CU500	WATER DETAILS				
CU501	STORM DETAILS				
CU502	CURB INLET DETAILS				
CU503	SEWER DETAILS				
ARCHITECTURAL					
PROJECT INFORMATION					
AL3.00	LIFE SAFETY CODE COMPLIANCE INFORMATION				
AL1.01	LIFE SAFETY PLAN LEVEL 01				
AL2.01	LIFE SAFETY PLAN LEVEL 02				
AS01	SITE PLAN				
A1.01	OVERALL FLOOR PLAN LEVEL 01				
A1.02	OVERALL FLOOR PLAN LEVEL 02				
A1.11	FLOOR PLAN LEVEL 01 SECTOR 01				
A1.12	FLOOR PLAN LEVEL 01 SECTOR 02				
A1.21	FLOOR PLAN LEVEL 02 SECTOR 01				
A1.22	FLOOR PLAN LEVEL 02 SECTOR 02				
A1.30	OVERALL ROOF PLAN				
A1.40	ENLARGED TOILET PLANS				
A2.01	OVERALL EXTERIOR ELEVATIONS				
A2.02	ENLARGED EXTERIOR ELEVATIONS				
A2.03	ENLARGED EXTERIOR ELEVATIONS				
A2.04	CANOPY FRAMES AND DETAILS				
A4.01	WALL SECTIONS				
A4.02	WALL SECTIONS				
A4.10	STAIR PLANS AND SECTIONS				
A4.20	ELEVATOR PLANS AND SECTIONS				
A5.01	WALL SECTION DETAILS				
A5.02	WALL SECTION DETAILS				
A5.03	WALL SECTION DETAILS				
A5.04	WALL SECTION DETAILS				
A5.10	ROOF DETAILS				
A5.20	EXTERIOR PLAN DETAILS				
A5.21	EXPANSION JOINTS				
A6.01	PARTITION TYPES				
A6.02	PARTITION FRAMING / HEAD DETAILS				
A6.10	DOOR SCHEDULE / INFORMATION				

SHEET NUMBER	SHEET NAME	12-06-19 - BID PACKAGE 02	01-08-20 - BID PACKAGE 02 - ADDENDUM 01	02-18-20 - BID PACKAGE 02 - ADDENDUM 04	03-30-20 - BID PACKAGE 02 - ASI 03
MECHANICAL					
A6.11	STOREFRONT ELEVATIONS				
A6.20	STANDARD TOILET LAYOUT / ACCESSORIES				
A6.21	SHOWER DETAILS				
A6.30	INTERIOR SUPPORT DETAILS				
A6.40	INTERIOR PLAN DETAILS				
A7.00	INTERIOR FINISH SCHEDULE, LEGEND & WALL PROTECTION				
A7.01	WALL PROTECTION, TRANSITION & THRESHOLD DETAILS				
A7.11	FINISH PLAN LEVEL 01 SECTOR 01				
A7.12	FINISH PLAN LEVEL 01 SECTOR 02				
A7.13	FINISH PLAN LEVEL 02 SECTOR 01				
A7.14	FINISH PLAN LEVEL 02 SECTOR 02				
A8.01	INTERIOR ELEVATIONS				
A8.02	INTERIOR ELEVATIONS				
A8.03	INTERIOR ELEVATIONS				
A8.20	TOILET ELEVATIONS				
A8.30	MILLWORK ELEVATIONS				
A8.31	MILLWORK DETAILS				
A8.32	MILLWORK SECTIONS				
A8.11	CEILING PLAN LEVEL 01 SECTOR 01				
A8.12	CEILING PLAN LEVEL 01 SECTOR 02				
A8.21	CEILING PLAN LEVEL 02 SECTOR 01				
A8.22	CEILING PLAN LEVEL 02 SECTOR 02				
A9.30	CEILING DETAILS				
A10.00	SIGNAGE SCHEDULE & ELEVATIONS				
A10.01	SIGNAGE ELEVATIONS				
A10.02	SIGNAGE ELEVATIONS				
A10.03	SIGNAGE ELEVATIONS				
A10.04	SIGNAGE ELEVATIONS				
A10.05	SIGNAGE ELEVATIONS				
A10.06	SIGNAGE ELEVATIONS				
A10.07	SIGNAGE ELEVATIONS				
A10.10	ENLARGED SIGNAGE PLAN - LEVEL 01 SECTOR 01				
A10.11	ENLARGED SIGNAGE PLAN - LEVEL 01 SECTOR 02				
A10.12	ENLARGED SIGNAGE PLAN - LEVEL 02 SECTOR 01				
A10.13	ENLARGED SIGNAGE PLAN - LEVEL 02 SECTOR 02				
STRUCTURAL					
SA.02	ENLARGED PLANS				
PLUMBING					
P1.00	PLUMBING LGO, NOTES & SCHS				
P1.10	PLUMBING DETAILS				
P2.00	OVERALL LEVEL 01 DRAIN PLAN				
P2.11	DRAIN PLAN LEVEL 01 SECTOR 01				
P2.12	DRAIN PLAN LEVEL 01 SECTOR 02				
P2.13	OVERALL LEVEL 02 DRAIN PLAN				
P2.14	DRAIN PLAN LEVEL 02 SECTOR 01				
P2.15	DRAIN PLAN LEVEL 02 SECTOR 02				
P2.16	OVERALL ROOF PLAN				
P2.17	ROOF PLAN SECTOR 01				
P2.18	ROOF PLAN SECTOR 02				
P2.19	ENLARGED DRAIN PLANS				
P2.20	PLUMBING DRAIN/VENT ISOMETRIC				
P2.21	PLUMBING DRAIN/VENT ISOMETRIC				
P2.22	PLUMBING DRAIN/VENT ISOMETRIC				
P2.23	PLUMBING DRAIN/VENT ISOMETRIC				
P2.24	ROOF DRAIN ISOMETRIC				
P3.00	OVERALL LEVEL 01 SUPPLY PLAN				
P3.11	SUPPLY PLAN LEVEL 01 SECTOR 01				
P3.12	SUPPLY PLAN LEVEL 01 SECTOR 02				
P3.13	OVERALL LEVEL 02 SUPPLY PLAN				
P3.14	SUPPLY PLAN LEVEL 02 SECTOR 01				
P3.15	SUPPLY PLAN LEVEL 02 SECTOR 02				
P3.16	ENLARGED SUPPLY PLANS				
P3.17	ENLARGED MED GAS SUPPLY PLANS				

SHEET NUMBER	SHEET NAME	12-06-19 - BID PACKAGE 02	01-08-20 - BID PACKAGE 02 - ADDENDUM 01	02-18-20 - BID PACKAGE 02 - ADDENDUM 04	03-30-20 - BID PACKAGE 02 - ASI 03
ELECTRICAL					
E1.01	ELECTRICAL NOTES AND LEGEND				
E1.02	POWER PLAN LEVEL 01 SECTOR 01				
E1.03	POWER PLAN LEVEL 01 SECTOR 02				
E1.04	POWER PLAN LEVEL 02 SECTOR 01				
E1.05	POWER PLAN LEVEL 02 SECTOR 02				
E1.06	POWER PLAN LEVEL 01 SECTOR 01 NORTH				
E1.07	POWER PLAN LEVEL 01 SECTOR 01 CENTER				
E1.08	POWER PLAN LEVEL 01 SECTOR 01 SOUTH				
E1.09	POWER PLAN LEVEL 01 SECTOR 02 NORTH				
E1.10	POWER PLAN LEVEL 01 SECTOR 02 CENTER				
E1.11	POWER PLAN LEVEL 01 SECTOR 02 SOUTH				
E1.13	MAINTENANCE MECH YARD POWERLIGHTING				
E1.14	MECH POWER PLAN LEVEL 01 SECTOR 01				
E1.15	MECH POWER PLAN LEVEL 01 SECTOR 02				
E1.16	MECH POWER PLAN LEVEL 02 SECTOR 01				
E1.17	MECH POWER PLAN LEVEL 02 SECTOR 02				
E1.18	ROOF PLAN SECTOR 02				
E1.19	FIRE ALARM LEGEND AND NOTES				
E1.20	SYSTEMS PLAN LEVEL 01 SECTOR 01				
E1.21	SYSTEMS PLAN LEVEL 01 SECTOR 02				
E1.22	SYSTEMS PLAN LEVEL 02 SECTOR 01				
E1.23	SYSTEMS PLAN LEVEL 02 SECTOR 02				
E1.24	FIRST FLOOR CABLE TRAY PLAN				
E1.25	SECOND FLOOR CABLE TRAY PLAN				
E2.01	ZONING PLAN LEVEL 01 SECTOR 01				
E2.02	ZONING PLAN LEVEL 01 SECTOR 02				
E2.03	ZONING PLAN LEVEL 02 SECTOR 01				
E2.04	ZONING PLAN LEVEL 02 SECTOR 02				
E2.05	SITE LIGHTING PLAN				
E2.06	NORTH SECTOR 1 ENLARGED LIGHTING PLAN				
E2.07	CENTER SECTOR 1 ENLARGED LIGHTING PLAN				
E2.08	SOUTH SECTOR 1 ENLARGED LIGHTING PLAN				
E2.09	NORTH SECTOR 2 ENLARGED LIGHTING PLAN				
E2.10	CENTER SECTOR 2 ENLARGED LIGHTING PLAN				
E2.11	NORTH SECTOR 1 LEVEL 02 ENLARGED LIGHTING PLAN				
E2.12	SOUTH SECTOR 1 LEVEL 02 ENLARGED LIGHTING PLAN				
E2.13	LIGHTING PLAN LEVEL 01 SECTOR 01				
E3.01	ELECTRICAL SCHEDULES AND RESER				
E3.02	PANEL SCHEDULES				
E3.03	PANEL SCHEDULES				
E3.04	PANEL SCHEDULES				
E3.05	ELECTRICAL DETAILS				

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EQUIPMENT					
EQ1.11	EQUIPMENT PLAN LEVEL 01 SECTOR 01				
EQ1.12	EQUIPMENT PLAN LEVEL 01 SECTOR 02				
EQ1.21	EQUIPMENT PLAN LEVEL 02 SECTOR 01				
Grand total: 226					



1836 SOUTH BALTIMORE AVE.
TULSA, OK 74119
(539) 664-4618

MECHANICAL / ELECTRICAL / PLUMBING ENGINEER



3902 UNIVERSITY BOULEVARD
DURANT, OK 74701
(580) 931-9045

CIVIL ENGINEER



4700 LINCOLN ROAD NE, SUITE 102
ALBUQUERQUE, NM 87109
(505) 344-4080

STRUCTURAL ENGINEER



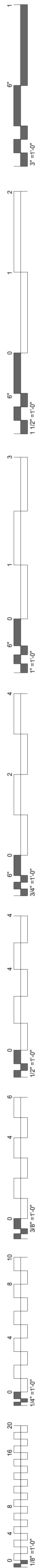
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HOUSTON, TX 77002
(281) 589-5900

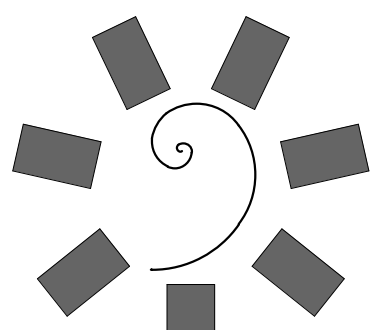
FIRE PROTECTION / LIFE SAFETY



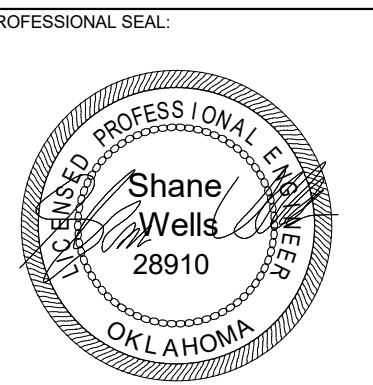
1316 E 35TH PLACE, SUITE 100
TULSA, OK 74105
(918) 382-9120

EQUIPMENT PLANNER

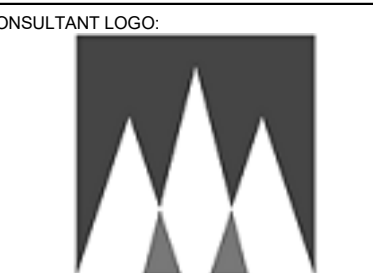




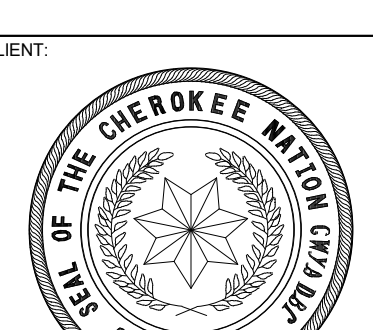
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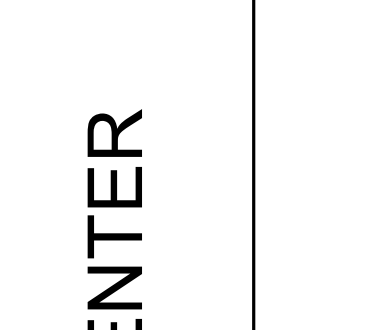
03/27/2020



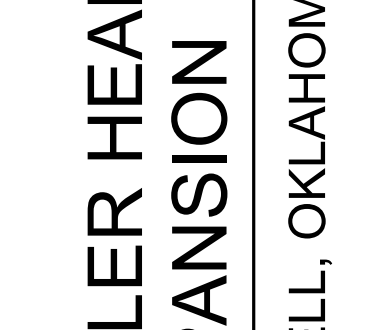
HP ENGINEERING
100% COMPLETE
PROJECT NO. 18068R
DATE: 03/27/2020
45 SOUTH 4TH STREET
FORT SMITH, AR 72601
(479) 783-2460
WWW.HPENGINEERING.COM



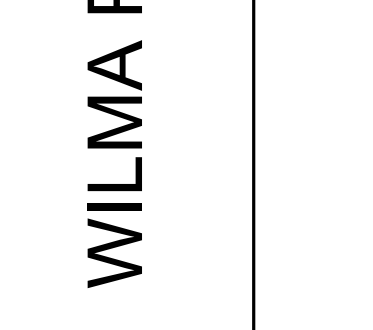
WILMA P. MANKILLER HEALTH CENTER
EXPANSION
STILLWELL, OKLAHOMA



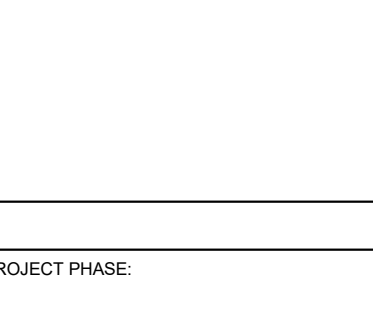
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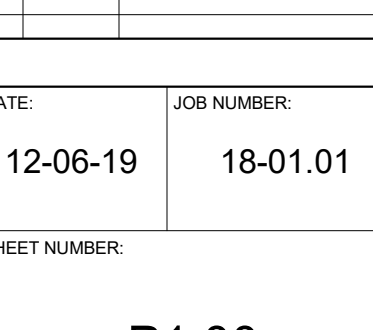
WILMA P. MANKILLER HEALTH CENTER
EXPANSION
STILLWELL, OKLAHOMA



WILMA P. MANKILLER HEALTH CENTER
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STILLWELL, OKLAHOMA



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STILLWELL, OKLAHOMA



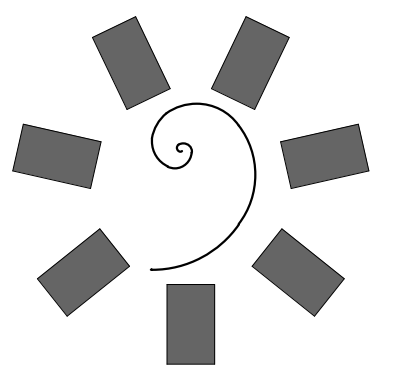
WILMA P. MANKILLER HEALTH CENTER
EXPANSION
STILLWELL, OKLAHOMA

GAS LOAD CALCULATION

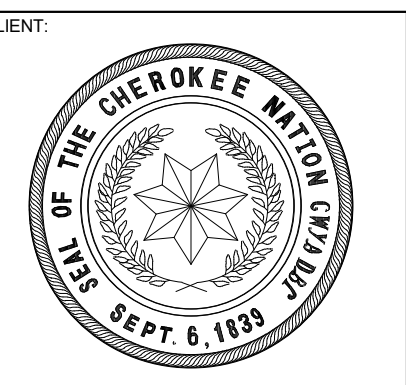
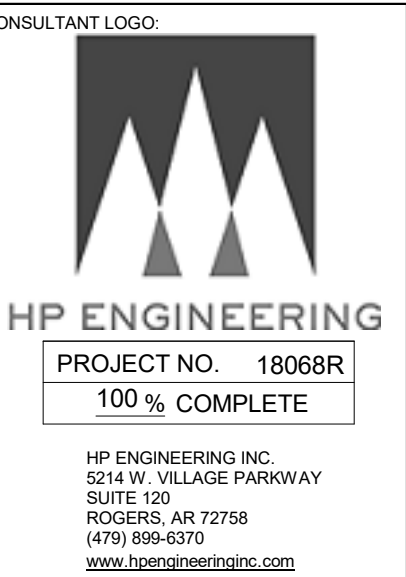
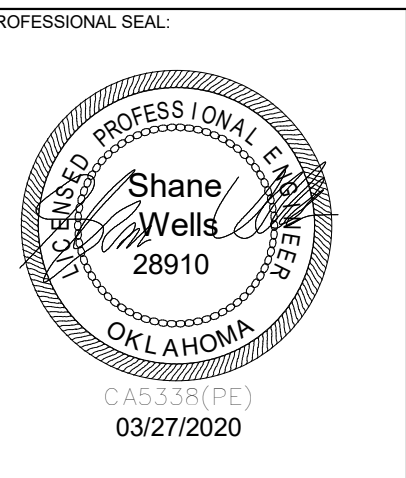
GAS LOAD CALCULATION NOTES: GAS LINES HAVE BEEN SIZED AS PER TABLE 402.4(2) OF THE 2008 INTERNATIONAL FUEL GAS CODE FOR PRESSURES OF LESS THAN 2PSI AND A PRESSURE DROP OF 0.5" WATER COLUMN AND 0.6 SPECIFIC GRAVITY. USING A DISTANCE OF 125 FEET.			
LONGEST RUN	94 (FEET) X 1.25 (FITTING LOSS) = 117.5 FEET TOTAL DEVELOPED LENGTH		
GAS TYPE:	< 0.5 PSI NATURAL		
EQUIPMENT	MBH INPUT (EACH)	QTY	TOTAL MBH INPUT
BOLER	1000	2	2000
GWH-1	399.9	2	799.8
GUH-1&2	30	2	60
Grand total			2859.8

PLUMBING EQUIPMENT SCHEDULE

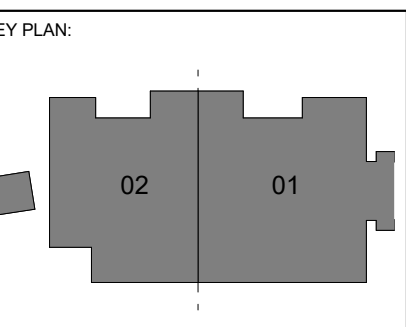
FIXTURE TAG	DESCRIPTION	MANUFACTURER	TRIM	ELECTRICAL REQUIREMENTS
BV-1	BALL VALVE	APOLLO INTERNATIONAL 94L1-A	LEAD FREE BALL VALVE, FULL PORT, BLOWOUT-PROOF, PRESSURE RETAINING, ADJUSTABLE STEM PACKING	
CBV-1	CALIBRATED BALANCE VALVE	BELLA-GOSSETT CIRCUIT SETTER PLUS	LEAD FREE, CIRCUIT SETTER PLUS, CALIBRATED BALANCE AND POSITIVE SHUT-OFF VALVE	
COTG-1	CLEANOUT TO GRADE, SPEED-SET OUTLET	J. R. SMITH 4237	UNFINISHED FLOOR CLEANOUT WITH ADJUSTABLE ROUND CAST IRON TRACTOR COVER TOP, DUGO CAST IRON CLEANOUT WITH ROUND ADJUSTABLE SCORATED SECURED CAST IRON TOP, TAPERED THREAD BRONZE PLUG, REFER TO PLANS FOR SIZES	
CP-1	CIRCULATING PUMP	ARMSTRONG ASTRO 280 SS	THREE SPEED, BRONZE BODY WITH BRASS IMPELLER, WITH AQUASTAT AND AUTOMATIC TIMER KIT, 5 GPM @ 25' HEAD-FEET	230V, 1PH, 218 WATTS
CP-2	CIRCULATING PUMP	ARMSTRONG ASTRO 286 SS	THREE SPEED, BRONZE BODY WITH BRASS IMPELLER, WITH AQUASTAT AND AUTOMATIC TIMER KIT, 17 GPM @ 25' HEAD-FEET	230V, 1PH, 370 WATTS
DI-1	DEIONIZED WATER	PROVIDED BY OTHER INSTALLED BY CONTRACTOR		
ET-1	EXPANSION TANK	WATTS PL-20	BRASS CONNECTION, WELDED STEEL CONSTRUCTION, POLYPROPYLENE LINER, BUTYL DIAPHRAGM, GROOVED DIAPHRAGM HOOP RING, WELDED AIR CHARGE FITTING, 14 GAL., 5.6 TANK ACCEPTANCE	
EW-1	ELECTRIC WATER COOLER, SPLIT LEVEL, WALL MOUNTED, STANDARD AND HANDICAPPED, NO LEAD DESIGN, ONE PIECE, STAINLESS STEEL BASIN, FLEXIBLE SAFETY BUBBLER	ELKAY ERFBM28K	ADA APPROVED, W/ TOUCH PADS ON FRONT, FLEXIBLE SAFETY BUBBLER, P-TRAP, WATER VALVE	115V, 1PH, 380W
EWS-1	EYE WASH STATION	STINGRAY S2230FLT/SSNA	WALL MOUNTED STAINLESS STEEL BOWL WITH TWO GS-PLUS SPRAY HEADS, 1/2" IPS CHROME PLATED BRASS STAY OPEN BALL VALVE, TMV-3	
EWS-2	EYE WASH STATION	STINGRAY S2240FLT	DECK MOUNTED EMERGENCY EYEWASH, SWING-DOWN OPERATED, CORROSION RESISTANT MATERIALS, CERAMIC STAY OPEN VALVE, LEAD-FREE BRASS BODY, TMV-3	
FD-1	FLOOR DRAIN-SQUARE	MFAB F1000-S	CAST IRON BODY, ANCHOR FLANGE, SECURED ROUND ADJUSTABLE STRAINER HEAD WITH HOLE GRATE, LOOSE GRATE AND SEDIMENT BUCKET, 1/2" TRAP & IPS CONNECTIONS, CONCEALED ARM CARRIER SYSTEM, PVC TYPE INSULATION AROUND 7" TRAP & IPS CONNECTIONS	
FPB-1	FROST PROOF HOSE BIBB - BOX	J.R. SMITH 5590QT	AUTOMATIC DRAINING, ANTI-SIPHON FREEZELESS, PROVIDE SHUT-OFF VALVE FOR SUPPLY LINE IN AN ACCESSIBLE LOCATION	
FS-1	FLOOR SINK	J. R. SMITH 3150	CAST IRON FLANGED RECEPTOR, SEEPAGE HOLES, ACID RESISTANT COATED INTERIOR, NICKEL BRONZE RIM, LOOSE GRATE, ALUMINUM TRAP GRIOT, GRATE, 1/2" TRAP & IPS CONNECTIONS	
GI-1	GREASE INTERCEPTOR	SCHIER GB-#75	POLYETHYLENE GREASE INTERCEPTOR WITH HIGHWAY TRAFFIC LOAD RATED, BOLTED, GAS/WATER TIGHT COMPOSITE COVER, CONTRACTOR SHALL HAVE LOCAL SANITARIAN AND ADMINISTRATIVE AUTHORITIES APPROVAL PRIOR TO ORDERING AND INSTALLATION	
HL-1	HANDICAPPED LAVATORY, COUNTER MOUNT, VITREOUS CHINA - OVAL	AMERICAN STANDARD 0478.028	AMERICAN STANDARD RELIANT 3 - 7385.004 SINGLE LEVER FAUCET, 0.5 GPM AERATOR, 4" CENTER SET RIM PLATED, TMV-1 BELOW DECK, ZURN Z8743-PC GRID STRAINER, ZURN Z8700 SERIES P-TRAP, ZURN Z8800 SERIES STOP WITH FLEXIBLE SUPPLIES AND TURN KEY, ZURN Z8946-1-NT ADA TRAP, 5" STOP AND SUPPLY PROTECTOR PVC TYPE INSULATION AROUND 7" TRAP & IPS CONNECTIONS, CONCEALED ARM CARRIER SYSTEM, PVC TYPE INSULATION AROUND 7" TRAP & IPS CONNECTIONS	
HL-2	HANDICAPPED LAVATORY, WALL MOUNT, VITREOUS CHINA	AMERICAN STANDARD DECLYN 0321.026	AMERICAN STANDARD RELIANT 3 - 7385.004 SINGLE LEVER FAUCET, 0.5 GPM AERATOR, 4" CENTER SET RIM PLATED, TMV-1 BELOW DECK, ZURN Z8743-PC GRID STRAINER, ZURN Z8700 SERIES P-TRAP, ZURN Z8800 SERIES STOP WITH FLEXIBLE SUPPLIES AND TURN KEY, ZURN Z8946-1-NT ADA TRAP, 5" STOP AND SUPPLY PROTECTOR PVC TYPE INSULATION AROUND 7" TRAP & IPS CONNECTIONS, CONCEALED ARM CARRIER SYSTEM, PVC TYPE INSULATION AROUND 7" TRAP & IPS CONNECTIONS	
HSH-1	HANDICAPPED SHOWER, 36" X 36"	AQUA BATH C4136BF-FJS 2"	STAINLESS STEEL DRAIN BODY STRAINER, SEAT, GRAB BARS, DELTA T13H332-25 SHOWER FAUCET SYSTEM	
HWC-1	HANDICAPPED WATER CLOSET, VITREOUS CHINA, FLUSH VALVE, FLOOR MOUNTED, ELONGATED RIM, 12" ROUGH-IN, SIPHON JET BOWL, 1.28 GPF	AMERICAN STANDARD MODERA 3461.001	BEMIS 1955CT OPEN FRONT SEAT, SLOAN ECOS 811-1.6/1.1 HARDWIRED SENSOR FLUSH VALVE, EL-451 TRANSFORMER, Z8972-COMB CLOSET BOLT/TWAX RING KIT, J.R. SMITH 0210-M54-KX 1000K CARRIER	120V, 25W
HWC-2	HANDICAPPED WATER CLOSET, VITREOUS CHINA, FLUSH VALVE, WALL MOUNTED, ELONGATED RIM, 12" ROUGH-IN, SIPHON JET BOWL, 1.28 GPF	ZURN Z8743-PC	BEMIS 1955CT OPEN FRONT SEAT, SLOAN ECOS 811-1.6/1.1 HARDWIRED SENSOR FLUSH VALVE, EL-451 TRANSFORMER, Z8972-COMB CLOSET BOLT/TWAX RING KIT, J.R. SMITH 0210-M54-KX 1000K CARRIER	120V, 25W
JS-1	JANITOR'S SINK, FLOOR MOUNTED, 24" X 24", ONE PIECE MOLDED CONSTRUCTION OF NATURAL CRUSHED STONE AND POLYESTER RESIN	FIAT FLOOR SINK MSB 2424	CHICAGO FAUCET 897-CP WALL MOUNTED 8" BODY W/ VACUUM BREAKER, HOSE BRACKET, MOP HANGER, BUMPER GUARDS, W/ 2 BRONZE 1.5" BRACKET, SUPPLIED W/ CAST BRASS DRAIN, PROVIDE CHECK VALVES ON HOT AND COLD WATER LINES IN AN ACCESSIBLE LOCATION	
JS-2	CLINIC SERVICE SINK, WALL MOUNTED, OVERFLOW DRAIN	AMERICAN STANDARD 9512.800-L	AMERICAN STANDARD 8947.117 MANUAL FLUSH VALVE TOP SPUD, AMERICAN STANDARD 7880.191 BEDPAN CLEANER, AMERICAN STANDARD 783000.075 R8300, 1.5" HIGH SWING SPOUT, 9" REACH, 4" WRIST BLADE HANDLES, 0.5 GPM AERATOR, 3-1/2" OPENING DRAIN, MCGUIRE 151M HEAVY DUTY BRASS BASKET & STRAINER, 1 1/2" CHROME PLATED TAILPIECE, MCGUIRE 8912 1 1/2" X 1 1/2" HEAVY DUTY CHROME PLATED CAST BRASS ANGLE STOPS W/ 5" CHROME PLATED COPPER EXTENSION TUBE & LOOSE KEYS, FLEXIBLE CHROME PLATED COPPER RISERS, MCGUIRE 111C SERIES 1 1/2" END OUTLET CONTINUOUS WASTE, PROVIDE THREE FAUCET HOLES ON DECK, 8" CENTERS	
DD-1	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-2	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-3	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-4	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-5	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-6	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-7	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-8	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-9	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-10	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-11	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-12	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-13	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-14	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-15	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-16	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-17	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-18	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-19	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-20	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-21	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-22	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-23	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-24	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-25	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-26	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-27	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-28	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-29	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-30	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-31	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-32	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-33	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-34	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-35	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-36	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-37	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-38	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-39	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-40	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-41	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-42	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-43	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-44	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-45	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-46	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-47	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-48	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-49	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-50	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-51	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-52	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-53	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-54	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-55	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-56	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-57	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-58	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-59	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-60	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-61	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-62	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-63	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-64	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-65	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-66	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-67	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-68	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-69	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-70	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-71	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-72	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-73	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-74	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-75	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-76	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-77	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-78	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-79	OVERFLOW DRAIN	J.R. SMITH 1015	ADJUSTABLE, DUGO CAST IRON BODY, FLASHING CLAMP, GRAVEL STOP, POLYETHYLENE DOME, WATER DAM, 1/2" TRAP & IPS CONNECTIONS	
DD-80	OVERFLOW DRAIN	J.R. SMITH 101		



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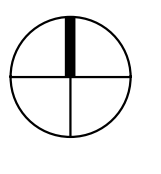


PROJECT PHASE:
BID PACKAGE 02

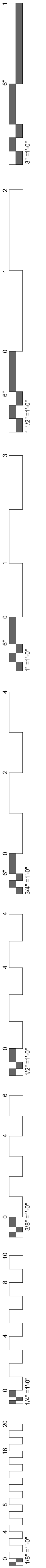
#	DATE	REVISIONS	DESCRIPTION

DATE: 12-06-19
JOB NUMBER: 18-01.01

SHEET NUMBER:
P2.00
**OVERALL
LEVEL 01 DRAIN
PLAN**



OVERALL LEVEL 01 DRAIN PLAN
1/8" = 1'-0"



KEYNOTES
 22.01 NEW 6" BUILDING DRAIN LINE.
 REFER TO CIVIL PLANS FOR
 CONTINUATION. 486 D.F.U.

SEISMIC RESTRAINTS FOR MEP EQUIPMENT AND SYSTEMS
 BUILDING IS CLASSIFIED AS SEISMIC DESIGN CATEGORY C. CONTRACTOR SHALL
 PROVIDE SEISMIC BRACING FOR PIPING, DUCTWORK AND EQUIPMENT TO MEET ALL
 LOCAL AND NATIONAL CODE REQUIREMENTS.
 CONTRACTOR'S RESPONSIBILITIES INCLUDE PROVIDING ALL SUBMITTALS AND DETAILS
 WITH STRUCTURAL ENGINEER'S CERTIFICATION FOR PERMITTING.

NOTE: IT IS THE PLUMBING CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE
 SITE CONTRACTOR TO CONFIRM THAT THE INVERT AND LOCATION OF THE SANITARY
 SERVICE IS COMPATIBLE WITH THE SITE UTILITIES PRIOR TO BEGINNING WORK.

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PROFESSIONAL SEAL

 Shane Wells
 28910
 03/27/2020

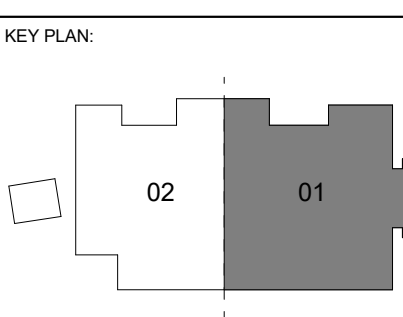
CONSULTANT LOGO

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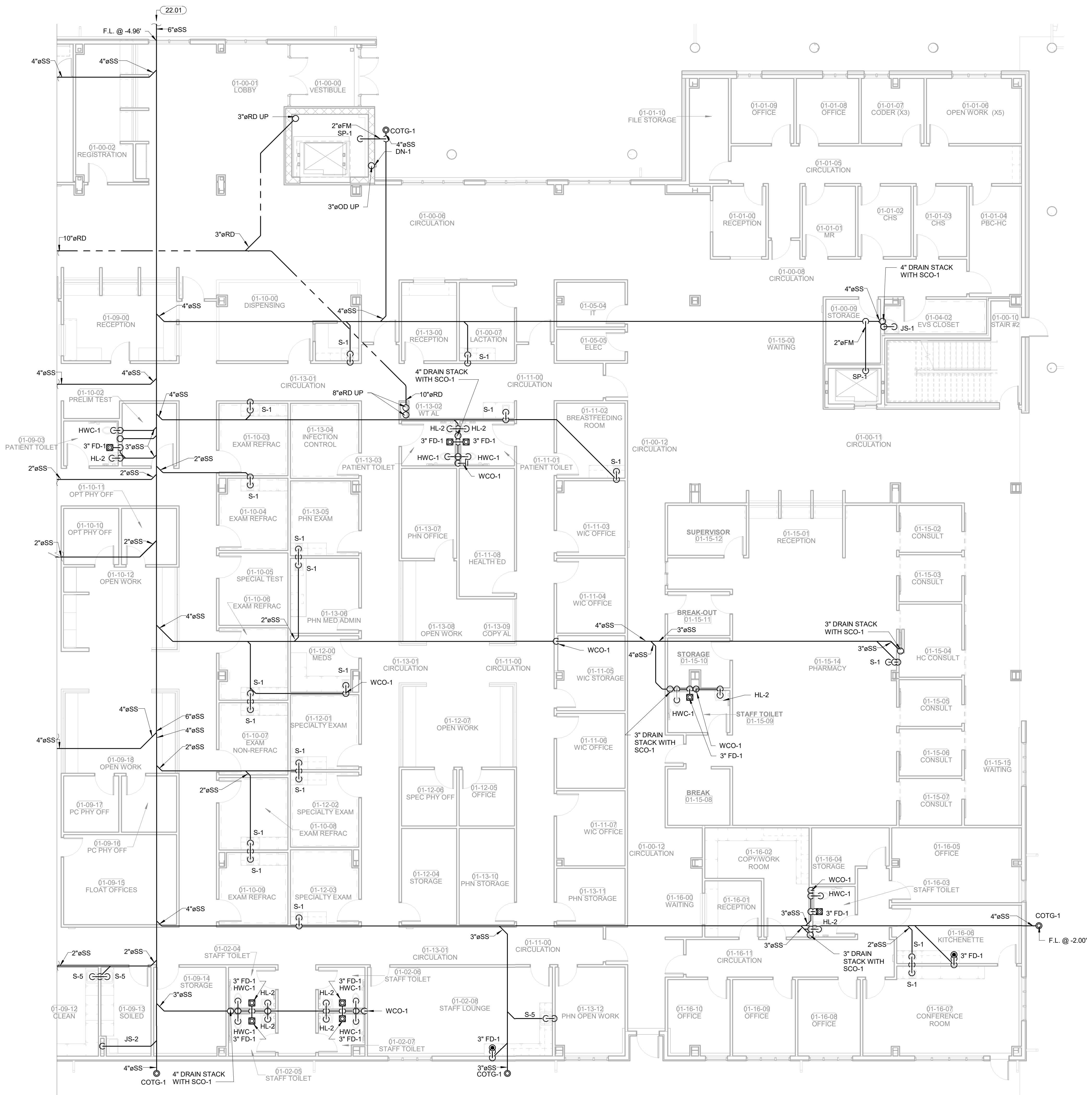


PROJECT PHASE
 BID PACKAGE 02

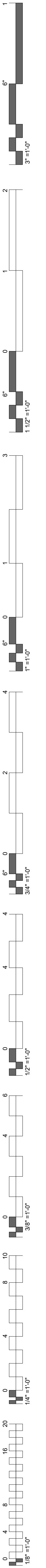
#	DATE	REVISIONS	DESCRIPTION

DATE: 12-06-19 JOB NUMBER: 18-01.01

SHEET NUMBER:
P2.11
DRAIN PLAN
LEVEL 01
SECTOR 01



FLOOR PLAN LEVEL 01 SECTOR 01 - DRAIN PLAN
 1/8" = 1'-0"



KEYNOTES

22.01 NEW 6" BUILDING DRAIN LINE. REFER TO CIVIL PLANS FOR CONTINUATION. 488 D.F.U.

22.02 NEW 4" DRAIN LINE. REFER TO CIVIL PLANS FOR CONTINUATION.

22.09 1/2" STORM DRAIN LINE. REFER TO CIVIL PLANS FOR CONTINUATION.

