LOCATION MAP

KALAMAZOO, MICHIGAN

KWRP BIOFILTRATION

CONTRACT 76

2022

ADMINISTRATION

JAMES RITSEMA - CITY MANAGER

JAMES J. BAKER, PE - PUBLIC SERVICES DIRECTOR & CITY ENGINEER

JIM CORNELL - WASTEWATER DIVISION MANAGER

RON JANSSEN - TREATMENT OPERATIONS SUPERINTENDENT

CHRIS NELSON - COLLECTIONS AND PLANT MAINTENANCE MANAGER

RYAN STOUGHTON, PE - ASSISTANT CITY ENGINEER - WASTEWATER

MEMBERS OF COMMISSION

DAVID ANDERSON - MAYOR

DON COONEY - VICE MAYOR

STEPHANIE HOFFMAN

ESTEVEN JUAREZ

QIANNA DECKER

JEANNE HESS

CHRIS PRAEDEL

THE CITY OF Kalamazoo

Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

STATUS ISSUED FOR BID
DATE FEBRUARY 2022

KAL-772500ICOV-COVER SHEET
1/28/2022 2:29 PM - SWILLIS
1/28/2022 2:29 PM

YARD PIPING LEGEND

UTILITY LINES:

Line	Description
AA	AERATION AIR
AL	ALUM
C	CABLE (UNDERGROUND)*
CA	COMPRESSED AIR
CL	CHLORINE SOLUTION
CO	COMBINED SEWER
CW	COLD CITY WATER
CLG	CHLORINE GAS
DG	DIGESTER GAS
DS	DIGESTED SLUDGE
DW	DILUTION WATER
EW	EFFLUENT WATER
E	Electrical (Underground)*
FC	FERRIC/FERROUS CHLORIDE
FD	FOUNDATION DRAIN
FE	FINAL EFFLUENT
FO	FIBER OPTIC
FU	FUEL OIL
G	GAS LINE (OFF SITE)
GR	GREASE
IC	IRON CHLORIDE
HW	HOT CITY WATER
ML	MIXED LIQUOR
NG	NATURAL GAS
P	POLYMER
PE	PRIMARY EFFLUENT
PS	PRIMARY SLUDGE
PW	PLANT WATER
RAS	RETURN ACTIVATED SLUDGE
RD	ROOF DRAIN
RS	RAW SEWAGE
SA	SANITARY SEWER
SB	SECONDARY BYPASS
SC	SCUM
SE	SECONDARY EFFLUENT
S	SIGNAL (UNDERGROUND)*
SPA	SPARE
ST	STORM SEWER
SM	STEAM
SP	DIGESTER SUPERNATANT
TD	TANK DRAIN
T	TELEPHONE (UNDERGROUND)*
TE	THICKENER EFFLUENT
TS	THICKENED SLUDGE
WAS	WASTE ACTIVATED SLUDGE
ST54	LARGE DIAMETER LINES (ANY TYPE)
/ / /	UTILITY LINE TO BE REMOVED
X X X	UTILITY LINE TO BE ABANDONED
SA8	NEW UTILITY LINE
54" SANITARY SEWER	LARGE DIAMETER NEW UTILITY LINE

ALPHA DESIGNATION REFERS TO UTILITY TYPE, NUMERICAL DESIGNATION REFERS TO PIPE NOMINAL DIAMETER. LINES WITH NO NUMERICAL DESIGNATION ARE OF UNKNOWN SIZE.

* AERIAL LINES, IF SHOWN, ARE DESIGNATED WITH LOWER CASE LETTERS

SYMBOLS:

Symbol	Description
SA	MANHOLE (ALPHA DESIGNATION REFERS TO UTILITY TYPE, "U" IS "UNKNOWN" TYPE)
PP	POWER POLE OR TELEPHONE POLE
LP	LIGHT POLE
FH, YH	FIRE HYDRANT OR YARD HYDRANT
	VALVE
CO	CLEAN OUT
IP	IRON PIN (OR LABELED POST, MARKER ETC.)
	CATCH BASINS
	SIGN
	BOLLARD
BORING B-2	SOIL BORING

STANDARD ABBREVIATIONS

ALUM.	ALUMINUM	MAX.	MAXIMUM
AVE.	AVENUE	MH	MANHOLE
BM	BENCH MARK	MJ	MECHANICAL JOINT
BF	BLIND FLANGE	MIN.	MINIMUM
BLDG.	BUILDING	N	NORTH
C/C	CENTER TO CENTER	NTS	NOT TO SCALE
CK'D PL.	CHECKERED PLATE	OC	ON CENTER
CONC.	CONCRETE	OD	OUTSIDE DIAMETER
DIA.	DIAMETER	PE	PLAIN END
DWG.	DRAWING	R	RADIUS
EW	EACH WAY	RR	RAILROAD
EF	EACH FACE	S	SOUTH
ECC.	ECCENTRIC	SCH.	SCHEDULE
EL.	ELEVATION	SH.	SHEET
E	EAST	SS	STAINLESS STEEL
EX.	EXISTING	ST.	STREET
F	FLANGE	STA.	STATION
' OR FT.	FEET OR FOOT	T&B	TOP AND BOTTOM
GAL.	GALLON	TYP.	TYPICAL
GR.	GRADE	VERT.	VERTICAL
HOR.	HORIZONTAL	W	WEST
" OR IN.	INCH	W/	WITH
ID	INSIDE DIAMETER	T/B	TOP OF
INV. EL.	INVERT ELEVATION	TOC	TOP OF CONCRETE
		B/	BOTTOM OF

PIPING ABBREVIATIONS

MATERIAL

ABS	ABS ACRYLONITRILE-BUTADIENE-STYRENE
ABSC	ABS COMPOSITE SEWER PIPE (TRUSS PIPE)
BSP	BLACK STEEL PIPE
CIP	CAST IRON PIPE
CISP	CAST IRON SOIL PIPE
CMP	CORRUGATED METAL PIPE
CPP	CONCRETE PRESSURE PIPE
CPT	CORRUGATED POLYETHYLENE TUBING
CPVC	CHLORINATED POLYVINYL CHLORIDE PIPE
Cu	COPPER TUBING OR PIPING
DIP	DUCTILE IRON PIPE
FRP	FIBERGLASS REINFORCED PIPE
GLDIP	GLASS-LINED DUCTILE IRON PIPE
GSP	GALVANIZED STEEL PIPE
HDPE	HIGH DENSITY POLYETHYLENE
PCP	PLAIN CONCRETE PIPE
PE	POLYETHYLENE
PP	POLYPROPYLENE
PPVC	PERFORATED POLYVINYL CHLORIDE PIPE
PVC	POLYVINYL CHLORIDE PIPE
PVCP	PERFORATED VITRIFIED CLAY PIPE
PVDF	POLYVINYLIDENE FLUORIDE (KYNAR)
RCP	REINFORCED CONCRETE PIPE
SP	STEEL PIPE
SSP	STAINLESS STEEL PIPE
SWS	SPIRAL WELDED STEEL
UPVC	UNPLASTICIZED POLYVINYL CHLORIDE PIPE
VCP	VITRIFIED CLAY PIPE

SERVICE

PS	PRIMARY SLUDGE
RAS	RETURN ACTIVATED SLUDGE
WAS	WASTE ACTIVATED SLUDGE
DS	DIGESTED SLUDGE
SC	SCUM
SP	SUPERNATANT
DG	DIGESTER GAS
NG	NATURAL GAS
CW	CITY WATER
HW	HOT CITY WATER
EW	EFFLUENT WATER
PW	PROTECTED WATER
CA	COMPRESSED AIR
TD	TANK DRAIN
SS	SANITARY SEWER
ST	STORM SEWER

VALVE SYMBOL LEGEND

- GATE, KNIFE GATE, BUTTERFLY OR GLOBE VALVES
- PLUG VALVE
- BALL VALVE
- PINCH VALVE
- CHECK VALVE

STRUCTURAL LEGEND

- EXISTING STRUCTURE
- EXISTING STRUCTURE TO BE REMOVED
- NEW CONCRETE STRUCTURE
- NEW BLOCK WALL
- NEW BRICK WALL

PIPING AND EQUIPMENT LEGEND

- EXISTING PIPING
- EXISTING PIPING OR EQUIPMENT TO BE REMOVED (IF YARD PIPING, ABANDON AND REMOVE AS REQUIRED)
- EXISTING PIPING OR EQUIPMENT TO BE RELOCATED
- NEW PIPING

8/12 = NUMBER OF SECTION / SHEET NUMBER ON WHICH SECTION IS SHOWN

SECTION 3/4 = NUMBER OF SECTION / SHEET NUMBER ON WHICH SECTION IS CUT

DELINEATION OF SECTIONS

(SECTIONS LETTERED ARE SHOWN ON SAME SHEET)

NOTE:
SECTION NUMBERS REFER TO DRAWINGS WITH THE SAME 2 LETTER PREFIX.

(A) = ELEVATION VIEW

5/7 = NUMBER OF DETAIL IN SECTION / SHEET NUMBER ON WHICH DETAIL IS SHOWN

6/7 = NUMBER OF DETAIL IN PLAN / SHEET NUMBER ON WHICH DETAIL IS SHOWN

DETAIL 5/9 = NUMBER OF DETAIL / SHEET NUMBER ON WHICH DETAIL IS TAKEN

DELINEATION OF BLOW - UP DETAILS

(DETAILS LETTERED ARE SHOWN ON SAME SHEET)

INDEX

NOTE:
EQUIPMENT PROCURED BY THE CITY FOR INSTALLATION BY THE CONTRACTOR IN THIS PROJECT INCLUDES ALL LABOR, MATERIAL, AND EQUIPMENT NECESSARY TO RECEIVE, UNLOAD, PROTECT AND STORE, INSTALL/ERECT, CONNECT AND PROVIDE POWER TO/FOR:

1. PRE-ENGINEERED METAL BUILDING PACKAGE - INCLUDES STRUCTURAL MEMBERS/FRAMING, INSULATED METAL WALL PANELS, INSULATED METAL ROOF PANELS, AND APPURTENANCES.
2. BIOFILTER CONTROL PANEL (X1)
3. MEDIA SUPPORT GRATING FOR BIOFILTERS (X3)
4. UPPER SURFACE SPRAY IRRIGATION SYSTEM FOR BIOFILTERS (X3)
5. LOWER IN-BED IRRIGATION SYSTEM FOR BIOFILTERS (X3)
6. BIOFILTER MEDIA (X3 LOTS OF TWO UNIQUE MEDIA TYPES)
7. BIOFILTER INTERNAL BAFFLES (X3 LOTS)
8. 36-INCH X 36-INCH SIDE ACCESS HATCHES FOR BIOFILTER(X3)
9. HUMIDIFICATION CHAMBER SPRAYERS AND PENETRATIONS IN BIOFILTERS (X3)
10. HUMIDIFICATION CHAMBER AIR DEFLECTORS (X3)
11. BIOFILTER BED ALUMINUM COVERS (X3)
12. CARBON SCRUBBERS WITH INTEGRAL MIST/GREASE ELIMINATORS (X3)
13. WATER IRRIGATION CONTROL PANELS (X3)
14. NUTRIENT METERING PUMPS (X3)
15. NUTRIENT TANK (X1)
16. NUTRIENTS (LOT)
17. HUMIDIFICATION RECIRCULATING SUMP PUMPS (X2)
18. PRESSURE/FLOW INSTRUMENTATION (LOT)
19. INTAKE AIR MIST/GREASE ELIMINATOR (X1)
20. CENTRIFUGAL FAN/BLOWERS W/ 50 HP MOTORS (X3)
21. DUCTWORK TRANSITION PIECES INTO/OUT OF PROVIDED FANS/BLOWERS
22. CENTRIFUGAL FAN/BLOWER VFD PANELS, INCLUDES VFDS (X3)

Note:
1. **ALL NOTES ON THE DRAWINGS BEAR THE SAME IMPORTANCE. SOME NOTES AND DIMENSIONS ARE BOLD TO AID IN READING THE DRAWING IN AREAS OF HIGH GRAPHIC DENSITY.**
2. **ACCURACY OF EXISTING ELEVATIONS AND DIMENSIONS IS NOT GUARANTEED. FIELD VERIFY BEFORE CONSTRUCTION.**

THE CITY OF Kalamazoo

LEGEND AND INDEX

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO | DATE | REVISIONS AFTER ISSUED FOR BID | BY

Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

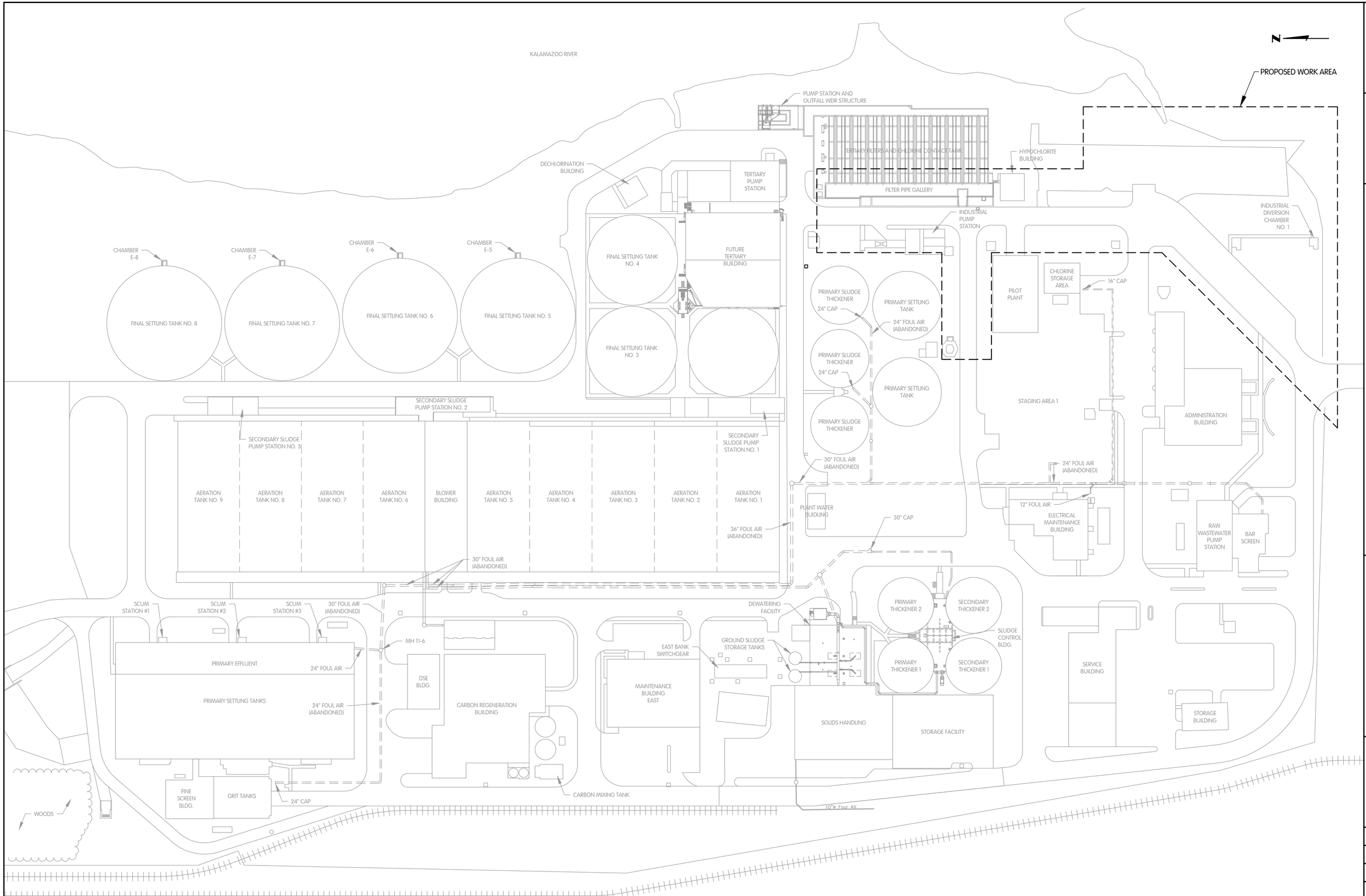
DESIGNED ADK | DRAWN CJAF | CHECKED AJD

STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

SHEET NO. G-1

1 OF 44



EXISTING KWRP PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.

Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE 1" = 60'

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
ADK	CJAF	AJD

STATUS: ISSUED FOR BID

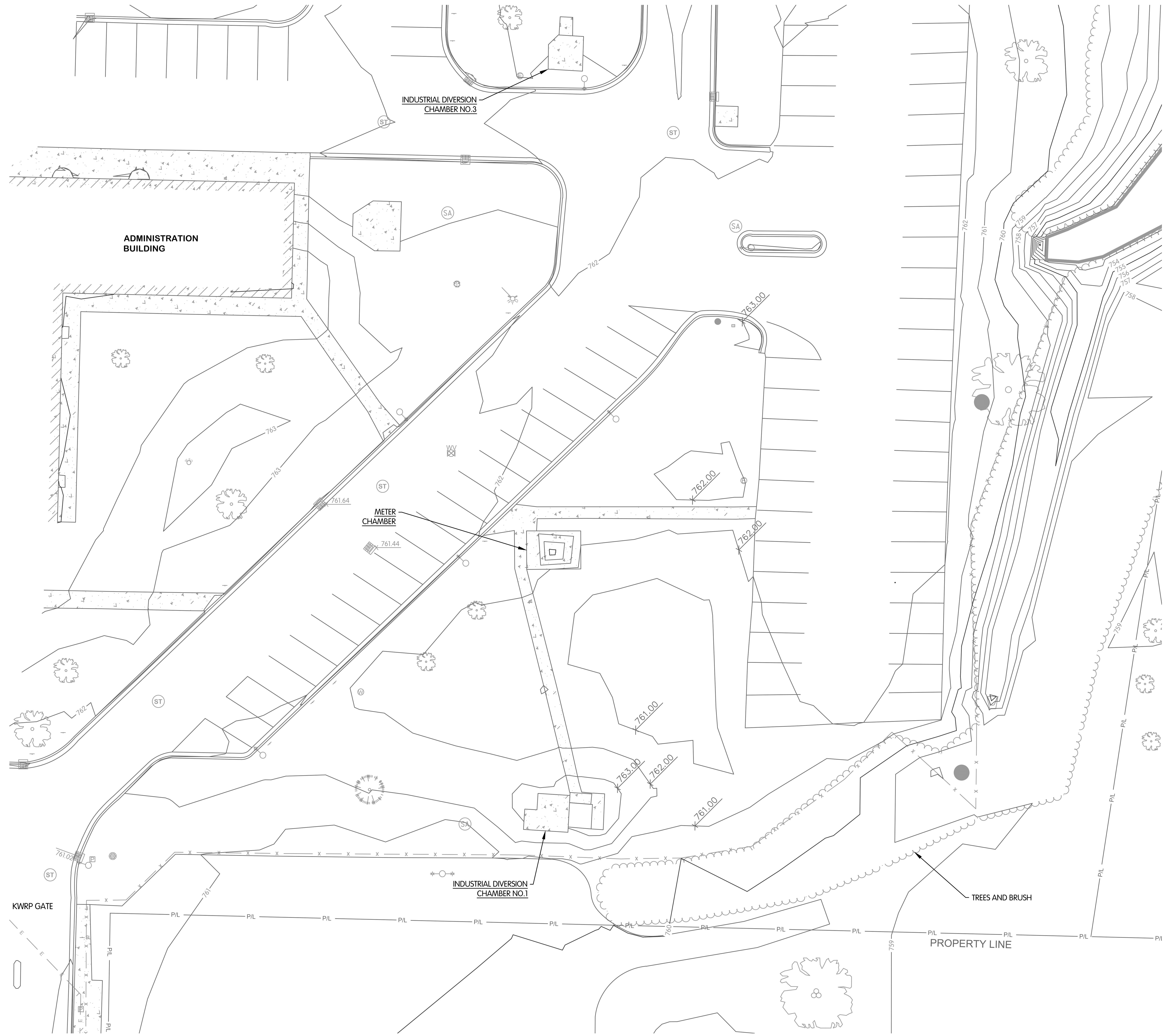
DATE: FEBRUARY 2022

SHEET NO.

G-2

2 OF 44

KAL-772500160\02-EXISTING KWRP PLAN
1/28/2022 2:30 PM - SWILLIS



THE CITY OF Kalamazoo

EXISTING SITE PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO	DATE	REVISIONS AFTER ISSUED FOR BID	BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.

Fluid thinking®.
www.JHeng.com

JOB NO.	017-7725.001
SCALE	1" = 20'

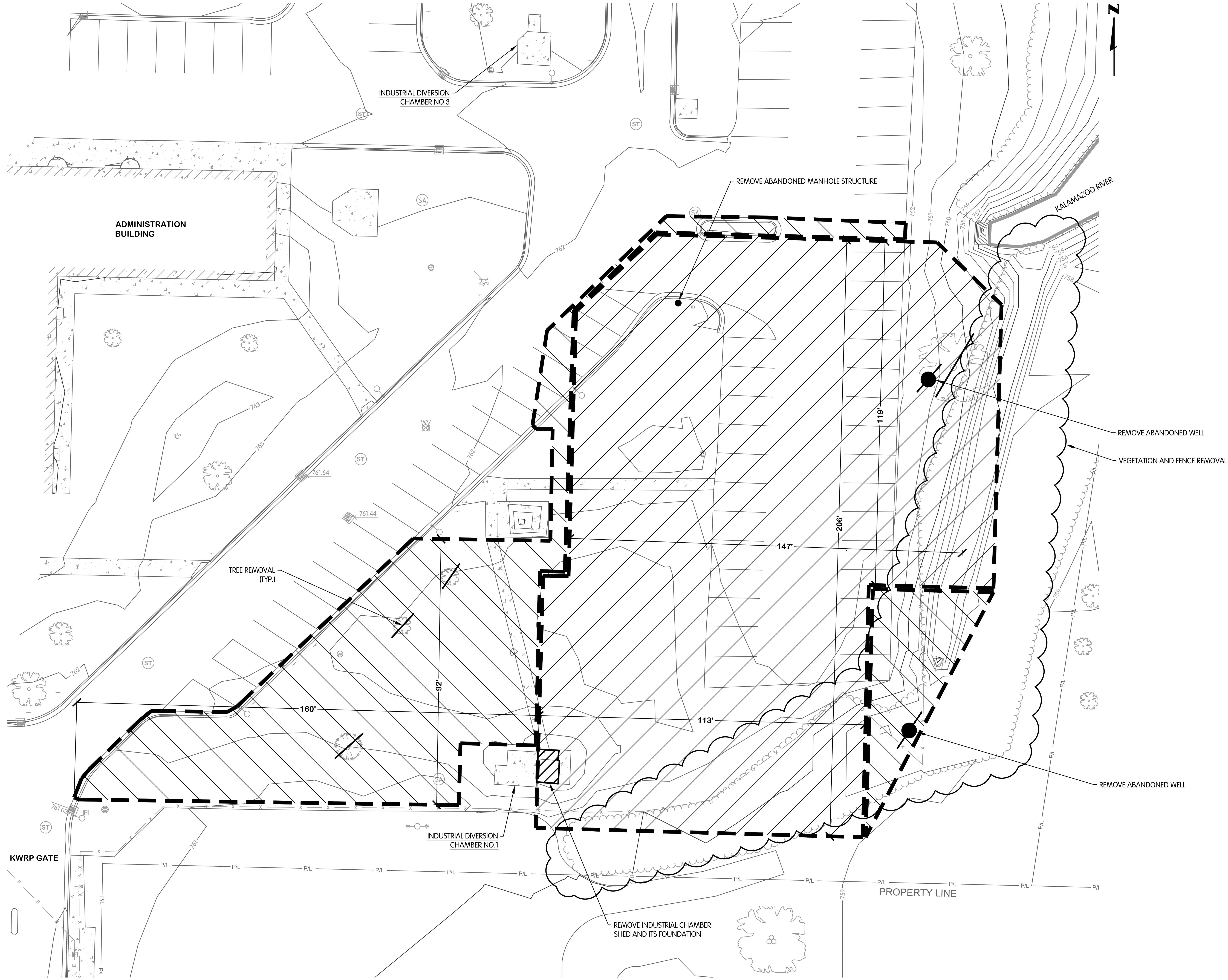
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
PEF	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

SHEET NO.
G-3
3 of 44

KAL-7725001G05-EXISTING SITE PLAN
1/26/2022 5:31 PM - SWILLIS
1/28/2022 2:30 PM



LEGEND

(single hatch)	REMOVE / EXCAVATE ALL MATERIAL TO ELEVATION OF 749.9, AREA WITHIN BOUNDARY = 26,723 SQFT (SEE SHEET R-2 FOR CROSS SECTIONS)
(double hatch)	REMOVE ALL MATERIAL AT SURFACE LEVEL TO BUILD PER SHEET C-1, AREA WITHIN BOUNDARY = 12,105 SQFT

THE CITY OF Kalamazoo

SITE REMOVAL PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

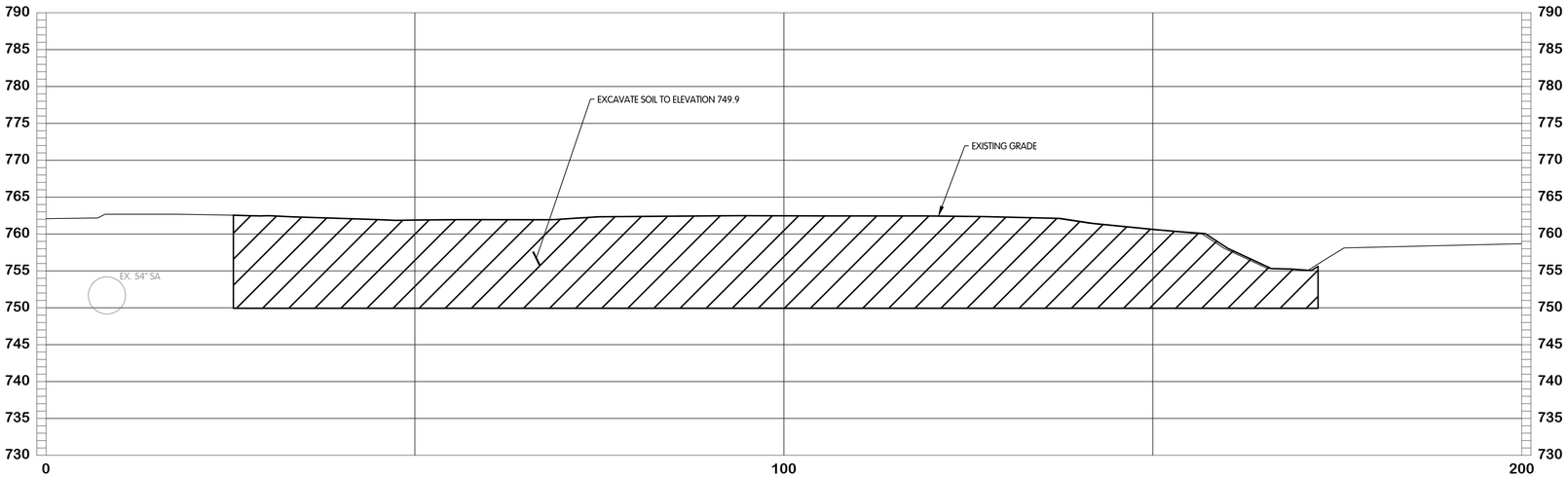
Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

JOB NO.	017-7725.001
SCALE	1" = 20'
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE	

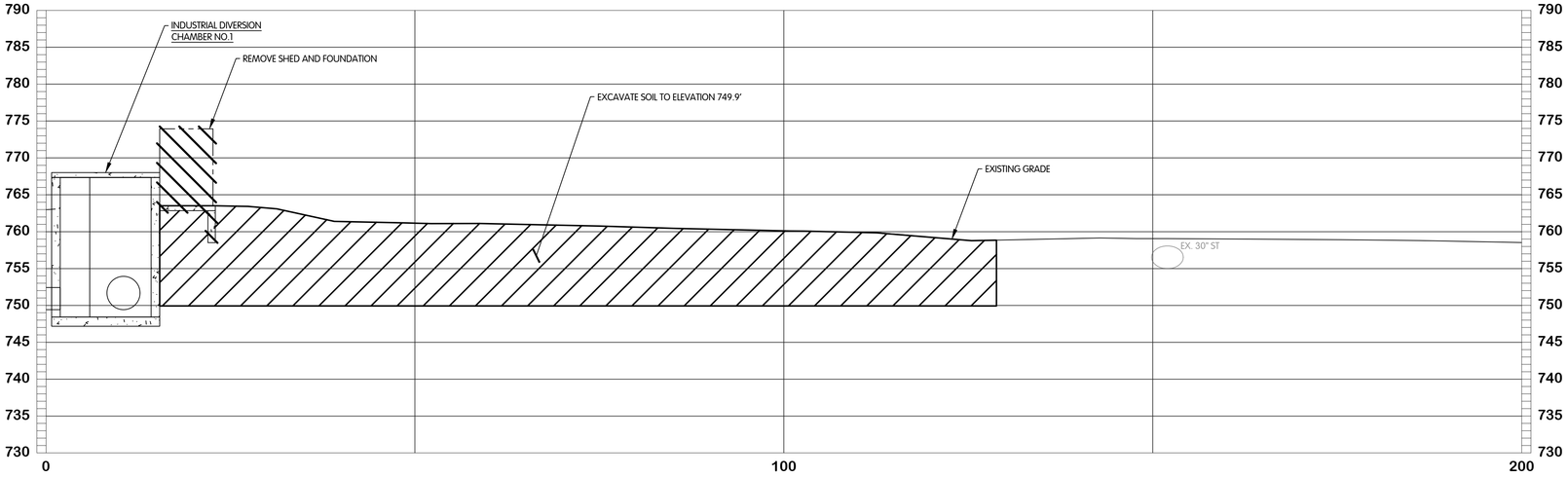
DESIGNED	DRAWN	CHECKED
PEF	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022
SHEET NO.
R-1
4 of 44

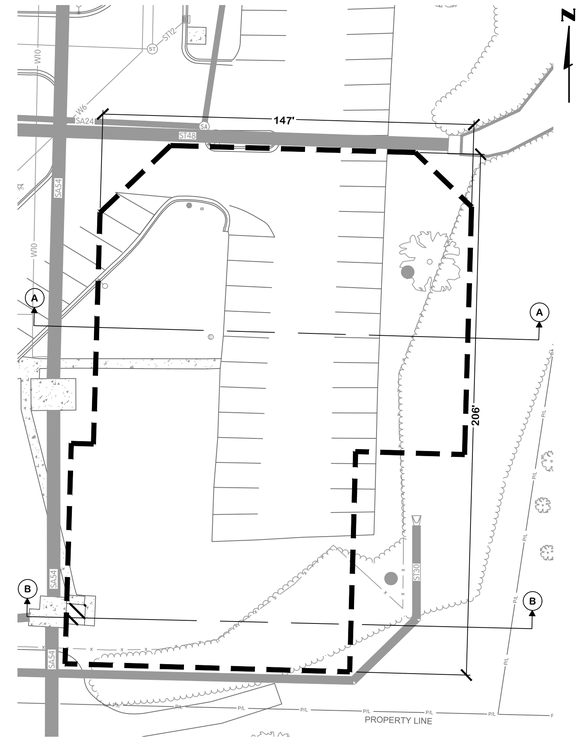
KAL-7725001R01-SITE REMOVAL PLAN
1/26/2022 5:32 PM - SWILLIS
1/28/2022 2:30 PM



SECTION A



SECTION B



PLAN VIEW

1" = 30'

NOTE: ADDITIONAL EXCAVATIONS MAY BE REQUIRED TO REMOVE INADEQUATE SOILS. CONTRACTOR SHALL WORK WITH GEOTECHNICAL ENGINEER AT TIME OF EXCAVATION TO ENSURE BEARING CAPACITY OF IN-SITU SOILS AT BOTTOM OF EXCAVATION IS ADEQUATE TO RECEIVE FILL MATERIALS. SEE SHEET C-7 FOR REFERENCE SOIL BORINGS AND LOCATIONS

THE CITY OF Kalamazoo

SITE REMOVAL PLAN SECTIONS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	BY
1	REVISIONS AFTER ISSUED FOR BID	

Jones & Henry Engineers, Ltd.

Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE 1" = 10'

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
PEF	CJAF	AJD

STATUS: ISSUED FOR BID

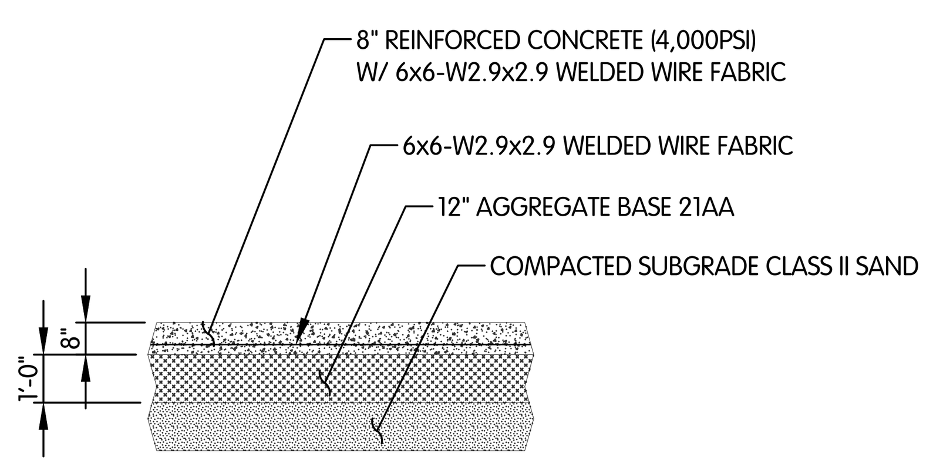
DATE: FEBRUARY 2022

SHEET NO.

R-2

5 OF 44

K:\KAL-7725001R02-SITE REMOVAL PLAN SECTIONS
1/28/2022 2:30 PM



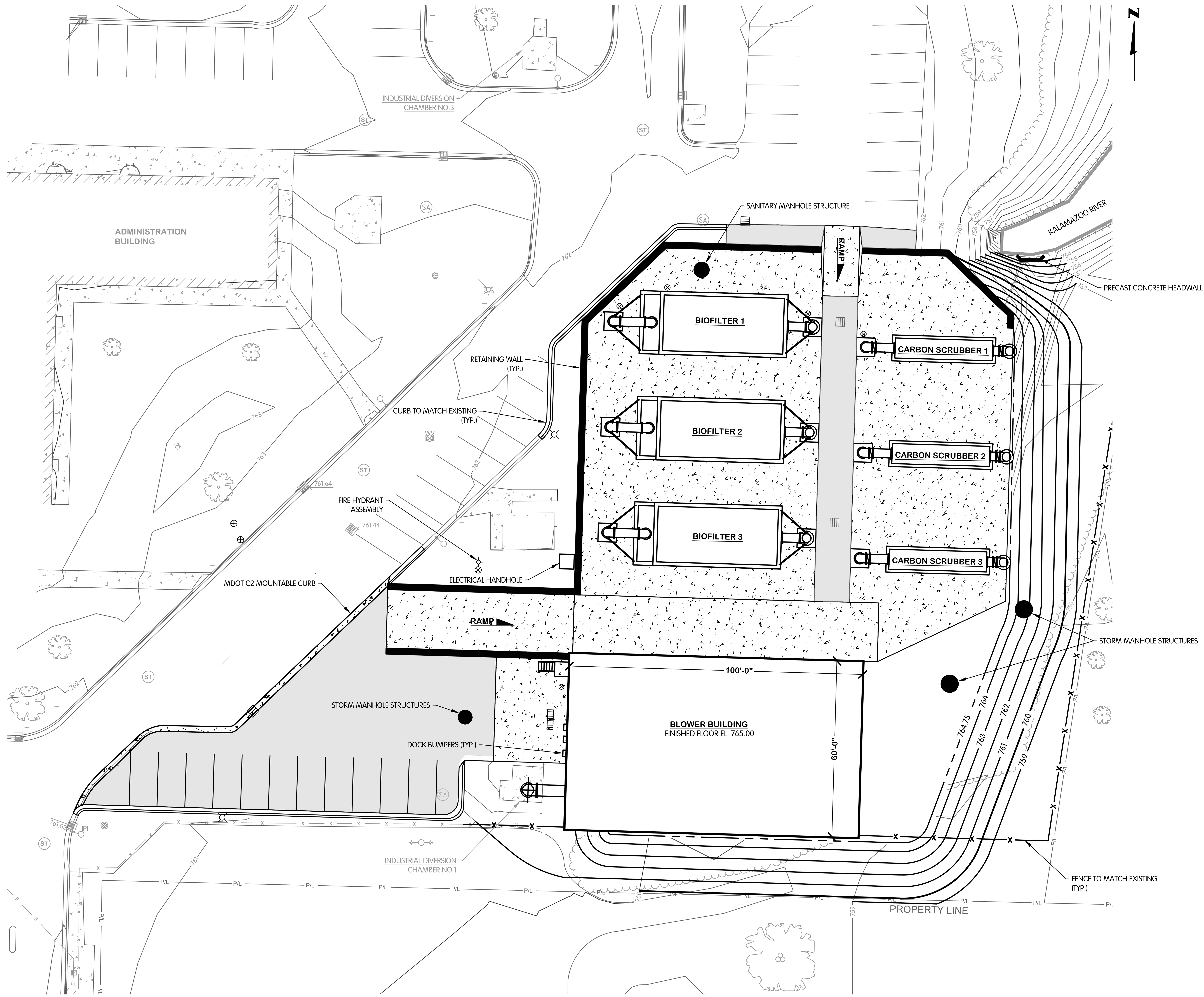
NOTE: GRADE OF CONCRETE SHALL SLOPE AWAY FROM STRUCTURES AND EQUIPMENT AND TOWARDS ENDGE OF PAVEMENT OR DRAINAGE STRUCTURE AT A 1/8" PER FT SLOPE.

TYP. CONCRETE PAVEMENT SECTION

NTS

LEGEND

- CONCRETE PAVEMENT (15,315 SQFT)
- ASPHALT PAVEMENT (7,082 SQFT)



SITE PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

THE CITY OF Kalamazoo

REVISIONS AFTER ISSUED FOR BID

Jones & Henry Engineers, Ltd.

Fluid thinking®. www.JHeng.com

JOB NO.	017-7725.001
SCALE	1" = 20'

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
ADK	CJAF	AJD

STATUS: ISSUED FOR BID

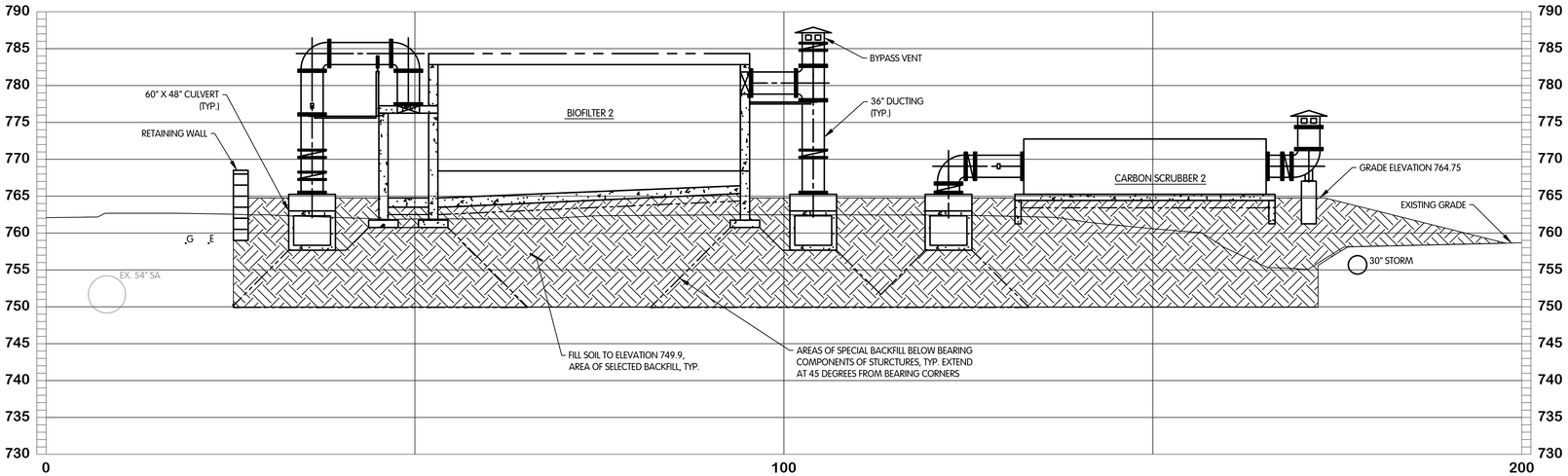
DATE: FEBRUARY 2022

SHEET NO.

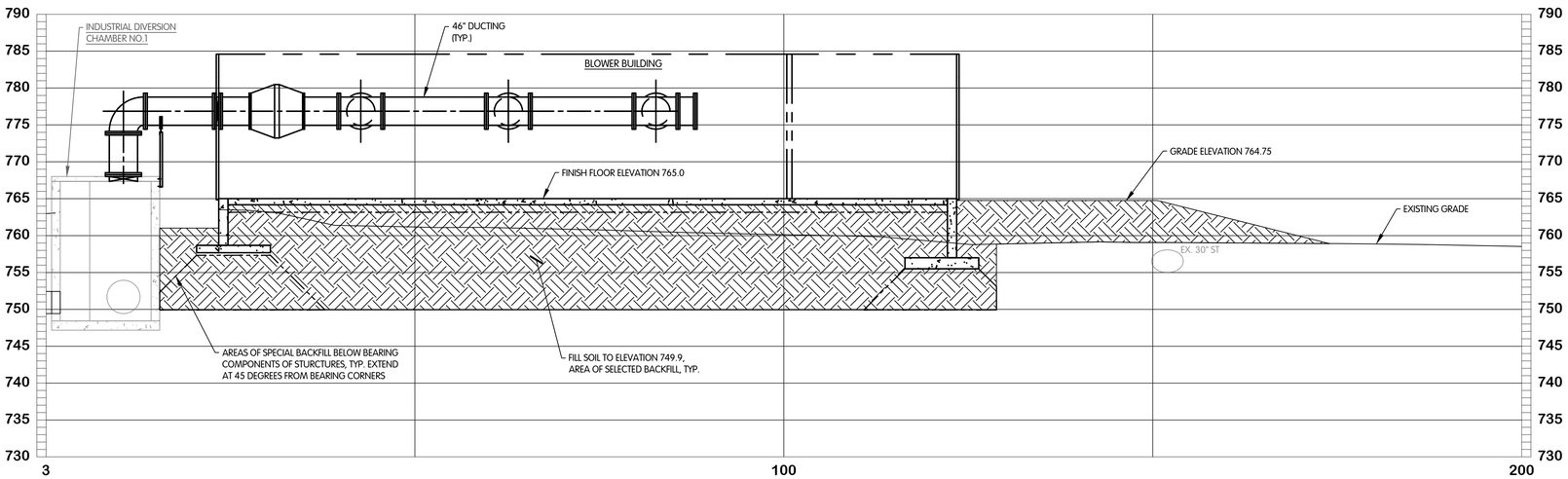
C-1

6 of 44

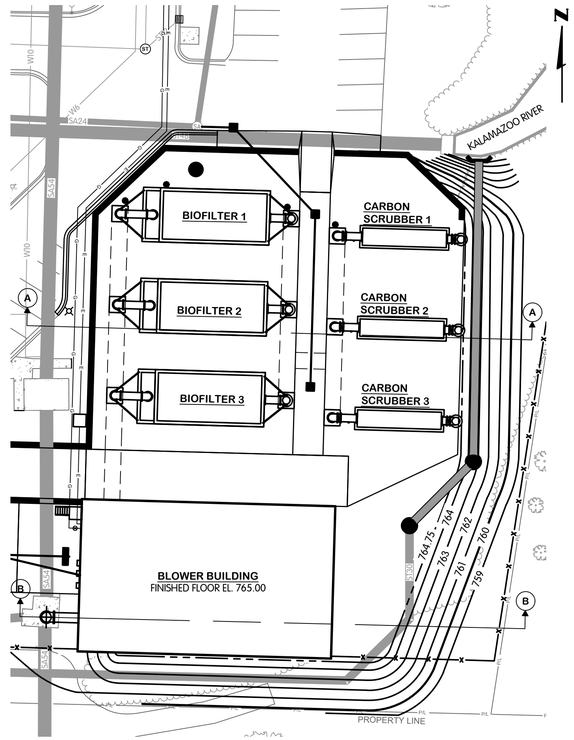
KAL-7725001C01-SITE PLAN
1/27/2022 11:34 AM - SWILLIS
1/28/2022 2:30 PM



SECTION A



SECTION B



PLAN VIEW

1" = 30'

THE CITY OF Kalamazoo

SITE PLAN SECTIONS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	BY
1	REVISIONS AFTER ISSUED FOR BID	

Jones & Henry Engineers, Ltd.

Fluid thinking©.
www.JHeng.com

JOB NO.	017-7725.001
SCALE	1" = 10'

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
PEF	CJAF	AJD

STATUS: ISSUED FOR BID

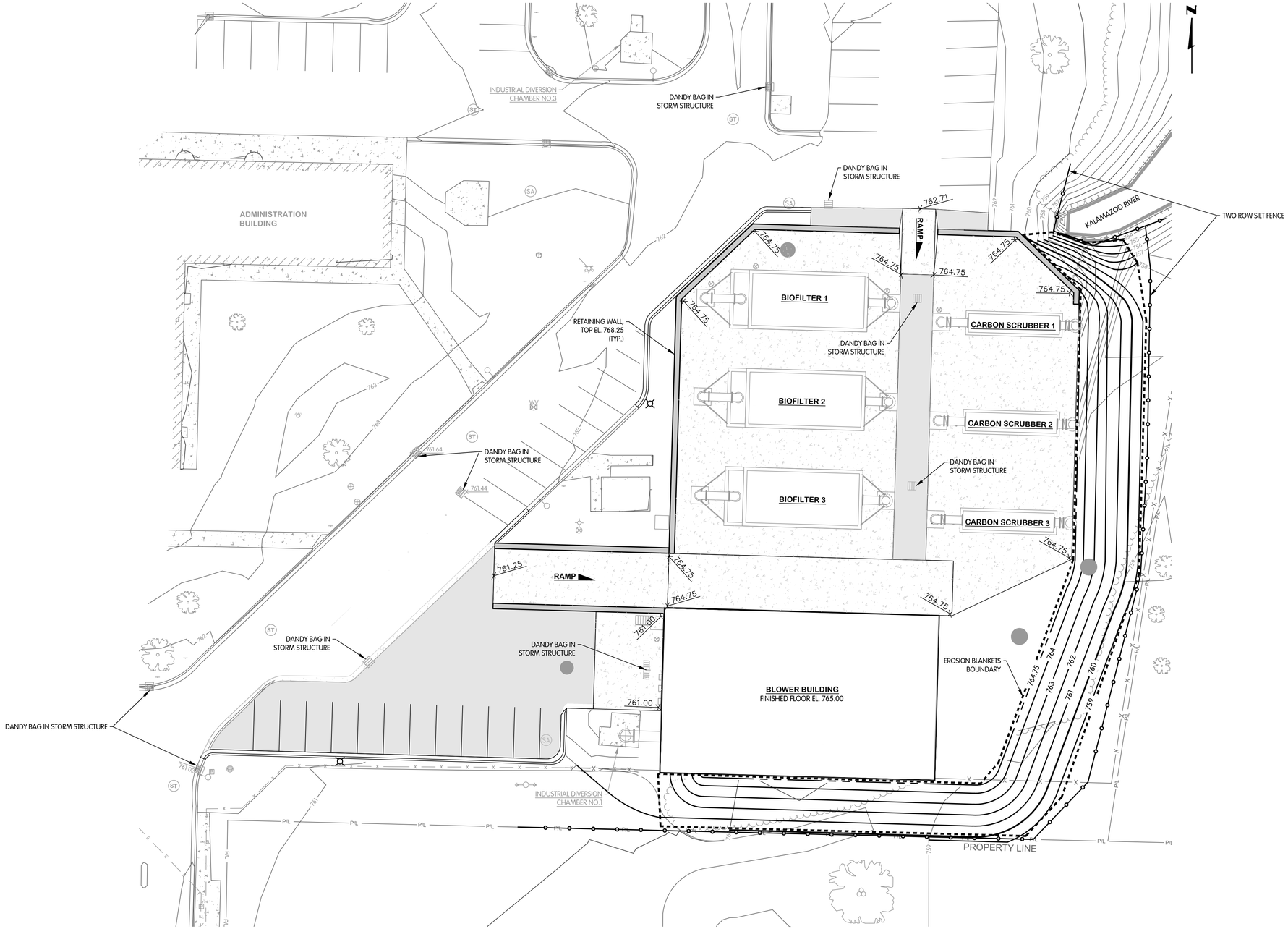
DATE: FEBRUARY 2022

SHEET NO.

C-2

7 OF 44

KAL-77250160A-SITE PLAN SECTIONS
1/28/2022 2:30 PM - SWILLIS
1/28/2022 2:30 PM



KAL-7725001\03-SITE GRADING & EROSION CONTROL PLAN
1/27/2022 12:44 PM S SWILLIS
1/28/2022 2:10 PM

THE CITY OF Kalamazoo

SITE GRADING & EROSION CONTROL PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

ISSUE NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY

Jones & Henry Engineers, Ltd.

Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE 1" = 20'

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
TLK	CJAF	AJD

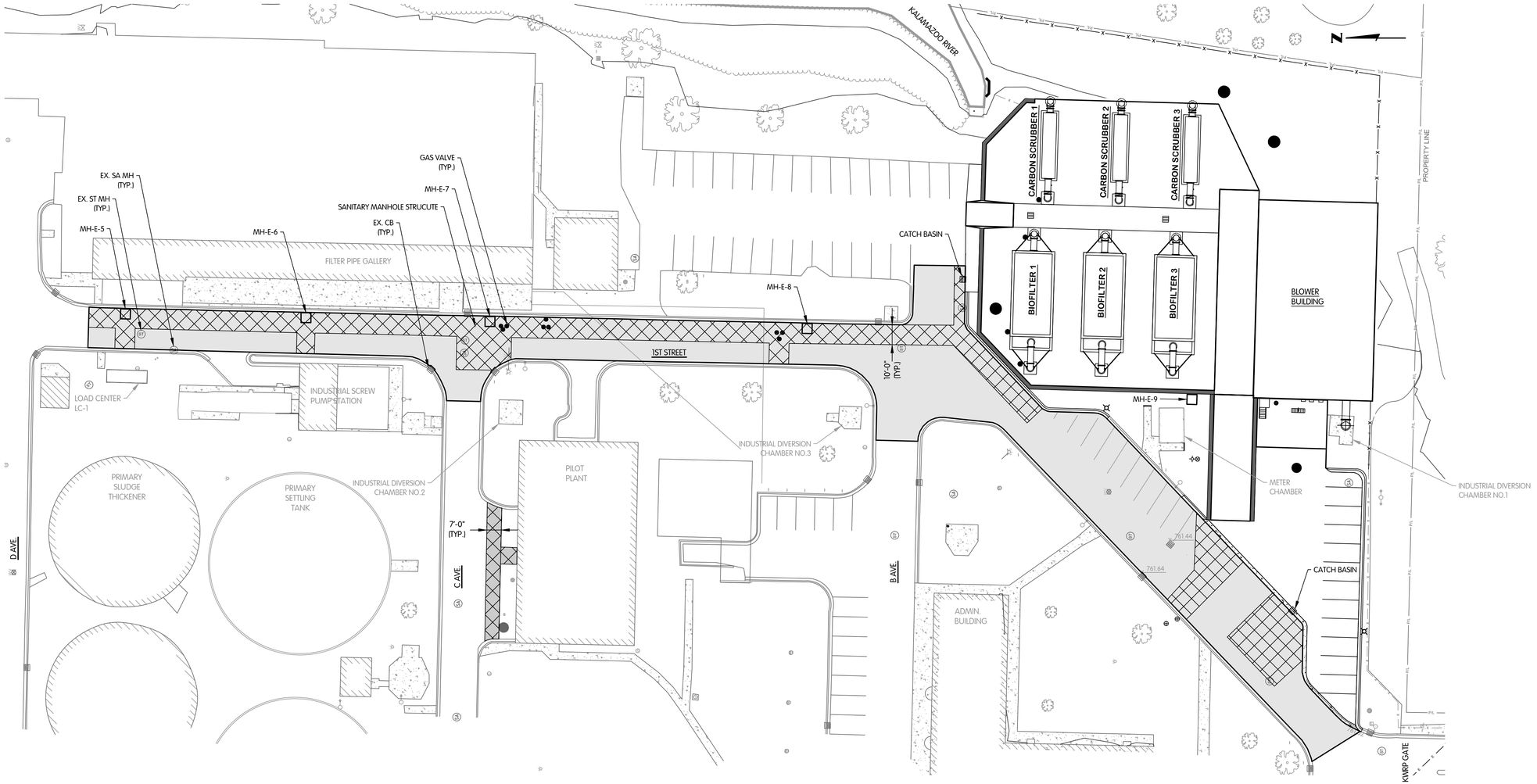
STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

SHEET NO.

C-3

8 OF 44



LEGEND

MILL AND OVERLAY PAVEMENT (22,081 SQFT)

TRENCH REPAIR

NOTE: REMOVE AND REPLACE CURB WHERE NECESSARY.

KAL-7725001SR01-SURFACE RESTORATION PLAN
1/31/2022 1:45 PM - SWILLIS
1/28/2022 2:30 PM

THE CITY OF Kalamazoo

SURFACE RESTORATION PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.

Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE 1" = 30'

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
PEF	CJAF	AJD

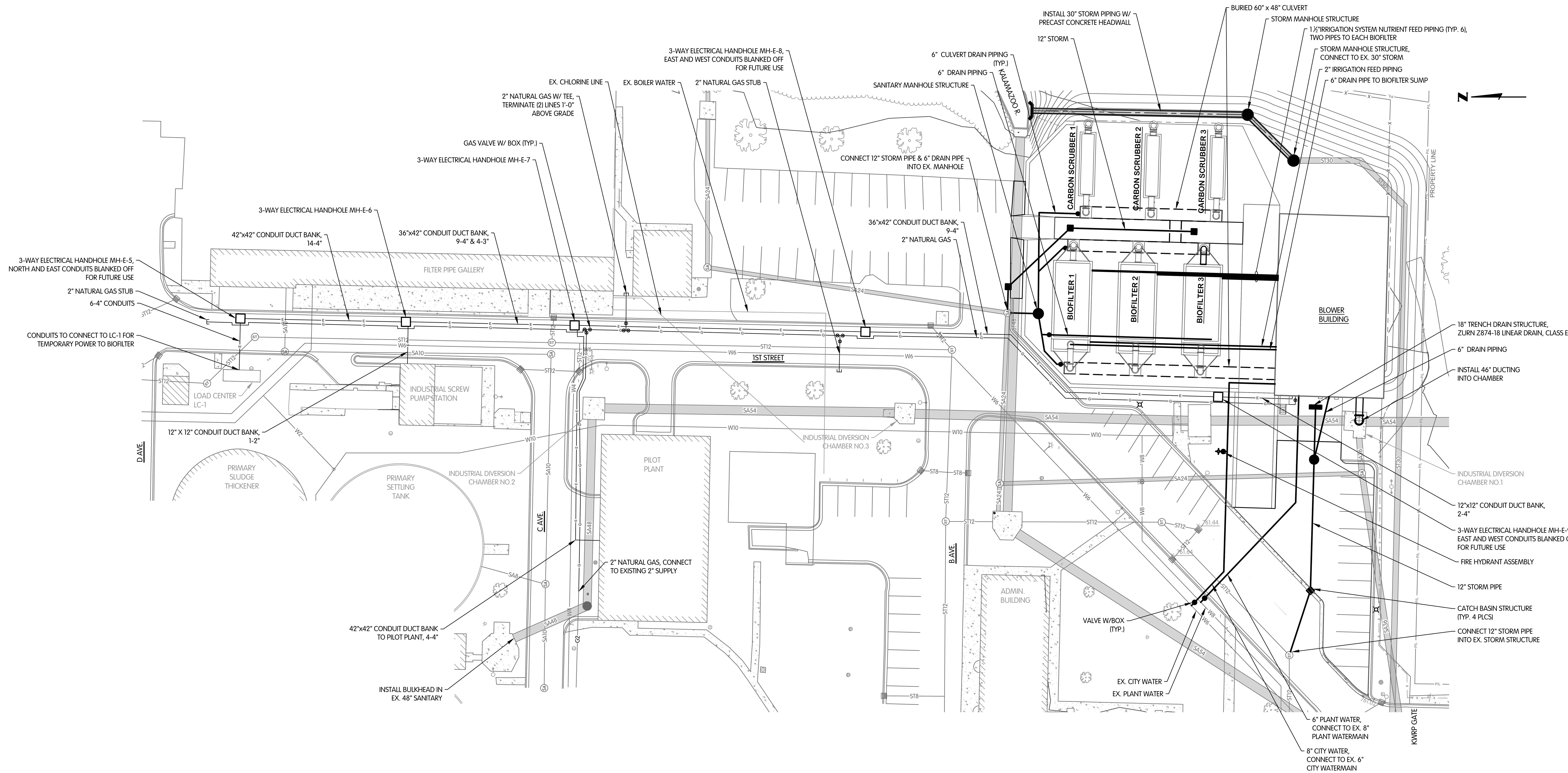
STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

SHEET NO.

C-4

9 OF 44



NOTES:

1. CONTRACTOR SHALL SLEEVE AROUND ANY CONDUIT AND PIPING FOUND DURING EXCAVATION FOR INSTALLATION OF DUCTBANK.
2. EXACT POSITION OF ELECTRICAL HANDHOLES WILL BE DETERMINED ONCE SURROUNDING UTILITIES HAVE BEEN LOCATED.
3. PLANT WATER PIPING ASSUMED TO BE 5 FEET BELOW GRADE.
4. CITY TO PROVIDE ELECTRICAL HANDHOLE STRUCTURES.
5. ALL UNDERGROUND CONDUIT TO BE PVC SCHEDULE 40 MINIMUM.
6. ALL UNDERGROUND CONDUIT ELBOWS TO BE RIGID GALVANIZED STEEL.
7. ALL CULVERT TO BE HS20 LOAD RATED.
8. CULVERT JOINTS SHALL BE GAS TIGHT.

THE CITY OF Kalamazoo

YARD PIPING PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

REVISIONS AFTER ISSUED FOR BID

NO	DATE	BY
1		
2		
3		
4		
5		

Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

JOB NO.	017-7725.001
SCALE	1" = 30'

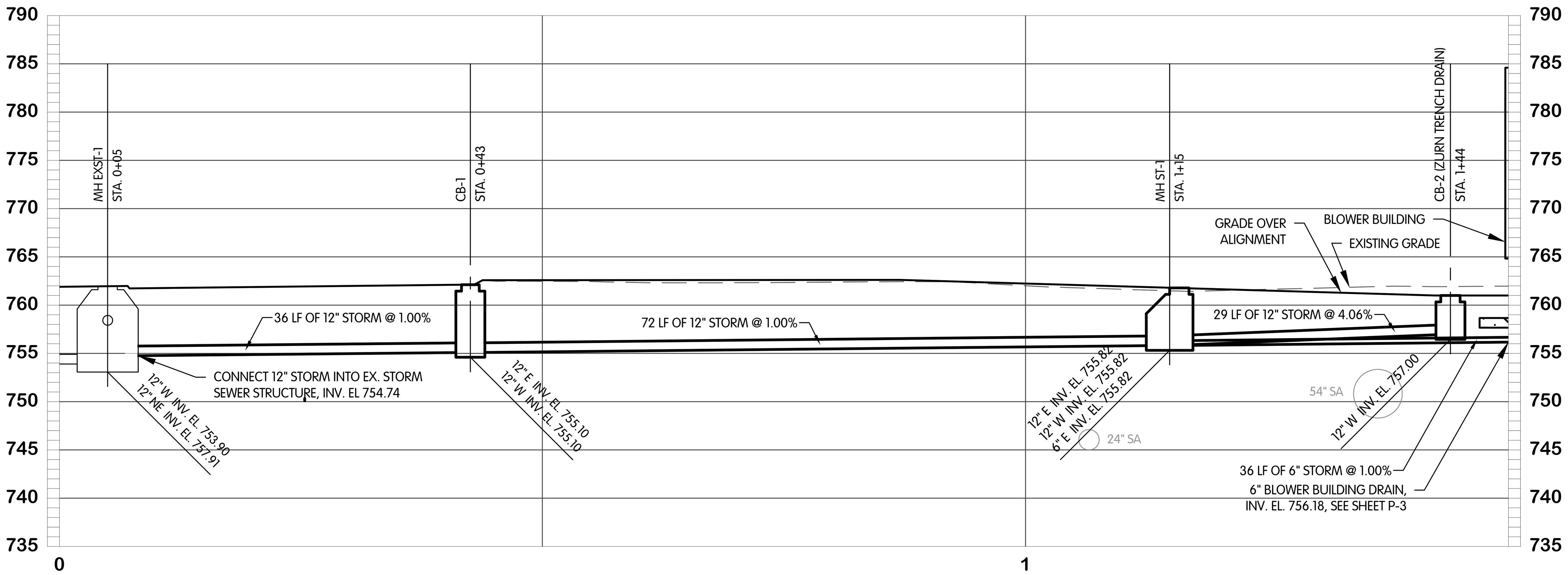
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
PEF	CJAF	AJD

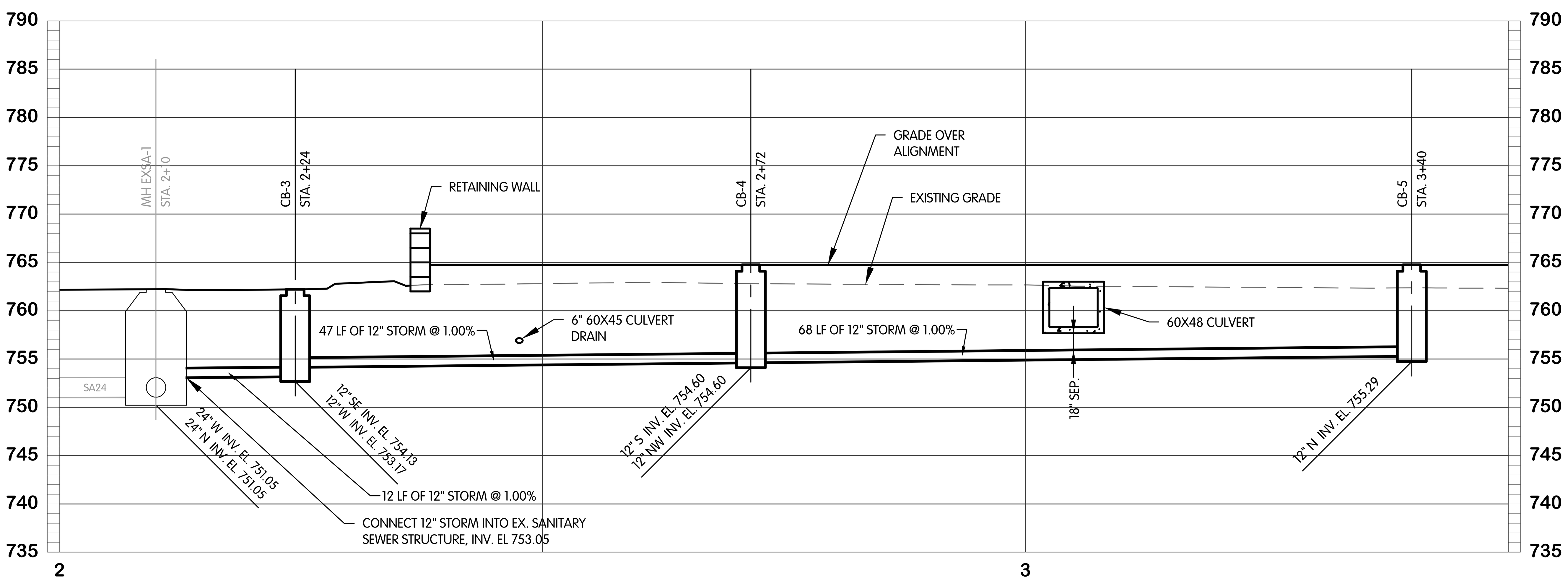
STATUS:	ISSUED FOR BID
DATE:	FEBRUARY 2022

SHEET NO.
C-5
10 OF 44

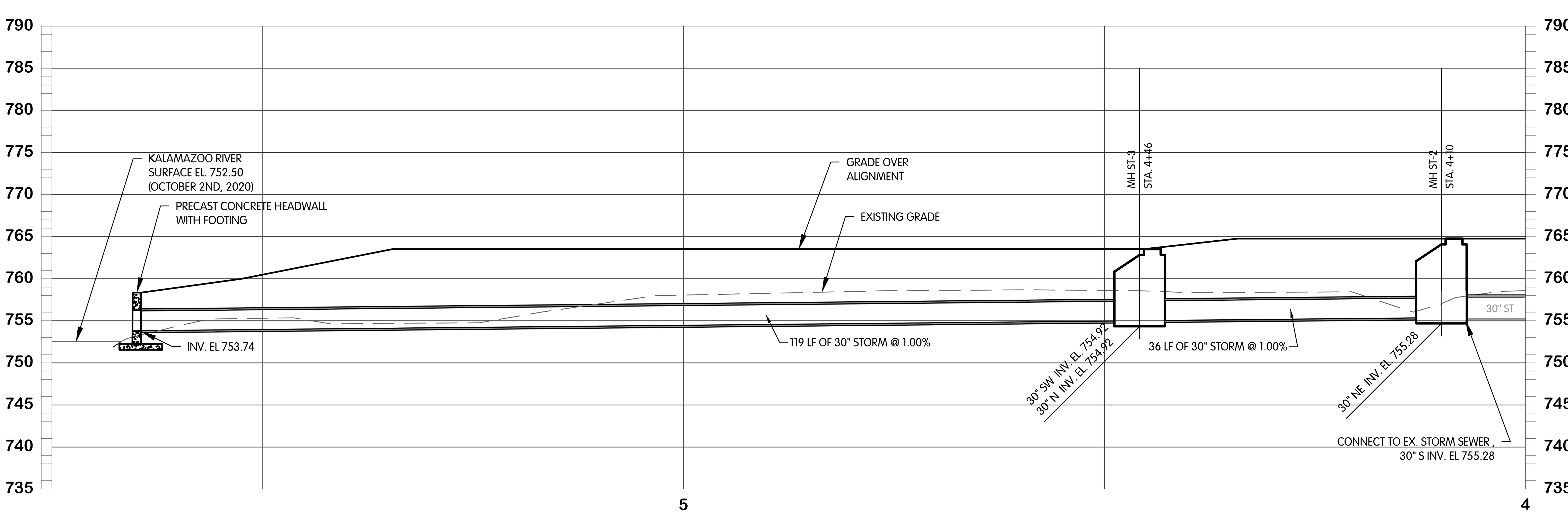
KAL-772500(YP)-YARD PIPNG PLAN
1/27/2022 3:34 PM - SWILLIS
1/28/2022 2:30 PM



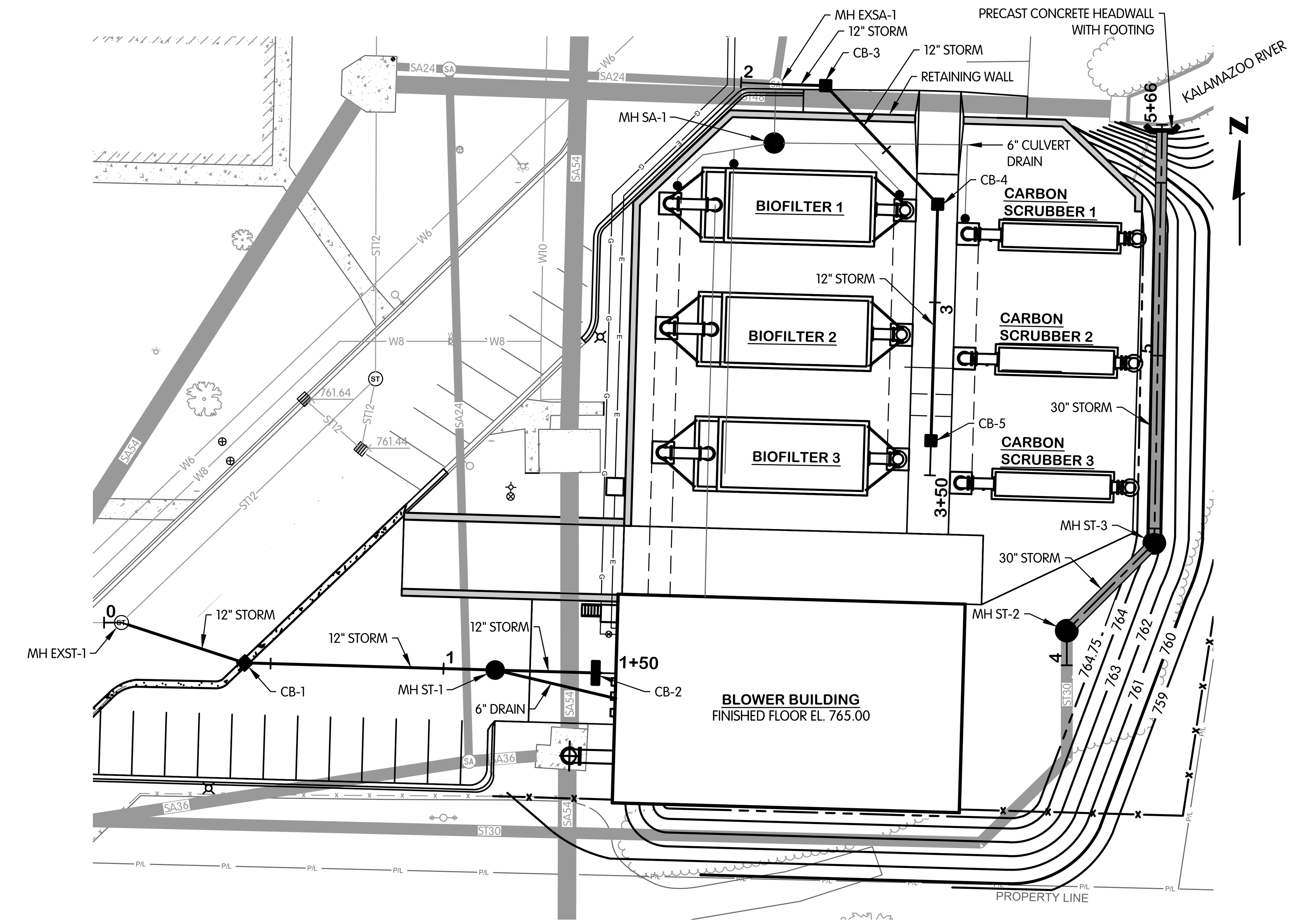
STA. 0+00 TO 1+50



STA. 2+00 TO 3+50



STA. 4+00 TO 5+66



PLAN VIEW

1" = 30'

THE CITY OF Kalamazoo

SITE PLAN SECTIONS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

REVISIONS AFTER ISSUED FOR BID

NO	DATE		BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.

Fluid thinking®.
www.JHeng.com

JOB NO.	017-7725.001
SCALE	1" =10'-0"

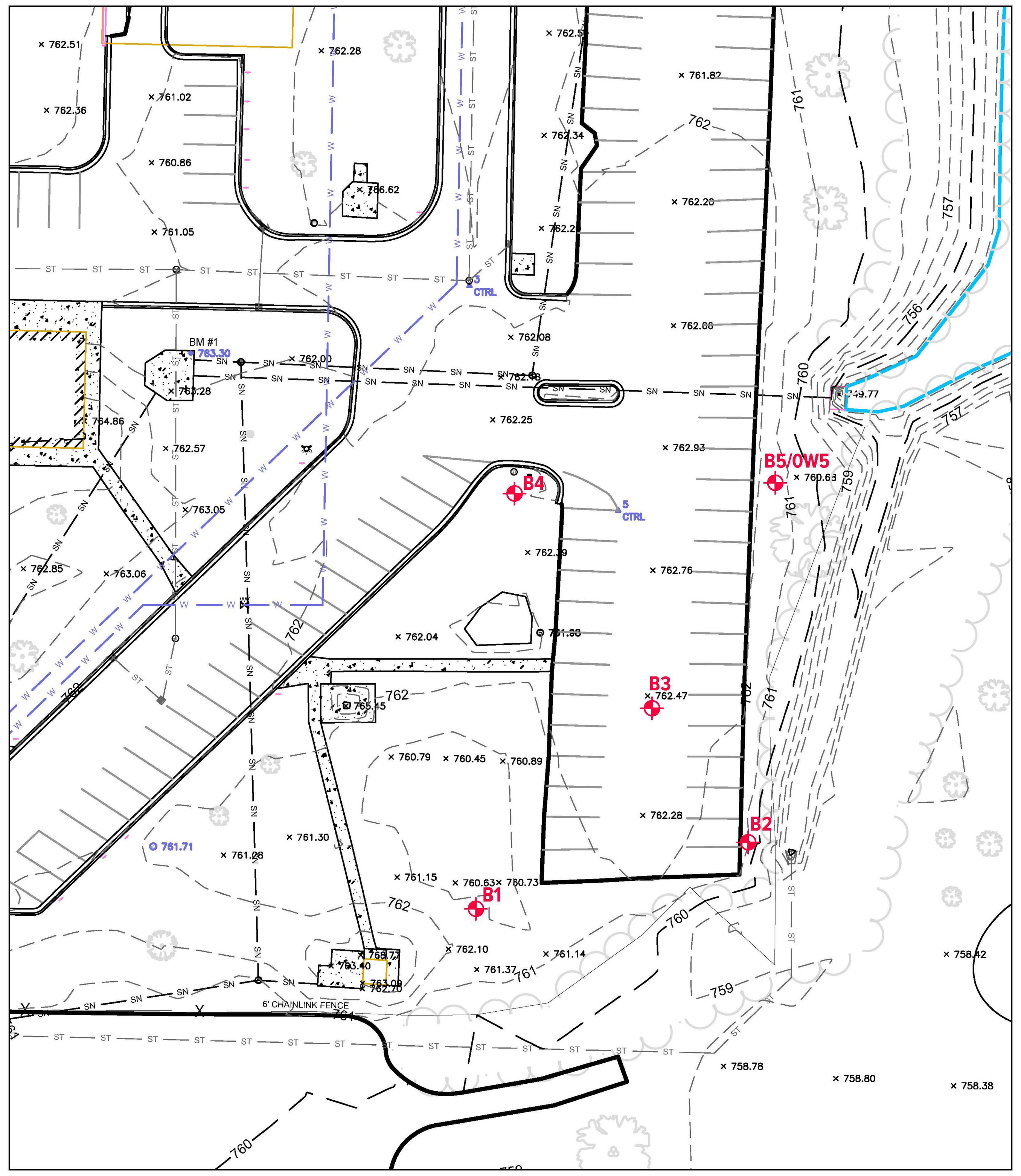
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
ADK	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

SHEET NO.
C-6
11 of 44

KAL-772500C07-STORM PLAN VIEW AND SECTIONS
1/27/2022 12:37 PM - SWILLIS
1/28/2022 2:30 PM



GRAPHIC SCALE: 1" = 40'

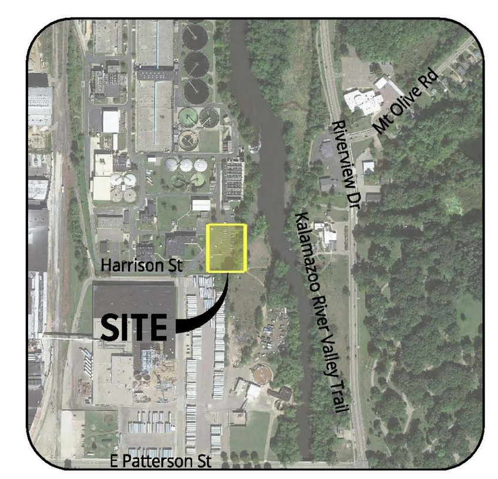
LEGEND

APPROXIMATE BORING LOCATION
WATER MAIN — W —
STORM SEWER — ST —
SANITARY SEWER — SN —
O/H POWER — E —
U.G. POWER — E —

GENERAL NOTES:

1. Utilities shown are approximate locations derived from actual measurements. They should not be interpreted to be exact locations nor should it be assumed that they are the only utilities in this area.
2. Benchmark #1: Plastic tag stamped "763.76" near the NE corner of overflow chamber East of the Administration Building. ELEVATION:763.30 (NAVD88).
3. Basis of Coordinates: Michigan State Plane South, International feet.
4. Control Point Information:

NO.	NORTHING	EASTING	ELEV	
1	296855.290	12797095.924	760.27	MAG NAIL
2	296626.441	12797089.940	761.54	MAG NAIL
3	296403.981	12797084.294	761.92	MAG NAIL
4	296177.009	12796873.824	761.58	MAG NAIL
5	296331.126	12797132.506	762.99	MAG NAIL



LOCATION MAP
NOT TO SCALE

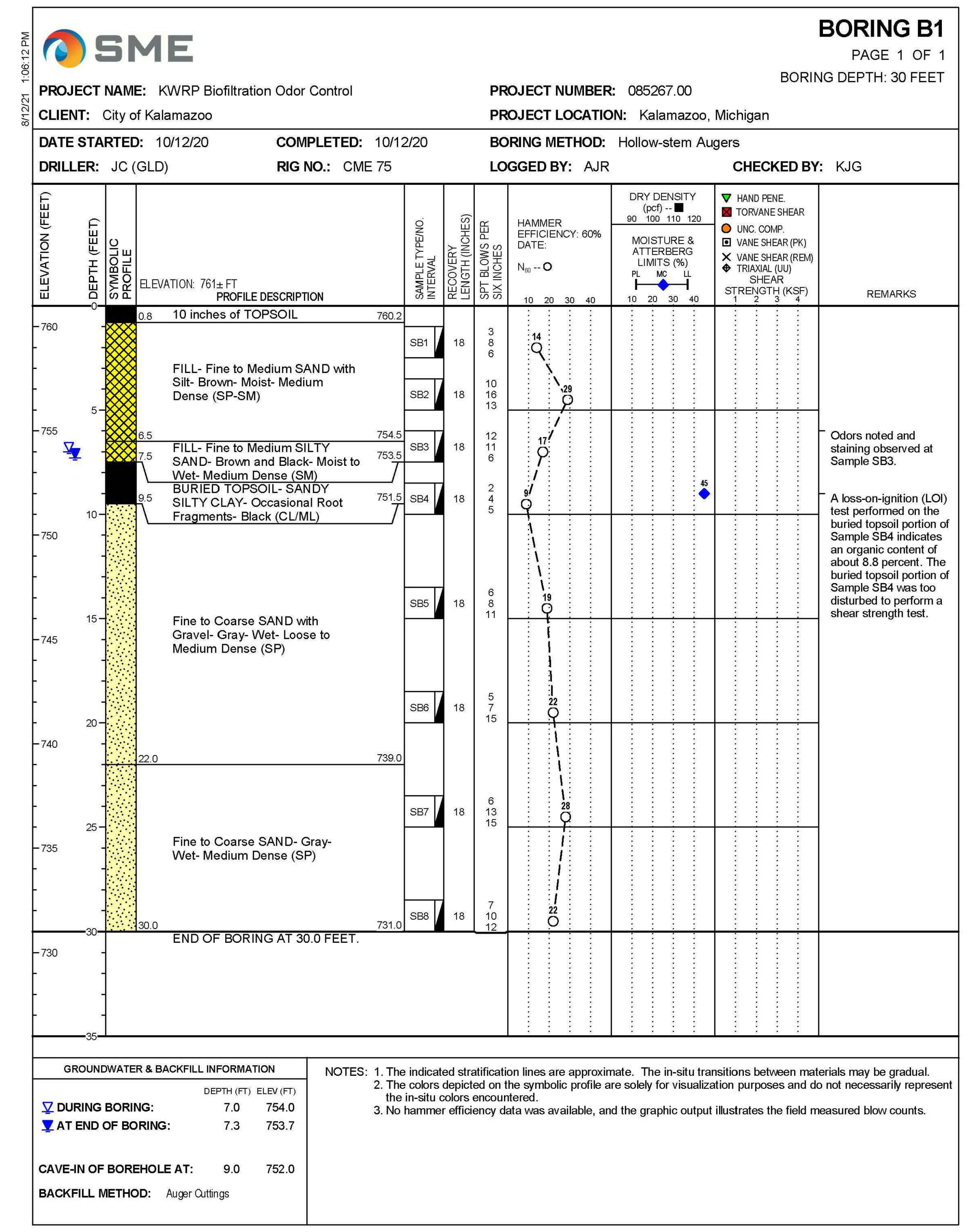
NOTE:
BASE DRAWING INFORMATION TAKEN FROM A CAD FILE 2672002 - KALAMAZOO WWTP.dwg, TITLED "TOPOGRAPHIC SURVEY FOR THE CITY OF KALAMAZOO WATER RECLAMATION FACILITY" DATED DECEMBER 4, 2020 AND PREPARED BY SUMMIT SURVEYING, INC.

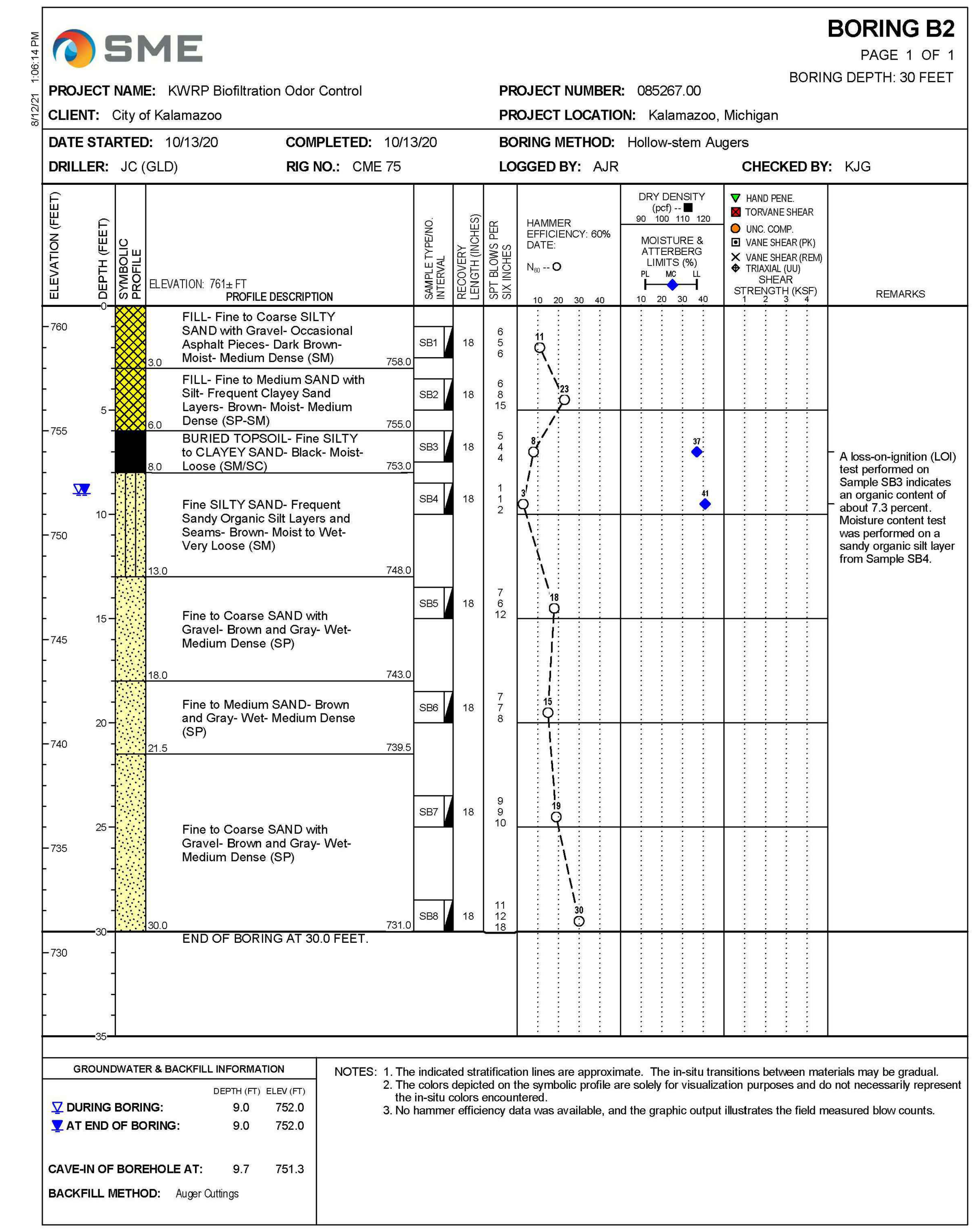
SME
www.sme-usa.com

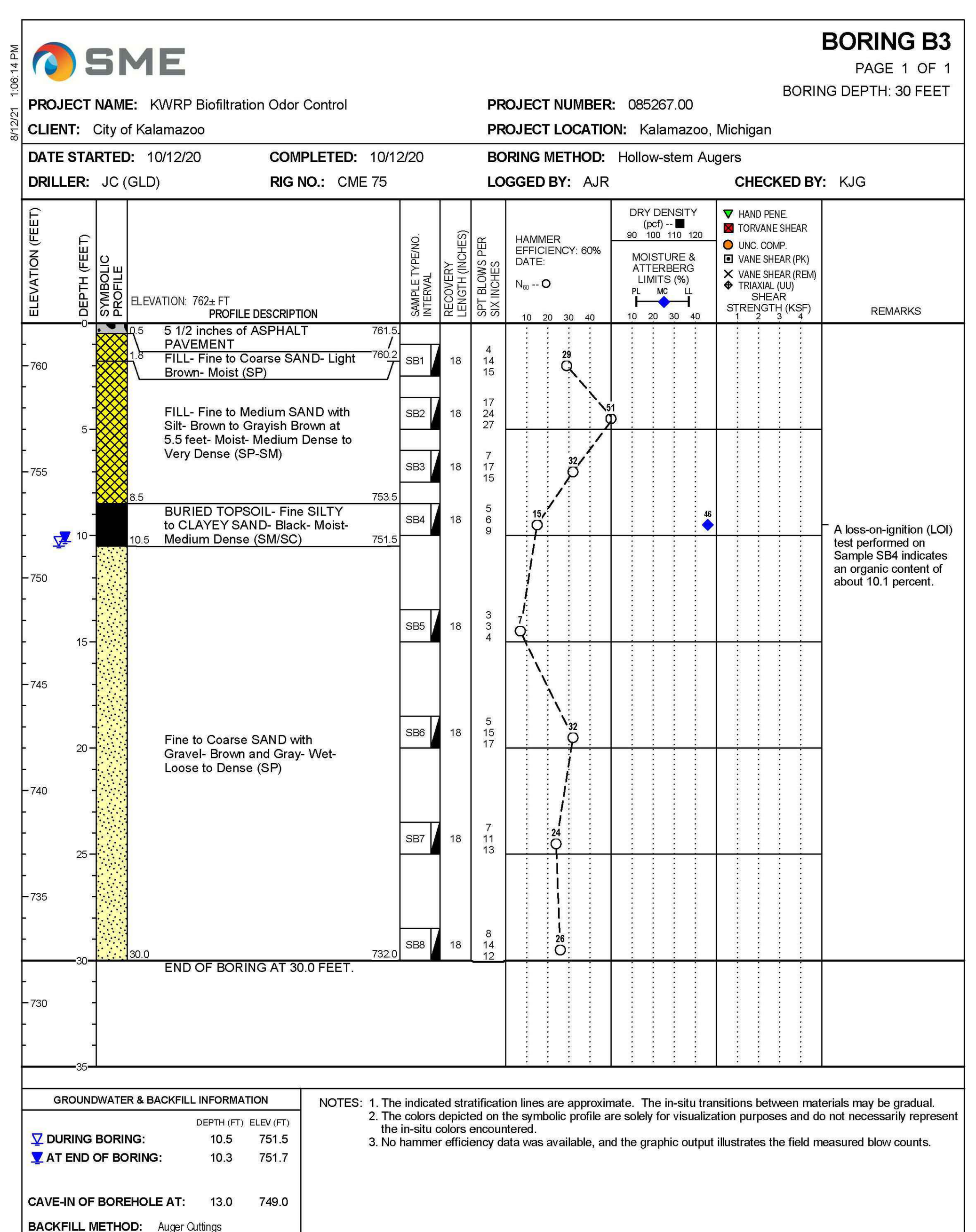
Project: KWRP BIOFILTRATION ODOR CONTROL
Project Location: CITY OF KALAMAZOO, MICHIGAN
Sheet Name: BORING LOCATION DIAGRAM

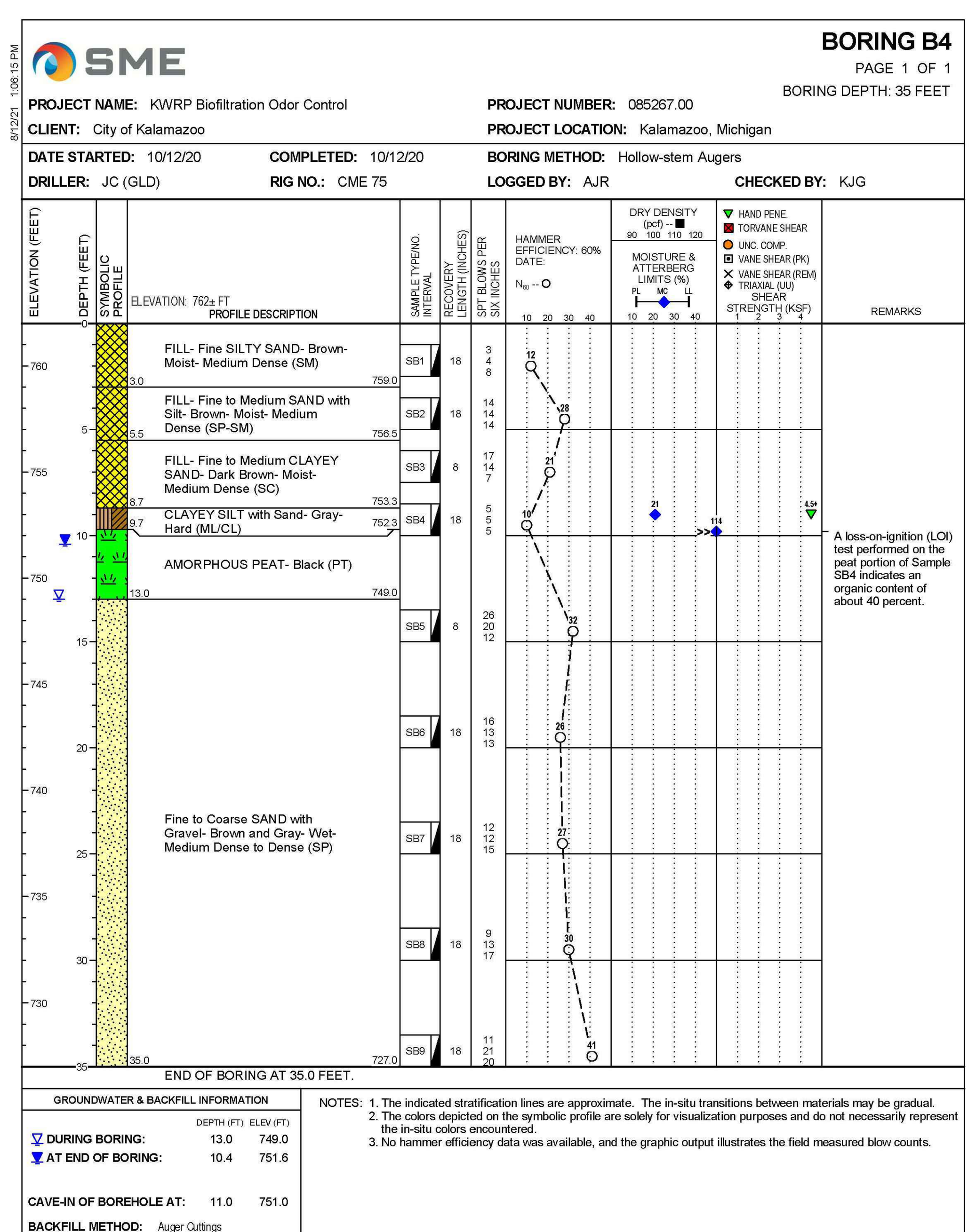
No.	Revision Date

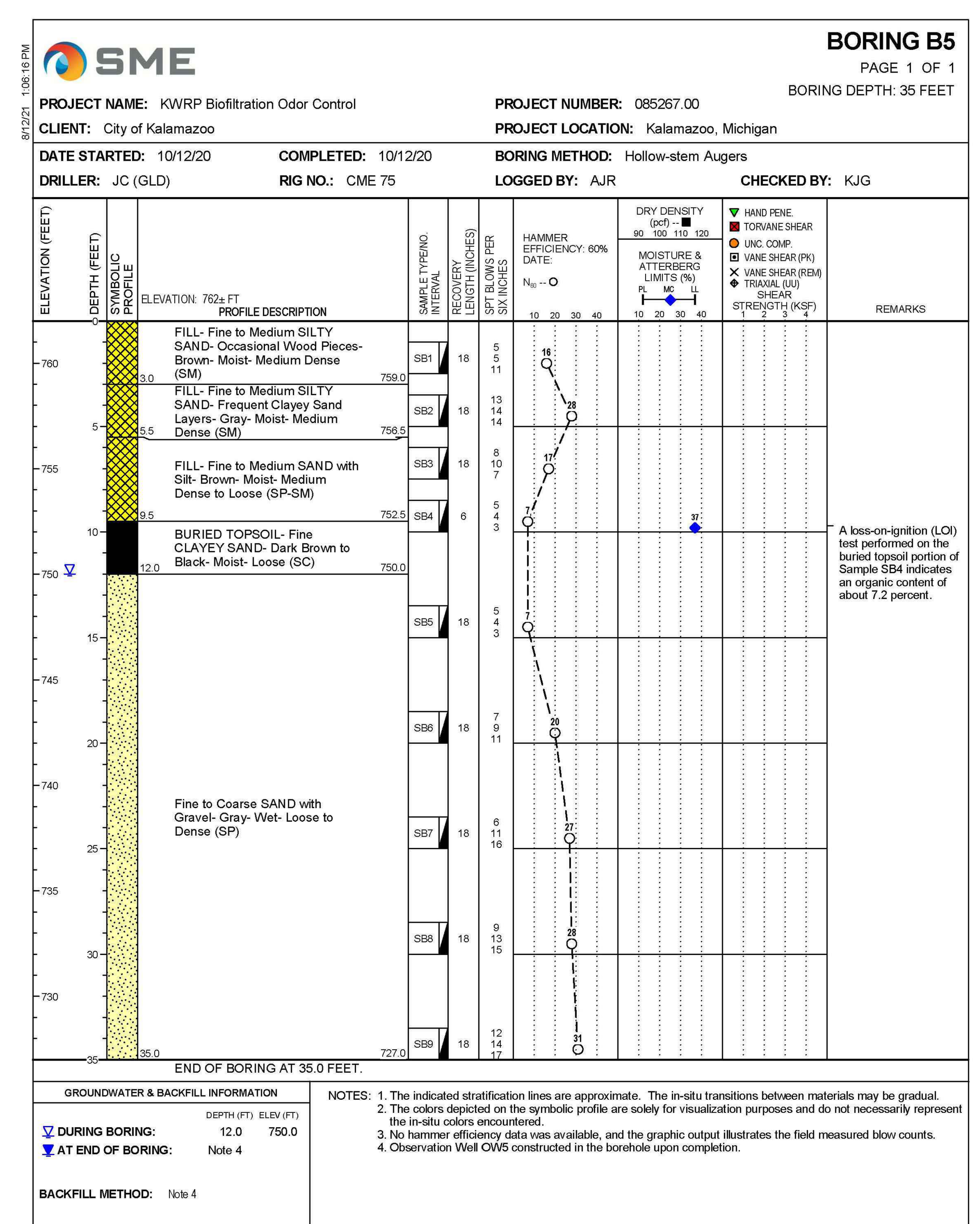
Date: 7/30/2021
CADD: JAB
Designer: AJR
Scale: AS NOTED
Project: 085267.00
Figure No.: 1

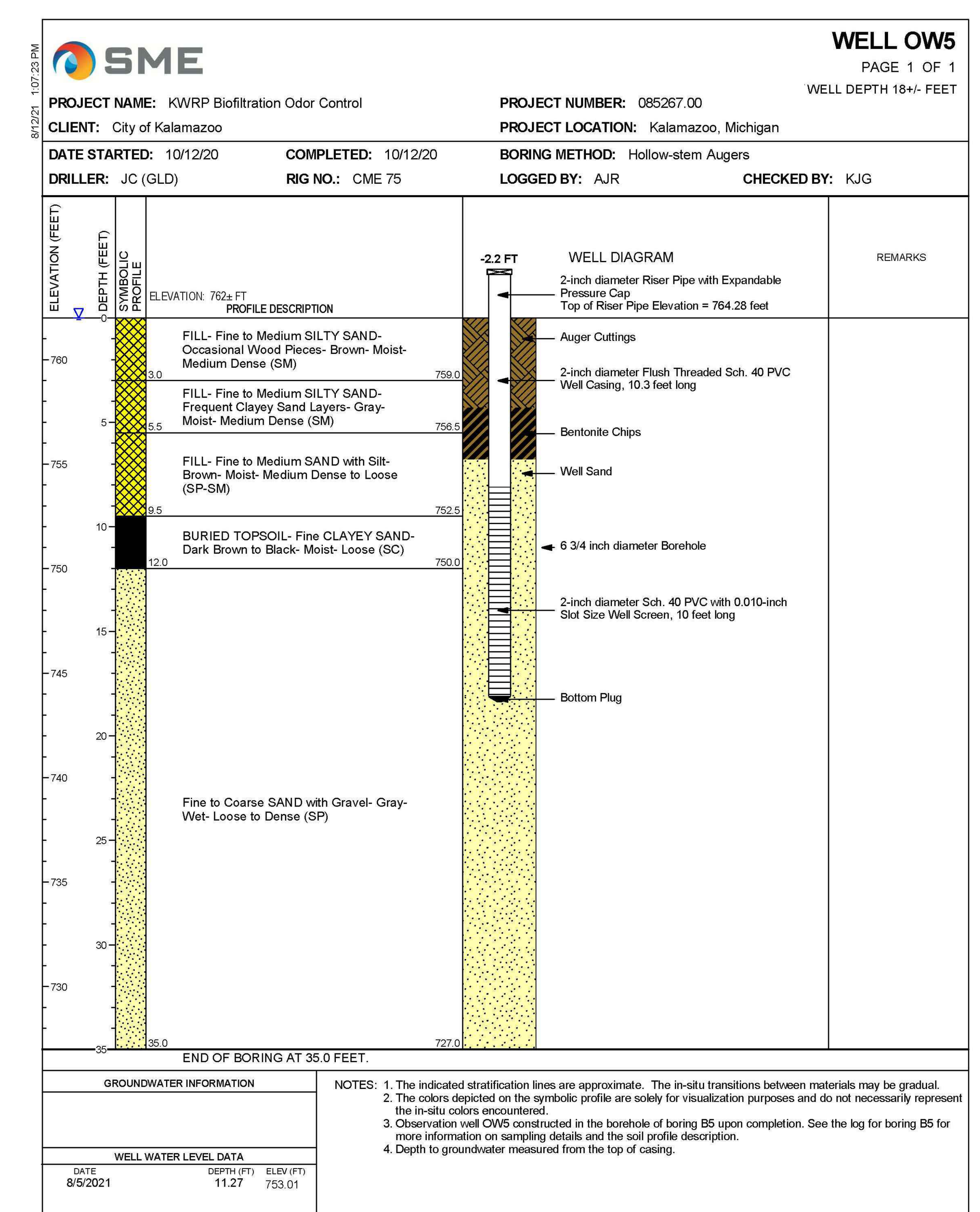












GEOTECHNICAL DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

THE CITY OF Kalamazoo

REVISIONS AFTER ISSUED FOR BID

NO.	DATE	BY
1		
2		
3		
4		
5		

Jones & Henry Engineers, Ltd.
Fluid thinking®...
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

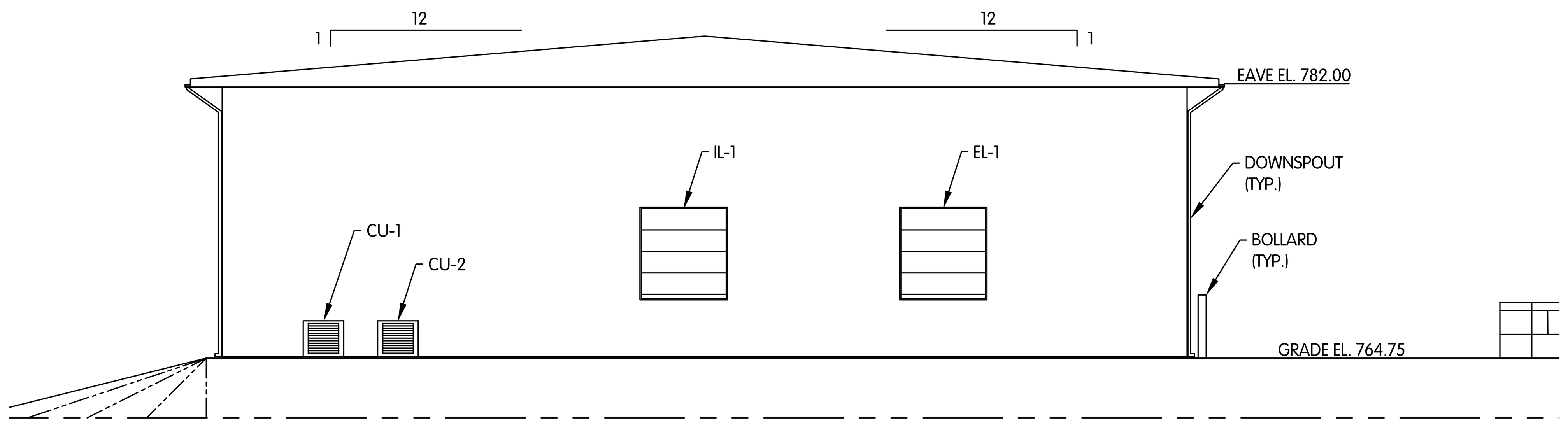
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
ADK	CJAF	AJD

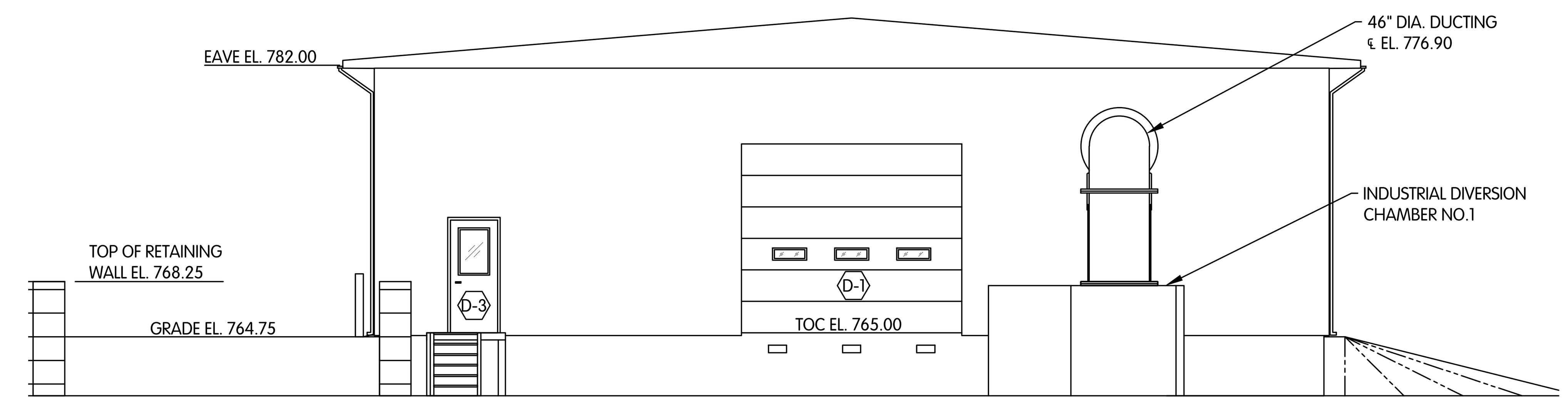
STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

SHEET NO.
C-7
12 OF 44

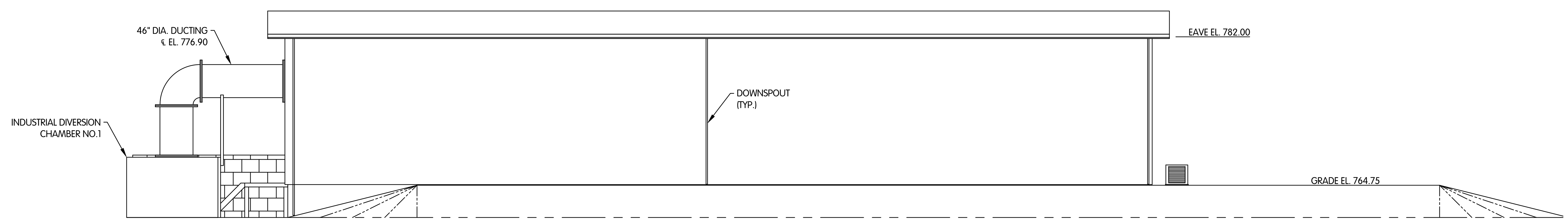
KAL-7725001C05-GEOTECHNICAL DETAILS
1/27/2022 11:43 AM - SWILLIS
1/28/2022 2:30 PM



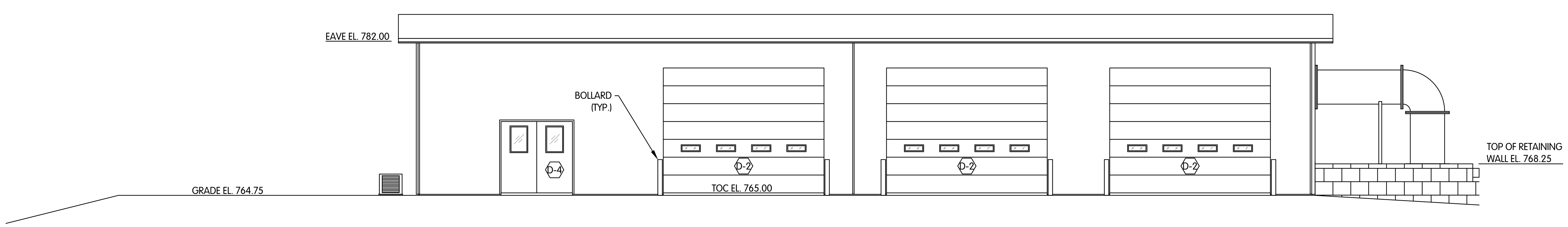
EAST ELEVATION



WEST ELEVATION



SOUTH ELEVATION



NORTH ELEVATION

THE CITY OF Kalamazoo

BLOWER BUILDING ARCHITECTURAL VIEWS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO	DATE	REVISIONS AFTER ISSUED FOR BID	BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.

Fluid thinking®. www.JHeng.com

JOB NO.	017-7725.001
SCALE	1/8" = 1'-0"

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
KDB	CJAF	AJD

STATUS: ISSUED FOR BID

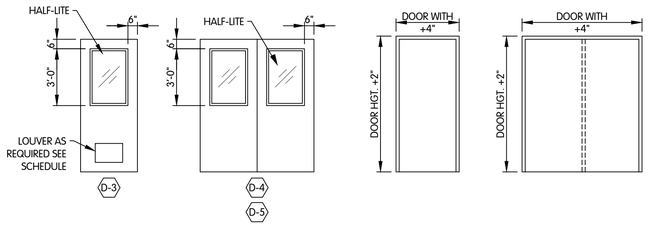
DATE: FEBRUARY 2022

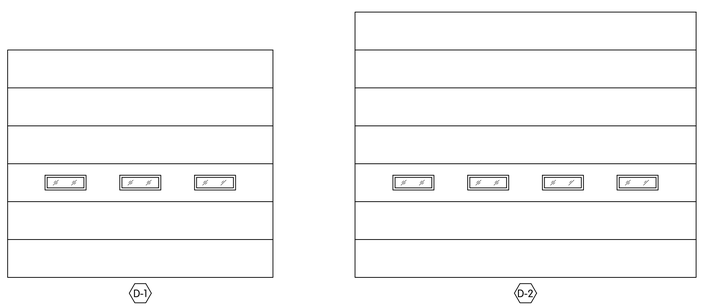
SHEET NO.

A-1

13 of 44

KAL-7725001A01-BLOWER BUILDING ARCHITECTURAL VIEWS
1/27/2022 11:38 AM - SWILLIS
1/28/2022 2:31 PM





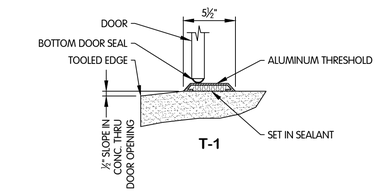
DOOR TYPES

1/4"=1'-0"

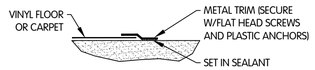
DOOR SCHEDULE

		DOOR					DETAILS					
TAG ID.	QTY.	WIDTH	HEIGHT	THICKNESS	TYPE	MAT.	HEAD	JAMB	THRESH	FRAME MAT.	GLAZING	UL LABEL
D-1	1	14'-0"	12'-0"	2"	ROLL UP	STEEL	H-10	J-10	T-3	GALV. STEEL	N/A	325
D-2	3	18'-0"	14'-0"	2"	OD	STEEL	H-10	J-10	T-3	GALV. STEEL	N/A	325
D-3	1	3'-0"	7'-2"	1 3/4"	HL	ALUMINUM	H-9	J-9	T-1	ALUMINUM	SAFETY	N/A
D-4	3	8'-0"	8'-0"	1 3/4"	HL	ALUMINUM	H-9	J-9	T-1	ALUMINUM	SAFETY	N/A
D-5	2	8'-0"	7'-2"	1 3/4"	HL	ALUMINUM	H-9	J-9	T-1	ALUMINUM	SAFETY	N/A

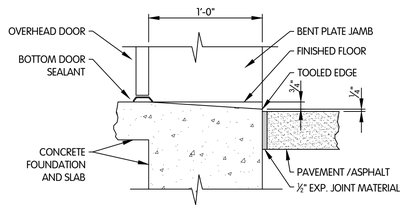
NOTE: HEADER AND JAMB DETAILS FOR PRE-ENGINEERED METAL BUILDING MAY DIFFER THAN SHOWN PER MANUFACTURER DETAILS. IF DETAILS DIFFER CONTRACTOR SHALL FOLLOW DETAILS AS PROVIDED BY BUILDING MANUFACTURER



T-1



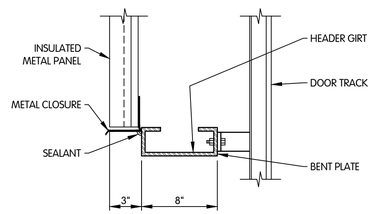
T-2



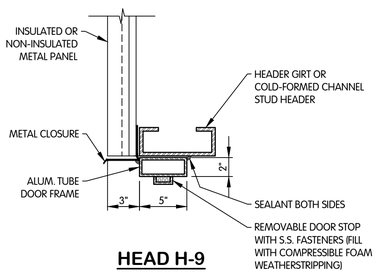
T-3

THRESHOLD TYPES

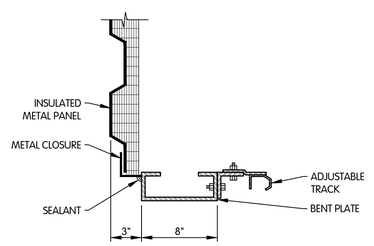
1½"=1'-0"



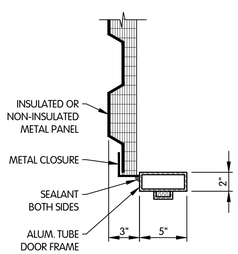
HEAD H-10



HEAD H-9



JAMB J-10



JAMB J-9

JAMB TYPES

1½"=1'-0"

STRUCTURAL DESIGN DATA

BUILDING CODE		2018 MICHIGAN BUILDING CODE
OCCUPANCY CATEGORY		= III
USE GROUP		= F-2
CONSTRUCTION TYPE		= 2-B
FLOOR	LIVE LOAD, UNLESS NOTED OTHERWISE	= 250 PSF
FLAT ROOF	LIVE LOAD	= 20 PSF (MIN.)
	MECHANICAL & ELECTRICAL	= 10 PSF
SNOW	GROUND SNOW LOAD	= P_G = 35 PSF
	FLAT ROOF	= P_f = 32 PSF
	SNOW EXPOSURE FACTOR	= C_e = 1.0
	SNOW LOAD IMPORTANCE FACTOR	= I_s = 1.1
	THERMAL FACTOR	= C_t = 1.0
WIND	BASIC WIND SPEED	= 120 MPH
	WIND EXPOSURE	= C
SEISMIC	SEISMIC IMPORTANCE FACTOR	= IE = 1.25
	SITE CLASS	= D
	SEISMIC DESIGN CATEGORY	= B
	DESIGN SPECTRAL RESPONSE ACCELERATIONS	= S_{DS} = 0.123 S_{D1} = 0.086
	ANALYSIS PROCEDURE	= EQUIVALENT LATERAL FORCE
STAIRS	LIVE LOAD, UNLESS NOTED OTHERWISE	= 100 PSF
GRATING	LIVE LOAD, UNLESS NOTED OTHERWISE	= 100 PSF
PLATFORM	LIVE LOAD, UNLESS NOTED OTHERWISE	= 100 PSF
SOILS	DESIGN BEARING CAPACITY	= 2500 PSF
CONCRETE	DESIGN STRENGTH AT 28 DAY	= 4500 PSI

GENERAL STRUCTURAL NOTES:

1. ALL CONSTRUCTION JOINTS IN WALLS AND BASE SLABS OF STRUCTURES THAT CONTAIN OR CONVEY LIQUIDS, OR CONTAIN EQUIPMENT OR OCCUPANTS, THAT ARE BELOW GRADE OR 100 YEAR FLOOD, SHALL HAVE CONTINUOUS WATERSTOPS TO MAKE THE STRUCTURE WATERTIGHT. JOIN THE WATERSTOPS AT ALL INTERSECTIONS SO THAT A CONTINUOUS SEAL IS PROVIDED. WATERSTOPS SHALL BE SECURED RIGIDLY IN THEIR DESIGN LOCATIONS DURING CONCRETE PLACEMENT. VIBRATE CONCRETE TO CONSOLIDATE IT AROUND THE WATERSTOPS.
2. LAP SPLICES, CONSTRUCTION JOINT DETAILS, WALL CORNER REINFORCEMENT DETAILS, JOINT SEALING DETAILS, SHEAR KEY DETAILS, ETC., UNLESS OTHERWISE SHOWN ON THE DRAWINGS, SHALL ADHERE TO STANDARD STRUCTURAL DETAIL DRAWINGS.
3. THE CONTRACTOR SHALL MAINTAIN ADEQUATE SUPERVISION AND CONTROL OF DEWATERING OPERATIONS TO ENSURE THAT STABILITY OF EXCAVATED AND CONSTRUCTED SLOPES ARE NOT ADVERSELY AFFECTED BY INFLOW OF GROUNDWATER AND TO PERMIT PLACEMENT AND CURING OF CONCRETE UNDER CONTROLLED ENVIRONMENTS.
4. CONCRETE MAT AND WALL CONSTRUCTION JOINTS SHALL NOT BE SPACED MORE THAN 60 FEET APART, UNLESS NOTED OTHERWISE. WHEN CONSTRUCTION JOINT SPACING EXCEEDS 25 FEET THE PLACEMENT OF CONCRETE SECTIONS SHALL BE ALTERNATED TO ALLOW ADJACENT SECTIONS TO BE PLACED AT LEAST 48 HOURS APART. THIS ALLOWS FOR SHRINKAGE TO OCCUR IN A SECTION PRIOR TO THE PLACEMENT OF ITS ADJACENT SECTIONS. HORIZONTAL REINFORCEMENT SPLICES SHALL BE LOCATED IN THE ADJACENT SECTION THAT WILL BE PLACED AT LEAST 48 HOURS LATER TO ALLOW FOR UNRESTRAINED SHRINKAGE TO OCCUR BETWEEN PLACED SECTIONS. JOINT TYPES AND LOCATION PLANS SHALL BE SUBMITTED WITH REBAR SHOP DRAWINGS FOR ENGINEER'S REVIEW.
5. BACKFILL SHALL NOT BE PLACED AGAINST CONCRETE TANK OR RETAINING WALLS PRIOR TO PLACEMENT OF TOP SLAB AND ADJACENT WALLS, AND SHALL NOT BE BACKFILLED PRIOR TO 28 DAYS AFTER PLACEMENT, UNLESS IT IS DEMONSTRATED THAT FIELD CURED TEST SPECIMENS HAVE REACHED THE CONCRETE DESIGN STRENGTH, OR CONTRACTOR INSTALLS ADEQUATE SHORING. SHORING SHALL BE THE CONTRACTORS RESPONSIBILITY AND INSTALLED AT NO COST TO OWNER.
6. THE BACKFILL UNDERNEATH BASE SLABS AND FOOTINGS SHALL BE SPECIAL BACKFILL, UNLESS OTHERWISE APPROVED, IN ACCORDANCE WITH THE SPECIFICATIONS AND SHALL BE WELL COMPACTED TO NOT LESS THAN 100% MAXIMUM DRY DENSITY IN ACCORDANCE WITH THE STANDARD PROCTOR TEST ASTM D-698 AND SPECIFICATION 02200.
7. WHEREVER REINFORCEMENT REQUIREMENTS FOR STRUCTURAL COMPONENTS (BEAMS, SLABS, WALLS, ETC.) DON'T AGREE AMONG DIFFERENT SECTIONS, THE MOST CONSERVATIVE REQUIREMENT AMONG THEM WILL GOVERN, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
8. IF NOT OTHERWISE SHOWN OR SPECIFIED ALL WALL VERTICAL REINFORCING SHALL BE DOWELED INTO BASE MATS, ALL WALL HORIZONTAL REINFORCING SHALL BE DOWELED WITH EITHER INTERSECTION OR CORNER BARS TO ADJACENT WALLS, AND ALL SLAB HORIZONTAL REINFORCING SHALL BE DOWELED INTO ADJACENT WALLS, WITH REINFORCING THAT MATCHES THE GIVEN REINFORCEMENT. IF NOT OTHERWISE SHOWN OR SPECIFIED, CONCRETE SECTIONS SHALL BE HORIZONTALLY AND VERTICALLY REINFORCED WITH #5 BARS AT 12" C/C, EACH WAY AND EACH FACE.
9. WHENEVER THICKNESSES OF STRUCTURAL COMPONENTS (WALLS, SLABS, BEAMS, ETC.) DON'T AGREE AMONG DIFFERENT SECTIONS, THE THICKEST SECTION AMONG THEM THEN SHALL GOVERN, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
10. VERIFY ALL EXISTING DIMENSIONS, ELEVATIONS AND CONDITIONS AT INTERFACE BETWEEN EXISTING & NEW CONSTRUCTION BEFORE STARTING TO FABRICATE STRUCTURAL STEEL OR DETAILING REBARS. NOTIFY THE ENGINEER OF ANY DISCREPANCIES FOR RESOLUTION.
11. DURING CONSTRUCTION OF NEW STRUCTURES OR STRUCTURAL ELEMENTS, PREVENT UNDERMINING THE FOUNDATIONS OF NEARBY EXISTING STRUCTURES BY SHEET PILING OR BY UNDERPINNING AS REQUIRED. TAKE ALL NECESSARY PROTECTIVE MEASURES TO PREVENT DAMAGE TO THE EXISTING STRUCTURES. CAREFULLY MONITOR THE SETTLEMENT OF EXISTING STRUCTURES DURING SHEET PILING OR UNDERPINNING OPERATIONS. CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF SHEET PILING OR UNDERPINNING OPERATIONS & SHALL SUBMIT THIS PROCEDURE TO THE ENGINEER FOR REVIEW.
12. THE CONTRACTOR SHALL ENSURE THAT FOUNDATIONS REST ON FIRM MATERIAL OVER THEIR ENTIRE AREA. THE TESTING LAB SHALL VERIFY THAT A SOIL BEARING CAPACITY OF THAT LISTED BY THE "STRUCTURAL DESIGN DATA" TABLE IS OBTAINED. THE BEARING CAPACITY VERIFICATION IS REQUIRED AT REGULAR INTERVALS IN EACH DIRECTION. NOTIFY THE ENGINEER OF ANY UNSUITABLE SOIL ENCOUNTERED. SUCH SOIL SHALL BE REMOVED AND REPLACED WITH COMPACTED SPECIAL BACKFILL AS DIRECTED BY THE ENGINEER.
13. ALL TREATED WOOD SHALL BE SECURED WITH STAINLESS STEEL OR HOT DIP GALVANIZED FASTENERS.
14. WHERE SAW CUTTING CONCRETE LEAVES SURFACE EXPOSED IN OR ABOVE LIQUID CONTAINING OR CONVEYING STRUCTURES, OR WHERE SPECIFICALLY CALLED FOR ELSEWHERE, APPLY " SIKA ARMATEC 110 EPOCEM" TO EXPOSED REINFORCING. THEN APPLY "SIKATOP 121 PLUS" OR " SIKATOP 122 PLUS" TO LEVEL THE SURFACE. THEN APPLY TWO COATS OF "SIKA GUARD 62" (20 MILS EACH) PROTECTIVE COATING. APPLICATIONS SHALL BE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS. USE THESE PRODUCTS OR ENGINEER APPROVED EQUAL.
15. ALL RAILING SYSTEMS SHALL BE ALUMINUM, UNLESS NOTED OTHERWISE.
16. CHAMFER STRIPS SHALL BE PLACED IN CORNERS OF FORMS AND AT ALL EXPOSED EDGES TO PRODUCE A BEVELED EDGE ON PERMANENTLY EXPOSED SURFACES. CHAMFERS SHALL BE ¾ - INCH OR AS NOTED ON DRAWINGS. CHAMFER STRIPS SHALL BE WOOD, METAL, PVC, OR RUBBER AND SHALL BE FABRICATED AND INSTALLED TO PRODUCE UNIFORMLY SMOOTH AND STRAIGHT LINES. CHAMFER STRIPS SHALL BE MITERED AT CHANGES IN DIRECTION.
17. PATCH ALL VISIBLE CONCRETE THAT GETS DAMAGED, CREATES LARGE DEPRESSIONS OR UNEVEN SURFACES FROM THE REMOVAL OF EXISTING BUILDING ELEMENTS, EQUIPMENT, EQUIPMENT BASES OR UTILITIES PER THE CONCRETE RESTORATION SPECIFICATIONS 03710, UNLESS NOTED OTHERWISE. PATCH SMALL ANCHOR HOLES FROM REMOVED EQUIPMENT OR UTILITIES WITH NON-SHRINK GROUT, UNLESS NOTED OTHERWISE.
18. CONTRACTOR SHALL ADD CONCRETE REINFORCEMENT DOWEL BAR REPLACEMENTS (DBR'S) WHERE REQUIRED TO FACILITATE CONSTRUCTION. LOCATION OF DBR'S REQUIRE ENGINEER'S APPROVAL.