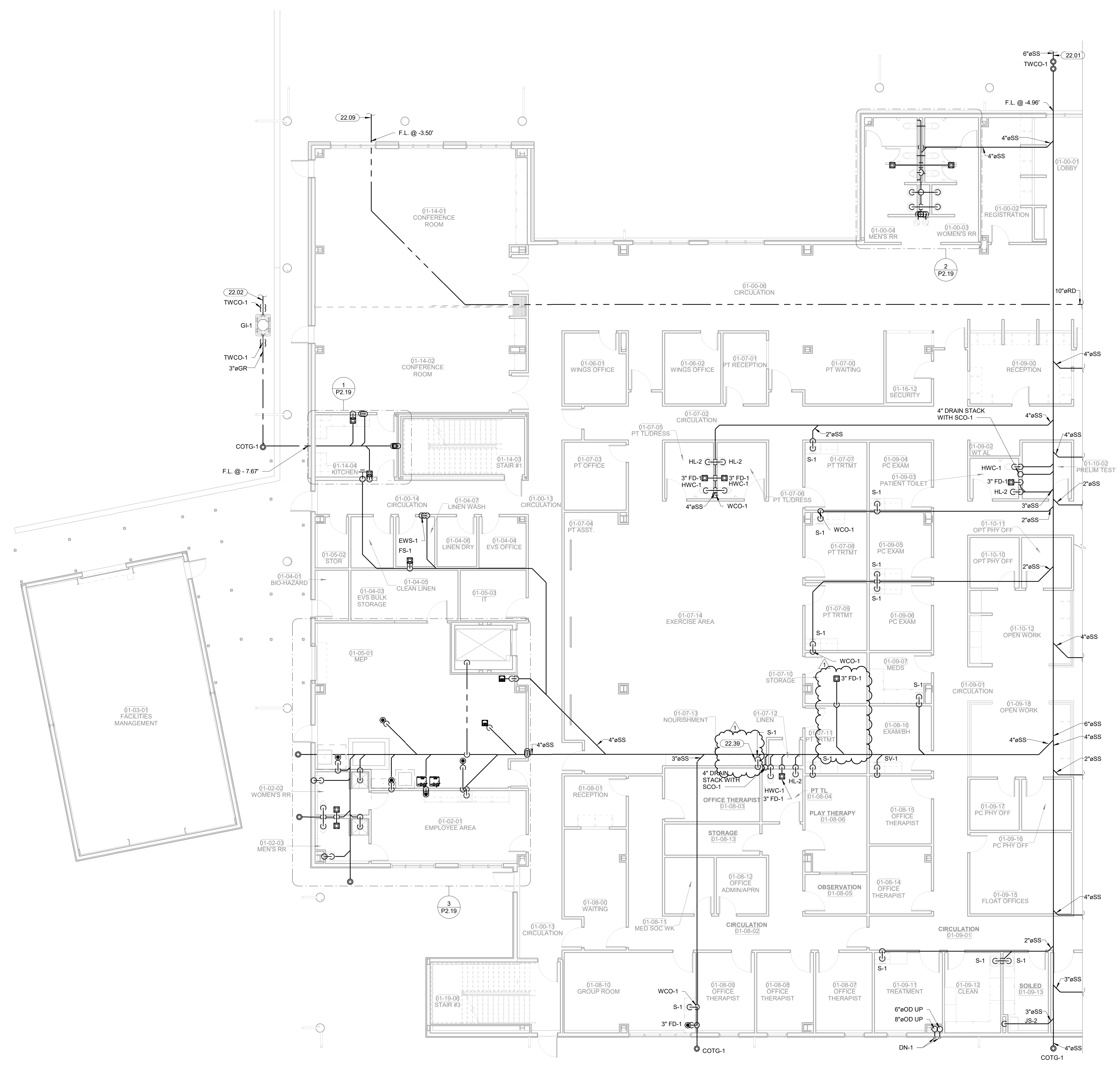
22.39 PROVIDE OPEN HUB DRAIN WITH TRAP GUARD UNDER COUNTER FOR DRAIN FROM COUNTER MOUNTED ICE MACHINE. HUB DRAIN SHALL BE CONNECTED TO THE DRAIN LINE AT THE SINK NEAR BY.

SEISMIC RESTRAINTS FOR MEP EQUIPMENT AND SYSTEMS

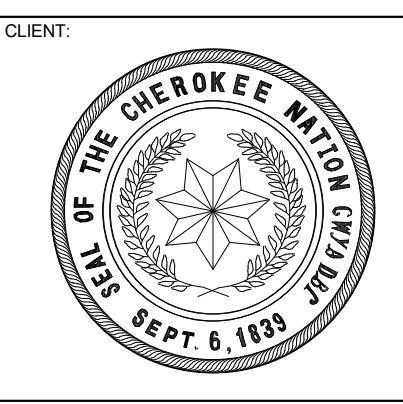
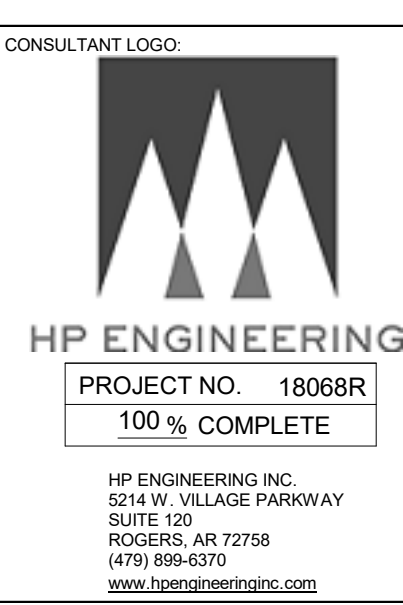
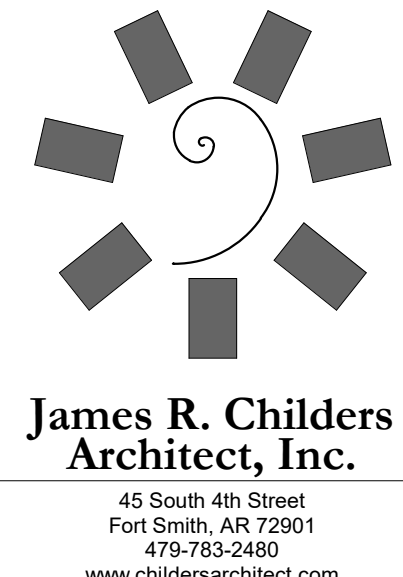
BUILDING IS CLASSIFIED AS SEISMIC DESIGN CATEGORY C. CONTRACTOR SHALL PROVIDE SEISMIC BRACING FOR PIPING, DUCTWORK AND EQUIPMENT TO MEET ALL LOCAL AND NATIONAL CODE REQUIREMENTS.

CONTRACTOR'S RESPONSIBILITIES INCLUDE PROVIDING ALL SUBMITTALS AND DETAILS WITH STRUCTURAL ENGINEER'S CERTIFICATION FOR PERMITTING.

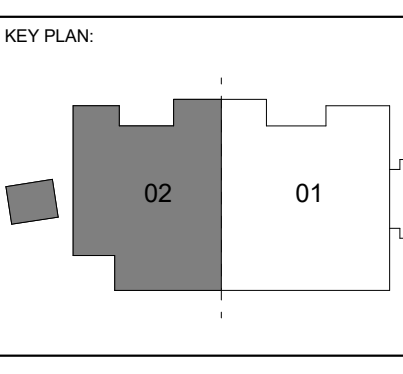
NOTE: IT IS THE PLUMBING CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE SITE CONTRACTOR TO CONFIRM THAT THE INVERT AND LOCATION OF THE SANITARY SERVICE IS COMPATIBLE WITH THE SITE UTILITIES PRIOR TO BEGINNING WORK.



FLOOR PLAN LEVEL 01 SECTOR 02 - DRAIN PLAN
1/8" = 1'-0"



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STILWELL, OKLAHOMA**

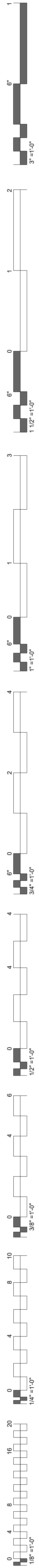


PROJECT PHASE:
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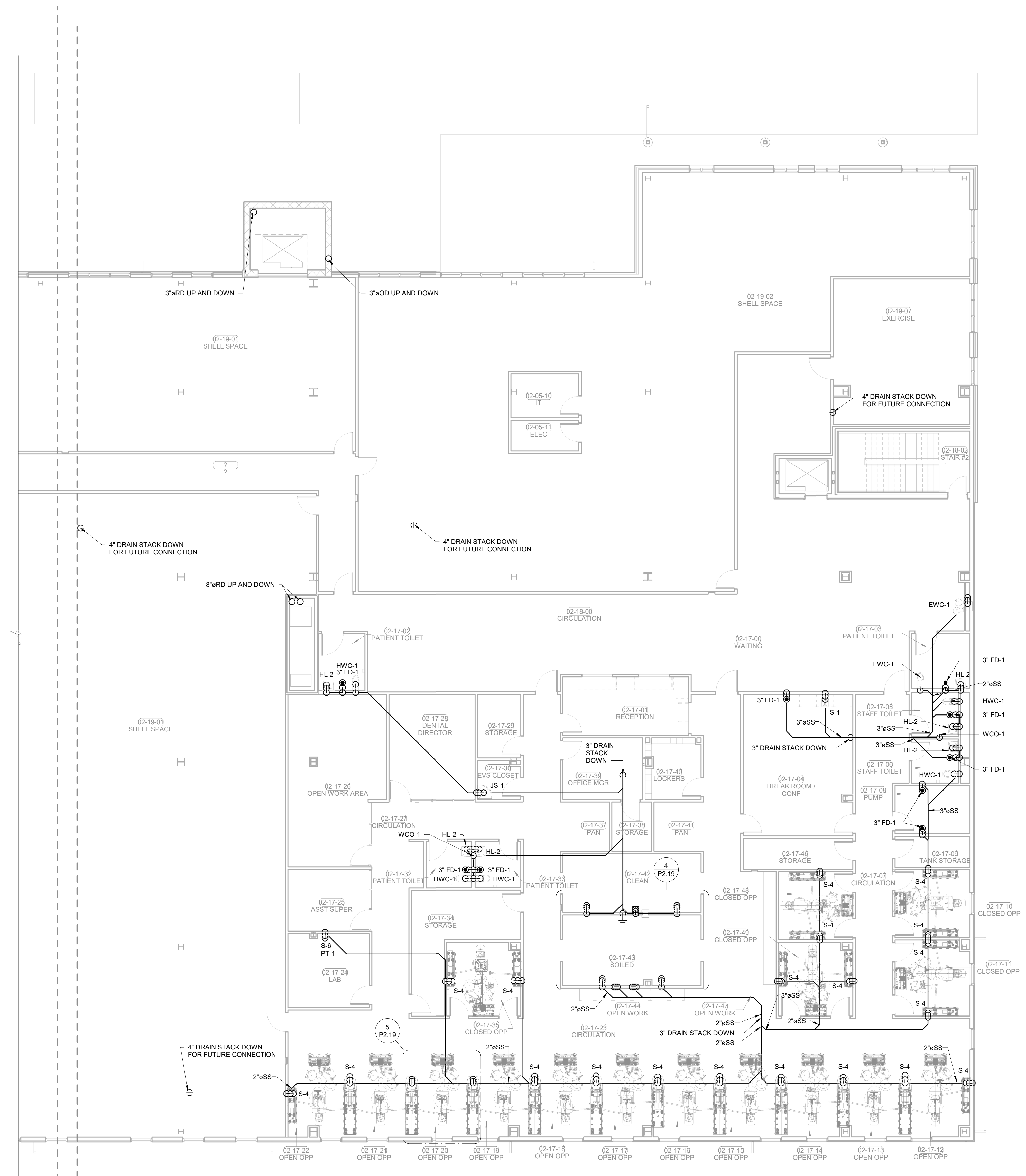
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DATE: 12-06-19
JOB NUMBER: 18-01.01

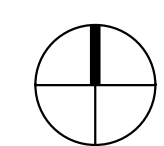
SHEET NUMBER:
P2.12
**DRAIN PLAN
LEVEL 01
SECTOR 02**

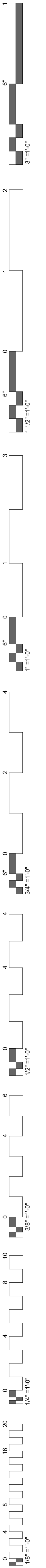


#	DATE	REVISIONS DESCRIPTION

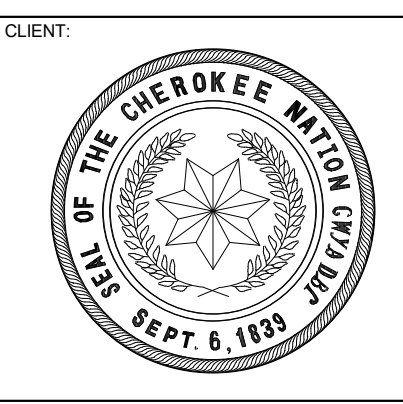
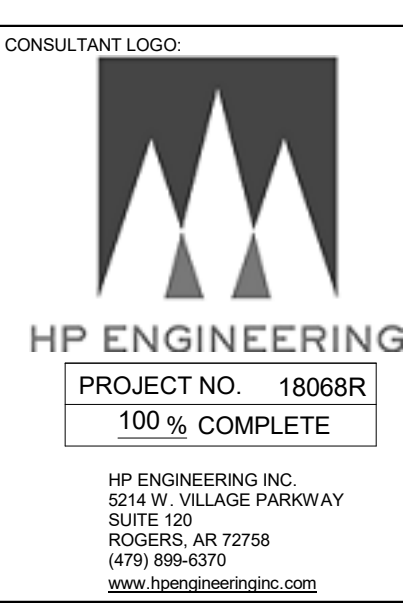
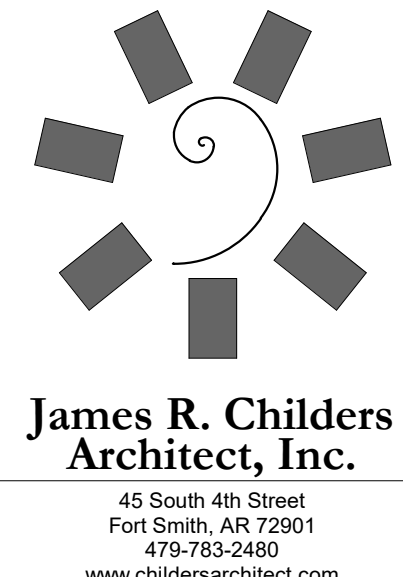


FLOOR PLAN LEVEL 02 SECTOR 01 - DRAIN PLAN
 1/8" = 1'-0"

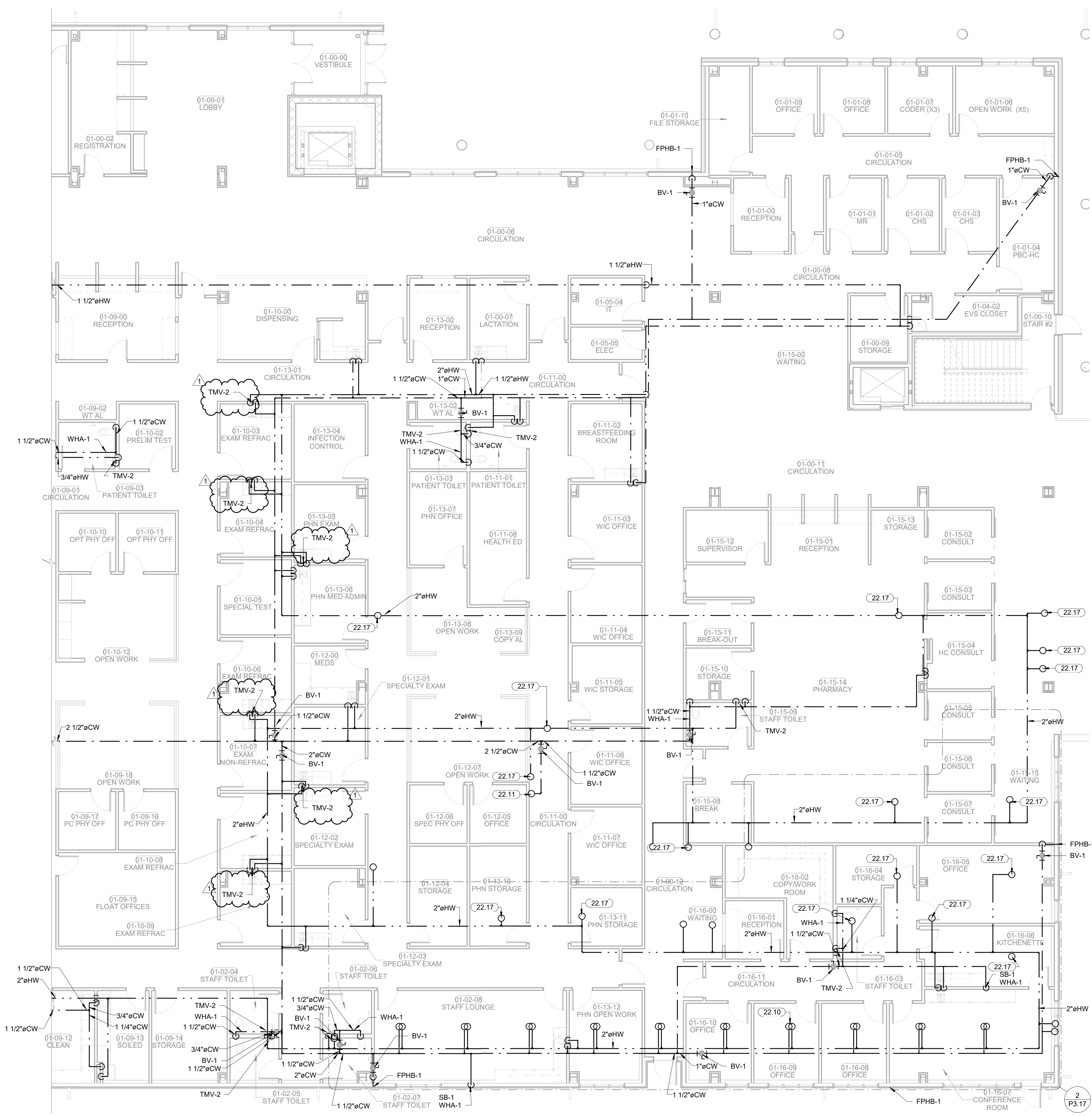




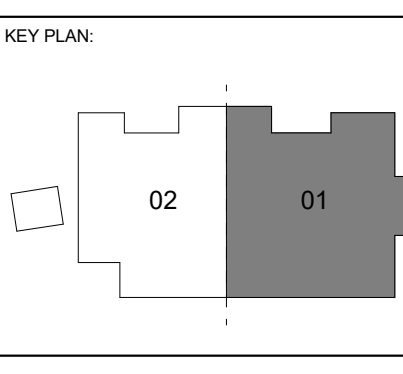
KEYNOTES	
Key Value	Keynote Text
22.10	3/4" CW & HW UP. TYPICAL 12 PLACES.
22.11	2-1/2" CW UP TO 2ND FLOOR.
22.17	3/4" HW UP.



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FLOOR PLAN LEVEL 01 SECTOR 01 - SUPPLY PLAN
1/8" = 1'-0"

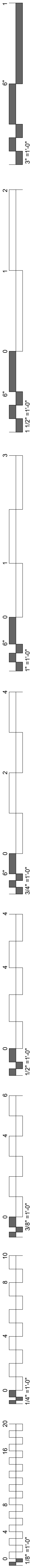


PROJECT PHASE:
BID PACKAGE 02

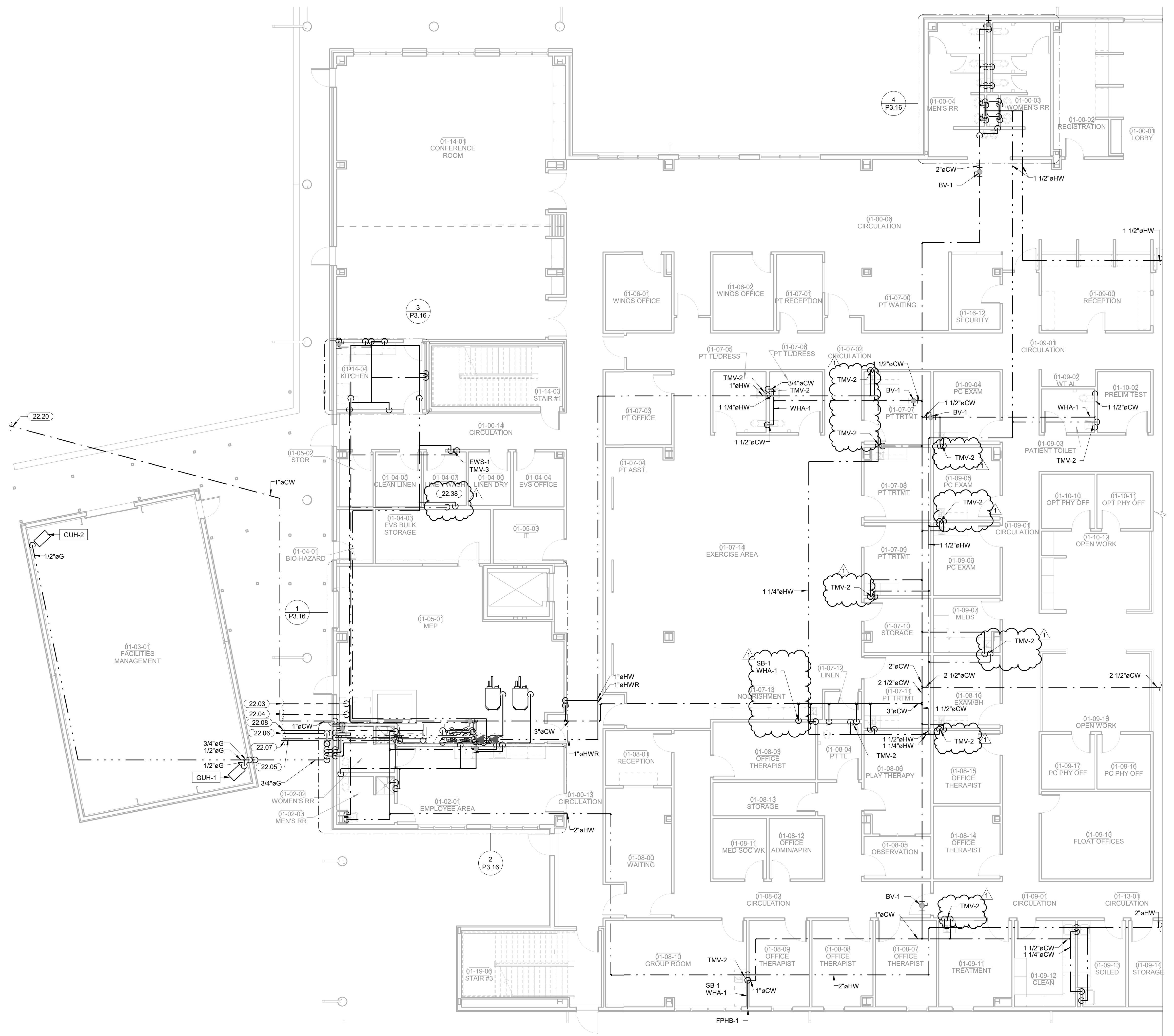
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1	3/30/20	BID PACKAGE 02	ASB 03

DATE: 12-06-19
JOB NUMBER: 18-01.01

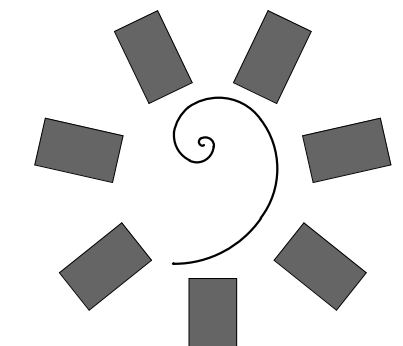
SHEET NUMBER:
P3.11
SUPPLY PLAN
LEVEL 01
SECTOR 01



- ### KEYNOTES
- 22.03 NEW 8" FIRE LINE. STUB UP INSIDE BUILDING FOR SPRINKLER CONTRACTOR CONNECTION. FIRE LINE TO BE SIZED BY SPRINKLER CONTRACTOR. REFER TO CIVIL PLANS FOR CONTINUATION.
 - 22.04 FIRE LINE TO FDC. REFER TO CIVIL PLANS FOR CONTINUATION. COORDINATE EXACT LOCATION OF FDC WITH LOCAL FIRE MARSHAL.
 - 22.05 3" DOMESTIC WATER LINE. REFER TO CIVIL PLANS FOR CONTINUATION. 143 G.P.M.
 - 22.06 2" MEDIUM PRESSURE GAS LINE (2 PSI). REFER TO CIVIL PLANS FOR CONTINUATION. 2895 & MBH
 - 22.07 IRRIGATION LINE TO RPZ-2. COORDINATE SIZE WITH IRRIGATION CONTRACTOR. REFER TO CIVIL PLANS FOR CONTINUATION.
 - 22.08 IRRIGATION LINE. COORDINATE SIZE WITH IRRIGATION CONTRACTOR. REFER TO CIVIL PLANS FOR CONTINUATION.
 - 22.20 PROVIDE 1" CW LINE TO THE MECHANICAL YARD YH-1. COORDINATE EXACT LOCATION OF THE YH-1 WITH EQUIPMENT AND OWNER/OWNER REPRESENTATIVE.
 - 22.38 PROVIDE CW LINE TO LAUNDRY DETERGENT DISPENSER. PROVIDE BACKFLOW PREVENTER PRIOR TO SOAP DISPENSER CONNECTION. COORDINATE WITH EQUIPMENT SUPPLIER FOR EXACT LOCATION OF DETERGENT DISPENSER AND SIZE OF CONNECTION.



FLOOR PLAN LEVEL 01 SECTOR 02 - SUPPLY PLAN
1/8" = 1'-0"



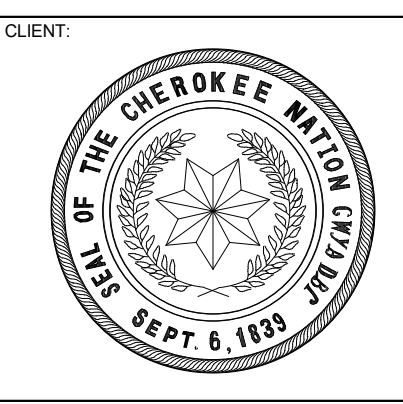
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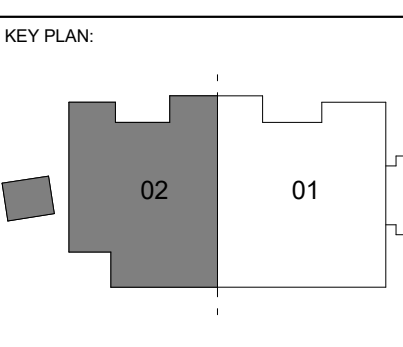
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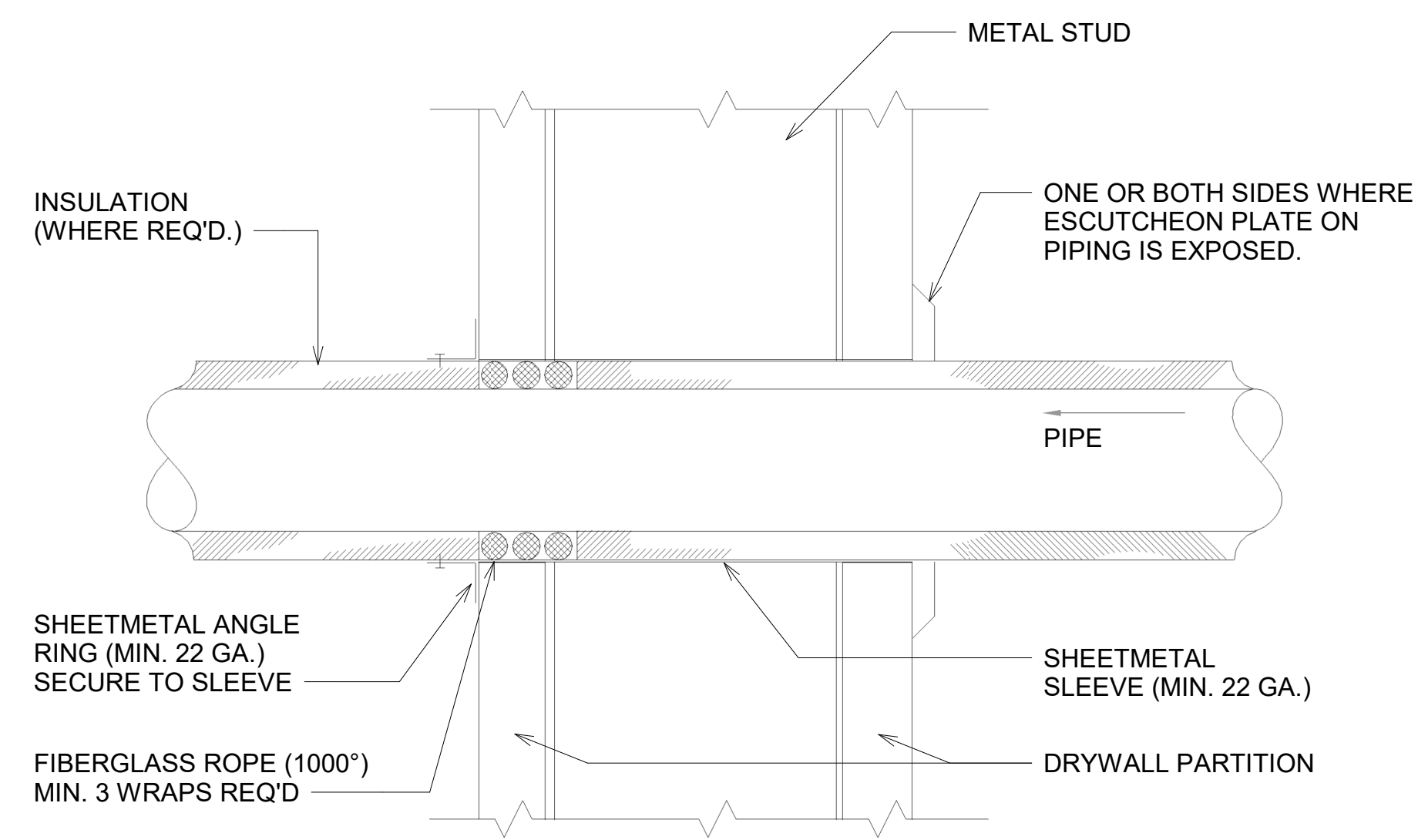
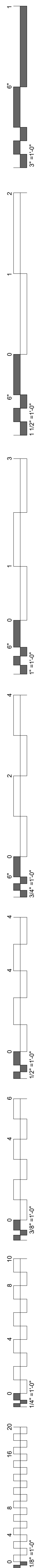


PROJECT PHASE
BID PACKAGE 02

#	DATE	REVISION DESCRIPTION
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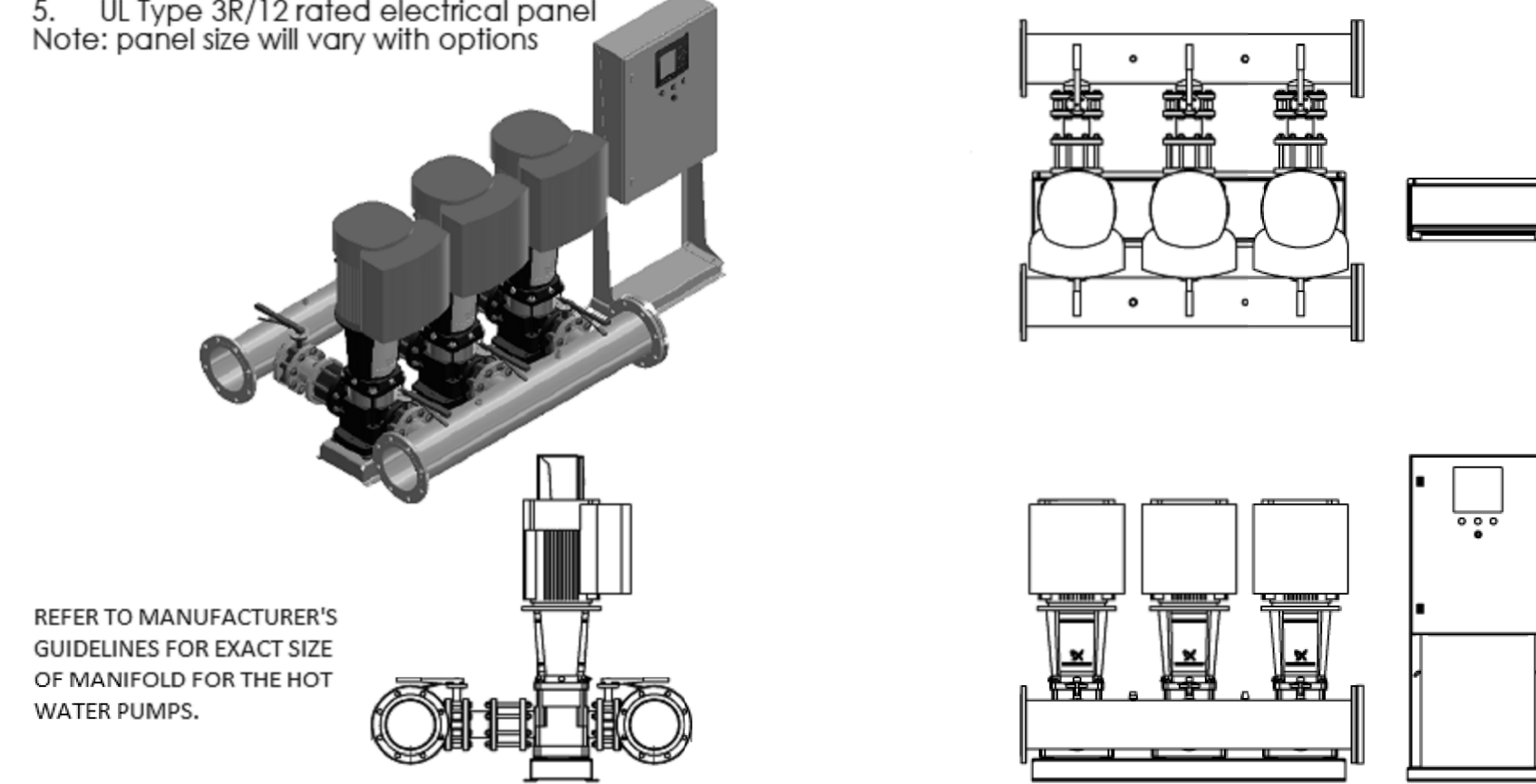
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SHEET NUMBER:
P3.12
SUPPLY PLAN
LEVEL 01
SECTOR 02