THE CITY OF Kalamazoo

STRUCTURAL
DESIGN DATA, GENERAL NOTES & DOOR DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	BY
1	REVISIONS AFTER ISSUED FOR BID	

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
KDB	CJAF	AJD

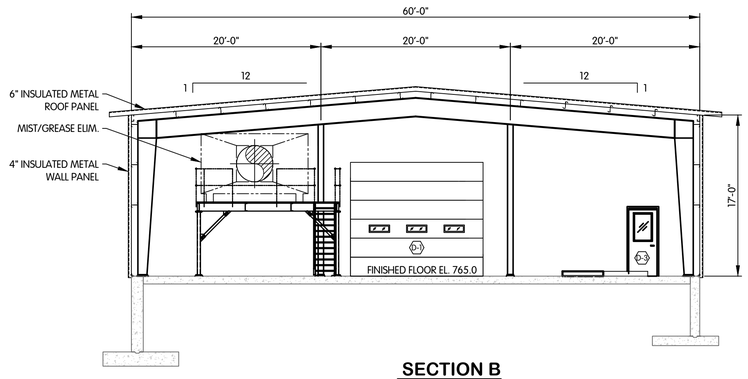
STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

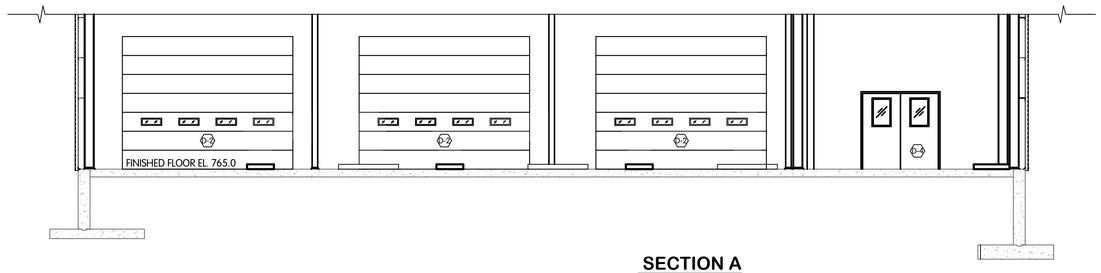
SHEET NO.
S-1
14 OF 44

KAL-7725001S01A-STRUCTURAL DESIGN DATA GENERAL NOTES & DOOR DETAILS
2/28/2022 2:31 PM - SWILLIS

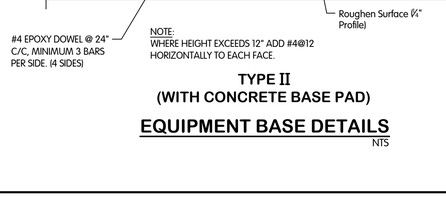
NOTE:
1. MECHANICAL AND ELECTRICAL ROOMS SHALL BE FULL HEIGHT 6" METAL STUD WALLS WITH METAL SIDING PANEL. BLOCKING SHALL BE ADDED AS REQUIRED TO MOUNT EQUIPMENT.
2. ADDITIONAL BUILDING FRAMING SHALL BE INSTALLED, AS REQUIRED, TO SUPPORT MECHANICAL AND ELECTRICAL EQUIPMENT ON WALLS AND AT WALL PENETRATIONS.
3. PIPE BOLLARDS W/ COVERS SHALL BE INSTALLED AT EACH SIDE OF OVERHEAD DOORS ON NORTH SIDE OF BUILDING. (2) BOLLARDS PER DOOR TYP.
4. DOCK BUMPERS SHALL BE INSTALLED ON WEST SIDE OVERHEAD DOOR.



SECTION B

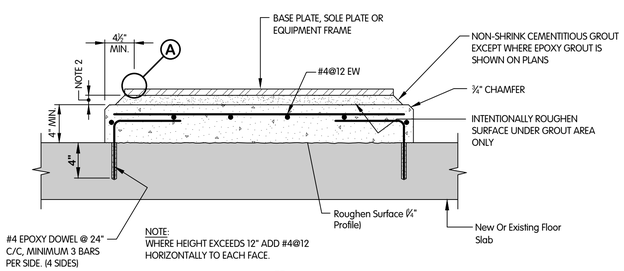


SECTION A



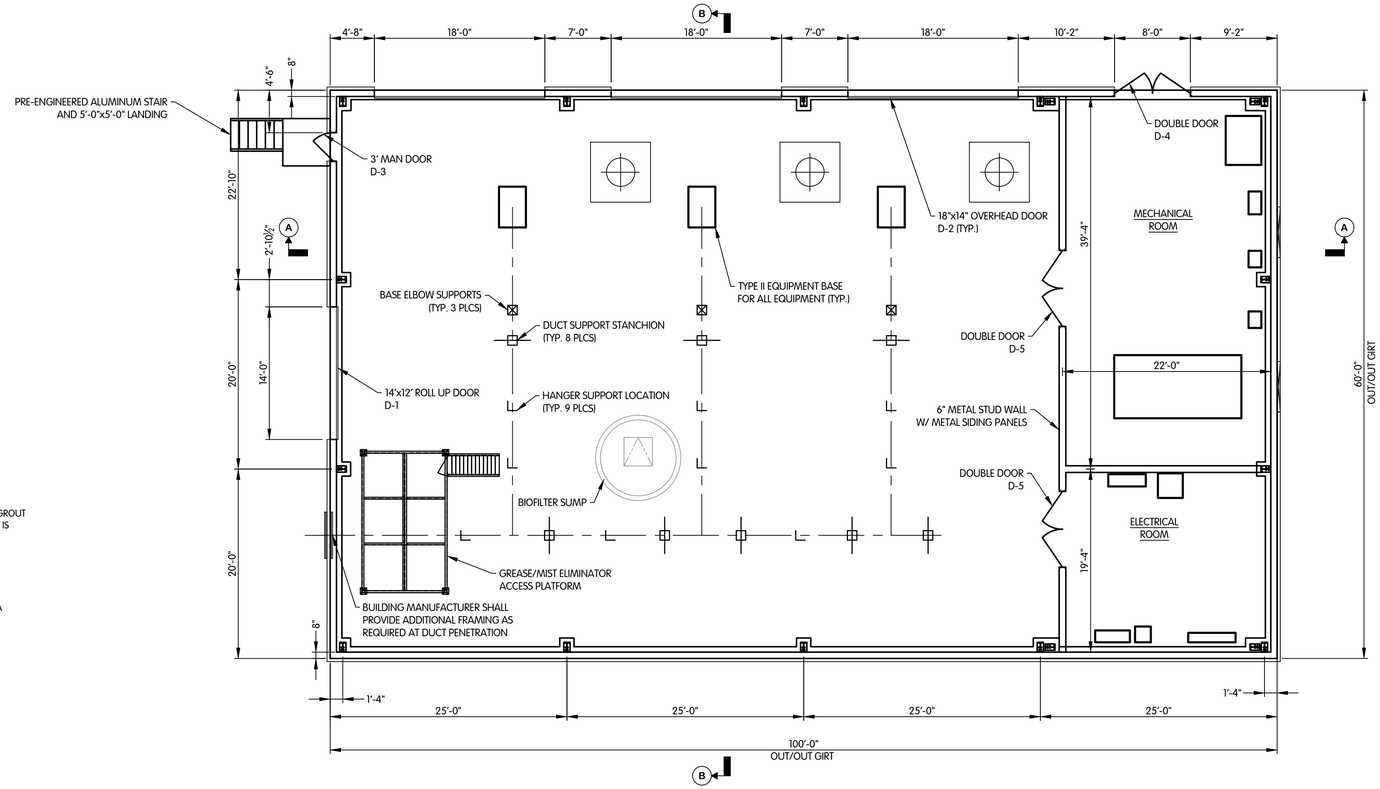
DETAIL A
(TYPICAL) NTS

EQUIPMENT BASE NOTES:
1. CONCRETE BASE PAD DIMENSIONS SHALL BE 4" LARGER THAN FURNISHED EQUIPMENT BASE ON ALL SIDES, UNLESS NOTED OTHERWISE.
2. GROUT THICKNESS UNDER EQUIPMENT BASES SHALL BE AS FOLLOWS:
   A). 3" MAX. UNLESS NOTED OTHERWISE.
   B). 1" MIN. FOR NON-SHRINK CEMENTITIOUS GROUT, U.N.O.
   C). 2" MIN. FOR EPOXY GROUT, U.N.O.
3. WHEN BASE IS ON ELEVATED SLAB THE SLAB BARS SHALL NOT BE CUT. USE REBAR FINDER EQUIPMENT TO LOCATE BARS AND ADJUST ANCHORAGE LOCATIONS TO MISS FLOOR BARS.



TYPE II
(WITH CONCRETE BASE PAD)

EQUIPMENT BASE DETAILS
NTS



N

THE CITY OF Kalamazoo

BLOWER BUILDING
STRUCTURE PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	BY
1	REVISIONS AFTER ISSUED FOR BID	

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO.	017-7725.001
SCALE	1/8" = 1'-0"
	THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
KDB	CJAF	AJD

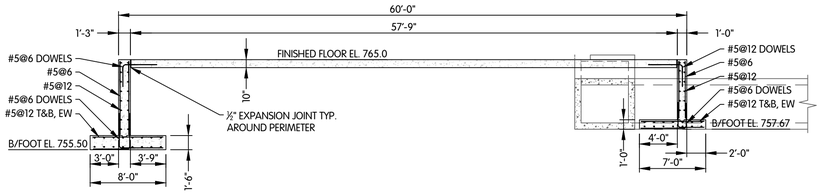
STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

SHEET NO.
S-2
15 OF 44

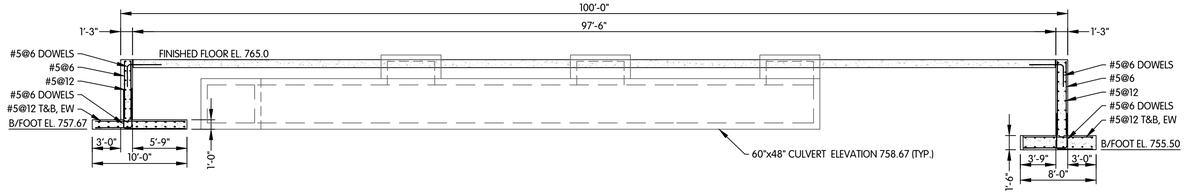
KAL-7725001SH-BLOWER BUILDING STRUCTURE PLAN
1/28/2022 2:31 PM - SWILLIS

BLOWER BUILDING STRUCTURAL REINFORCING NOTES:

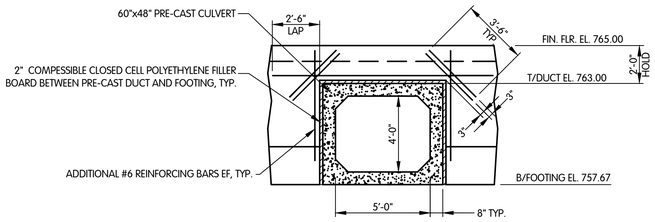
1. BUILDING SLAB SHALL BE 10" SLAB WITH #6 BARS @ 12" TOP AND BOTTOM, EACH WAY.
2. ALL FOOTINGS AND SLABS SHALL BE POURED ON 8" MIN. COMPACTED SPECIAL BACKFILL.
3. ALL BARS SHALL INCLUDE MATCHING DOWELS AND CORNER BARS.
4. ADDITIONAL REINFORCEMENT WILL BE REQUIRED AT ALL WALL AND SLAB OPENINGS.
5. COLUMN PIERS SHALL HAVE #4 TIES @ 10" TYP. WITH TOP (4) TIES @ 3".
6. ALL COLUMN PIERS SHALL HAVE TYPICAL ADDITIONAL PIER REINFORCING, SEE DETAIL.



SECTION B



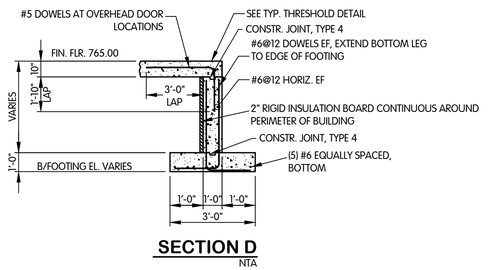
SECTION A



SECTION C

1/4" = 1'-0"

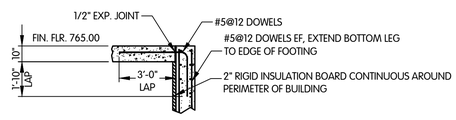
NOTE: BUILDING SLAB REINFORCING NOT SHOWN FOR CLARITY



SECTION D

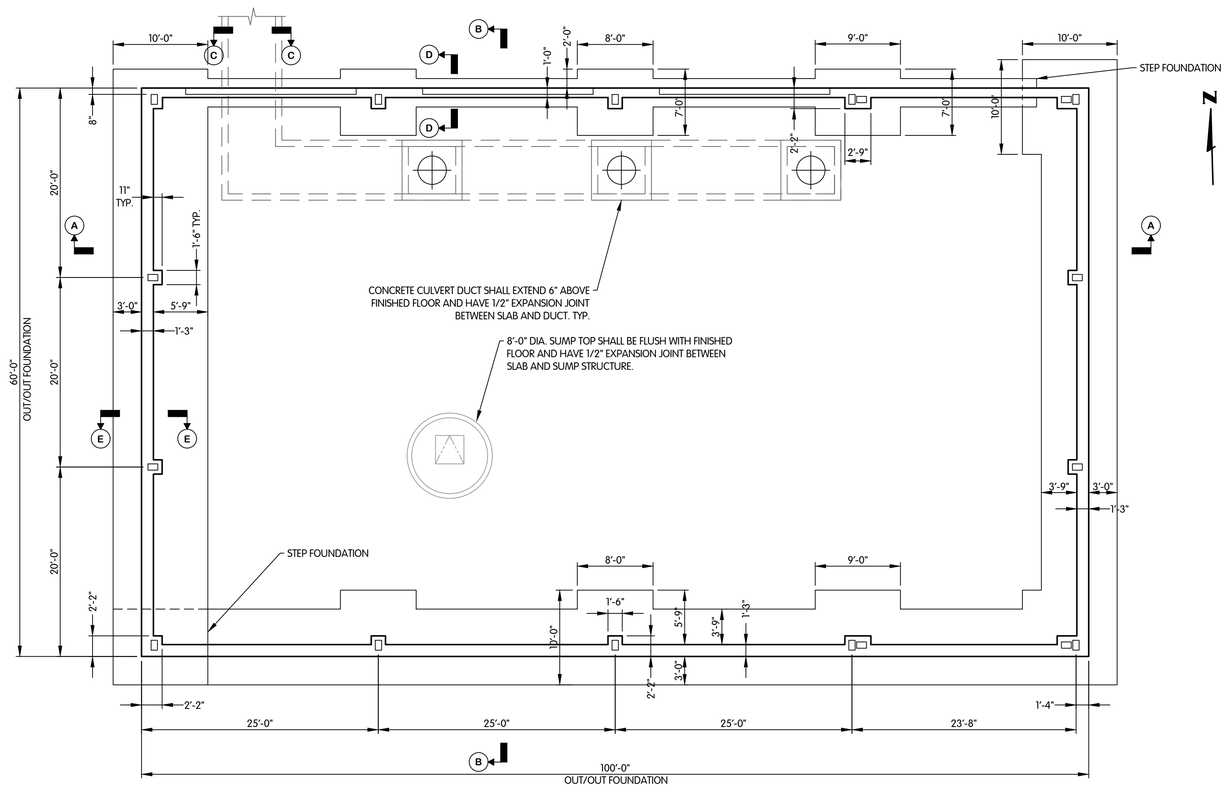
NTA

NOTE: BUILDING SLAB REINFORCING NOT SHOWN FOR CLARITY



SECTION E

1/4" = 1'-0"



THE CITY OF Kalamazoo

BLOWER BUILDING FOUNDATION PLAN & DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	BY
5		
4		
3		
2		
1	REVISIONS AFTER ISSUED FOR BID	

Jones & Henry Engineers, Ltd.

Fluid thinking©.
www.JHeng.com

JOB NO.	017-7725.001
SCALE	1/8" = 1'-0"

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
KDB	CJAF	AJD

STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

SHEET NO.

S-3

16 OF 44

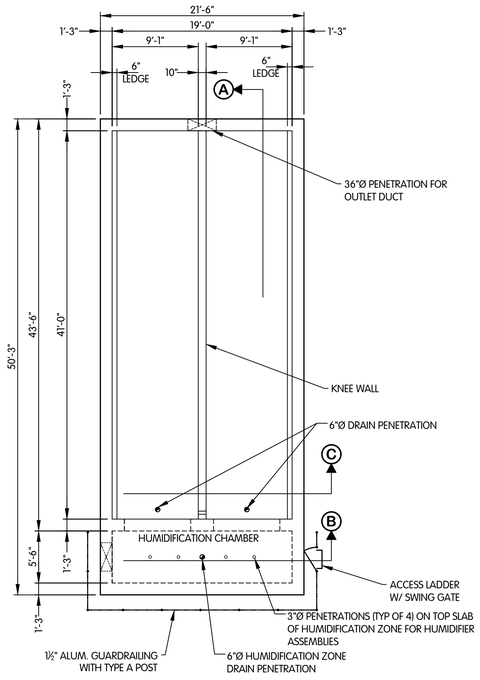
KAL-77250ISI02-BLOWER BUILDING FOUNDATION PLAN & DETAILS
1/27/2022 10:44 - SWILLIS
1/27/2022 2:31 PM

GENERAL BIOBED NOTES:

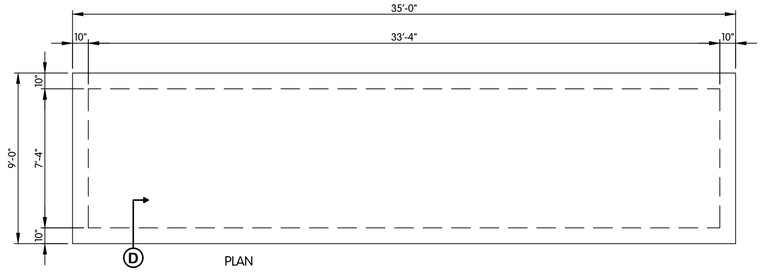
1. REFER TO PROJECT PLANS FOR ACTUAL ORIENTATION, QUANTITY AND LOCATION.
2. CONTRACTOR TO SUPPLY AND INSTALL ALL EMBEDDED ITEMS AS REQUIRED FOR ALL PLUMBING, DUCTING, AND ELECTRICAL COMPONENTS, UNLESS NOTED OTHERWISE.
3. AIR TIGHT MAN DOOR CAST IN CONCRETE, 18" ABOVE FLOOR SURFACE AS SHOWN.
4. BIOBED COVER SHALL BE ANCHORED AND SEALED TO BIOBED STRUCTURE AS OUTLINED BY COVER MANUFACTURER.
5. ALL FOOTINGS AND SLABS SHALL BE POURED ON 8" MINIMUM COMPACTED SPECIAL BACKFILL.

BIOBED STRUCTURE REINFORCING NOTES:

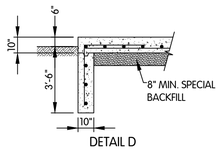
1. TANK WALLS SHALL BE REINFORCED WITH #7 BARS @ 6" EACH WAY AND EACH FACE.
2. TANK SLAB SHALL BE REINFORCED WITH #7 BARS @ 6" EACH WAY AND EACH FACE.
3. HUMIDIFICATION CHAMBER TOP SLAB SHALL BE REINFORCED WITH #7 BARS @ 12" EACH WAY AND EACH FACE.
4. ALL BARS SHALL INCLUDE MATCHING DOWELS AND CORNER BARS.
5. ADDITIONAL REINFORCEMENT WILL BE REQUIRED AT ALL WALL AND SLAB OPENINGS.
6. WATERSTOPS SHALL BE INCLUDED AT EACH CONSTRUCTION AND CONTROL JOINT AND WHERE SPECIFIED BY FINAL DESIGN.



PLAN



PLAN

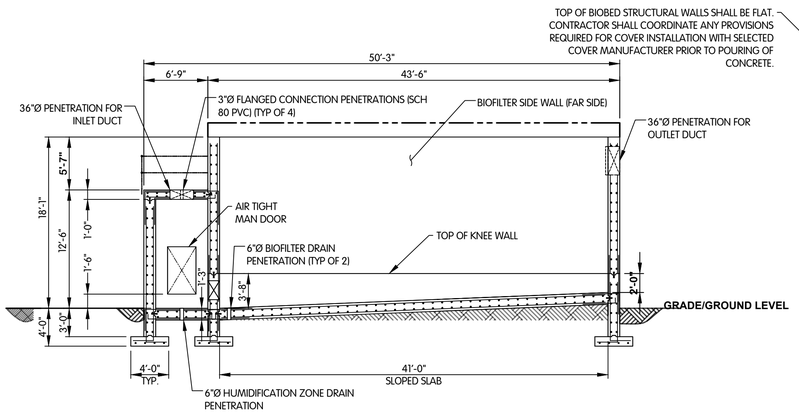


DETAIL D

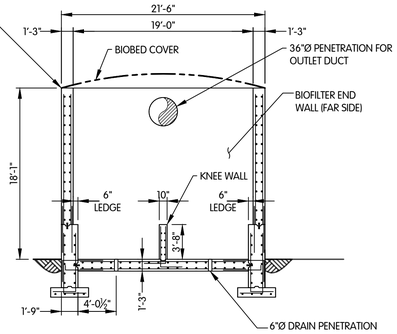
NOTE:
PAD DIMENSIONS ARE MINIMUM AND MUST BE VERIFIED WITH EQUIPMENT SUPPLIED PRIOR TO CONSTRUCTION. PAD SHALL BE MINIMUM 12" LARGER THAN EQUIPMENT BASE ON ALL SIDES.

CARBON SCRUBBER PAD DETAIL

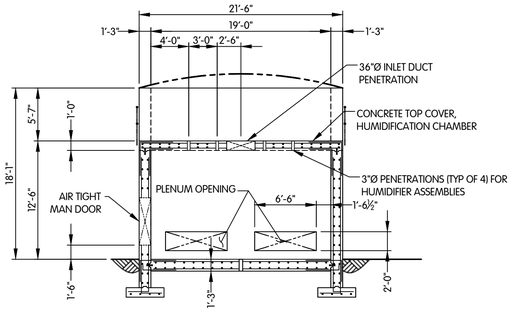
1/4" = 1'-0"



SECTION A



SECTION C



SECTION B
HUMIDIFICATION CHAMBER

BIOFILTER DETAILS

1/8" = 1'-0"

KAL-7725001S03-BIOFILTER & CARBON SCRUBBER PAD STRUCTURAL DETAILS
1/28/2022 2:51 PM - SWILLIS

THE CITY OF Kalamazoo

BIOFILTER & CARBON SCRUBBER PAD STRUCTURAL DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
6			
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
KDB	CJAF	AJD

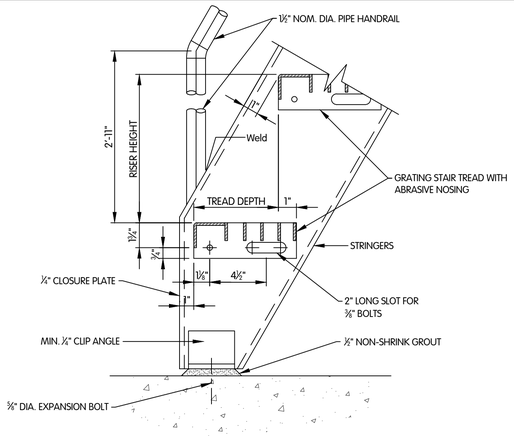
STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

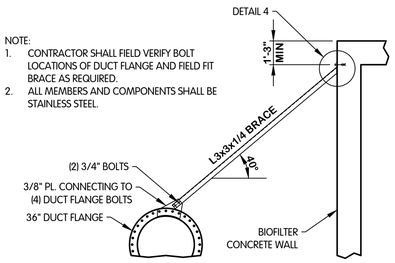
SHEET NO.

S-4

17 OF 44

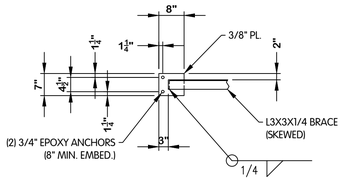


SHIP LADDER DETAIL
NTS

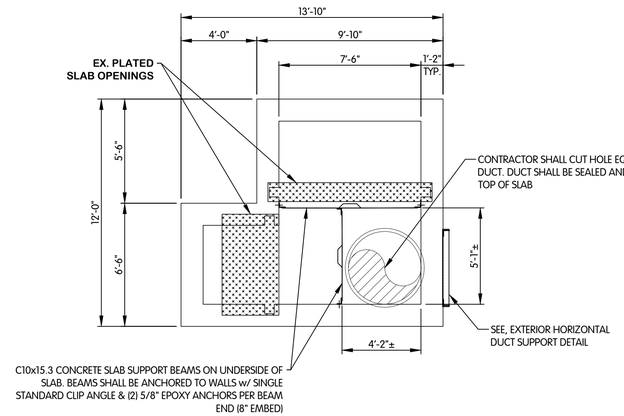


NOTE:
1. CONTRACTOR SHALL FIELD VERIFY BOLT LOCATIONS OF DUCT FLANGE AND FIELD FIT BRACE AS REQUIRED.
2. ALL MEMBERS AND COMPONENTS SHALL BE STAINLESS STEEL.

TYP. 36" DUCT BRACE SUPPORT DETAIL
1/4"=1'-0"

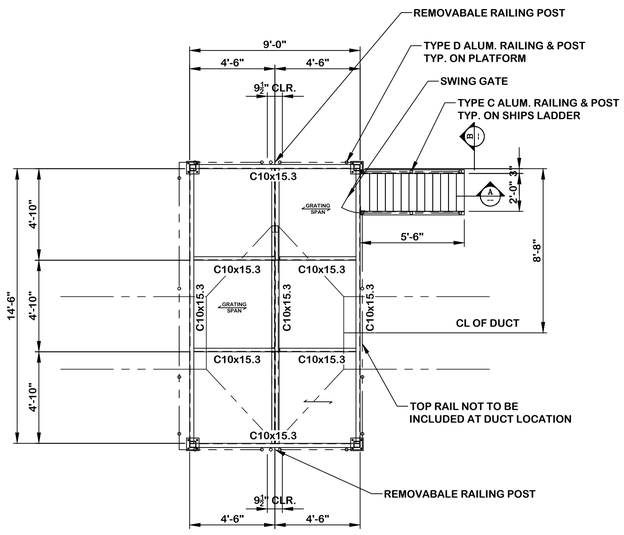


DETAIL 4
1/2"=1'-0"



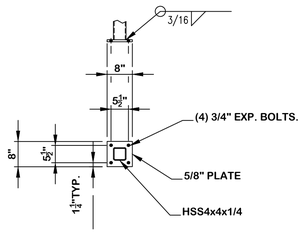
DIVERSION CHAMBER SLAB SHORING
NTS

NOTE:
1. CONTRACTOR SHALL EVALUATE INTERIOR CONDITIONS OF CHAMBER ESPECIALLY AT BEAM ANCHORAGE LOCATION AND HOLE CORE LOCATION PRIOR TO WORK. IF CRACKS OR QUESTIONABLE CONDITIONS ARE OBSERVED CONTACT ENGINEER AND DO NOT PROCEED UNTIL DIRECTION IS GIVEN.
2. ALL STEEL COMPONENTS INSIDE CHAMBER SHALL BE 316 S.S. U.N.O.
3. CONTRACTOR SHALL FIELD LOCATE DUCT PENETRATION LOCATION AS CLOSE TO SOUTH EAST CORNER OF CHAMBER AS REASONABLE.

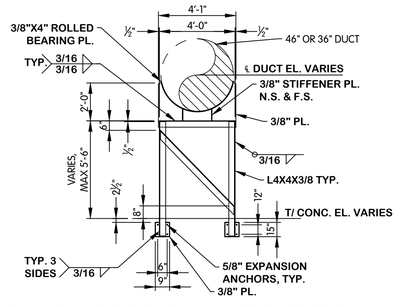


GREASE & MIST ELIMINATOR PLATFORM PLAN
1/4"=1'-0"

NOTE: CONTRACTOR SHALL FIELD VERIFY PLATFORM ELEVATION WITH SELECTED GREASE/MIST ELIMINATOR DIMENSIONS TO ENSURE EQUIPMENT REST ON GRATING. GROUT PADS BELOW COLUMNS CAN BE VARIED BUT SHALL BE BETWEEN 1/2" AND 1 1/2" THICK.

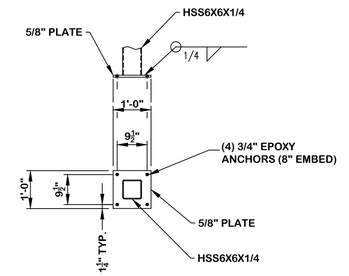


DETAIL 1
1/2"=1'-0"

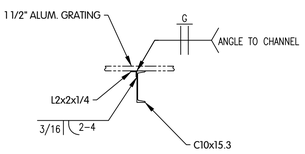


EXTERIOR HORIZONTAL DUCT SUPPORT DETAIL
NTS

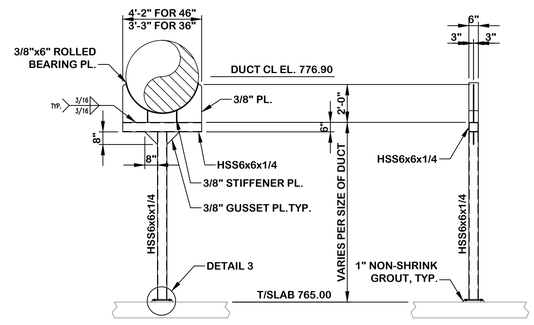
NOTE:
1. CONTRACTOR SHALL FIELD VERIFY DUCT AND SLAB ELEVATION
2. ALL MATERIALS AND COMPONENTS SHALL BE GALV. STEEL.



DETAIL 3
1/2"=1'-0"

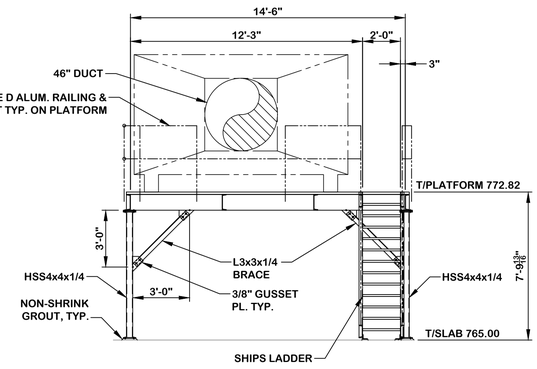


DETAIL 2
1/2"=1'-0"



NOTE: STANCHION SUPPORTS SHALL NOT BE SPACED MORE THAN 8'-0" APART UNLESS SPECIFICALLY NOTED OTHERWISE. WHERE A GREATER SPAN BETWEEN SUPPORTS IS DESIRED A HANGER CAN BE USED IN PLACE OF THE STANCHION. IF THIS DONE STANCHION SUPPORTS SHALL NOT EXCEED 16'-0" SPACING. ADDITIONAL HEADER STEEL MAYBE REQUIRED FOR HANGER MOUNTING.

TYPICAL DUCT SUPPORT STANCHION
1/4"=1'-0"



SECTION A
1/4"=1'-0"

SECTION B
1/4"=1'-0"

KAL-772500\S00-GREASE MIST ELIMINATOR PLATFORM & STRUCTURAL DETAILS
1/28/2022 2:31 PM - SWILLIS

THE CITY OF Kalamazoo

GREASE MIST ELIMINATOR PLATFORM & STRUCTURAL DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	BY
5		
4		
3		
2		
1	REVISIONS AFTER ISSUED FOR BID	

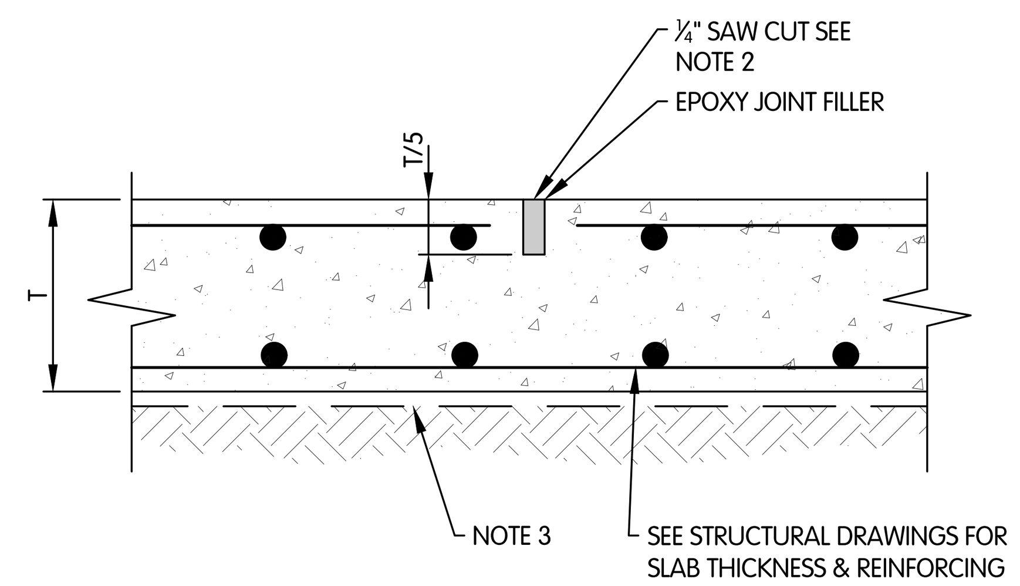
Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001
SCALE 1/4" = 1'-0"
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

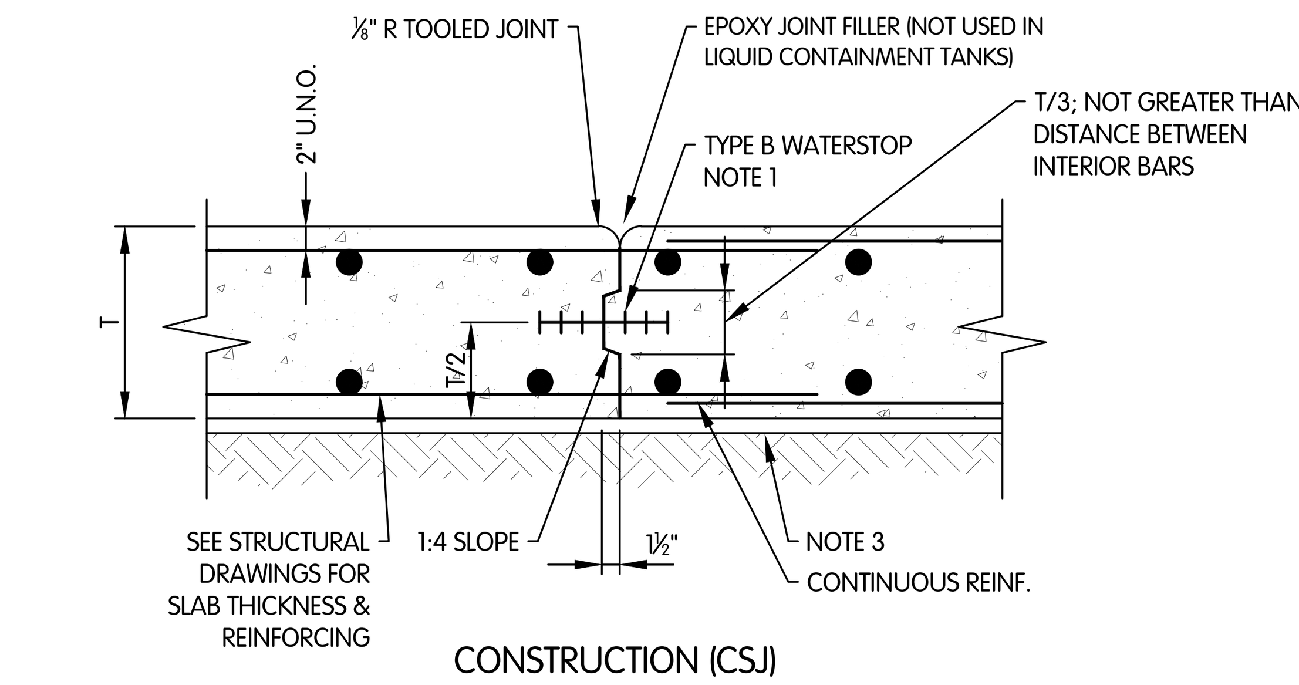
DESIGNED	DRAWN	CHECKED
KDB	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

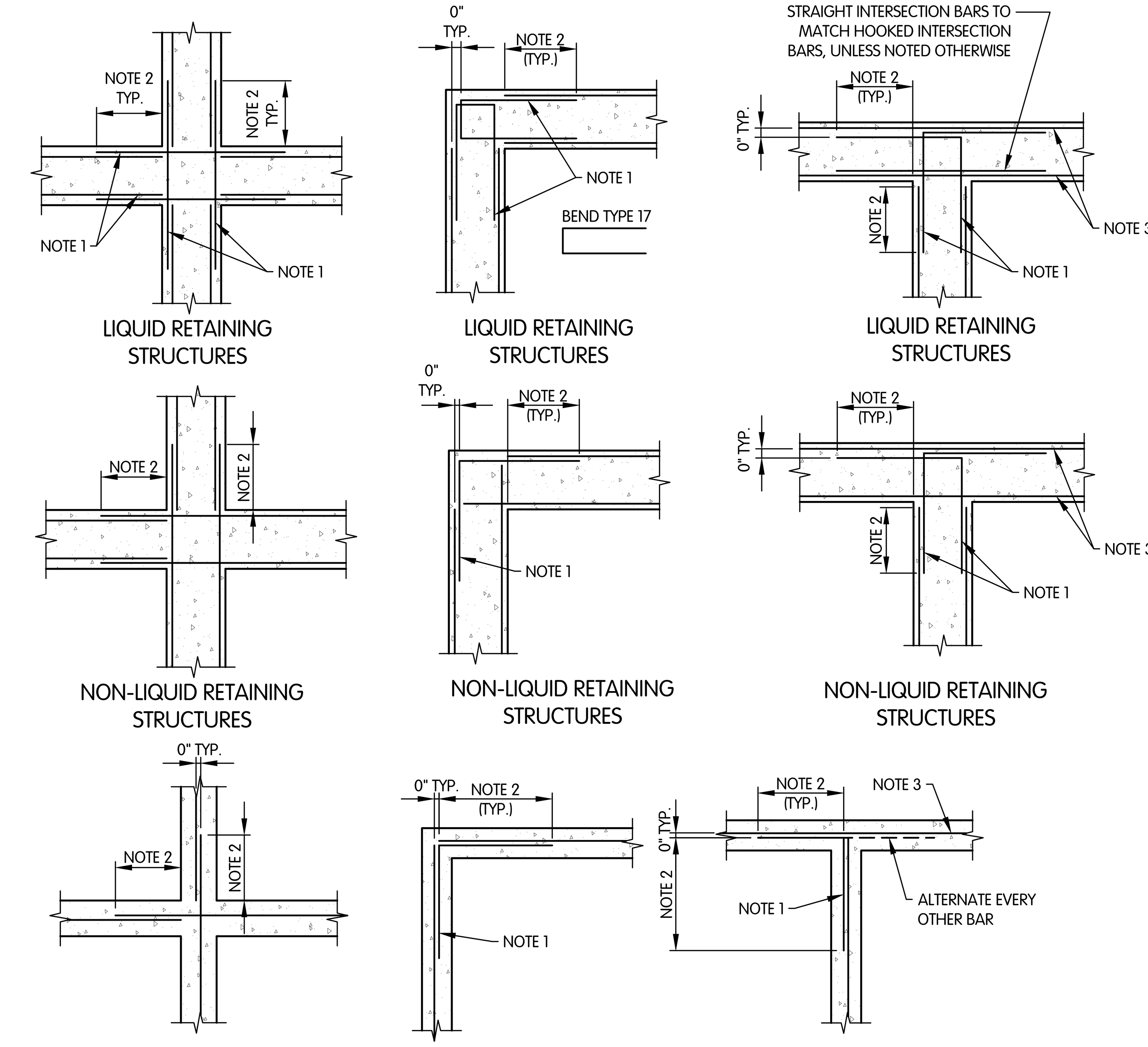
SHEET NO.
S-5
18 OF 44



CONTROL JOINT (CJ)



CONSTRUCTION (CSJ)



WALL HORIZONTAL DOWEL REINFORCEMENT NOTES:

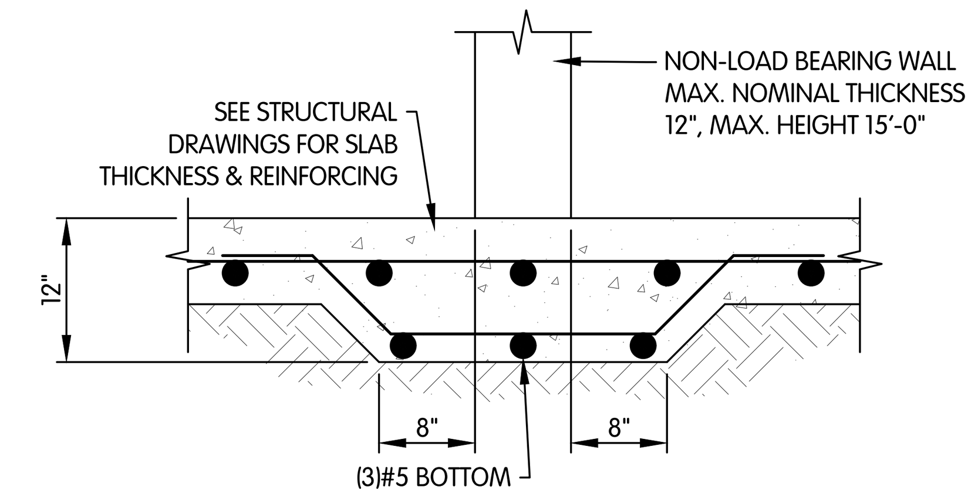
1. SAME SIZE AND SPACING AS HORIZONTAL REINFORCEMENT, UNLESS NOTED OTHERWISE.
2. ALL DOWEL LEG LENGTHS SHALL EQUAL THE LAP LENGTH FOR TOP BARS, UNLESS NOTED OTHERWISE.
3. CONTINUE HORIZONTAL BARS ACROSS WALL INTERSECTION. LAP ON EITHER SIDE OF WALL INTERSECTION PASSED THE DOWEL BAR LAPS.

TYPICAL CONCRETE WALL CORNER AND INTERSECTION HORIZONTAL REINFORCEMENT DETAILS

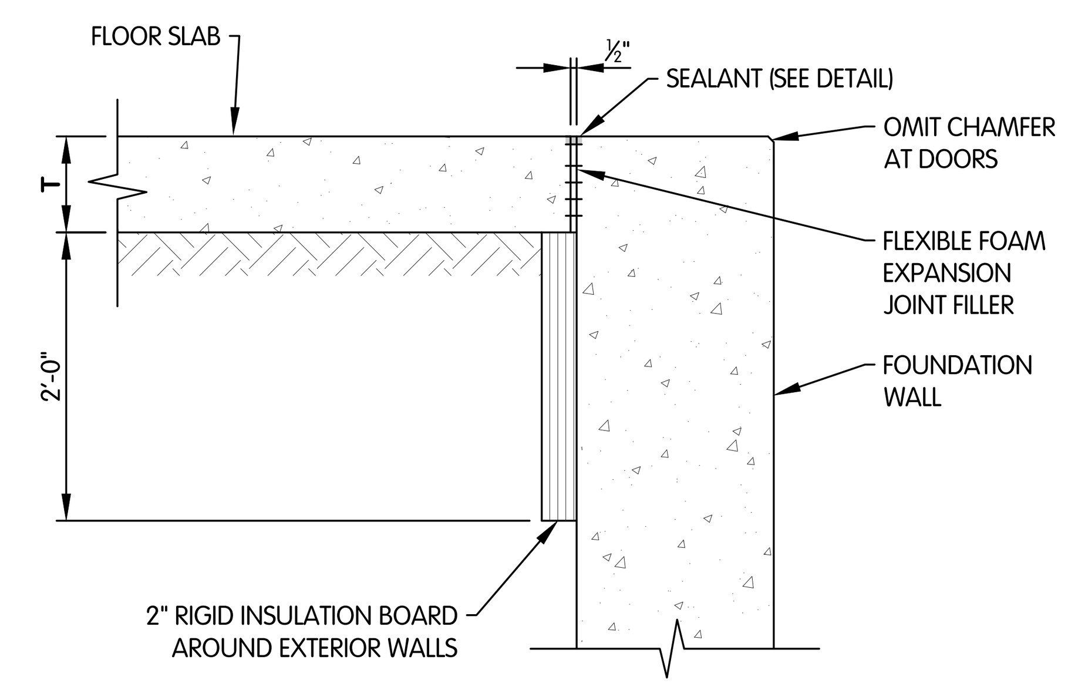
NTS

TYPICAL CONCRETE COVER	
CONCRETE CAST AGAINST EXPOSED EARTH	3"
SURFACE EXPOSED TO EARTH OR WEATHER	2"
SURFACE EXPOSED TO OR OVER WATER, SEWAGE, OR OTHER LIQUIDS	
SLABS, WALLS, JOISTS:	2"
BEAMS, COLUMNS	
PRIMARY REINFORCEMENT:	2½"
STIRRUPS AND TIES:	2"
OTHER SURFACES	
SLABS, WALLS, JOISTS:	1"
BEAMS, COLUMNS	
PRIMARY REINFORCEMENT:	2"
STIRRUPS AND TIES:	1½"

NT DETAILS
RE SHOWN ON DRAWINGS OR SPECIFIED.
IQUID CONTAINMENT TANKS, UNLESS NOTED OTHERWISE.
CES PER SPEC. 03300.



THICKENED SLAB AT WALLS



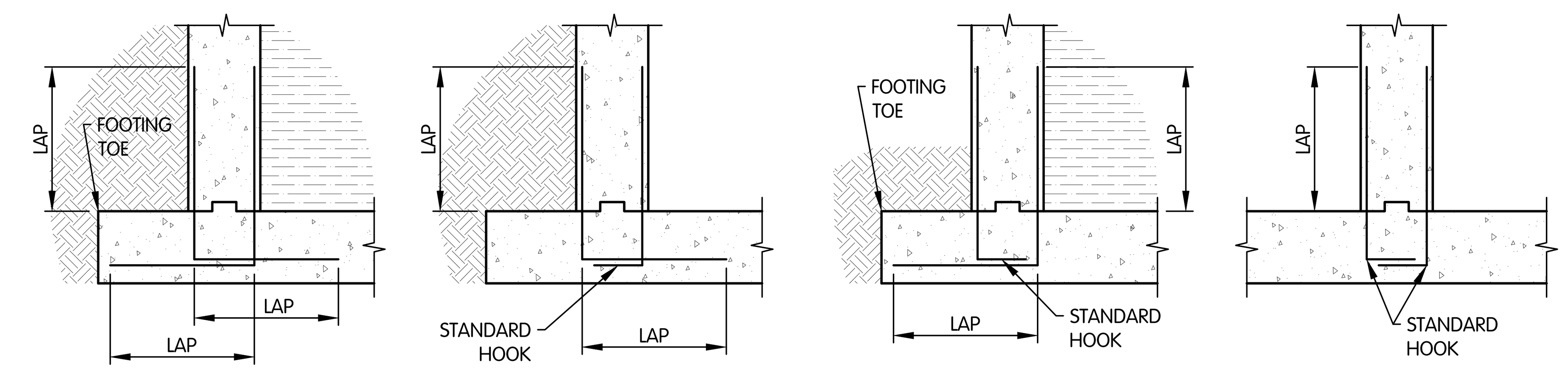
PERIMETER ISOLATION JOINT

LAP SPLICE LENGTH (IN.)

UNLESS SHOWN OTHERWISE

BAR SIZE	CLEAR COVER 2" OR MORE		CLEAR COVER LESS THAN 2"	
	TOP REINFORCEMENT	BOTTOM AND VERTICAL REINFORCEMENT	TOP REINFORCEMENT	BOTTOM AND VERTICAL REINFORCEMENT
#3	18	16	18	16
#4	24	19	24	19
#5	30	23	30	23
#6	36	28	40	31
#7	42	33	54	42
#8	51	39	71	55

NOTE:
TOP REINFORCEMENT IS DEFINED AS HORIZONTAL REINFORCEMENT WITH MORE THAN 12" OF FRESH CONCRETE CAST BENEATH THE BAR. HORIZONTAL BARS IN WALLS SHALL BE CONSIDERED AS TOP REINFORCEMENT.



CONDITION 1
SOIL OR WATER ON BOTH SIDES GREATER THAN 48"

CONDITION 2
SOIL OUTSIDE, LESS THAN 48" OF WATER INSIDE

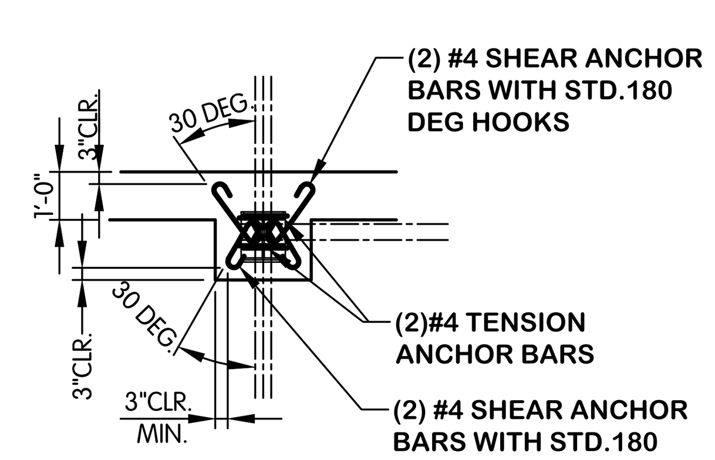
CONDITION 3
WATER INSIDE, LESS THAN 48" OF SOIL OUTSIDE

CONDITION 4
NO WATER OR SOIL

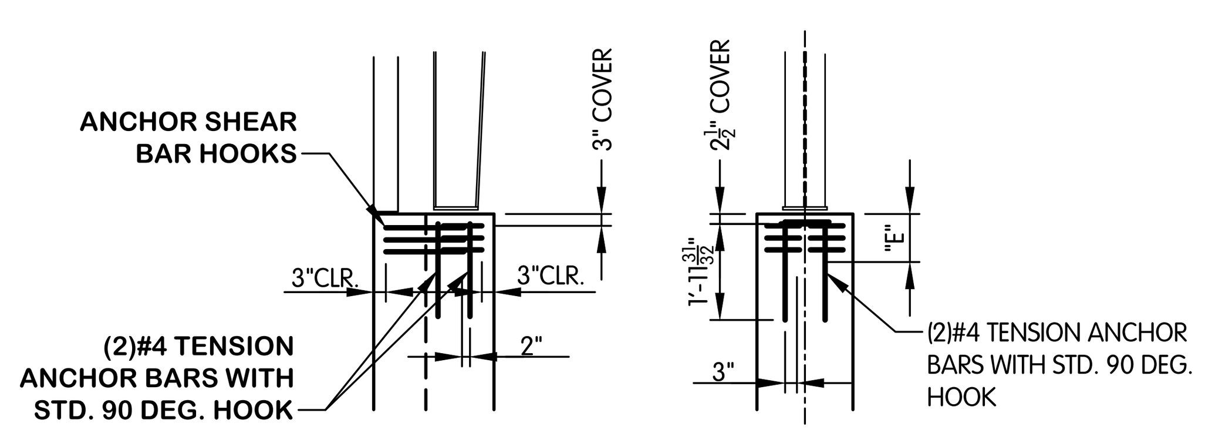
NOTES:
1. WHERE LAP LENGTH HOOK IS INDICATED AND SLAB TOE LENGTH IS NOT LONG ENOUGH FOR LAP HOOK, REDUCE HOOK LENGTH TO TOE LENGTH MINUS 2" COVER.