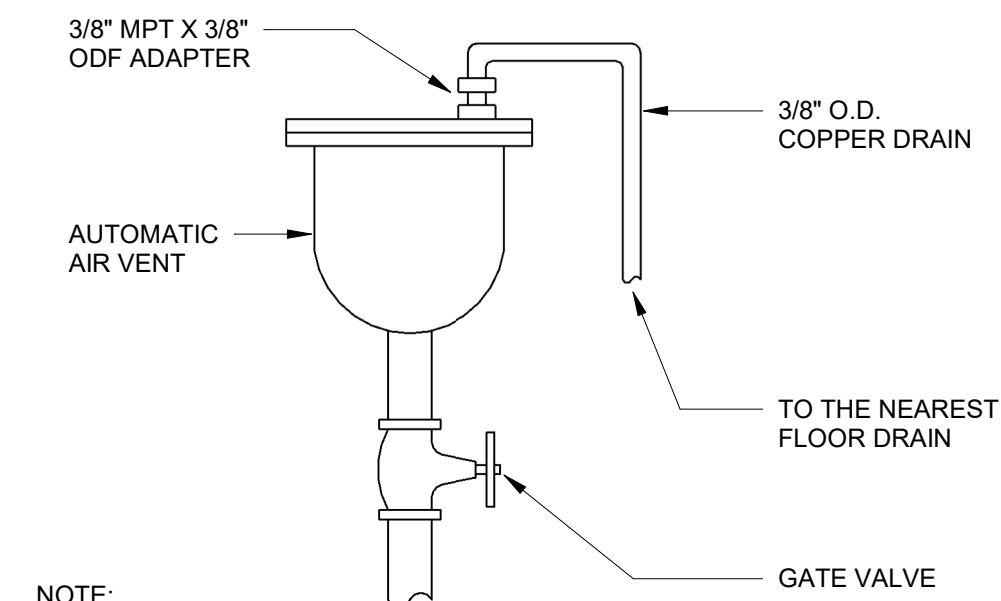


9 PIPE SLEEVE THRU WALL DETAIL
SCALE: N.T.S.

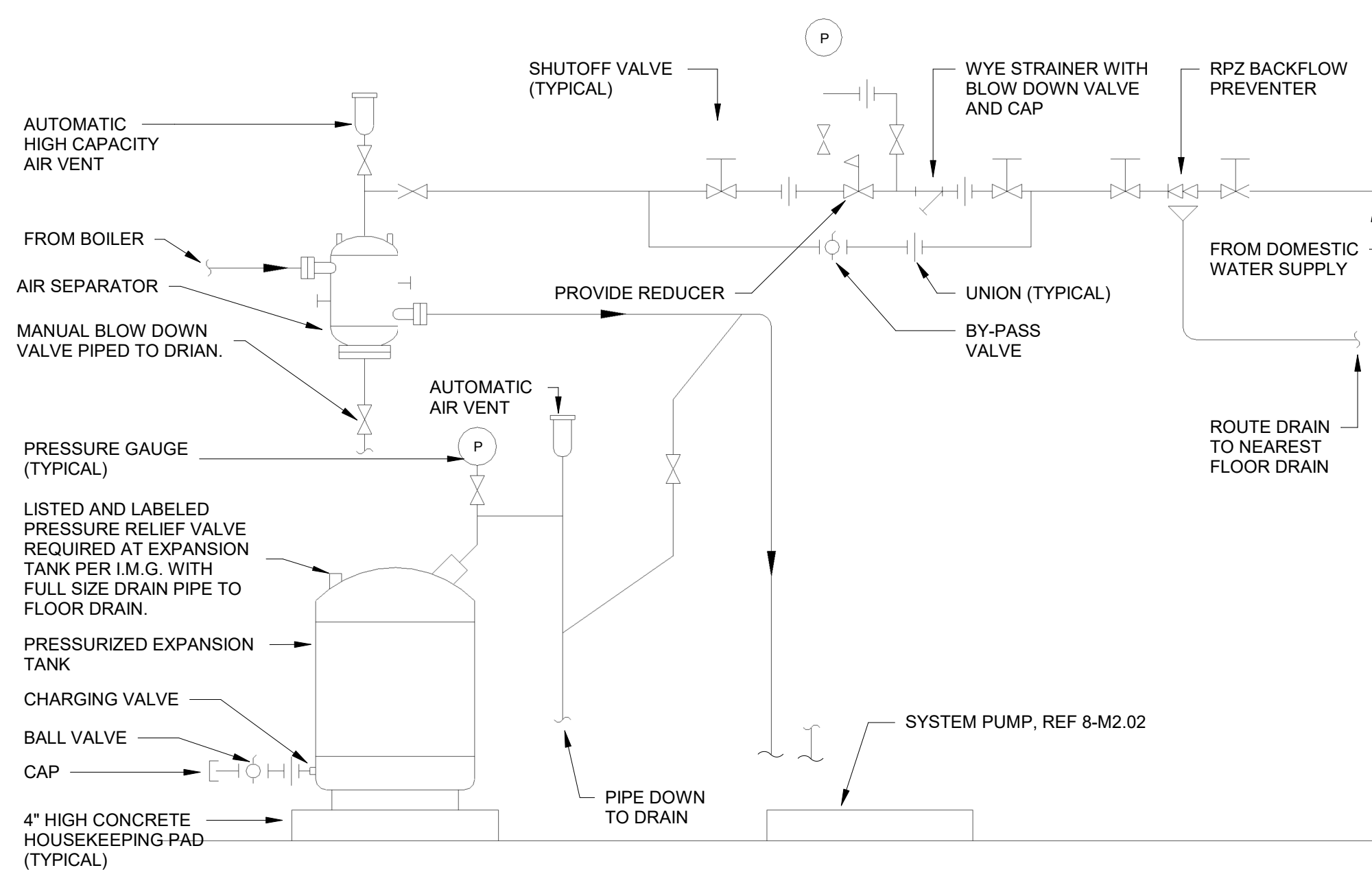
1. Manifolds 8" ANSI Class 150 AISI 316SS Schedule 10s ASTM A312 or $\phi 219.1\text{mm} \times 3\text{mm}$
 2. Base/Frame AISI 304SS
 3. Standard system layout : panel right facing suction
 4. 4" lug style ANSI 150# class butterfly valve
 5. UL Type 3R/12 rated electrical panel
- Note: panel size will vary with options



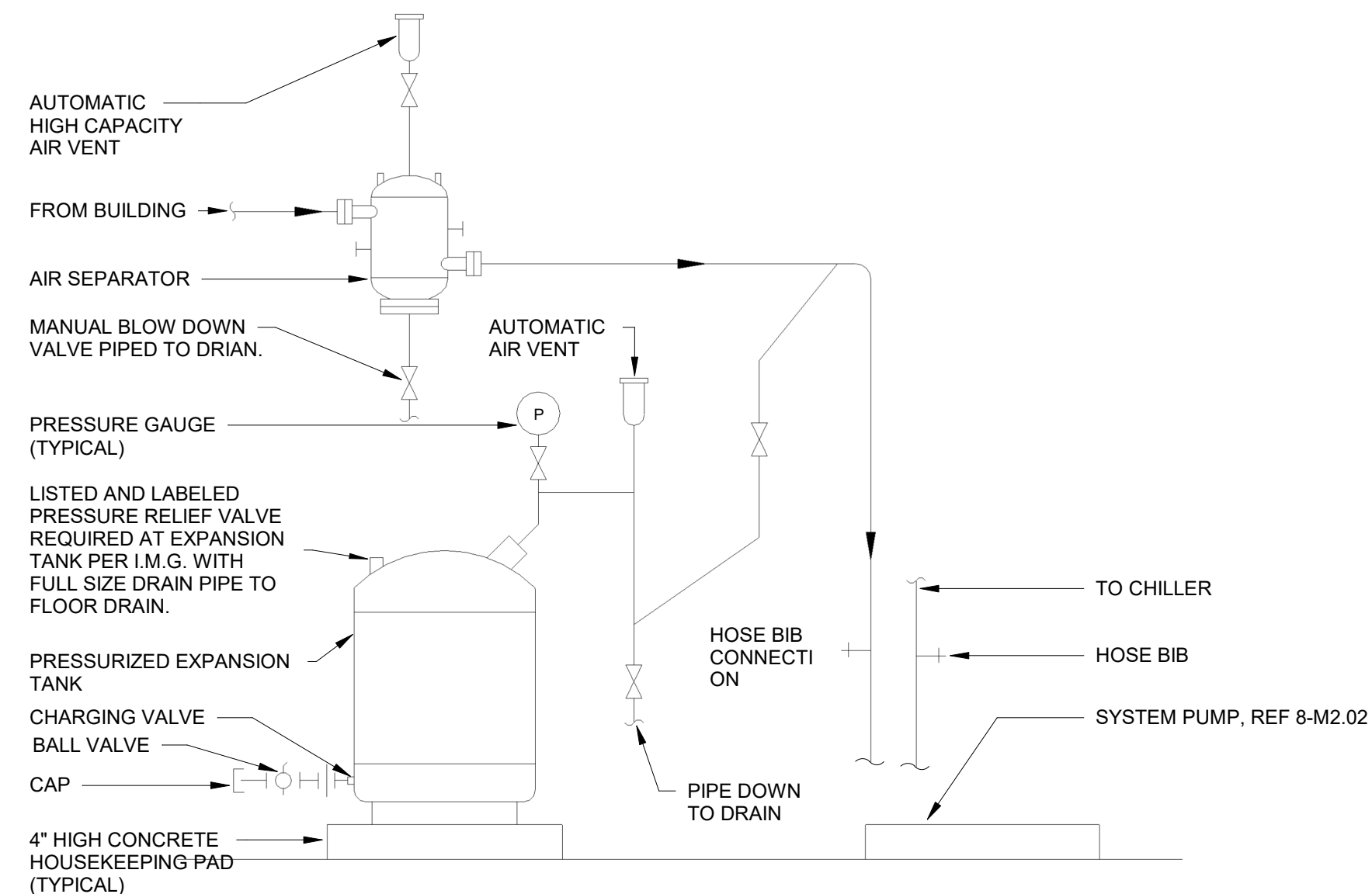
8 TRIPLEX PUMP SYSTEM DETAIL
1/4" = 1'-0"



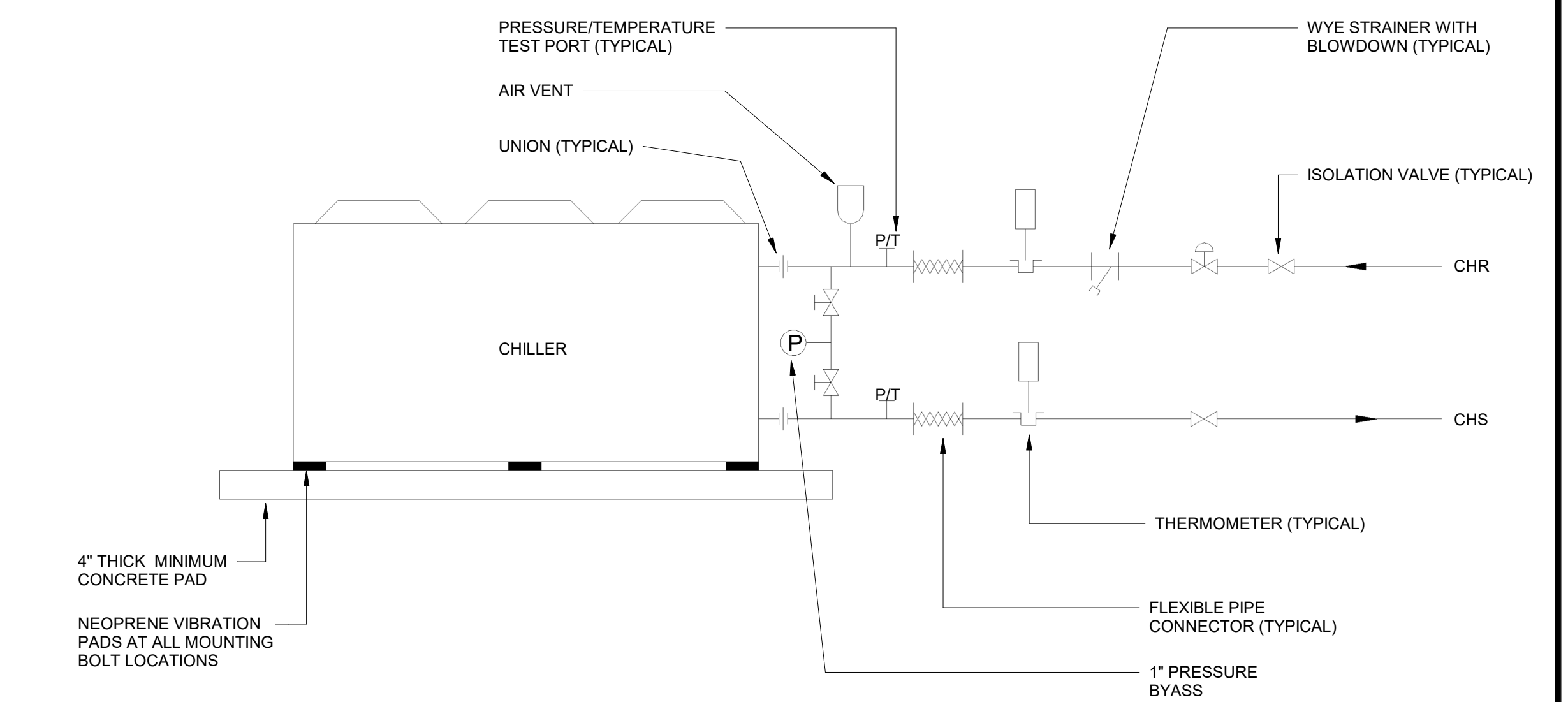
7 AIR VENT DETAIL
3/16" = 1'-0"



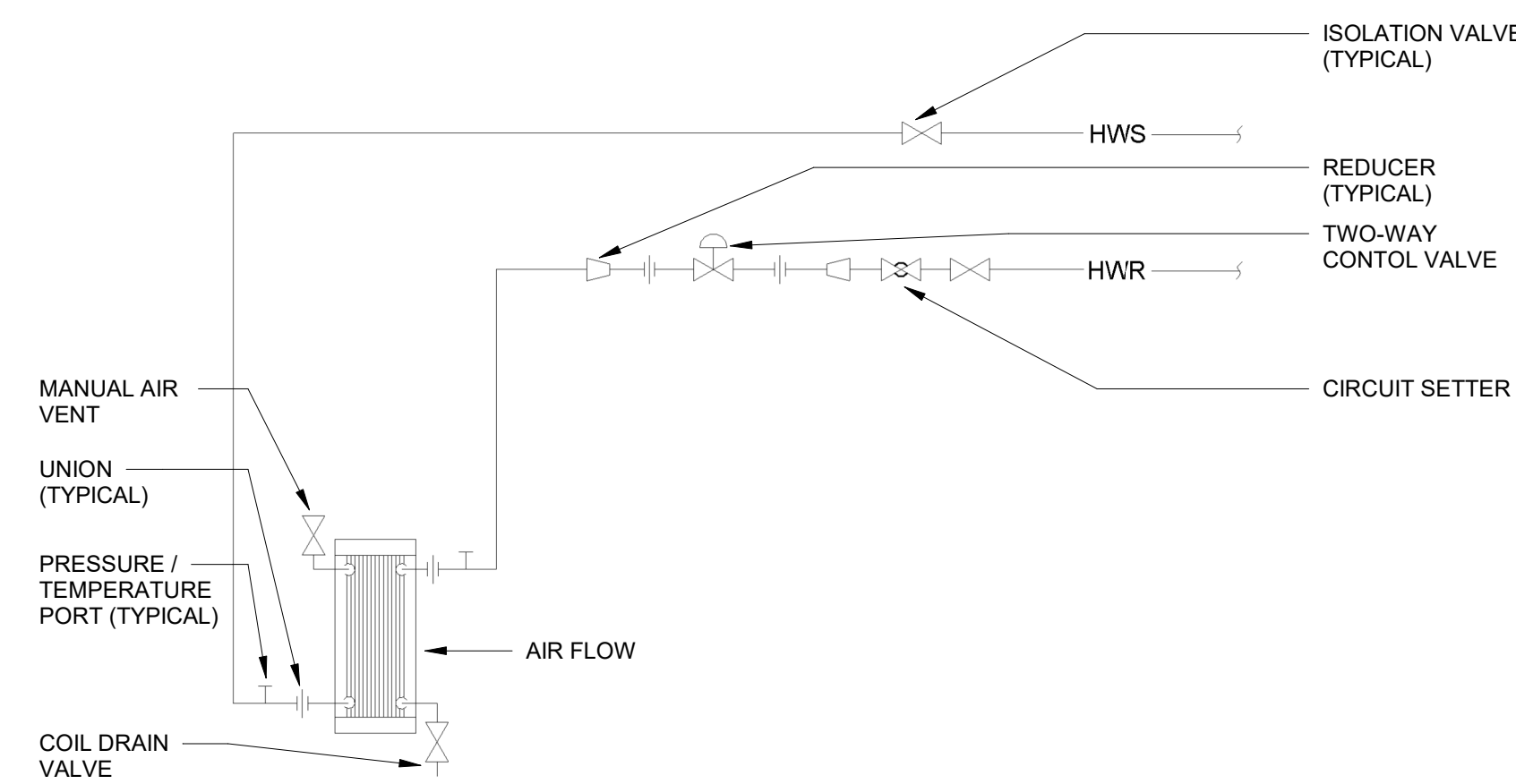
6 HEATING WATER SYSTEM MAKEUP AND EXPANSION TANK DETAIL
SCALE: N.T.S.



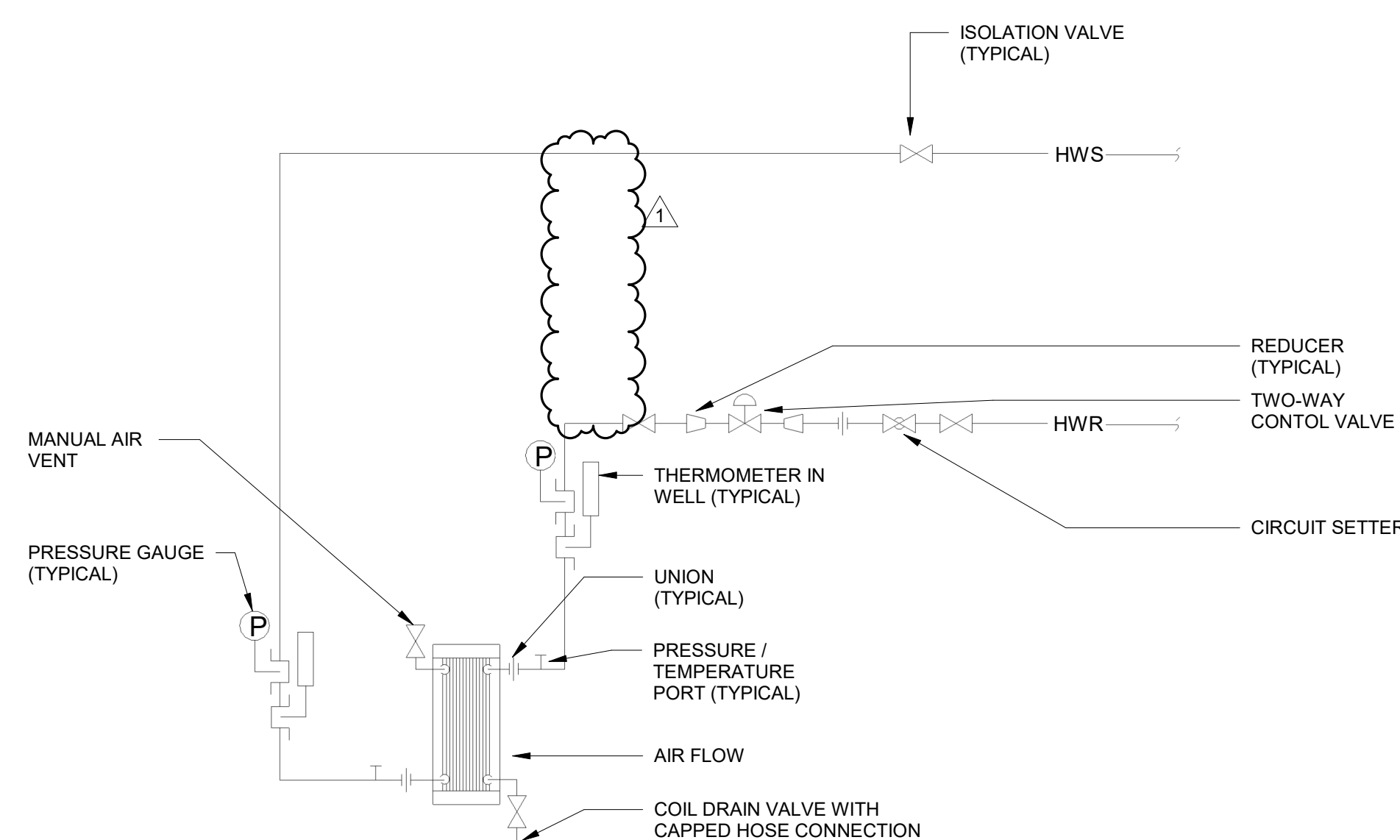
5 CHILLED WATER SYSTEM EXPANSION TANK DETAIL
SCALE: N.T.S.



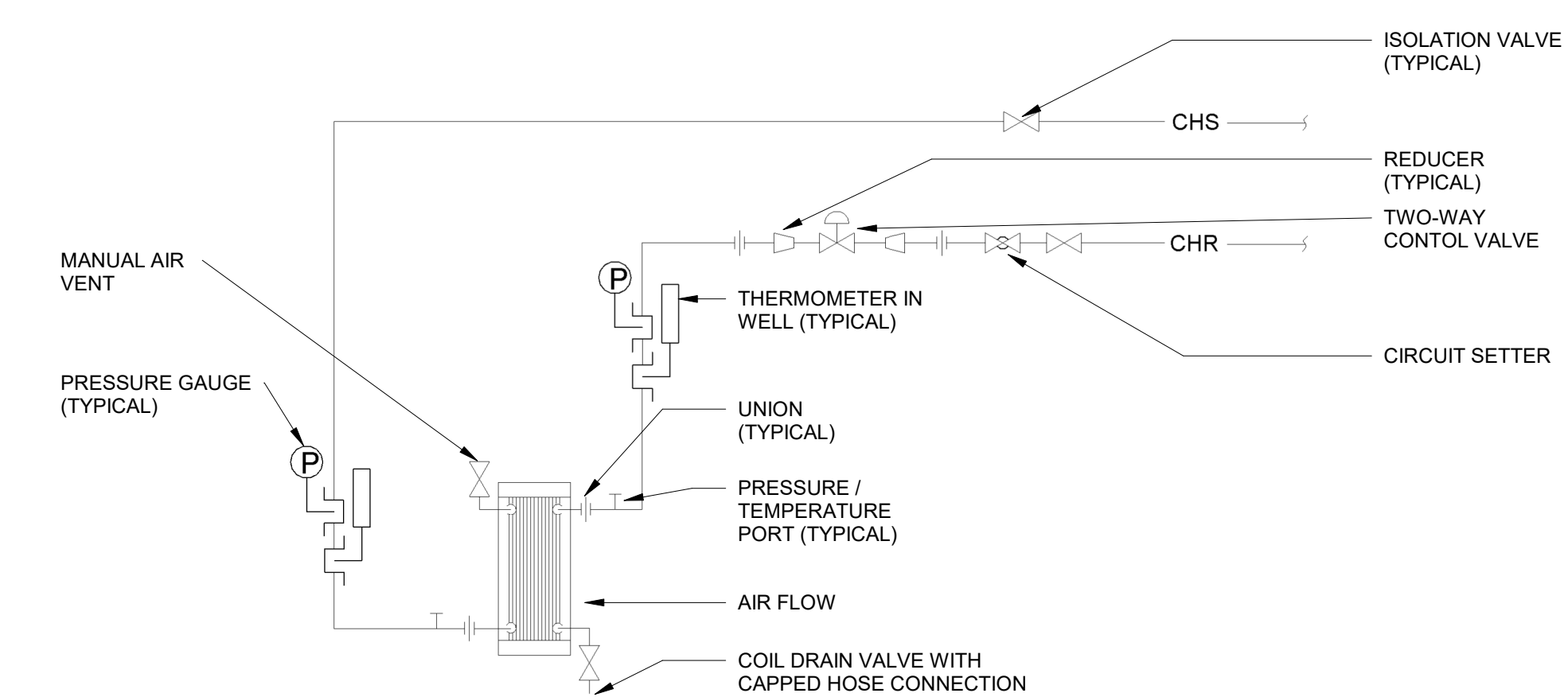
4 AIR COOLED CHILLER PIPING CONNECTION DETAIL
SCALE: N.T.S.



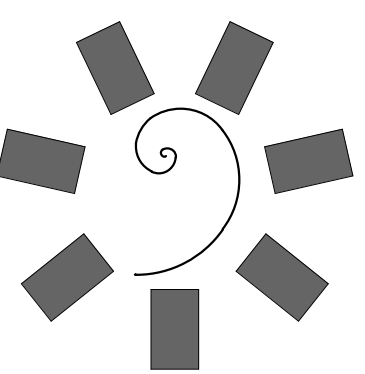
3 HOT WATER REHEAT COIL AT VAV BOX
3/16" = 1'-0"



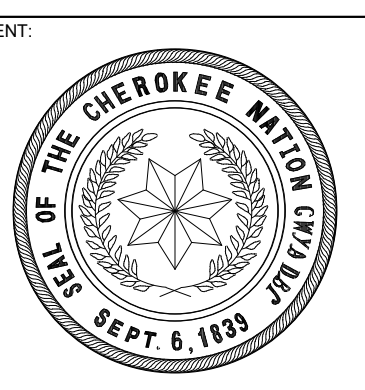
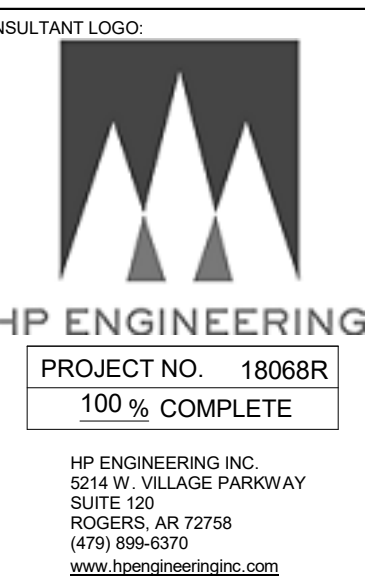
2 AHU REHEAT COIL PIPING
3/16" = 1'-0"



1 AHU CHILLED WATER COIL
3/16" = 1'-0"



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STILWELL, OKLAHOMA

KEY PLAN:

PROJECT PHASE:
BID PACKAGE 02

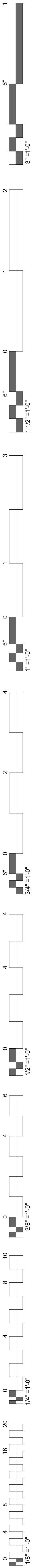
#	DATE	REVISIONS	DESCRIPTION
1	3/30/20	BID PACKAGE 02 - ASI 03	

DATE: 12-06-19
JOB NUMBER: 18-01.01

SHEET NUMBER:

M2.02

MECHANICAL
DETAILS



Sequence of Operation – Airside Optimization

System Operating Modes: The Building Automation System (BAS) shall include a user-adjustable time-of-day schedule to define when the various areas of the facility are expected to be occupied versus unoccupied. Then, based on current zone conditions, the BAS determines the current system operating mode.

Occupied Heat/Cool
During the Occupied Mode, each VAV terminal unit varies primary airflow, cycles a terminal fan (if equipped), and/or modulates (or stages) a local or remote heat source (if equipped) to maintain zone temperature at the occupied setpoint (cooling or heating). Meanwhile, the air-handling unit (AHU) modulates the supply fan and return fan (if equipped) to deliver the required airflow to the zones, positions the outdoor-air damper to bring in required amount of ventilation, modulates the central relief damper (or relief fan) to maintain building pressure at the desired setpoint, and modulates the chilled-water valve, modulates (or stages) the source of heat, and/or enables the airside economizer to discharge air at the desired setpoint.

Unoccupied Heat/Cool
During the Unoccupied Mode, each VAV terminal unit varies primary airflow, cycles a terminal fan (if equipped), and/or modulates (or stages) a local or remote heat source (if equipped) to maintain zone temperature at the unoccupied setpoint (cooling or heating). Meanwhile, the AHU shuts off, unless a zone requires unoccupied cooling or heating. If needed to operate, the AHU modulates the supply fan and return fan (if equipped) to deliver the required airflow to the zones, closes the outdoor-air damper, closes the central relief damper (or shuts off the central relief fan), and modulates the chilled-water valve or modulates (or stages) the source of heat to discharge air at the desired setpoint.

Morning Warm-up/Pre-cool
During the Morning Warm-up/Pre-cool Mode, each VAV terminal unit varies primary airflow, cycles a terminal fan (if equipped), and/or modulates (or stages) a local or remote heat source (if equipped) to raise/lower the zone temperature to the occupied setpoint (heating or cooling), and then closes. Meanwhile, the AHU modulates the supply fan and return fan (if equipped) to deliver the required airflow to the zones, closes the outdoor-air damper, closes the central relief damper (or shuts off the central relief fan), and modulates the chilled-water valve or modulates (or stages) the source of heat to discharge air at the desired setpoint.

Optimized System Level Control Sequences: The BAS shall perform the following optimized system-level control strategies:

Optimal Start
The BAS shall initiate Optimal Start mode such that the AHU is started and VAV boxes are enabled to allow the zone temperature to reach the occupied heating or cooling setpoint prior to scheduled occupancy. The system shall wait as long as possible before starting, so that the temperature in each zone reaches the occupied setpoint just in time for scheduled occupancy.

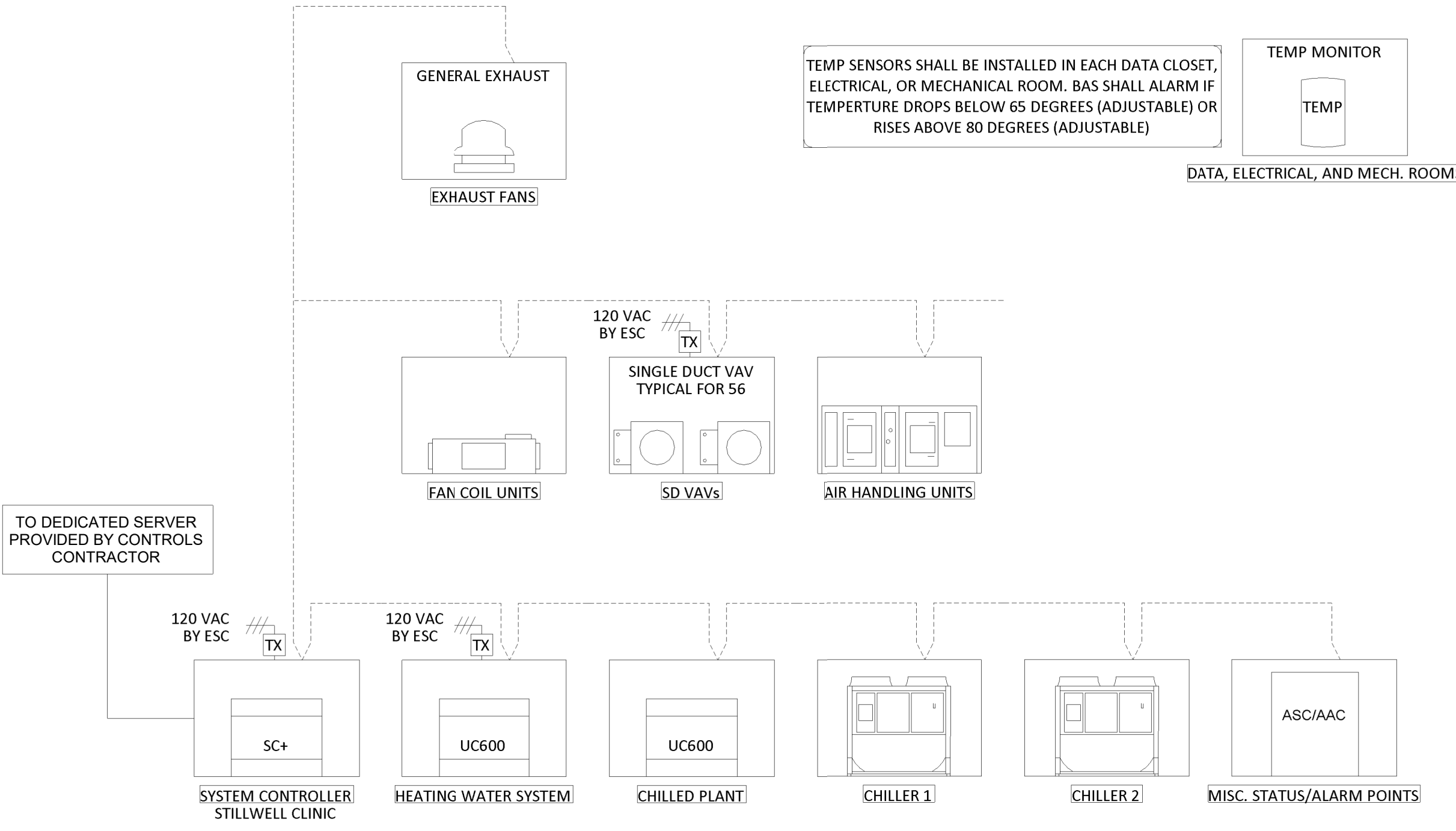
Optimal Stop
The BAS shall initiate Optimal Stop mode such that cooling or heating is disabled so that the zone temperature does not drift beyond the occupied standby setpoint by the end of the scheduled occupancy period. The AHU supply fan shall continue operating, and ventilation control shall continue, through the end of the scheduled occupancy period.

Unoccupied Economizing (Night Purge)
Between 4:00 AM (adj.) and 6:00 AM (adj.), the BAS shall initiate Unoccupied Economizing mode if the current zone temperature is at least 1°F warmer than the occupied cooling setpoint and the outdoor dry-bulb temperature is more than 15°F (adj) cooler than the current zone temperature. When initiated, the AHU is started (OA damper fully open, chilled-water valve closed) and VAV boxes are enabled to allow the zone temperature to cool to the occupied cooling setpoint.

Optimized Control of Supply Duct Static Pressure (Fan-Pressure Optimization)
At a frequency of once every 10 minutes, the BAS shall monitor the damper position of all VAV terminal units. The BAS shall calculate a new supply fan duct static pressure setpoint based on the position of the furthest-open VAV damper, and send this newly-calculated setpoint to the AHU controller. When any VAV damper is more than 75% (adj) open, the supply fan duct static pressure setpoint shall be reset upward by 5% until no damper is more than 75% (adj) open or the static pressure setpoint has reset to the maximum setting. When all VAV dampers are less than 65% (adj) open, the supply fan duct static pressure setpoint shall be reset downward by 5% until at least one damper is more than 65% (adj) open or the static pressure setpoint has reset to the minimum setting.

Optimized Control of Supply Air Temperature (SAT Reset)
At a frequency of once every 10 minutes, the BAS shall monitor the outdoor dry-bulb temperature, as well as the zone temperature and damper position of all VAV terminal units. The BAS shall calculate a new SAT setpoint based on current outdoor air (OA) temperature, and send this newly-calculated SAT setpoint to the AHU controller. When the OA temperature is warmer than 65°F (adj), the SAT setpoint shall be 55°F (adj). When the OA temperature is colder than 55°F (adj), the SAT setpoint shall be 60°F (adj). When the OA temperature is between 55°F (adj) and 65°F (adj), the SAT setpoint shall be reset proportionally between 55°F (adj) and 60°F (adj). If at least two (adj) zones have both 1) a VAV damper that is more than 75% open, and 2) a current zone temperature that is higher than the current cooling setpoint, then the SAT setpoint shall return to 55°F (adj). If the outdoor dew point is higher than 60°F (adj), this SAT Reset sequence shall be suspended and the SAT setpoint shall be reset to 55°F (adj) until outdoor dew point drops below 57°F (adj).

Optimized Control of Ventilation (Ventilation Optimization)
The actual outdoor airflow shall be sensed at the outdoor air intake of the AHU, and controlled to an airflow setpoint determined according to ASHRAE Standard 62.1. When the BAS time-of-day schedule indicates that a zone is unoccupied, the required outdoor airflow for that zone shall be zero. When the schedule indicates that a zone is occupied, the required outdoor airflow for that zone shall equal the design outdoor airflow, unless the zone is equipped with occupancy sensor and/or a carbon dioxide (CO₂) sensor, or uses a time-of-day ventilation schedule, to reduce the required outdoor airflow during periods of partial occupancy. The required outdoor-air fraction (current required outdoor airflow divided by the current primary airflow) shall be continuously calculated for each zone (VAV terminal unit). At a frequency of once every 10 minutes, the BAS shall gather this data from all VAV terminal units, calculate the minimum required outdoor airflow for the system according to ASHRAE 62.1, and send this newly-calculated outdoor airflow setpoint to the AHU controller.



1 CONTROLS - RISER AND MAIN SEQUENCE OF OPERATIONS
N.T.S.

Sequence of Operations - Chilled Water Plant

System General Description:
The chilled water system consists of the following:
Two (2) chillers, configured as: one (1) lead and one (1) lag
Three (3) chilled water pumps: one (1) lead, one (1) lag and one (1) standby
One (1) chilled water isolation valve per chiller
Chilled water bypass valve
The Building Automation System (BAS) controller provides stand-alone control or control from a higher level BAS and provides lead/lag/standby control for the chilled water pumps and controls the chilled water bypass valve to maintain minimum flow through operating chillers.

Chilled Water Plant Enable
The chilled water plant will be enabled in response to a need for chilled water from any system load as indicated by any chilled water valve being commanded to more than 50% open for more than 5 minutes.

Startup - Soft Start
System Soft Start - The chiller plant control system will initiate a "soft start" mode whenever the system chilled water temperature exceeds the specified chilled water system setpoint by 20°F (adj) at system start-up. The chiller plant control application will add cooling capacity during soft start mode only if return water temperature is not declining at a rate of at least 0.5°F (adj) per minute. This prevents the unnecessary operation of chillers and limits system electrical demand during chilled water loop pull down.

Chiller Sequencing
When the chilled water system is enabled the chiller plant control system will send an enable signal to the lead chiller and chilled water pumping control. The chiller plant control system will initiate the start of the next chiller in the sequence whenever the chilled water load, as determined by the system supply water temperature, is not met for 20 (adj) minutes. The chiller plant control system will initiate the shutdown of the next chiller in the sequence whenever excess chilled water capacity exists, as determined by percent run load amps, for 20 (adj) minutes.

Chiller Rotation
Chiller rotation will be initiated based on an operator editable day of week/time, fixed number of days, number of run hours, or by the cycling of a binary input. Chiller cycling caused by normal system load fluctuations will cause the chillers to change rotation sequence or at the operator's option chillers may be forced into the new rotation sequence at the time of sequence change.

Chiller Setpoint Control
The chiller plant control system will control individual chiller setpoints to maintain the system supply water temperature setpoint.

Failure Recovery
Upon sensing a chiller failure the chiller plant control system will shut down the failed chiller immediately and initiate the start of the next chiller in the rotation sequence. In the event of a power loss, the chiller plant control application will compare the number of chillers running to the number of chillers running prior to the power loss. The application will add chillers one at a time, skipping normal delay timers, until the chillers running equals the number of chillers running prior to the power loss.

Chilled Water Supply Temp Reset:
The chilled water supply temperature setpoint default shall be 42 deg. F. (adj.)
This setpoint shall be reset based on outside air dry bulb temperature. When the outside air dry bulb is 65 deg. F. or greater, the chilled water supply temperature shall be 42 deg. F. When the outside air dry bulb temperature is between 65 and 55 deg. F. the chilled water supply temperature setpoint shall be linearly reset between 42 and 55 deg. F.
If at any time any AHU chilled water valve is more than 97% open, this reset shall be disabled and the chilled water supply temperature setpoint shall revert to default. If the system global outside air temperature sensor is in fault, an alarm shall be annunciated at the BAS and the chilled water supply temperature setpoint shall revert to default.

Chilled Water Pumping System Enable/Disable:
The chilled water pumping system shall be enabled on a contact closure from any system chiller. When enabled, the BAS controller shall open the isolation valve and starts the lead chilled water pump. As additional chillers make chilled water requests, the next pump in the sequence shall be enabled and chiller isolation valves opened. When the chilled water pumping system is disabled, the chilled water pumps shall be off and the isolation valves shall be closed unless requested by one of the chillers. The isolation valve for the first chiller in the sequence shall be an exception to this. If the plant is disabled, the isolation valve for that chiller shall be opened so that the pump can start immediately when the plant is enabled.

Chilled Water Pump Control:
When enabled as described above, the BAS controller shall start the lead chilled water pump through a contact closure of the pumps Variable Frequency Drive (VFD) drive run-enable contacts.

The BAS controller shall monitor the chilled water system differential pressure sensor. When the pump VFD is enabled, the BAS controller shall control the analog speed signal that is sent to the pump VFD to maintain the chilled water differential pressure setpoint which is reset as described in the Pump Optimization section of this sequence. The default setpoint shall be 15 psig (adj.).
When the running pump(s)' speed is controlled to 100% (60 hz) and the system differential pressure setpoint is not maintained for 5 minutes, the next available lag pump shall start. When multiple pumps are running to maintain setpoint, their speed shall be modulated in unison.
If more than 1 pump is running and their speed is over 75% **, the last pump most recently started shall be disabled, subject to a minimum on/off timer of 10 minutes (adj.).
** this speed shall be adjusted by the BAS Contractor according to the pump curves provided by the pump manufacturer. The speed shall be chosen which according to the pump curves, indicates the resulting running pump(s) would be able to maintain the current flow and pressure at 90% or less speed.

If a pump is commanded on and fails to prove status (through the VFD) for more than 30 seconds (adj.), the BAS controller shall cancel the start command to that pump, annunciate a chilled water pump failure alarm to the BAS, and start the next pump in the sequence.

Once the problem has been corrected, the operator shall be able to clear the alarm failure from the BAS controller from the BAS interface or by manually overriding the pump on momentarily. This shall re-enable the pump participation in the lead/lag sequence.

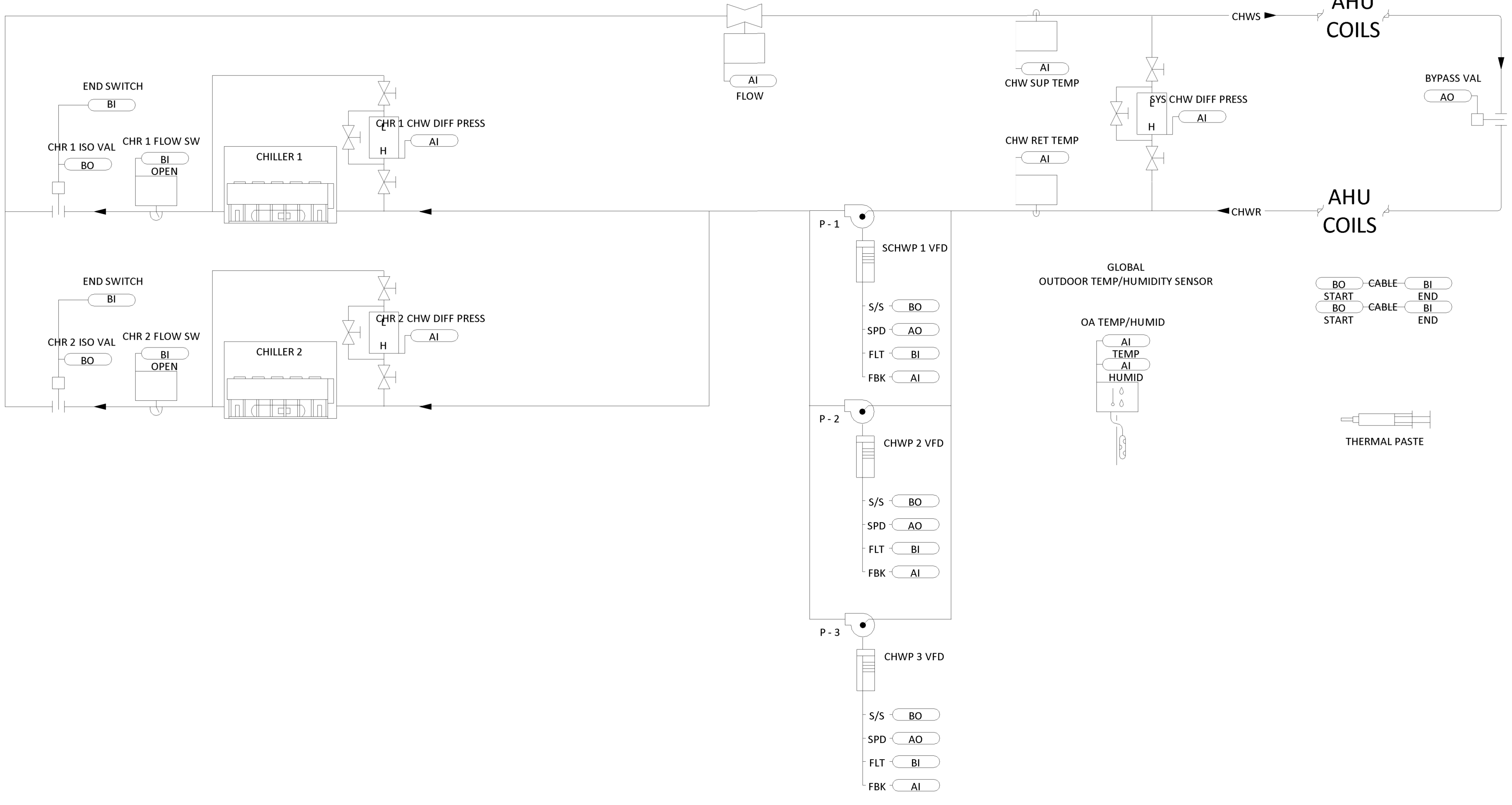
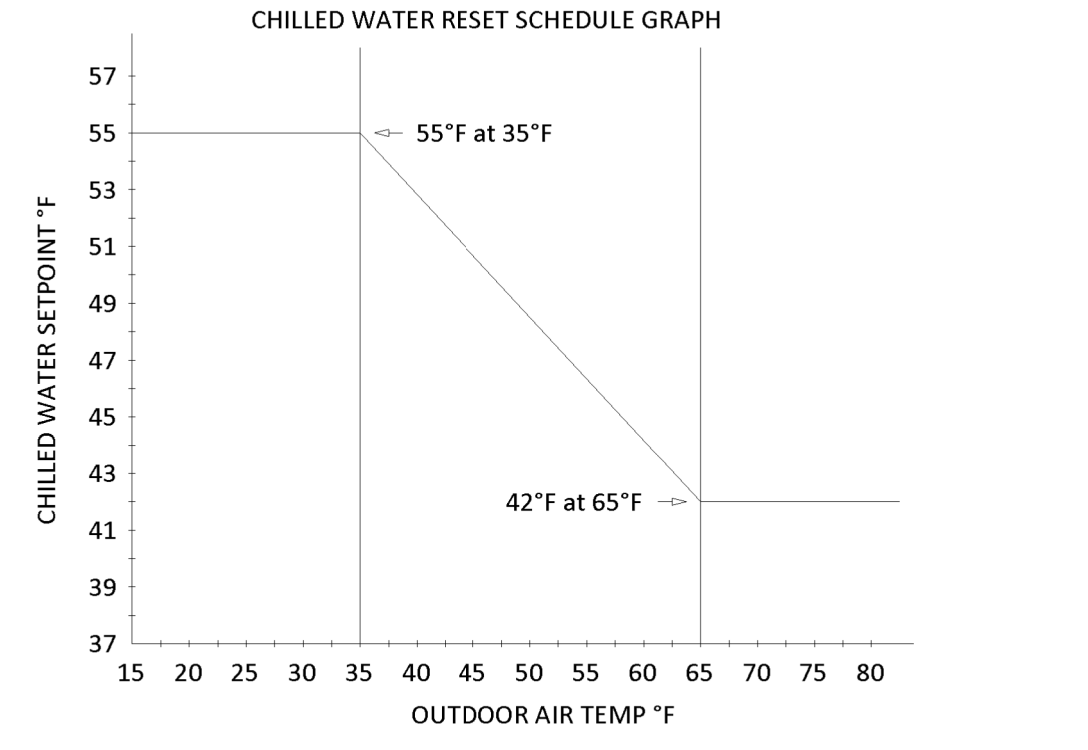
Chilled Water Pump Lead/Lag Rotation:
The chilled water pump lead/lag sequence shall be rotated on a weekly schedule. The sequence shall be based on calculated run time with the pump having the least run time as lead, the pump with the next lowest run time will be the second in the sequence and so on. An operator shall be able to manually change the lead/lag sequence from the BAS.

System Differential Setpoint Optimization:
The BAS shall continually monitor the position of all valves in the chilled water system. From the BAS interface an operator shall be able to exclude any valve for consideration in this optimization.

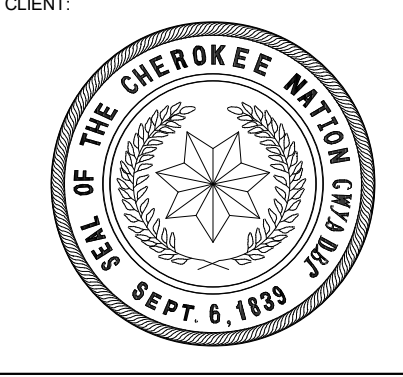
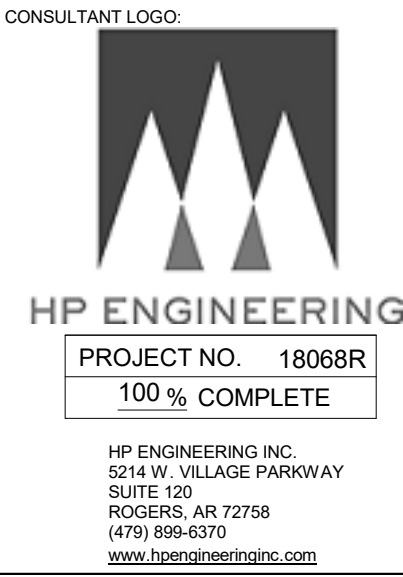
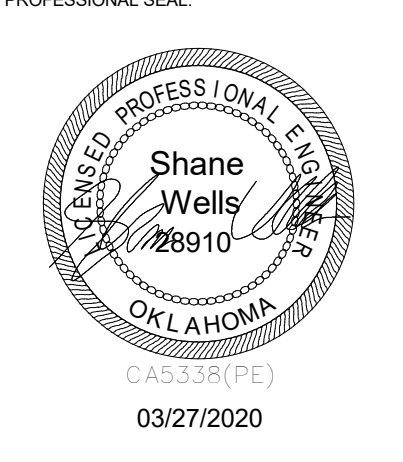
At chilled water system startup, the differential pressure setpoint is 100% of the maximum pressure setpoint. When all valves are less than 85% open, the differential pressure setpoint shall be lowered by 0.1 psig (adj.). This occurs every 5 minutes until at least one valve is more than 85% open, or if the setpoint is equal to the minimum differential pressure setpoint, or if the pump VFD's are at a minimum speed setting (22 Hz).
When any valve is more than 95% open, the differential pressure setpoint shall increase by 0.1 psig (adj.). This occurs every 5 minutes until no valve is more than 95% open, or if the differential pressure setpoint has risen to the system's maximum setting, or if the pump VFD's are at the maximum setting (60 Hz).
If the system differential pressure sensor is in fault, an alarm shall be annunciated at the BAS and the differential setpoint shall revert to default.

Chiller Isolation Valves:
Chiller isolation valves shall prevent the flow of water through non-operating chillers. Chiller chilled water pump operation will be coordinated with the isolation valve operation.

Bypass Valve Control:
The BAS controller shall monitor the evaporator differential pressure of the chillers. When the pressure of an operating chiller indicates a low pressure (flow), the BAS controller shall control the analog signal that is sent to the bypass valve to maintain minimum pressure (flow) on all operating chillers.



2 CONTROLS - CHILLED PLANT
N.T.S.



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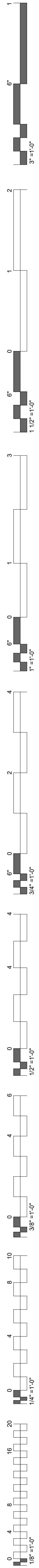
KEY PLAN:

#	DATE	REVISIONS	DESCRIPTION
1	3/9/20	BID PACKAGE 02 - ASI 03	

PROJECT PHASE:
BID PACKAGE 02

DATE: 12-06-19 JOB NUMBER: 18-01.01

SHEET NUMBER:
M9.01
MECHANICAL CONTROLS



Sequence of Operations

Heating Water System

General Description:
The hot water system consists of multiple boilers with factory BACnet interfaces, and associated pumps. The Building Automation System (BAS) controller shall control the supply of heating water at a temperature setpoint (adj.) by communicating setpoints and enable/disable commands to the boilers via their BACnet interface, and directly controlling the secondary system pumps.

Heating System Enable/Disable:
The heating system shall be enabled when the outdoor air temperature is below 60.0 deg. F (adj.) or any system AHU heating valve is commanded more than 50% open for 5 minutes, or when at least 3 VAV heating valves are commanded more than 50% open for 5 minutes. When enabled, the BAS controller shall start the lead hot water distribution pump, the lead boiler circulating pump, and enable the lead boiler. The boiler factory control shall operate the boiler to maintain its local supply setpoint. Heating shall be disabled when the outdoor air temperature is above 65.0 deg. F (adj.) and no hot water valve is commanded 50% or more open. When heating is disabled, the hot water pumps and boilers shall be commanded to OFF.

Boiler Control:
Boilers will be controlled by their factory controller including lead/lag, rotation, and firing based on enable/disable and setpoints communicated to the boiler controllers via their factory BACnet interface from the BAS.

Hot Water Reset:
The hot water supply temperature setpoint shall be linearly reset from 180.0 deg. F (adj.) to 180.0 deg. F (adj.) as the outdoor air temperature falls from 60.0 deg. F (adj.) to 20.0 deg. F (adj.) per the provided hot water reset schedule graph.

Hot Water Distribution Pump Start/Stop:
The BAS controller shall start a hot water pump through a contact closure of the pump's variable frequency drive (VFD) run-enable contacts.

Hot Water Distribution Pump Status:
The BAS controller shall detect hot water pump run status by comparing the VFD speed feedback to the commanded speed and monitoring the VFD fault contacts.

Hot Water Distribution Pump Lead/Lag:
The hot water pump lead/lag sequence shall be based on a weekly schedule. From the BAS controller's optional Tracer™ TD7 Color Touch Screen Display or a BAS workstation, an operator shall be able to manually change the lead/lag sequence. If the lead pump speed falls below 40% (adj.) for five minutes (adj.) the lag pump shall be disabled.

Hot Water Distribution Pump Failure:
If the lead start/stop relay is enabled and the current switch status is off for more than 30 seconds (adj.), the BAS controller shall annunciate a hot water pump failure alarm to the BAS workstation and starts the lag pump. When a pump failure exists, lead/lag automation shall be disabled and the currently running pump becomes the lead pump. Once the problem has been corrected, the operator shall be able to clear the alarm failure from the BAS controller or BAS workstation. This action shall re-enable the lead/lag sequence.

Hot Water Distribution Pump Speed:
The BAS controller shall monitor the heating water system differential pressure sensor. When the pump VFD is enabled, the BAS controller shall control the analog speed signal that is sent to the pump VFD to maintain the heating water differential pressure setpoint which is reset as described in the Pump Optimization section of this sequence. The default setpoint shall be 15 psig (adj.).

When the running pump(s) speed is controlled to 100% (60 Hz) and the system differential pressure setpoint is not maintained for 5 minutes, the next available lag pump shall start. When multiple pumps are running to maintain setpoint, their speed shall be modulated in unison. If more than 1 pump is running and their speed is over 75% **, the last pump most recently started shall be disabled, subject to a minimum on/off timer of 10 minutes (adj.).

** this speed shall be adjusted by the BAS Contractor according to the pump curves provided by the pump manufacturer. The speed shall be chosen which according to the pump curves, indicates the resulting running pump(s) would be able to maintain the current flow and pressure at 90% or less speed.

If a pump is commanded on and fails to prove status (through the VFD) for more than 30 seconds (adj.), the BAS controller shall cancel the start command to that pump, annunciate a chilled water pump failure alarm to the BAS, and start the next pump in the sequence. Once the problem has been corrected, the operator shall be able to clear the alarm failure from the BAS interface or by manually overriding the pump on momentarily. This shall re-enable the pumps participation in the lead/lag sequence.

Pump Optimization:
The BAS shall continually monitor the hot water control valve position of all AHUs in the hot water system.

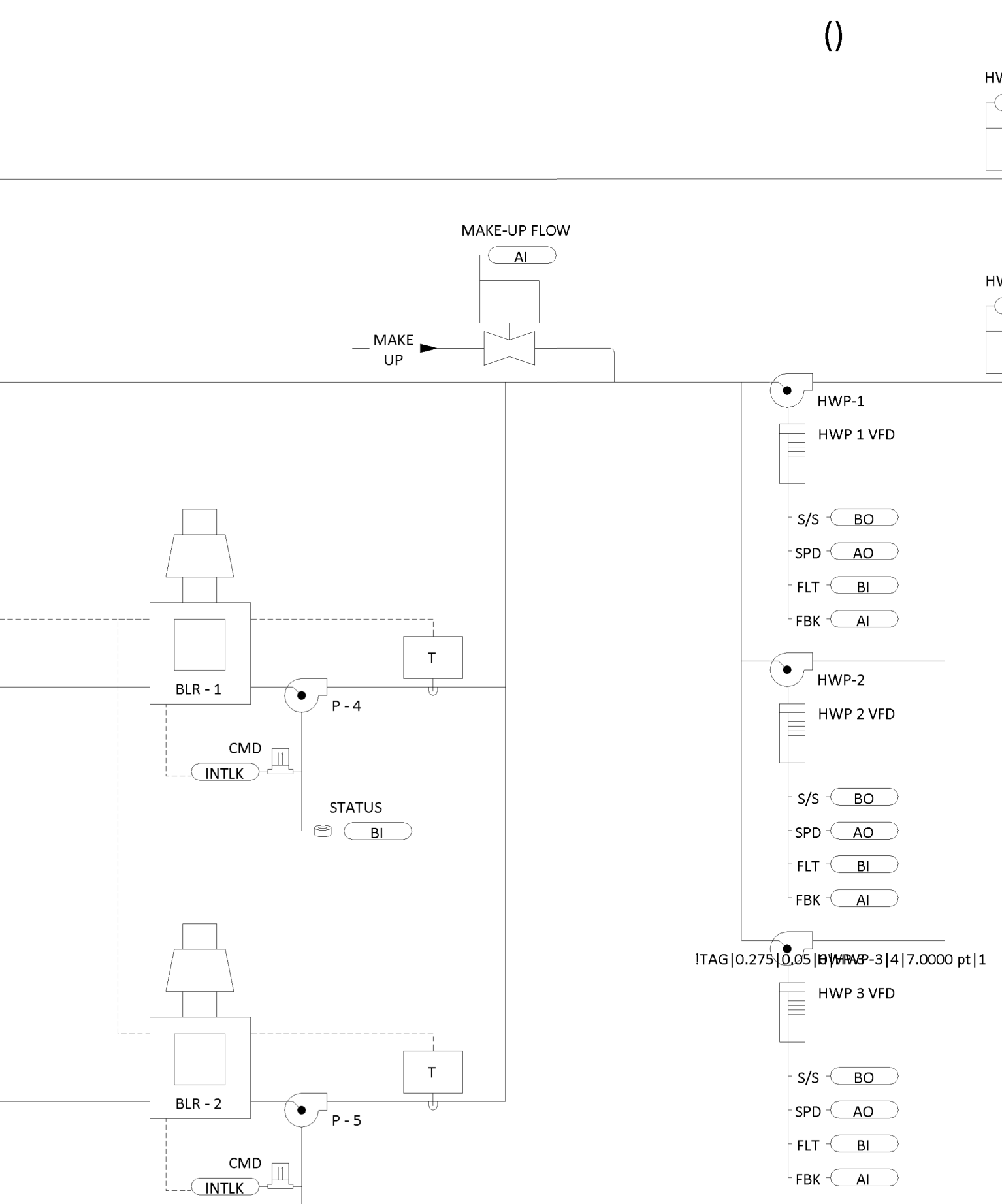
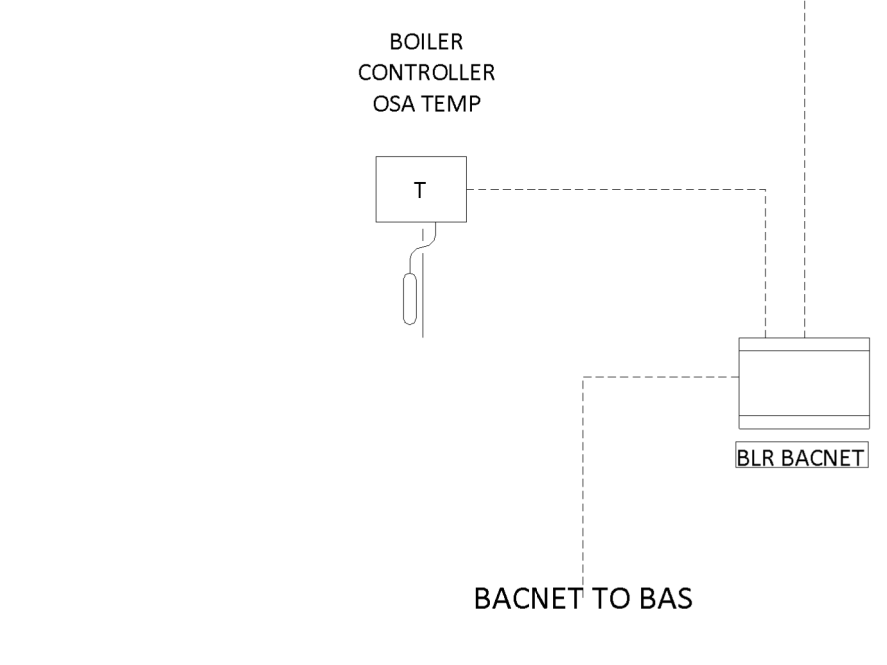
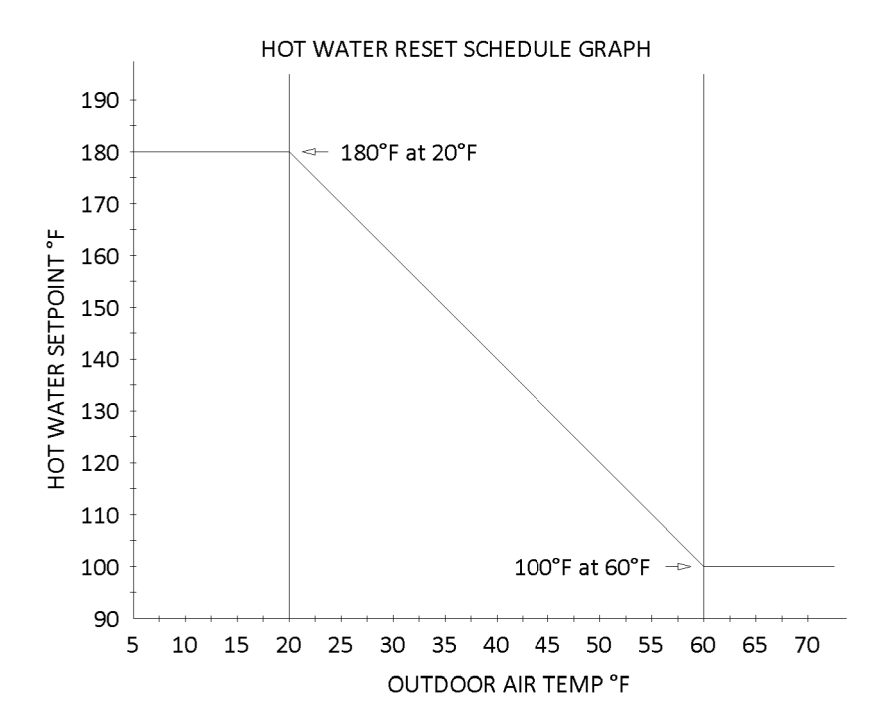
At hot water system startup, the hot water pressure setpoint is 100% of the maximum pressure setpoint. When all hot water valves are less than 85% open, the hot water differential pressure setpoint shall be lowered by 0.1 psig (adj.) of the current hot water differential pressure setpoint. This occurs every 5 minutes until at least one valve is more than 85% open, or if the setpoint is equal to the minimum hot water differential pressure setpoint, or if the pump VFD's are at a minimum speed setting (22 Hz). When any hot water valve is more than 95% open, the hot water pressure setpoint shall increase by 0.1 psig (adj.) of the current hot water differential setpoint. This occurs every 5 minutes until no valve is more than 95% open, or if the hot water differential pressure setpoint has risen to the system's maximum setting, or if the pump VFD's are at the maximum setting (60 Hz).

Freeze Protection:

When the outdoor air temperature falls below 35.0 deg. F (adj.), the hot water distribution pump shall operate continuously to provide hot water circulation to all associated hot water coils. If the hot water supply temperature falls below 60.0 deg. F (adj.) during unoccupied periods, the boiler sequence shall be enabled to safeguard against low water temperature.

Make-Up Water Flow Monitoring:

If the Make-Up flow meter registers flow for more than 10 minutes (adjustable), or if the totalized flow surpasses 2 gallons (adj.) in a single month, an alarm shall be generated in the BAS.



1 CONTROLS- HEATING WATER PLANT

N.T.S.

Sequence of Operations

Air Handling Units

Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied Bypass, Morning Warm-up/Free-Cool, Occupied/Unoccupied and Heat/Cool modes. The BAS shall also send the discharge air temperature setpoint and the duct static pressure setpoint. If communication is lost with the BAS the controller shall operate using default modes and setpoints.

Occupied:
During occupied periods, the supply fan shall run continuously and the outside air damper shall open to maintain minimum ventilation requirements. The chilled water and hot water valves shall modulate to maintain the discharge air temperature setpoint. If economizing is enabled the outside air damper shall also modulate to maintain the discharge air temperature setpoint. If the discharge air temperature sensor fails the chilled water and hot water valves shall close and an alarm shall be annunciated at the BAS.

Unoccupied:
When the space temperature is below the unoccupied heating setpoint of 60.0 deg. F (adj.) the supply fan shall start, the outside air damper shall remain closed and the hot water valve shall open. When the space temperature rises above the unoccupied heating setpoint of 60.0 deg. F (adj.) plus the unoccupied differential of 4.0 deg. F (adj.) the supply fan shall stop and the hot water valve shall close. When the space temperature is above the unoccupied cooling setpoint of 85.0 deg. F (adj.) the supply fan shall start, the outside air damper shall open if economizing is enabled and remain closed if economizing is disabled and the chilled water valve shall open. When the space temperature falls below the unoccupied cooling setpoint of 85.0 deg. F (adj.) minus the unoccupied differential of 4.0 deg. F (adj.) the supply fan shall stop, the chilled water valve shall close and the outside air damper shall close.

Optimal Start:
The BAS shall monitor the scheduled occupied time, occupied space setpoints and space temperature to calculate when the optimal start occurs.

Morning Warm-up Mode:
During optimal start, if the average space temperature is below the occupied heating setpoint a morning warm-up mode shall be activated. When morning warm-up is initiated the unit shall enable the heating and supply fan. The outside air damper shall remain closed. When the space temperature reaches the occupied heating setpoint (adj.), the unit shall transition to the occupied mode.

Pre-Cool Mode:
During optimal start, if the average space temperature is above the occupied cooling setpoint, pre-cool mode shall be activated. When pre-cool is initiated the unit shall enable the fan and cooling or economizer. The outside air damper shall remain closed, unless economizing. When the space temperature reaches occupied cooling setpoint (adj.), the unit shall transition to the occupied mode.

Optimal Stop:
The BAS shall monitor the scheduled unoccupied time, occupied setpoints and space temperature to calculate when the optimal stop occurs. When the optimal stop mode is active the unit controller shall maintain the space temperature to the space temperature offset setpoint. Outside air damper shall remain enabled to provide minimum ventilation.

Occupied Bypass:
The BAS shall monitor the status of the "on" and "cancel" buttons of the space temperature sensors. When an occupied bypass request is received from a space sensor, the unit shall transition from its current occupancy mode to occupied bypass mode and the unit shall maintain the space temperature to the occupied setpoints (adj.).

Supply Air Temperature Reset Control:
The supply air temperature setpoint shall be reset to the optimal setpoint communicated by the BAS. The BAS shall reset the supply air temperature setpoint based on the current outside air temperature, but shall override this reset function and return the supply air temperature setpoint to 55.0 deg. F (adj.) if more than two (adj.) zones begin to overheat. Also, the BAS shall override this reset function whenever outdoor dew point is higher than 60.0 deg. F (adj.) or indoor humidity is higher than 60% RH (adj.). If the supply air temperature drops below the minimum limit, a low temperature alarm shall be annunciated and the unit shall shut down. If the supply air temperature rises above the maximum limit, a high temperature alarm shall be annunciated.

Economizer:
The discharge air temperature sensor shall measure the dry bulb temperature of the air leaving the cooling coil while economizing. When economizing is enabled and the unit is operating in the cooling mode, the economizer damper shall be modulated between its minimum position and 100% to maintain the discharge air temperature setpoint. The economizer damper shall modulate toward minimum position in the event the mixed air temperature falls below the low temperature limit setting.

Comparative Enthalpy:
Outside air (OA) enthalpy shall be compared with Return air (RA) enthalpy point. The economizer shall enable when OA enthalpy is less than RA enthalpy + 2.0 BTU/LB. The economizer shall disable when OA enthalpy is greater than RA enthalpy.

Demand Control Ventilation:
When in the occupied mode, the flow-measuring outdoor-air (Traç™) damper shall modulate to maintain the current outdoor airflow at setpoint. The BAS shall calculate and reset this outdoor airflow setpoint based on the current ventilation requirements of the VAV terminal units.

Supply Fan:

The fan shall be off in the unoccupied mode. When the unit controller is in the occupied mode, the supply fan shall operate continuously and its speed shall be modulated to maintain the duct static pressure setpoint. The duct static pressure setpoint shall be sent by the BAS and shall be reset between the minimum and maximum static pressure limits to maintain the critical zone VAV air damper in a position between 65% and 75% open.

If the supply fan fails to prove status for 30 seconds (adj.), the fan shall be commanded off, the outside air damper shall close, all valves will close and an alarm will be annunciated at the BAS. A manual reset shall be required to restart the fan. A hardwired, high static pressure cut-off switch shall be electrically interlocked with the variable speed drive. If the high static pressure cut-off switch is tripped the fan shall stop, the outside air damper shall close, all valves will close and an alarm will be annunciated at the BAS. A manual reset of the high static pressure cut-off switch shall be required to restart the fan.

Building Pressure Control:

A differential pressure transducer shall actively monitor the difference in pressure between the building (indoor) and outdoors. If the building pressure increases above the desired setpoint, the AHU controller shall turn on the exhaust fan and modulate the exhaust fan VFD to control building pressure at setpoint. If the building pressure decreases below the desired setpoint, the controller shall turn off the exhaust fan.

Building Pressure Control:
A differential pressure transducer shall actively monitor the difference in pressure between the building (indoor) and outdoors. If the building pressure increases above the desired setpoint, the AHU controller shall enable the exhaust fan, and modulate the exhaust fan VFD to control building pressure at setpoint. If the building pressure decreases below the desired setpoint, the controller shall disable the exhaust fan.