STANDARD CONCRETE WALL REINFORCEMENT DOWELS TO BASE SLAB

NTS



PIER PLAN



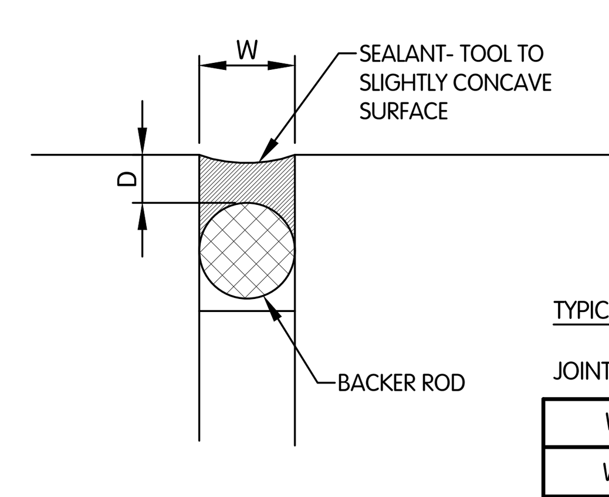
SECTION A

SECTION B

NOTES:
1. PLACE SHEAR ANCHOR BARS SO THAT THE INTERIOR HOOK IS TOUCHING THE COLUMN ANCHORS AS SHOWN BY THE PIER PLAN.
2. THIS SECTION APPLIES TO ALL METAL BUILDING PRIMARY FRAME BUILDING COLUMNS AND WIND COLUMNS

TYPICAL ADDITIONAL PIER REINFORCING DETAIL

NTS



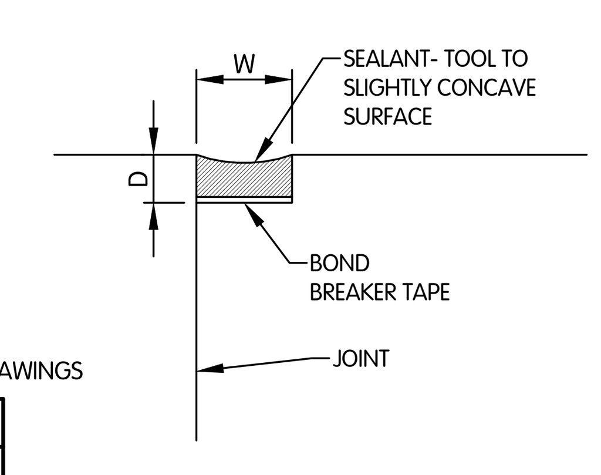
STANDARD

TYPICAL SEALANT NOTES:

JOINT WIDTH (W) AS SHOWN ON DRAWINGS

W ≤ ½"	D = ¼"
W = ¾"	D = ⅜"
W ≥ 1"	D = ½"

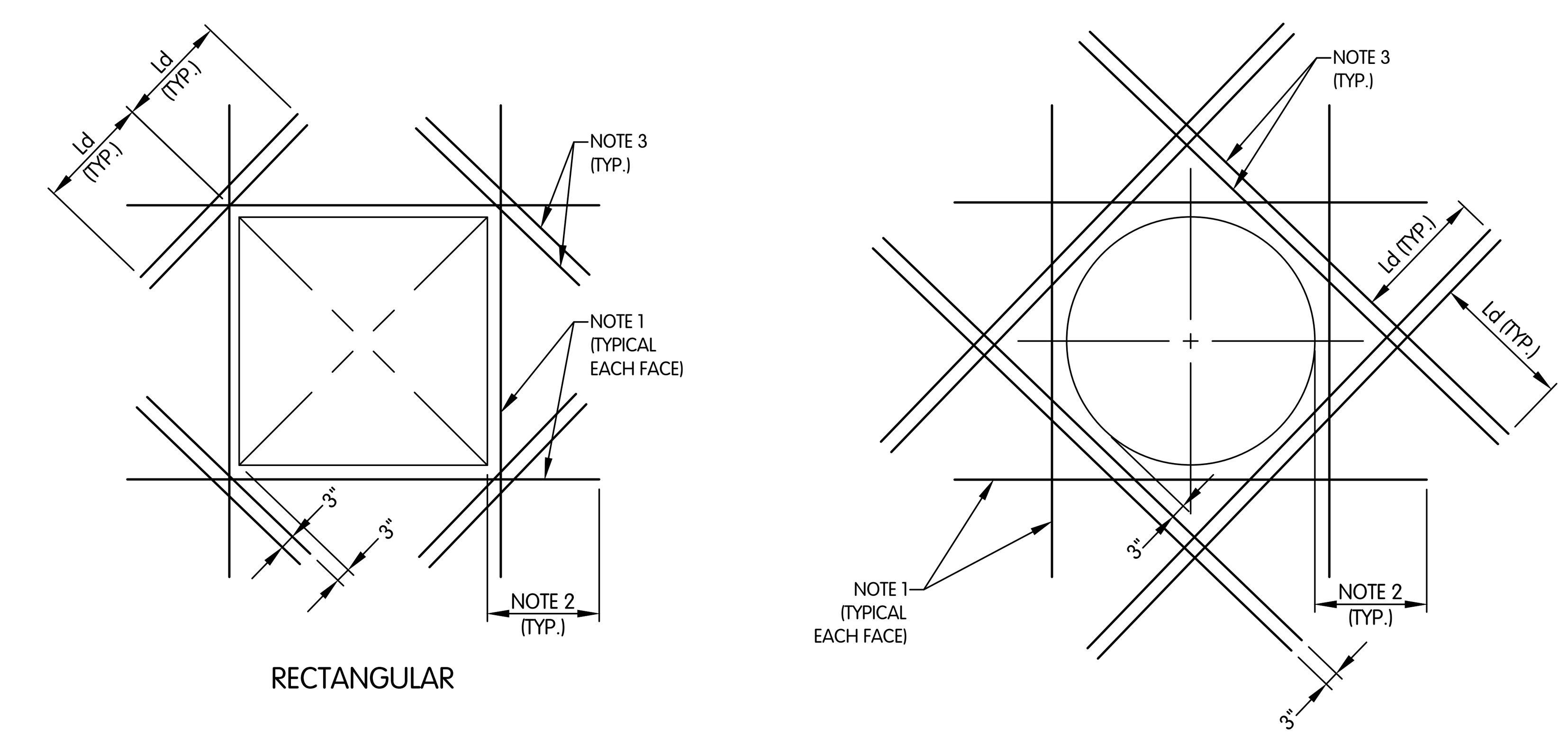
1. BLUNT SHARP EDGES OF CONCRETE JOINTS WITH GRINDER BEFORE SEALING.



SHALLOW

TYPICAL SEALANT DETAILS

NTS



RECTANGULAR

CIRCULAR

REINFORCEMENT AT OPENING NOTES:

1. ADDITIONAL REINFORCEMENT EQUAL IN AREA TO REINFORCEMENT CUT BY OPENING.
2. LAP SPLICE LENGTH FOR TOP BARS.
3. DIAGONAL BARS - EACH FACE, 2 EACH CORNER - SIZE AS FOLLOWS

CONC. THICKNESS	BAR SIZE	DEVELOPMENT LENGTH (Ld)
12" TO 18"	#5	21"
GREATER THAN 18"	#6	25"

4. DIAGONAL BARS NOT REQUIRED FOR OPENINGS WITH LARGEST DIMENSION LESS THAN 12".
5. ONLY DIAGONAL BARS ARE REQUIRED AT DOOR, WINDOW, OR HATCHED OPENING.

TYPICAL ADDITIONAL REINFORCEMENT FOR OPENINGS BETWEEN 8" AND 48"

NTS

THE CITY OF Kalamazoo

CONCRETE REINFORCEMENT DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.
Fluid thinking®...
www.JHeng.com

JOB NO.	017-7725.001
SCALE	NONE

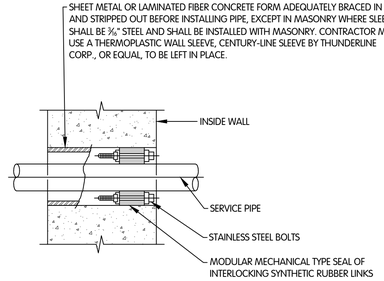
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
KDB	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

SHEET NO.
S-6
19 OF 44

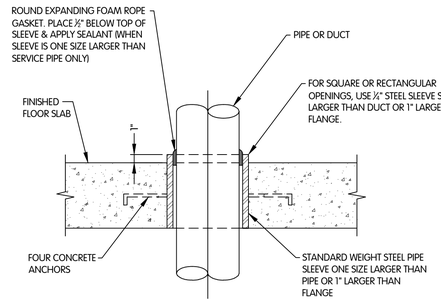
KAL-7725001S07-CONCRETE REINFORCEMENT DETAILS
1/27/2022 11:39 AM - SWILLIS
1/28/2022 2:31 PM



TYPE C

NOTE:
1. EXISTING WALLS SHALL BE CORE DRILLED.
2. CONCRETE SHALL BE WORKED IN AND VIBRATED TO ELIMINATE ALL VOIDS IN CONCRETE - IF VOIDS DO REMAIN, FILL WITH GROUT BEFORE INSTALLING PIPE AND RUBBER SEALS.
3. UNLESS OTHERWISE SHOWN ON THE DRAWINGS ALL INTERIOR WALL PENETRATIONS SHALL USE TYPE C PIPE SLEEVE.

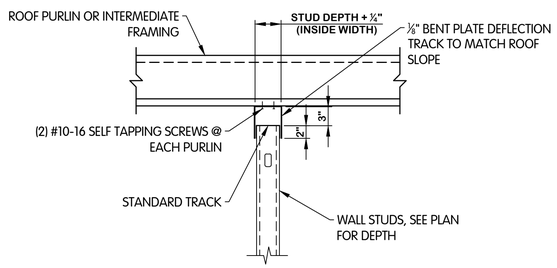
PIPE SLEEVE
NTS



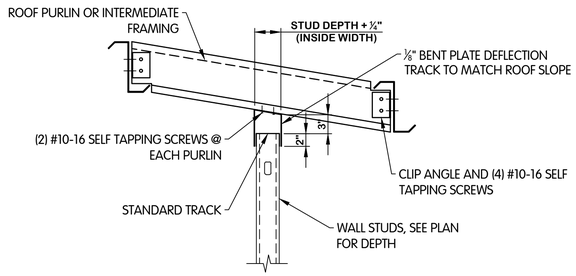
TYPE D

NOTE:
THRU EXISTING FLOORS WHERE TYPE "D" FLOOR SLEEVES ARE CALLED OUT, THE CONTRACTOR SHALL CORE FLOOR AND CAULK AS SHOWN, ELIMINATING THE STEEL SLEEVE.

FLOOR SLEEVE
NTS



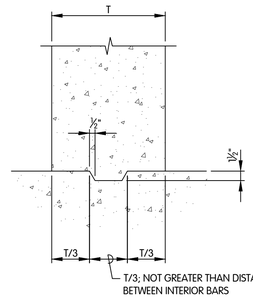
PERPENDICULAR TO PURLINS



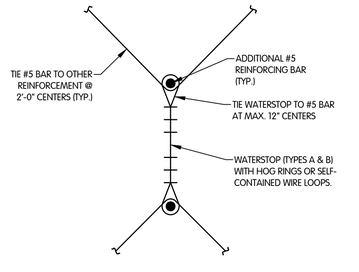
PARALLEL TO PURLINS

NOTES:
1. BUILDING MANUFACTURER SHALL PROVIDE INTERMEDIATE PURLIN FRAMING AT 5'-0" MAX. C/C WHERE WALL RUNS PARALLEL TO ROOF PURLINS.
2. PROVIDE DEFLECTION TRACK ABOVE ALL INTERIOR METAL STUD WALLS.
3. WHERE TRACK RUNS PARALLEL WITH ROOF RIDGE BEND TRACK LEGS AT ROOF PITCH SO THEY REMAIN PLUMB WITH STUD WALLS.

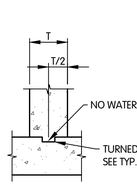
TYPICAL TOP OF INTERIOR STUD WALL CONNECTION DETAIL
NTS



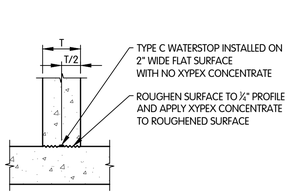
TYPICAL SHEAR KEY



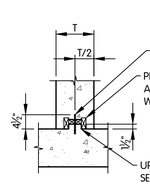
TYPICAL WATERSTOP DETAIL
NTS



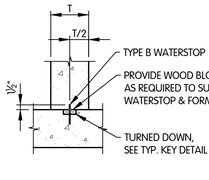
TYPE 4



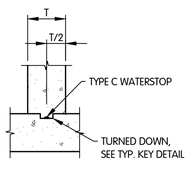
TYPE 5



TYPE 1



TYPE 2



TYPE 3

STANDARD CONSTRUCTION JOINT DETAILS
NTS

THE CITY OF Kalamazoo

WALL CONNECTION AND STRUCTURAL DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.

Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
KDB	CJAF	AJD

STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

SHEET NO.
S-7
20 OF 44

KAL-7725\01\S08-WALL CONNECTION AND STRUCTURAL DETAILS
1/27/2022 10:04 AM S SMILLIS
1/26/2022 2:32 PM
XREFERENCED FILES:

RAILING NOTES:

1. GUARD RAILING SHALL BE STANDARD AND STAIR AND RAMP RAILING SHALL BE TYPE 1, UNLESS NOTED OTHERWISE ON DRAWINGS.
2. MAXIMUM RAILING POST SPACING SHALL BE 5'-0"

WITHOUT STUD	H = 34"	H = 42"
STEEL - SCH. 40	4'-6"	4'-0"
ALUMINUM - SCH. 40	4'-6"	3'-0"
ALUMINUM - SCH. 80	5'-0"	4'-0"

WITH STUD	H = 34"	H = 42"
STEEL - SCH. 40	5'-0"	5'-0"
ALUMINUM - SCH. 40	5'-0"	5'-0"

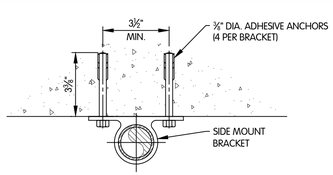
3. REFER TO POST BASE CONNECTION DETAILS FOR ADDITIONAL POST SPACING RESTRAINTS AND STUD INSERT REQUIREMENTS.
4. HANDRAILS ON SWITCHBACK OR DOGLEG STAIRS SHALL BE CONTINUOUS TO ADJACENT FLIGHT.
5. WHEN STAIRS NOTED ON DRAWINGS TO BE ADA ACCESSIBLE, PROVIDE ADDITIONAL 1'-0" EXTENSION AT BOTTOM OF STAIRS.

RAILING BASE CONNECTION NOTES:

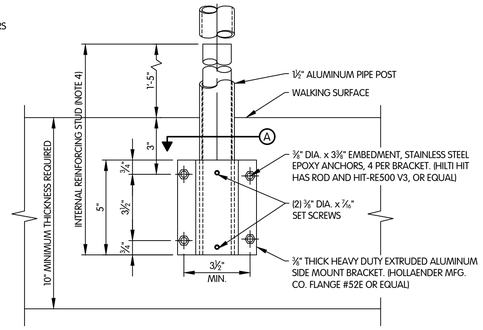
1. PROVIDE COAL TAR PAINT OR NEOPRENE GASKET BETWEEN ALUMINUM SURFACES IN CONTACT WITH CONCRETE, MASONRY, OR DISSIMILAR METALS.
2. ANCHORS FASTENERS:

RAILING MATERIAL	FASTENER
CARBON STEEL	ZINC PLATED CARBON STEEL
ALUMINUM	STAINLESS STEEL
STAINLESS STEEL	STAINLESS STEEL

3. POST BRACKET MATERIAL SHALL MATCH POST MATERIAL, UNLESS NOTED OTHERWISE.
4. POST SHALL BE REINFORCED WITH INTERNAL METAL STUD WHEN REQUIRED BY ENGINEERED DESIGN. STUD SHALL BE WELDED TO POST TO ACT AS ONE MEMBER.



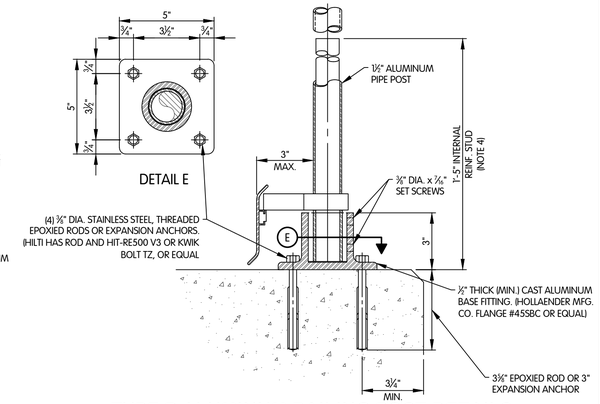
DETAIL A



NOTE:
RAILING POSTS AT CORNERS TO BE LOCATED 6" MIN. FROM CENTER OF POST TO EDGE OF CONCRETE.

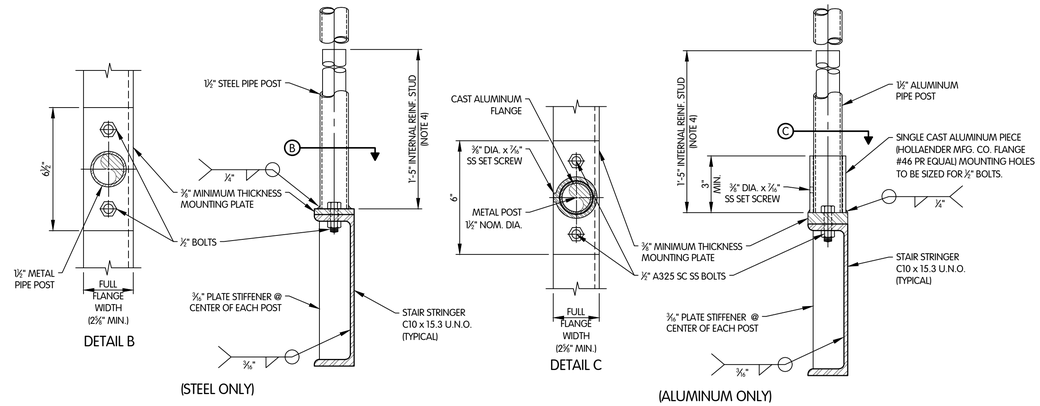
TYPE A ALUMINUM RAILING POST

3" = 1'-0"



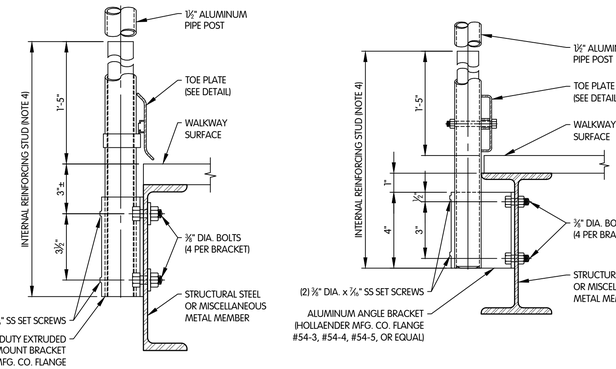
TYPE B ALUMINUM RAILING POST DETAILS

3" = 1'-0"



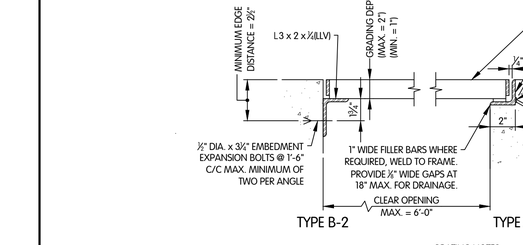
TYPE C METAL STAIR RAILING POST DETAILS

3" = 1'-0"



TYPE D ALUMINUM RAILING POST DETAILS

3" = 1'-0"

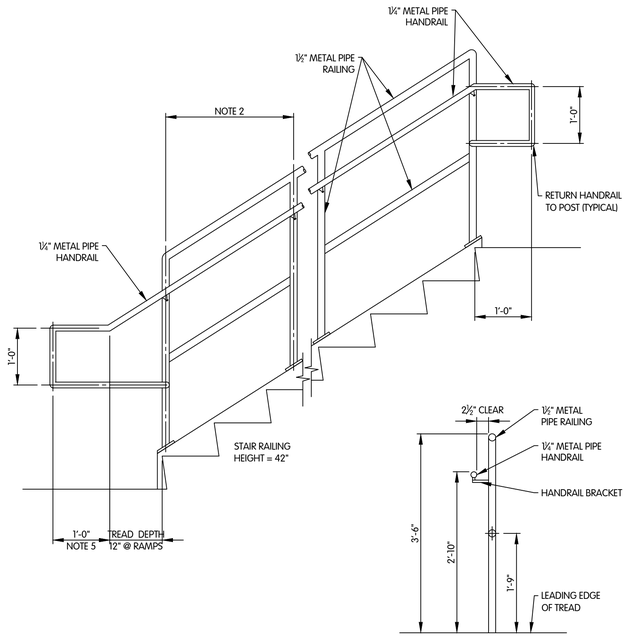


GRATING FRAME DETAILS

2"=1'-0"

GRATING NOTES:

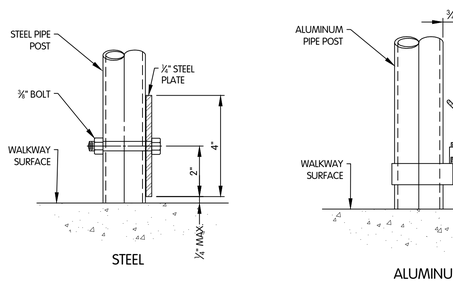
1. APPLY BITUMINOUS PAINT TO ALL ALUMINUM SURFACES IN CONTACT WITH CONCRETE.
2. ANCHORS FOR ALUMINUM AND STAINLESS STEEL TO BE STAINLESS STEEL. ANCHORS FOR GALVANIZED CARBON STEEL TO BE ZINC-PLATED.
3. PROVIDE GALVANIZED STEEL ANGLE FRAMES WITH GALVANIZED STEEL GRATING. FOR ALUMINUM GRATING, PROVIDE ALUMINUM TYPE A FRAME OR STAINLESS STEEL TYPE B-1 OR B-2 FRAMES.
4. FOR B-2 FRAMES USE POWER WRENCH TORQUE REDUCER AS REQUIRED BY ANCHOR MANUFACTURER.



STAIR AND RAMP RAILING, TYPE I

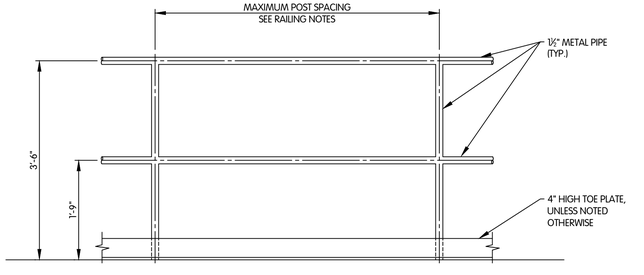
NOTE: STAIR SHOWN, RAMP SIMILAR.

¾" = 1'-0"



TOE PLATE DETAIL

4" = 1'-0"



GUARD RAILING, STANDARD

½" = 1'-0"

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

RAILING AND STRUCTURAL DETAILS

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

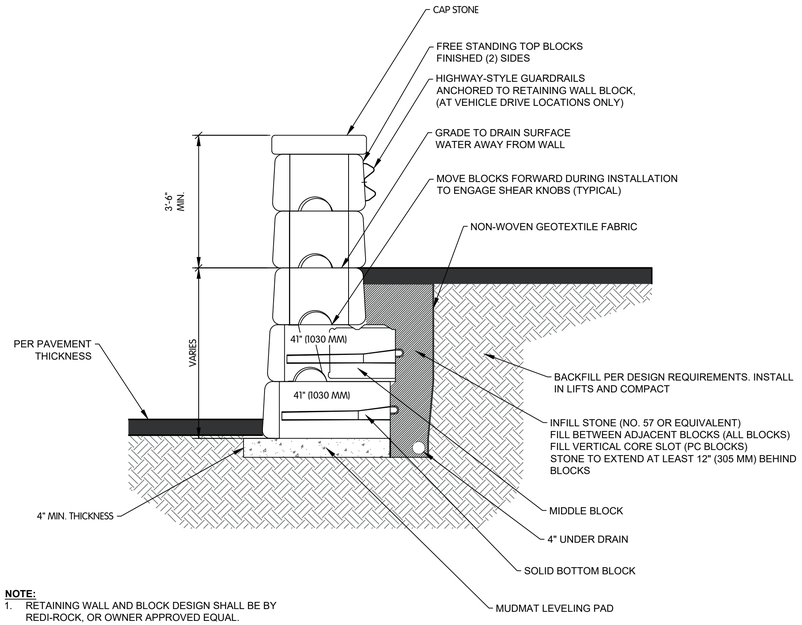
JOB NO. 017-7725.001
SCALE NONE
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
KDB	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

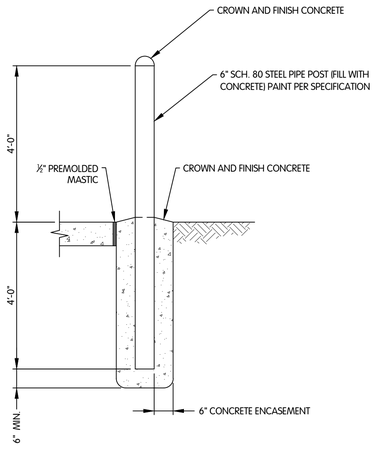
SHEET NO. S-8
21 OF 44

KAL-772500S09
1/28/2022 2:12 PM
1/28/2022 2:12 PM



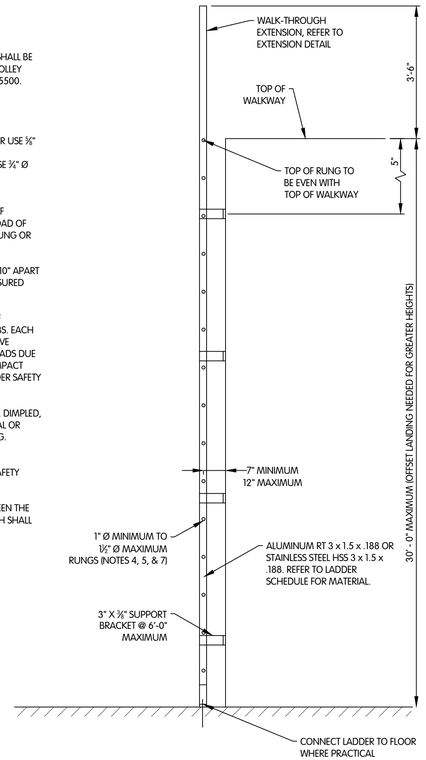
NOTE:
1. RETAINING WALL AND BLOCK DESIGN SHALL BE BY REDI-ROCK, OR OWNER APPROVED EQUAL.
2. BLOCK FINISH AND PROFILE PER OWNER.

TYPICAL RETAINING WALL DETAIL
½" = 1'-0"

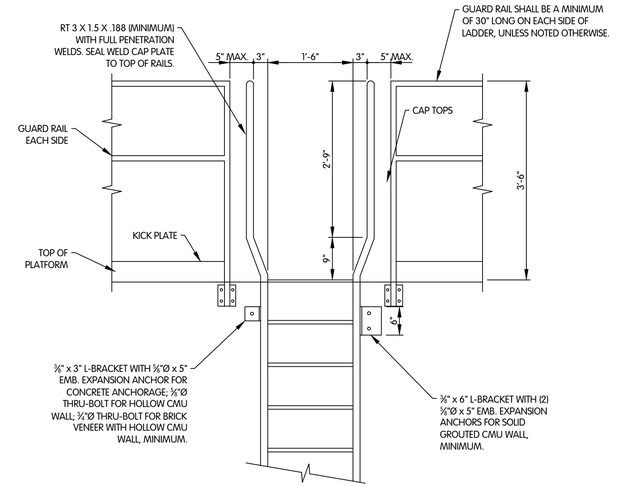


BOLLARD DETAIL
NTS

NOTES:
1. ALL CONSTRUCTION TO BE WELDED.
2. LADDERS WITH CLIMB GREATER THAN 24' SHALL BE EQUIPPED WITH FALL PROTECTION RAIL, TROLLEY AND HARNESS. REFER TO SPECIFICATION 05500.
3. SUPPORT BRACKET FASTENER:
   A. TO CONCRETE, USE ⅜" DIAMETER X 5" EMBEDMENT EXPANSION ANCHORS.
   B. MASONRY CMU WALL WITHOUT VENEER USE ½" Ø THRU-BOLT.
   C. MASONRY CMU WALL WITH VENEER USE ¾" Ø THRU-BOLT.
   D. TO STEEL, USE ½" Ø BOLTS.
4. EACH RUNG OR STEP SHALL BE CAPABLE OF SUPPORTING A SINGLE CONCENTRATED LOAD OF 300 LBS. APPLIED IN THE MIDDLE OF THE RUNG OR STEP.
5. RUNGS SHALL BE SPACED NOT LESS THAN 10" APART AND NOT MORE THAN 12" APART AS MEASURED BETWEEN THE CENTERS OF THE RUNGS.
6. EACH FIXED LADDER SHALL BE CAPABLE OF RESISTING AT LEAST TWO LOADS OF 300 LBS. EACH CENTERED BETWEEN ANY TWO CONSECUTIVE ATTACHMENTS PLUS ANY ANTICIPATED LOADS DUE TO ICE BUILD-UP, WINDS, AND RIGGING IMPACT LOADS RESULTING FROM THE USE OF LADDER SAFETY DEVICES (IF APPLICABLE).
7. RUNGS SHALL BE CORRUGATED, KNURLED, DIMPLED, OR COATED WITH SKID RESISTANT MATERIAL OR OTHERWISE TREATED TO MINIMIZE SLIPPING. ADHESIVE GRIT TAPE IS NOT ACCEPTABLE.
8. INTERIOR STEEL LADDERS TO BE PAINTED SAFETY YELLOW.
9. LADDERS RUNGS SHALL BE 18" WIDE BETWEEN THE RAILS. LADDER EXTENSION WALK-THROUGH SHALL BE 24" WIDE BETWEEN THE RAILS.



LADDER SECTION
½" = 1'-0"



ALUMINUM LADDER TOP EXTENSION DETAIL
¾" = 1'-0"

LADDER AND MISCELLANEOUS DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001
SCALE NONE
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
KDB	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

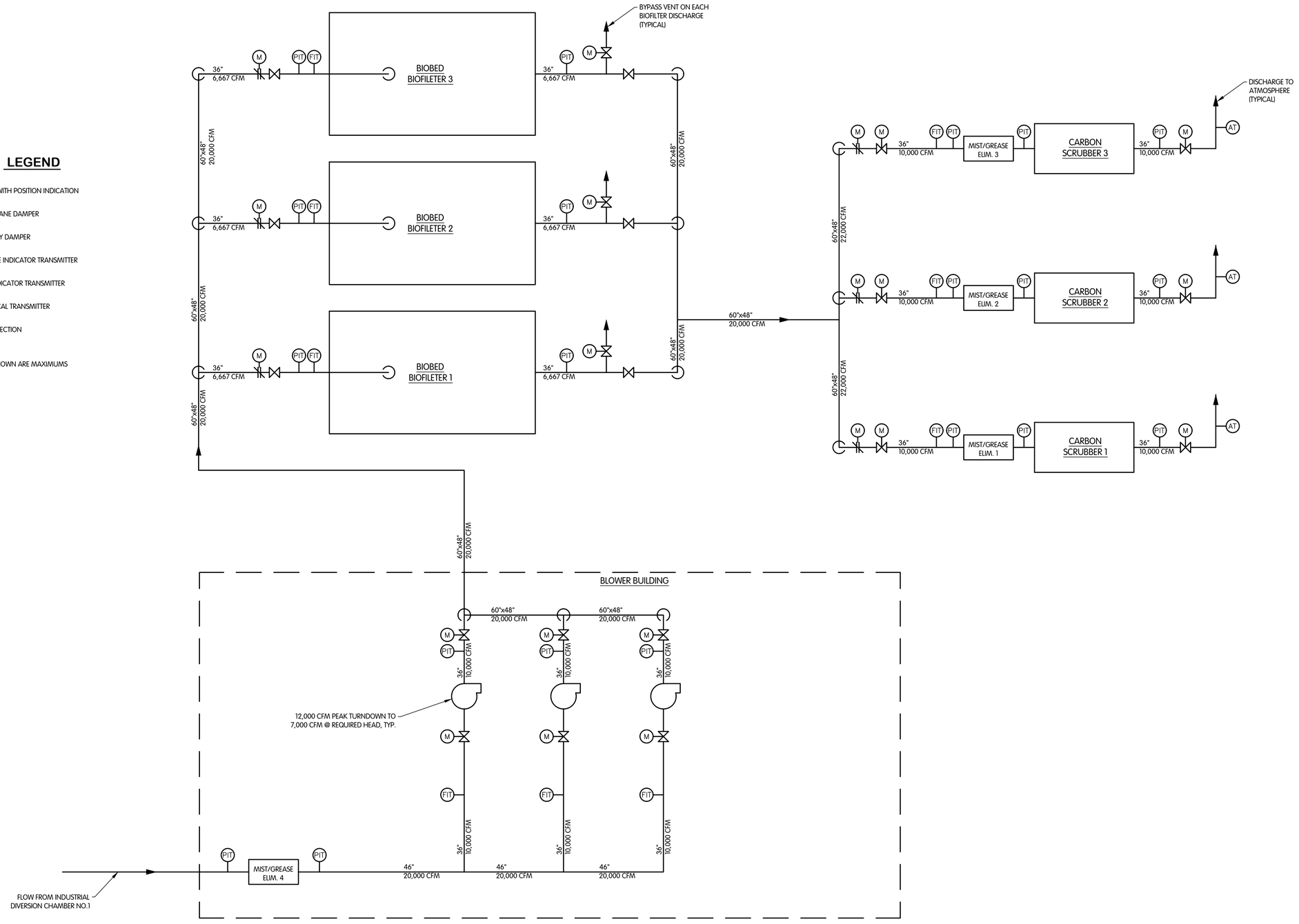
SHEET NO.
S-9
22 OF 44

KAL-7725001S10
1/28/2022 2:32 PM
1/28/2022 2:32 PM

LEGEND

- (M) MOTOR WITH POSITION INDICATION
- RADIAL VANE DAMPER
- BUTTERFLY DAMPER
- (PIT) PRESSURE INDICATOR TRANSMITTER
- (FIT) FLOW INDICATOR TRANSMITTER
- (AT) ANALYTICAL TRANSMITTER
- FLOW DIRECTION

FLOW RATES SHOWN ARE MAXIMUMS



BIOFILTRATION AIRFLOW SCHEMATIC

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.

Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID

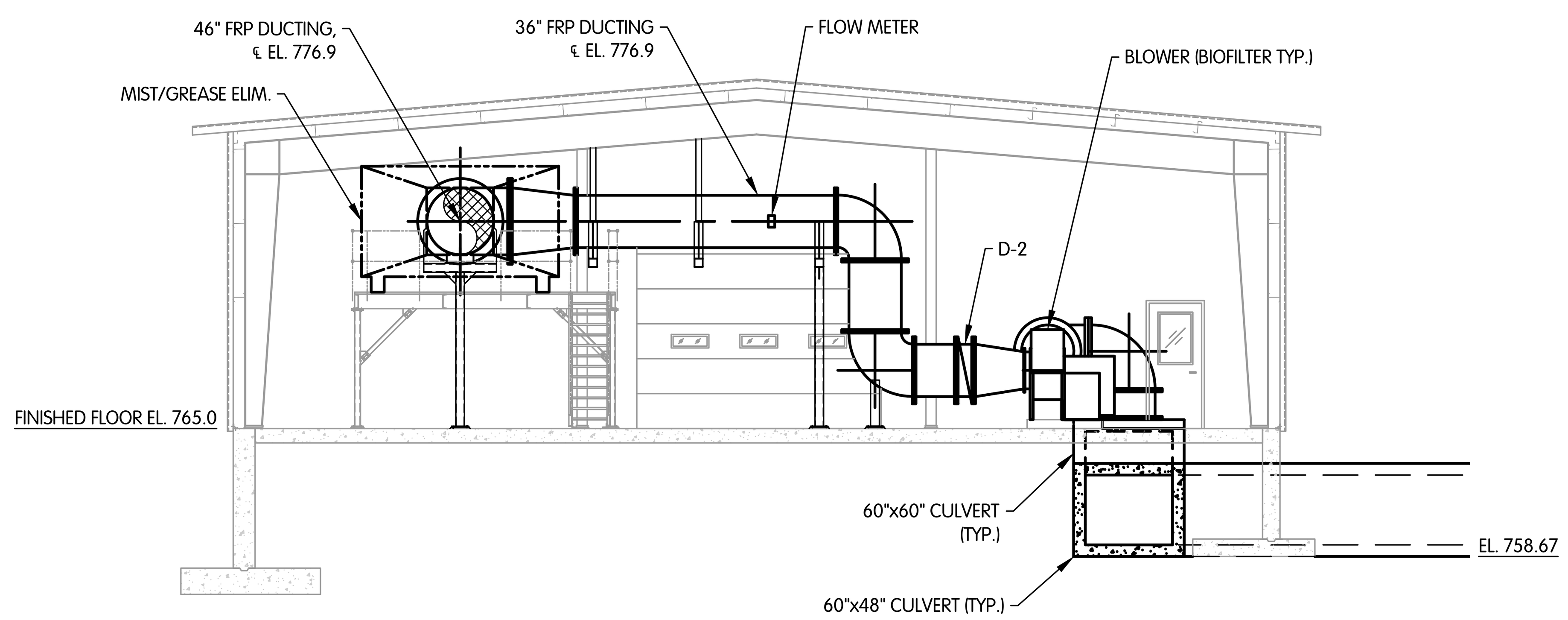
DATE: FEBRUARY 2022

SHEET NO.

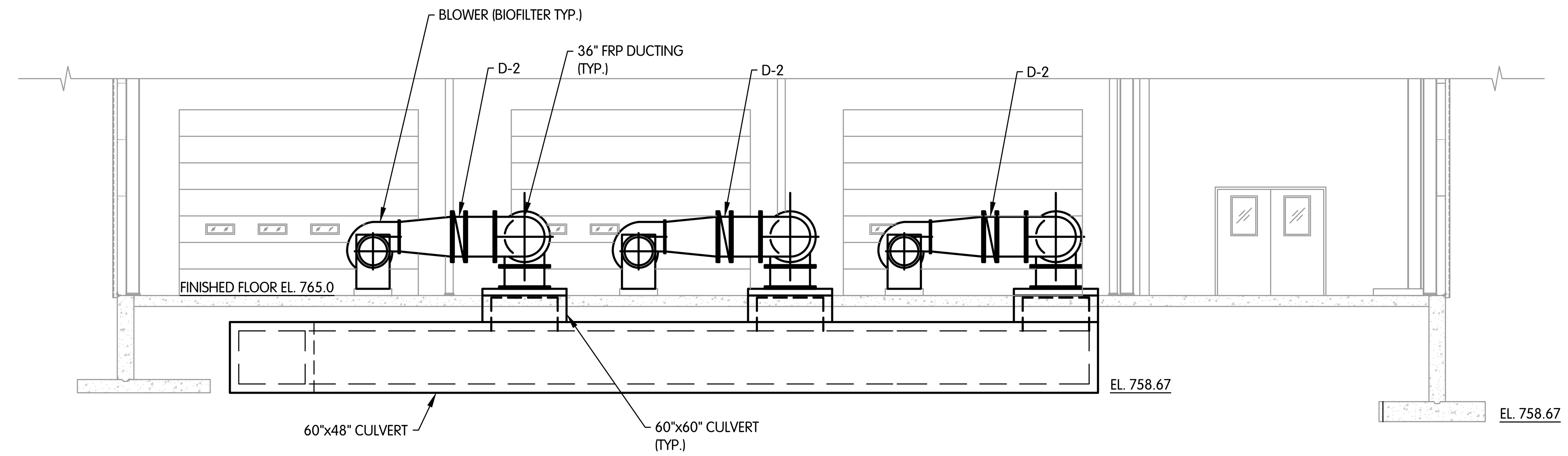
PE-1

23 OF 44

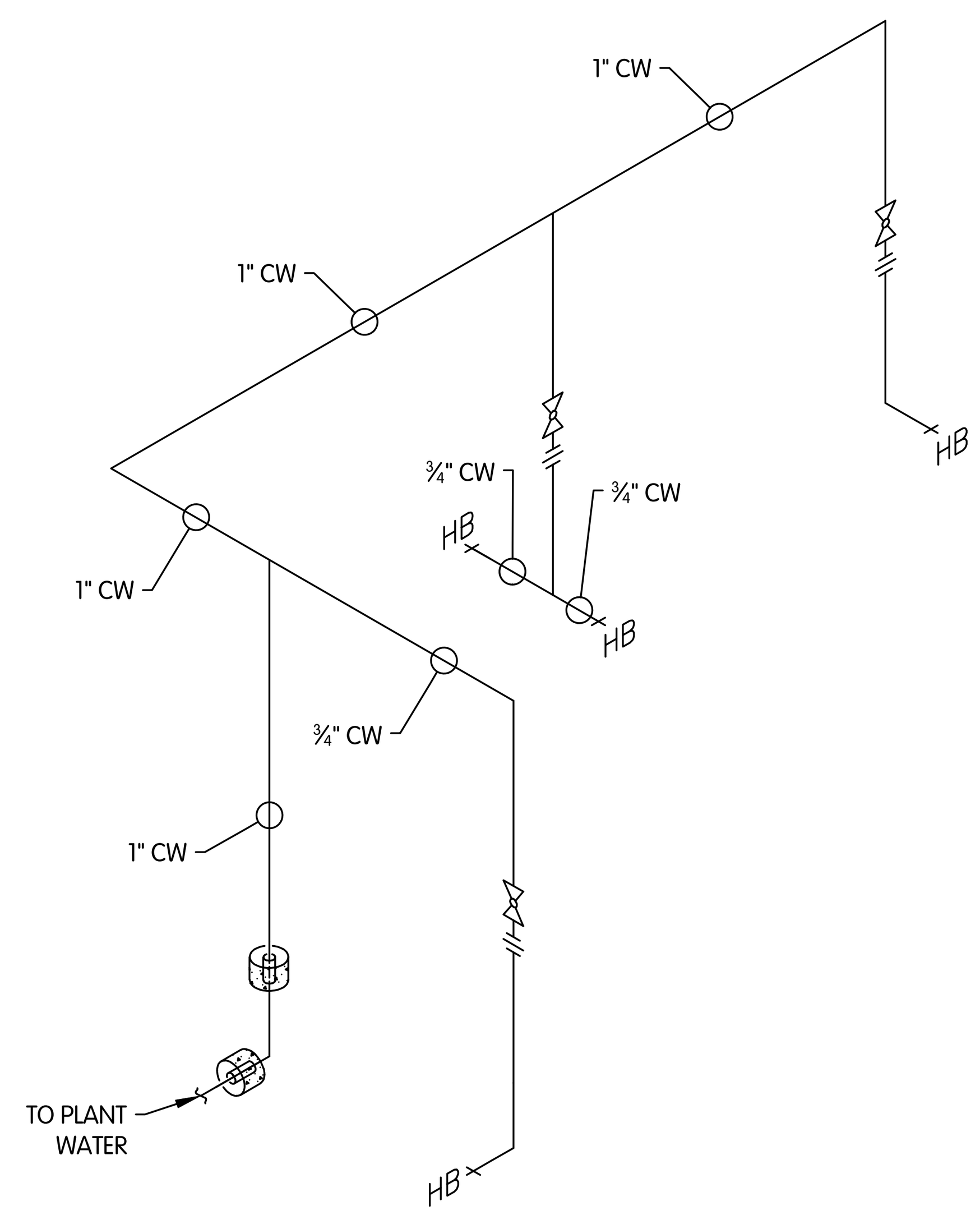
KAL-7725001G03-BIOFILTRATION AIRFLOW SCHEMATIC
1/27/2022 10:44 AM - SWILLIS
1/28/2022 2:32 PM



SECTION B



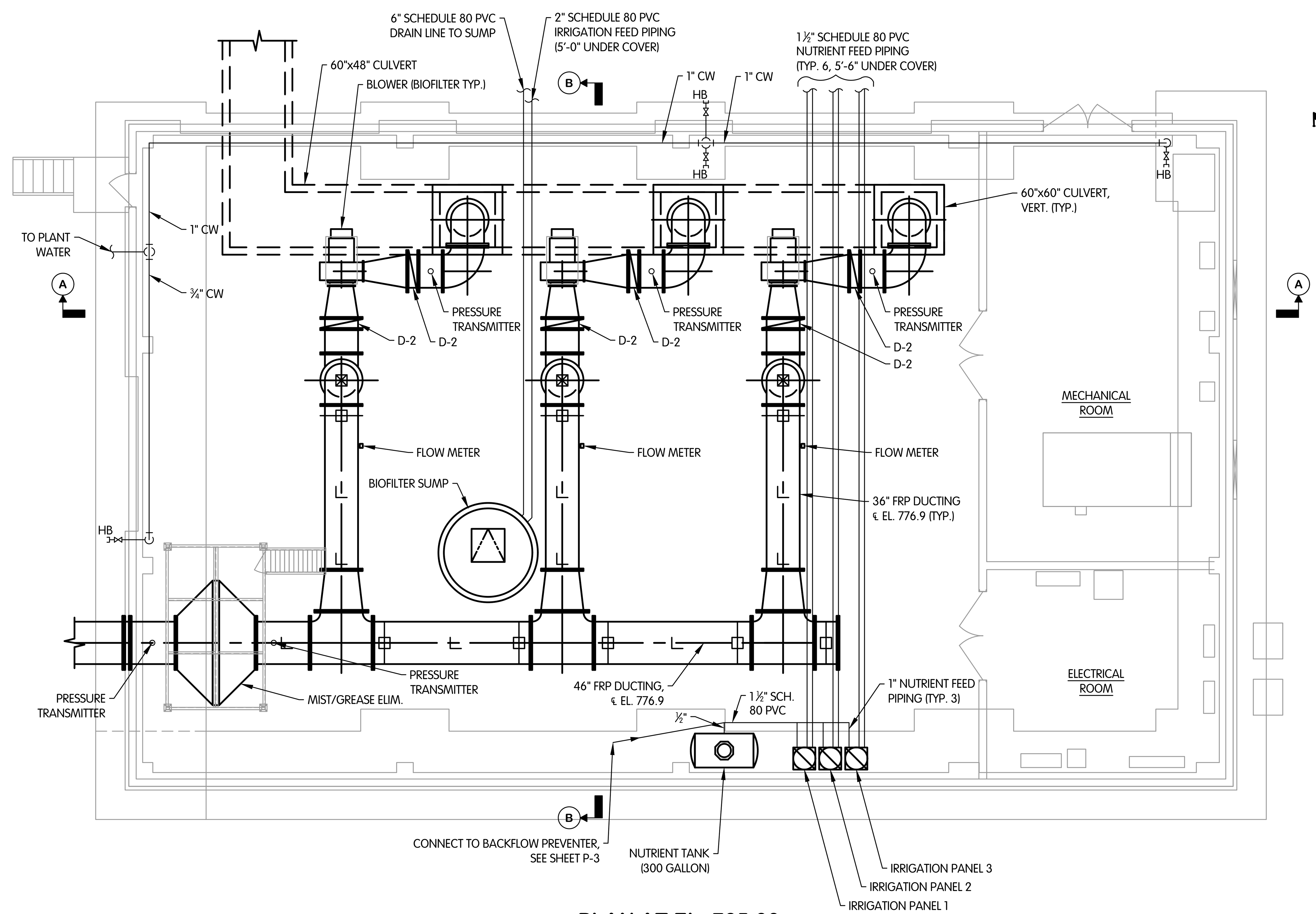
SECTION A



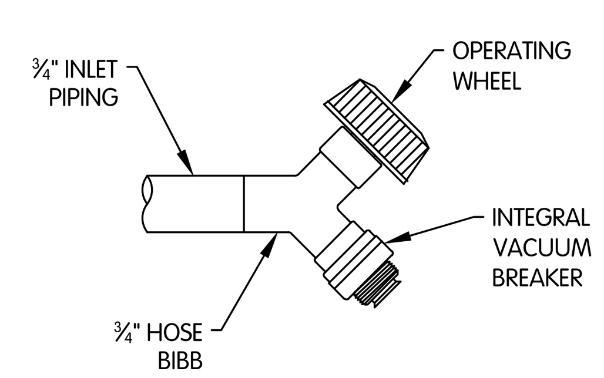
ISOMETRIC
NTS

LEGEND

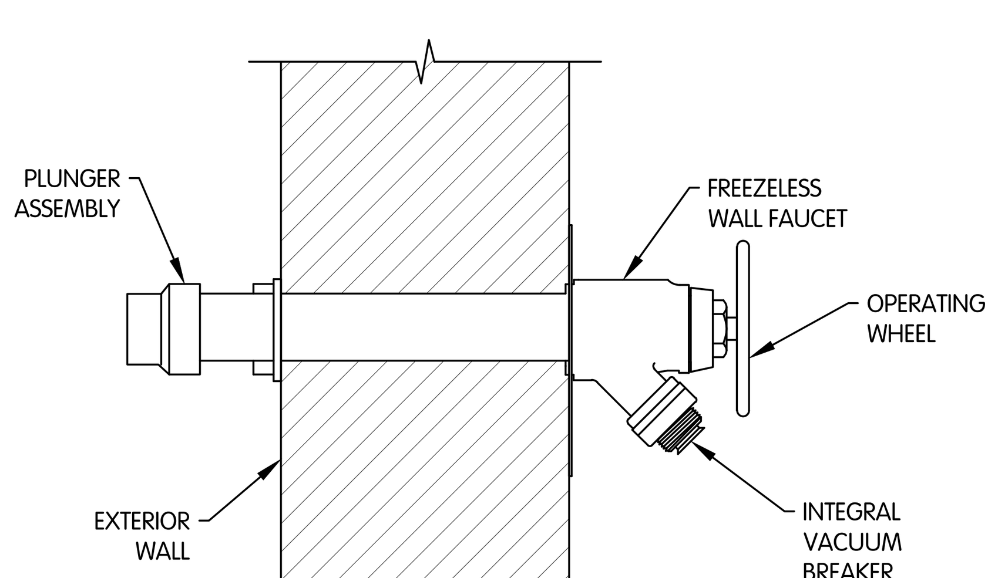
CW = COLD WATER
HB = HOSE BIB



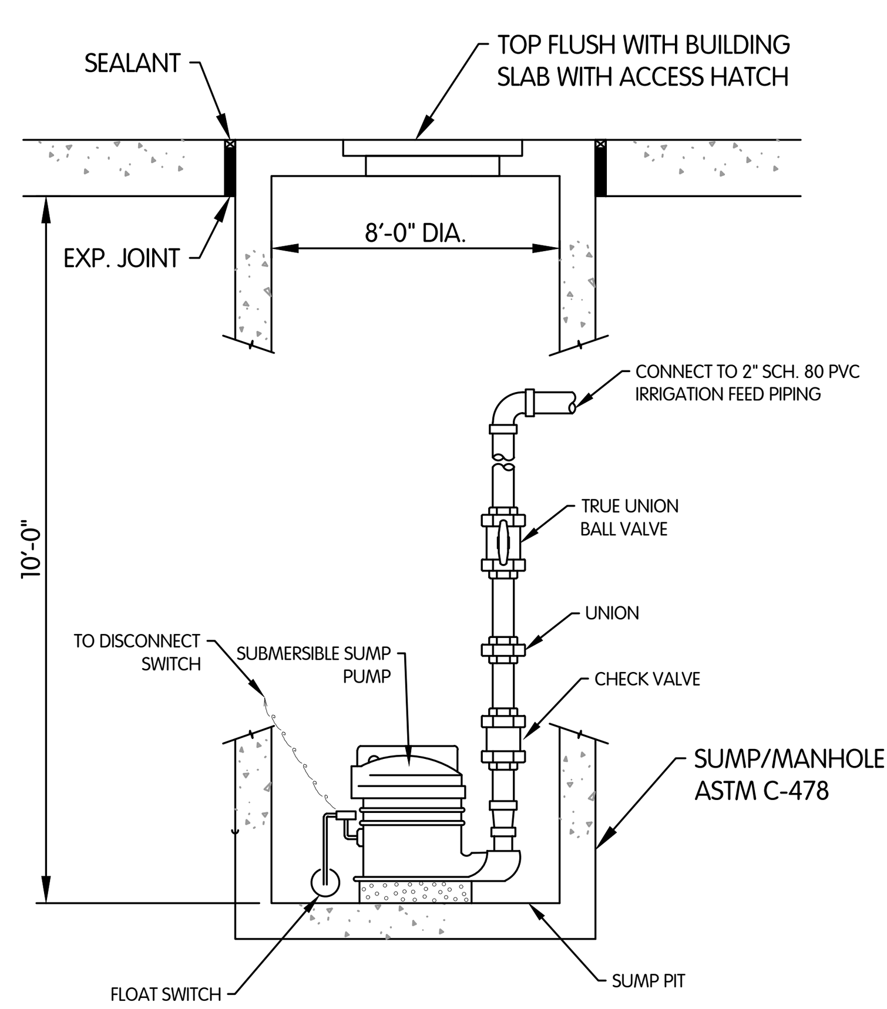
PLAN AT EL. 765.00



HOSE BIBB DETAIL
NTS



NON-FREEZE WALL FAUCET DETAIL
NTS



SUMP/MANHOLE DETAIL
NTS

CONTROL DAMPER SCHEDULE

TAG	SIZE	TYPE	BLADES	MATERIAL	OPERATOR	SERVICE	MAKE	MODEL	NOTES
D-1	36	ISOLATION	BUTTERFLY	FRP	MANUAL	GEAR OPERATOR	RUSKIN	SERIES 914	1, 2, 3
D-2	36	ISOLATION	BUTTERFLY	FRP	MOTORIZED	OPEN/CLOSE	RUSKIN	SERIES 914	1, 2, 4
D-3	36	CONTROL	RADIAL VANE	FRP	MOTORIZED	MODULATING	RUSKIN	SERIES 851FG	1, 2, 4

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. SEE DRAWINGS FOR SIZES, AIRFLOW, AND QUANTITY.
3. PROVIDE WITH LOCKOUT.
4. PROVIDE 120/1/60 DAMPER MOTOR OPERATOR.

THE CITY OF Kalamazoo

BLOWER BUILDING PIPING & EQUIPMENT PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

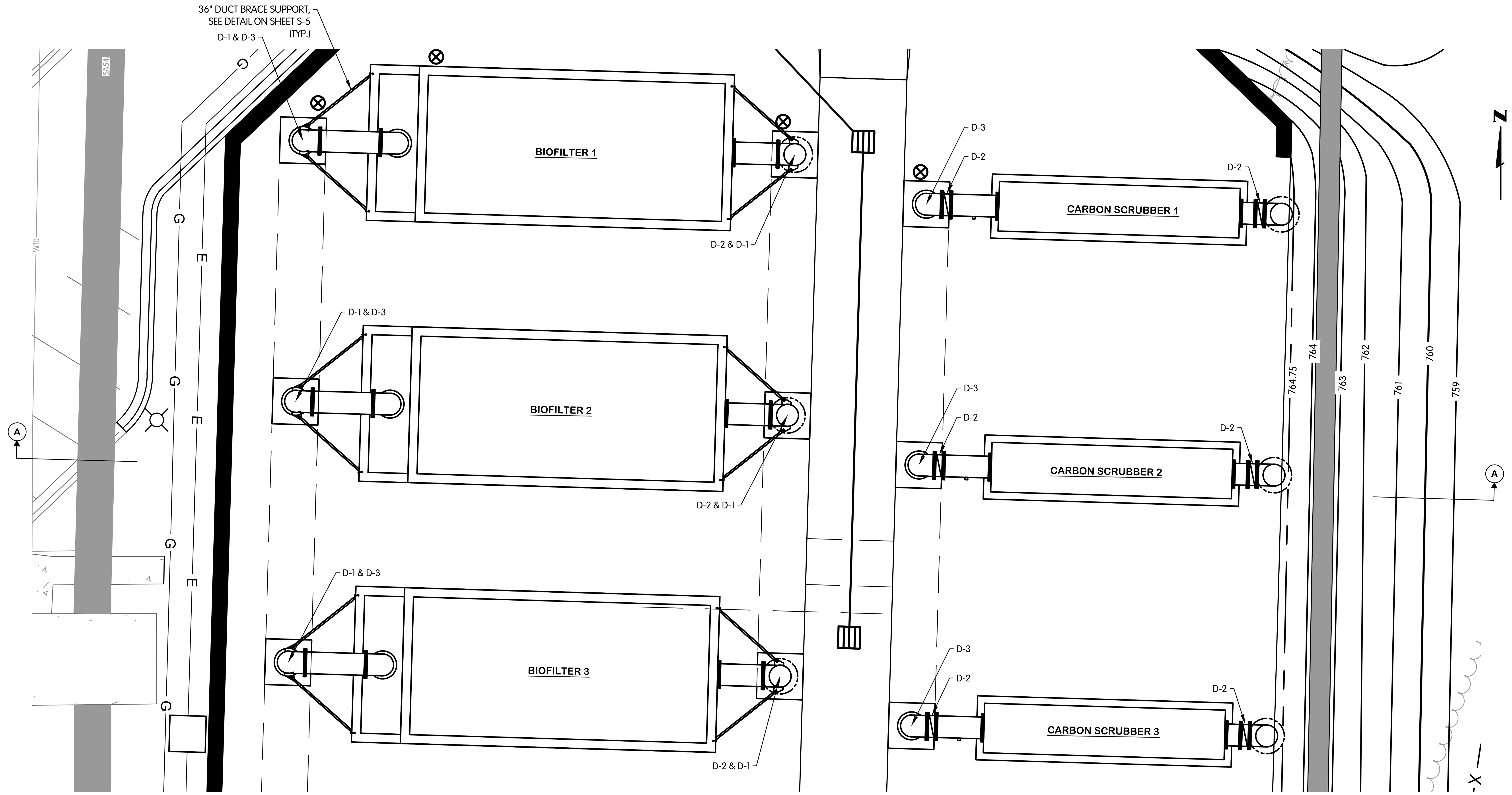
Jones & Henry Engineers, Ltd.
Fluid thinking®. www.JHeng.com

JOB NO. 017-7725.001
SCALE 1/8" = 1'-0"
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022
SHEET NO.
PE-2
24 of 44

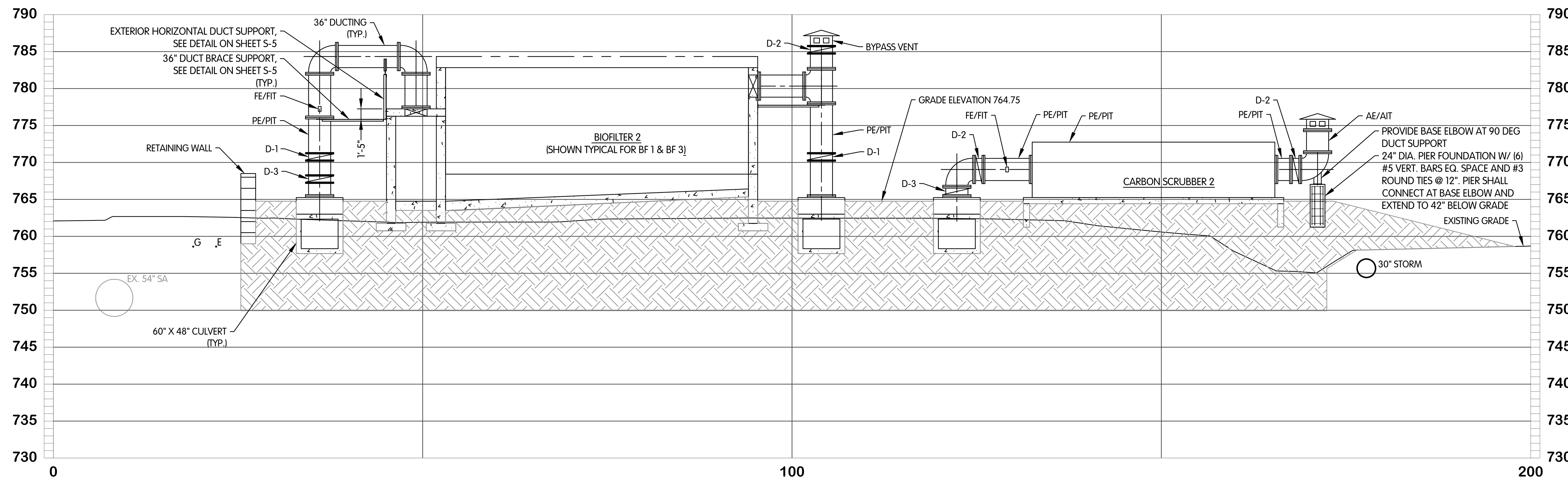
KAL-7725001PE01-BLOWER BUILDING PIPING AND EQUIPMENT PLAN
1/27/2022 5:55 PM - SWILLIS
1/28/2022 2:32 PM



PLAN VIEW

CONTROL DAMPER SCHEDULE									
TAG	SIZE	TYPE	BLADES	MATERIAL	OPERATOR	SERVICE	MAKE	MODEL	NOTES
D-1	36	ISOLATION	BUTTERFLY	FRP	MANUAL	GEAR OPERATOR	RUSKIN	SERIES 914	1, 2, 3
D-2	36	ISOLATION	BUTTERFLY	FRP	MOTORIZED	OPEN/CLOSE	RUSKIN	SERIES 914	1, 2, 4
D-3	36	CONTROL	RADIAL VANE	FRP	MOTORIZED	MODULATING	RUSKIN	SERIES 851FG	1, 2, 4

NOTE:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. SEE DRAWINGS FOR SIZES, AIRFLOW, AND QUANTITY.
3. PROVIDE WITH LOCKOUT.
4. PROVIDE 120/1/60 DAMPER MOTOR OPERATOR.