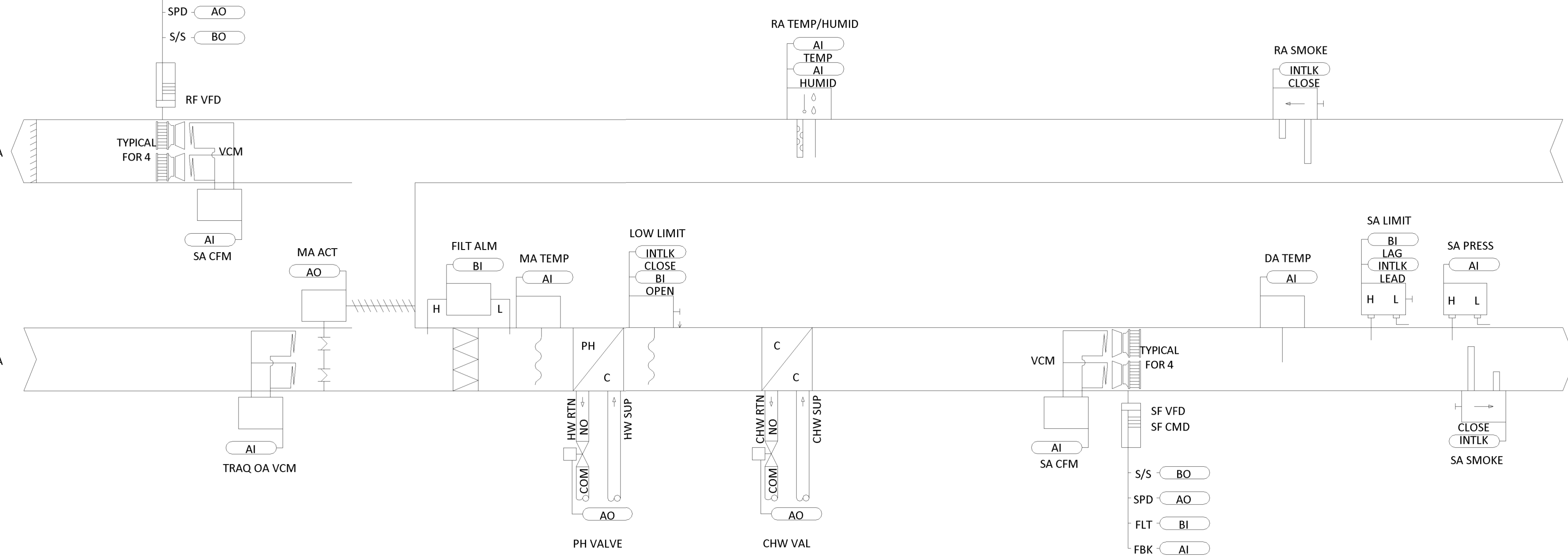
Mixed Air Low Limit:
The initial damper opening rate shall be limited to 2% per minute (adj.) until the damper has reached its minimum ventilation position. The outside air damper shall modulate to a position less than the minimum damper position if the mixed air temperature drops below 50.0 deg. F (adj.). If the mixed air temperature sensor fails an alarm shall be annunciated at the BAS and the outside air damper shall return to the minimum position.

Freeze Protection:
A hardwired, low limit temperature switch shall be electrically interlocked with the variable speed drive. If the low limit temperature switch is tripped 38.0 deg. F (adj.), the outside air damper shall close, all valves shall open to 100% (adjust per climate) and an alarm shall be annunciated at the BAS. A manual reset of the low limit temperature switch shall be required to restart the fan.

Smoke Detector Shutdown:
The unit shall shut down in response to a signal from either smoke detector indicating the presence of smoke. The smoke detectors shall be interlocked to the unit through the dry contacts of the smoke detectors. A manual reset of the smoke detectors shall be required to restart the unit.

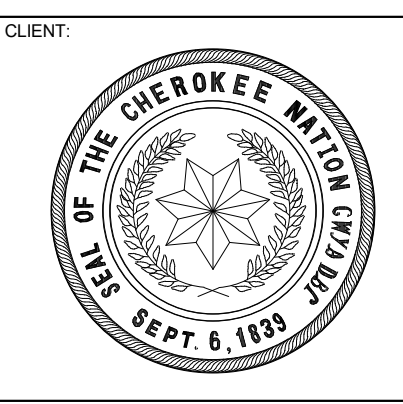
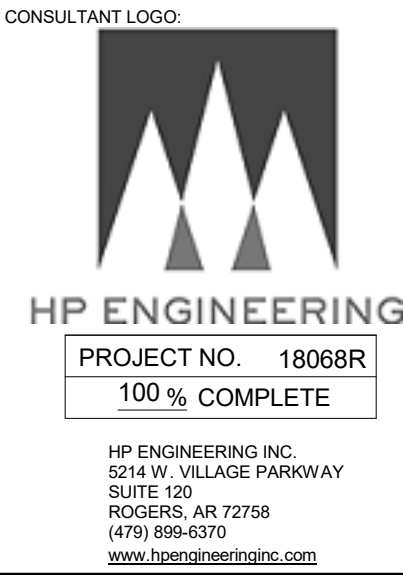
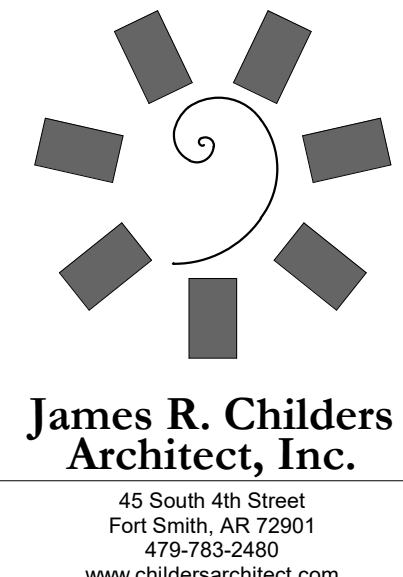


AIR HANDLING UNITS



2 CONTROLS- AHU'S

N.T.S.



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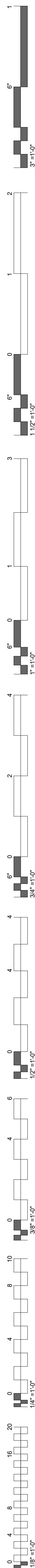
KEY PLAN

PROJECT PHASE
BID PACKAGE 02

#	DATE	REVISIONS	DESCRIPTION
1	3/30/20	BID PACKAGE 02 - ASH 03	

DATE: 12-06-19 JOB NUMBER: 18-01.01

SHEET NUMBER: M9.02
MECHANICAL CONTROLS



Sequence of Operations
- VAV with Hydronic Reheat

Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied and Unoccupied commands. The BAS may also send a Heat/Cool mode, priority shutdown commands, space temperature and/or space temperature setpoint. If communication is lost with the BAS, the VAV controller shall operate using its local setpoints.

Occupancy Mode:

The occupancy mode shall be communicated from the BAS. The VAV controller shall also include a spare binary input for possible future occupancy sensor connection, not included in this project.

Occupied:

Normal operating mode for occupied spaces or daytime operation. When the unit is in the occupied mode the VAV shall maintain the space temperature at the active occupied heating or cooling setpoint. Applicable ventilation and airflow setpoints shall be enforced. The occupied mode shall be the default mode of the VAV.

Unoccupied:

Normal operating mode for unoccupied spaces or nighttime operation. When the unit is in unoccupied mode the VAV controller shall maintain the space temperature at the stored unoccupied heating or cooling setpoint regardless of the presence of a hardwired or communicated setpoint. When the space temperature exceeds the active unoccupied setpoint the VAV shall modulate fully closed.

Occupied Bypass:

Mode used to temporarily place the unit into the occupied operation. Tenants shall be able to override the unoccupied mode from the space sensor. The override shall last for a maximum of 4 hours (adj.). The tenants shall be able to cancel the override from the space sensor at any time. During the override the unit shall operate in occupied mode.

Heat/Cool Mode:

The Heat/Cool mode shall be set by a communicated value or automatically by the VAV. In standalone or auto mode the VAV shall compare the primary air temperature with the configured auto changeover setpoint to determine if the air is "hot" or "cold". Heating mode implies the primary air temperature is hot. Cooling mode implies the primary air temperature is cold.

Heat/Cool Setpoint:

The space temperature setpoint shall be determined either by a local (e.g., thumbwheel) setpoint, the VAV default setpoint or a communicated value. The VAV shall use the locally stored default setpoints when neither a local setpoint nor communicated setpoint is present. If both a local setpoint and communicated setpoint exist, the VAV shall use the communicated value.

Cooling Mode:

When the unit is in cooling mode, the VAV controller shall maintain the space temperature at the active cooling setpoint by modulating the airflow between the active cooling minimum airflow setpoint to the maximum cooling airflow setpoint. Based on the VAV controller occupancy mode, the active cooling setpoint shall be one of the following:

Setpoint	Default Value
Occupied Cooling Setpoint	74.0 deg. F
Unoccupied Cooling Setpoint	85.0 deg. F
Occupied Standby Cooling Setpoint	78.0 deg. F

Occupied Min and Max Cooling Airflow Setpoint See VAV Schedule

The VAV shall use the measured space temperature and the active cooling setpoint to determine the requested cooling capacity of the unit. The outputs will be controlled based on the unit configuration and the requested cooling capacity.

Ventilation Control:

When the unit is in unoccupied mode, the ventilation airflow setpoint will be zero. When the unit is in occupied mode, the ventilation airflow setpoint will equal the design outdoor airflow (see VAV schedule).

CO₂ Sensor (For VAV Units with **2 Sensors Scheduled or shown on floor plans**)

When the unit is in occupied mode, the ventilation airflow setpoint is equal to the Design Minimum Ventilation setpoint. When the CO₂ concentration is at or below DCV Minimum CO₂ Concentration, the ventilation airflow setpoint is equal to the Design Minimum Ventilation setpoint.

When the CO₂ concentration is at or above Design CO₂ Concentration, the Ventilation airflow setpoint is equal to the Design Minimum Ventilation setpoint.

When the CO₂ concentration is between the scheduled CO₂ concentration values, the control system will interpolate between Ventilation setpoints.

The current ventilation airflow setpoint shall be communicated to the BAS for control of the system outdoor -air intake.

Heating Mode:

When the unit is in heating mode, the VAV controller shall maintain the space temperature at the active heating setpoint by modulating the airflow between the active heating minimum airflow setpoint to the maximum heating airflow setpoint. Based on the VAV controller occupancy mode, the active heating setpoint shall be one of the following:

Setpoint	Default Value
Occupied Heating Setpoint	71.0 deg. F
Unoccupied Heating Setpoint	60.0 deg. F
Occupied Standby Heating Setpoint	67.0 deg. F

Occupied Min and Max Heating Airflow Setpoint See VAV Schedule

The VAV controller shall use the measured space temperature and the active heating setpoint to determine the requested heating capacity of the unit. The outputs will be controlled based on the unit configuration and the requested heating capacity.

Reheat Control:

Reheat will only be allowed when the primary air temperature is 5.0 deg. F below the configured reheat enable setpoint of 70.0 deg. F (adj.). The reheat shall be enabled when the space temperature drops below the active heating setpoint and the minimum airflow requirements are met. During reheat the VAV shall operate at its minimum heating airflow setpoint and energize the heat as follows:

Proportional Hot Water Reheat:

If the space temperature is below the heating setpoint the hot water reheat valve shall modulate as required to maintain the active heating setpoint.

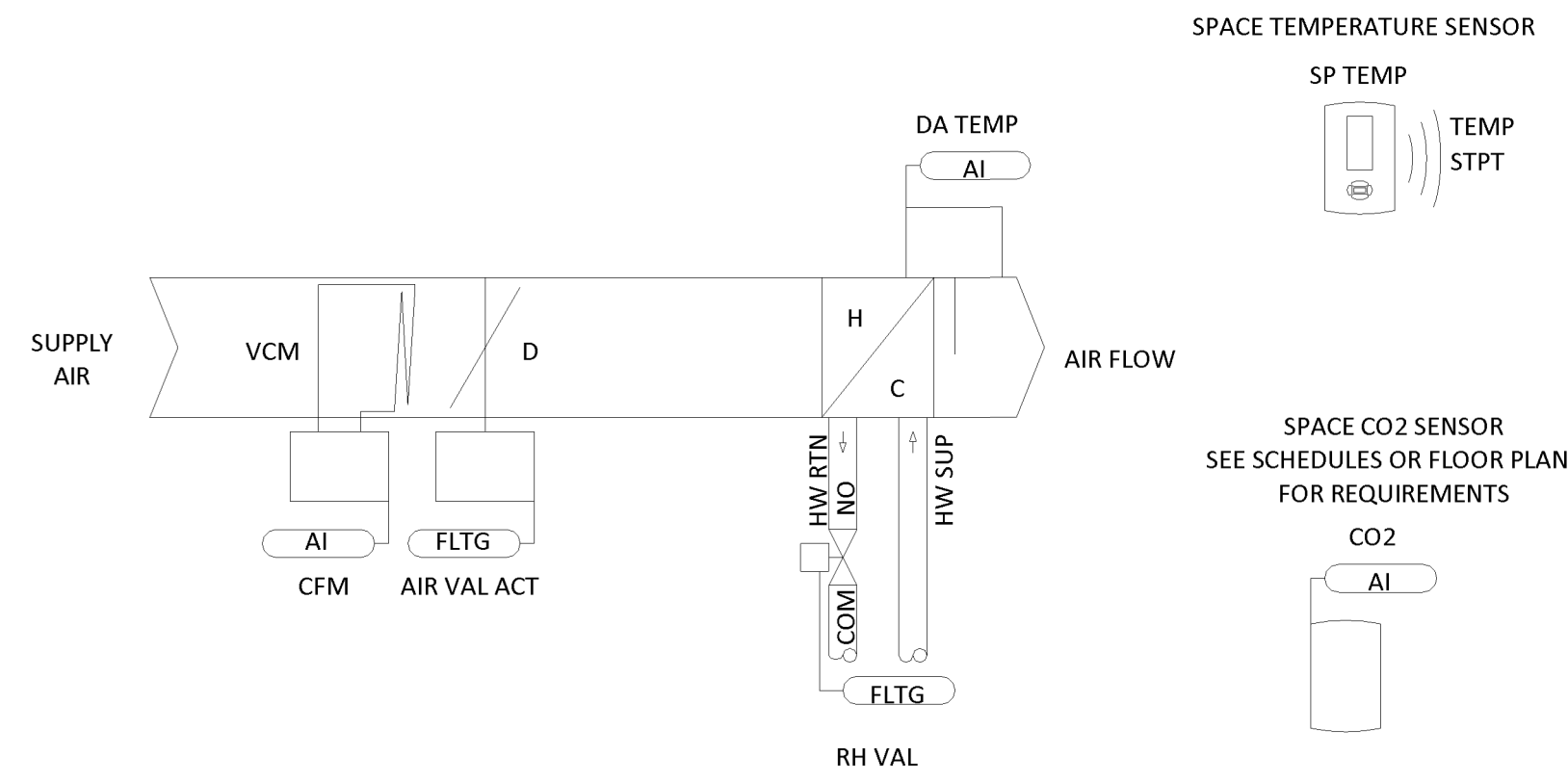
Ventilation Control (Fixed):

When the unit is in unoccupied mode, the ventilation airflow setpoint shall be zero. When the unit is in occupied mode, the ventilation airflow setpoint shall equal the design outdoor airflow (see VAV schedule).

The current ventilation airflow setpoint shall be communicated to the BAS for control of the system outdoor -air intake.

Space Sensor Failure:

If there is a fault with the operation of the zone sensor an alarm shall be annunciated at the BAS. Space sensor failure shall cause the VAV to drive the damper to minimum air flow if the VAV is in the occupied mode, or drive it closed if the VAV is in the unoccupied mode.



1 CONTROLS- VAV'S

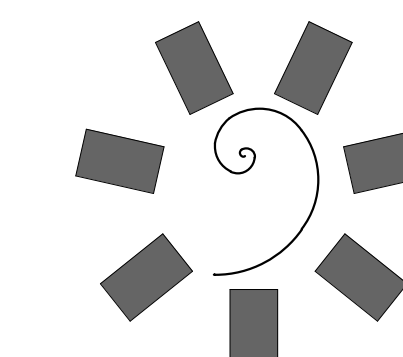
N.T.S.

(EXHAUST AND MISCELLANEOUS I/O)

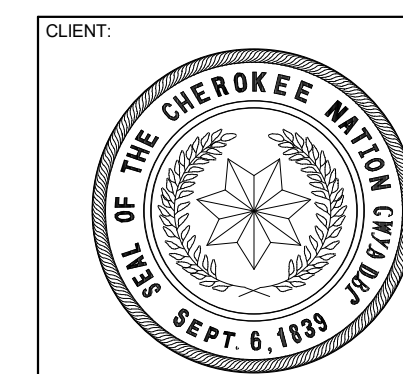
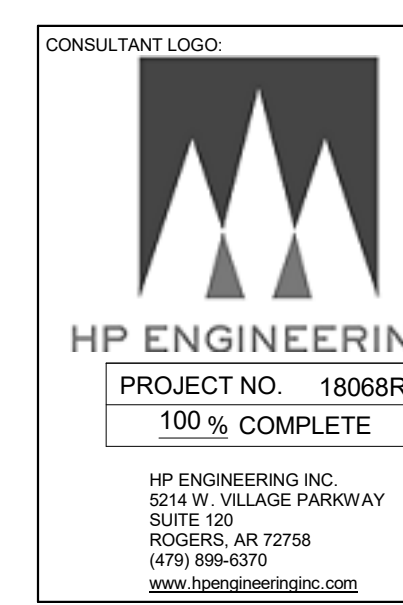
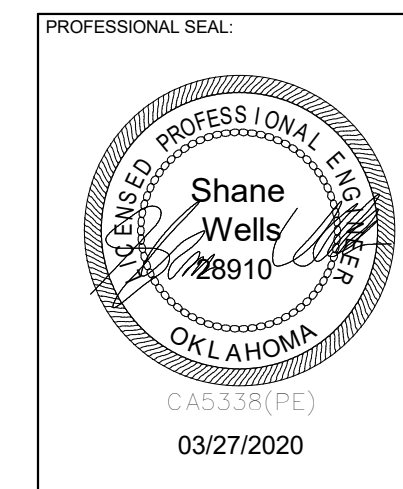


2 CONTROLS- EXHAUST AND MISCELLANEOUS I/O

N.T.S.



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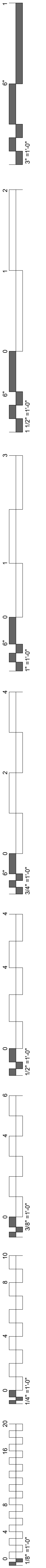
**WILMA P. MANKILLER HEALTH CENTER
 EXPANSION
 STILLWELL, OKLAHOMA**

PROJECT PHASE:
BID PACKAGE 02

#	DATE	REVISION DESCRIPTION
1	3/30/20	BID PACKAGE 02 - ASI 03

DATE: **12-06-19** JOB NUMBER: **18-01.01**

SHEET NUMBER:
M9.03
MECHANICAL CONTROLS



KEYNOTES

26.24 MAKE CONNECTIONS TO AUTOMATIC FLUSH TOILETS/URINAL AND AUTOMATIC SINKS PER MANUFACTURER SPECIFICATIONS.

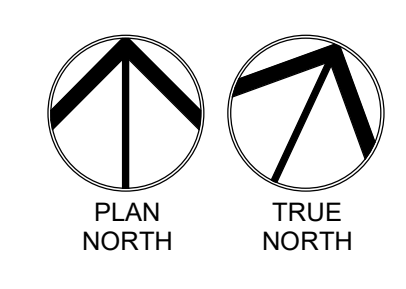
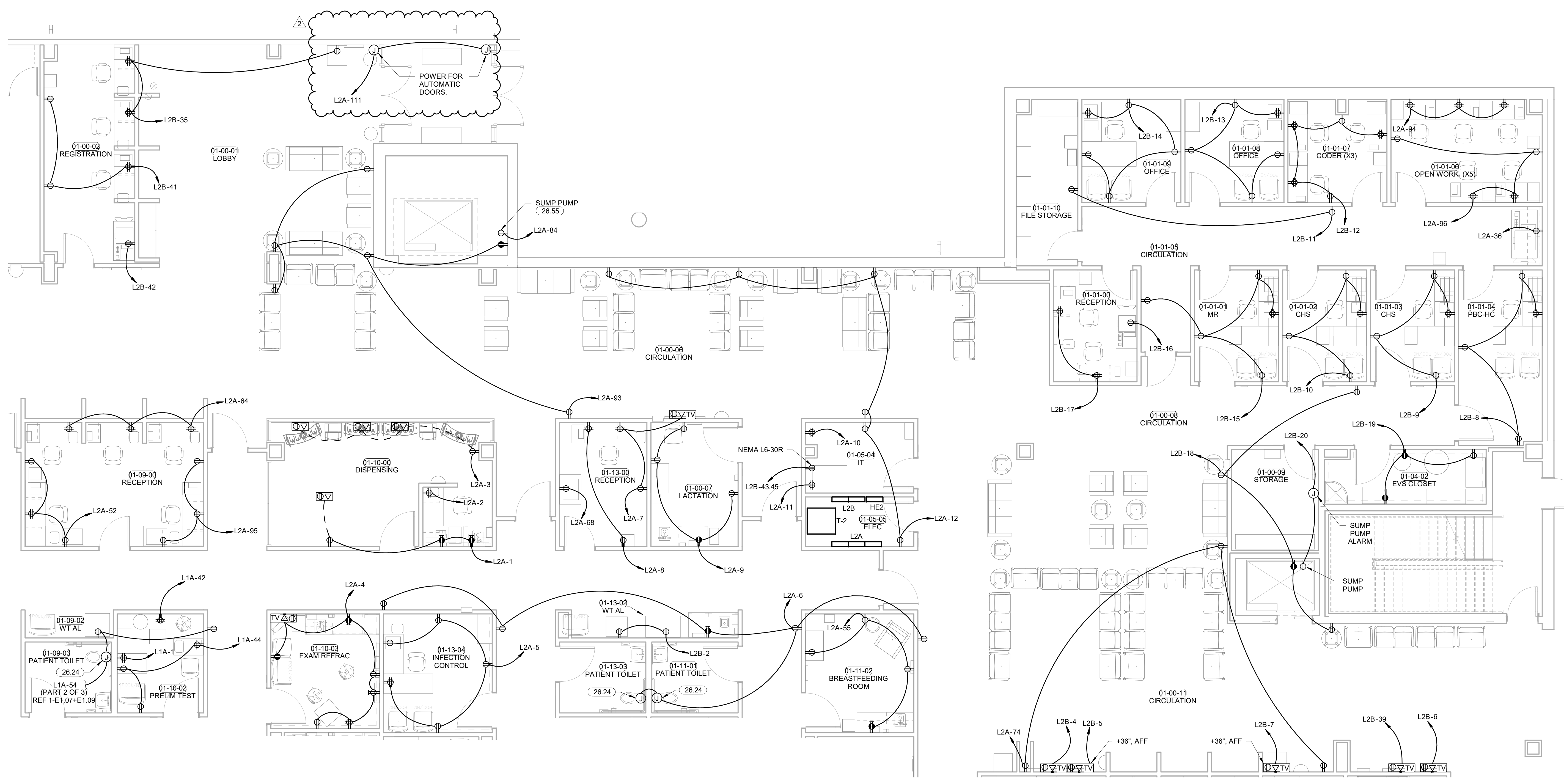
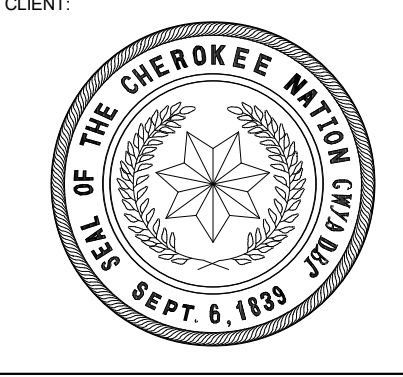
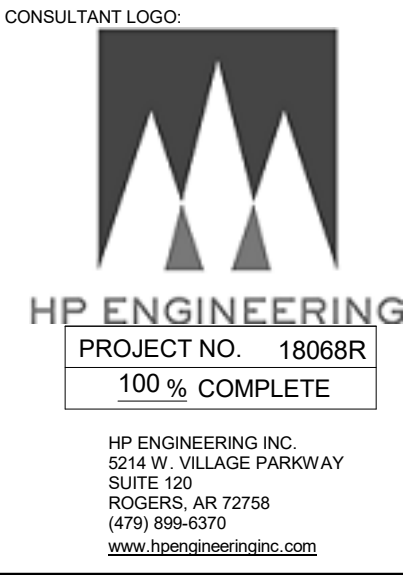
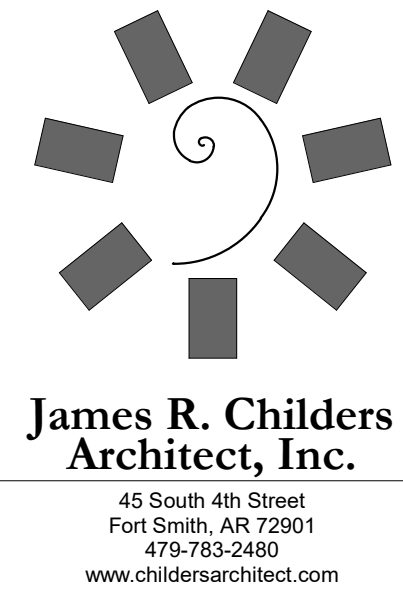
26.55 COORDINATE SUMP PUMP ALARM LOCATION WITH OWNER AND MECHANICAL CONTRACTOR PRIOR TO ROUGH IN.

POWER PLAN NOTES

COORDINATE MOUNTING HEIGHTS FOR POWER ASSOCIATED WITH TV OUTLETS WITH ARCHITECT PRIOR TO ROUGH-IN.

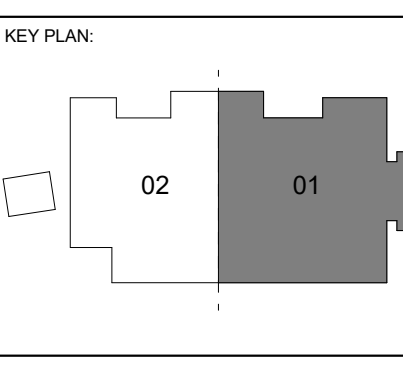
E.C. SHALL COORDINATE ALL EQUIPMENT WITH THE ILO DESIGN DRAWINGS TO ENSURE PLACEMENT OF EQUIPMENT WORKS AS DESIGNED.

GROUNDING OF RECEPTACLES AND FIXED ELECTRICAL EQUIPMENT IN PATIENT CARE SPACES SHALL COMPLY WITH NEC 517.13.



1 POWER PLAN LEVEL 01 SECTOR 01 NORTH
3/16" = 1'-0"

**WILMA P. MANKILLER HEALTH CENTER
EXPANSION**
STILWELL, OKLAHOMA

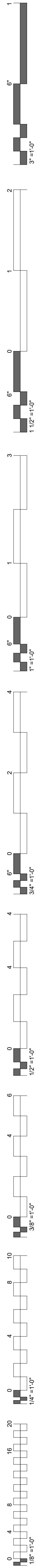


PROJECT PHASE:
BID PACKAGE 02

#	DATE	REVISIONS
1	1/19/20	BID PACKAGE 02 - ADD 01
2	3/30/20	BID PACKAGE 02 - ASH 03

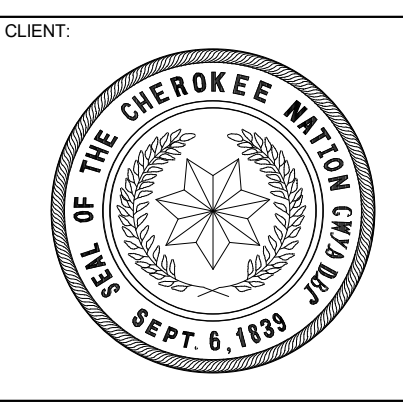
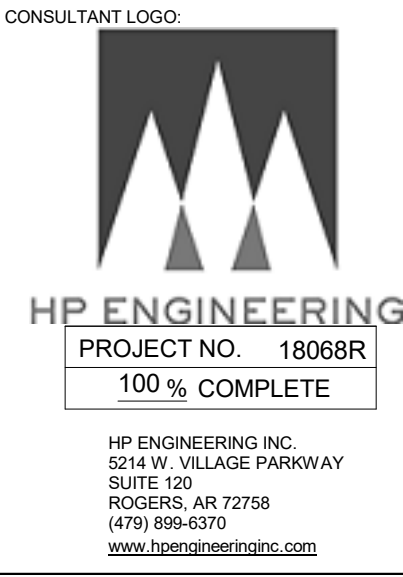
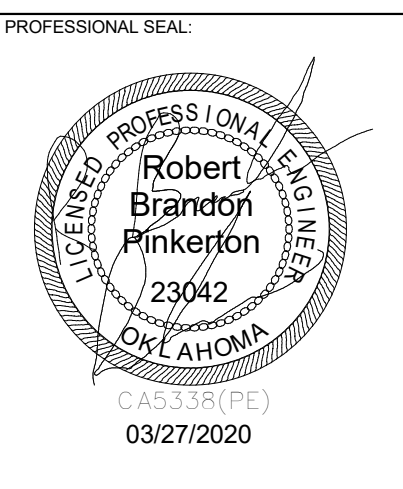
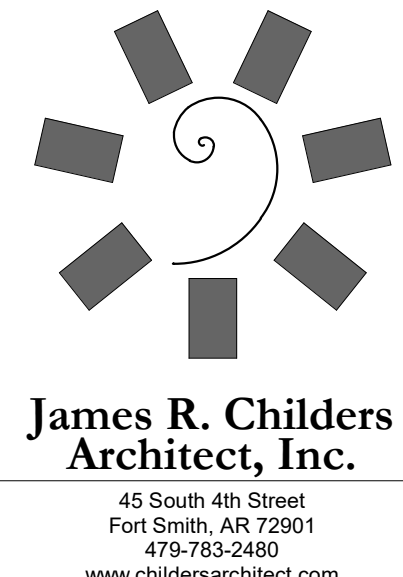
DATE: 12-06-19
JOB NUMBER: 18-01.01

SHEET NUMBER:
E1.06
POWER PLAN
LEVEL 01
SECTOR 01 N

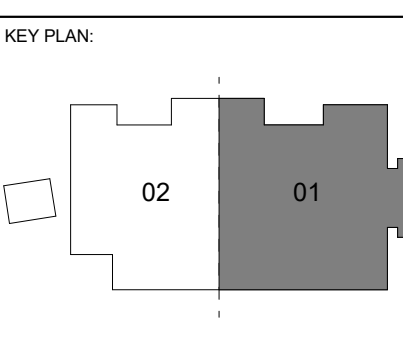


MECHANICAL POWER PLAN NOTES

E.C. SHALL MAKE CONNECTIONS BETWEEN THE OUTDOOR AND INDOOR UNITS OF THE MINI-SPLIT SYSTEM.
 EXHAUST FANS SHALL BE CIRCUITED WITH LIGHTS UNLESS SHOWN OTHERWISE. REFER TO MECHANICAL PLANS FOR CONTROLS OF EXHAUST FANS.
 VAV DISCONNECTS ARE FACTORY INSTALLED.



**WILMA P. MANKILLER HEALTH CENTER
EXPANSION**
 STILLWELL, OKLAHOMA



PROJECT PHASE
 BID PACKAGE 02

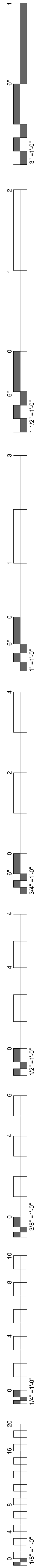
#	DATE	REVISIONS / DESCRIPTION
1	1/19/20	BID PACKAGE 02 - ADD 01
2	3/30/20	BID PACKAGE 02 - ASB 03

DATE: 12-06-19 JOB NUMBER: 18-01.01

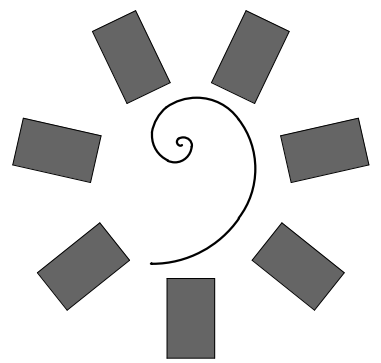
SHEET NUMBER:
E1.14
 MECH POWER
 PLAN LEVEL 01
 SECTOR 01



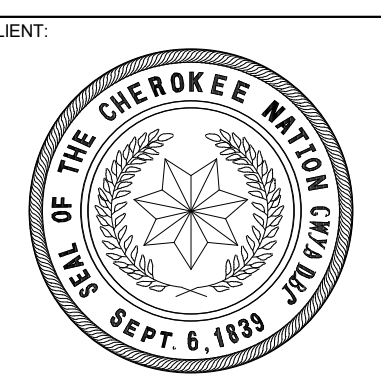
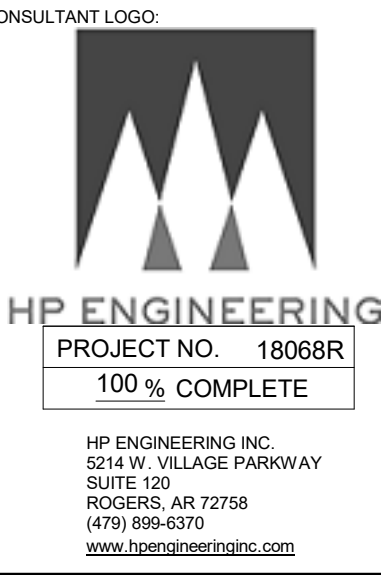
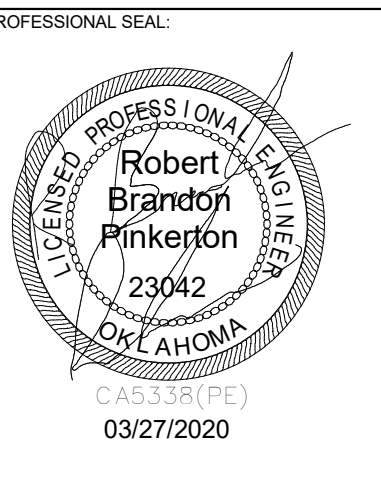
1 MECHANICAL POWER PLAN LEVEL 01 SECTOR 01
 1/8" = 1'-0"



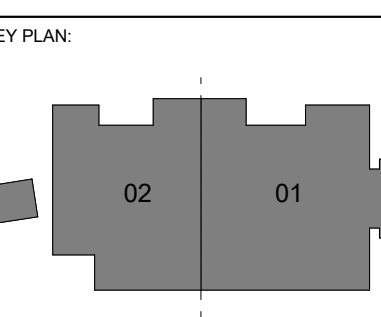
KEYNOTES
 26.52 PROVIDE WEATHERPROOF BOX, METALLIC IN USE COVER, AND ALL REQUIRED MATERIALS FOR INSTALLATION OF GFI MAINTENANCE RECEPTACLE TO BE MOUNTED ON UNISTRUT WITH DISCONNECT.