SECTION A

THE CITY OF Kalamazoo

BIOFILTER & CARBON SCRUBBER PIPING & EQUIPMENT SECTION

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO	DATE	REVISIONS AFTER ISSUED FOR BID	BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

JOB NO. 017-7725.001
SCALE 1" = 10'-0"
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

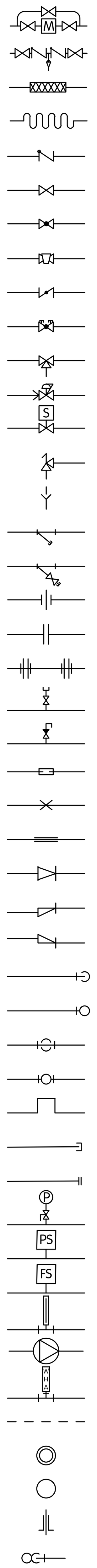
DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

SHEET NO.
PE-3
25 OF 44

KAL-772500PE02-BIOFILTER & CARBON SCRUBBER PIPING & EQUIPMENT SECTION
1/27/2022 11:39 AM - SWILLIS
1/28/2022 2:32 PM

PLUMBING SYMBOLS LEGEND



- METER ASSEMBLY
- RPZ BACKFLOW PREVENTER
- FLEXIBLE PIPE CONNECTOR
- FLEXIBLE PIPE
- CHECK VALVE
- GATE VALVE
- BALL VALVE (MANUAL)
- PLUG VALVE
- BUTTERFLY VALVE
- COMBINATION BALANCING VALVE
- THERMOSTATIC MIXING VALVE
- PRESSURE REDUCING VALVE, SELF CONTAINED
- SOLENOID OPERATED VALVE
- TEMPERATURE/PRESSURE RELIEF VALVE
- DRAIN
- STRAINER
- STRAINER WITH BLOW OFF VALVE AND PLUG
- UNION CONNECTION
- FLANGED CONNECTION
- SPOOL PIECE, FLANGED
- HOSE CONNECTOR
- AIR VENT
- EXPANSION JOINT OR COMPENSATOR
- PIPE ANCHOR
- PIPE GUIDE
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER-FLUSH TOP
- ECCENTRIC REDUCER-FLUSH BOTTOM
- PIPE ELBOW, 90 TURNED DOWN
- PIPE ELBOW, 90 TURNED UP
- PIPE TEE, OUTLET TURNED DOWN
- PIPE TEE, OUTLET TURNED UP
- EXPANSION LOOP
- CAP ON END OF PIPE
- CLEANOUT PLUG
- PRESSURE GAGE WITH SHUT-OFF COCK (BALL VALVE)
- PRESSURE SWITCH
- FLOW SWITCH
- THERMOMETER
- CENTRIFUGAL PUMP
- WATER HAMMER ARRESTOR
- VENT PIPING
- FLOOR CLEANOUT
- FLOOR OR ROOF DRAIN
- VENT THROUGH ROOF
- P-TRAP

PLUMBING ABBREVIATIONS

AD	AREA DRAIN
AFF	ABOVE FINISHED FLOOR
BFP	BACKFLOW PREVENTER
CA	COMPRESSED AIR
CFH	CUBIC FEET PER HOUR
CL	CENTERLINE
CS	CUP SINK
CW	COLD WATER
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DN	DOWN (PENETRATES FLOOR SLAB)
ELEV	ELEVATION
EESU	EMERGENCY EYEWASH AND SHOWER UNIT
EEW	EMERGENCY EYEWASH
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
FT	FEET
GAL	GALLONS
GCO	GRADE CLEANOUT
GPM	GALLONS PER MINUTE
GWH	GAS FIRED WATER HEATER
HB	HOSE BIBB
HC	HOSE CONNECTION
HR	HOSE REEL
HW	HOT WATER
HWR	HOT WATER RETURN
HWRP	HOT WATER RECIRCULATION PUMP
IW	INDIRECT WASTE
IN	INCH
KS	KITCHEN SINK
LAV	LAVATORY
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MS	MOP SINK
NG	NATURAL GAS
NPW	NON POTABLE WATER
NTS	NOT TO SCALE
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH (GAUGE)
PW	POTABLE WATER
RD	ROOF DRAIN
SAN	SANITARY
SD	STORM DRAIN
SH	SHOWER
SP	SUMP PUMP
SQFT	SQUARE FEET
SS	SERVICE SINK
TMV	THERMOSTATIC MIXING VALVE
TW	TEPID WATER
TWH	TANKLESS WATER HEATER
TYP	TYPICAL
UP	UP (PENETRATES FLOOR SLAB)
UR	URINAL
V	VENT
VAC	VACUUM
VB	VACUUM BREAKER
VTR	VENT THROUGH ROOF
W	WASTE
WC	WATER CLOSET
WCO	WALL CLEANOUT
WF	WALL FAUCET
WHA	WATER HAMMER ARRESTOR
W/	WITH

PLUMBING GENERAL NOTES

1. THE SYMBOLS AND ABBREVIATIONS LIST ON THIS SHEET IS A COMPREHENSIVE STANDARD GUIDE INTENDED FOR GENERAL USE ON ALL PROJECTS. THEREFORE, NOT ALL THE SYMBOLS AND ABBREVIATIONS CONTAINED IN THIS LIST ARE NECESSARILY USED ON THIS PARTICULAR PROJECT AND SHOULD BE USED FOR CLARIFICATION ONLY.
2. ALL WORK SHALL BE CARRIED OUT AS PER THE LATEST REQUIREMENTS OF BUILDING, PLUMBING, AND ELECTRICAL CODES, AMERICANS WITH DISABILITIES ACT (ADA), AND ALL OTHER GOVERNING AGENCIES HAVING JURISDICTION.
3. PROVIDE ALL MATERIAL, EQUIPMENT, AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE PLUMBING SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED, AND AS REQUIRED BY CODE.
4. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD AND SHALL REPORT DISCREPANCIES, IF ANY, TO THE ENGINEER FOR CLARIFICATION PRIOR TO STARTING ANY WORK.
5. COORDINATE ACTUAL LOCATIONS AND SIZES OF ALL EQUIPMENT CONNECTONS, DRAINS, ETC., WITH EQUIPMENT DIMENSIONAL DRAWINGS. REFER TO ARCHITECTURAL DRAWINGS FOR ACTUAL LOCATIONS OF ALL PLUMBING FIXTURES, MINOR ADJUSTMENTS TO CONDITIONS SHALL BE SUPPLIED AT NO ADDITIONAL COST TO THE OWNER.
6. INSTALL ALL PLUMBING EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
7. THE CONTRACTOR SHALL PERFORM ALL CUTTING, CORE DRILLING, CHIPPING, AND PATCHWORK AS REQUIRED.
8. ALL SURFACES DAMAGED IN THE COURSE OF THE WORK SHALL BE RESTORED TO THE ORIGINAL CONDITION AND IN ACCORDANCE TO DRAWINGS AND SPECIFICATIONS. LOCATIONS AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS SHALL BE COORDINATED WITH THE OTHER TRADES.
9. ALL FLOOR DRAINS ARE AT LOW POINTS OF FLOORS AND SHALL BE INSTALLED FLUSH WITH THE FINISHED FLOOR. LOCATIONS ARE SHOWN ON THE STRUCTURAL DRAWINGS.
10. ALL FLOOR DRAINS FOR EQUIPMENT SHALL BE FIELD COORDINATED AND LOCATED ADJACENT TO THE EQUIPMENT PADS IN THE APPROXIMATE LOCATIONS SHOWN ON THE DRAWINGS.
11. ALL BRANCH PIPING TO EQUIPMENT OR FIXTURES SHALL BE PROVIDED WITH SHUT-OFF VALVES, WHETHER SHOWN, OR NOT SHOWN ON DRAWINGS.
12. CHANGES IN DIRECTION IN DRAINAGE PIPING SHALL BE MADE BY THE USE OF 45 DEGREE ELLS, LONG SWEEPS, 90 DEGREES WYES WITH CLEANOUTS, OR BY A COMBINATION OF EQUIVALENT FITTINGS. THERE SHALL BE NO DOUBLE WYES IN THE HORIZONTAL PLANE.
13. SANITARY TEES AND QUARTER BENDS MAY BE USED IN DRAINAGE LINES ONLY WHERE DIRECTION OF FLOW IS FROM HORIZONTAL TO THE VERTICAL.
14. ALL VENT RISERS RUN STRAIGHT THROUGH ROOF SHALL HAVE AN APPROVED EXPANSION JOINT SYSTEM INSTALLED BELOW ROOF.
15. ALL PIPING CONNECTIONS TO EQUIPMENT SHALL BE THROUGH UNION CONNECTIONS. PROVIDE DI-ELECTRIC UNIONS OR FLANGES TO ISOLATE DISSIMILAR METALS.
16. ALL WYE TYPE STRAINERS SHALL HAVE A 3-INCH LONG THREADED NIPPLE, THREADED END BALL VALVE AND CAP OR PLUG ON BLOWDOWN SIDE.
17. AN ACCESSIBLE CLEANOUT SHALL BE PROVIDED AT THE BASE OF EACH SOIL OR WASTE STACK AND ROOF LEADER.
18. ALL DRAINAGE PIPING SHALL BE INSTALLED TO SLOPE AT A MINIMUM 1/8" PER FOOT UNLESS OTHERWISE NOTED.
19. ALL PIPING PENETRATING OR IN CONTACT WITH CONCRETE, MASONRY, OR OTHER CORROSIVE MATERIAL SHALL BE SLEEVED.
20. ALL HOT AND TEPID WATER PIPING AND ALL COLD WATER PIPING ABOVE SUSPENDED CEILINGS SHALL BE INSULATED.
21. ALL EXPOSED FIXTURE P-TRAPS, FITTINGS, AND VALVES SHALL BE CHROME PLATED COPPER OR BRASS.
22. P-TRAPS SHALL BE PROVIDED AT ALL FLOOR DRAINS EXCEPT WHERE NOTED.
23. VENT PIPING SERVING FLOOR DRAIN HEADERS SHALL BE TAKEN OFF ABOVE THE CENTERLINE OF THE SOIL PIPE, AND THE VENT SHALL RISE AT AN ANGLE NOT MORE THAN 45 DEGREES.
24. WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF EQUIPMENT ARE REQUIRED, THE PRODUCT OF ONE MANUFACTURER SHALL BE USED.
25. COORDINATE THE EXACT ROUTING OF PIPES WITH OTHER TRADE CONTRACTORS SO THAT NO CONFLICTS OCCUR WITH PIPING, LIGHTS, STRUCTURE, DUCTS, ETC.
26. ESCUTCHEONS AND COVER PLATES ARE REQUIRED FOR FINISH WALL PENETRATIONS.
27. ALL VENT PIPING SHALL SLOPE UP TO THE VENT THROUGH THE ROOF. VENT THROUGH THE ROOF TERMINATION SHALL BE A MINIMUM OF 10'-0" FROM ANY FRESH AIR INTAKES.
28. AUTOMATIC TRAP PRIMERS SHALL BE USED FOR FLOOR DRAINS. THE PRIMER SHALL BE THE PASSIVE TYPE FED-OFF OF THE NEAREST COLD WATER PIPE SERVING A FREQUENTLY USED FIXTURE.
29. NATURAL GAS PIPING CONNECTION TO EQUIPMENT OR APPLIANCE SHALL BE PROVIDED WITH A FULL SIZED DIRT LEG AND UNION.
30. NATURAL GAS PRESSURE REGULATORS LOCATED OUTDOORS SHALL HAVE THERE VENTS TURNED DOWN AND SCREENED.
31. NATURAL GAS PRESSURE REGULATORS LOCATED INDOORS SHALL HAVE INDIVIDUAL FULL SIZED VENT PIPING TO THE EXTERIOR.

THE CITY OF Kalamazoo

PLUMBING LEGEND & GENERAL NOTES

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.
Fluid thinking®...
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

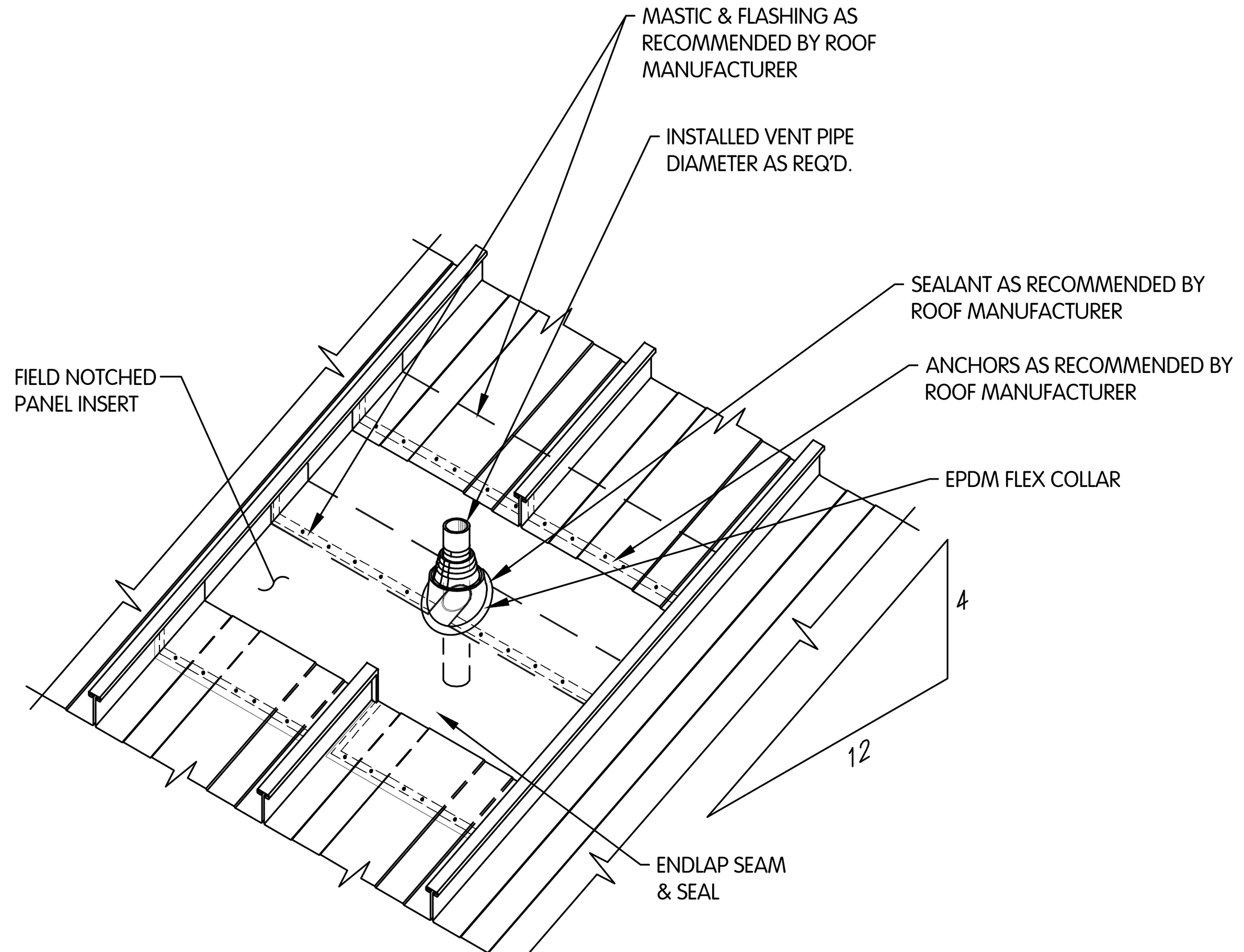
STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

SHEET NO.

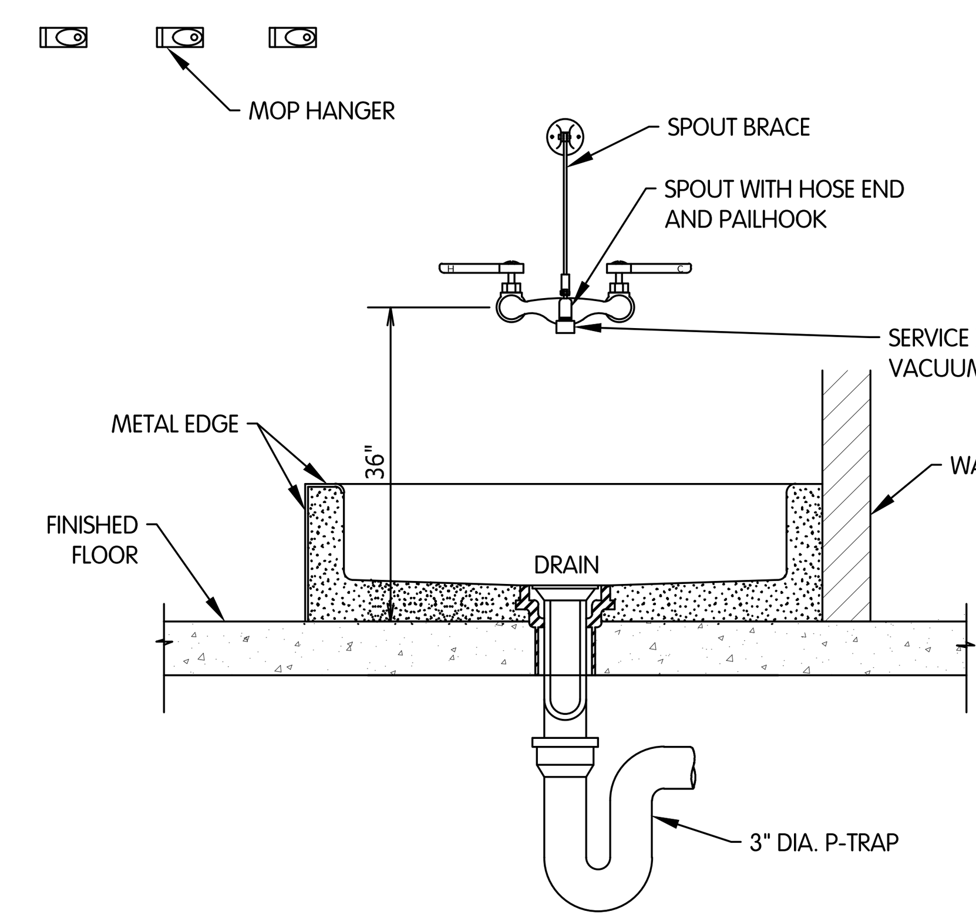
P-1

KAL-772500IP01-PLUMBING LEGEND & GENERAL NOTES
1/28/2022 9:50 AM - SWILLIS
1/28/2022 2:32 PM

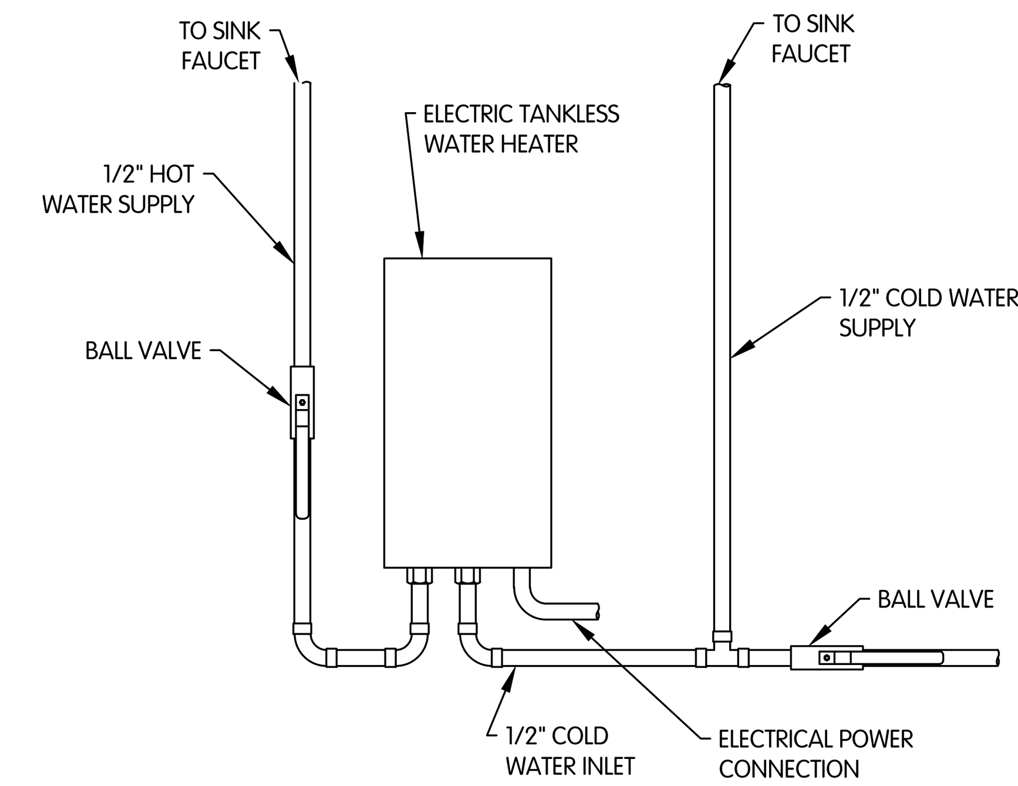


NOTE:
PIPE & CONDUIT SIMILAR (METAL SLEEVE NOT REQUIRED)

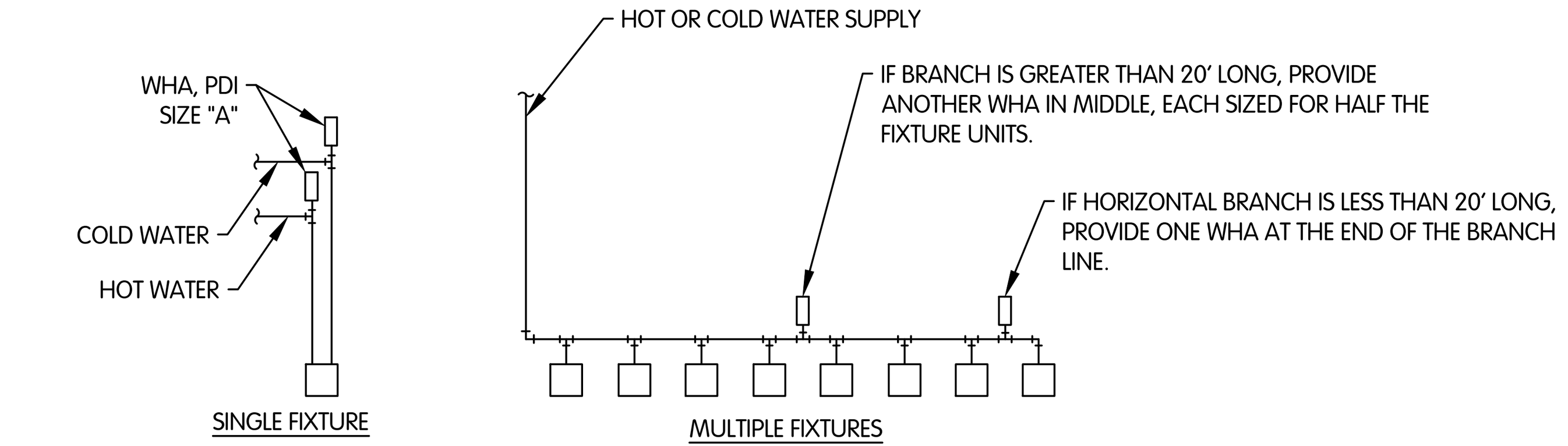
ROOF VENT PIPE DETAIL
NTS



MOP SINK DETAIL
NTS



ELECTRIC TANKLESS WATER HEATER DETAIL
NTS

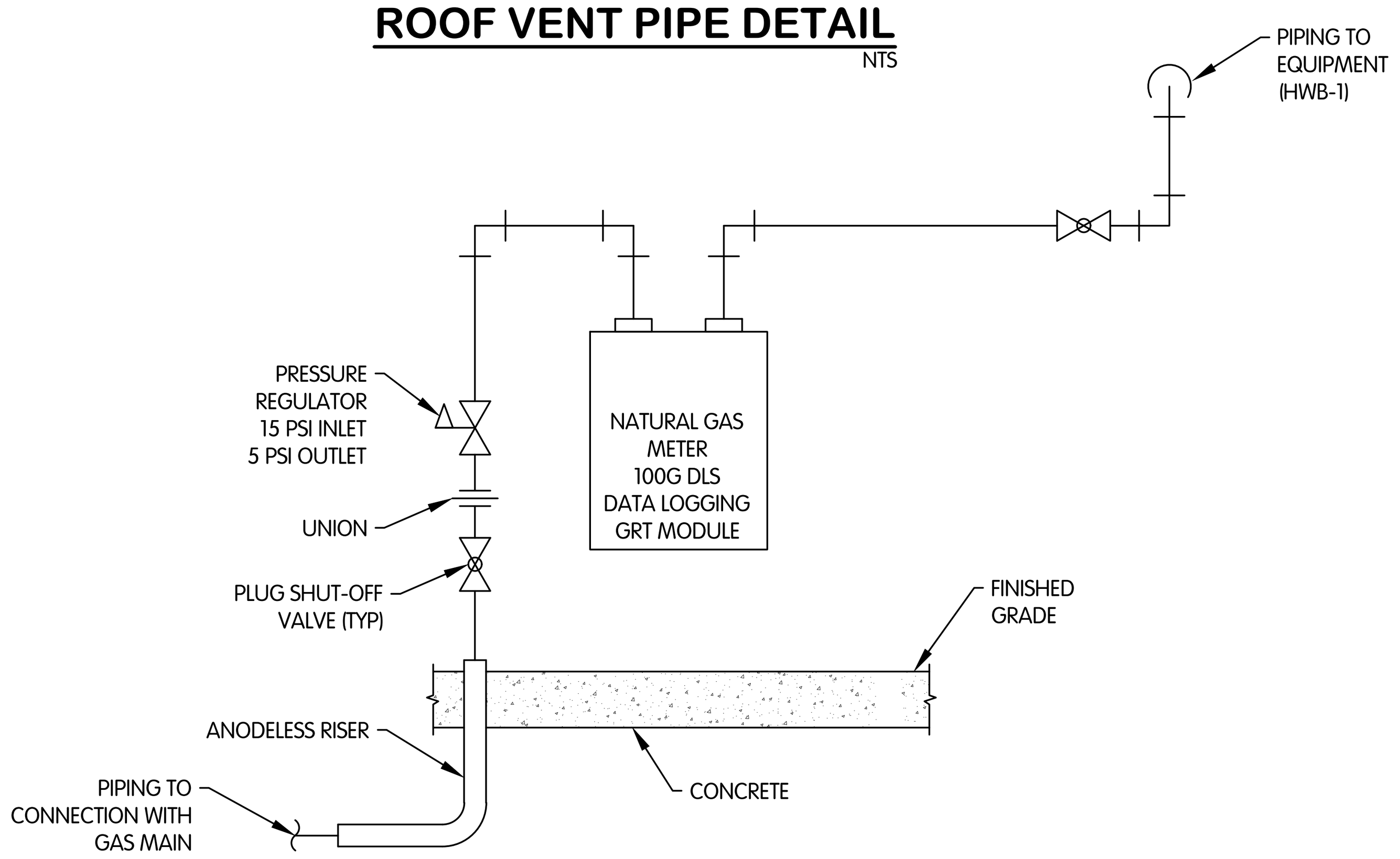


WATER HAMMER ARRESTER SIZE		
P.D.I. SIZE	PIPE SIZE (IN.)	FIXTURE UNITS (FU)
AA	1/2	1-3
A	1/2	1-11
B	3/4	12-32
C	1	33-60
D	1-1/4	61-113
E	1-1/2	114-154
F	2	155-330

FIXTURE UNIT TABULATION		
FIXTURE	COLD	HOT
WATER CLOSET FLUSH VALVE	10	---
WATER CLOSET FLUSH TANK	5	---
URINAL FLUSH VALVE	5	---
SHOWER HEAD	3	3
SERVICE SINK/MOP SINK	2.25	2.25
LAVATORY	1.5	1.5
KITCHEN SINK	1	1
HOSE BIBB/WALL FAUCET	3	---
DRINKING FOUNTAIN	0.25	---

NOTE:
DO NOT PROVIDE AIR CHAMBERS. PROVIDE WATER HAMMER ARRESTERS BY PRECISION PLUMBING PRODUCTS, SIOUX CHIEF, WATTS, OR EQUAL, WITH PISTON AND O-RING CONSTRUCTION HAVING PDI #WH-201, ASSE #1010, AND ANSI #A112.26.1M CERTIFICATION. INSTALL IN HORIZONTAL OR VERTICAL POSITION, NEVER IN THE UPSIDE DOWN POSITION. INSTALL IN LINE WITH WATER FLOW DIRECTION IF POSSIBLE. SIZE THE UNITS AS SHOWN ON THE DRAWINGS AND/OR PER TABLES SHOWN ABOVE. INSTALL PER PDI STANDARDS AND MANUFACTURER'S INSTRUCTIONS.

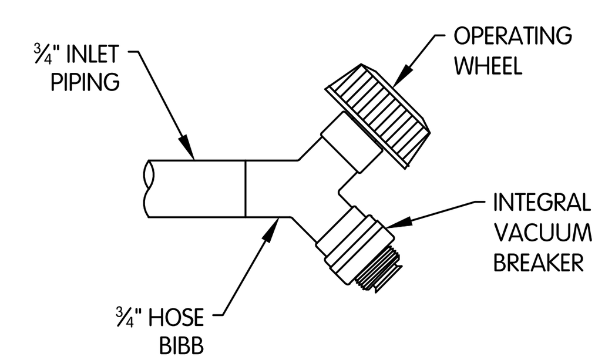
WATER HAMMER ARRESTER DETAIL
NTS



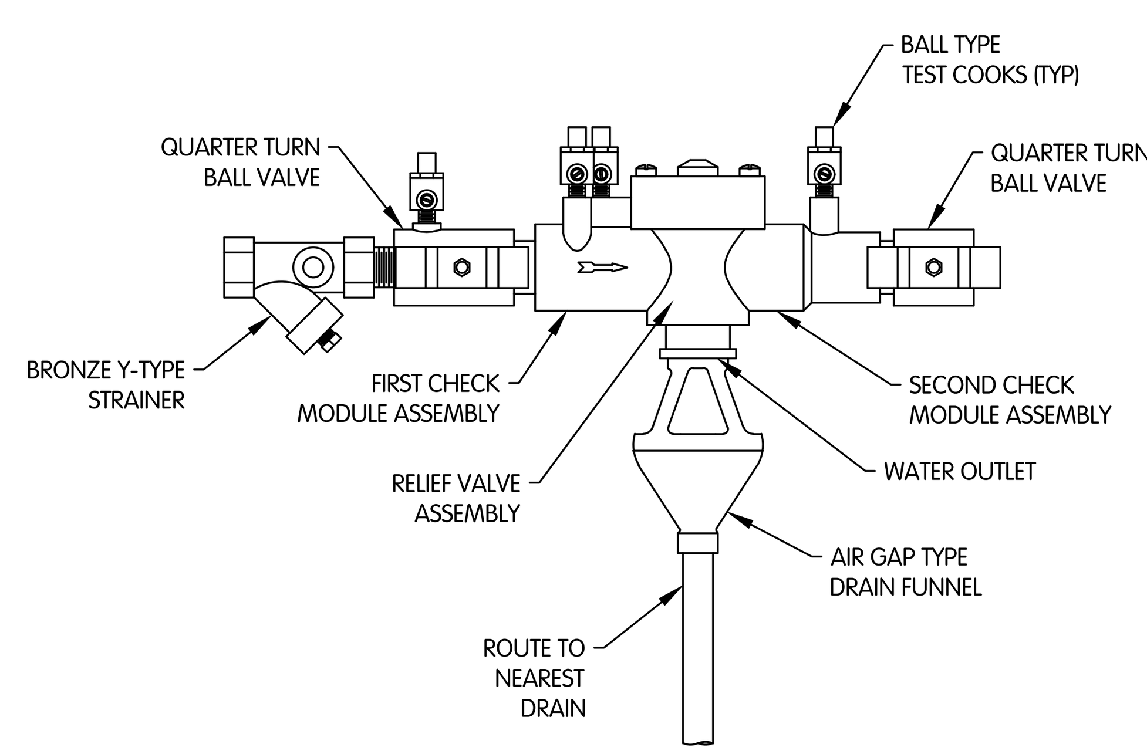
NOTES:

1. NATURAL GAS METER AND PRESSURE REGULATOR SET ASSEMBLY TO BE FURNISHED AND INSTALLED BY CONTRACTOR.
2. NATURAL GAS METER AND PRESSURE REGULATOR SET ASSEMBLY SHALL BE PROTECTED PER THE REQUIREMENTS OF NATURAL GAS PROVIDER.
3. ALL BURIED NATURAL GAS PIPING SHALL BE PE 4710 HDPE IPS SDR-11. ALL ABOVE GRADE OR EXPOSED PIPING SHALL BE SCHEDULE 40 BLACK STEEL.
4. INSTALL BOLLARDS AROUND NATURAL GAS METER AND PIPING FOR PROTECTION. SEE BOLLARD DETAIL.

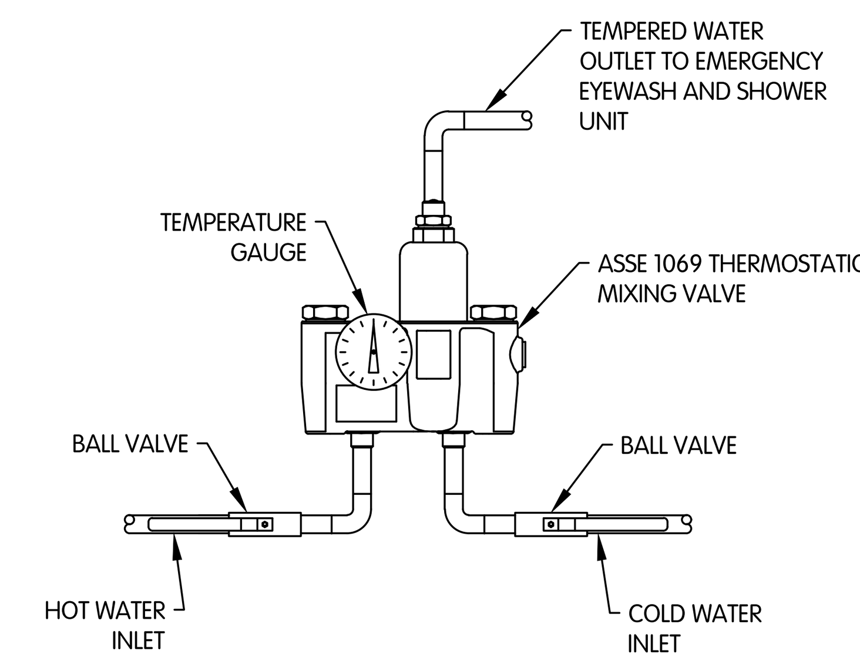
NATURAL GAS METER AND PRESSURE REGULATOR SET ASSEMBLY DETAIL
NTS



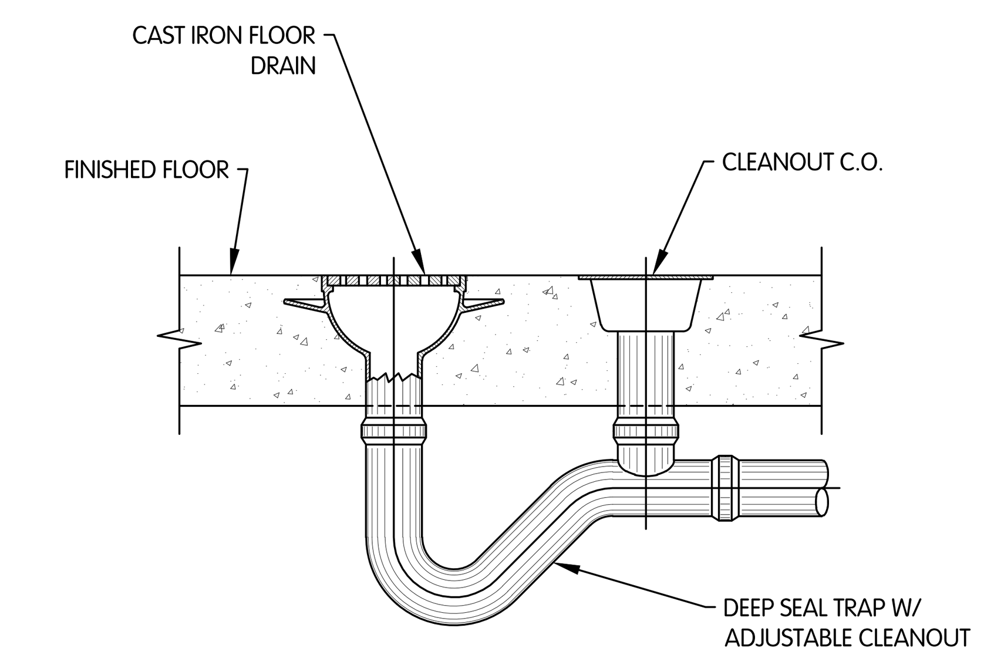
HOSE BIBB DETAIL
NTS



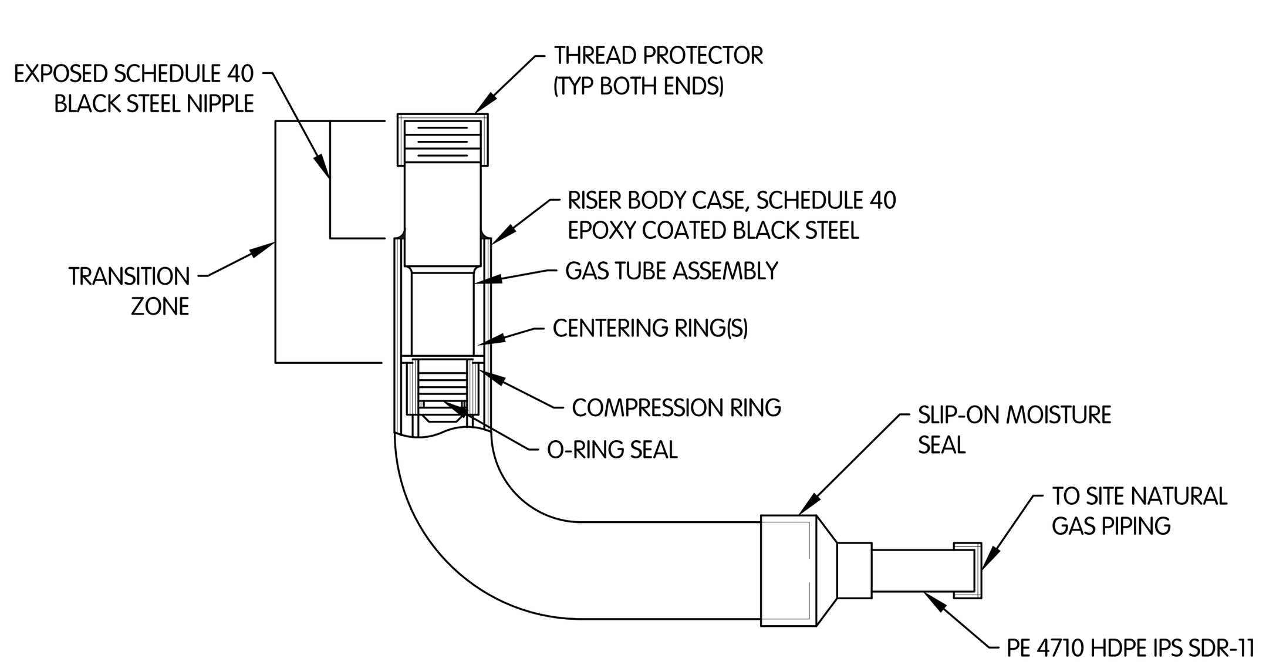
SMALL BACKFLOW PREVENTER DETAIL
NTS



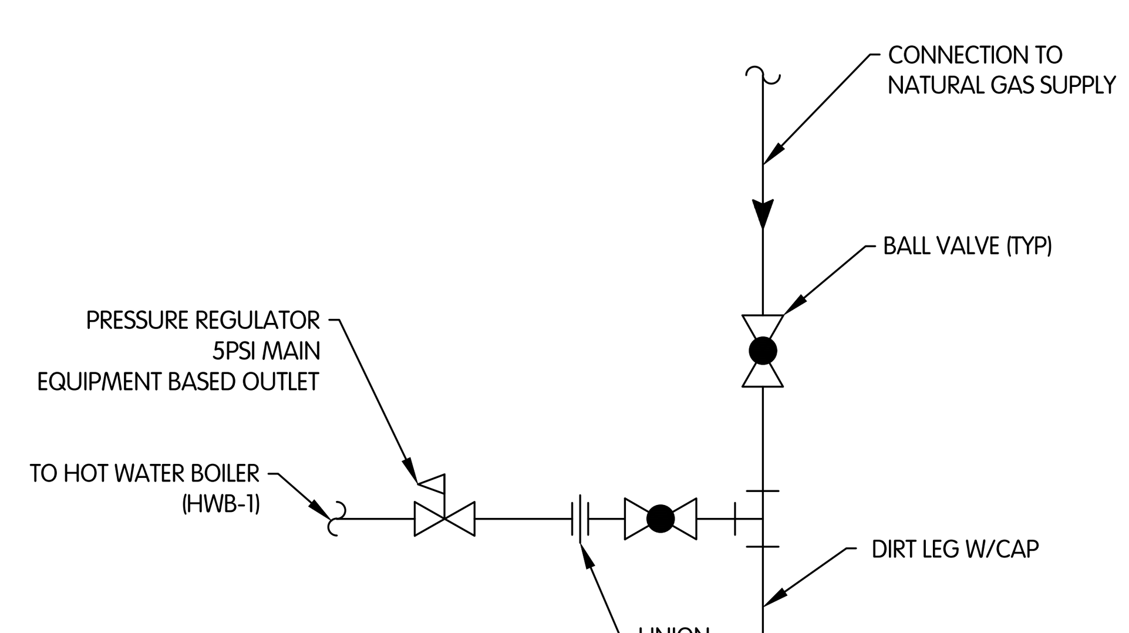
THERMOSTATIC MIXING VALVE DETAIL
NTS



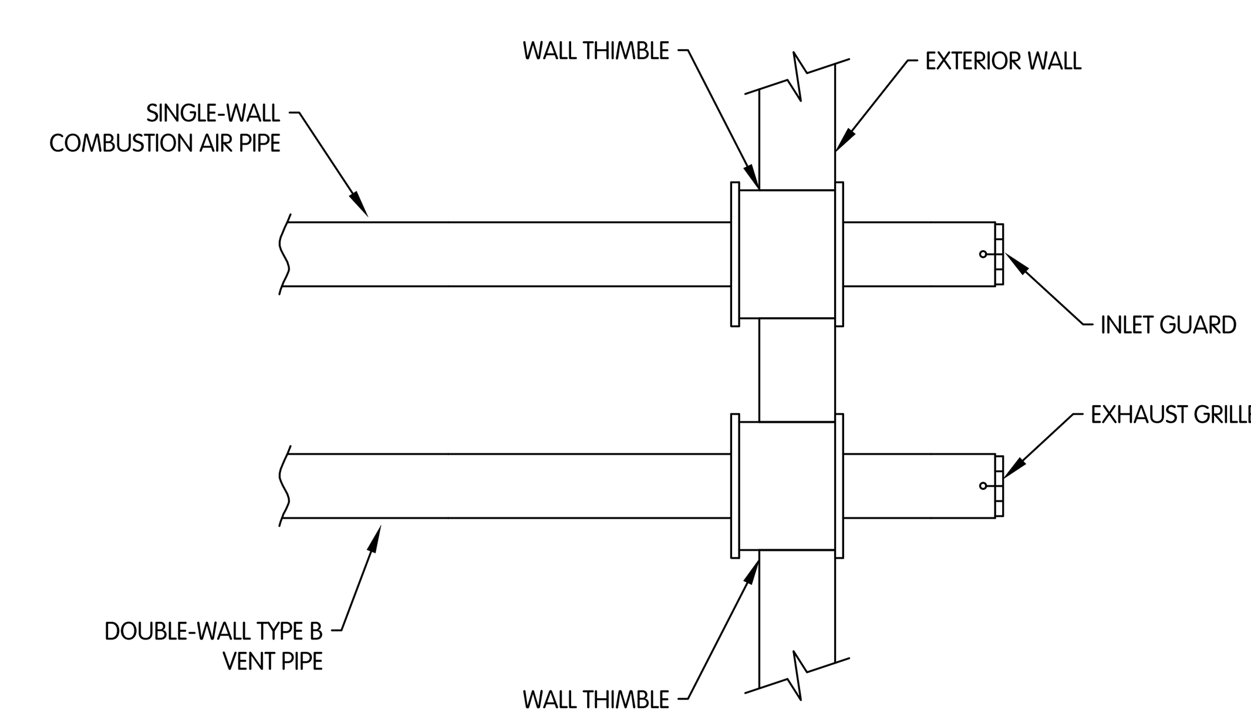
TYPE B FLOOR DRAIN DETAIL
NTS



NATURAL GAS PIPE RISER DETAIL
NTS



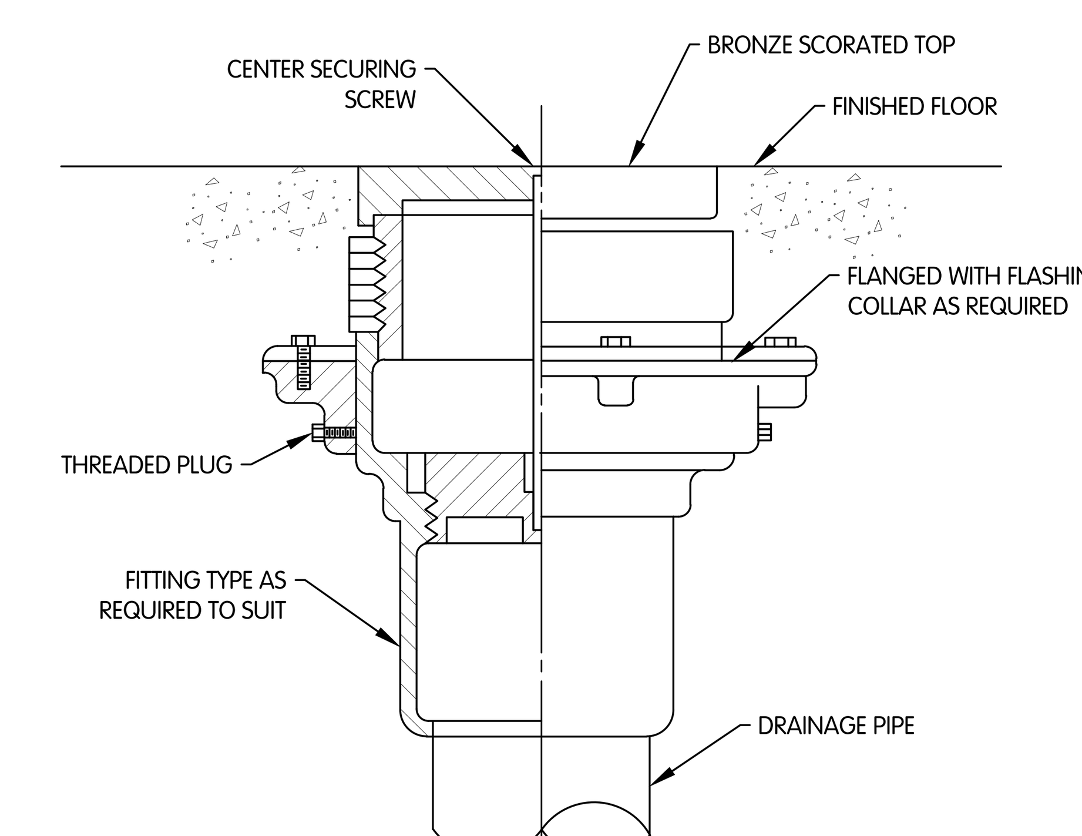
GAS PIPING EQUIPMENT CONNECTION DETAIL
NTS



NOTES:

1. INSTALLATION OF COMBUSTION AIR PIPES AND FLUE GAS PIPES TO BE IN ACCORDANCE WITH ASSOCIATED MANUFACTURER'S RECOMMENDATIONS.

COMBUSTION AIR AND FLUE GAS DETAIL
NTS



FLOOR CLEANOUT DETAIL
NTS

THE CITY OF Kalamazoo

PLUMBING DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

REVISIONS AFTER ISSUED FOR BID

NO	DATE	BY
1		
2		
3		
4		
5		

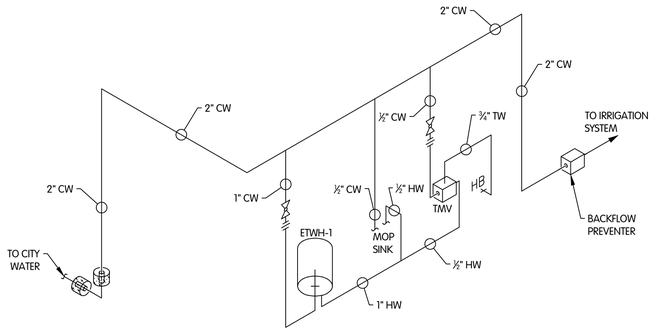
Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

JOB NO. 017-7725.001
SCALE NONE
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022
SHEET NO.
P-2
27 OF 44

KAL-772500P06-PLUMBING DETAILS
1/28/2022 1:50 PM - SWILLIS
1/28/2022 2:32 PM

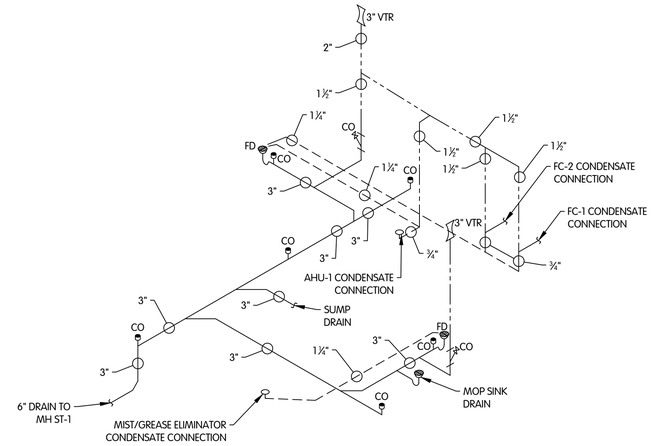


PLUMBING ISOMETRIC

NTS

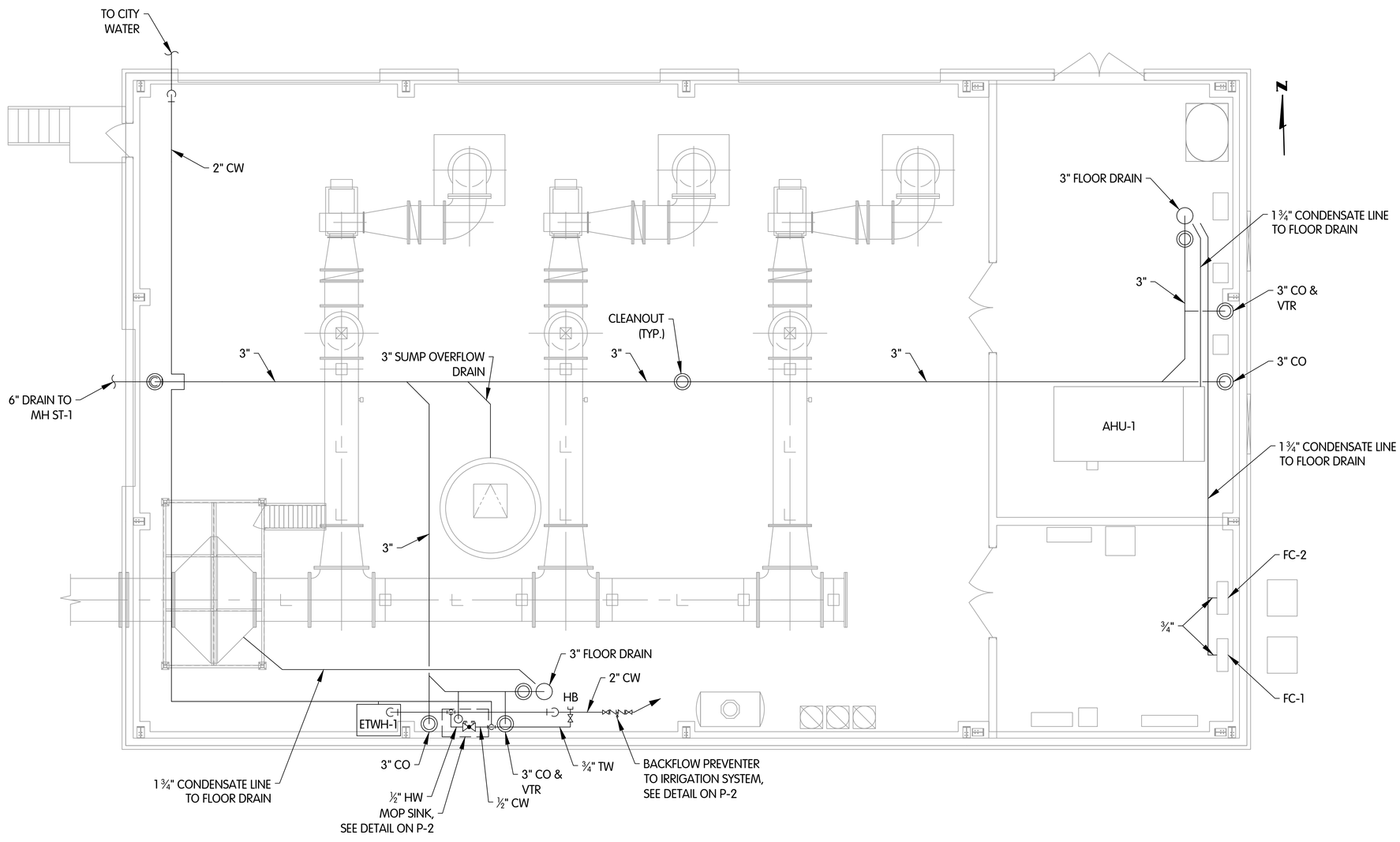
LEGEND

ETWH = ELECTRIC TANKLESS WATER HEATER
TMV = TEMPERATURE METERING VALVE
VTR = VENT THROUGH ROOF
HB = HOSE BIB
CW = COLD WATER
HW = HOT WATER
TW = TEMPERED WATER



DRAIN ISOMETRIC

NTS



THE CITY OF Kalamazoo

BLOWER BUILDING PLUMBING LAYOUT

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE 3/16" = 1'-0"

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID

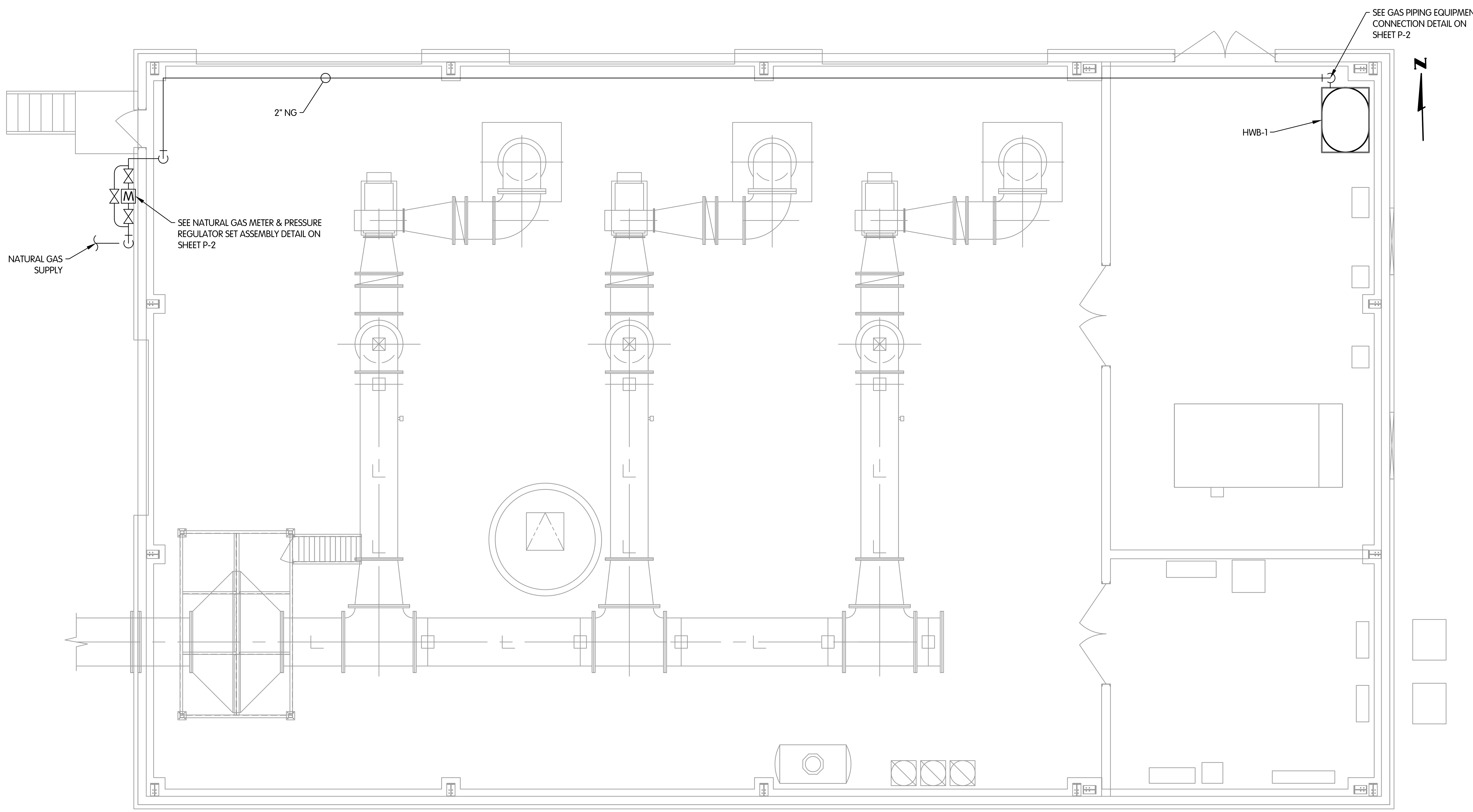
DATE: FEBRUARY 2022

SHEET NO.

P-3

28 OF 44

KAL-7725001P02-BLOWER BUILDING PLUMBING LAYOUT
1/28/2022 2:16 PM - SWILLIS
1/28/2022 2:12 PM



BLOWER BUILDING NATURAL GAS LAYOUT

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO	DATE	REVISIONS AFTER ISSUED FOR BID	BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

JOB NO. 017-7725.001
SCALE 3/16" = 1'-0"
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

SHEET NO.
P-4
29 OF 44

KAL-772500IP03-BLOWER BUILDING NATURAL GAS LAYOUT
1/28/2022 2:13 PM - SWILLIS
1/28/2022 2:32 PM

HVAC SYMBOLS LEGEND

- METER ASSEMBLY
- RPZ BACKFLOW PREVENTER
- FLEXIBLE PIPE CONNECTOR
- FLEXIBLE PIPE
- CHECK VALVE
- GATE VALVE
- GLOBE VALVE (MANUAL) N.C.
- BALL VALVE (MANUAL)
- PLUG VALVE
- BUTTERFLY VALVE
- COMBINATION BALANCING VALVE
- COMBINATION PUMP DISCHARGE VALVE
- ANGLE GATE VALVE (MANUAL)
- AUTOMATIC CONTROL VALVE 2-WAY
- AUTOMATIC CONTROL VALVE 3-WAY
- PRESSURE REDUCING VALVE, SELF CONTAINED
- PRESSURE REDUCING VALVE, PILOT OPERATED
- SOLENOID OPERATED VALVE
- MOTORIZED BALL VALVE
- PRESSURE RELIEF VALVE
- DRAIN
- STRAINER
- STRAINER WITH BLOW OFF VALVE AND PLUG
- UNION CONNECTION
- FLANGED CONNECTION
- SPOOL PIECE, FLANGED
- HOSE CONNECTOR
- AIR VENT
- EXPANSION JOINT OR COMPENSATOR
- PIPE ANCHOR
- PIPE GUIDE
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER-FLUSH TOP
- ECCENTRIC REDUCER-FLUSH BOTTOM
- PIPE ELBOW, 90 TURNED DOWN
- PIPE ELBOW, 90 TURNED UP
- PIPE TEE, OUTLET TURNED DOWN
- PIPE TEE, OUTLET TURNED UP
- EXPANSION LOOP
- PRESSURE GAGE WITH SHUT-OFF COCK (BALL VALVE)
- PRESSURE SWITCH
- FLOW SWITCH
- THERMOMETER
- CENTRIFUGAL PUMP
- THERMOSTAT
- CONTROL SWITCH
- PUMP SUCTION DIFFUSER

- SUPPLY AIRFLOW
- RETURN OR EXHAUST AIRFLOW
- DIRECTION OF FLOW IN DUCTWORK
- 12x8 DUCT SIZE-FIRST FIGURE IS SIDE SHOWN
- DUCT SECTION, SUPPLY
- DUCT SECTION, RETURN
- DUCT SECTION, EXHAUST
- MOTORIZED DAMPER
- SMOKE DAMPER WITH ACCESS DOOR
- FIRE DAMPER WITH ACCESS DOOR
- MANUAL BALANCING DAMPER
- BACKDRAFT DAMPER
- CHANGE OF ELEVATION: RISE (R) OR DROP (D)
- ACCESS DOOR OR ACCESS PANEL
- MITERED ELBOW WITH TURNING VANES
- FLEXIBLE DUCT CONNECTION
- SPLITTER DAMPER-SEE PLAN FOR NECK SIZE
- AIR EXTRCATOR WITH VANES
- DUCT TRANSITION RECTANGULAR
- DUCT TRANSITION RECTANGULAR TO ROUND
- BRANCH TAKE-OFF FROM MAIN DUCT
- VANED ELBOW 90 (SHORT RADIUS)
ROUND ELBOW 90 (SHORT RADIUS)
- DUCT ELBOW 90-TURNED UP-RECTANGULAR
- DUCT ELBOW 90-TURNED DOWN-RECTANGULAR
- SUPPLY REGISTER
- RETURN GRILLE
- EXHAUST GRILLE
- SUPPLY DIFFUSER-ROUND NECK
- VAV BOX, TERMINAL UNIT
- (#,SIZE)
(CFM) TERMINAL AIR DEVICE NOMENCLATURE
- FLEXIBLE DUCTWORK
- MOTOR ACTUATED DAMPER
- OPPOSED BLADE DAMPER
- PARALLEL BLADE DAMPER
- SMOKE DETECTOR (P-PHOTOELECTRIC, I-IONIZATION)
- CENTRIFUGAL FAN
- PROPELLER FAN
- VANEAXIAL FAN
- UNIT HEATER

HVAC ABBREVIATIONS

AC	AIR CONDITIONING
ACU	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AMB	AMBIENT
AMP	AMPERAGE
APD	AIR PRESSURE DROP
B	BOILER
BD	BALANCING DAMPER
BDD	BACKDRAFT DAMPER
BFP	BACKFLOW PREVENTER
BHP	BRAKE HORSEPOWER
BOD	BOTTOM OF DUCT
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
CW	CLOCKWISE
CCW	COUNTER CLOCKWISE
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
CV	CONTROL VALVE
CWCP	CHILLED WATER CIRCULATION PUMP
CWR	CHILLED WATER RETURN
CWS	CHILLED WATER SUPPLY
DB	DRY BULB
DIA	DIAMETER
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EF	EXHAUST FAN
EFF	EFFICIENCY
EG	EXHAUST GRILLE
ELEV	ELEVATION
ESP	EXTERNAL STATIC PRESSURE
EUH	ELECTRIC UNIT HEATER
EWH	ELECTRIC WALL HEATER
EWT	ENTERING WATER TEMPERATURE
FA	FREE AREA
FCU	FAN COIL UNIT
FD	FIRE DAMPER
FF	FINISHED FLOOR
FPM	FEET PER MINUTE
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FEET
GAL	GALLONS
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GUH	GAS FIRED UNIT HEATER
H	HEATING
HP	HORSEPOWER
HR	HOUR
HVU	HEATING VENTILATING UNIT
HVAC	HEATING, VENTILATING, AND AIR CONDITIONING
HWCP	HOT WATER CIRCULATION PUMP
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HWUH	HOT WATER UNIT HEATER
HZ	HERTZ
IN	INCHES
IN. WG	INCHES WATER GAGE
KW	KILOWATTS
KWH	KILOWATTS PER HOUR
L	LOUVER
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LF	LINEAR FEET
LWT	LEAVING WATER TEMPERATURE
MAU	MAKE-UP AIR UNIT
MIN	MINUTE
MD	MOTORIZED DAMPER
MFG	MANUFACTURER
N/A	NOT APPLICABLE
NC	NORMALLY CLOSED
NG	NATURAL GAS
NO	NORMALLY OPEN
OA	OUTSIDE AIR
PD	PRESSURE DROP
PH	PHASE
PS	PRESSURE SWITCH
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
RA	RETURN AIR
RG	RETURN GRILLE
RH	RELATIVE HUMIDITY
RL	REFRIGERANT LIQUID
RPM	REVOLUTIONS PER MINUTE
RS	REFRIGERANT SUCTION
SA	SUPPLY AIR
SD	SUPPLY DIFFUSER, SUPPLY DETECTOR, SMOKE DAMPER
SF	SUPPLY FAN
SP	STATIC PRESSURE
SR	SUPPLY REGISTER
SV	SOLENOID VALVE
T	THERMOSTAT
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
V	VENTILATING, VOLTS
VAV	VARIABLE AIR VOLUME
W	WATT
W/	WITH
WB	WET BULB
WC	WATER COLUMN
WPD	WATER PRESSURE DROP

HVAC GENERAL NOTES

1. THE SYMBOLS AND ABBREVIATIONS LIST ON THIS SHEET IS A COMPREHENSIVE STANDARD GUIDE INTENDED FOR GENERAL USE ON ALL PROJECTS. THEREFORE, NOT ALL THE SYMBOLS AND ABBREVIATIONS CONTAINED IN THIS LIST ARE NECESSARILY USED ON THIS PARTICULAR PROJECT AND SHOULD BE USED FOR CLARIFICATION ONLY.
2. ALL WORK SHALL BE CARRIED OUT AS PER THE LATEST REQUIREMENTS OF BUILDING, MECHANICAL, PLUMBING, AND ELECTRICAL CODES, NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), AMERICANS WITH DISABILITIES ACT (ADA), AND ALL OTHER GOVERNING AGENCIES HAVING JURISDICTION.
3. PROVIDE ALL MATERIAL, EQUIPMENT, AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE HVAC SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED, AND AS REQUIRED BY CODE.
4. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD AND SHALL REPORT DISCREPANCIES, IF ANY, TO THE ENGINEER FOR CLARIFICATION PRIOR TO STARTING ANY WORK.
5. EXACT LOCATION OF ALL EQUIPMENT AND ACCESSORIES SHALL BE VERIFIED IN THE FIELD. EQUIPMENT SIZES AND LOCATIONS ARE APPROXIMATE. ACTUAL DIMENSIONS TO BE DETERMINED BY EQUIPMENT FURNISHED.
6. INSTALL ALL HVAC EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
7. THE CONTRACTOR SHALL PERFORM ALL CUTTING, CORE DRILLING, CHIPPING, AND PATCHWORK AS REQUIRED.
8. ALL SURFACES DAMAGED IN THE COURSE OF THE WORK SHALL BE RESTORED TO THE ORIGINAL CONDITION AND IN ACCORDANCE TO DRAWINGS AND SPECIFICATIONS. LOCATIONS AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS SHALL BE COORDINATED WITH THE OTHER TRADES.
9. ALL OPENINGS IN FIRE WALLS DUE TO DUCTWORK, PIPING, CONDUITS, ETC., SHALL BE FIRE STOPPED WITH A PRODUCT SIMILAR TO 3M OR EQUAL.
10. ALL MATERIALS SHALL BE AS PER THE DRAWINGS AND SPECIFICATIONS AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO ITS INSTALLATION.
11. ALL WORK SHALL BE COORDINATED WITH OTHER TRADES DURING INSTALLATION.
12. ALL INDICATED DUCT DIMENSIONS ARE CLEAR INSIDE DIMENSIONS. CONTRACTOR SHALL INCORPORATE THICKNESS OF DUCT INSULATION OR LINING AS APPLICABLE TO DETERMINE TOTAL OUTSIDE DIMENSIONS. FIRST DIMENSION IS IN PLANE OF DRAWING, SECOND IS PERPENDICULAR TO DRAWING.
13. PROVIDE FLEXIBLE DUCT CONNECTIONS AT THE POINT OF CONNECTION IN SUPPLY, RETURN, AND EXHAUST DUCTWORK SYSTEMS BETWEEN THE HVAC EQUIPMENT AND DUCTWORK.
14. PROVIDE ALL 90 DEGREE SQUARE ELBOWS WITH SINGLE THICKNESS TURNING VANES UNLESS OTHERWISE INDICATED. PROVIDE ACESS DOORS UPSTREAM OF ALL ELBOWS WITH TURNING VANES.
15. PROVIDE BALANCING DAMPERS AT POINTS ON SUPPLY, RETURN, AND EXHAUST SYSTEMS WHERE BRANCHES ARE TAKEN FROM LARGER DUCTS AS REQUIRED FOR BALANCING. INSTALL MINIMUM TWO DUCT WIDTHS FROM DUCT TAKE-OFF. PROVIDE BALANCING DAMPERS ON DUCT TAKE-OFF TO DIFFUSERS, REGISTERS, AND GRILLES, REGARDLESS OF WHETHER DAMPERS ARE SPECIFIED AS PART OF THE DIFFUSER, REGISTER, OR GRILLE ASSEMBLY. ALL BALANCING DAMPERS SHALL BE PROVIDED WITH LOCKING POSITION INDICATORS.
16. PROVIDE ACCESS DOORS IN DUCTWORK AT SMOKE DETECTORS, FIRE DAMPERS, SMOKE DAMPERS, AND BALANCING DAMPERS, AND OTHER ITEMS LOCATED IN THE DUCTWORK WHICH REQUIRE SERVICE AND/OR INSPECTION.
17. EQUIPMENT SIZES AND LOCATIONS ARE APPROXIMATE. ACTUAL DIMENSIONS TO BE DETERMINED BY EQUIPMENT FURNISHED.
18. CONCRETE HOUSEKEEPING PADS TO SUIT HVAC EQUIPMENT SHALL BE SIZED AND LOCATED BY THE HVAC CONTRACTOR. PADS SHALL BE FURNISHED AND INSTALLED BY THE GENERAL CONTRACTOR. COORDINATE FINAL EQUIPMENT SIZE AND LOCATION OF HOUSEKEEPING PADS WITH THE GENERAL CONTRACTOR. MINIMUM CONCRETE PAD THICKNESS SHALL BE 6 INCHES. PAD SHALL EXTEND BEYOND THE EQUIPMENT A MINIMUM OF 6 INCHES ON EACH SIDE.
19. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURERS' CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR FINAL EQUIPMENT CONNECTIONS FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION.
20. PROVIDE VIBRATION ISOLATION FOR ALL HVAC EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.
21. INSTALL UNIONS AND/OR FLANGES BETWEEN HVAC EQUIPMENT AND PIPING TO PERMIT DISASSEMBLY FOR ALTERATION OR REPAIRS.
22. PROVIDE FLEXIBLE CONNECTIONS IN ALL PIPING SYSTEMS CONNECTED TO PUMPS OR HVAC EQUIPMENT AND OTHER EQUIPMENT WHICH REQUIRES VIBRATION ISOLATION EXCEPT AT COILS. FLEXIBLE CONNECTIONS SHALL BE INSTALLED AS CLOSE TO THE HVAC EQUIPMENT AS POSSIBLE OR AS INDICATED ON THE DRAWINGS.
23. LOCATE ALL TEMPERATURE, PRESSURE, AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER FOR GOOD ACCURACY.
24. WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF EQUIPMENT ARE REQUIRED, THE PRODUCT OF ONE MANUFACTURER SHALL BE USED.
25. FOR LOUVER LOCATIONS, SEE ARCHITECTURAL DRAWINGS.
26. ALL AIR CONDITIONING AND CONDENSING TYPE HEATING EQUIPMENT CONDENSATE DRAIN PIPING FROM EQUIPMENT SHALL BE PIPED FULL SIZE OF THE UNIT DRAIN OUTLET WITH "P" TRAP AND PIPED AND DISCHARGED TO THE NEAREST DRAIN SLOPED 1/8 INCH PER FOOT. SEE HVAC DETAILS FOR DEPTH OF CONDENSATE TRAP.
27. ALL PIPING AND DUCTS IN FINISHED ROOMS SHALL BE CONCEALED IN FURRED CHASES OR SUSPENDED CEILINGS. ACCESS DOORS SHALL BE INSTALLED FOR ANY CONCEALED DEVICE REQUIRING ADJUSTMENT.
28. FOR INTERLOCKING WIRING SCHEMATICS SEE ELECTRICAL DRAWINGS.
29. ALL CONTROL WIRING AND CONDUIT SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE AND DIVISION 16 OF THE SPECIFICATIONS.
30. THERMOSTATS AND OTHER CONTROL COMPONENTS SHALL BE MOUNTED 5'-0" A.F.F. UNLESS OTHERWISE NOTED.
31. ALL TESTS SHALL BE COMPLETED BEFORE ANY HVAC EQUIPMENT OR PIPING INSULATION IS APPLIED.

THE CITY OF Kalamazoo

HVAC LEGEND & GENERALNOTES

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	BY
5		
4		
3		
2		
1		

REVISIONS AFTER ISSUED FOR BID

Jones & Henry Engineers, Ltd.

Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

SHEET NO.

H-1

30 OF 44

KAL-77250\IH02-HVAC LEGEND & GENERAL NOTES
1/27/2022 10:01 AM - SWILLIS
1/26/2022 1:32 PM

HOT WATER UNIT HEATER SCHEDULE

TAG	LOCATION	TYPE	TOTAL (MBH)	AIRFLOW (CFM)	WATER DATA				ELECTRICAL			MAKE	MODEL	NOTES
					FLOW (GPM)	EWT (°F)	LWT (°F)	PD (FT)	FAN	MOTOR	V/PH/HZ			
HWUH-1	MECHANICAL ROOM	PROPELLER	8	245	0.8	200	180	0.8	16 W	1550	120/1/60	TRANE	UHSBA08	1,2
HWUH-2	PROCESS AREA	PROPELLER	24.8	580.0	2.5	200.0	180.0	2.2	25 W	1550.0	120/1/60	TRANE	UHSBA25	1,2
HWUH-3	PROCESS AREA	PROPELLER	24.8	580.0	2.5	200.0	180.0	2.2	25 W	1550.0	120/1/60	TRANE	UHSBA25	1,2
HWUH-4	PROCESS AREA	PROPELLER	24.8	580.0	2.5	200.0	180.0	2.2	25 W	1550.0	120/1/60	TRANE	UHSBA25	1,2
HWUH-5	ELECTRICAL ROOM	PROPELLER	8.0	245.0	0.8	200.0	180.0	0.8	16 W	1550.0	120/1/60	TRANE	UHSBA08	1,2
HWUH-6	PROCESS AREA	PROPELLER	24.8	580.0	2.5	200.0	180.0	2.2	25 W	1550.0	120/1/60	TRANE	UHSBA25	1,2
HWUH-7	PROCESS AREA	PROPELLER	24.8	580.0	2.5	200.0	180.0	2.2	25 W	1550.0	120/1/60	TRANE	UHSBA25	1,2
HWUH-8	PROCESS AREA	PROPELLER	24.8	580.0	2.5	200.0	180.0	2.2	25 W	1550.0	120/1/60	TRANE	UHSBA25	1,2
HWUH-9	PROCESS AREA	PROPELLER	24.8	580.0	2.5	200.0	180.0	2.2	25 W	1550.0	120/1/60	TRANE	UHSBA25	1,2

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. UNIT SHALL BE ASME CERTIFIED.

HOT WATER PUMP SCHEDULE

TAG	LOCATION	TYPE	SERVICE	WATER DATA			ELECTRICAL			MAKE	MODEL	NOTES
				FLOW (GPM)	HEAD (FT)	PUMP EFFICIENCY (%)	MOTOR (HP)	MOTOR (RPM)	V/PH/HZ			
HWP-1	MECHANICAL ROOM	IN-LINE	HOT WATER	142.5	26	72.0	2	1750	480/3/60	BELL & GOSSETT	E-80 3x3x7C	1,2
HWP-2	MECHANICAL ROOM	IN-LINE	HOT WATER	142.5	26	72.0	2	1750	480/3/60	BELL & GOSSETT	E-80 3x3x7C	1,2

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. INSTALL WITH FLEXIBLE PIPE CONNECTIONS.

DUCTLESS SPLIT MINI SCHEDULE

TAG	LOCATION	TYPE	REFRIGERANT	CAPACITIES		FC				NOTES
				COOLING (BTUH)	HEATING (BUTH)	MAKE	MODEL	V/PH/HZ	MCA	
FC-1/CU-1	ELECTRIC ROOM	DUCTLESS MINISPLIT	R410A	12,000	N/A	TRANE	4MXW2312	208/1/60	3	1,2,3,4,5,6,7,8,9
FC-2/CU-2	ELECTRIC ROOM	DUCTLESS MINISPLIT	R410A	12,000	N/A	TRANE	4MXW2312	208/1/60	3	1,2,3,4,5,6,7,8,9

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. INDOOR FC ELECTRICALLY POWERED FROM OUTDOOR UNIT HP.
3. INDOOR FC WITH FOUR FAN SPEEDS.
4. INDOOR FC WITH FILTER TRACK AND FACTORY SUPPLIED CLEANABLE FILTER.
5. HP WITH ROTARY TYPE COMPRESSOR.
6. EVAPORATOR COIL ENTERING AIR DRY BULB/WET BULB TEMPERATURES: 80/67 DEGREES F.
7. CONDENSING UNIT AMBIENT AIR DRY BULB TEMPERATURE: 95 DEGREES F.
8. PRE-CHARGED LINE SETS FOR INSTALLATION OF REFRIGERANT PIPING.
9. HARD WIRED REMOTE CONTROLLER WITH MODE, FAN SPEED, AND TEMPERATURE SELECTION, CARRIER MODEL KSACN0101AAA.

FAN SCHEDULE

TAG	LOCATION	MAKE	MODEL	AIRFLOW (CFM)	STATIC PRESSURE (INCH W.C.)	DRIVE	POWER (HP)	ELECTRICAL (V/PH/HZ)	NOTES
EF-1	MECHANICAL ROOM	LOREN COOK	Vane Axial Fan 36CVB	11,300	0.50	BELT	3	480/3/60	1,2,3,4,5,6,7,8,9,10,11

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. INTEGRAL PRE-WIRED, NEMA 3R RATED DISCONNECT SWITCH.
3. SPARKPROOF ALUMINUM CONSTRUCTION.
4. GRAVITY TYPE BACKDRAFT DAMPER.
5. INLET AND OUTLET FLEXIBLE DUCT CONNECTIONS.
6. VIBRATION ISOLATORS.
7. BELT GUARD.
8. WEATHERPROOF MOTOR AND BELT GUARD COVER.
9. SPARE BELT SET.
10. ALUMINUM BIRDSCREEN.
11. FINISH PROVEN CORROSION RESISTANT WITH HYDROGEN SULFIDE FUMES.

HOT WATER BOILER SCHEDULE

TAG	LOCATION	TYPE	FUEL	INPUT (BTUH)	OUTPUT (BTUH)	WATER DATA				ELECTRICAL		MAKE	MODEL	NOTES
						FLOW (GPM)	EWT (°F)	LWT (°F)	PD (FT)	MOTOR (HP)	V/PH/HZ			
HWB-1	MECHANICAL ROOM	CONDENSING BOILER	NATURAL GAS	1,750,000	1,684,000	142	180	200	5	1/2	120/1/60	LOCHINVAR	FBN1751	1,2,3

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. PROVIDE ASME RATED PRESSURE RELIEF VALVE.
3. PROVIDE WITH MODULATING BURNER CONTROL.

GLYCOL FEED SCHEDULE

TAG	LOCATION	TYPE	SERVICE	WATER DATA		PRESSURE SWITCH DATA			ELECTRICAL			TANK DATA	MAKE	MODEL	NOTES
				FLOW (GPM)	HEAD	Cut-In Pressure (PSI)	Cut-Out Pressure (PSI)	Adjustable Pressure Differential (PSI)	FAN MOTOR (HP)	MOTOR (RPM)	V/PH/HZ	VOLUME (GAL)			
GF-1	MECHANICAL ROOM	AUTOMATIC W/ POLYETHYLENE TANK	HOT WATER	1.5	100	10-45	20-60	10-30	1/3	1750	120/1/60	50	Neptune	G-50-1	1,2

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. INSTALL WITH FLEXIBLE PIPE CONNECTIONS.

AIR HANDLING UNIT SCHEDULE

TAG	LOCATION	TYPE	SUPPLY AIRFLOW (CFM)	OUTSIDE AIRFLOW (CFM)	FAN SECTION			HEATING COIL DATA							COOLING COIL DATA	FILTER		ELECTRICAL (V/PH/HZ)	MAKE	MODEL	NOTES
					E.S.P. (IN. W.C.)	HP	FAN TYPE	TOTAL (MBH)	FLOW (GPM)	EAT (°F)	LAT (°F)	EWT (°F)	LWT (°F)	WPD (FT)	APD (IN)	TOTAL (MBH)	TYPE	MERV				
AHU-1	MECHANICAL ROOM	MODULAR	11300	11300	2.00	20	FC	1100	109.9	0	100	180	160	6.0	0.44		2" PLEATED	8	480/3/60	TRANE	CSAA021	1,2,3,4,5,6

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. MAXIMUM COIL FACE VELOCITY SHALL NOT EXCEED 550 FPM.
3. COPPER COILS WITH ALUMINUM FINS.
4. PROVIDE INTERNAL VIBRATION ISOLATION AT SUPPLY FANS.
5. PROVIDE ACCESS SECTION BETWEEN COIL SECTIONS.
6. FAN SHALL BE SELECTED SO THAT FAN SURGE DOES NOT OCCUR AS SPEED REDUCES TO MINIMUM AIRFLOW.

EXPANSION TANK SCHEDULE

TAG	LOCATION	TYPE	SERVICE	TANK VOLUME (GAL.)	MIN ACCEPTANCE VOLUME (GAL.)	TANK PRE-CHARGE (PSI)	MAKE	MODEL	NOTES
ET-1	MECHANICAL ROOM	DIAPHRAGM	HOT WATER	11.3	2.64	12	BELL & GOSSETT	D-40	1,2

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. INSTALL WITH SUPPORT RING.

AIR SEPARATOR SCHEDULE

TAG	LOCATION	TYPE	SERVICE	FLOW (GPM)	PIPESIZE (INCHES)	WPD (FT)	MAKE	MODEL	NOTES
AS-1	MECHANICAL ROOM	TANGENTIAL	HOT WATER	142.45	4	0.34	BELL & GOSSETT	ROLAIRTROL RL-4F	1,2

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. UNIT SHALL BE ASME CERTIFIED.

LOUVER SCHEDULE

TAG	LOCATION	SERVICE	TYPE	MODULAR OPENING SIZE		DEPTH (IN.)	AIRFLOW (CFM)	FREE AREA (SQ. FT.)	MAKE	MODEL	NOTES
				WIDTH (INCHES)	HEIGHT (INCHES)						
IL-1	MECHANICAL ROOM	INTAKE	STATIONARY	64	68	4	11300	16.59	RUSKIN	ELF375DX	1,2,3,5,6,7,8
EL-1	MECHANICAL ROOM	EXHAUST	STATIONARY	64	68	4	11300	16.59	RUSKIN	ELC375DX	1,2,3,5,6,7,8

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. FRONT STATIONARY DRAINABLE BLADE WITH INTEGRAL BACKDRAFT DAMPER.
3. STATIONARY DRAINABLE BLADE.
4. COMBINATION DRAINABLE BLADE.
5. 6063T6 EXTRUDED ALUMINUM CONSTRUCTION.
6. BIRDSCREEN MOUNTED ON EXTERIOR.
7. INSECT SCREEN MOUNTED ON INTERIOR.
8. KYNAR OR FLUOROPOLYMER FINISH ON ENTIRE LOUVER AND BIRDSCREEN. COLOR TO BE SELECTED BY OWNER.

CONTROL DAMPER SCHEDULE

TAG	TYPE	BLADES	MATERIAL	DUCT TYPE	MAKE	MODEL	NOTES
BD	BALANCING	OPPOSED	ALUMINUM	RECTANGULAR	RUSKIN	CD51	1,2,3,4
MD	MOTORIZED	PARALLEL	ALUMINUM	RECTANGULAR	RUSKIN	CD51	1,2,3,4
BDD	BACKDRAFT	PARALLEL	ALUMINUM	RECTANGULAR	RUSKIN	BD2A2	1,2,3,4

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. SEE DRAWINGS FOR SIZES, AIRFLOW, AND QUANTITY.
3. PROVIDE WITH LOCKING QUADRANT.
4. PROVIDE 120/1/60 DAMPER MOTOR OPERATOR.

AIR OUTLETS SCHEDULE

TAG	SERVICE	TYPE	STATIC P.D. (IN. W.C.)	PATTERN	MATERIAL	FINISH	MAKE	MODEL	NOTES
SR	SUPPLY	REGISTER	0.08	DOUBLE DEFLECTION	ALUMINUM	CLEAR ANODIZED	TITUS	350FS	1,2,3,4
EG	EXHAUST	GRILLE	0.08	EGGCRATE	ALUMINUM	CLEAR ANODIZED	TITUS	50F	1,2,3,4

NOTES:
1. INSTALL PER MANUFACTURERS INSTRUCTIONS.
2. SEE DRAWING FOR SIZES, AIRFLOW, AND QUANTITY.
3. INTEGRAL BALANCING DAMPER.
4. DUCT MOUNTING.

THE CITY OF Kalamazoo

HVAC SCHEDULE

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

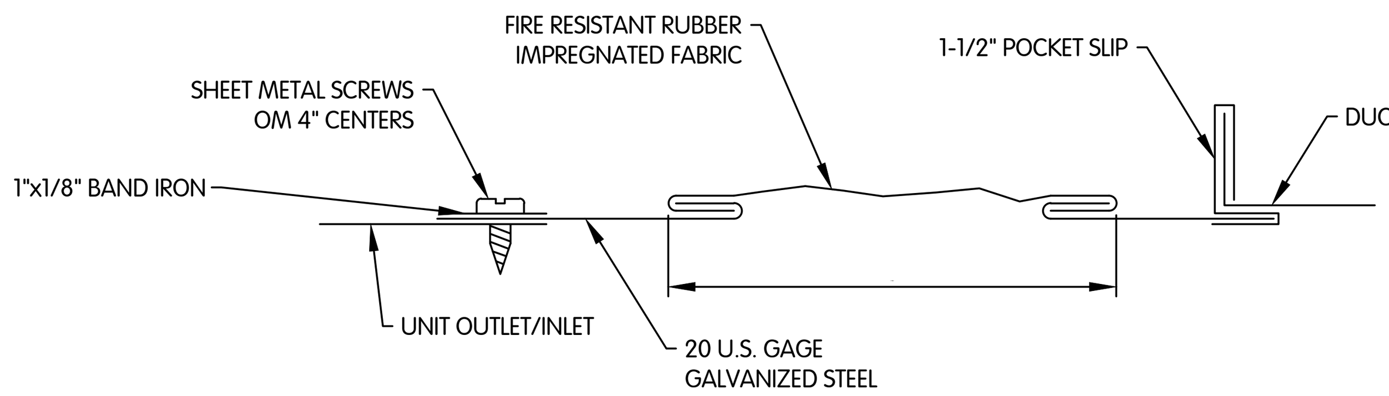
DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID

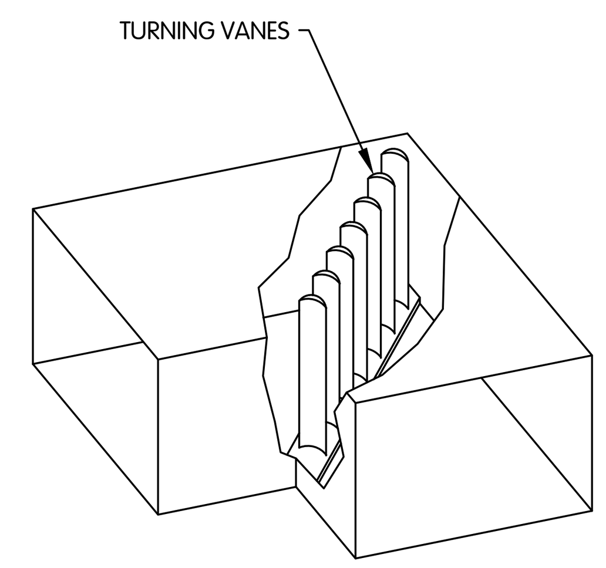
DATE: FEBRUARY 2022

SHEET NO.
H-2
31 OF 44

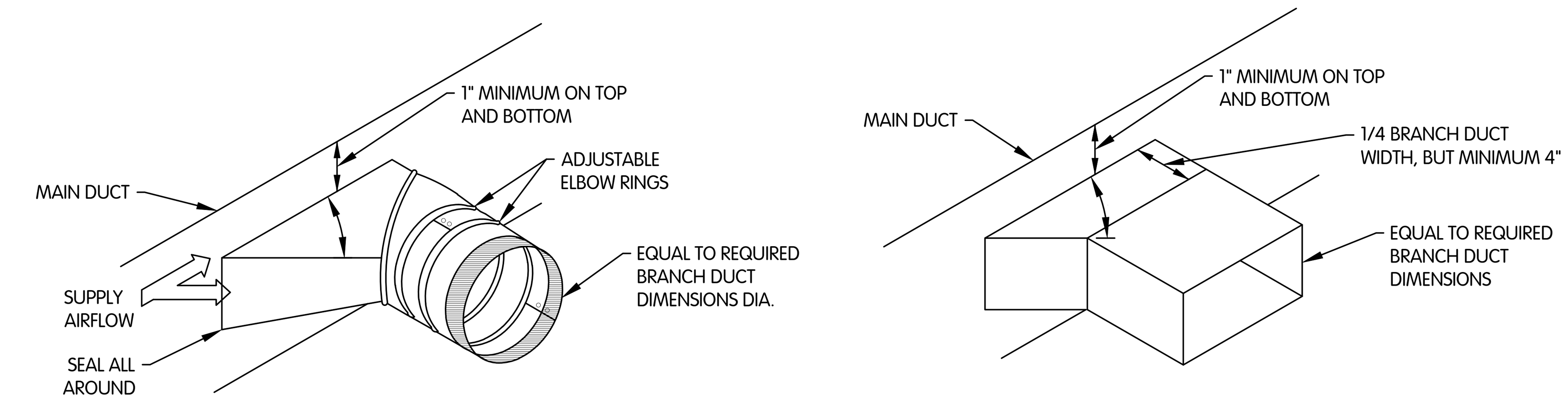
KAL-77250\H06-HVAC SCHEDULE
2/8/2022 2:42 PM - SWILLIS



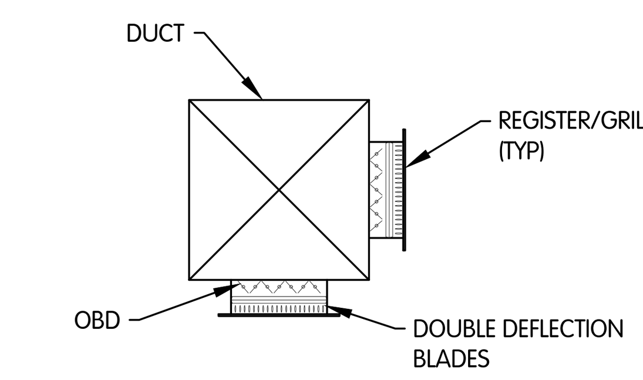
TYPICAL FLEXIBLE CONNECTION DETAIL
NTS



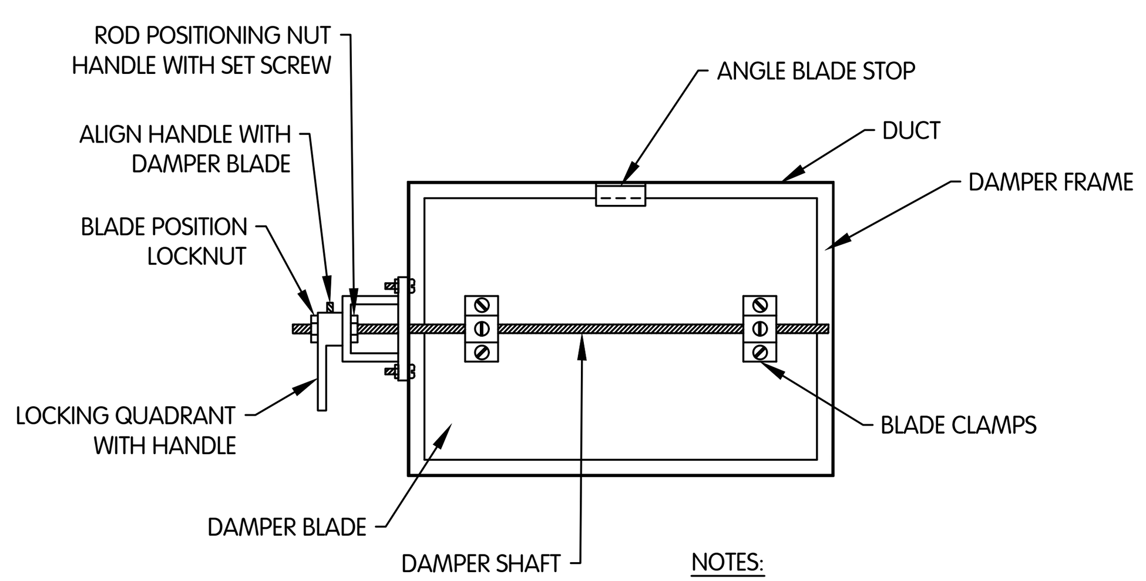
TYPICAL DUCT ELBOW DETAIL
NTS



TYPICAL BRANCH TAKE-OFF FITTING DETAIL
NTS



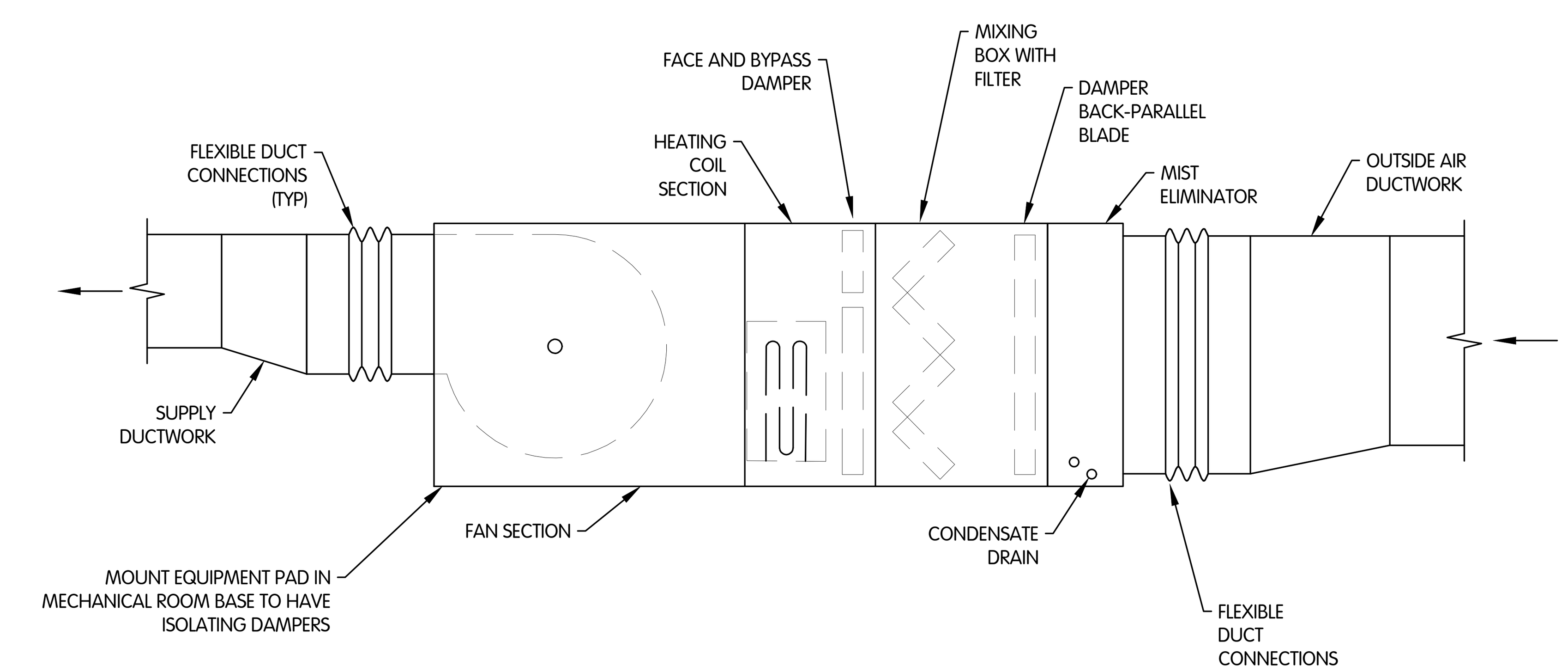
DUCT MOUNTED REGISTER/GRILLE DETAIL
NTS



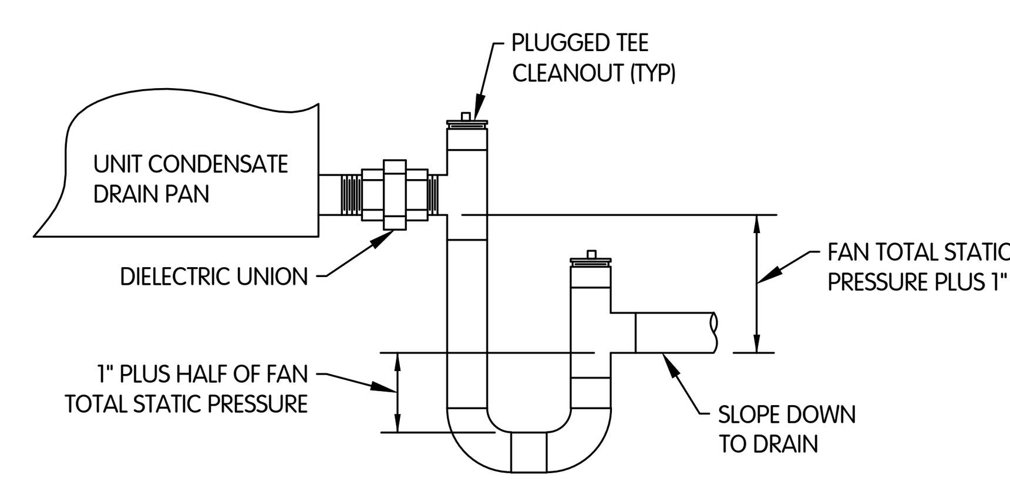
NOTES:

1. DAMPERS FOR ROUND DUCTS SHALL BE SIMILAR TO THE DAMPER SHOWN ABOVE.
2. ENSURE THAT FULL 90 DEGREE DAMPER BLADE MOVEMENT IS UNOBSTRUCTED.
3. FOR DUCT HEIGHTS MORE THAN 12 INCHES, PROVIDE OPPOSED BLADE DAMPERS.

MANUAL BALANCING DAMPER DETAIL
NTS



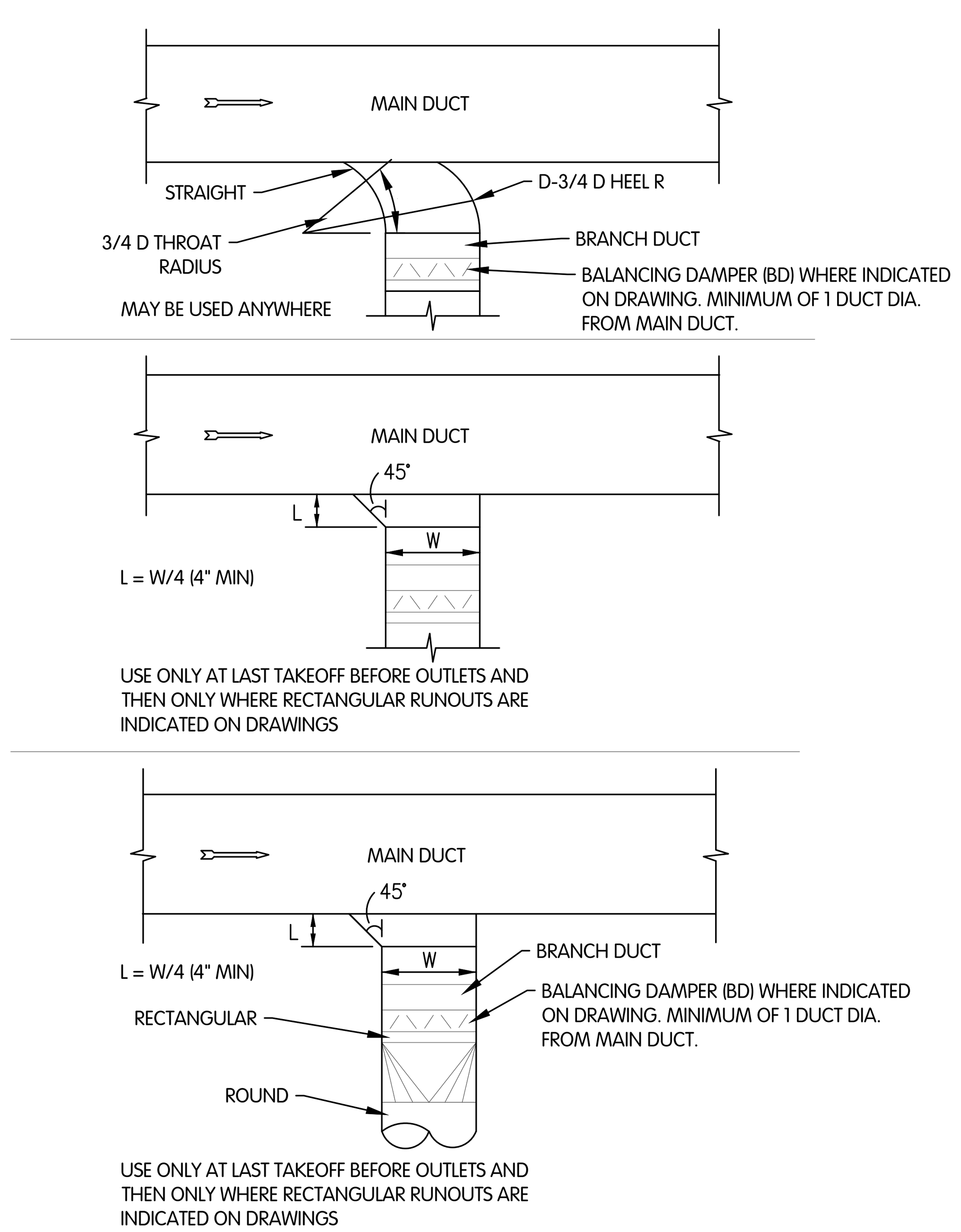
AIR HANDLING UNIT DETAIL
NTS



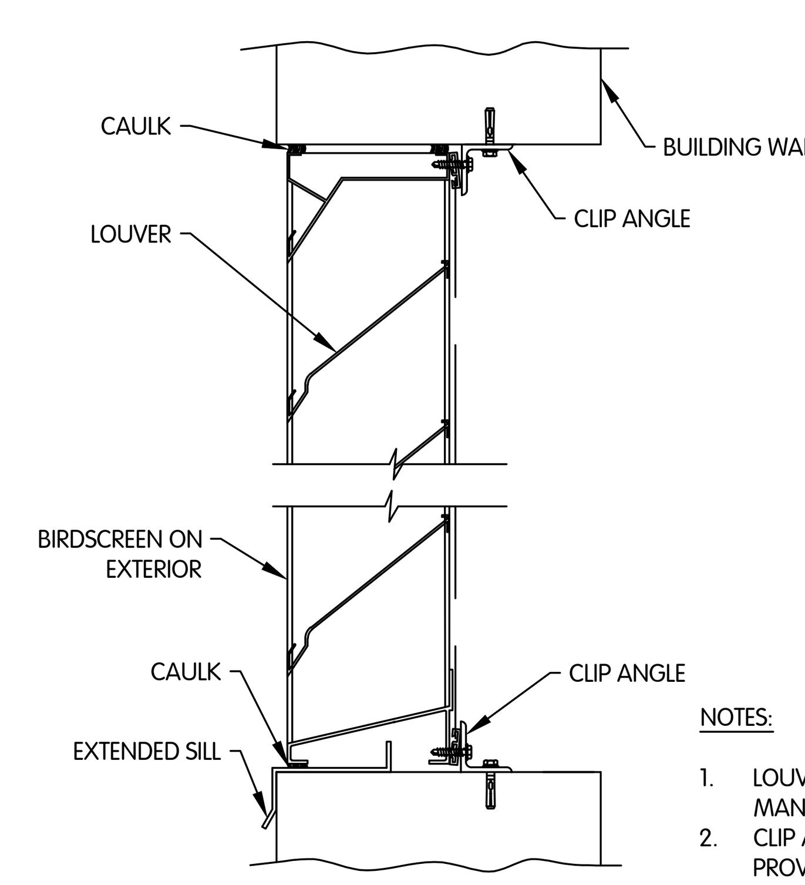
NOTES:

1. LOCATE TRAP AS CLOSE AS POSSIBLE TO CONDENSATE DRAIN PAN OUTLET WITH BOTTOM BELOW SUPPORT STRUCTURE.
2. DRAIN PIPING SHALL BE INSULATED.
3. SIZE OF TRAP PIPING TO BE LARGER OF EQUIPMENT OUTLET SIZE OR DIMENSION OF PLANS.
4. DRAIN PIPING SHALL PENETRATE THE ROOF LINE WITHIN THE CONFINEMENT OF THE HVAC EQUIPMENT CURB.

CONDENSATE DRAIN TRAP DETAIL
NTS



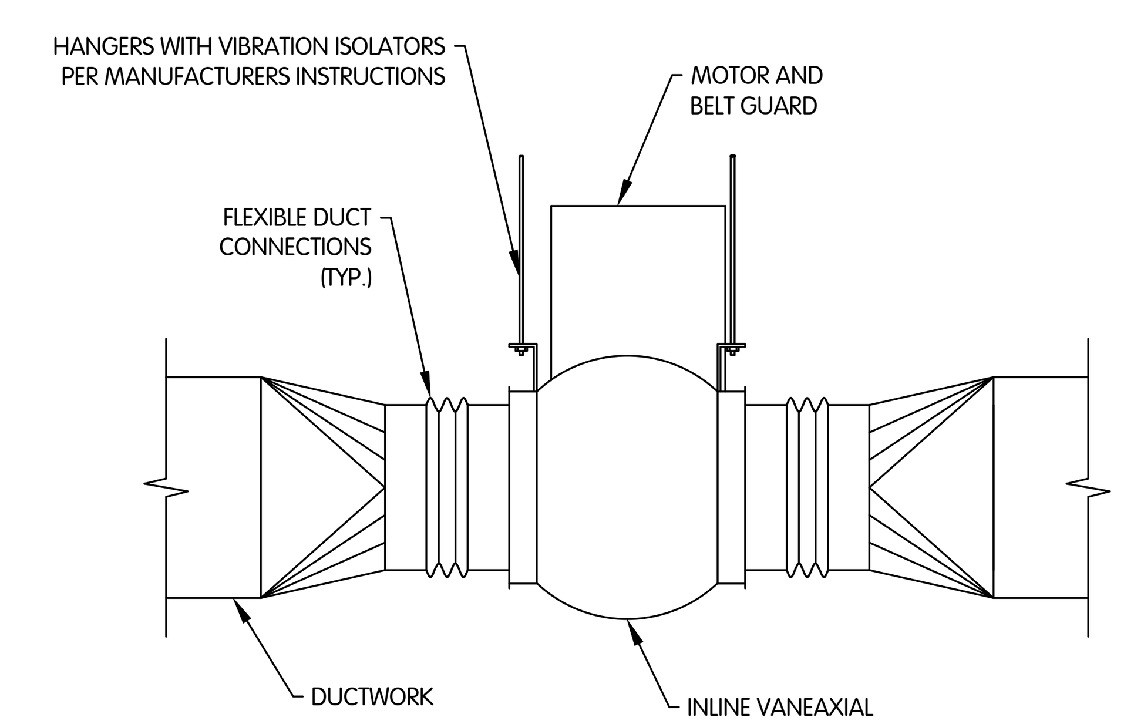
TYPICAL BRANCH CONNECTION DETAIL
NTS



NOTES:

1. LOUVER TO BE ASSEMBLED AT LOUVER MANUFACTURER FACTORY.
2. CLIP ANGLES AND EXTENDED SILL TO BE PROVIDED BY LOUVER MANUFACTURER.
3. INSTALLATION OF LOUVER TO BE IN ACCORDANCE WITH LOUVER MANUFACTURER'S RECOMMENDATIONS.

TYPICAL STATIONARY LOUVER DETAIL
NTS



INLINE VANEAXIAL FAN DETAIL
NTS

THE CITY OF Kalamazoo

HVAC DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

JOB NO.	017-7725.001
SCALE	NONE

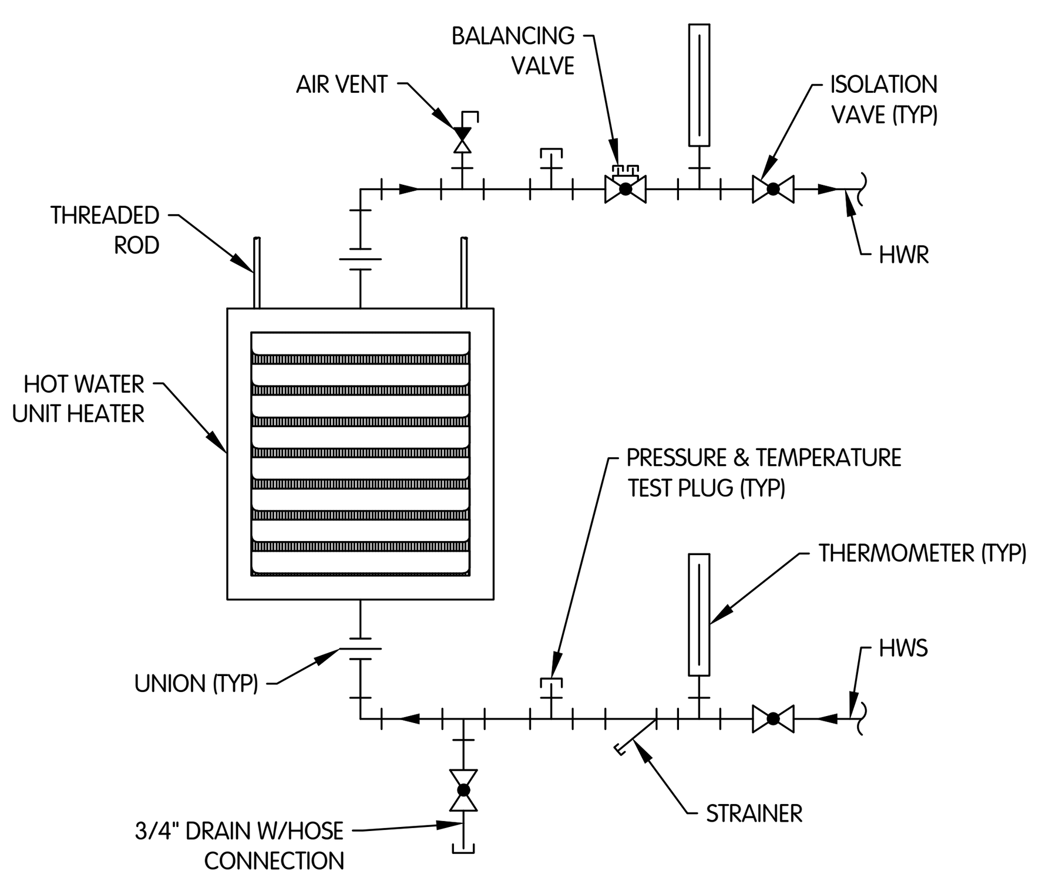
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

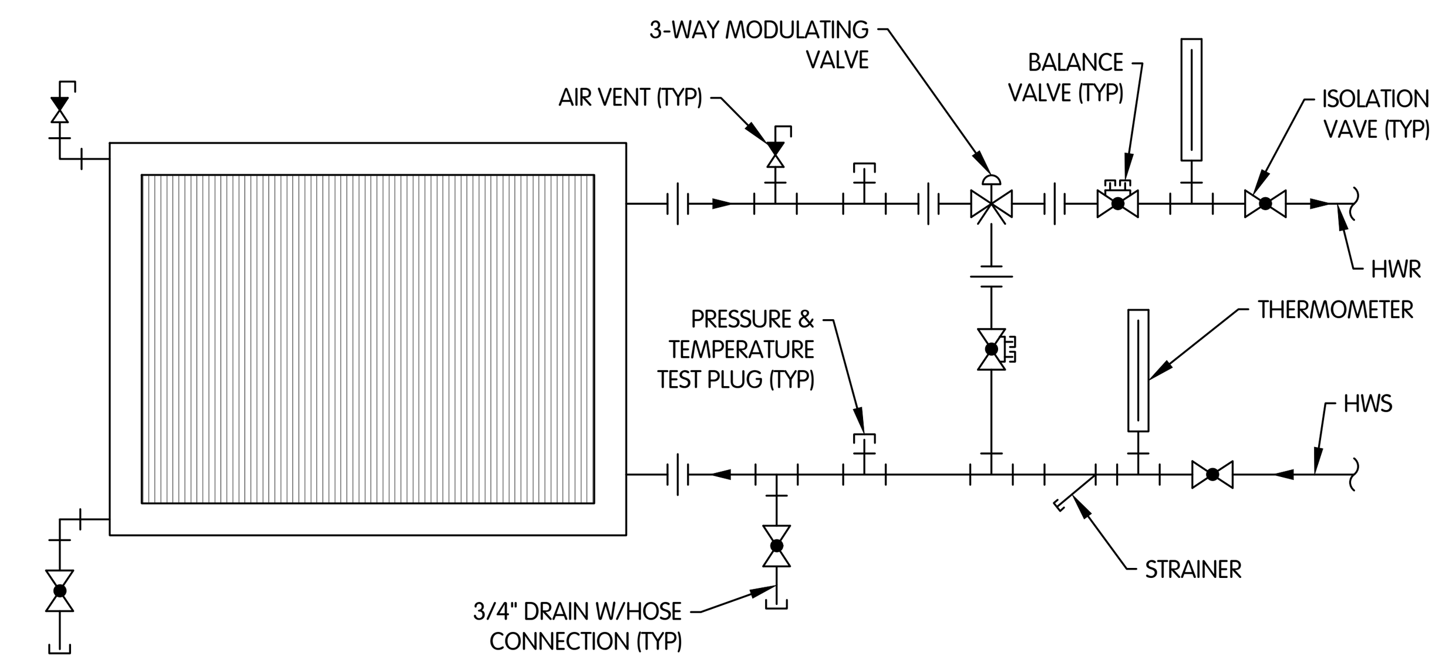
STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

SHEET NO.
H-3
32 of 44

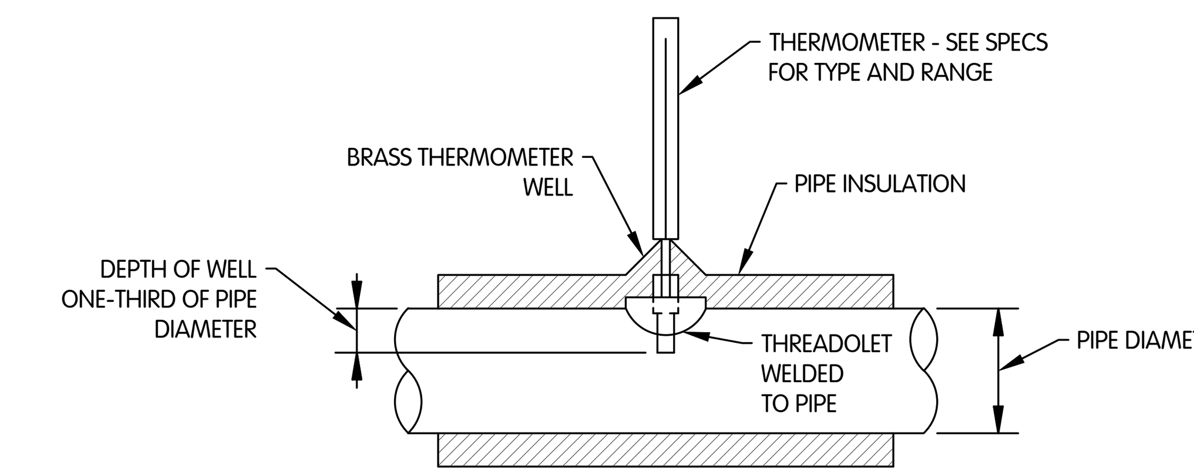
KAL-7725001H06-HVAC DETAILS
1/27/2022 11:40 AM - SWILLIS
1/28/2022 2:33 PM



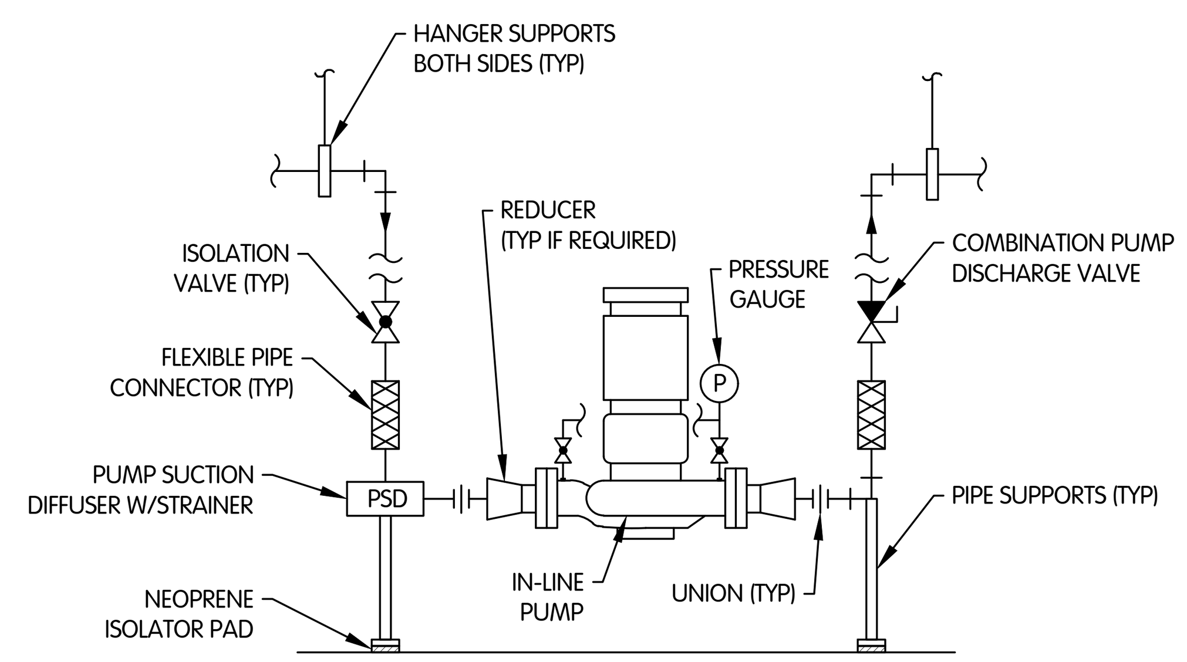
HOT WATER UNIT HEATER DETAIL
NTS



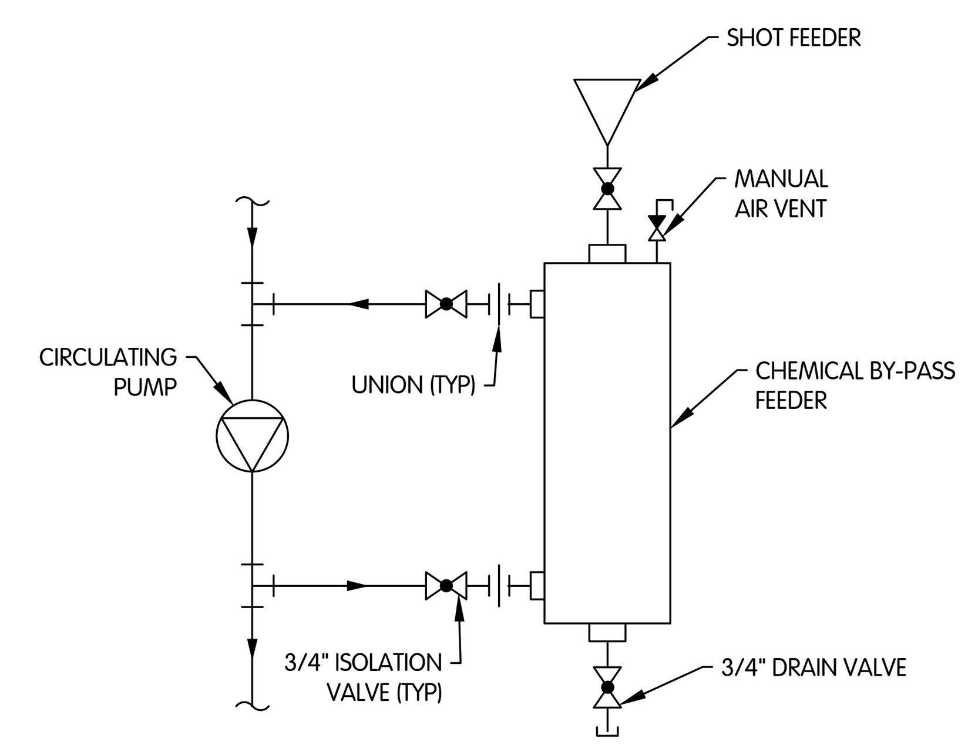
UNIT COIL PIPING DETAIL (3-WAY VALVE)
NTS



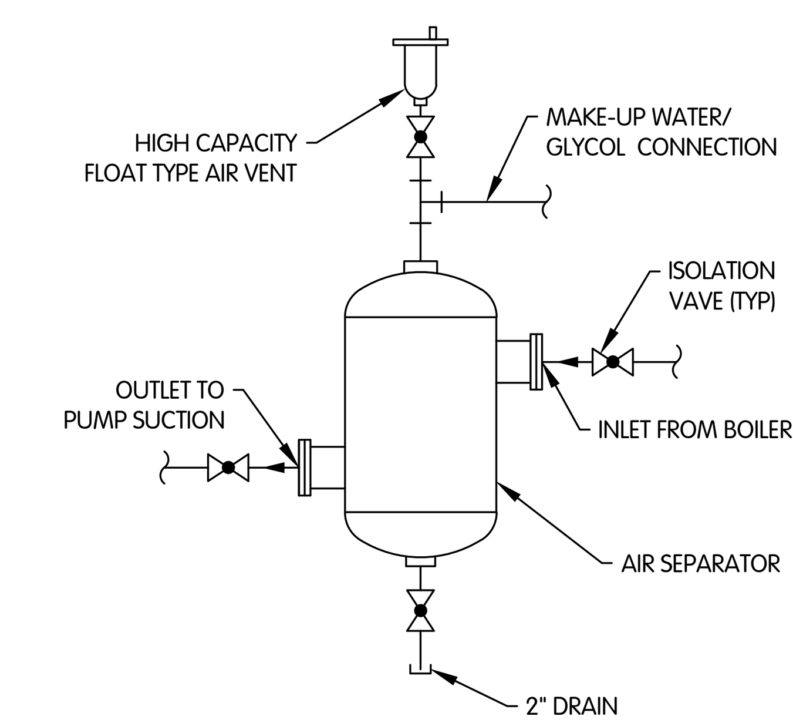
THERMOMETER IN INSULATED PIPE DETAIL
NTS



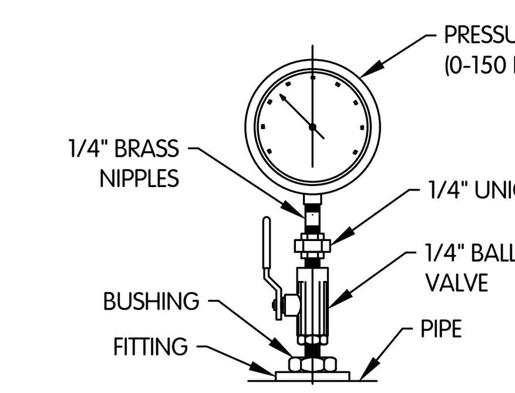
VERTICAL IN-LINE PUMP DETAIL
NTS



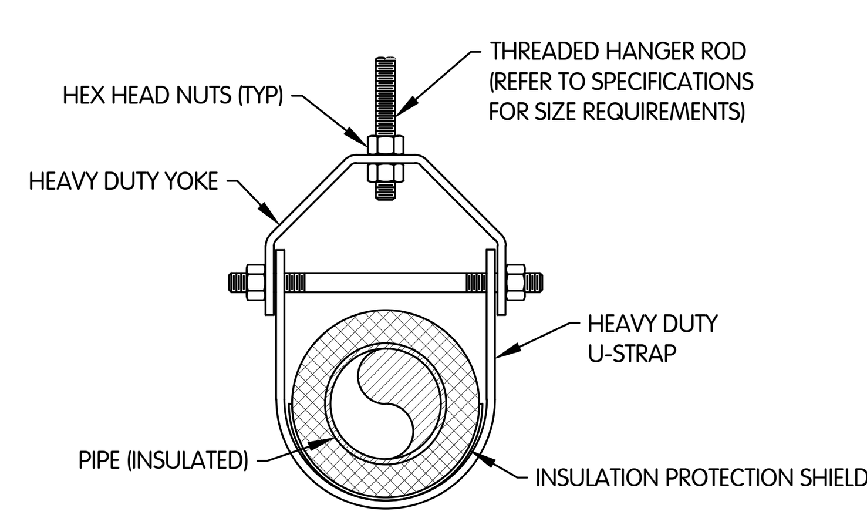
CHEMICAL BY-PASS FEEDER DETAIL
NTS



AIR SEPARATOR DETAIL
NTS



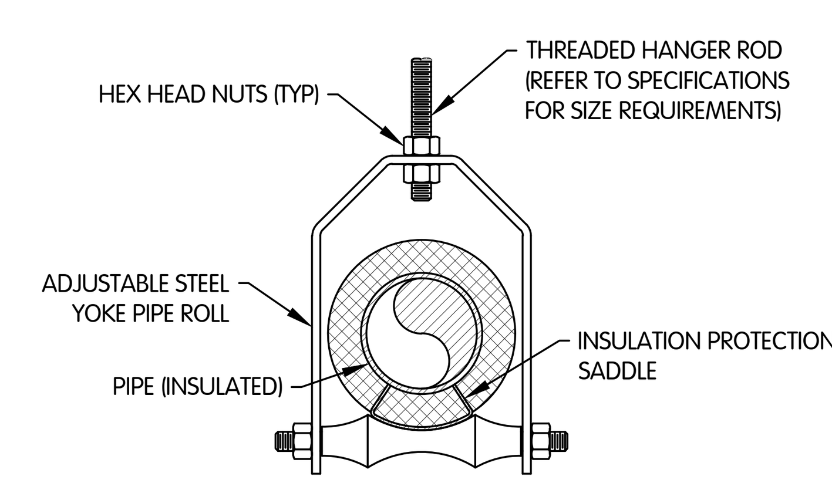
PRESSURE GAUGE DETAIL
NTS



NOTES:

1. UTILIZE ADJUSTABLE CLEVIS HANGERS FOR HEATING OR CHILLED WATER PIPING 2-1/2 INCH DIAMETER AND SMALLER.
2. OVERSIZE CLEVIS HANGER AS REQUIRED TO ALLOW FOR INSULATING PIPING WITHIN HANGER.
3. PROVIDE PIPE INSULATION PROTECTION SHIELD BETWEEN INSULATION AND CLEVIS.