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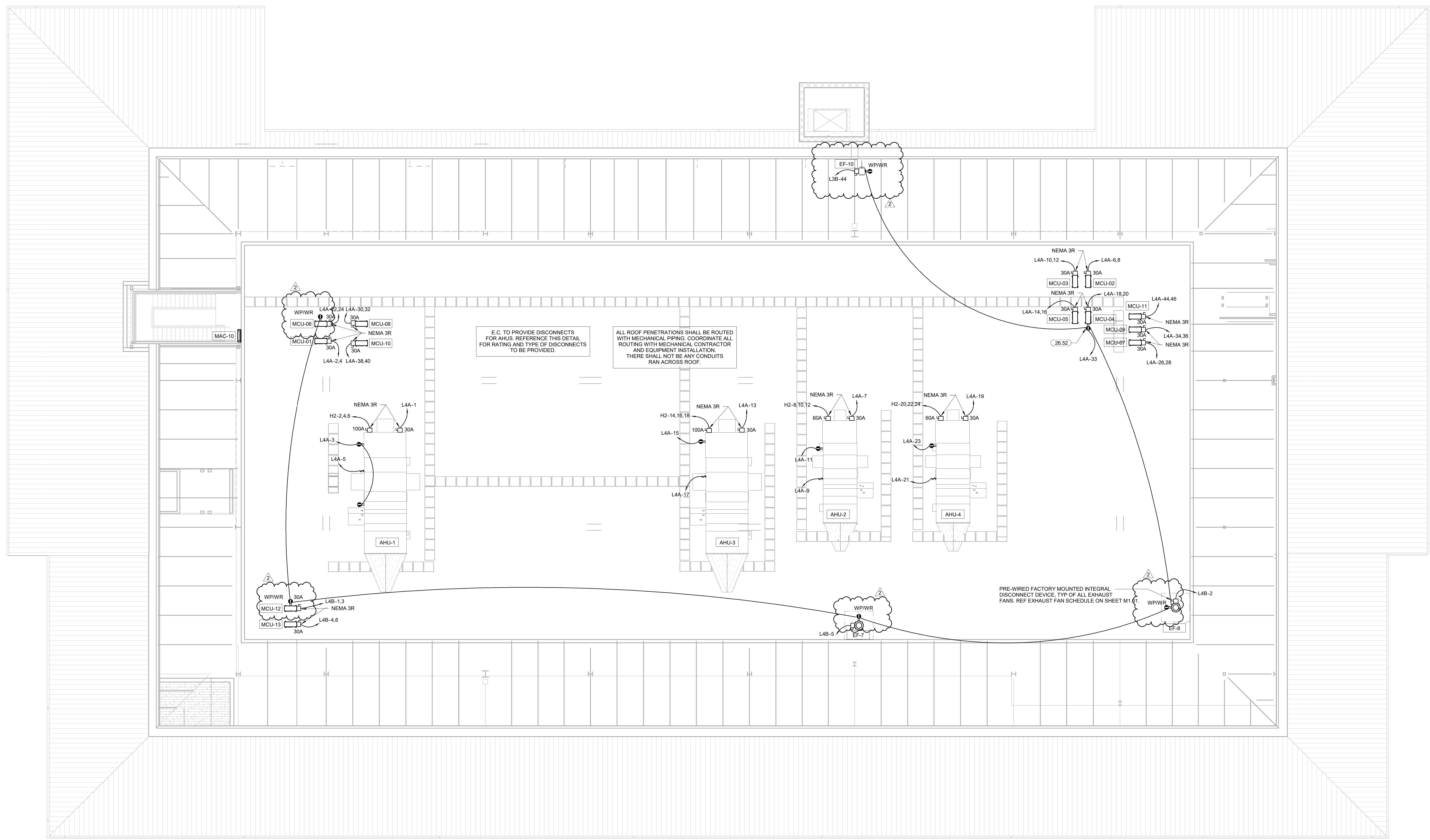
PROJECT PHASE:
 BID PACKAGE 02

#	DATE	REVISIONS	DESCRIPTION
1	1/19/20	BID PACKAGE 02 - ADD 01	
2	3/30/20	BID PACKAGE 02 - ASB 03	

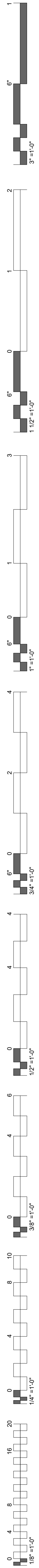
DATE: 12-06-19
 JOB NUMBER: 18-01.01

SHEET NUMBER:
 E1.18

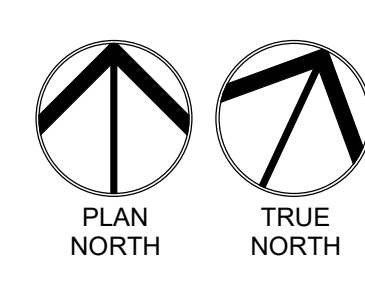
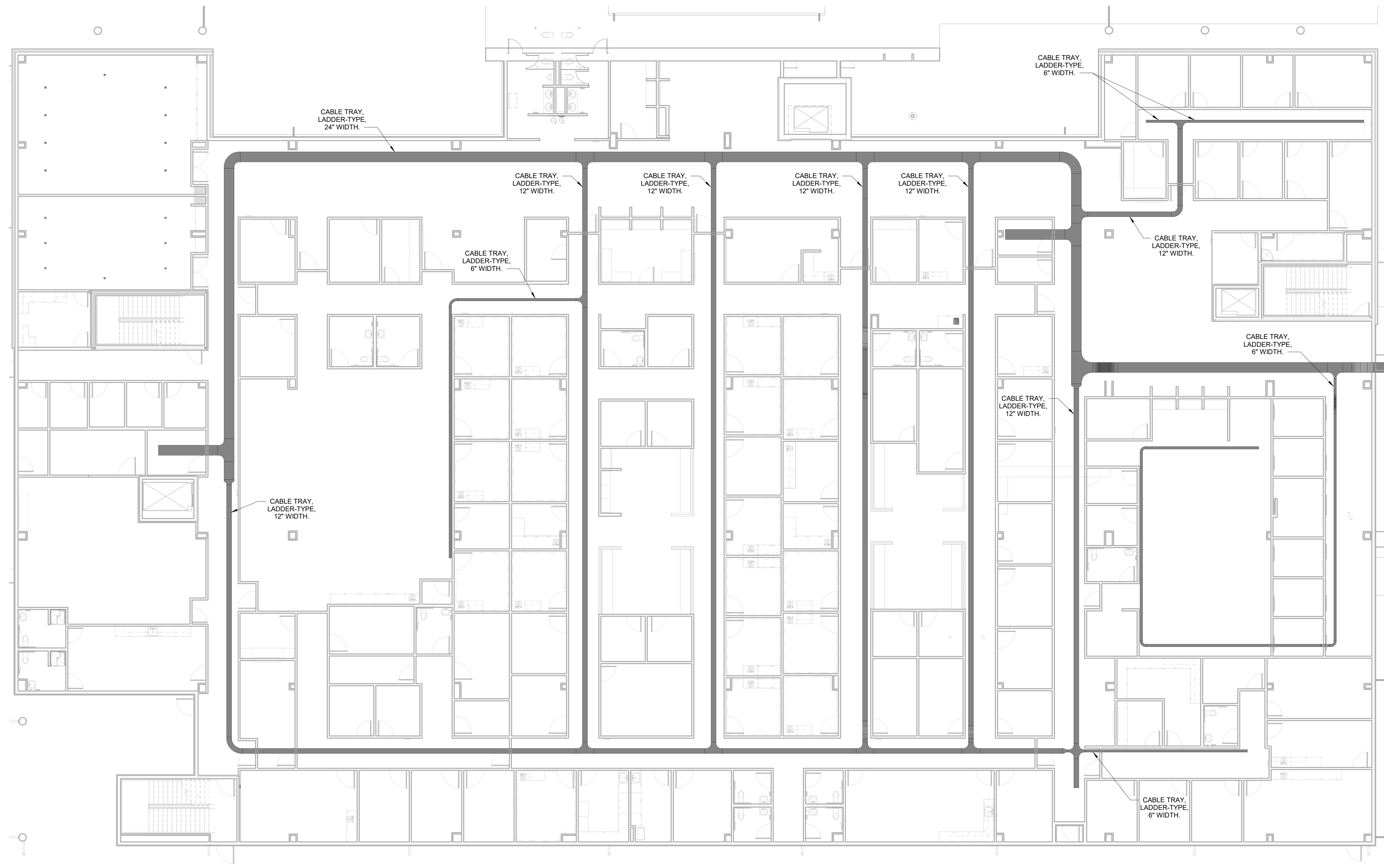
MECH POWER
 PLAN ROOF



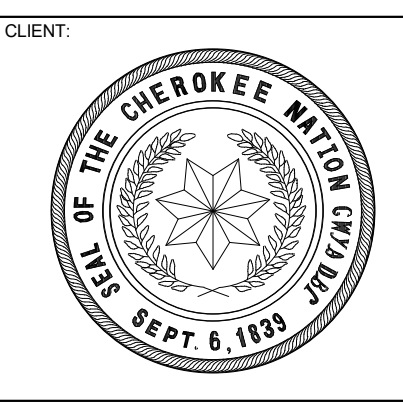
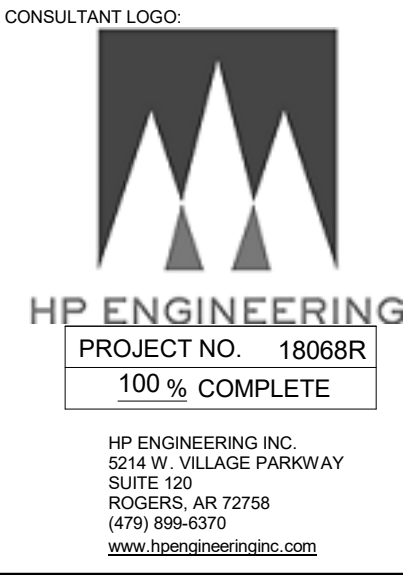
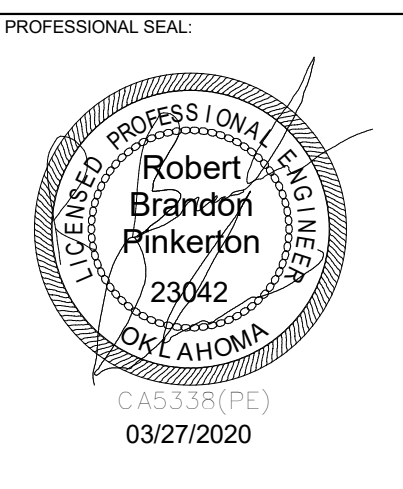
1 MECHANICAL POWER PLAN LEVEL 3
 1/8" = 1'-0"
 PLAN NORTH TRUE NORTH



CABLE TRAY NOTES
 PROVIDE SMOKE RATED PENETRATIONS AT ALL SMOKE WALLS. SEE ARCHITECTURAL SHEETS FOR SMOKE RATED WALL LOCATIONS.



1 FIRST FLOOR CABLE TRAY PLAN
 1" = 10'-0"



**WILMA P. MANKILLER HEALTH CENTER
 EXPANSION**
 STILLWELL, OKLAHOMA

KEY PLAN:

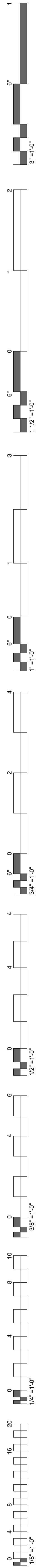
PROJECT PHASE:
 BID PACKAGE 02

#	DATE	REVISIONS DESCRIPTION
1	3/30/20	BID PACKAGE 02 - ASI 03

DATE: 12-06-19 JOB NUMBER: 18-01.01

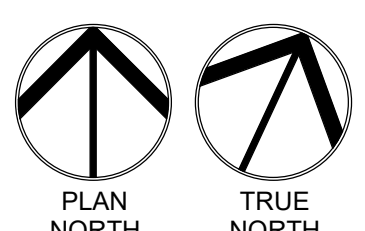
SHEET NUMBER:
E1.24

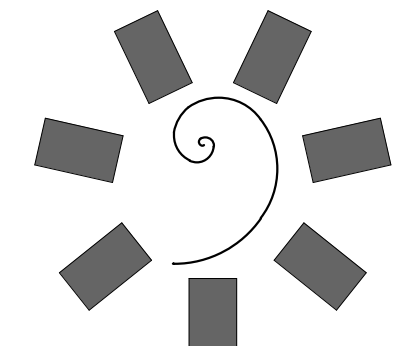
**FIRST FLOOR
 CABLE TRAY
 PLAN**

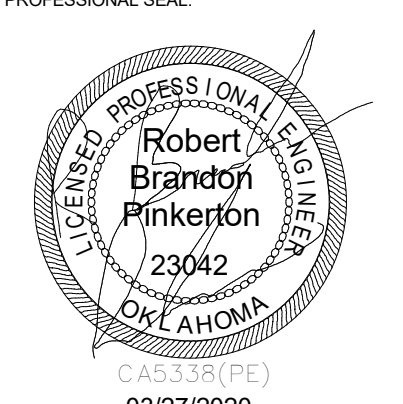


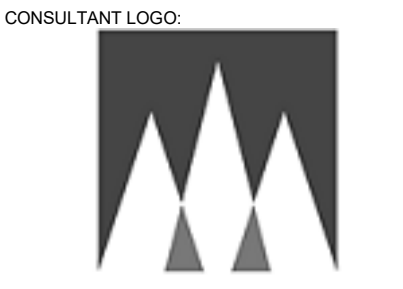
CABLE TRAY NOTES
 PROVIDE SMOKE RATED PENETRATIONS AT ALL SMOKE WALLS. SEE ARCHITECTURAL SHEETS FOR SMOKE RATED WALL LOCATIONS.

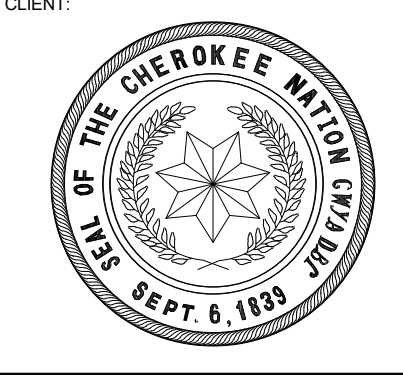



1 SECOND FLOOR CABLE TRAY PLAN
 1/8" = 1'-0"


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PROFESSIONAL SEAL

 03/27/2020

CONSULTANT LOGO

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WILMA P. MANKILLER HEALTH CENTER
EXPANSION
 STILLWELL, OKLAHOMA

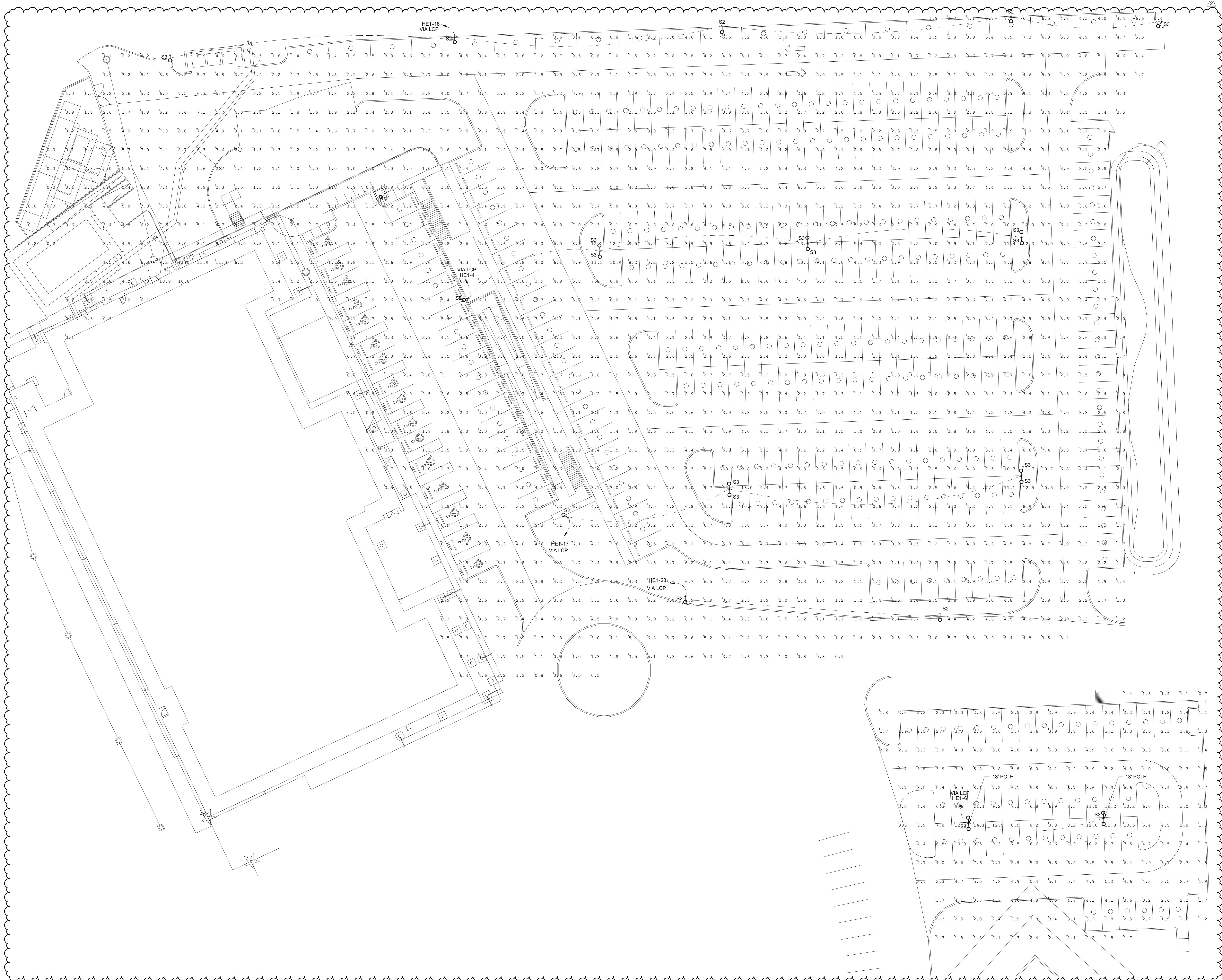
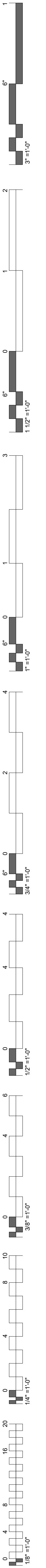
KEY PLAN

PROJECT PHASE
 BID PACKAGE 02

#	DATE	REVISIONS	DESCRIPTION
1	3/30/20	BID PACKAGE 02 - ASI 03	

DATE: 12-06-19 JOB NUMBER: 18-01.01

SHEET NUMBER:
E1.25
SECOND FLOOR
CABLE TRAY
PLAN



1 SITE LIGHTING PLAN
 1" = 20'-0"

WILMA P. MANKILLER HEALTH CENTER
EXPANSION
 STILLWELL, OKLAHOMA

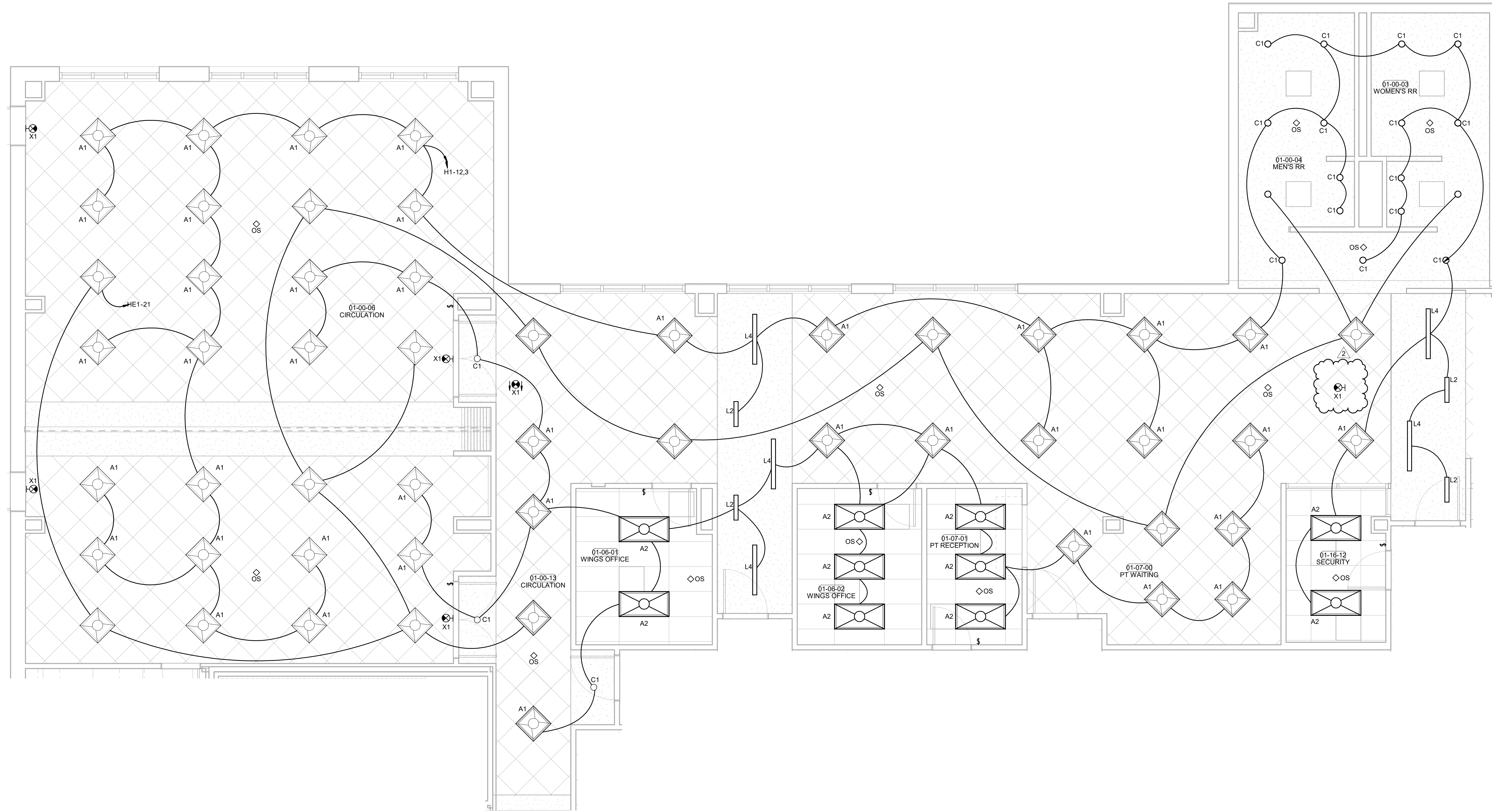
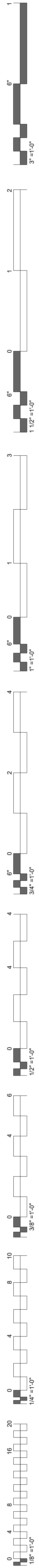
KEY PLAN

PROJECT PHASE

BID PACKAGE 02

#	DATE	REVISIONS	DESCRIPTION
1	1/18/20	BID PACKAGE 02 - ADD 01	
2	3/30/20	BID PACKAGE 02 - ASB 03	

DATE:	12-06-19	JOB NUMBER:	18-01.01
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 PLAN NORTH
 TRUE NORTH
1 NORTH SECTOR 2 ENLARGED LIGHTING
 1/4" = 1'-0"

WILMA P. MANKILLER HEALTH CENTER
EXPANSION
 STILLWELL, OKLAHOMA

KEY PLAN:

PROJECT PHASE:
 BID PACKAGE 02

#	DATE	REVISIONS
1	1/19/20	BID PACKAGE 02 - ADD 01
2	3/30/20	BID PACKAGE 02 - ASB 03

DATE: 12-06-19 JOB NUMBER: 18-01.01

SHEET NUMBER:
E2.09

NORTH SECTOR
2 ENLARGED
LIGHTING PLAN

SWITCHBRD: MDP1 NEW

Location: MEP 01-05-01
Supply From: ATS1
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating: (7) FULLY RATED
Mains Type: MLO
Mains Rating: 2000 A

Notes:

CKT	Load Name	CB	P	Wire	A	B	C	Wire	P	CB	Load Name	CKT
1												2
3	T-1 (8)	300	3	--	667	516					T-3 (8)	4
5					615	540						6
7					656	512						8
9	CHILLER 1 (8)	300	3	--	723	723					CHILLER 2 (8)	10
11					723	723						12
13					557	724						14
15	T-2 (8)	175	3	--	493	730					H2 (8)	16
17					493	730						18
19					145	0					SPACE	20
21	T-4 (8)	175	3	--	180	0					SPACE	22
23					111	0					SPACE	24
25					389	0					SPACE	26
27	H1 (8)	200	3	--	365	0					SPACE	28
29					0	0					SPACE	30
31	SPACE	--	--	--	0	0					SPACE	32
33	SPACE	--	--	--	0	0					SPACE	34
35	SPACE	--	--	--	0	0					SPACE	36
37	SPACE	--	--	--	0	0					SPACE	38
39	SPACE	--	--	--	0	0					SPACE	40
41	SPACE	--	--	--	0	0					SPACE	42
Total Load:					439825 VA	437321 VA	441329 VA					
Total Amps:					1589 A	1579 A	1595 A					

Load Classification

Connected Load	Demand Factor	Estimated Demand	Panel Totals
Hvac	248410 VA	100.00%	248410 VA
Lighting	17313 VA	125.00%	21642 VA
Motor	18955 VA	100.00%	18955 VA
Other	69080 VA	100.00%	69080 VA
Power	652512 VA	100.00%	652512 VA
Receptacle	240189 VA	52.08%	125095 VA
Heating	600 VA	0.01%	0 VA
Lighting - Exterior	63483 VA	125.00%	79354 VA
Kitchen	63483 VA	65.00%	41264 VA
Continuous	4981 VA	125.00%	6226 VA
Total Conn. Load: 1318475 VA			
Total Est. Demand: 1188873 VA			
Total Conn. Current: 1586 A			
Total Est. Demand... 1428 A			

SWITCHBRD: MSBE NEW

Location: MECHANICAL YARD
Supply From: GENERATOR
Mounting: SURFACE
Enclosure: NEMA 3R

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating: (7) FULLY RATED
Mains Type: MLO
Mains Rating: 2000 A

Notes:

CKT	Load Name	CB	P	Wire	A	B	C	Wire	P	CB	Load Name	CKT
1												2
3	ATS1 (8)	2000	3	--	439	223					ATS2 (8)	4
5					437	224						6
7					441	207						8
9	400A SPACE	400	3	--	179	0					400A SPACE	10
11					179	0						12
13					0	0					400A SPACE	14
15	400A SPACE	--	--	--	0	0						16
17					0	0						18
Total Load:					480130 VA	477733 VA	480090 VA					
Total Amps:					1735 A	1725 A	1734 A					

Load Classification

Connected Load	Demand Factor	Estimated Demand	Panel Totals
Hvac	248410 VA	100.00%	248410 VA
Lighting	37459 VA	125.00%	46823 VA
Motor	18955 VA	100.00%	18955 VA
Other	69080 VA	100.00%	69080 VA
Power	689923 VA	100.00%	689923 VA
Receptacle	240189 VA	52.08%	125095 VA
Heating	600 VA	0.01%	0 VA
Lighting - Exterior	10898 VA	125.00%	13623 VA
Kitchen	63483 VA	65.00%	41264 VA
Continuous	4981 VA	125.00%	6226 VA
Total Conn. Load: 1437954 VA			
Total Est. Demand: 1313375 VA			
Total Conn. Current: 1730 A			
Total Est. Demand... 1580 A			

Branch Panel: MSBN NEW

Location: MECHANICAL YARD
Supply From: UTILITY TRANSFORMER
Mounting: SURFACE
Enclosure: NEMA 3R

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating: (7) FULLY RATED
Mains Type: MLO
Mains Rating: 2000 A

Notes:

CKT	Load Name	CB	P	Wire	A	B	C	Wire	P	CB	Load Name	CKT
1												2
3	ATS2 (8)	200	3	--	223	439					ATS1 (8)	4
5					224	437						6
7					207	441						8
9	SPD	100	3	--	0	0					LCP PHASE LOSS CIRCUIT	10
11					0	0						12
13					0	0						14
15	400A SPACE	--	--	--	0	0					400A SPACE	16
17					0	0						18
Total Load:					462138 VA	459741 VA	462098 VA					
Total Amps:					1670 A	1660 A	1670 A					

Load Classification

Connected Load	Demand Factor	Estimated Demand	Panel Totals
Hvac	248410 VA	100.00%	248410 VA
Lighting	37459 VA	125.00%	46823 VA
Motor	18955 VA	100.00%	18955 VA
Other	69080 VA	100.00%	69080 VA
Power	689923 VA	100.00%	689923 VA
Receptacle	240189 VA	52.08%	125095 VA
Heating	600 VA	0.01%	0 VA
Lighting - Exterior	10898 VA	125.00%	13623 VA
Kitchen	63483 VA	65.00%	41264 VA
Continuous	4981 VA	125.00%	6226 VA
Total Conn. Load: 1383978 VA			
Total Est. Demand: 1293999 VA			
Total Conn. Current: 1665 A			
Total Est. Demand... 1515 A			

Branch Panel: H1 NEW

Location: MEP 01-05-01
Supply From: MDP1
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating: (7) FULLY RATED
Mains Type: MLO
Mains Rating: 225 A

Notes:

CKT	Load Name	CB	P	Wire	A	B	C	Wire	P	CB	Load Name	CKT
1												2
3	HWP-1	30	3	#10	6318	224					CHWP-1	4
5					6318	224						6
7					6633	210					Lighting	8
9	BP-1	30	3	#10	6633	1129					MEP & CIRCULATION LIGHTING	10
11					6633	2322					CIRCULATION LIGHTING	12
13	SPACE	--	--	--	0	3349					PHARMACY LOBBY & CORRIDOR LTG	14
15	SPACE	--	--	--	0	0					PHARMACY & CIRCULATION...	16
17	SPACE	--	--	--	0	0					2780	18
19	SPACE	--	--	--	0	0					SPACE	20
21	SPACE	--	--	--	0	0					SPACE	22
23	SPACE	--	--	--	0	0					SPACE	24
25	SPACE	--	--	--	0	0					SPACE	26
27	SPACE	--	--	--	0	0					SPACE	28
29	SPACE	--	--	--	0	0					SPACE	30
31	SPACE	--	--	--	0	0					SPACE	32
33	SPACE	--	--	--	0	0					SPACE	34
35	SPACE	--	--	--	0	0					SPACE	36
37	SPACE	--	--	--	0	0					SPACE	38
39	SPACE	--	--	--	0	0					SPACE	40
41	SPACE	--	--	--	0	0					SPACE	42
Total Load:					38957 VA	36527 VA	40500 VA					
Total Amps:					142 A	132 A	148 A					

Load Classification

Connected Load	Demand Factor	Estimated Demand	Panel Totals
Lighting	9790 VA	125.00%	12238 VA
Motor	18955 VA	100.00%	18955 VA
Power	87240 VA	100.00%	87240 VA
Total Conn. Load: 115985 VA			
Total Est. Demand: 118433 VA			
Total Conn. Current: 140 A			
Total Est. Demand... 142 A			

Branch Panel: H2 NEW

Location: ELEC 02-05-12
Supply From: MDP1
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating: (7) FULLY RATED
Mains Type: MLO
Mains Rating: 400 A

Notes:

CKT	Load Name	CB	P	Wire	A	B	C	Wire	P	CB	Load Name	CKT
1	OPEN OFF LIGHTING	20	1	#10	2949	208					AHU-01 SINGLE POINT	2
3	SHELL SPACE & CIRCULATION LTG	20	1	--	2590	208						4
5	RECEPTION & BREAKROOM...	20	1	--	1984	208						6
7	SPACE	--	--	--	0	144					AHU-02 SINGLE POINT	8
9	SPACE	--	--	--	0	144						10
11	SPACE	--	--	--	0	208					AHU-03 SINGLE POINT	12
13	SPACE	--	--	--	0	208						14
15	SPACE	--	--	--	0	144					AHU-04 SUPPLY FAN	16
17	SPACE	--	--	--	0	144						18
19	SPACE	--	--	--	0	144						20
21	SPACE	--	--	--	0	0					SPACE	22
23	SPACE	--	--	--	0	0					SPACE	24
25	SPACE	--	--	--	0	0					SPACE	26
27	SPACE	--	--	--	0	0					SPACE	28
29	SPACE	--	--	--	0	0					SPACE	30
31	SPACE	--	--	--	0	0					SPACE	32
33	SPACE	--	--	--	0	0					SPACE	34
35	SPACE	--	--	--	0	0					SPACE	36
37	SPACE	--	--	--	0	0					SPACE	38
39	SPACE	--	--	--	0	0					SPACE	40
41	SPACE	--	--	--	0	0					SPACE	42
Total Load:					73448 VA	73090 VA	72483 VA					
Total Amps:					285 A	264 A	262 A					

Load Classification

Connected Load	Demand Factor	Estimated Demand	Panel Totals
Hvac	211408 VA	100.00%	211408 VA
Lighting	7523 VA	125.00%	9404 VA
Total Conn. Load: 219021 VA			
Total Est. Demand: 229002 VA			
Total Conn. Current: 283 A			
Total Est. Demand... 266 A			

Branch Panel: HE1 NEW

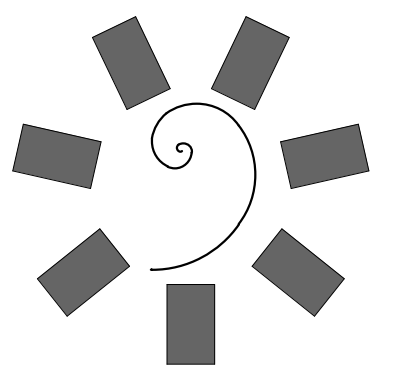
Location: MEP 01-05-01
Supply From: ATS2
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

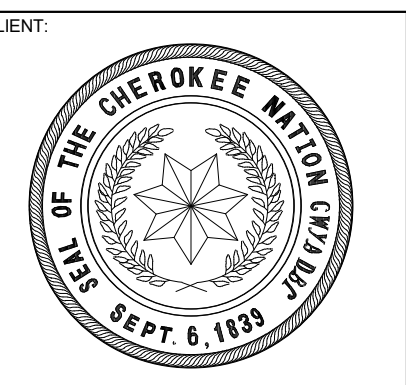
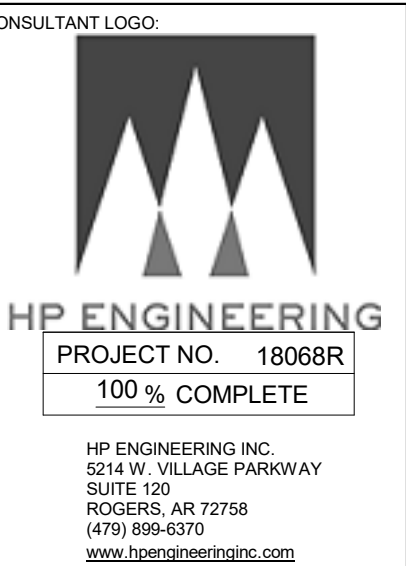
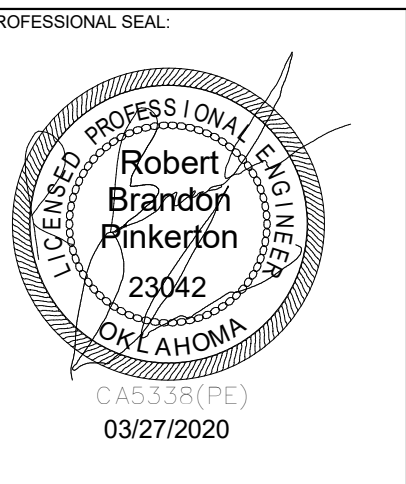
A.I.C. Rating: (7) FULLY RATED
Mains Type: MLO
Mains Rating: 225 A

Notes:

CKT	Load Name	CB	P	Wire	A	B	C	Wire	P	CB	Load Name	CKT
1												2
3	HE2 (8)	100	3	--	7962	140					MECHANICAL SHOP LIGHTING	4
5					2926	1994					PARKING LOT LIGHTING(10)	6
7					2841	1000					PARKING LOT LIGHTING(10)	8
9	HE4 (8)	100	3	--	0	135					HE3 (8)	10
11					0	124						12
13	SPACE	--	--	--	0	0					SPACE	14
15	EXTERIOR BUILDING LIGHTING(10)	20	1	#8	2470	0					SPACE	16
17	PARKING LOT LIGHTING(10)	20	1	#8	1494	1976					PARKING LOT LIGHTING(10)	18
19	EXTERIOR BUILDING LIGHTING(10)	20	1	#8	684	0					SPACE	20
21	EMERGENCY LIGHTING(2)	20	1	#8	2560	0					SPACE	22
23	Lighting - Exterior	20	1	--	988	0					SPACE	24
25					0	0					SPACE	26
27					0	0					SPACE	28
29					0	0					SPACE	30
31	SPACE	--	--	--	0	0					SPACE	32
33	SPACE	--	--	--	0	0					SPACE	34
35	SPACE	--	--	--	0	0					SPACE	36
37	SPACE	--	--	--	0	0					SPACE	38
39	SPACE	--										



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**WILMA P. MANKILLER HEALTH CENTER
EXPANSION**
STILWELL, OKLAHOMA

KEY PLAN

PROJECT PHASE
BID PACKAGE 02

#	DATE	REVISIONS	DESCRIPTION
1	1/16/20	BID PACKAGE 02 - ADD 01	
2	2/14/20	BID PACKAGE 02 - ADD 04	

DATE: 12-06-19 JOB NUMBER: 18-01.01

SHEET NUMBER:
E3.04
PANEL SCHEDULES

PANELBOARD NOTES (#)

1. TERMINATE GROUND ON ISOLATED GROUND BUS.
2. INSTALL LOCKING DEVICE FURNISHED WITH PANELBOARD (LOCK-OFF FOR MAINTENANCE).
3. INSTALL LOCKING DEVICE FURNISHED WITH PANELBOARD (LOCK-ON FOR CRITICAL LOAD).
4. GFI BREAKER FOR PERSONNEL PROTECTION (5mA).
5. GFI BREAKER FOR EQUIPMENT PROTECTION (30mA).
6. CONDUCTOR SIZE SHOWN IN PANEL SCHEDULE HAS BEEN INCREASED FOR VOLTAGE DROP. SIZE EQUIPMENT GROUND PROPORTIONALLY PER NEG. REFERENCE GROUND WIRE SIZING CHART.
7. REFER TO ONE-LINE DIAGRAM FOR AVAILABLE FAULT CURRENT FOR INTERRUPT RATINGS.
8. REFER TO ONE-LINE DIAGRAM FOR WIRE SIZES.
9. FACTORY WIRED TO LOAD.
10. THRU CONTROLLER. REFER TO LIGHTING CONTROLLER DETAIL.
11. ADD CIRCUIT BREAKER TO EXISTING PANEL.