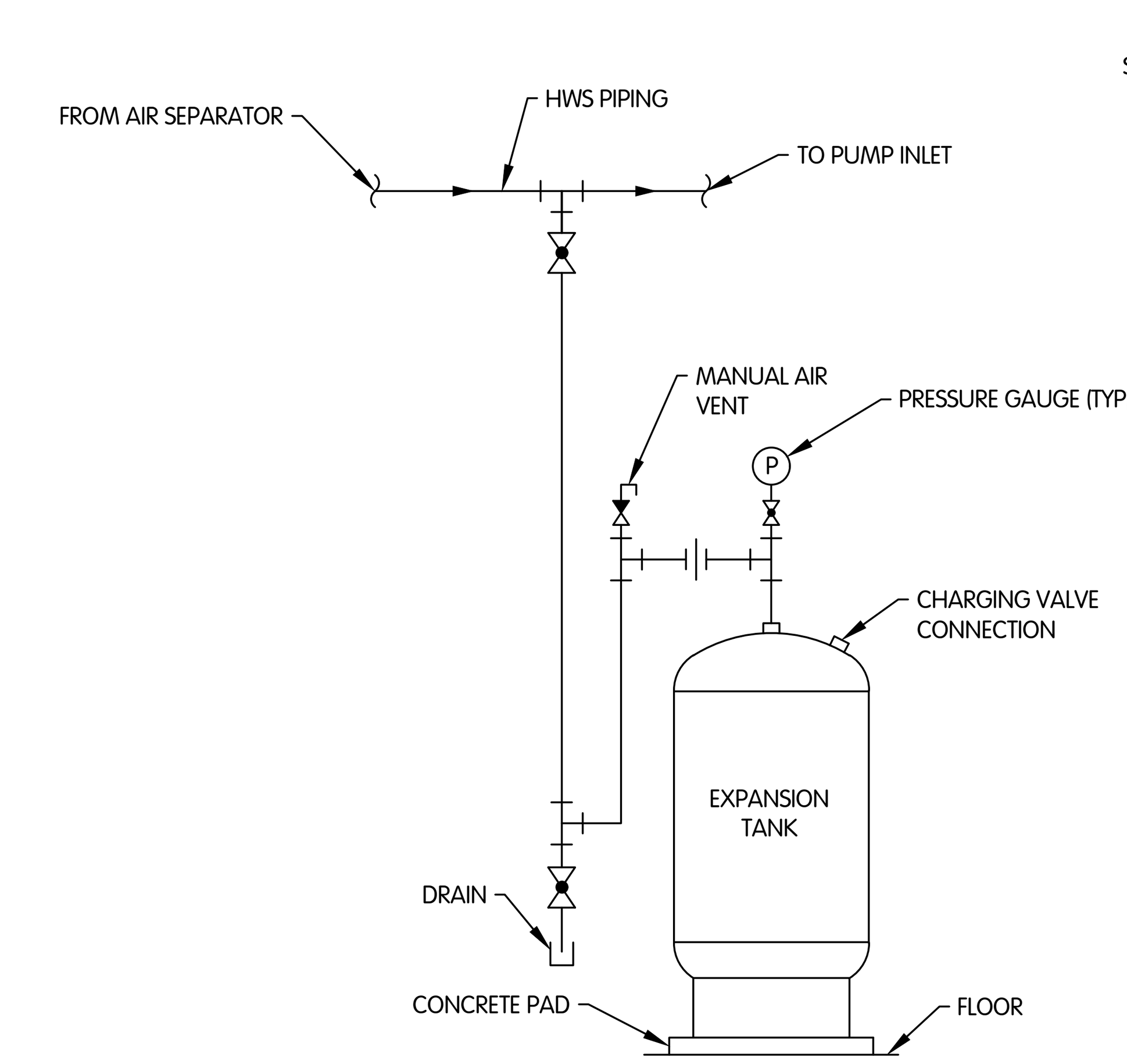
ADJUSTABLE CLEVIS PIPE HANGER INSTALLATION DETAIL
NTS



NOTES:

1. UTILIZE ROLL HANGER FOR ALL HEATING OR CHILLED WATER PIPING 3 INCH DIAMETER AND LARGER.
2. OVERSIZE ROLL HANGER AS REQUIRED TO ALLOW FOR INSULATING PIPING WITHIN HANGER.
3. PROVIDE PIPE INSULATION PROTECTION SHIELD BETWEEN INSULATION AND CLEVIS.

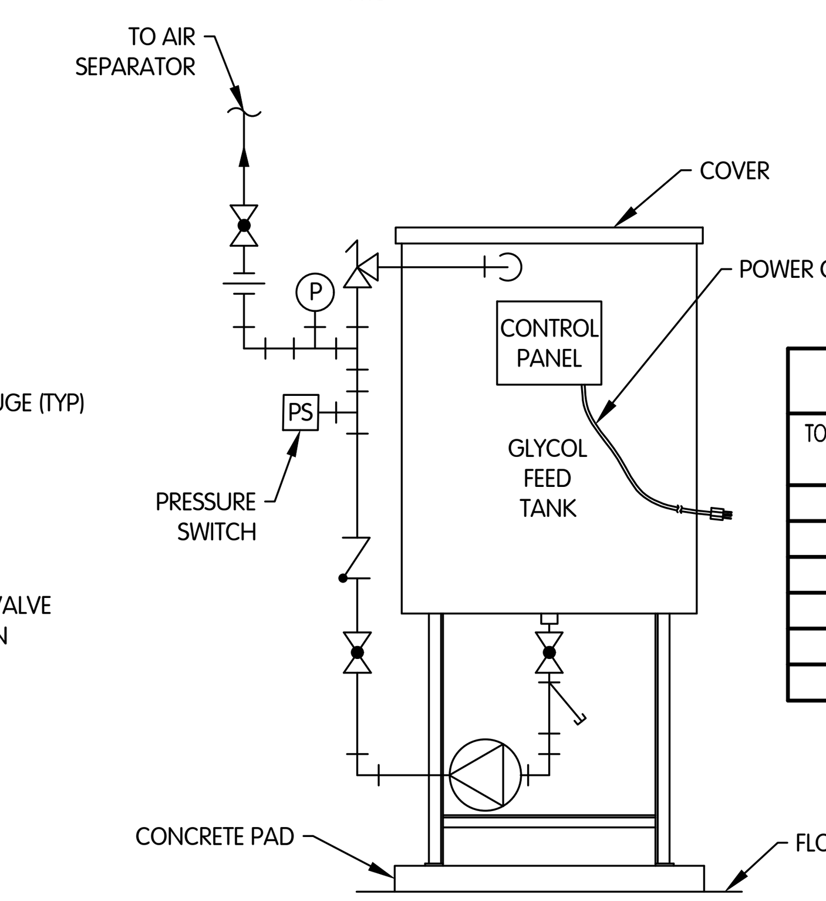
ADJUSTABLE STEEL YOKE PIPE ROLL HANGER INSTALLATION DETAIL
NTS



NOTES:

1. CONNECT TO SIDE OF MAIN TO PREVENT AIR OR DEBRIS FROM ENTERING PIPE TO TANK. TOP OR BOTTOM CONNECTION NOT PERMITTED.
2. PROVIDE ANTI THERMOSYPHON LOOP TO PREVENT GRAVITY HEATING OF TANK.

EXPANSION TANK DETAIL
NTS

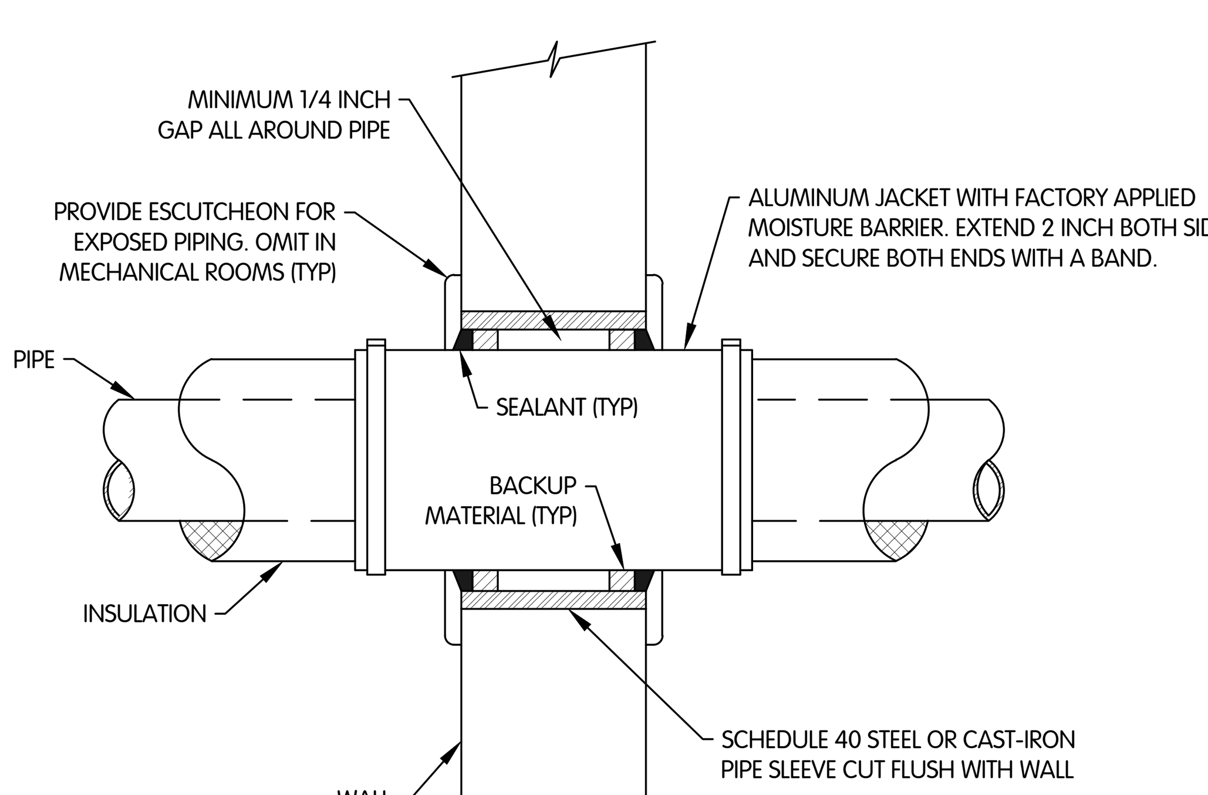


MAKE-UP GLYCOL SUPPLY PIPE SIZE		
TOTAL SYSTEM PUMP FLOW (GPM)	PIPE SIZE (INCHES)	PRV MINIMUM FLOW (GPM)
UP TO 200	1/2	3
201-500	3/4	5
501-1,200	1	10
1,201-3000	1-1/4	20
3,001-5,000	1-1/2	30
5,001-12,000	2	60

NOTES:

1. GLYCOL FEED TANK AND PIPING UPSTREAM OF THE PRESSURE GAUGE IS PROVIDED BY MANUFACTURER'S PACKAGED GYLCOL FEED SYSTEM.
2. PROVIDE A 120/1/60 ELECTRICAL RECEPTACLE NEAR UNIT TO ACCEPT POWER PLUG CONNECTION.

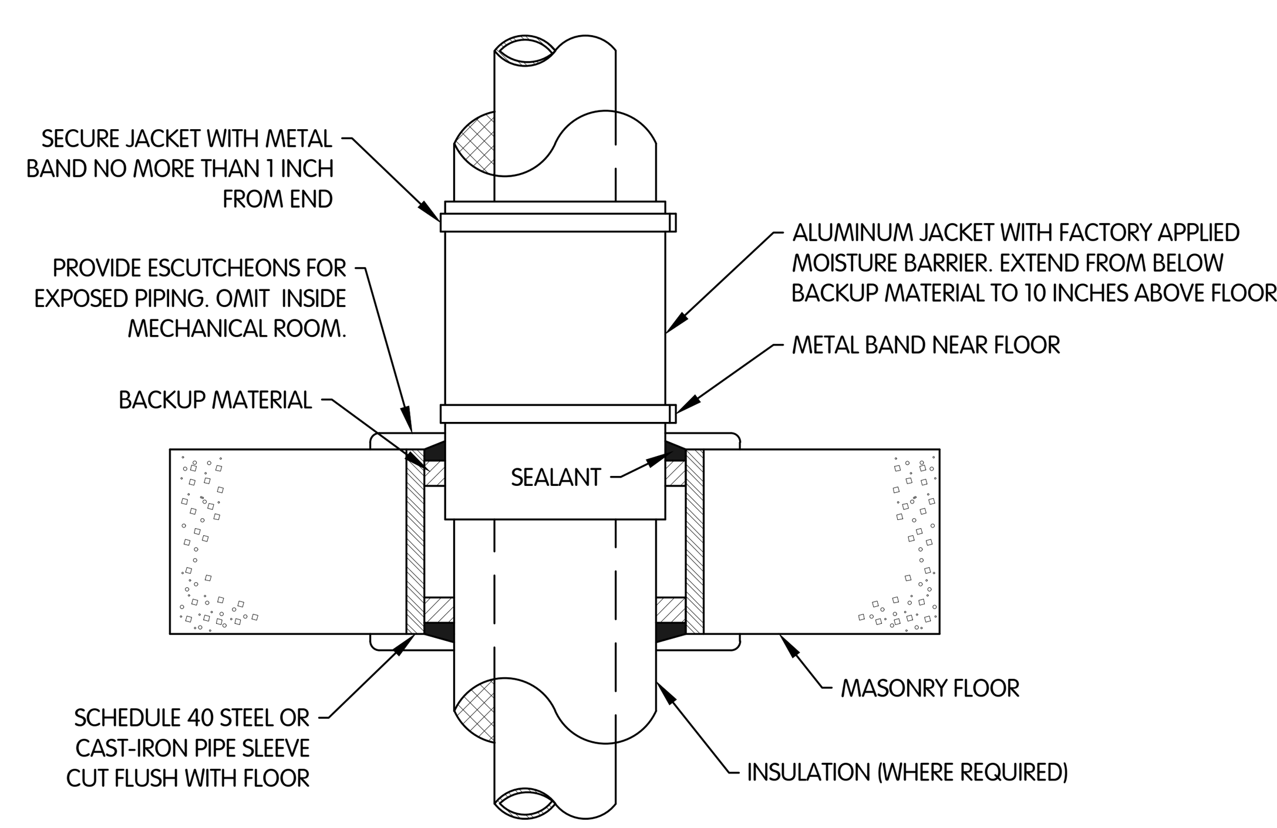
GLYCOL FEED SYSTEM CONNECTION DETAIL
NTS



NOTES:

1. FOR GYPSUM BOARD WALLS PROVIDE MINIMUM 16 GAUGE GALVANIZED STEEL SLEEVE W/LOCK-TYPE LONGITUDNAL SEAM.
2. OMIT ALUMINUM JACKET IF PIPING IS UNINSULATED.

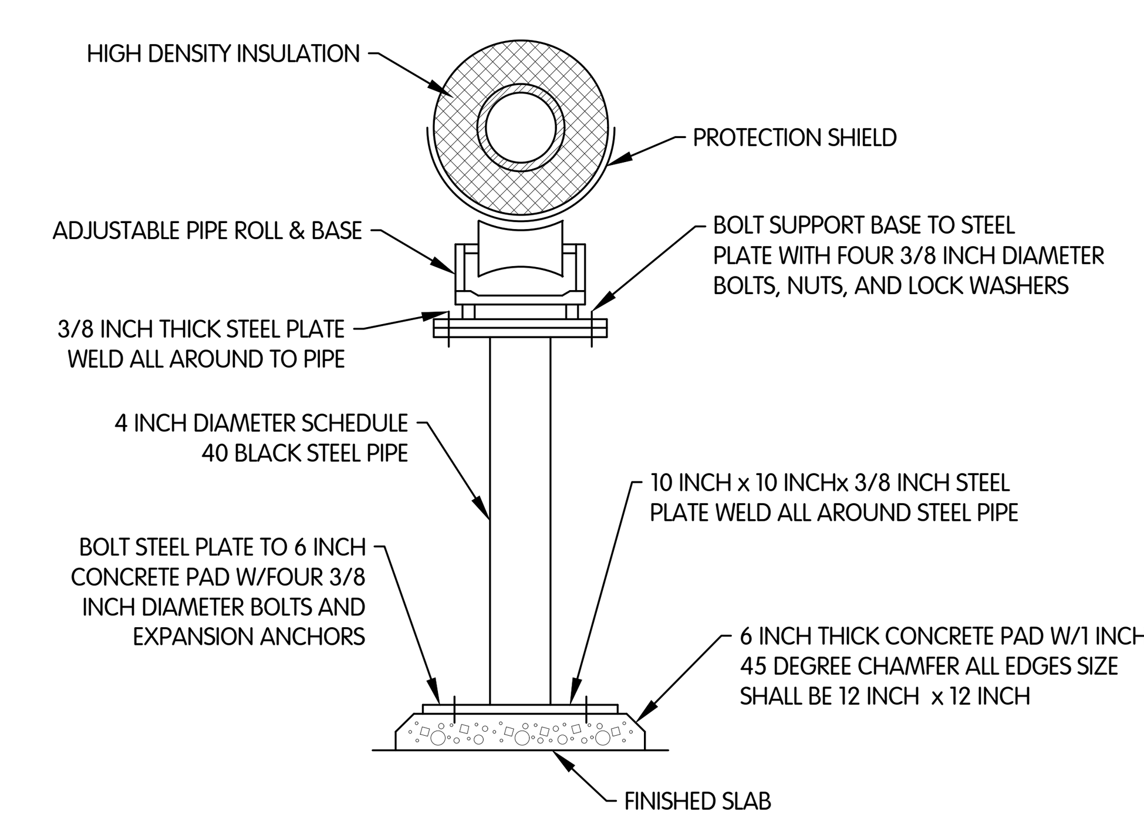
WALL PIPE PENETRATION DETAIL
NTS



NOTES:

1. OMIT ALUMINUM JACKET IF PIPING IS UNINSULATED.

FLOOR PIPE PENETRATION DETAIL
NTS



NOTES:

1. FOR USE IN EQUIPMENT ENCLOSURE AREAS.
2. FOR CHILLED WATER PIPING 4 INCH DIAMETER AND LARGER.

CHILLED WATER INSULATED PIPE SUPPORT DETAIL
NTS

THE CITY OF Kalamazoo

HVAC HYDRONIC WATER CONNECTION DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.
Fluid thinking®...
www.JHeng.com

JOB NO. 017-7725.001
SCALE NONE
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022
SHEET NO.
H-4

KAL-7725001H03-HVAC HYDRONIC WATER CONNECTION DETAILS
1/27/2022 11:40 AM - SWILLIS
1/28/2022 2:33 PM

HYDRONIC HEATING SYSTEM

HOT WATER SYSTEM SEQUENCE OF OPERATION:

THE HOT WATER BOILER HWB-1 LOCATED IN THE MECHANICAL ROOM SHALL BE CONTROLLED BY IT'S OWN CONTROL PANEL AND AQUASTAT TO SUPPLY HOT WATER TO THE SYSTEM. THE BOILER CONTROL PANEL SHALL BE INITIATED AND THE BOILER SHALL BE ALLOWED TO FIRE VIA AN OUTDOOR AIR THERMOSTAT WHEN THE TEMPERATURE REACHES 55 DEGREES F OR LESS. AUXILIARY RELAYS AT THE BOILER CONTROL PANEL SHALL ACTIVATE HOT WATER CIRCULATION PUMP HWP-1 WHEN BOILER IS ACTIVATED.

LEAD HOT WATER CIRCULATION PUMP HWP-1 ALSO LOCATED IN THE MECHANICAL ROOM SHALL CIRCULATE HOT WATER THROUGH SUPPLY AND RETURN PIPING SYSTEM TO THE HEATING EQUIPMENT. HWP-1 SHALL BE CONTROLLED BY A HAND-OFF-AUTO (HOA) SWITCH. IN THE AUTO MODE, HWP-1 SHALL BE INTERLOCKED AND AUTOMATICALLY ACTIVATED BY HWB-1.

HOT WATER CIRCULATION PUMP HWP-2 IS THE LAG PUMP. THE TWO HOT WATER CIRCULATION PUMPS SHALL OPERATE IN A LEAD/LAG FASHION. LEAD PUMP HWP-1 SHALL RUN FIRST. ON FAILURE OF THE LEAD PUMP, THE LAG PUMP SHALL RUN AND THE LEAD PUMP SHALL TURN OFF.

HOT WATER UNIT HEATERS (HWUH) SEQUENCE OF OPERATION:

HOT WATER UNIT HEATERS SHALL BE CONTROLLED BY A SINGLE TEMPERATURE, WALL-MOUNTED THERMOSTAT THAT MAINTAINS SPACE TEMPERATURE BY CYCLING UNIT FAN MOTOR.

ELECTRICAL ROOM

FAN COIL UNIT/CONDENSING UNIT (FC-1/CU-1 & FC-2/CU-2) SEQUENCE OF OPERATION:

ELECTRICAL ROOM SHALL BE COOLED BY TWO DUCTLESS SPLIT SYSTEMS CONSISTING OF AN INDOOR FAN COIL UNIT FC AND OUTDOOR CONDENSING UNIT CU. CONTROL THE SYSTEM BY A SINGLE STAGE COOL, HARD WIRED THERMOSTAT. ENERGIZE FC FAN AND CU COMPRESSOR/CONDENSER FAN WHENEVER THE THERMOSTAT CALLS FOR COOLING. COMPRESSOR/CONDENSER FAN SHALL RUN SUBJECT TO THEIR OWN INTERNAL SAFETIES AND CONTROLS. DE-ENERGIZE THE COOLING AND FAN WHEN THERMOSTAT HAS REACHED SET-POINT. DE-ENERGIZE CU AND FC FAN WHEN THERMOSTAT HAS REACHED SET-POINT.

BIOFILTRATION BUILDING AHU-1/EF-1

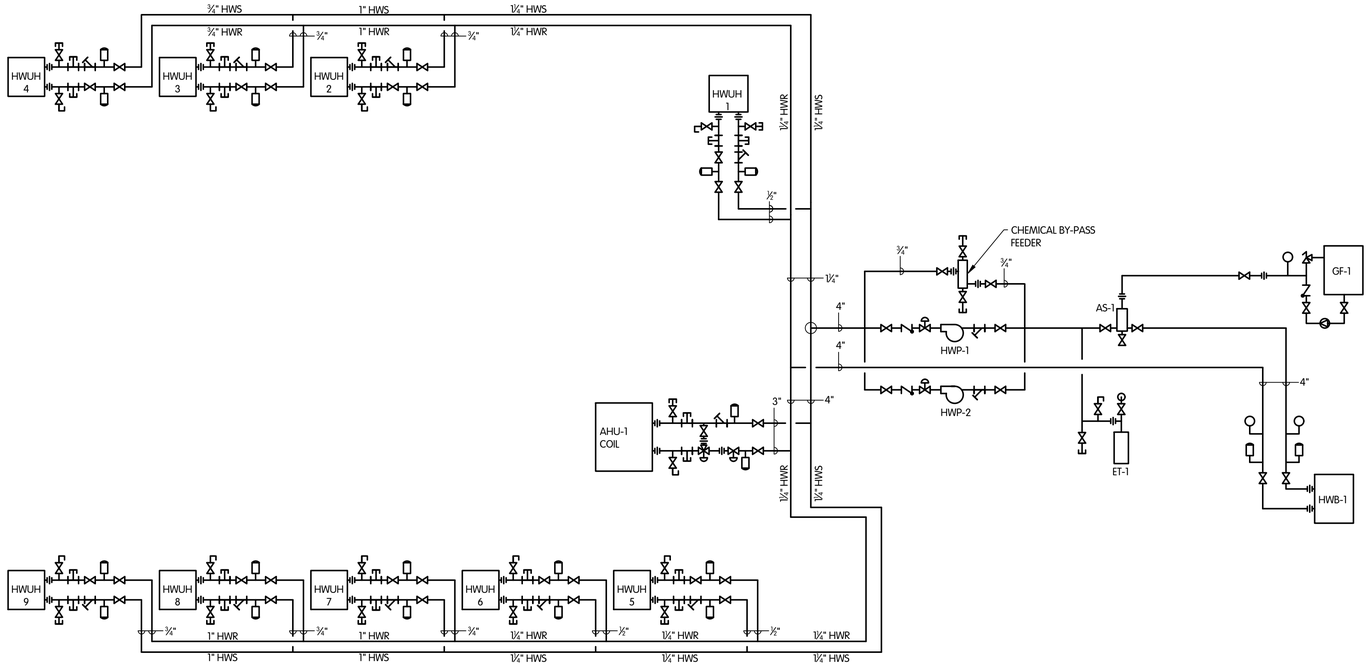
BIOFILTRATION BUILDING MAKE-UP AIR HANDLING UNIT AHU-1 AND EXHAUST FAN EF-1 SEQUENCE OF OPERATION:

HEATING AND VENTILATION FOR THE BIO-FILTRATION BUILDING SHALL BE SUPPLIED BY MAKE-UP AIR HANDLING UNIT AHU-1 AND DUCT MOUNTED INLINE EXHAUST FAN EF-1. EF-1 SHALL BE CONTROLLED BY A "HAND-OFF-AUTO" (HOA) SWITCH. WHEN THE SWITCH IS IN THE HAND POSITION, THE EF-1 MOTOR SHALL BE ACTIVATED. WHEN THE SWITCH IS IN THE OFF POSITION, EF-1 MOTOR SHALL BE DE-ACTIVATED, WHEN THE SWITCH IS IN THE AUTO POSITION, EF-1 MOTOR SHALL BE INTERLOCKED WITH AHU-1 SUPPLY FAN. MAKE-UP AIR FOR EF-1 SHALL BE PROVIDED BY AHU-1 THAT IS DUCTED TO THE SPACE. THE SYSTEM SHALL RUN CONTINUOUSLY AND PROVIDE 6 AIR CHANGES PER HOUR OF AIRFLOW TO THE SPACE.

AHU-1 SUPPLY FAN SHALL RUN CONTINUOUSLY AND BE CONTROLLED BY AN HOA SWITCH, CONTROL PANEL, SUPPLY AND OUTSIDE AIR DUCT MOUNTED THERMOSTATS, AND SAFETY CONTROL DEVICES. A THERMOSTAT MOUNTED IN THE SUPPLY DUCTWORK DOWNSTREAM OF THE UNIT SHALL SENSE THE DISCHARGE AIR TEMPERATURE. A THERMOSTAT MOUNTED IN THE OUTSIDE AIR DUCTWORK UPSTREAM OF THE UNIT SHALL SENSE INLET (OUTSIDE) AIR TEMPERATURE.

WHEN OUTSIDE AIR THERMOSTAT SENSES A TEMPERATURE ABOVE 40° F, THE SUPPLY AIR THERMOSTAT SHALL MODULATE THE FACE AND BYPASS DAMPERS AND HOT WATER COIL 3-WAY CONTROL VALVE IN CONCERT TO MAINTAIN A LEAVING AIR TEMPERATURE OF 55° F. WHEN OUTSIDE AIR THERMOSTAT SENSES A TEMPERATURE BELOW 40° F, THE SUPPLY AIR THERMOSTAT SHALL MODULATE THE HOT WATER COIL 3-WAY CONTROL VALVE TO 100% FULL OPEN AND MODULATE FACE AND BYPASS DAMPERS TO MAINTAIN A LEAVING AIR TEMPERATURE OF 55° F.

SAFETY AND AIRFLOW DEVICES SHALL CONSIST OF THE FOLLOWING. A FREEZE PROTECTION THERMOSTAT MOUNTED ON THE DOWNSTREAM FACE OF THE UNIT COIL SHALL DEACTIVATE AHU-1 FAN WHEN A TEMPERATURE OF BELOW 40° F IS SENSED, BYPASS DAMPER SHALL GO TO FULL OPEN AND FACE DAMPER SHALL GO TO FULL CLOSED. A SIGNAL ALARM LIGHT "COIL FREEZE" SHALL BE LIGHTED ON THE AHU-1 CONTROL PANEL. A DUCT MOUNTED SMOKE DETECTOR SD LOCATED IN THE EXHAUST FAN EF-1 DUCTWORK SHALL DEACTIVATE AHU-1 FAN AND EF-1 WHENEVER SMOKE IS DETECTED AND SIGNAL ALARM LIGHT "SMOKE" ON AHU-1 CONTROL PANEL. DIFFERENTIAL PRESSURE SWITCH PS SHALL SIGNAL INDICATOR LIGHT "FAN ON" ON AHU-1 CONTROL PANEL WHENEVER THE FAN IS IN OPERATION. DIFFERENTIAL PRESSURE SWITCH PS SHALL SIGNAL INDICATOR LIGHT "DIRTY FILTER" ON AHU-1 CONTROL PANEL UPON SENSING A CLOGGED FILTER ON AHU-1.

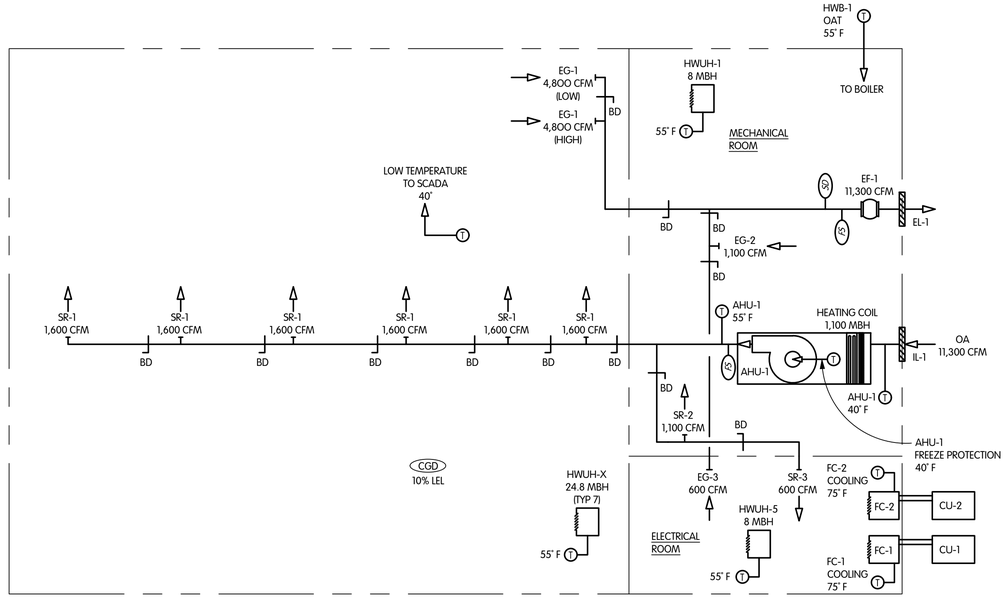


HWUH PIPING SCHEMATIC

LEGEND

HWUH =	HOT WATER UNIT HEATER
HWB =	HOT WATER BOILER
HWP =	HOT WATER PUMP
AHU =	AIR HANDLER UNIT
AS =	AIR SEPARATOR
BD =	BALANCING DAMPER
CU =	CONDENSER UNIT
ET =	EXPANSION TANK
GF =	GLYCOL FEED SYSTEM
CGD =	COMBUSTIBLE GAS DETECTOR
FS =	FLOW SWITCH
SD =	SMOKE DETECTOR
FC=	FAN COIL
(T) =	THERMOSTAT

NOTE: ALL NUMBERS CFM UNLESS NOTED.



BIOFILTER AIRFLOW SCHEMATIC

THE CITY OF Kalamazoo

HVAC SCHEMATICS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	BY
5		
4		
3		
2		
1	REVISIONS AFTER ISSUED FOR BID	

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

SHEET NO.
H-5
34 OF 44

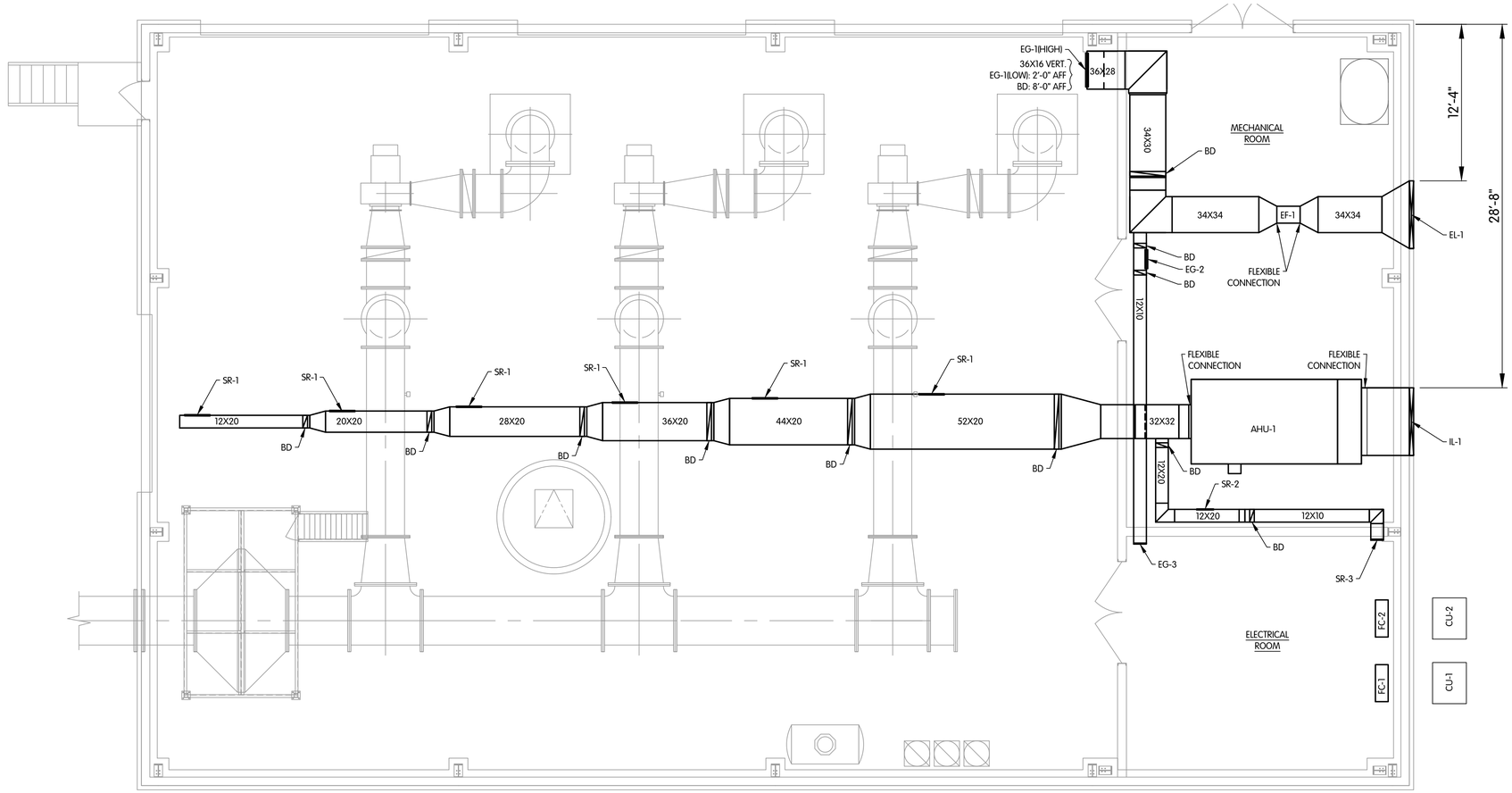
KAL-7725001H05-HVAC SCHEMATICS
1/20/2022 2:34 PM S SWILLIS
1/20/2022 2:33 PM

LEGEND

AHU = AIR HANDLER UNIT
CU = CONDENSING UNIT
IL = INTAKE LOUVER
EL = EXHAUST LOUVER
EF = EXHAUST FAN
SR = SUPPLY REGISTER
EG = EXHAUST GRILLE
BD = BALANCING DAMPER
FC = FAN COIL

SR-1 = SIZE/CFM: 24X16/1,600
SR-2 = SIZE/CFM: 16X16/1,100
SR-3 = SIZE/CFM: 12X12/600
EG-1 = SIZE/CFM: 32X32/4,800
EG-2 = SIZE/CFM: 18X14/1,100
EG-3 = SIZE/CFM: 12X12/600

NOTES:
1. AIR SUPPLY DUCTING TO BE 14'-0" ABOVE FINISHED FLOOR.
2. EXHAUST DUCTING TO BE 10'-0" ABOVE FINISHED FLOOR.



N

BLOWER BUILDING
HVAC PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001
SCALE 3/16" = 1'-0"
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

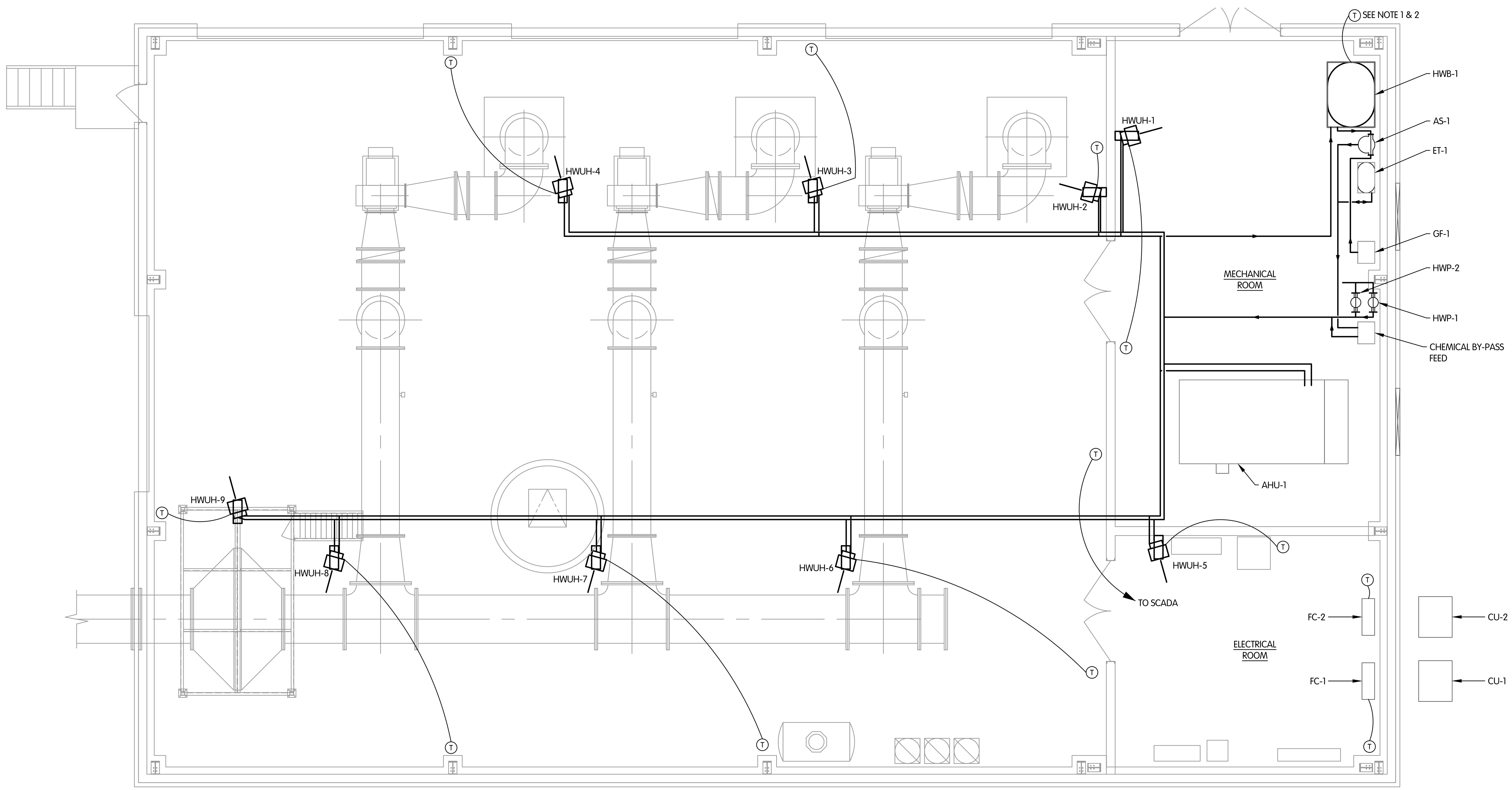
SHEET NO.
H-6
35 OF 44

KAL-77250(H0)-BLOWER BUILDING HVAC PLAN
1/28/2022 11:14 AM - SWILLIS
1/28/2022 2:33 PM

LEGEND

HWUH = HOT WATER UNIT HEATER
HWB = HOT WATER BOILER
HWP = HOT WATER PUMP
AHU = AIR HANDLER UNIT
AS = AIR SEPARATOR
BD = BALANCING DAMPER
CU = CONDENSER UNIT
ET = EXPANSION TANK
GF = GLYCOL FEED SYSTEM
(T) = THERMOSTAT

NOTES:
1. OUTSIDE AIR THERMOSTAT.
2. PROVIDE SUN SHIELD.



N

THE CITY OF Kalamazoo

BLOWER BUILDING HYDRONIC PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO	DATE	REVISIONS AFTER ISSUED FOR BID	BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

JOB NO. 017-7725.001
SCALE 3/16" =1'-0"
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
LMM	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022
SHEET NO.
H-7
36 OF 44

KAL-7725001H07-BLOWER BUILDING HYDRONIC PLAN
1/28/2022 11:24 AM - SWILLIS
1/28/2022 2:33 PM

SINGLE-LINE DIAGRAM LEGEND

30A
FRS-R -30
FUSED DISCONNECT SWITCH.
(SWITCH SIZE, FUSE TYPE AND FUSE SIZE AS SHOWN)

30A
UNFUSED DISCONNECT SWITCH
(SWITCH SIZE AS SHOWN)

40A
THERMAL-MAGNETIC CIRCUIT BREAKER OR MOTOR CIRCUIT PROTECTOR-MCP
(TRIP SIZE AS SHOWN)

CB
HIGH OR MEDIUM VOLTAGE CIRCUIT BREAKER

12470
1000KVA
480Y/277V
LIGHTING OR POWER TRANSFORMER,THREE PHASE UNLESS NOTED OTHERWISE (CONNECTION, SIZE & RATING AS SHOWN)

FULL VOLTAGE NON-REVERSING MOTOR STARTER WITH OVERLOADS (FVNR)

R
F
FULL VOLTAGE REVERSING MOTOR STARTER WITH OVERLOADS
(FVR)

S
F
TWO SPEED MOTOR STARTER WITH OVERLOADS

VACUUM CONTACTOR

5
THREE PHASE AC MOTOR
(HORSEPOWER AS SHOWN)

600/5
AS
AM
CURRENT TRANSFORMER WITH AMMETER SWITCH, AND AMMETER
(RATIO AS SHOWN)

600/5
CURRENT TRANSFORMER WITH SHORTING BLOCK (RATIO AS SHOWN)

VS
VM
POTENTIAL TRANSFORMER WITH VOLTMETER SWITCH, AND VOLTMETER

6KV
LIGHTNING ARRESTER
(VOLTAGE RATING AS SHOWN)

TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS)

GROUND CONNECTION

LINE OR LOAD REACTOR

K
KIRK KEY
(DASHED LINES TO INTERLOCKED DEVICES)

DRAWOUT FOR SWITCHGEAR OR MOTOR CONTROL CENTER

100E
HIGH OR MEDIUM VOLTAGE FUSED CUTOUT (SIZE AS SHOWN)

4/0
CABLE LIMITER (SIZE AS SHOWN)

G
800A
450KW
STAND-BY GENERATOR
(SIZE AS SHOWN)
WITH FIELD PROTECTION CIRCUIT BREAKER
(TRIP SIZE AS SHOWN)

VFD BP
VARIABLE FREQUENCY DRIVE WITH A BY-PASS OPTION (SHOWN WITH INTEGRAL EXTERNAL DISCONNECT HANDLE)

CP = CONTROL PANEL
SSRVS = SOLID STATE REDUCED VOLTAGE STARTER
(SHOWN WITH INTEGRAL EXTERNAL DISCONNECT HANDLE)

DPM
DIGITAL POWER METER

WHM
WATTHOUR METER

AUTOMATIC TRANSFER SWITCH (ATS)

MANUAL TRANSFER SWITCH (MTS)

POWER FACTOR CORRECTION CAPACITOR - (PFCC) (SIZE PER MOTOR MANUFACTURER RECOMMENDATIONS.)