EQUIPMENT GROUNDING CONDUCTOR SIZING CHART

BKRR AMPS	WIRE SIZE						
	PHASE	GROUND	12	10	8	6	4
15-20	PHASE	GROUND	12	10	8	6	4
25-30	PHASE	GROUND	10	8	6	4	3
35-50	PHASE	GROUND	8	6	4	3	2
60	PHASE	GROUND	6	4	3	2	1
70	PHASE	GROUND	8	4	4	3	2
80-90	PHASE	GROUND	4	3	2	1	1/0
100	PHASE	GROUND	3	2	1	1/0	2/0

PER NEC 250.122(B)

Branch Panel: L4B NEW

Location: ELEC 02-05-12
Supply From: MOUNTING: SURFACE
Enclosure: NEMA 1
Volts: 120/208 Wye
Phases: 3
Wires: 4
A.I.C. Rating: (7) FULLY RATED
Mains Type: MCB
Mains Rating: 200 A

CKT	Load Name	CB	P	Wire	A	B	C	Wire	P	CB	Load Name	CKT		
1	MCU-12	15	2		1456	500				1	20	EF-8	2	
2										2	15	MCU-13	4	
3													6	
4													8	
5	EF-7	15	1										10	
6													12	
7	SPARE	20	1	--	0	0				--	1	20	SPARE	14
8													16	
9	SPARE	20	1	--	0	0				--	1	20	SPARE	18
10													20	
11	SPARE	20	1	--	0	0				--	1	20	SPARE	22
12													24	
13	SPARE	20	1	--	0	0				--	1	20	SPARE	26
14													28	
15	SPARE	20	1	--	0	0				--	1	20	SPARE	30
16													32	
17	SPARE	20	1	--	0	0				--	1	20	SPARE	34
18													36	
19	SPARE	20	1	--	0	0				--	1	20	SPARE	38
20													40	
21	SPARE	20	1	--	0	0				--	1	20	SPARE	42
22													44	
23	SPARE	20	1	--	0	0				--	1	20	SPARE	46
24													48	
25	SPARE	20	1	--	0	0				--	1	20	SPARE	50
26													52	
27	SPARE	20	1	--	0	0				--	1	20	SPARE	54
28													56	
29	SPARE	20	1	--	0	0				--	1	20	SPARE	58
30													60	
31	SPARE	20	1	--	0	0				--	1	20	SPARE	62
32													64	
33	SPARE	20	1	--	0	0				--	1	20	SPARE	66
34													68	
35	SPARE	20	1	--	0	0				--	1	20	SPARE	70
36													72	
37	SPARE	20	1	--	0	0				--	1	20	SPARE	74
38													76	
39	SPARE	20	1	--	0	0				--	1	20	SPARE	78
40													80	
41	SPARE	20	1	--	0	0				--	1	20	SPARE	82
42													84	
43	SPARE	20	1	--	0	0				--	1	20	SPARE	86
44													88	
45	SPARE	20	1	--	0	0				--	1	20	SPARE	90
46													92	
47	SPARE	20	1	--	0	0				--	1	20	SPARE	94
48													96	
49	SPARE	20	1	--	0	0				--	1	20	SPARE	98
50													100	
51	SPARE	20	1	--	0	0				--	1	20	SPARE	102
52													104	
53	SPARE	20	1	--	0	0				--	1	20	SPARE	106
54													108	
55	SPARE	20	1	--	0	0				--	1	20	SPARE	110
56													112	
57	SPARE	20	1	--	0	0				--	1	20	SPARE	114
58													116	
59	SPARE	20	1	--	0	0				--	1	20	SPARE	118
60													120	
61	SPARE	20	1	--	0	0				--	1	20	SPARE	122
62													124	
63	SPARE	20	1	--	0	0				--	1	20	SPARE	126
64													128	
65	SPARE	20	1	--	0	0				--	1	20	SPARE	130
66													132	
67	SPARE	20	1	--	0	0				--	1	20	SPARE	134
68													136	
69	SPARE	20	1	--	0	0				--	1	20	SPARE	138
70													140	
71	SPARE	20	1	--	0	0				--	1	20	SPARE	142
72													144	
73	SPARE	20	1	--	0	0				--	1	20	SPARE	146
74													148	
75	SPARE	20	1	--	0	0				--	1	20	SPARE	150
76													152	
77	SPARE	20	1	--	0	0				--	1	20	SPARE	154
78													156	
79	SPARE	20	1	--	0	0				--	1	20	SPARE	158
80													160	
81	SPARE	20	1	--	0	0				--	1	20	SPARE	162
82													164	
83	SPARE	20	1	--	0	0				--	1	20	SPARE	166
84													168	

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
Hvac	5824 VA	100.00%	5824 VA	
Power	1028 VA	100.00%	1028 VA	Total Conn. Load: 6852 VA
Receptacle				Total Est. Demand: 6852 VA
Lighting - Exterior				Total Conn. Current: 19 A
				Total Est. Demand: 19 A

Branch Panel: L4A NEW

Location: ELEC 02-05-12
Supply From: T4
Mounting: SURFACE
Enclosure: NEMA 1
Volts: 120/208 Wye
Phases: 3
Wires: 4
A.I.C. Rating: (7) FULLY RATED
Mains Type: MCB
Mains Rating: 200 A

CKT	Load Name	CB	P	Wire	A	B	C	Wire	P	CB	Load Name	CKT		
1	AHU-1 UV	15	1		462	1456				2	15	MCU-01	2	
2	AHU-1 GFCl	15	1			360	1456			2	15	MCU-02	4	
3	AHU-1 LIGHTING	15	1			391	1456			2	15	MCU-03	6	
4	AHU-2 UV	15	1		232	1456				2	15	MCU-04	8	
5	AHU-2 LIGHTING	15	1			391	1456			2	15	MCU-05	10	
6	AHU-3 UV	15	1		462	1456				2	15	MCU-06	12	
7	AHU-3 LIGHTING	15	1			1200	1456			2	15	MCU-07	14	
8	AHU-4 UV	15	1		232	1456				2	15	MCU-08	16	
9	AHU-4 LIGHTING	15	1			391	1456			2	15	MCU-09	18	
10	AHU-5 UV	15	1		232	1456				2	15	MCU-10	20	
11	AHU-5 LIGHTING	15	1			180	1976		#10	2	25	MCU-11	22	
12	SPARE	20	1	--	0	1456				--	1	20	SPARE	24
13	SECTOR 2 SERVICE	20	1			1440	1456			2	15	MCU-12	26	
14	ELEVATOR CAB LIGHTS	20	1			200	1976		#10	2	25	MCU-13	28	
15	SPARE	20	1	--	0	1976				--	1	20	SPARE	30
16	ROOF MAINTENANCE RECEPTACLE	20	1			1080	1456			2	15	MCU-14	32	
17	SPARE	20	1	--	0	1456				--	1	20	SPARE	34
18	SPARE	20	1	--	0	1976			#10	2	25	MCU-15	36	
19	SPARE	20	1	--	0	1976			#10	2	25	MCU-16	38	
20	SPARE	20	1	--	0	1976			#10	2	25	MCU-17	40	
21	SPARE	20	1	--	0	1976			#10	2	25	MCU-18	42	
22	SPARE	20	1	--	0	1976			#10	2	25	MCU-19	44	
23	SPARE	20	1	--	0	1976			#10	2	25	MCU-20	46	
24	SPARE	20	1	--	0	1976			#10	2	25	MCU-21	48	
25	SPARE	20	1	--	0	1976			#10	2	25	MCU-22	50	
26	SPARE	20	1	--	0	1976			#10	2	25	MCU-23	52	
27	SPARE	20	1	--	0	1976			#10	2	25	MCU-24	54	
28	SPARE	20	1	--	0	1976			#10	2	25	MCU-25	56	
29	SPARE	20	1	--	0	1976			#10	2	25	MCU-26	58	
30	SPARE	20	1	--	0	1976			#10	2				

Project Manual

Bid Package 2
Addendum No.03
Volume 2
Divisions 27

Cherokee Nation WILMA P. MANKILLER HEALTH CENTER EXPANSION

Stilwell, Oklahoma

February, 05 2020

Division	Section Title	Pages
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PROCUREMENT AND CONTRACTING DOCUMENTS GROUP

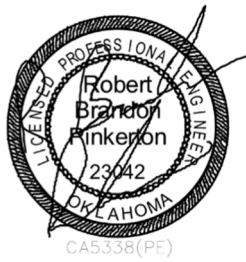
SPECIFICATIONS GROUP

Facility Services Subgroup

DIVISION 27 - COMMUNICATIONS

27 0000 CNIS Network Construction Standards and Requirements

END OF TABLE OF CONTENTS



Cherokee Nation Information Technology
Network Construction Standards and Requirements

INTRODUCTION

The following Network Construction Standards and Requirements pertain to the requirements of the Cherokee Nation Information Technology Network Section. All preceding documentation is superseded by this document and shall be used until replaced.

This is our requirements that we require to be followed when designing, constructing, or refurbishing any building that requires a network to be installed or upgraded. If there are any questions please contact Cherokee Nation Information Technology Network Group.

PART 1 – GENERAL

1) SECTION REQUIREMENTS

- a) Summary: Furnish and install complete with all accessories a Structured Cabling System (SCS). The SCS shall serve as a vehicle for transport of data, video and voice telephony signals throughout the network from designated demarcation points to outlets located at various desks, workstation and other locations as indicated on the contract drawings and described herein.
- b) Submittals
 - i) Product Data
 - (1) Owner is providing a list of standard parts required for the contract. Any additional parts used the vendor/contractor will provide manufacture's catalog information showing dimensions, colors and configurations.
 - (2) Submittals shall include all items called for in PART 2 – PRODUCTS of this document and the manufacturers cut sheets for the following:
 - (a) All balanced twisted pair cable.
 - (b) All connectors and required tooling.
 - (c) All termination system components for each cable type.
 - (d) All test equipment to be used for balanced twisted pair channels.
 - (3) A Performance Specification showing manufacturer's Guaranteed Published Channel Performance over the full swept frequency range.
 - (4) Technical data sheets shall include the physical specifications as well as the following electrical and transmission characteristics for balanced twisted pair channels:
 - (a) Mutual Capacitance
 - (b) Characteristic Impedance
 - (c) DC Resistance
 - (d) Insertion Loss (IL)
 - (e) Pair-to-Pair Near End Crosstalk (NEXT)
 - (f) Power Sum Near End Crosstalk (PSNEXT)
 - (g) ELFEXT (ELFEXT)
 - (h) Power Sum ELFEXT (PSELFEXT)
 - (i) Return Loss (RL)
 - (j) Propagation delay
 - (k) Delay Skew
 - ii) Samples
 - (1) Prior to installation, samples of cable and components shall be provided to the Owner, its

Consultants and Construction Manager for evaluation prior to Installation

- (a) Submit samples of each type of cable
 - (i) Three (3) 24" long samples of each type of cable, copper (6e & 6a) and fiber (SM & MM). For the copper, the sample cannot be from the same box/reel. Must take from three separate boxes/reels.
 - (ii) Three (3) samples of each connector.
 - (iii) One each 100ft terminated copper of the 6e & 6a cable in a bag for test reference and permanent storage in the Main Closet. Each should start at the lowest footage mark.
- iii) Manufacturer's Instructions
 - (1) Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
 - (2) Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.
- iv) Material Guarantee
 - (1) The wiring vendor/contractor (installer) shall guarantee at the time of the bid that all Category 6A and 6E cabling and components meet or exceed specifications (including installation) as referenced in 1.2.
 - (2) The successful wiring vendor/contractor (installer) will insure that all correct parts are ordered per Products Section of this document and installed in accordance with manufacturers design and installation guidelines. Vendor/contractor shall submit complete parts and part numbers to the Construction Manager prior to installation of equipment.
 - (3) Test Fiber optic cables upon receipt at Project site:
 - (a) Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
 - (b) Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in final documentation.
- v) Quality Assurance
 - (1) For Cat 6a and 6e copper and Fiber optic the following will be provided:
 - (a) System:
 - (i) The successful Bidder shall warrant that all materials and equipment furnished within the channel, under the contract are new, in good working order, free from defects, and in conformance with the Structured Cabling SYSTEM specifications. All installed equipment must conform to the manufacturer's official published specifications. The warranty shall begin at the Structured Cabling System acceptance date and remain in effect for a period of twenty-five year from that date. The successful Bidder shall agree to repair, adjust, and/or replace (as determined by the Purchaser to be in its best interest) any defective equipment, materials, or other parts of the Structured Cabling System at the successful Bidder's sole cost. The Purchaser will incur no costs for service or replacement of parts within the channel during the warranty period of 25 years.
 - (ii) Selected vendor must provide a Structured Cabling System warranty for a minimum of 25 years. The Structured Cabling System warranty must guarantee the electrical performance to meet or exceed the requirements as outlined in documents TIA/EIA 568A and ISO DIS 11801 and offer a twenty five (25) year warranty within the Structured Cabling SYSTEM Channel, beginning at acceptance by the Purchaser. The warranty must include complete parts and labor replacement of defective products. The products must be warranted for a minimum of 20 years by the manufacturer. The Structured Cabling System warranty must have provisions for replacing the contracting

organization at no cost to the customer should the contractor lose his status as an authorized installer or otherwise not fulfill his obligation to the customer as outlined in the Structured Cabling System warranty program.

(iii) The successful Bidder shall warrant and supply evidence that the installation of materials and hardware will be made in strict compliance with all applicable provisions of the National Electric Code, the rules and regulations of the Federal Communications Commission, and state and/or local codes or ordinances that may apply.

(b) Application:

(i) Minimum twenty (20) year application assurance: The application assurance shall cover the failure of the wiring system to support the application which it was designed to support, as well as additional application(s) introduced in the future for a minimum twenty (20) year period.

vi) Certifications

- (1) The successful vendor/contractor shall meet the current year Panduit Business Partner Agreement – Panduit Certified Installer (and/or Addendum), and shall provide a copy of the PCI certificate before awarding contract.
- (2) A copy of certification not less than 6 months from expiration for the vendors/installer Panduit Certified Copper and Fiber Technicians (PCT) shall be submitted upon awarding of contract before first cable is pulled and or installed.
- (3) If the successful vendor/contractor subcontracts the job (and so on), then each awarded vendor/installer shall comply with the same certifications as above.

2) STANDARDS AND CODE COMPLIANCE REFERENCES

a) The following industry standards are the basis for the structured cabling system described in this document:

i) TIA/EIA

- (1) ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises, February 2009
- (2) ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard, February 2009
- (3) ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components
- (4) Standards, August 2009
- (5) ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard, June 2008.
- (6) TIA/EIA569A Commercial Building Standard for Telecom Pathways and Spaces
- (7) TIA/EIA606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
- (8) TIA/EIA607 Commercial Building Grounding/Bonding Requirements
- (9) TIA/EIA942 Telecommunications Infrastructure Standard for Data Centers
- (10) IEEE Std 802.3(tm)-2008 Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.
- (1) IEEE Std 802.3(tm)-2008 Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications. IEEE 802.3bc-2009, Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications. Amendment 2: Ethernet Organizationally Specific Type, Length, Value (TLVs).

ii) NFPA70 National Electric Code (NEC) 2005

iii) ISO/IEC· ISO/IEC 11801 Generic Cabling for Customer Premises

iv) BICSI ITSIM, Chapter. 4, "Pulling Cable."

3) ADDITIONAL SUPPPORT

- a) Cherokee Nation Information Technology Network Construction Standards and Requirements – this document.
- b) Notes, drawings and instructions from Owner as needed.
- c) Panduit Certification PLUSSM System Warranty Program, Panduit Warranty Guide.
- d) Successful vendor/contractor is invited to review an existing network to see how Owner would like to see how the network should look upon completion.

- 4) The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above (section 2 and 3) shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

PART 2 – PRODUCTS

1) SYSTEM REQUIREMEMNTS

- a) Expansion Capability: Provide spare conductor pairs in telecommunication cables, positions in cross-connect and patch panels, terminal strips to accommodate 20 percent future increase in the number of workstations shown on Drawings. All components and cabling shall be capable of 10G Bandwidth speed throughout the entire system.

2) CABLE TRAY

a) Installation:

- i) Cable tray will be the Chatsworth part no. 10250-718, {Standard length is 9'11-1/2"}. Cable Tray shall be installed with side stringers facing up so that the ladder forms a U-shape.
- ii) Cable Tray shall be secured to the structural ceiling, building truss system, wall, floor or the tops of equipment racks and/or cabinets using the manufacturer's recommended supports and appropriate installation hardware and methods as defined by local code or the authority having jurisdiction (AHJ). Cable Tray shall be supported every 5' or less in accordance with TIA-569-B. Cable Tray shall be supported within 2' of every splice and within 2' on both/all sides of every intersection. Support Cable Tray within 2' on both sides of every change in elevation. Cable tray support will use the Threaded Ceiling kit (11310-003) or a combination of Runway Support Bracket (11408-003) with 5/8 All-Thread Rod on the outside, Ceiling Support Bracket (11406-002), Threaded Rod I-Beam Clamps (10557-003), or appropriate hex nuts, split lock washers and plain washers through the bottom chord of the joists. Cable Tray splices will be made in mid-span, not over a support, with the manufacturer's recommended splice hardware.
- iii) Cable Tray shall be installed with a minimum clearance of 12" above the Cable Tray. Leave a minimum of 12" in between Cable Tray and ceiling/building truss structure. When located above an acoustical drop ceiling, leave a minimum of 3" clearance between the top of the drop ceiling tiles and the bottom of the Cable Tray.
- iv) Connections between tray sections shall be with the Butt-Splice kit (11301-001). If a redirection of up or down is required to go over or under utilities, use the Butt Swivel Splice kit (1 0487 -001). For the up or down movement of tray do not exceed more than 30 degrees so the cable will lie on the tray. **The use of cut up tray sections/pieces on joints shall not be used. Manufacture parts shall be used.**
- v) Intersections (T or X shaped) shall be made using the Junction Splice Kit (11308-001), with Cable Runway Corner Bracket (11595-715) added to create a radius for the cable to lay on when making turns. For an L-turn use the Cable Runway E-Bend (10822-709).
- vi) The cable tray is offset the length of the room to accommodate the rack, for all the cable to come off the track within 4 feet of the left hand wall when standing in the doorway.

- vii) Cover the exposed ends of cable runway that do not terminate against a wall or the ceiling with Protective End Caps (10643-001) or an End Closing Kit (11700-709).
- viii) The installer will provide touch-up paint color-matched to the finish on the Cable Tray and will correct any minor cosmetic damage (chips, small scratches, etc.) resulting from normal handling during the installation process prior to delivery to the owner. If a component is cosmetically damaged to the extent that correction in the field is obvious against the factory finish, the component will be replaced with a new component finished from the factory. If a component is physically damaged due to mishandling or modification during the installation process, it shall not be used as part of the Cable Tray system. Paint listed in parts list.

b) Grounding

- i) Grounding will be in accordance with the Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications J-STD-607 -A. Within the telecommunications room/s and throughout the building, the Cable Tray shall be bonded together, electrically continuous, and bonded to the TGB. Cable Tray and turns shall be bonded across each splice with a bonding kit (40164-001 or 025). Cable Tray shall be bonded to the Telecommunications Grounding Buss bar (TGB) using an approved ground lug on the Cable Tray and a minimum #6 grounding wire. Remove paint from the Cable Tray where bonding/ground lugs contact the Cable Tray so that the lug will contact bare metal. Use antioxidant joint compound in between the bare metal on the Cable Tray and ground lug. Use antioxidant joint compound in between the bus bar and the ground lug. Verify continuity through the bonds at splices and intersections between individual Cable Tray sections and turns and through the bond to the TGB.
- ii) **The use of cut up tray sections/pieces on joints shall not be used as a grounding bond between the joints.**

3) IT ROOM

- a) Server room shall be Air Conditioned with a separate unit on a separate thermostat.
- b) The HVAC shall be provided on a 24 hours-per-day, 365 days-per year basis. If a standby power source is available in the building, consideration should be given to connecting the HVAC system serving the telecommunications equipment room to the standby supply.
- c) The temperature and humidity shall be controlled to provide continuous operating ranges of 18deg C (64deg F) to 24 "C (75deg F) with 30% to 55% relative humidity. Humidification and dehumidification equipment may be required depending upon local environmental conditions
- d) A positive air pressure differential with respect to surrounding areas should be provided.
- e) Need 120v power receptacles on all walls with dedicated circuits. The rack vertical management will have twist lock and quad receptacles as request by the owner and Drawings.
- f) Wall - 3/4" void free A-C grade (or better) plywood with 2 coats of fire retardant paint.
- g) Equipment not related to the support of the equipment room (e.g., piping, ductwork, pneumatic tubing, etc.) shall not be installed in; pass through, or enter the equipment room.

4) MOUNTING ELEMENTS

- a) Use the following charts to reference which equipment will be used.

Chart 1

Line item	P/N	Description	Qty
1	4220W	Dell 42U enclosure, wide (4220W): 750mm wide x 1070mm deep	
2	PRV15	Panduit Vertical Cable manager	
3	CMR4P84	Panduit 4-Post rack	
4	PRD15	Panduit Dual hinged door	

5	PREP	Panduit End Panel	
6	RGRB19U	Panduit ground bar	
7	GB2B0312TPI-1	Panduit Telecommunications ground bar	
8	10250-724	Chatsworth Universal cable runway, Black – 24 Inch Wide	Reference
9	11301-702	Chatsworth Butt Splice Kit, 2" Stringer, Black	Reference
10	10724-724	Chatsworth Cable runway radius bend – 24inch Wide	Reference
11	11309-701	Chatsworth Foot kit, cable runway	Reference
12	11421-724	Chatsworth Wall angle support kit, cable runway – 24inch Wide	Reference
13	31470-712	Chatsworth Cable runway standoff support kit	Reference
14	10506-702	Chatsworth Cable runway elevation kit	Reference
15	11302-701	Chatsworth Junction-splice kit	Reference
16	10723-724	Chatsworth Cable runway radius bend	Reference
17	11959-724	Chatsworth Corner Bracket 24 inch Radius,	Reference
18	11746-724	Chatsworth Triangular Supports Bracket, steel	Reference

Chart 2

Line item	Qty	P/N	Description	Purpose	Notes
1		CJ6X88TGBU	Panduit Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Blue	Closet A Zone	
2		CJ6X88TGOR	Panduit Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Orange	Closet B Zone	
3		CJ6X88TGGR	Panduit Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Green	Closet C Zone	
4		CJ6X88TGRD	Panduit Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Red	Closet D Zone	
5		CJ6X88TGIW	Panduit Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Off White	Closet E Zone	
6		CJ688TGYL	Panduit Category 6, RJ45, 8-position, 8-wire universal module, Yellow	Camera Systems	
7		CJ688TGVL	Panduit Category 6, RJ45, 8-position, 8-wire universal module, Violet	Multimedia	
8		CJ6X88TGBU-24	Panduit Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Blue (24-Pk)	Closet A Zone	
9		CJ6X88TGOR-24	Panduit Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Orange (24-Pk)	Closet B Zone	
10		CJ6X88TGGR-24	Panduit Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Green (24-Pk)	Closet C Zone	
11		CJ6X88TGRD-24	Panduit Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Red (24-Pk)	Closet D Zone	
12		CJ6X88TGIG-24	Panduit Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Int Gray (24-Pk)	Closet E Zone	
13		CJ688TGYL-24	Panduit Category 6, RJ45, 8-position, 8-wire universal module, Yellow (24-Pk)	Camera Systems	
14		CJ688TGVL-24	Panduit Category 6, RJ45, 8-position, 8-wire universal module, Violet (24-Pk)	Multimedia	
15		PUR6004BU-UY	Panduit TX6000 Cat6 UTP riser copper cable	Camera Systems and Multimedia	
16	50	UTP6A7BU	Cat 6a 10Gb UTP patch cable, 7ft, Blue	Closet A network room connection	
17	70	UTP6A14BU	Cat 6a 10Gb UTP patch cable, 14ft, Blue	Closet A network room connection	
18	70	UTP6A20BU	Cat 6a 10Gb UTP patch cable, 7ft, Blue	Closet A network room connection	
19	70	UTP6A7OR	Cat 6a 10Gb UTP patch cable, 7ft, Orange	Closet B network room connection	
20	50	UTP6A7GR	Cat 6a 10Gb UTP patch cable, 7ft, Green	Closet C network room connection	
21	50	UTP6A7RD	Cat 6a 10Gb UTP patch cable, 7ft, Red	Closet D network room connection	
22	30	UTP6A7	Cat 6a 10Gb UTP patch cable, 7ft, Off White.	Closet E network room connection	
23	120	UTP6A5YL	Cat 6a 10Gb UTP patch cable, 5ft, Yellow	Security Cameras	
24	10	UTP6A3YL	Cat 6a 10Gb UTP patch cable, 3ft, Yellow	Security Cameras lamp posts	
25	30	UTP6A3VL	Cat 6a 10Gb UTP patch cable, 3ft, Violet	Multimedia	
26		Vendor specific	Panduit Mini-Com Snap-On Modular furniture faceplates	Modular Furniture	Check Panduit's catalog. Must have a label. Vendor specific faceplate.
27		CBIW	Panduit Single gang faceplate frame accepts two 1/2 size module inserts or three 1/3 size module inserts.	Multimedia plates	For other colors replace suffix IW (Off White) with EI (Electric Ivory), WH (White), IG (Int Gray) or BL (Black)
28		CHS2IW-X	Panduit Two module space, 1/2 size, sloped insert accepts two Mini-Com modules	Multimedia plates	For other colors replace suffix IW (Off White) with EI (Electric Ivory), WH (White), IG (Int Gray) or BL (Black)
29		CHB2IW-X	Panduit 1/2 Blank Insert	Multimedia plates	For other colors replace suffix IW (Off White) with EI (Electric Ivory), WH (White), IG (Int Gray) or BL (Black)
30		KWPY	Panduit Stainless steel phone plate	Wall phones	The cable is terminated and left in the wall box.
31		CFPL2IWY	Single gang, vertical faceplate accepts two Mini-Com modules	Network wall plates	For other colors replace suffix IW (Off White) with EI (Electric Ivory), WH (White), IG (Int Gray) or BL (Black)
32		CFPL3IWY	Single gang, vertical faceplate accepts three Mini-Com modules	Network wall plates	For other colors replace suffix IW (Off White) with EI (Electric Ivory), WH (White), IG (Int Gray) or BL (Black)
33		CFPL4IWY	Single gang, vertical faceplate accepts four Mini-Com modules	Network wall plates	For other colors replace suffix IW (Off White) with EI (Electric Ivory), WH (White), IG (Int Gray) or BL (Black)
31		CMBIW-X	Mini-Com blank module	Network wall plates	For other colors replace suffix IW (Off White) with EI (Electric Ivory), WH (White), IG (Int Gray) or BL (Black)
32		TTS-35RX0	Panduit Tak-Tape (10 PK)	All network binding	
33		FOOPRX24Y	Panduit Opti-Core 24-Fiber indoor interlocking armored cable	All Back bone	
34		EZDP44	Fire Barrier CBL Pathway Single EZ Path W/WPLT Series 44		
35		RGESD2-1	Panduit Two-hole ESD port with 5/8" hole spacing		
36		11310-003	Chatsworth Threaded Ceiling Kit, Cable Runway		

37	11421-712	Chatsworth Wall Angle Support Kit, Cable Runway		
38	10250-712	Chatsworth Universal Cable Runway – 12 inch wide		
39	10723-712	Chatsworth Cable Runway Radius Bend 90-Degree Outside Bend – 12 inch Wide		
40	10724-712	Chatsworth Cable Runway Radius Bend 90-Degree Inside Bend – 12 inch Wide		
41	11301-702	Chatsworth Butt-Splice Kit		
42	11298-701	Chatsworth Heavy Duty Junction-Splice Kit		
43	10642-001	Chatsworth Chatsworth Protective End Caps For Runway		
44	10622-010	Chatsworth Standard Busbar 4"Wx1/4"Hx10"L		
45	40164-001	Chatsworth #6AWG Ground Strap		
46	10250-718	Chatsworth Universal Cable Runway		
47	10723-718	Chatsworth Cable Runway Radius Bend 90 degree Outside Bend		
48	10724-718	Chatsworth Cable Runway Radius Bend 90 degree Inside Bend		
49	11421-718	Chatsworth Wall Angle Support Kit, Cable Runway		
50	11304-000	Chatsworth J-bolt Kit		
51	11301-001	Chatsworth Butt-Splice Kit		
52	10506-706	Chatsworth Cable Runway Elevation Kit 6"		
53	1201-701	Chatsworth Cable Runway Radius Drop Stringer		
54	12100-718	Chatsworth Cable Runway Radius Drop Cross Member		
55	JMDWB-1-X	Panduit Drop Wire brackets for J-hooks		
56	JMJH2-X20	Panduit J Hook		
57	FOPRX24Y	Panduit Opti-Core 24-Fiber 10gig indoor interlocking armored cable		
58	RGTBSG-C	Panduit Green thread-forming bonding screw, #12-24 x 1/2" (pkg 100)		

5) UNSHIELDED TWISTED-PAIR CABLING

- a) Backbone Fiber Cable:
 - i) Panduit Opti-Core 24-Fiber 10gig indoor interlocking armored cable, p/n FOPRX24Y
 - ii) Comply with TIA/EIA 568-B.1 & 3, and 598-B
 - iii) NFPA 70
- b) Horizontal Copper cable:
 - i) For Security Cameras and Multimedia:
 - (1) NO. 23 AWG, 100 ohm, four pair. Panduit PUR6004BU-UY
 - (2) Comply with TIA/EIA-568-B.2 and ANSI/TIA-568-C.2, Category 6e
 - (3) NFPA 70, types CMG and CMP
 - ii) For Main Network:
 - (1) NO. 23 AWG, 100 ohm, four pair. Panduit PUR6X04BU-UY
 - (2) Comply with TIA/EIA-568-B.2 and ANSI/TIA-568-C.2, Category 6A
 - (3) NFPA 70, types CMG and CMP
- c) Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, using modules designed for punch-down caps or tools.
 - i) IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
- d) Cross-Connect Panel: Modular array of IDC terminal blocks arranged to terminate building cables and permit interconnection between cables.
 - i) Number of Terminals per Field: One for each conductor in assigned cables plus 25 percent spare.
 - ii) Number of Jacks per Field: One for each four-pair UTP cable indicated.
- e) Jacks and Jack Assemblies: As referenced in Charts 1 and 2.
- f) Patch Cords: Factory made, four pair cables, to length as stated in parts reference, matching color to closet zone as referenced in Charts 1 and 2.

6) MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLY

- a) Modular unit suitable for terminating single or multiple horizontal cables in one central location, providing an intermediary point between telecommunications closet and workstation.
 - i) NRTL listed as complying with UL 50 and UL 1863.
 - ii) Number of Terminals per Field: One for each conductor in assigned cables.
 - iii) Number of Connectors per Field:
 - (1) One for each four-pair UTP cable indicated.
 - (2) One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.
- b) Mounting: Owner furnished Modular Walls and Furniture: As provide by modular furniture manufacturer. Reference Charts 1 and 2.

7) WORKSTATION OUTLETS

- a) Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, modular, RJ-45. Comply with TIA/EIA-568-B.1.
- b) Workstation Outlets: Single, dual, triple or quad jack connector mounted in a single or multi-gang faceplate as shown in the prints.
 - i) Jacks will be the color of the Closet/ Zone they are in. See prints.
 - ii) Faceplate: Flush; high impact plastic; color determined by Architect and or Owner. Part numbers listed in Part Reference.
 - iii) Legend: Contractor printed labels showing Closet then cable number, i.e. A001, A002, B101, C125.

8) MULTIMEDIA OUTLET

- a) Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, modular, RJ-45. Comply with TIA/EIA-

568-B.1.

- b) Workstation Outlets: dual connector mounted in a single faceplate as shown in the prints.
 - i) Jacks will be the color of Violet. See Charts 1 and 2.
 - ii) Faceplate: Flush; high impact plastic; color determined by Architect and or Owner. Part numbers listed in Charts 1 and 2 Part Reference.
- c) Legend: Contractor printed labels showing Closet, M (for MultiMedia) then cable number, i.e. AM01.

9) SECURITY CAMERA OUTLETS

- a) Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, modular, RJ-45. Comply with TIA/EIA-568-B.1.
- b) Workstation Outlets: dual connector mounted in a single faceplate as shown in the prints.
 - i) Jacks will be the color of Yellow. See Charts 1 and 2.
 - ii) Legend: Contractor printed labels showing Closet, S (for Security) then cable number, i.e. AS01.
 - iii) Outlets will be either in the following configurations according to drawings.
 - (1) If internal wall mount then terminated jack will be placed in the box with a blank faceplate, flush; high impact plastic; color determined by Architect and or Owner.
 - (2) If external wall mount then the terminated jack will be placed on or in the internal inside wall close to the camera mount in a single ganged box with:
 - (a) Faceplate: Flush; high impact plastic; color determined by Architect and or Owner. Part numbers listed in Charts 1 and 2 Part Reference.
 - (3) If ceiling mounted then the terminated jack will be placed on top plate of the nearest wall in a single ganged box with:
 - (a) Faceplate: Flush; high impact plastic; color determined by Architect and or Owner. Part numbers listed in Charts 1 and 2 Part Reference.

10) GROUNDING AND BONDING

- a) Materials: Comply with NFPA 70, TIA/EIA-607, and UL 467.
- b) Reference Charts for what type of hardware is to be used in each Closet.
- c) Reference Manufacturer instructions on what and how grounding should be done if not referenced in this section.
- d) Reference drawings for location of hardware on equipment racks.
- e) Reference Part 2, section 2b), Cable Tray Grounding.

11) IDENTIFICATION PRODUCTS

- a) Reference Steps 7-9 above for labeling legend.
- b) Adhesive-Backed Cable Labels: Use a label-making machine or printer to construct adhesive-backed label tabs from plastic or paper strips. Labels shall be over laminating type in order to protect type-face information with clear Mylar film. Handwritten labels are prohibited
- c) Four-pair UTP cable shall have labels affixed directly to cable jacket:
 - i) Within 3 inches from jack all outlets listed in steps 8-10.
 - ii) Within 6 from jack at patch panels
 - iii) Within 6 from entry into blocks.
- d) Fiber Optic Cables:
 - i) Shall have labels affixed to a label carrier that protects the cable and allows the re-positioning and rotation of the identification label.
 - ii) Warning Label shall be affixed along the consistent distance apart identifying that the cable is an optical fiber.
- e) Wiring Block Labels: Cardboard-like strips or adhesive labels that slip inside or onto clear plastic designation strips or label holders located on protector panels and wiring blocks

- f) Telecommunications Outlet (TO) Labels/Workstations: Use a label-making machine to construct label tabs from plastic or paper strips or adhesive labels. Handwritten labels are unacceptable

12) CONDUIT SIZING SCHEDULE

SCHEDULE 0 – Conduit Trade Size	SCHEDULE 1 - Max Number of Cables based upon allowable fill.			
	SCHEDULE 2 - Cable outside Diameter, mm (in), [a=Category 3, 6e] or [b=6A, 10Gig]			
	SCHEDULE 3 - 6.1 (2.4) [a]	SCHEDULE 4 - 7.9 (.31) [b]	SCHEDULE 5 - 9.4 (.37) [b]	SCHEDULE 6
SCHEDULE 7 - 27 (1 ")	SCHEDULE 8 - 4	SCHEDULE 9 - 2	SCHEDULE 10-2	SCHEDULE 11
SCHEDULE 12 - 35 (1-1/4")	SCHEDULE 13-5	SCHEDULE 14-4	SCHEDULE 15 - 3	SCHEDULE 16
SCHEDULE 17 - 41 (1-1/2")	SCHEDULE 18-6	SCHEDULE 19-4	SCHEDULE 20 - 4	SCHEDULE 21

13) CONDUIT RUNS

- a) Conduits from any Telecommunication closet, cable tray, horizontal pathway is not allowed except in the following:
- i) Conduit can be from the TO to the top of the wall with a minimum of 4 inches exposed. Preferred is 1 foot above the wall with 90 degree bend so that the cable repair margin can be Velcro wrapped into the bend of the conduit. All exposed ends of conduits will have a EMT screw connector with plastic bushing to protect the cable from nicks.
 - ii) A 2-inch conduit is required to each wall-mounted box that supports a multi-user telecommunications outlet assembly (MUTOA). A MUTOA is a special type of telecommunications outlets that can support up to 12 voice/data jacks. It is suitable for use in locations where there is a cluster of machines where each one is within 15 feet from the MUTOA.
 - iii) Flexible conduits such as metallic flexible conduit are not to be used as pathways for telecommunications cables to avoid sheath damage to the cables. Therefore, the use of flexible conduits as pathway for telecommunications cables must be avoided at all times.
 - iv) Minimize the amount of turns/curve in the conduit from the top of wall to the gang box. If under a window or opening, reroute conduit to place straight down next to window or opening.

14) TELECOMMUNICATIONS EQUIPMENT ROOM (T-E-R)

- a) A telecommunications equipment room (T-E-R) is where the entrance conduits terminate. It is usually located on the ground floor but may also be located in the basement. A T-E-R typically functions as the main cross-connect (MCC). It is the main telecommunications serving point for the building. It will contain telecommunications equipment, much of it mounted on 19" - 4 post racks. Cables will be spliced and terminated on the walls. It is important that the entrance conduits stub up in the T-E-R as close to a corner as possible.
- b) When designing the T-E-R floor space, allowance shall be made for non-uniform occupancy, throughout the building. The practice is to provide 0.07 m² (0.75 ft²) of equipment room space for every 10 m² (100 ft²) of work area space. The equipment room shall be designed to a minimum of 14 m² (150 ft²). See section 8.2 of TIA/EIA-569 pg.72 for more information. In the case of smaller buildings see annex B.3 of the TIA/EIA-569.
- c) In certain buildings, the T-E-R will be further designated as a Node Room. A Node Room is used as a

cabling hub not just for that building but for other buildings in that neighborhood of the campus. A Node Room requires additional space, air conditioning, and additional entrance conduits. It may require 30 amp outlets. In some cases, where a Node Rooms is designated in a building, a separate TR on the same floor as the Node Room may be required.

- d) CN-NTD will advise FD&C and the architect in the initial planning stage if a Node Room has been designated, No water sprinklers may be installed in a Node Room. A separate fire suppression system, based on one of the approved replacements for Halon, must be installed in coordination with CN Risk Management
- e) A Node Room will house PBX telephone switching equipment, large wet- or dry-cell batteries, routers for campus wide area network (WAN), related local area network (LAN) switches, optical fiber cross connects and optical communications gear. Hence, it should be located so that it is accessible for the delivery of large equipment throughout its useful life. It must be at least 10' from a potential source of EMI (motors, transformers, photocopying equipment, etc.).

15) TELECOMMUNICATIONS ROOMS (TRS)

- a) TRs are smaller than T-E-Rs. They are the cabling hubs for floors within a building. They also contain network electronics, typically mounted in 19" - 4 post racks. See table 7.2-1 of TIA/EIA. 569 pg. 66 for more information.

16) ELEVATOR PHONES

- a) Elevator phones are cabled to each elevator equipment room. There must be at least one TO in the elevator equipment room that is cabled to the Main telecom room. There must be a dedicated number of jacks on the TO so to accommodate all elevators in the building. Recommend that there be one phone block dedicated to Safety and Security to be easily identified.

PART 3 – EXECUTION

1) INSTALLATION STANDARDS

- a) Reference Part 1 –General,
 - i) Section 2) STANDARDS AND CODE COMPLIANCE REFERENCES
 - ii) Section 3) ADDITIONAL SUPPPORT
- b) The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

2) APPLICATION OF MEDIA

- a) Backbone Cable for Data Service: 10Gig 24 fiber cable for runs between equipment rooms and wiring closet and for runs between closets.
- b) Backbone Cable for Multimedia Service: UTP Category 6e cable to be run from Closet “A” Multimedia panel to each of the other closet multimedia patch panels, i.e. A to B, A to C, A to D, A to E. The cable will be terminated as the last port on the patch panel, i.e 21, 22, 23, 24.
- c) Backbone Cable for Telecommunications to run from Telecom Entrance Room to each closet, terminated at the Telecom patch panel, reference locations on drawings.
- d) Horizontal Cable for Data Service: 10Gig UPT Category 6A cable for runs between wiring closets and workstation outlets.
- e) Horizontal Cable for Security Cameras:
 - i) UTP Category 6e cable for runs between wiring closets and equipment. Starting at port 1 on Security Camera patch panel.
 - ii) Fiber Optic 6-fiber cable for runs from closet to lamp posts in parking lot. Terminating in fiber box.

- f) Horizontal cable for Multimedia Service: UTP Category 6e cable for runs between wiring closets and equipment. Starting at port 1 on Multimedia patch panel.

3) WORKMANSHIP

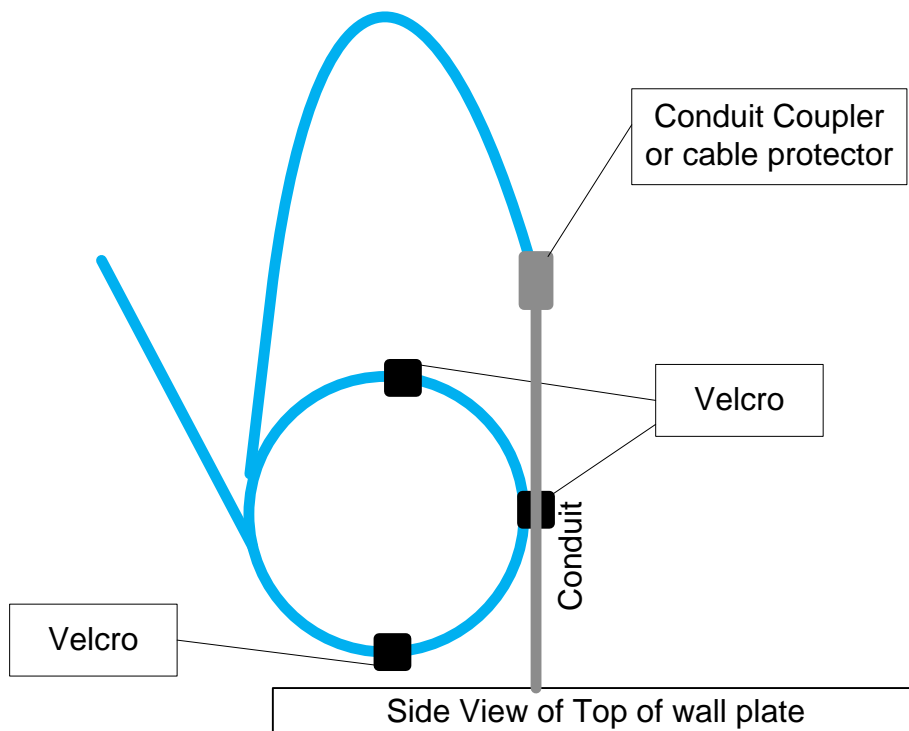
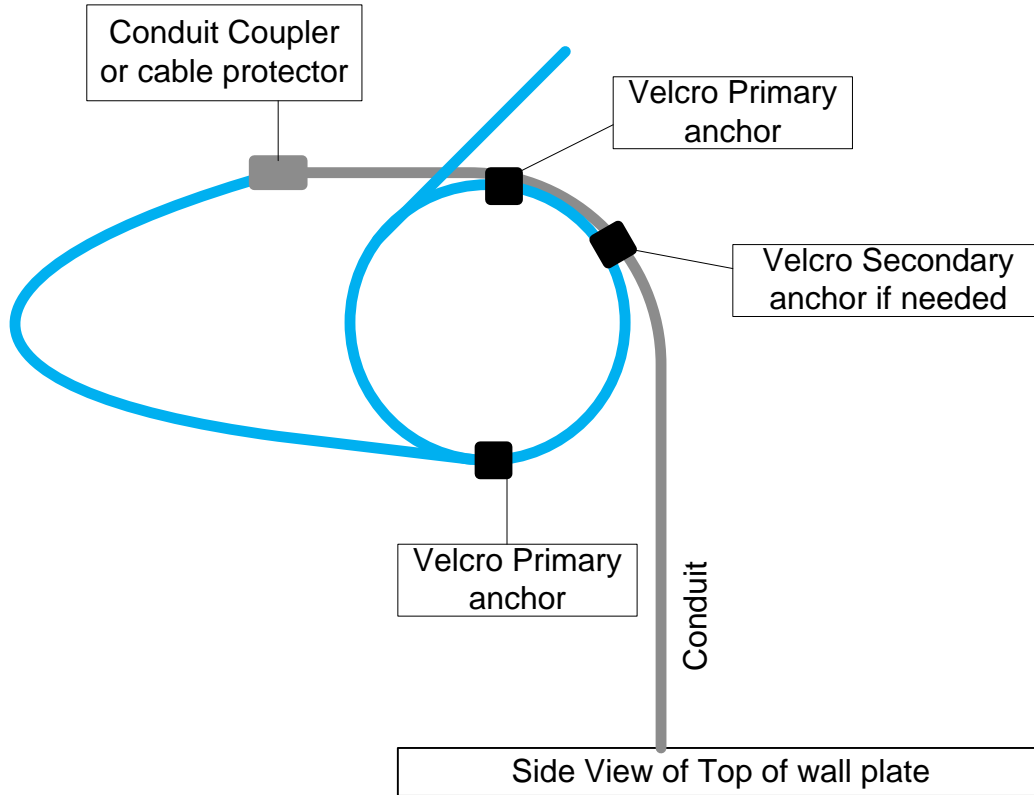
- a) Manufactured products, materials, equipment, and components shall be provided, conditioned, applied, installed, connected, and tested in accordance with the manufacturer's specifications and printed instructions.
- b) The installation of all system components shall be carried out under the direction of qualified personnel. Appearance shall be considered as important as mechanical and electrical efficiency. Workmanship shall meet or exceed industry standards. All work shall be performed in a high quality manner and the overall appearance shall be clean, neat and orderly.
- c) The vendor/contractor and subcontractor will have the following personnel on site during install:
 - i) Supervisor for every 4 Panduit Certified Copper and Fiber Technicians (PCT)
 - (1) If the supervisor is a PCT, the supervisor can also have up to a maximum of 4 non-certified PCT's.
 - ii) A PCT can have up to a maximum of 4 non-certified PCT's.
 - iii) If subcontracted, each supervisor is responsible to the primary site vendor/contractor.
 - (1) Primary supervisor has no limit to subcontractor supervisor to manage.
 - (2) Primary supervisor will then have an assistant supervisor who will supervise as follows:
 - (a) If the assistant supervisor is a PCT, the supervisor can also have up to a maximum of 4 non-certified PCT's.
- d) Inspection
 - i) The Contractor must allow Owner, its Consultants, Construction Manager, CNIT, their agents and the manufacturer's agent to observe and evaluate workmanship and can have problems corrected or work halted until corrected.
 - ii) On-going inspections shall be performed during construction by the project manager Owner, its Consultants, Construction Manager, CNIT their agents. All work shall be performed in a high quality manner and the overall appearance shall be clean, neat and orderly.

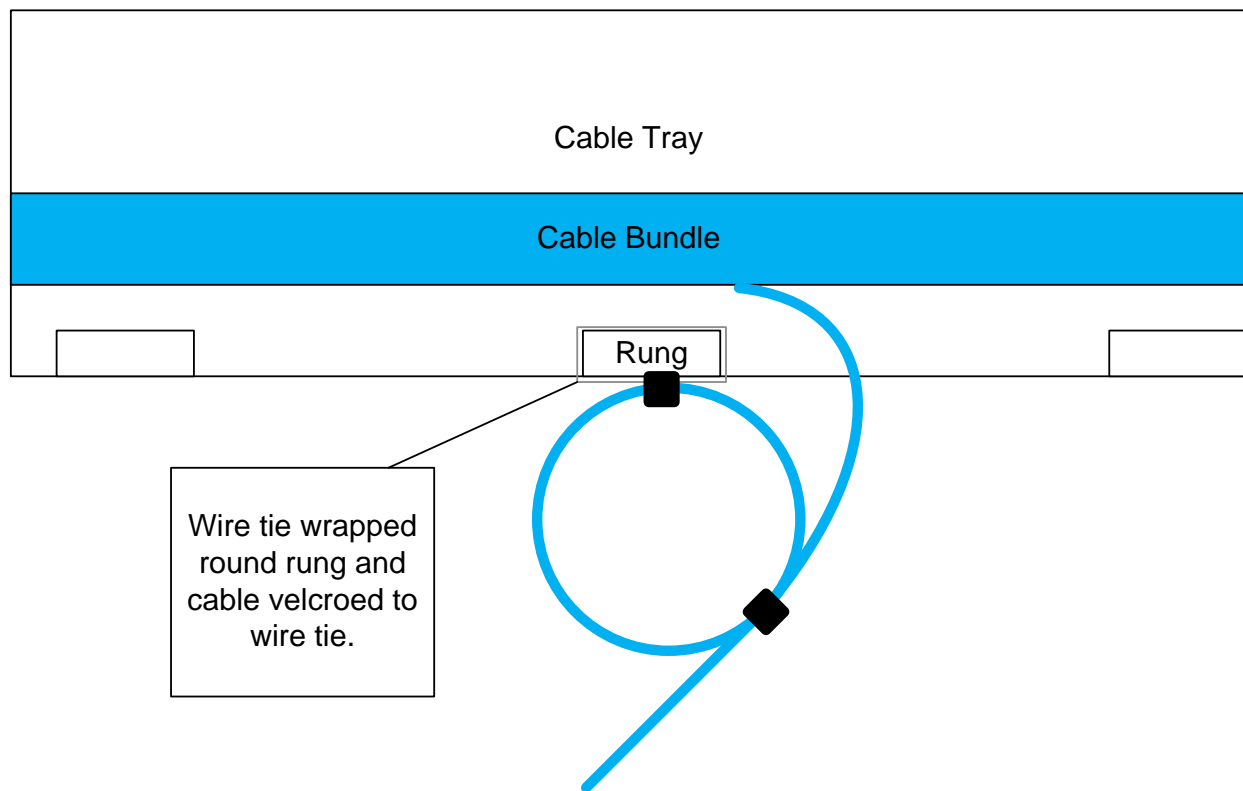
4) INSTALLATION

- a) Comply with:
 - i) Reference Part 1 –General,
 - ii) Section 2) STANDARDS AND CODE COMPLIANCE REFERENCES
 - iii) Section 3) ADDITIONAL SUPPPORT
 - iv) The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.
- b) Wiring Method: Install cables in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces. Cable trays shall be as standardized by CNIT using ladder type cable trays.
- c) The path for the cable tray shall be clear of obstructions, such as HVAC ducts, large pipes and structural beams within the building. Use of enclosed tray and conduits is not allowed. Elevations of trays will be minimized as to not have a stair step effect. Where fire or smoke barriers are penetrated by the ladder tray, they shall be fire stopped to maintain the rating of the barrier. Alternatively, EZ- Path Systems may be used through the penetrations. The number of sleeves required depends on the number of cables and size of tray. Use 50% fill ratio to determine the number of sleeves. Two additional spare sleeves should be installed to accommodate future cable placement.
- d) Place cable trays above drop ceilings in corridors. Do not place them above offices, patient/treatment rooms or inaccessible spaces. There must be at least 4 inches of vertical space between the suspended ceiling tile and the bottom of the cable tray; 12 inches of vertical clearance from the top of the cable tray

- to the true ceiling; and 2' total side clearance (i.e. if the cable tray is wall mounted and there is no clearance on one side, then minimum clearance on the other side should be 2'.
- e) It is desirable that the cable tray originates from the TR. If the TR is surrounded with smoke or fire rated walls then EZ-Path systems will be installed
 - f) Access ceiling panels must be installed at 5-foot interval if cable tray is passing through a hard or solid ceiling. The panels should be within 1-1/2 feet from the cable tray. They shall not be mounted directly underneath the cable tray. Trays shall not change level or change direction if placed above a hard or solid ceiling.
 - g) All metallic cable trays must be grounded but should not be used as grounding conductor for equipment.
 - h) Wiring Method: Install cables in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
 - i) Wiring within Wiring Closets and Enclosures:
 - i) Install 3/4" void free A-C grade (or better) plywood with 2 coats of fire retardant paint on walls of equipment rooms and wiring closet from floor to ceiling.
 - ii) Mount patch panels, terminal strips, and other connecting hardware on floor-mounted racks. Reference drawings for placement.
 - j) Horizontal Fiber Optic to the parking lot lampposts:
 - i) Pull will be from the rack mount fiber box designated for security systems to the lamppost.
 - ii) Terminate each fiber at rack end and mount into fiber box.
 - iii) At lamp post leave the equivalent of twice the pole height inside the base opening. Do not terminate cable. Seal cable with weather proof tape. Cable will be terminated and tested by owner.
 - k) Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated cross-connects, patch panels, workstations or locations as indicated in the Drawings.
 - l) Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - m) Lacing/tie wraps will be accomplished by Velcro strapping. The strap must be able to be rotatable without slipping. **NO WIRE TIES WILL BE USED ON ANY CABLE OR CABLE BUNDLES.**
 - n) Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - o) Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Use lacing bars and distribution spools.
 - p) Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - q) Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
 - r) In the communications equipment room, install a 3-5 foot long service loop on each end of cable neatly stored inside the Vertical management.
 - s) Pulling Cable: Comply with BICSI ITSIM, Chapter. 4, "Pulling Cable." Monitor cable pull tensions.
 - t) Only anchor the cable bundles at the network room cable trays starting at the top when it comes down into the room down to the racks.
 - u) When cable drops come off the tray it will go between the rungs. No cable will come over the top and bent over the edge. If the cable is to be pulled through the red iron the cable will go through the bottom of the cable tray between the rungs then up to the red iron. The only time cable will go over the edge of the cable tray is if another tray is connected at an angle to that tray and the cable is changing directions.

- v) When the cable is installed there will be a minimum of 3ft of cable at drop location end for repair margin. If the drop is within 10ft of the cable tray, the repair margin can be anchored under the cable tray to one of the rungs. If more than 10ft then the repair margin will be anchored to the drops conduit above the wall. If there is not enough conduit then the margin can be anchored to the nearest red iron. Do not anchor to an electrical conduit. See drawings. When anchoring to the cable tray, wrap a plastic wire tie around the rung with the ratchet head below the rung. Then secure the repair margin to the wire tie with Velcro. See drawings:





w) Separation from EMI Sources:

- i) NO CONDUITS, POWER CABLE/CONDUCTORS OR EQUIPMENT SHALL BE LAID IN, THROUGH OR ACROSS THE TOP (WITHIN 12 INCHES) THE CABLE TRAY. IF CONDUITS, POWER CABLE/CONDUCTORS OR EQUIPMENT ARE UNDER THE TRAY, STEPS ii-vi BELOW WILL BE FOLLOWED.
- ii) Comply with BICSI TDMM and TIA/EIA-5 69-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
- iii) Separation between open communications cables, cables in nonmetallic raceways or fiber optic cable in armored cable and unshielded power conductors and electrical equipment shall be as follows:
 - (1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 6 inches.
 - (2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - (3) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
- iv) Separation between communications cables in grounded metallic raceways/conduit and unshielded power lines or electrical equipment shall be as follows:
 - (1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 6 inches.
 - (2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - (3) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
- v) Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - (1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 1 inch.
 - (2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - (3) Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
- vi) Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
- vii) Separation between Communications Cables and Fluorescent Fixtures:

- (1) A minimum of 6 inches if cable is running perpendicular (90deg) to the fixture.
- (2) A minimum of 2ft if running parallel to the fixture (including cable tray). If less than, reroute cable from another direction or have fixture moved.

5) GROUNDING

- a) Grounding will be in accordance with the Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications J-STD-607 -A. Within the telecommunications room, Cable Tray should be bonded together, electrically continuous, and bonded to the TGB. Cable Tray and turns shall be bonded across each splice with a bonding kit (40164-001 or 025). Cable Tray shall be bonded to the Telecommunications Grounding Busbar (TGB) using an approved ground lug on the Cable Tray and a minimum #6 grounding wire. Remove paint from the Cable Tray where bonding/ground lugs contact the Cable Tray so that the lug will contact bare metal. Use antioxidant joint compound in between the bare metal on the Cable Tray and ground lug. Use antioxidant joint compound in between the bus bar and the ground lug. Verify continuity through the bonds at splices and intersections between individual Cable Tray sections and turns and through the bond to the TGB.
- b) Reference NFPA 70 (latest Edition) Article 250 for other grounding requirements.
- c) Grounding of patch panels, fiber boxes or equipment brackets to the racks can be accomplished by one Panduit bonding screw (reference Charts 1 and 2) on each side securing the bracket to the rack. Use of antioxidant paste is required.

6) IDENTIFICATION

- a) Comply with TIAEIA-606-A.
 - i) Administration class for this Project shall be Class 4.
 - ii) Color-code cross-connect and telecom fields. Apply colors to voice and data service backboards, connections, covers, and labels.
- b) Use logical and systematic designations for facility's architectural arrangement and nomenclature, and a consistent color-coded identification of individual conductors.
 - i) Jacks will be the color of the Closet/ Zone they are in. See Drawings.
 - (1) Closet "A" – Blue
 - (2) Closet "B" – Orange
 - (3) Closet "C" – Green
 - (4) Closet "D" – Red
 - (5) Closet "E" – Off White
 - (6) Security Cameras – Yellow
 - (7) Multimedia – Violet
- c) Reference Part 2 – Products, Section 12.
- d) Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
- e) Label each terminal strip and screw terminal in each cabinet, rack, or panel if applicable.
- f) Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- g) Cabling Administration Drawings: Show building floor plans with cable administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIAEIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

7) FIELD QUALITY CONTROL

- a) Perform the following field tests and inspections and prepare test reports following the Standards and Code Compliance References for the following:
 - i) Category 6a UTP Cabling Tests:
 - (1) Test instruments shall meet or exceed applicable requirements as defined in the TIA Cat 6A Standard. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration. Owner prefers that tester be the Fluke DTX-1800 as owner can except all test reports in the LinkWare file format. The tester will have current calibration sticker attached and a copy of sticker or calibration certificate attached to final documentation.
 - (2) Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - (3) Wire-map test that reports open circuits, short circuits, crossed pairs, reversed pairs, split pairs, and improper terminations.
 - (4) Channel and permanent link tests for cable length, insertion loss, near-end crosstalk loss, power sum near-end crosstalk loss, equal-level far-end crosstalk loss, power sum equal level far-end crosstalk, return loss, propagation delay, and delay skew. Performance shall comply with guaranteed channel performance up to 500MHz.
 - (5) Alien Crosstalk will not be required.
 - ii) Category 6a UTP Cabling Tests:
 - (1) Test instruments shall meet or exceed applicable requirements as defined in the TIA Cat 6A Standard. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration. Owner prefers that tester be the Fluke DTX-1800 as owner can except all test reports in the LinkWare file format. The tester will have current calibration sticker attached and a copy of sticker or calibration certificate attached to final documentation.
 - (2) Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - (3) Wire-map test that reports open circuits, short circuits, crossed pairs, reversed pairs, split pairs, and improper terminations.
 - (4) Channel and permanent link tests for cable length, insertion loss, near-end crosstalk loss, power sum near-end crosstalk loss, equal-level far-end crosstalk loss, power sum equal level far-end crosstalk, return loss, propagation delay, and delay skew. Performance shall comply with guaranteed channel performance up to 500 MHz.
 - iii) Back Bone Fiber Cable
 - (1) Test instruments shall meet or exceed applicable requirements. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration. Owner prefers that tester be the Fluke DTX-1800 as owner can except all test reports in the LinkWare file format. The tester will have current calibration sticker attached and copy of sticker or calibration certificate attached to final documentation.
 - (2) Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components. Inspect cabling terminations in communications equipment rooms for compliance with color-coding.
 - (3) Optical Fiber Cable Tests:
 - (a) Field-test instruments shall have the latest software and firmware installed.
 - (b) Link and channel test results from the OLTS and OTDR shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.

- (c) Fiber end-faces shall be inspected at 200X or 400X magnification. 200X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers. Scratched, pitted or dirty connectors shall be diagnosed and corrected.
 - (i) If possible it is preferable that the end-face images be recorded in the memory of the test instrument for subsequent uploading to a PC and reporting.
- (d) Testing shall be performed on each cabling segment (connector to connector).
- (e) Testing shall be performed on each cabling channel (equipment to equipment) that is planned for use per the owner's instructions.
- (f) Testing of the cabling shall be performed using high-quality test cords of the same fiber type as the cabling under test. The test cords for OLTS testing shall be between 1 m and 5 m in length. The test cords for OTDR testing shall be approximately 100 m for the launch cable and at least 25 m for the receive cable.
- (g) Optical loss testing
 - (i) Backbone link
 1. Multimode backbone links shall be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper or the equivalent method.
 2. Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.
 3. Use the One Reference Jumper Method specified by ANSI/TIA/EIA-526- 1 4A, Method B and ANSI/TIA/EIA-526-7, Method A. 1 or the equivalent method. The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.
- (h) OTDR Testing
 - (i) Backbone, horizontal and centralized links shall be tested at the appropriate operating wavelengths for anomalies and to ensure uniformity of cable attenuation and connector insertion loss.
 - (ii) Backbone multimode: 850 nm and 1300 nm
 - (iii) Each fiber link and channel shall be tested in one direction.
 - (iv) A launch cable shall be installed between the OTDR and the first link connection.
 - (v) A receive cable shall be installed after the last link connection.
- (i) Magnified Endface Inspection
 - (i) Fibers shall be inspected at 250X or 400X magnification. The 250X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers.
- (j) Length Measurement
 - (i) The length of each fiber shall be recorded.
 - (ii) It is preferable that the optical length be measured using an OLTS or OTDR.
- (k) A Fail or Fail* result must be diagnosed corrected and retested.
 - (i) If not able to be corrected then remove, replace cabling and retest where test results indicate that they do not comply with specified requirements and the cost shall be borne by the installation contractor
 - (ii) If the results cannot be corrected then the installation contractor may bring in the manufacture's agent, technician or engineer and the cost shall be borne by the installation contractor. If determined that the problem cannot be corrected then under supervision of

the end-user, the representative shall repeat 100% removal, reinstallation and testing and the cost shall be borne by the installation contractor.

- iv) Horizontal Fiber Optic to the parking lot lampposts.
 - (1) Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components. Inspect cabling terminations in communications equipment rooms for compliance with color-coding.
 - (2) Visual light test connection with bright light or visible light.
 - (a) If not visible, terminate cable and test as an iii) Back Bone Fiber Cable to trouble shoot. If fail must be diagnosed corrected and retested.
 - (i) If not able to be corrected then remove, replace cabling and retest where test results indicate that they do not comply with specified requirements and the cost shall be borne by the installation contractor
 - (ii) If the results cannot be corrected then the installation contractor may bring in the manufacture's agent, technician or engineer and the cost shall be borne by the installation contractor. If determined that the problem cannot be corrected then under supervision of the end-user, the representative shall repeat 100% removal, reinstallation and testing and the cost shall be borne by the installation contractor.
 - (3) Cable will be final tested by Owner at a later date.
- v) Cable Samples, the 6a & 6e cable will be tested and added to documentation and warranty.
 - (1) Use the samples to check verification of manufacturer recommendations for setting the testers.
- b) Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. Appropriate training programs include but are not limited to installation certification programs provided by BICSI or the ACP (Association of Cabling Professionals). A copy of the certification will be attached to final documentation.
- c) One hundred percent of the installed cabling links must pass the requirements of the standards mentioned above except as noted. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation.
- d) The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The contractor shall provide proof that the interface has been calibrated within the period recommended by the Manufacturer. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
- e) The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests (detailed in Section I.2.2 of ANSI/TIA/EIA-568-B.2). Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.
 - i) A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks. To which extent '*' results shall determine approval or disapproval of the element under test shall be defined in the relevant detail specification, or agreed on as a part of a contractual specification.
 - ii) A Fail or Fail* result must be diagnosed corrected and retested.

- (1) If not able to be corrected then remove, replace cabling and retest where test results indicate that they do not comply with specified requirements and the cost shall be borne by the installation contractor
- (2) If the results cannot be corrected then the installation contractor may bring in the manufacture's agent, technician or engineer and the cost shall be borne by the installation contractor. If determined that the problem cannot be corrected then under supervision of the end-user, the representative shall repeat 100% removal, reinstallation and testing and the cost shall be borne by the installation contractor.

f) Additional Requirements:

- i) A representative of the end-user shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase five business days before testing commences.
- ii) At an agreed time a representative of the end-user will select a random sample of 10% of the installed links. The representative (or his authorized delegate) shall test these randomly selected links and the results are to be stored in a separate documentation that will be attached with final documentation (but does not have to be submitted for warranty). The results obtained shall be compared to the data provided by the installation contractor. If more than 3% of the sample results differ in terms of the pass/fail determination:
 - (1) The installation contractor under supervision of the end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.
 - (2) If the results cannot be corrected then the installation contractor may bring in the manufacture's agent, technician or engineer and the cost shall be borne by the installation contractor. If determined that the problem cannot be corrected then under supervision of the end-user, the representative shall repeat 100% removal, reinstallation and testing and the cost shall be borne by the installation contractor.

8) TEST RESULTS DOCUMENTATION

- a) The test results/measurements shall be transferred into a WindowsTM-based database utility that allows for the maintenance, inspection and archiving of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered, i.e., "as saved in the tester" at the end of each test and that these results cannot be modified at a later time. The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used. Owner prefers that the test results/measurements be in the LinkWare file format.
- b) The database for the completed job shall be stored and delivered on CD-ROM or DVD including the software tools required to view, inspect, and print any selection of test reports.
- c) A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information
 - i) The identification of the link in accordance with the naming convention defined in the overall system documentation
 - ii) The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number
 - iii) The date and time the test results were saved in the memory of the tester.
- d) General Information to be provided in the electronic data base with the test results information for each link:
 - i) The identification of the customer site as specified by the end-user
 - ii) The name of the personnel performing the test
 - iii) The identification of the link in accordance with the naming convention defined in the overall system documentation

- iv) The overall Pass/Fail evaluation of the link-under-test
 - v) The name of the standard selected to execute the stored test results
 - vi) The date and time the test results were saved in the memory of the tester
 - vii) The brand name, model and serial number of the tester
 - viii) The identification of the tester interface
 - ix) The revision of the tester software and the revision of the test standards database in the tester
 - x) The test results information must contain information on each of the required test parameters that are listed.
- e) For all copper (6a & 6e)
- i) The cable type and the value of NVP used for length calculations
 - ii) In-link (In-Channel) detailed test results. The detailed test results data to be provided in the electronic database for must contain the following information:
 - iii) For each of the frequency-dependent test parameters, the value measured at every frequency during the test is stored. The PC-resident database program must be able to process the stored results to display and print a color graph of the measured parameters. The PC-resident software must also provide a summary numeric format in which some critical information is provided numerically as defined by the summary results (minimum numeric test results documentation) as outlined above for each of the test parameters.
 - (1) Length: Identify the wire-pair with the shortest electrical length, the value of the length rounded to the nearest 0.1 m (1) and the test limit value.
 - (2) Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value.
 - (3) Delay Skew: Identify the pair with the largest value for delay skew, the value calculated in nanoseconds (ns) and the test limit value.
 - (4) Insertion Loss (Attenuation): Minimum test results documentation as explained in Section B for the worst pair.
 - (5) Return Loss: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link.
 - (6) NEXT, ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link.
 - (7) PS NEXT and PS ACR-F: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link.
- iv) Between-Link (Between-Channel) Test Results Data
- v) A test report shall be provided for each disturbed link included in the Alien Crosstalk sample test. This test report must contain:
- (1) PS ANEXT results at each frequency (See Table 1) for each wire pair in a victim link as well as the PS ANEXT results for the average of these four wire pairs. The worst case margin and the worst values shall be provided for each wire pair and the average of the four wire pairs. PS ANEXT shall be measured and tested from the end of the link or channel where all cables are terminated at a distribution panel. In case the cabling runs from panel to panel (data center) where the worst case PS ANEXT margin is less than 2 dB, the PS ANEXT test results for each disturbed link shall be collected and saved from both ends (both panels) of the disturbed link.

(2) PS AACR-F results at each frequency tested for each wire pair in a disturbed link as well as the PS AACR-F results for the average of the four wire pairs. The worst case margin and the worst values shall be provided for each wire pair and the average of the four wire pairs. PS AACR-F only needs to be measured and tested from one end of the link or channel.

f) Fiber tests:

- i) The fiber identification number.
- ii) The length for each optical fiber.
 - (1) Optionally the index of refraction used for length calculation when using a length capable OLTS.
- iii) Test results to include OLTS attenuation link and channel measurements at the appropriate wavelength(s) and the margin (difference between the measured attenuation and the test limit value).
- iv) Test results to include OTDR link and channel traces and event tables at the appropriate wavelength(s).
- v) The length for each optical fiber as calculated by the OTDR.
- vi) The overall Pass/Fail evaluation of the link-under-test for OLTS and OTDR measurements.
- vii) A picture or image of each fiber end-face if done.
- viii) A pass/fail status of the end-face based upon visual inspection.

9) CONSTRUCTION REVIEW

- c) The following shall be examined and shall comply satisfactorily in all instances.
 - i) Design documentation complete.
 - ii) All cables properly labeled, from end-to-end.
 - iii) All terminated cables been properly tested in accordance with the specifications for the specific category as well as tested for opens, shorts, polarity reversals, transposition and presence of AC and/or DC voltage.
 - iv) The cable type suitable for its pathway.
 - v) The cables bundled in parallel.
 - vi) The pathway manufacturer's guidelines been followed.
 - vii) All cable penetrations installed properly and fire stopped according to code.
 - viii) The Contractors avoided excessive cable bending.
 - ix) Potential EMI and RFI sources been considered.
 - x) Table Fill is correct.
 - xi) All hanging supports are within 1.5 meters (5 feet).
 - xii) Hanging cable exhibit some sag.
 - xiii) IDF room terminations are compatible with applications equipment.
 - xiv) Patch Panel instructions been followed:
 - (1) Jacket removal point
 - (2) Termination positions
 - (3) All pair terminations tight with minimal pair distortions
 - (4) Twists maintained up to Index Strip
 - xv) Modular Panel instructions been followed:
 - (1) Cable dressing first
 - (2) Jackets remain up to the Connecting Block
 - (3) All pair terminations tight and undistorted
 - (4) Twists maintained up to the Connecting Block

- xvi) Connectors are properly turned right side up in the Jack Panels without cables wrapped or twisted around the Mounting Collars.
 - xvii) The correct outlet connectors have been used
 - xviii) Outlets have been wired correctly (T568B)
 - xix) The cable jacket maintained up to the Jack.
 - xx) Identification markings uniform, permanent and readable.
- d) The Owner, its Consultants, Construction Manager, CNIT, and their agents will review and observe installation work to ensure compliance by the contractor with requirements of the Contract Documents.
 - e) The contractor shall inspect and test completed communications installations to demonstrate specified performance levels including the following:
 - i) Furnish all instruments and personnel required for the inspections and tests.
 - ii) Perform tests in the presence of the Engineer and Owner when required.
 - iii) Demonstrate that the system components operate in accordance with the Contract Documents.
 - f) Review, observation, assistance, and actions by the Owner, its Consultants, Construction Manager, CNIT, and their agents shall not be construed as undertaking supervisory control of the work or of methods and means employed by the contractor. The Owner, its Consultants, Construction Manager, CNIT, and their agents review and observation activities shall not relieve the contractor from the responsibilities of these Contract Documents.
 - g) The fact that Owner, its Consultants, Construction Manager, CNIT, and their agents does not make early discovery of faulty or omitted work shall not bar the Owner from subsequently rejecting this work and withholding payment until the contractor makes the necessary corrections.
 - h) Regardless of when discovery and rejection are made, and regardless of when the contractor is ordered to correct such work, the contractor shall have no claim against the Owner, its Consultants, Construction Manager, CNIT, and their agents for an increase in the Subcontract price, or for any payment on account of increased cost, damage, or loss.

10) DEFINITION OF ACCEPTANCE

- a) System acceptance shall be defined as that point in time when the following requirements have been fulfilled:
 - i) The complete system has successfully completed all testing requirements.
 - ii) All punch list items have been corrected and accepted.
 - iii) All submittals and documentation have been submitted, reviewed, and approved. Including:
 - (1) A list of the documentation showing what was submitted to Panduit for the CERTIFICATION PLUSSM SYSTEM WARRANTY PROGRAM according to the Panduit Warranty Guide.
 - (a) A copy of the E-form, or Fax is acceptable. Or
 - (b) If mailed, a copy of the package Tracking number is acceptable.
 - (2) Verification of delivery will be done by Owner, its Consultants, CNIT, and their agents with Panduit. If:
 - (a) Verified as delivered then acceptance can continue.
 - (b) Verified as NOT delivered, then the acceptance is not complete.