SCHEMATIC LEGEND

OPEN CONTACTS
WITH TIME-DELAY CLOSING

CLOSED CONTACTS
WITH TIME-DELAY OPENING

OPEN CONTACTS
WITH TIME-DELAY OPENING

CLOSED CONTACTS
WITH TIME-DELAY CLOSING

FLOW SWITCH
CLOSES ON INCREASE IN FLOW

FLOW SWITCH
OPENS ON INCREASE IN FLOW

LIQUID LEVEL SWITCH CLOSES ON RISING LEVEL

LIQUID LEVEL SWITCH OPENS ON RISING LEVEL

PRESSURE OR VACUUM SWITCH CLOSES ON RISING PRESSURE

PRESSURE OR VACUUM SWITCH OPENS ON RISING PRESSURE

TEMPERATURE SWITCH
CLOSES ON RISING TEMPERATURE

TEMPERATURE SWITCH
OPENS ON RISING TEMPERATURE

LIMIT SWITCH
NORMALLY OPEN

LIMIT SWITCH
NORMALLY OPEN - HELD CLOSED

LIMIT SWITCH NORMALLY CLOSED

LIMIT SWITCH
NORMALLY CLOSED - HELD OPEN

FOOT SWITCH
OPENS BY FOOT PRESSURE

FOOT SWITCH
CLOSES BY FOOT PRESSURE

MUSHROOM HEAD, MAINTAINED ACTION (PUSH-PULL) PUSH BUTTON SWITCH
(SHOWN WITH ONLY 1 CIRCUIT)

ON
OFF
XO
2 - POSITION, MAINTAINED ACTION SELECTOR SWITCH

H
O
A
XOO
OOX
3 - POSITION, MAINTAINED ACTION SELECTOR SWITCH
H - O - A: HAND-OFF-AUTOMATIC
L - O - R: LOCAL-OFF-REMOTE
PCS: PLANT CONTROL SYSTEM
PLC: PROGRAMMABLE LOGIC CONTROLLER

INDICATES ITEMS IN A SEPARATE COMMON ENCLOSURE

XY
CONTACTOR COIL
M - MOTOR STARTER CONTACTOR
MF - MOTOR STARTER FORWARD CONTACTOR
MR - MOTOR STARTER REVERSE CONTACTOR
ML - MOTOR STARTER LOW SPEED CONTACTOR
MH - MOTOR STARTER HIGH SPEED CONTACTOR
SC - MOTOR STARTER STARTING CONTACTOR
RC - MOTOR STARTER RUN CONTACTOR
BP - BYPASS CONTACTOR
CC - CAPACITOR CONTACTOR
LC - LIGHTING CONTACTOR
IC - ISOLATION CONTACTOR
C - GENERAL CONTACTOR

XR
CONTROL RELAY COIL
CR - INSTANTANEOUS CONTROL RELAY
TR - TIME DELAY RELAY

OL
MOTOR STARTER OVERLOAD RELAY N.C. CONTACT

SOLENOID COIL
SV - SOLENOID VALVE

ETM
ELAPSED TIME METER

NORMALLY OPEN MOMENTARY ACTION PUSHBUTTON SWITCH
(SHOWN WITH ONLY 1 CIRCUIT)

NORMALLY CLOSED MOMENTARY ACTION PUSHBUTTON SWITCH
(SHOWN WITH ONLY 1 CIRCUIT)

R
PUSH-TO-TEST PILOT LIGHT WITH COLORED LENS CAP
R - RED
G - GREEN
A - AMBER
W - WHITE
B - BLUE
CL - CLEAR

F
ZERO SPEED SWITCH
(NORMALLY OPEN)

F
ZERO SPEED SWITCH
(NORMALLY CLOSED)

GENERAL ELECTRICAL ABBREVIATIONS

PVC - POLYVINYL CHLORIDE
RGS - RIGID GALVANIZED STEEL
PVC/RGS - PVC COATED RGS

MOTOR STARTER ABBREVIATIONS

FVNR - FULL VOLTAGE, NON-REVERSING
FVR - FULL VOLTAGE REVERSING
TS1W - TWO SPEED, ONE WINDING
TS2W - TWO SPEED, TWO WINDING
TSR1W - TWO SPEED REVERSING, ONE WINDING
TSR2W - TWO SPEED REVERSING, TWO WINDING

ELECTRICAL PLAN LEGEND

G
GROUND WIRE
DIRECT BURIAL CABLE
CONDUIT CONCEALED
CONDUIT EXPOSED
CONDUIT IN CONCRETE DUCT BANK
HOMERUN
CONDUIT TURNS UP
CONDUIT TURNS DOWN
CAPPED CONDUIT (FUTURE USE)
CONDUIT TEE
CADWELD CONNECTION
B
B
B = BUSWAY
C
C
C = CABLE TRAY
S
SINGLE POLE TOGGLE SWITCH
S_2
DOUBLE POLE TOGGLE SWITCH
S_3
THREE-WAY TOGGLE SWITCH
S_4
FOUR-WAY TOGGLE SWITCH
S_P
TOGGLE SWITCH WITH GREEN PILOT LIGHT
S_K
KEY-OPERATED SWITCH
5
SINGLE RECEPTACLE
3
DUPLEX RECEPTACLE
5
RECEPTACLE, (SINGLE) 120,30A.OR LARGER
6,8
RECEPTACLE, (SINGLE) 240V,2POLE
4,6,8
POWER RECEPTACLE 480V,3PH WITH DISCONNECT SWITCH (SIZE AS SHOWN)
TELEPHONE RECEPTACLE
COMPUTER RECEPTACLE
BOLLARD LIGHT FIXTURE
B
2
CEILING MOUNTED FIXTURE
O
1
WALL MOUNTED FIXTURE
D
1
POLE MOUNTED FIXTURE
A
2
FLUORESCENT FIXTURE
A
2
FLUORESCENT TROFFER - GRID CEILING LAY IN
E
1
EMERGENCY LIGHTING FIXTURE, (2-HEAD SHOWN)
EXIT FIXTURE (WITH DIRECTION ARROW WHERE INDICATED)
MCC
MOTOR CONTROL CENTER (MCC) OR SWITCHGEAR (SWG)
DISTRIBUTION PANEL 480V OR 480Y/277V
LIGHTING PANEL 120/208V OR 120/240V
UPS
UNINTERRUPTIBLE POWER SUPPLY
EPP
EMERGENCY POWER PACK
CP
CONTROL PANEL (SHOWN WITH EXTERNAL DISCONNECT HANDLE)
MAGNETIC MOTOR STARTER 480V, 3 PHASE
MAGNETIC MOTOR STARTER 120V, 1 PHASE
COMBINATION MAGNETIC MOTOR STARTER 480V, 3 PHASE
COMBINATION MAGNETIC MOTOR STARTER 120V, 1 PHASE
S_M
MANUAL MOTOR STARTER 480V, 3 PHASE
S_V
MANUAL MOTOR STARTER 120V, 1 PHASE
DISCONNECT SWITCH (SEE SINGLE LINE DIAGRAM FOR SIZE & TYPE)
½
SINGLE PHASE AC MOTOR(HORSEPOWER AS SHOWN,DC INDICATES DC MOTOR)

2
THREE PHASE AC MOTOR(HORSEPOWER AS SHOWN)
MOTOR OPERATED VALVE, 3 PHASE,WITH MAGNETIC STARTER AND CONTROLS
MOTOR OPERATED VALVE, 1 PHASE,WITH MAGNETIC STARTER AND CONTROLS
GROUND ROD WITH CADWELD CONNECTION
PP
PP= POWER POLE, LP = LIGHT POLE
AIR TERMINAL (LIGHTNING PROTECTION)
F
STROBE LIGHT (F=FIRE ALARM, G=GAS ALARM)
R/F
HEAT DETECTOR - RATE OF RISE/FIXED TEMPERATURE
P
SMOKE DETECTOR - (P = PHOTOELECTRIC, I = IONIZATION)
F
PULL STATION - FIRE ALARM
HORN, BELL, OR SIREN
HORN/STROBE COMBINATION
CA
CAPACITOR
CONTROL STATION
JB
BOX - JUNCTION, TERMINAL, PULL OR HAND HOLE
M
ELECTRIC MANHOLE
XF
TRANSFORMER (SEE SINGLE LINE FOR SIZE & TYPE)
LC
LIGHTING CONTACTOR
FT
FLOW TRANSMITTER
LT
LEVEL TRANSMITTER
PT
PRESSURE TRANSMITTER
TT
TEMPERATURE TRANSMITTER
AT
ANALYSIS TRANSMITTER (I.E. OXYGEN, TURBIDITY)
PI
INDICATOR - PRESSURE, FLOW, LEVEL, DENSITY, ANALYSIS
DT
DENSITY TRANSMITTER
ZS
LIMIT (POSITION) SWITCH
PS
PRESSURE SWITCH
TS
TEMPERATURE SWITCH (I.E. MOTOR THERMO PROTECTOR)
CS
CONVEYOR CABLE SWITCH
SS
SPEED SWITCH
FS
FLOW SWITCH
LS
LEVEL SWITCH
NS
MOISTURE SENSOR
OS
TORQUE SWITCH
VS
VIBRATION SWITCH
LC
LOAD CELL
LE
TRANSMITTER SENSING ELEMENT - LEVEL, FLOW, DENSITY, PRESSURE, ANALYSIS
S
SOLENOID
T
THERMOSTAT
H
HEATER IN MOTOR
PC
PHOTOELECTRIC CELL
G
GAS DETECTOR WITH CONTROL PANEL (GAS TYPE AS SHOWN)
T
THERMOCOUPLE
V
PNEUMATIC VALVE OPERATOR
I
CURRENT TO PRESSURE TRANSDUCER

ELECTRICAL NOTES

1. STRUCTURAL MATERIALS ARE NOT SHOWN ON ELECTRICAL DRAWINGS. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS.
2. ALL ELECTRICAL EQUIPMENT ELEVATIONS SHOWN ARE TO BOTTOM OF DEVICE OR PANEL, UNLESS OTHERWISE NOTED.
3. NUMBER SHOWN # (I.E.1173.5), INDICATES A SPECIFICATION REFERENCE FOR ITEMS OTHER THAN DIVISION 16. THE ELECTRICAL ITEM UNDER THIS REFERENCE IS SUPPLIED BY ANOTHER PART OF THE CONTRACT. UNLESS OTHERWISE NOTED IN THAT SPECIFICATION, THE CONTRACTOR SHALL INSTALL AND WIRE THE ITEM PER THE DRAWINGS AND DIVISION 16 SPECIFICATIONS.
4. CONTROL WIRING SHALL CONFORM TO ALL REQUIREMENTS AS SHOWN ON THE P & ID DRAWINGS WHETHER SHOWN ON THE ELECTRICAL DRAWINGS OR NOT.
5. WHERE LINES ARE SHOWN CONNECTING ELECTRICAL EQUIPMENT, THEY ARE NOT INTENDED AS CONDUIT ROUTING. CONTRACTOR SHALL ROUTE ALL CONDUIT RUNS (SHOWN OR NOT) PER DIVISION 16 SPECIFICATIONS.
6. WP INDICATES WATERPROOF. LETTER ON OR NEXT TO LIGHT FIXTURE INDICATES TYPE, PER SECTION 16510. NUMBER WITH LIGHT FIXTURE OR RECEPTACLE INDICATES CIRCUIT NUMBER.
7. GFCI INDICATES A CIRCUIT BREAKER OR RECEPTACLE WITH A 6 MA GROUND FAULT CIRCUIT INTERRUPTER. GFEPD INDICATES A CIRCUIT BREAKER OR RECEPTACLE WITH A 30 MA GROUND FAULT EQUIPMENT PROTECTION DEVICE.
8. FOR BELOW GRADE CONDUIT PENETRATIONS THROUGH EXISTING EXTERIOR CONCRETE WALLS, PROVIDE TYPE A CONDUIT SLEEVE FOR PVC CONDUIT. FOR RGS OR PVC-COATED RGS CONDUIT, PROVIDE TYPE B CONDUIT SLEEVE THROUGH CONCRETE WALLS, AND TYPE C CONDUIT SLEEVE THROUGH EXISTING CONCRETE WALLS.
9. FOR ABOVE GRADE CONDUIT PENETRATIONS THROUGH EXTERIOR CONCRETE WALLS, PROVIDE TYPE C CONDUIT SLEEVE. FOR MASONRY WALLS PROVIDE TYPE F CONDUIT SLEEVE.
10. FOR CONDUIT PENETRATIONS THROUGH EXISTING CONCRETE FLOORS AND WALLS BETWEEN ADJACENT NON-CLASSIFIED (NON-HAZARDOUS) AREAS, PROVIDE TYPE C CONDUIT SLEEVES FOR ALL CONDUIT TYPES. FOR SIMILAR PENETRATIONS THROUGH CONCRETE FLOORS AND WALLS, PROVIDE TYPE D CONDUIT SLEEVES FOR ALL CONDUIT TYPES.
11. FOR CONDUIT PENETRATIONS THROUGH CONCRETE FLOORS AND WALLS SEPARATING CLASSIFIED (HAZARDOUS) AREAS FROM NON-CLASSIFIED (NON-HAZARDOUS) AREAS, PROVIDE TYPE G CONDUIT SLEEVES. FOR SIMILAR PENETRATIONS THROUGH MASONRY WALLS, PROVIDE TYPE H CONDUIT SLEEVE. FOLLOW MECHANICAL SEAL MANUFACTURER'S RECOMMENDATIONS TO MEET 3-HOUR FIRE RESISTANCE REQUIREMENTS.
12. LEGENDS ARE FOR REFERENCE ONLY AND DOES NOT MEAN THAT ALL ITEMS ARE USED.

THE CITY OF Kalamazoo

ELECTRICAL LEGEND

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	BY
5		
4		
3		
2		
1		

REVISIONS AFTER ISSUED FOR BID

Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

JOB NO. 017-7725.001
SCALE NONE
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE
DESIGNED PEM | DRAWN CJAF | CHECKED AJD
STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022
SHEET NO. E-1
37 OF 44

KAL-7725001E01A-ELECTRICAL LEGEND
1/28/2022 2:33 PM - SWILLIS

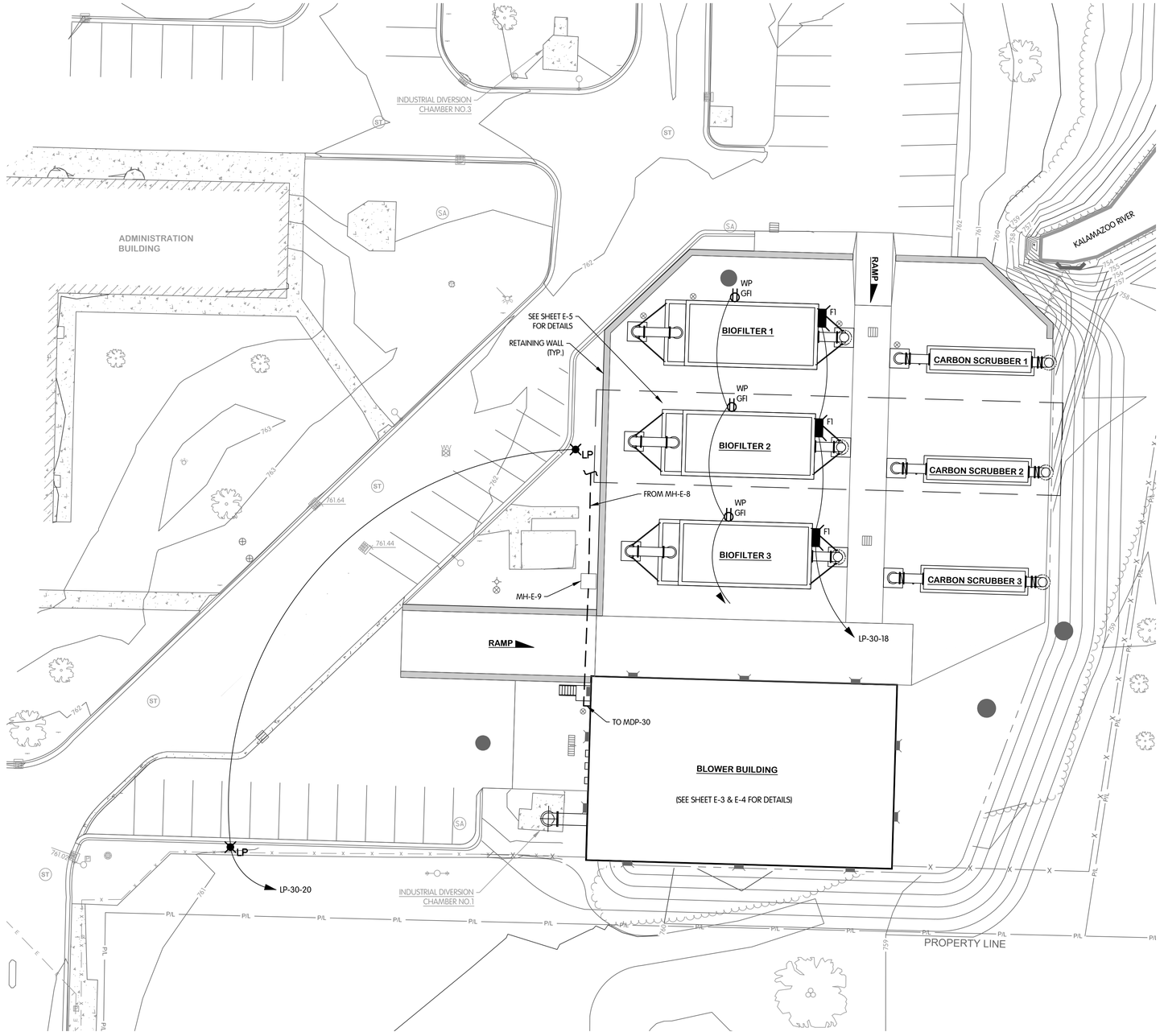
LIGHTING LEGEND		
TYPE	DESCRIPTION	EQUAL TO
	Type 2 Medium Distribution, Single Led Area Luminaire Mounted on a 30 Ft. Round Pole With Natural Aluminum Finish. Fixture Furnished With Integral Photo Cell Receptacle And Photocell. Fixture Shall Be Wired At 208V Unless Noted Otherwise.	*Lithonia Fixture: DSX2-LED-P1-50K-T2M-MVOLT-RPA-DNAXD/DLW27F1.5JU Pole: RTA 30-7E-DM19A5-DNA-VD-BC*

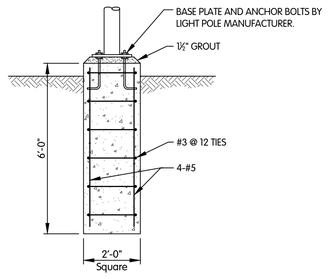
LEGEND

LP POLE MOUNTED LUMINAIRE

WALL PACK LUMINAIRE
(F1 SEE LIGHTING SCHEDULE ON SHEET E-3)

EXTERIOR LIGHTING:
1) ALL LUMINAIRES INDIVIDUALLY PHOTOCELL CONTROLLED.
2) 1.5-2 AVG FOOTCANDLES ON PAVEMENT.
3) ALL LIGHTING SHALL BE OF THE SAME DESIGN.





LIGHT POLE BASE DETAIL
NTS

THE CITY OF KALAMAZOO

LIGHTING SITE PLAN & DETAILS

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

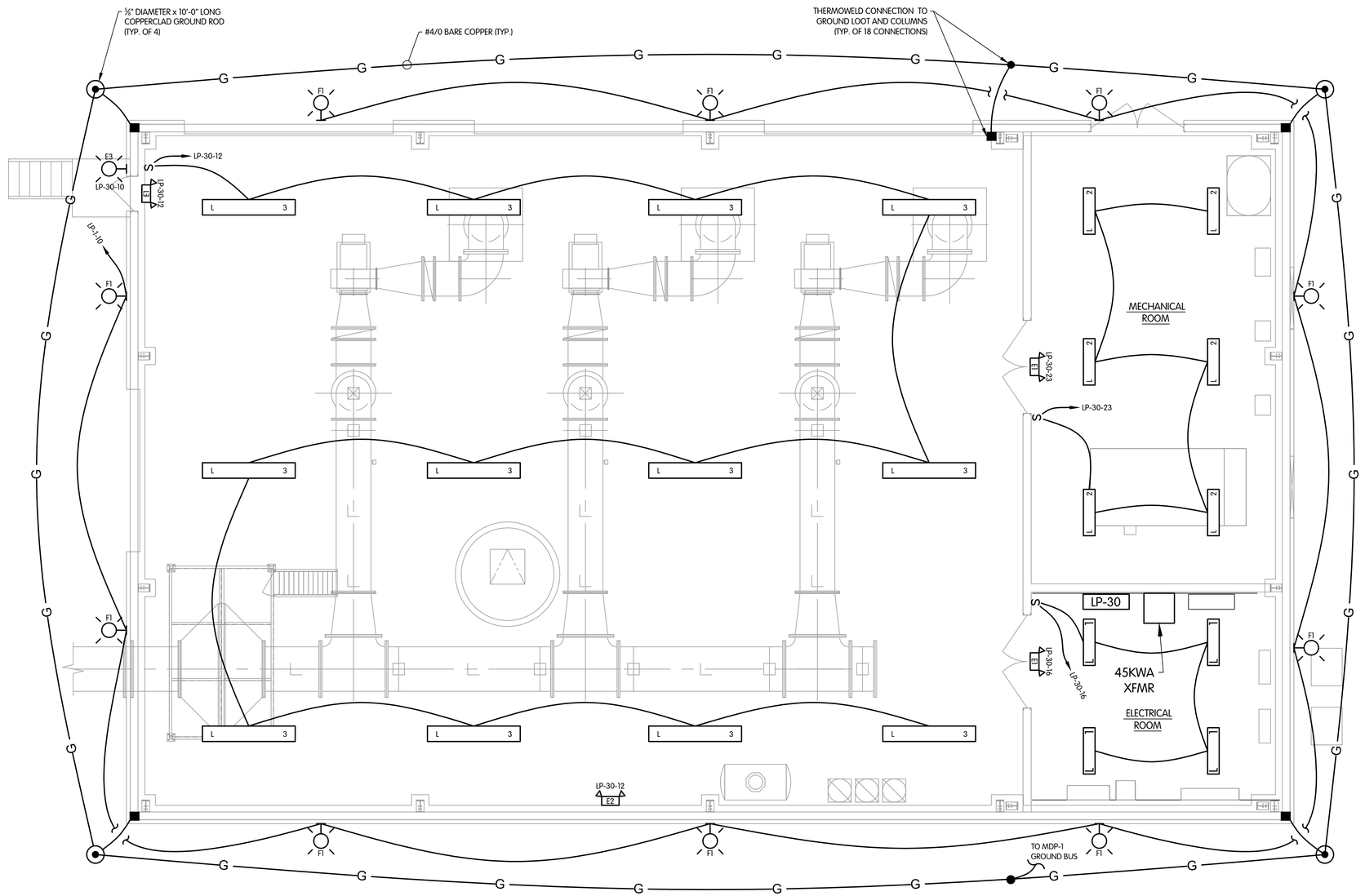
NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO.	017-7725.001
SCALE	1" = 20'
	THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE
DESIGNED	PEM
DRAWN	CJAF
CHECKED	AJD
STATUS:	ISSUED FOR BID
DATE:	FEBRUARY 2022
SHEET NO.	E-2
	38 OF 44

KAL-772500\E02-LIGHTING SITE PLAN & DETAILS
1/27/2022 11:04 AM - SWILLIS
1/28/2022 2:33 PM

BLOWER BUILDING LIGHTING SCHEDULE	
SYMBOL	DESCRIPTION
L 1	LITHONIA CAT. NO. FEM-L48-8000LW-IMACD-MD-MVOLT-40K-80CRI LINEAR LED, 8000 LUMENS, ACRYLIC CLEAR DEEP LENS, MEDIUM DISTRIBUTION, MULTIVOLT, 4000K, 80CRI, 50.5 WATTS. MOUNTED AT 14'-0" AFF
L 2	LITHONIA CAT. NO. FEM-L48-10000LW-IMACD-MD-MVOLT-40K-80CRI LINEAR LED, 10000 LUMENS, ACRYLIC CLEAR DEEP LENS, MEDIUM DISTRIBUTION, MULTIVOLT, 4000K, 80CRI, 62 WATTS. MOUNTED AT 14'-0" AFF
L 3	LITHONIA CAT. NO. FEM-L96-15000LW-IMACD-MD-MVOLT-40K-80CRI LINEAR LED, 15000 LUMENS, ACRYLIC CLEAR DEEP LENS, MEDIUM DISTRIBUTION, MULTIVOLT, 4000K, 80CRI, 94.2 WATTS. MOUNTED AT 14'-0" AFF
F1	LITHONIA CAT. NO. DSXW1-LED-20C-1000-40K-T2S-MVOLT-PE-HS D-SERIES LED WALL LUMINAIRE, 20 LEDS, 1000mA DRIVE CURRENT, 4000K, TYPE 2 SHORT DISTRIBUTION, MULTIVOLT, BUTTON STYLE PHOTOCELL, HOUSE-SIDE SHIELD, 7204 LUMENS, 73 WATTS. MOUNTED AT 15'
E1	LITHONIA CAT. NO. LHQM-LED-R-HO / ELA-T-SD-Q-L0309 COMBO EXIT/EMERGENCY LED, WHITE HOUSING W/ RED LETTERS, 120/277V, 50' - 104' OPERATION, 90-MINUTE NI-CAD BATTERY, SELF-DIAGNOTICS, 4 WATTS, TWIN LED HEADS. MOUNTED AT 8' AFF. WIRE AHEAD OF SWITCH FOR LIGHTS SERVING AREA
E2	LITHONIA CAT. NO. EU2L EMERGENCY LED, WHITE HOUSING, 120/277V, 50' - 104' OPERATION, 90-MINUTE NI-CAD BATTERY, SELF-DIAGNOTICS, 4 WATTS. MOUNTED AT 8' AFF. WIRE AHEAD OF SWITCH FOR LIGHTS SERVING AREA
E3	HOLOPHANE CAT. NO. CZAFB-OEL-DDBTXD-UVOLT-LTP-SDRT-WT-CW ARCHITECTURAL EMERGENCY LED LIGHT FOR INDOOR/OUTDOOR USE, NORMALLY-OFF WITH INTERNAL LITHIUM ION PHOSPHATE BATTERY, DARK BRONZE TEXTURED, 120-347V, SELF-DIAGNOSTICS, WIDE-THROW, -30° - 50°C OPERATION. MOUNTED AT 8'



NOTES:
1) TOP OF FIXTURE AT 14'-0" ABOVE FINISHED FLOOR.
2) BLOWER ROOM: 20-25 AVG. FOOTCANDLES ON FLOOR.
3) ELECTRICAL ROOM: 30-35 AVG. FOOTCANDLES ON FLOOR.
4) MECHANICAL ROOM: 30-35 AVG. FOOTCANDLES ON FLOOR.
5) CONTRACTOR SHALL PROVIDE GROUNDING. BOND TO METAL FRAME AND MAIN DISTRIBUTION PANEL.

N

THE CITY OF Kalamazoo

BLOWER BUILDING
LIGHTING & GROUNDING PLAN

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001
SCALE 3/16" = 1'-0"
THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
PEM	CJAF	AJD

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

SHEET NO.
E-3
39 OF 44

KAL-77250(E0)-BLOWER BUILDING LIGHTING & GROUNDING PLAN
1/27/2022 11:46 AM - SWILLIS
1/28/2022 2:53 PM

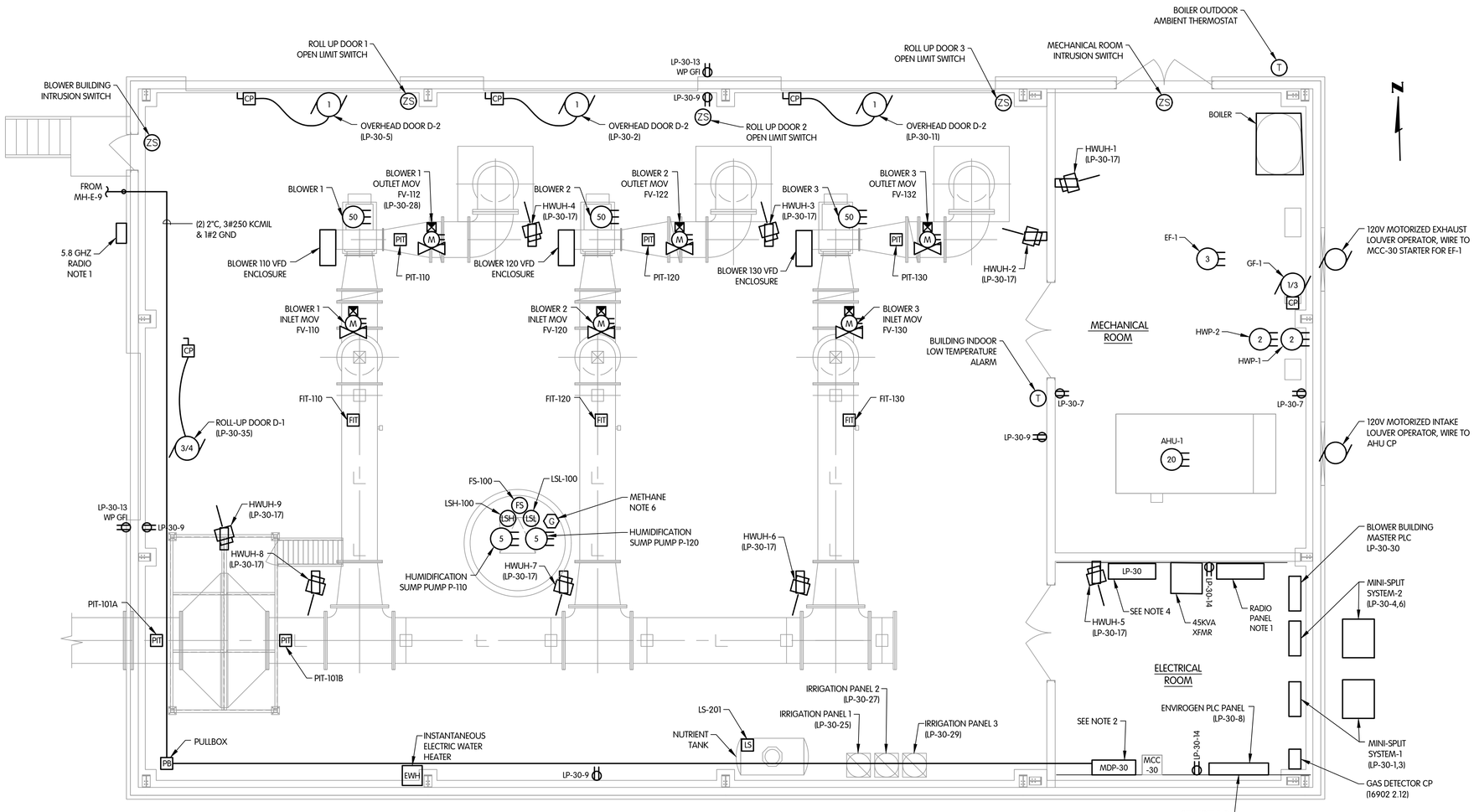
PANELBOARD DESIGNATION / TAG:		LP-30			LOCATION:		BLOWER BUILDING										
ELECTRICAL CHARACTERISTICS:		120/208V 3PH 4W			FEEDER SIZE:		175A - 4#2/0 & 1#6 Grd - 2"C										
PANELBOARD CONSTRUCTION:		CIRCUIT BREAKER			FED FROM:		MDP-30 VIA 45 KVA XFMR										
	AMP MAIN LUGS	10k	A.I.C. (FULLY RATED)				SURFACE	MOUNTING									
175	AMP MAIN BREAKER/SWITCH	100	% NEUTRAL (SOLID)				NEMA 12	ENCLOSURE									
42	AVAILABLE CIRCUIT SPACES	TOP	INCOMING FEED					MISC.									
'L'	After the circuit no. indicates handle locking device.																

		VOLT AMPS			CIRCUIT		WIRE SIZE		CIRCUIT		VOLT AMPS				
	LOAD DESCRIPTION	A	B	C	POLE	AMP			AMP	POLE	A	B	C	LOAD DESCRIPTION	
1	MINI SPLIT SYSTEM	2704			2	35	#8	#10	30	1	1920			OVERHEAD DOOR 2	2
3			2704				#8	#8	35	2		2704		MINI SPLIT SYSTEM 2	4
5	OVERHEAD DOOR D-2			1920	1	30	#10	#8					2704		6
7	MECHANICAL ROOM RECEPTACLES	800			1	20	#12	#12	20	1	600			ENVIROGEN PLC PANEL	8
9	BLOWER ROOM RECEPTACLES		400		1	20	#10	#8	20	1		734		EXTERIOR LIGHTING	10
11	OVERHEAD DOOR D-2			1920	1	30	#10	#12	20	1			1140	BLOWER ROOM LIGHTING	12
13	EXTERIOR RECEPTACLES	400			1	20	#8	#12	20	1	400			ELICTRIC ROOM RECEPTACLES	14
15	BIOFILTER 1 PIPING HEAT TRACE		600		1	20	#8	#12	20	1		206		ELECTRICALROOM LIGHTING	16
17	UNIT HEATER FANS (UH-1-9)			225	1	20	#12	#12	20	1			219	BIOFILTER LIGHTS	18
19	BIOFILTER 2 PIPING HEAT TRACE	600			1	20	#8	#8	20	1	280			SITE LIGHT POLES	20
21	SPARE				1	20		#8	20	1		600		BIOFILTER 3 PIPING HEAT TRACE	22
23	MECHANICAL ROOM LIGHTING			376	1	20	#12	#10	20	1			300	MAGNETIC FLOW TRANSMITTERS	24
25	WATER IRRIGATION PANEL 1	45			1	20	#12	#12	20	1	1000			RADIO PANEL	26
27	WATER IRRIGATION PANEL 2		45		1	20	#12	#8	20	1		600		BIOFILTER RECEPTACLES	28
29	WATER IRRIGATION PANEL 3			45	1	20	#12	#12	20	1			1500	BLOWER BUILDING MASTER PLC	30
31	GLYCOL PUMP	864			1	20	#12	#8	20	1	576			FV-110, 112, 120, 122, 130, 131	32
33	GAS DETECTOR		500		1	20	#12	#12	20	1		288		FV-211, 221, 231	34
35	ROLL-UP DOOR D-1			1440	1	20	#12	#12	20	1			288	FCV-214, 224, 234	36
37	SPARE				1	20		#8	20	1	576			FV-310, 312, 330	38
39	SPARE				1	20		#12	20	1		288		FCV-310, 320, 330	40
41	SPARE				1	20			20	1				SPACE	42
	SUB TOTAL VA	5,413	4,249	5,926							5,352	5,420	6,151	**SUB TOTAL VA**	
	PHASE TOTALS	**A**	**B**	**C**											
	TOTAL PHASE VA	10,765	9,669	12,077										**CONNECTED AMPS (Balanced)**	
	TOTAL PHASE AMPS	89.7	80.6	100.6										**PHASE DEMAND AMPS (Balanced)**	
	TOTAL CONNECTED KVA		32.511											**TOTAL DEMAND KVA**	

Circuit wire size(s) indicated are minimum allowable. Refer to wire sizing Table(s) and one-line diagram(s) on plan(s) additional information

Options: SUB-FEED LUGS; SUB-FEED BREAKER; FEED-THRU LUGS; SERVICE ENTRANCE RATED; 100% RATING

Options: MULTIPLE SECTIONS; YES SPD; BOLT-ON BREAKERS; MAIN TERMINAL LUGS



NOTES:
1) SEE SHEET E-8 FOR RADIO PANEL DETAILS AND MASTER PLC RISER DIAGRAM.
2) SEE SHEET E-6 FOR SINGLE LINE DIAGRAM.
3) SEE SHEET E-7 FOR ENVIROGEN PLC RISER DIAGRAM.
4) SEE PANEL BOARD SCHEDULE THIS SHEET.
5) H_2S AND COMBUSTIBLE GAS SENSORS MOUNTED AT 18" ABOVE FINISHED FLOOR.
6) METHANE GAS SENSOR MOUNTED TO BOTTOM OF ROOF STEEL AT ROOF PEAK.

THE CITY OF Kalamazoo

BLOWER BUILDING ELECTRICAL PLAN

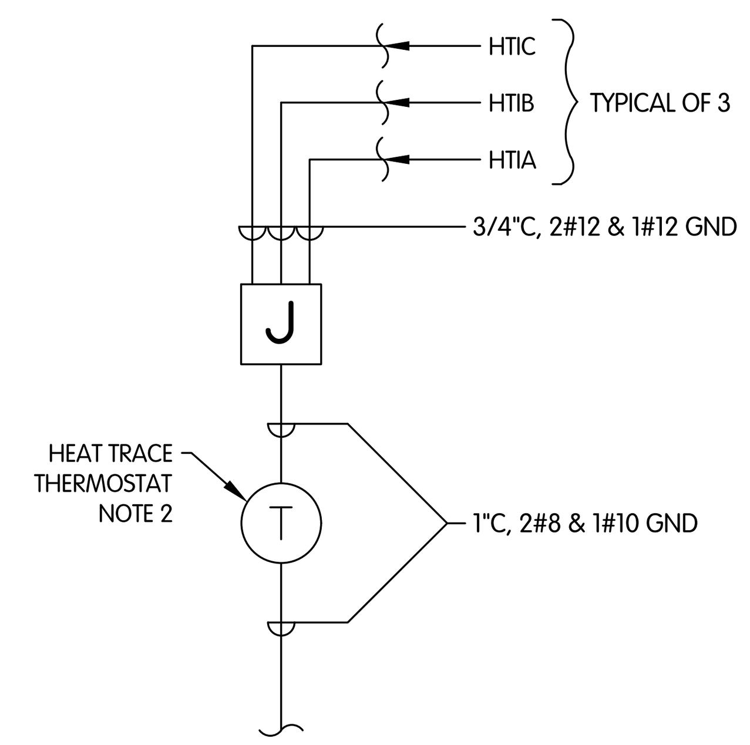
KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.
Fluid thinking©.
www.JHeng.com

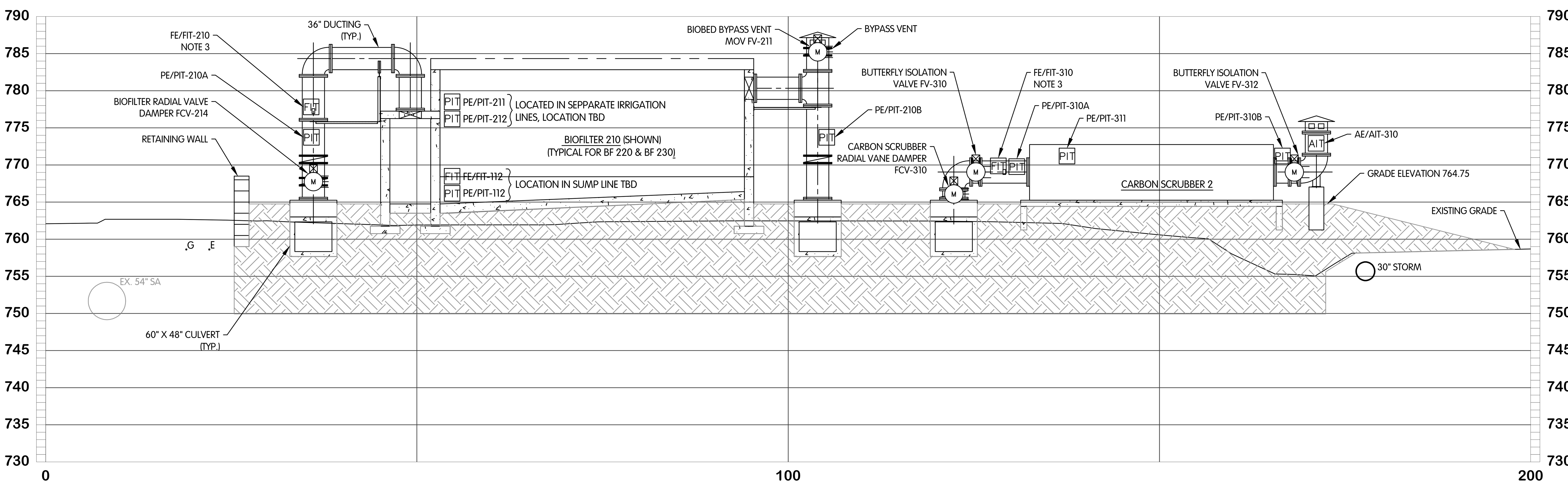
JOB NO.	017-7725.001
SCALE	3/16" = 1'-0"
	THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE
DESIGNED	PEM
DRAWN	CJAF
CHECKED	AJD
STATUS:	ISSUED FOR BID
DATE:	FEBRUARY 2022
SHEET NO.	E-4
	40 OF 44

K:\KAL-77250\E\E05-BLOWER BUILDING ELECTRICAL PLAN
2/10/2022 11:44 SWILLIS
2/10/2022 2:33 PM



BIOFILTER HEAT TRACE RISER DIAGRAM

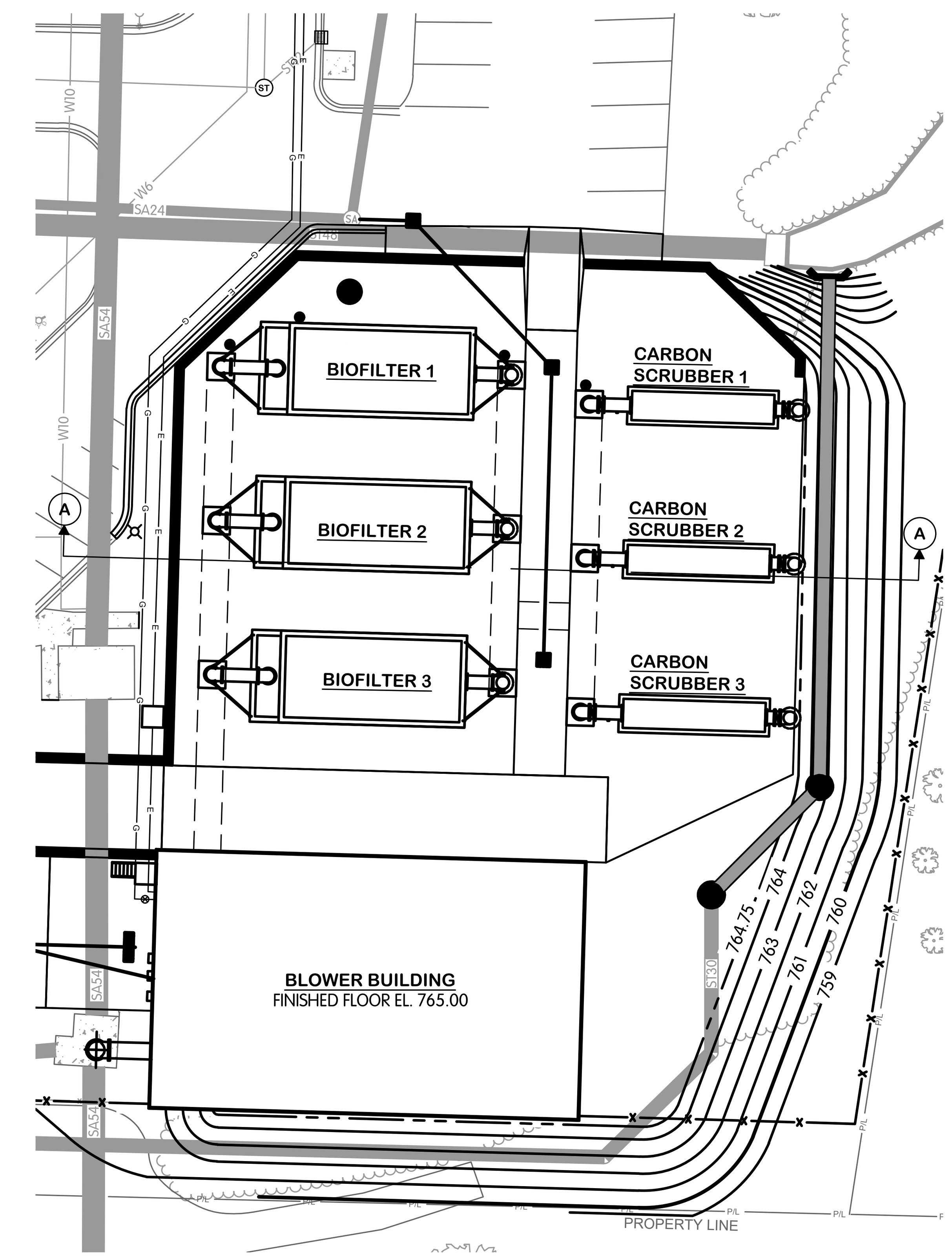
(BIOFILTER 210 SHOWN TYPICAL FOR BF 220 & BF 230)



SECTION A

NOTES:

1. SECTION APPLIES TO ALL BIOFILTERS AND CARBON SCRUBBERS.
2. HEAT TRACE THERMOSTAT FOR WATER PIPING FROM IRRIGATION PANEL SUMP (2@1½") AND HUMIDIFIER SUMP (1@2"), ASSUME 25 FEET OF HEAT TRACED PIPE FOR EACH RUN.
3. VERIFY LENGTH OF DUCT STRAIGHT SECTION. FLOW METER INDICATED SHALL BE LOCATED AT APPROXIMATELY 80% OF THE DUCT LENGTH FROM THE DUCT SUPPLY END.



PLAN VIEW

1" = 30'

THE CITY OF Kalamazoo

BIOFILTER & CARBON SCRUBBER ELECTRICAL SECTION

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO	DATE	REVISIONS AFTER ISSUED FOR BID	BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.

Fluid thinking®.
www.JHeng.com

JOB NO. 017-7725.001

SCALE 1" =10'-0"

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
PEM	CJAF	AJD

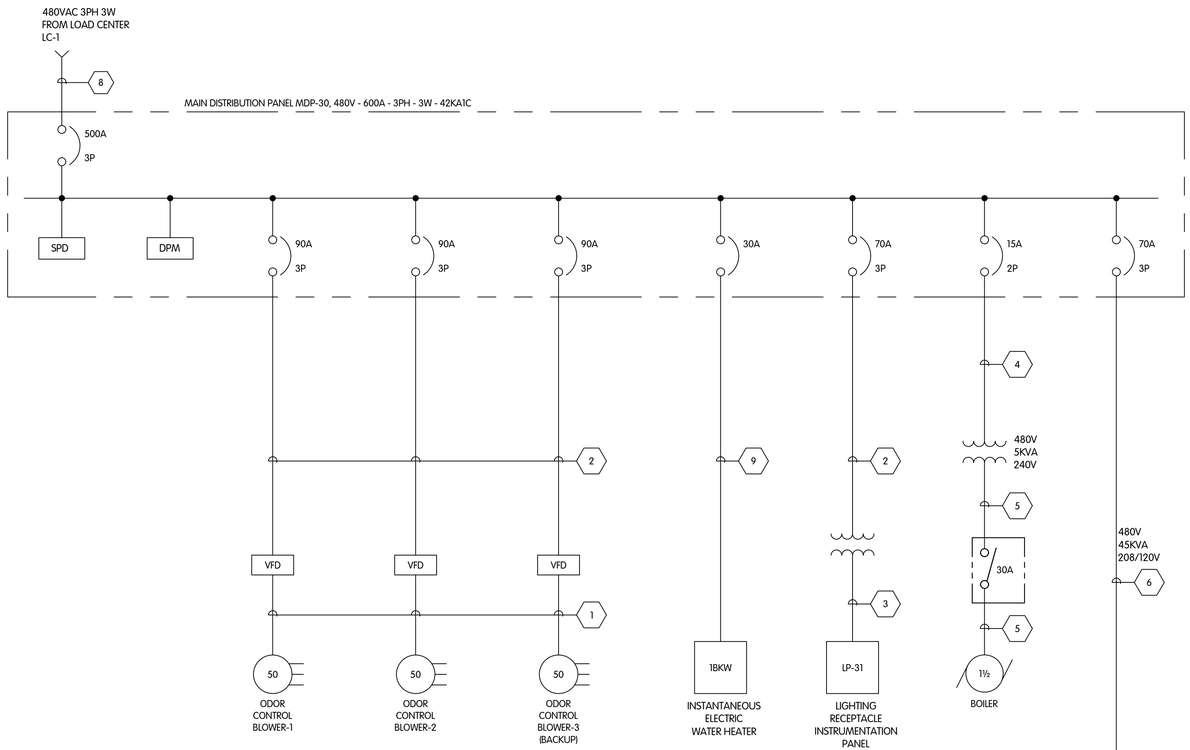
STATUS: ISSUED FOR BID

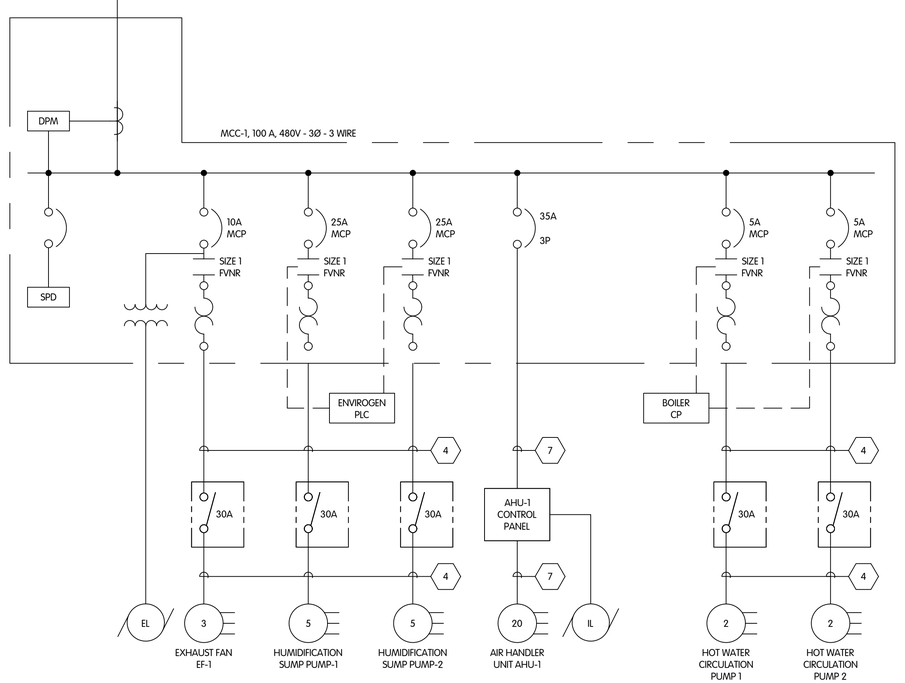
DATE: FEBRUARY 2022

SHEET NO. E-5

41 OF 44

KAL-7725001E06-BIOFILTER & CARBON SCRUBBER ELECTRICAL SECTION
1/27/2022 11:40 AM - SWILLIS
1/28/2022 2:33 PM





CONDUIT AND WIRE SCHEDULE	
NUMBER	CONDUIT AND WIRE
1	2"C, VFD RATED 3/C#4 W/ 1#8 GND
2	1"C, 3#4 & 1#8 GND
3	2"C, 4#2/0 & 1#8 GND
4	¾"C, 3#12 & 1#12 GND
5	¾"C, 2#10 & 1#10 GND
6	1"C, 3#4 & 1#8 GND
7	¾"C, 3#8 & 1#10 GND
8	(2) 3"C, 3#500KCMIL & 1#2 GND
9	¾"C, 3#10 & 1#10 GND

THE CITY OF Kalamazoo

ONE LINE DIAGRAM

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.

Fluid thinking©
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
PEM	CJAF	AJD

STATUS: ISSUED FOR BID

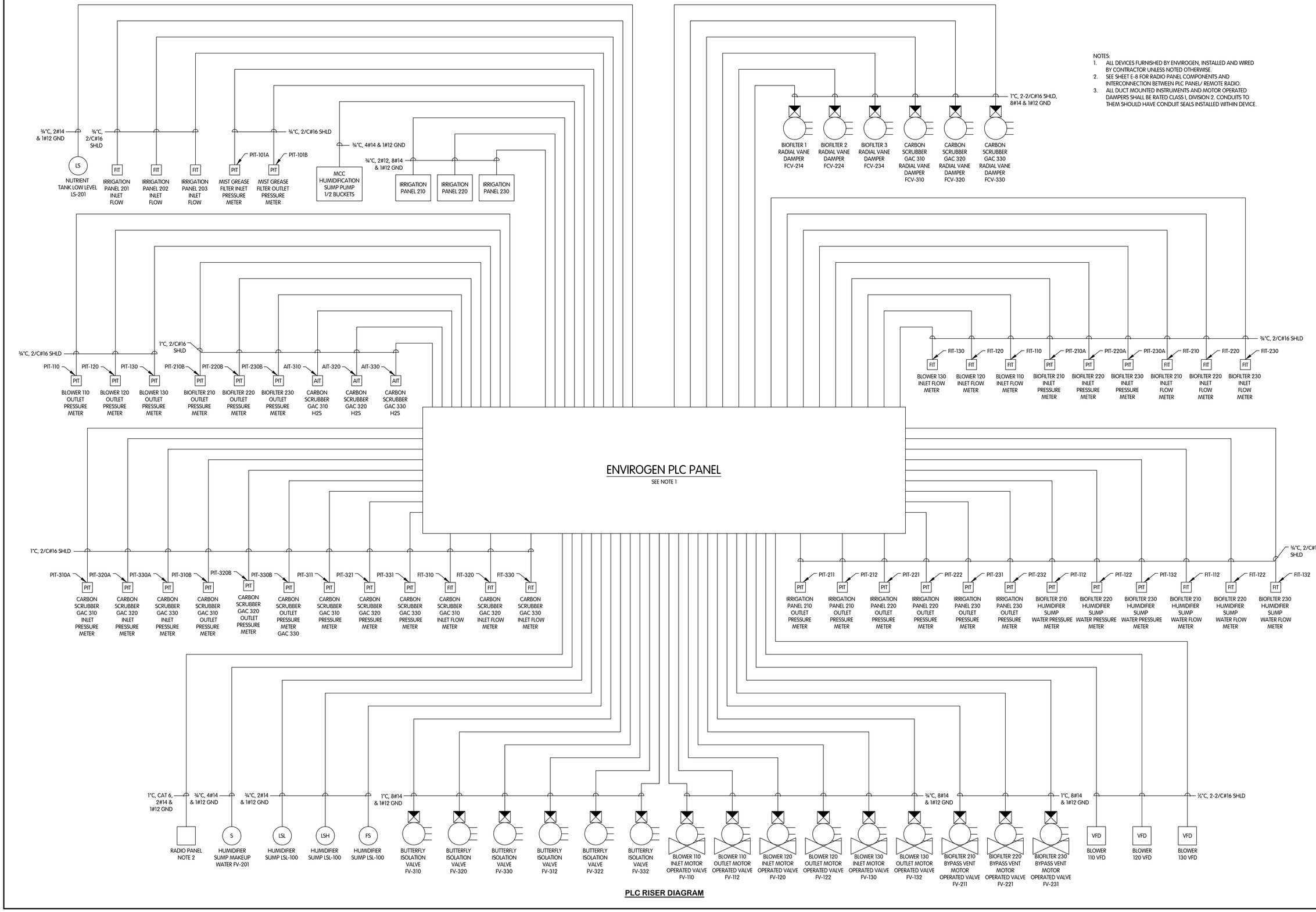
DATE: FEBRUARY 2022

SHEET NO.

E-6

42 OF 44

KAL-77250(IE)3-ONE LINE DIAGRAM
1/27/2022 10:40 AM - SWILLIS
1/26/2022 2:33 PM



PLC RISER DIAGRAM

THE CITY OF Kalamazoo

ENVIROGEN PLC RISER DIAGRAM

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY
5			
4			
3			
2			
1			

Jones & Henry Engineers, Ltd.

Fluid thinking©.
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
PEM	CJAF	AJD

STATUS: ISSUED FOR BID

DATE: FEBRUARY 2022

SHEET NO.

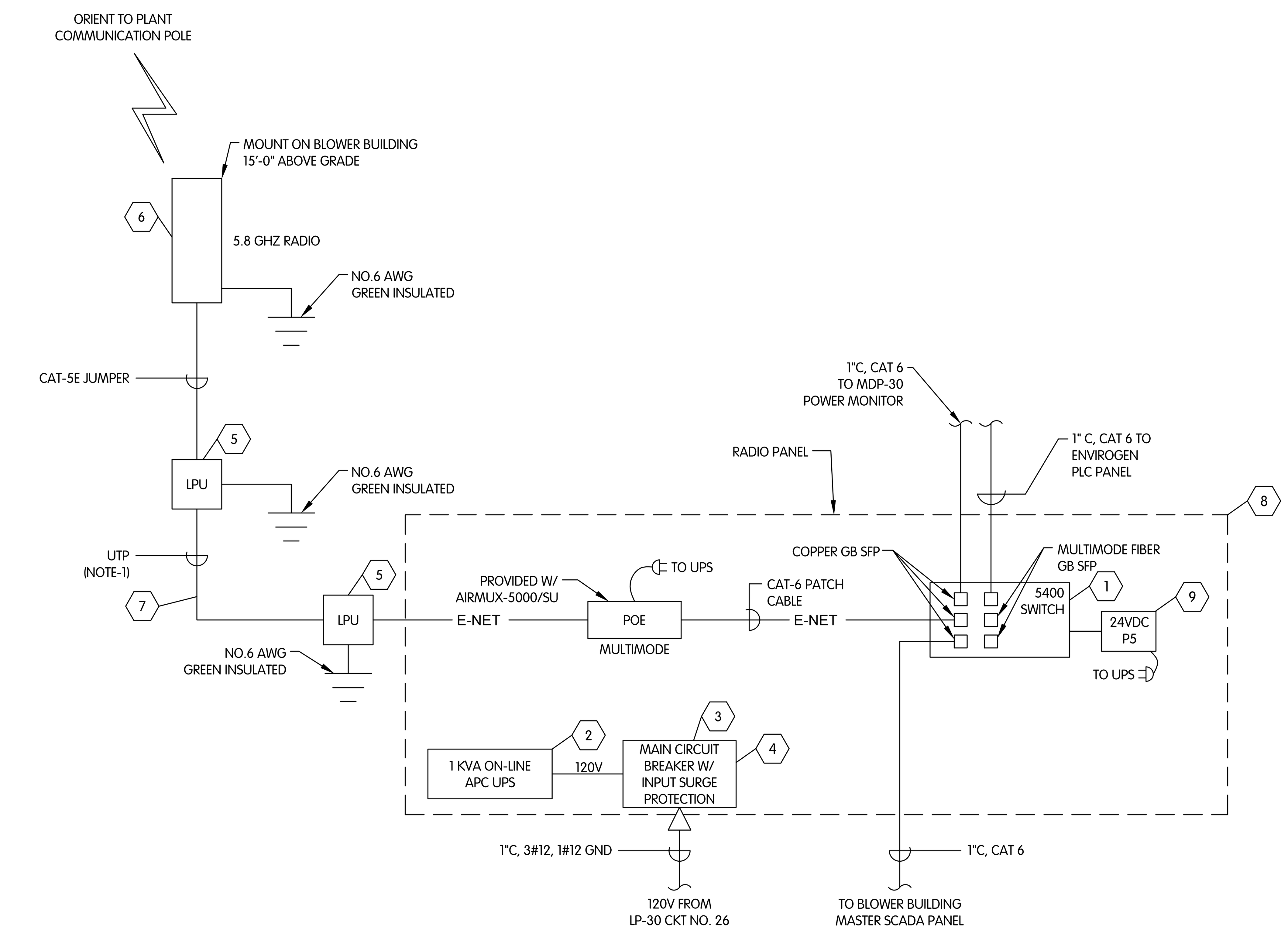
E-7

43 OF 44

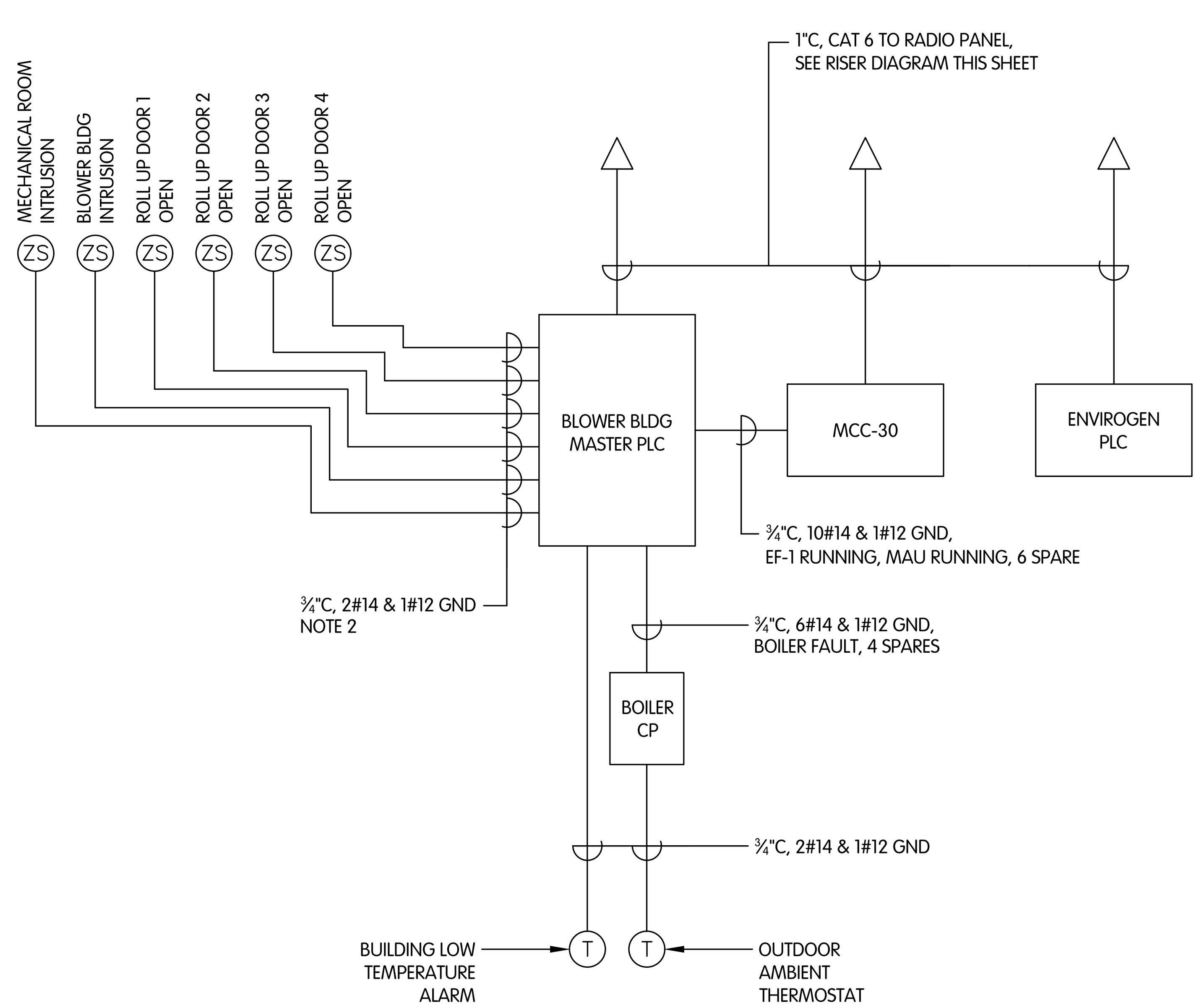
KAL-7725001E07-ENVIROGEN PLC RISER DIAGRAM
2/28/2022 2:33 PM - SWILLIS

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	1783-HMS8TG4CGR	ROCKWELL STRATIX 5400 4-GB SFP 8-COPPER PORTS LAYER 3 SWITCH
2	1	BR1000G	1KVA ON-LINE APC UPS
3	1	1489 M-SERIES	ROCKWELL 15A BREAKER
4	1	4983-DC12020	ROCKWELL INPUT SURGE PROTECTION
5	2	AIRMUX-OUTDOOR-LPU-KIT	OUTDOOR LIGHTING PROTECTION UNITS FOR 10/100/1000BASE-T POE SURGE PROTECTOR (INCLUDING 0.5M CAT5E CABLE AND WALL/POLE MOUNTING KIT)
6	1	AIRMUX-5000/SU-PRO/F58F/100M/EMB	SU-PRO 100 ODU, WITH AN INTEGRATED ANTENNA, SUPPORTING MULTI FREQUENCY BANDS AT 5.X GHZ, FACTORY DEFAULT 5.8 GHZ FCC
7	NOTE-1	AIRMUX-UTP/100	100m UNSHIELDED TWISTED PAIR
8	1	SCE-30H3012LP	SAGINAW 30"x30"x12" DEEP NEMA 12 ENCLOSURE
9	1	1606-XLE240E	ROCKWELL 24VDC POWER SUPPLY

NOTES:
1. 100m CABLE LENGTHS SHOWN. REVISE TO SUIT PROJECT. AVAILABLE LENGTHS: 100m, 75m, 50m, 25m. PROVIDE FIBER TO COPPER MEDIA.
2. PROVIDE 24VDC POWER SUPPLY IN BLOWER BUILDING PLC PANEL FOR DOOR / ROLL UP DOOR SWITCHES.



RADIO PANEL RISER DIAGRAM



BLOWER BUILDING PLC RISER DIAGRAM

THE CITY OF Kalamazoo

BLOWER BUILDING ELECTRICAL RADIO COMMUNICATION DIAGRAM

KWRP BIOFILTRATION - CONTRACT 76 - KALAMAZOO, MICHIGAN

REVISIONS AFTER ISSUED FOR BID

NO	DATE		BY
1			
2			
3			
4			
5			

Jones & Henry Engineers, Ltd.
Fluid thinking®.
www.JHeng.com

JOB NO. 017-7725.001

SCALE NONE

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

DESIGNED	DRAWN	CHECKED
PEM	CJAF	PEM

STATUS: ISSUED FOR BID
DATE: FEBRUARY 2022

SHEET NO.
E-8
44 OF 44

KAL-772500IE08-BLOWER BUILDING ELECTRICAL RADIO COMMUNICATION DIAGRAM
1/27/2022 11:40 AM - SWILLIS
1/28/2022 2:33 PM
XREFERENCED FILES: