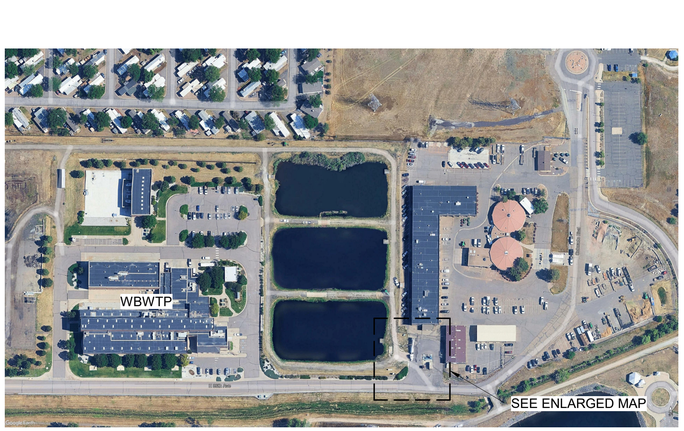
CITY OF THORNTON

WBWTP PAC FACILITY

3651 E 86th Ave, Thornton, CO 80229

ISSUED FOR BID

OCTOBER 2026



VICINITY MAP

CITY OF THORNTON



ENLARGED MAP

City of Thornton Project No. 24-149

Burns & McDonnell Project No. 177918

no.	date	by	chk	description
0	10/14/26	CRC	NKR	ISSUED FOR BID

BURNS McDONNELL
9191 S. JAMAICA STREET
ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

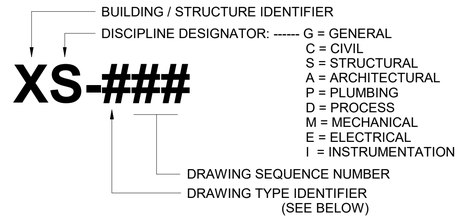
Cover

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CITY OF THORNTON

Contract Drawings

DRAWING IDENTIFICATION SYSTEM:

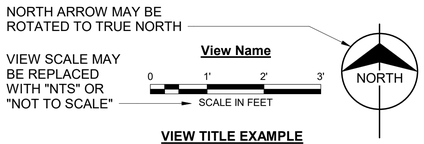


BUILDING / STRUCTURE IDENTIFIERS:

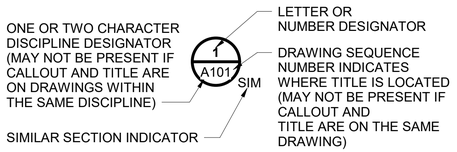
0 - GENERAL
1 - PAC PRETREATMENT FACILITY
2 - SLUDGE LAGOON EFFLUENT
3 - UNASSIGNED
4 - WGL PUMP STATION
5 - MAIN TREATMENT BUILDING
6 - UNASSIGNED
7 - UNASSIGNED
8 - UNASSIGNED
9 - UNASSIGNED

DRAWING TYPE IDENTIFIERS:

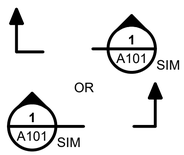
0 - GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS
1 - PLANS
2 - ELEVATIONS
3 - SECTIONS
4 - ENLARGED PLANS
5 - DETAILS
6 - SCHEDULES and DIAGRAMS
7 - DISCIPLINE SPECIFIC
8 - DISCIPLINE SPECIFIC
9 - ISOMETRICS



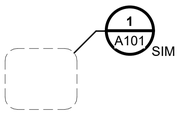
VIEW TITLE EXAMPLE



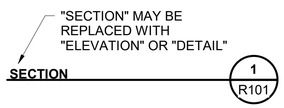
SECTION, DETAIL, AND ELEVATION SYMBOL IDENTIFIERS



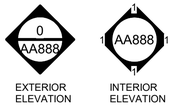
SECTION CALLOUT EXAMPLE



DETAIL CALLOUT EXAMPLE



SECTION, DETAIL, OR ELEVATION TITLE EXAMPLE



ELEVATION CALLOUT EXAMPLE

SHEET NUMBER | **SHEET NAME**

GENERAL

0G-001	COVER
0G-002	INDEX

CIVIL

0C-001	CIVIL NOTES, LEGEND, AND ABBREVIATIONS
0CX-101	EXISTING CONDITIONS PLAN
0CD-101	DEMOLITION PLAN
0CS-101	SITE PLAN
0CU-101	UTILITY PLAN
0CE-101	INITIAL EROSION CONTROL PLAN
0CE-102	INTERIM EROSION CONTROL PLAN
0CE-103	FINAL EROSION CONTROL PLAN
0C-501	CIVIL DETAILS

STRUCTURAL

0S-001	ABBREVIATIONS, LEGEND, & SPECIAL INSPECTIONS
0S-002	STANDARD CONCRETE DETAILS AND NOTES
0S-003	DESIGN CRITERIA, GEOTECH INFORMATION, AND STANDARD DRILLED SHAFT DETAIL
1S-100	PAC SILO FOUNDATION AND SECTIONS

PROCESS

0D-001	PROCESS GENERAL NOTES, LEGEND, AND ABBREVIATIONS
0D-002	DESIGN CRITERIA
0D-003	PROCESS FLOW DIAGRAM
0D-501	PROCESS DETAILS I
0D-601	EQUIPMENT SCHEDULE
1D-101	PAC PRETREATMENT FACILITY PLAN AND SECTION
1D-102	PAC PRETREATMENT FACILITY DETAILS

ELECTRICAL

0E-001	ELECTRICAL GENERAL NOTES, SYMBOLS, AND ABBREVIATIONS I
0E-002	ELECTRICAL GENERAL NOTES, SYMBOLS, AND ABBREVIATIONS II
0E-003	ELECTRICAL MATERIALS, DESIGNATION, AND HAZARDOUS CLASSIFICATION
0E-500	ELECTRICAL DETAILS I
0E-501	ELECTRICAL DETAILS II
0E-502	ELECTRICAL DETAILS III
0ED-600	DEMOLITION ONE-LINE DIAGRAM I
0E-600	ONE-LINE DIAGRAM I
0E-700	LOAD SCHEDULES I
0E-710	PANEL SCHEDULES I
0E-711	PANEL SCHEDULES II
0E-750	MAIN CONNECTION DIAGRAM
0E-850	NETWORK ARCHITECTURE DIAGRAM
0ES-100	ELECTRICAL SITE PLAN

INSRUMENTATION (P&IDs)

0I-001	PROCESS AND INSTRUMENTATION LEGEND I
0I-002	PROCESS AND INSTRUMENTATION LEGEND II
0I-003	PROCESS AND INSTRUMENTATION LEGEND III
1I-601	PAC SILO P&ID
1I-602	SLUDGE LAGOON EFFLUENT P&ID

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BURNS McDONNELL
9191 S. JAMAICA STREET
ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

CITY OF THORNTON
WBWTP PAC FACILITY
Project Number 177918

Index

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GENERAL NOTES:

1. THE PROJECT SITE IS LOCATED IN THORNTON, COLORADO.
2. ALL DIMENSIONS, ELEVATIONS, AND STATIONS ARE IN FEET, UNLESS INDICATED OTHERWISE.
3. CALLOUTS, COORDINATES, AND DIMENSIONS ARE POINTED TO OR MEASURED TO EDGE OF PAVEMENT, BACK OF CURB, OR OUTSIDE FACE OF FOUNDATION WALL, UNLESS INDICATED OTHERWISE.
4. THE CONTRACTOR SHALL CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO AT LEAST TWO BUSINESS DAYS PRIOR TO CONSTRUCTION, NOT INCLUDING DAY OF NOTIFICATION. CALL 811 OR 1-(800) 922-1987.
5. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL REQUIRED PERMITS PRIOR TO THE COMMENCEMENT OF ANY WORK ON THE PROJECT, OR AS APPROVED BY THE OWNER. CONTRACTOR SHALL COORDINATE ALL REQUIRED INSPECTIONS WITH THE APPROPRIATE ADMINISTRATIVE AUTHORITY. COST OF ANY PERMITS AND FEES ASSOCIATED SHALL BE PAID BY CONTRACTOR.
6. ALL WORK SHALL BE SUBJECT TO INSPECTION BY AUTHORIZED PERSONNEL OF LOCAL AND GOVERNMENT REGULATORY AGENCIES AND THE CONTRACTOR.
7. THE CONTRACTOR SHALL CONFINE GRADING AND CONSTRUCTION ACTIVITIES TO WITHIN THE OWNER'S PROPERTY. DISTURBANCES TO THE PROPERTY SHALL BE RESTORED TO THE ORIGINAL CONDITION AS INDICATED.
8. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE ENGINEER OF ANY PROBLEM IN CONFORMING TO THE APPROVED GRADES AS INDICATED FOR ANY ELEMENT OF THE PROPOSED IMPROVEMENTS PRIOR TO CONSTRUCTION.
9. THE CONTRACTOR SHALL PROVIDE ALL TRAFFIC CONTROL NECESSARY TO COMPLETE THE WORK, INCLUDING ANY MOBILIZATION OF EQUIPMENT ON PUBLIC ROADWAYS. ALL TRAFFIC CONTROL DEVICES AND METHODS OF CONTROLLING TRAFFIC THROUGH CONSTRUCTION ZONES SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (M.U.T.C.D.), FEDERAL HIGHWAY ADMINISTRATION, AND ALL REVISIONS THERETO (INCLUDING STATE SUPPLEMENTS).
10. UNDERGROUND FACILITIES, STRUCTURES, AND UTILITIES HAVE BEEN PLOTTED FROM AVAILABLE SURVEYS AND RECORDS; AND, THEREFORE, THEIR LOCATIONS MUST BE CONSIDERED APPROXIMATE ONLY. IT IS POSSIBLE THERE MAY BE OTHERS, THE EXISTENCE OF WHICH ARE PRESENTLY NOT KNOWN OR SHOWN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THEIR EXISTENCE AND EXACT LOCATION AND TO AVOID DAMAGE THERETO. CONTRACTOR SHALL PROVIDE THE COST OF ANY POTHOLING OR UNDERGROUND INVESTIGATIONS DEEMED NECESSARY TO IDENTIFY AND LOCATE EXISTING FACILITIES AND/OR UTILITIES.
11. THE CONTRACTOR IS RESPONSIBLE FOR THE PREVENTION OF DAMAGE TO ADJACENT PROPERTY. NO PERSON SHALL EXCAVATE ON LAND SO CLOSE TO THE PROPERTY LINE AS TO ENDANGER ANY ADJOINING IMPROVEMENTS, SIDEWALK, ALLEY OR UTILITY WITHOUT SUPPORTING AND PROTECTING SUCH PROPERTY FROM SETTLING, OR OTHER DAMAGE THAT MIGHT RESULT FROM THE WORK PRESCRIBED ON THIS PLAN. THE LOCAL AGENCY WILL HOLD THE CONTRACTOR RESPONSIBLE FOR CORRECTION OF DAMAGE TO ADJACENT PROPERTY, PUBLIC OR PRIVATE.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PRESERVING PROPERTY MONUMENTATION, AND WILL BE REQUIRED TO RE-ESTABLISH, AT HIS/HER EXPENSE, ANY MONUMENTATION WHICH IS DAMAGED OR DESTROYED DURING CONSTRUCTION OPERATIONS. SUCH MONUMENTATION SHALL BE RE-ESTABLISHED BY A LICENSED LAND SURVEYOR IN ACCORDANCE WITH STATE LAWS.
13. CONTRACTOR IS RESPONSIBLE FOR THE SAFE AND SECURE STORING OF GOODS, MATERIALS, AND EQUIPMENT ONSITE. CONTRACTOR SHALL COORDINATE THE FINAL LOCATION OF STORAGE AND LAYDOWN AREAS WITH THE OWNER PRIOR TO CONSTRUCTION.
14. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY POWER, PROCESS, AND UTILITY SERVICE BYPASSES AND CONNECTIONS REQUIRED BY THE WORK AND TO SUSTAIN CONTINUOUS OPERATIONS OF THE FACILITY.
15. ALL WORK SHALL BE CONDUCTED IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS AND LOCAL AND GOVERNMENT CODES, ORDINANCES, AND REGULATIONS. IN CASE OF CONTRADICTION OR DISCREPANCY BETWEEN REQUIREMENTS, CONTRACTOR SHALL INCORPORATE WHICHEVER IS MOST STRINGENT. WHERE A QUESTION REMAINS ON WHICH REQUIREMENT IS MOST STRINGENT, CONTRACTOR SHALL SUBMIT ISSUE TO THE ENGINEER IN WRITING. THE DECISION OF THE ENGINEER SHALL BE CONSIDERED FINAL.
16. NO ACTIVITY MAY USE UNSUITABLE MATERIAL (E.G. TRASH, DEBRIS, CAR BODIES, ASPHALT, ETC.). MATERIAL USED FOR CONSTRUCTION OR DISCHARGED MUST BE FREE FROM TOXIC POLLUTANTS IN TOXIC AMOUNTS (SEE SECTION 307 OF THE CLEAN WATER ACT).

CIVIL LEGEND AND SYMBOLOGY

SCREENED OR GRAYSCALE ITEMS REPRESENT EXISTING FEATURES

LINE SYMBOLOGY

T	TELECOM LINE	5600	EXISTING CONTOUR
E	ELECTRIC LINE (BURIED)	5600	PROPOSED CONTOUR
FO	FIBER OPTIC	X	FENCE (WOOD OR METAL)
SS	SANITARY SEWER		BUILDING OUTLINE
ST	STORM SEWER		FLOWLINE
W	WATER LINE	W(m)	WATER LINE (MAPPED)
G	GAS LINE	G(m)	GAS LINE (MAPPED)
E(m)	ELECTRIC LINE (MAPPED)	CP	CARRIER PIPE
T(m)	TELECOM LINE (MAPPED)	FL	SILO FILL PIPE
SS(m)	SANITARY SEWER (MAPPED)	FD	SILO FEED PIPE
ST(m)	STORM SEWER (MAPPED)		

SYMBOLS (UTILITIES)

- (S) SANITARY SEWER MH
- (ST) STORM MANHOLE
- (W) WATER MANHOLE
- WATER VALVE

PATTERNS

- DEMOLITION
- CONCRETE
- ASPHALT
- EXISTING BUILDING
- BUILDING

ABBREVIATIONS:

@	AT	MAX	MAXIMUM
Ø	DIAMETER	MH	MANHOLE
'	FOOT OR FEET	MIN	MINIMUM
"	INCH OR INCHES	N	NORTH OR NORTHING
#	NUMBER	N/A	NOT APPLICABLE
%	PERCENT	NIC	NOT IN CONTRACT
APPROX	APPROXIMATE	OC	ON CENTER
ASPH	ASPHALT	OVHD	OVERHEAD
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS	P&ID	PROCESS & INSTRUMENTATION
ATG	ADJUST TO GRADE	PAC	POWDERED ACTIVATED CARBON
BC	BACK OF CURB		
BLDG	BUILDING	PC	POINT OF CURVATURE
BO	BY OTHERS	PCC	PORTLAND CEMENT CONCRETE
BOP	BOTTOM OF PIPE		
BSC	BOLTED SLEEVE COUPLING	PI	POINT OF INTERSECTION
C&G	CURB AND GUTTER	PIP	PROTECT IN PLACE
CATV	CABLE TELEVISION	PP	POWER POLE
CDOT	COLORADO DEPARTMENT OF TRANSPORTATION	PRC	POINT OF REVERSE CURVATURE
CL	CENTERLINE	PROC	PROCESS
CIS	CENTER IN SLAB	PROP	PROPOSED
CIW	CENTERED IN WALL	PT	POINT OF TANGENCY
CMP	CORRUGATED METAL PIPE	PVMT	PAVEMENT
CNTR	CENTER	R	RADIUS
CO	CLEAN-OUT	R&R	REMOVE AND REPLACE
CONC	CONCRETE	R/W OR ROW	RIGHT-OF-WAY
CONSTR	CONSTRUCTION	RCP	REINFORCED CONCRETE PIPE
COT	CITY OF THORNTON		
CP	CONTROL POINT	S	SOUTH
DESC	DESCRIPTION	SAN	SANITARY
DIA	DIAMETER	SCH	SCHEDULE
DIP	DUCTILE IRON PIPE	SDWK	SIDEWALK
DND	DO NOT DISTURB	SPEC	SPECIFICATION
DWG	DRAWING	SS	SANITARY SEWER
E	EAST OR EASTING	SST	STAINLESS STEEL
EBOX	ELECTRIC BOX	STA	STATION
EFF	EFFLUENT	STD	STANDARD
ELEC	ELECTRIC	STRUC	STRUCTURAL
EL OR ELEV	ELEVATION	TBA	TO BE ABANDONED
EOA	EDGE OF ASPHALT	TBD	TO BE DETERMINED
ESMT	EASEMENT	TBR	TO BE REMOVED
ETC	ETCETERA	TBR&R	TO BE REMOVED AND REPLACED
EXIST	EXISTING		
EXP	EXPANSION	TBRBO	TO BE REMOVED BY OTHERS
FC	FACE OF CURB	TBR&RBO	TO BE REMOVED AND REPLACED BY OTHERS
FF	FINISHED FLOOR		
FG	FINISHED GRADE	TC	TOP OF CURB
FH	FIRE HYDRANT	TE	THREADED END
FL	FLOWLINE	TH	THICKNESS
FT	FOOT OR FEET	TOW	TOP OF WALL
GAL	GALLON	TP	TOP OF PAVEMENT
GM	GAS METER	TPED	TELEPHONE PEDESTAL
GS	GALVANIZED STEEL	TRANSF	TRANSFORMER
HDPE	HIGH DENSITY POLYETHYLENE	TYP	TYPICAL
		UIP	USE IN PLACE
HMA	HOT MIX ASPHALT	W	WEST
HP	HIGHPOINT	W/	WITH
ICV	IRRIGATION CONTROL VALVE	WM	WATER METER
		WMH	WATER MANHOLE
INV	INVERT	WSE	WATER SURFACE ELEVATION
LF	LINEAR FEET		
LP	LIGHT POLE	WTR	WATER
		WV	WATER VALVE

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PRELIMINARY - NOT FOR CONSTRUCTION

BURNS McDONNELL
9191 S. JAMAICA STREET
ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

date	detailed by
OCTOBER 2026	C. HARRIS
designed by	**checked by**
C. HARRIS	J. LEE

CITY OF THORNTON

WBWTP PAC FACILITY

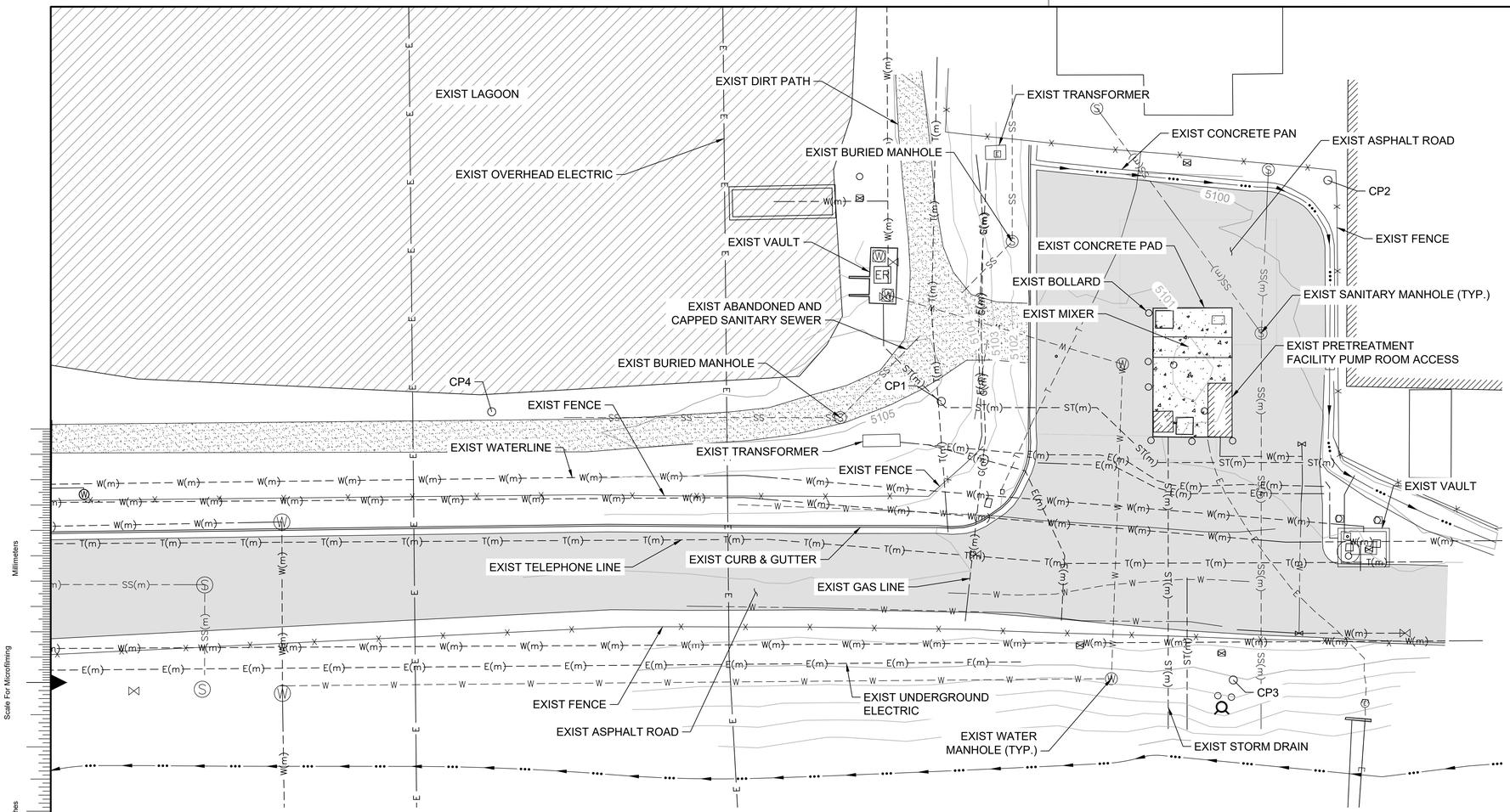
CIVIL NOTES, LEGEND, AND ABBREVIATIONS

project	contract
177918	

drawing 0C-001 — **rev.** 0

sheet **of** **sheets**

Scale For Microfilming
Millimeters
Inches



NOTES:

1. SURVEY WAS COMPLETED BY ASCENT GEOMATICS SOLUTIONS AUGUST, 2025.
2. THE PROJECT SITE FALLS WITHIN FEMA ZONE X - AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN PER FEMA FIRM PANEL 08001C0602H DATED MARCH 5, 2007.

CONTROL STATEMENT:

1. THE SITE HORIZONTAL CONTROL USES STATE PLANE COLORADO NORTH ZONE (GRID) NAVD88.
2. VERTICAL BENCHMARK @ NGS CONTROL STATION H 411 WITH AN ELEVATION OF 5078.17'.

CONTROL POINT SUMMARY

CONTROL POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	1189636.08	3156693.80	5105.06	#5 REBAR
2	1189704.79	3156813.87	5100.68	NAIL/SPIKE
3	1189549.50	3156784.49	5100.40	#5 REBAR
4	1189632.84	3156554.13	5105.16	#5 REBAR

EXISTING CONDITIONS PLAN

0 10' 20' 40'
SCALE IN FEET

NORTH

no.	date	by	chk	description
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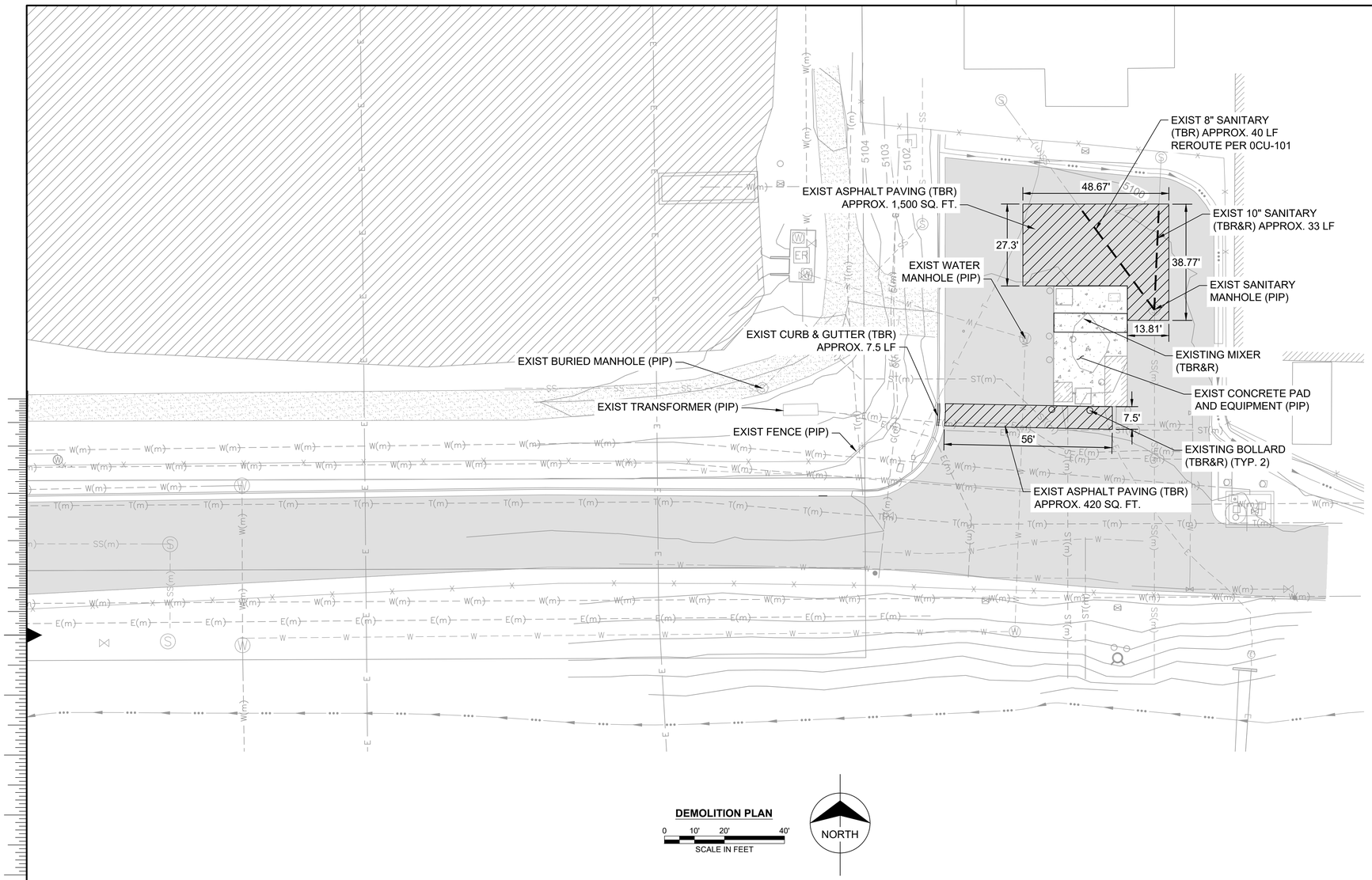
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EXISTING CONDITIONS PLAN

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177918	

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DEMOLITION PLAN

0 10' 20' 40'

SCALE IN FEET

NORTH

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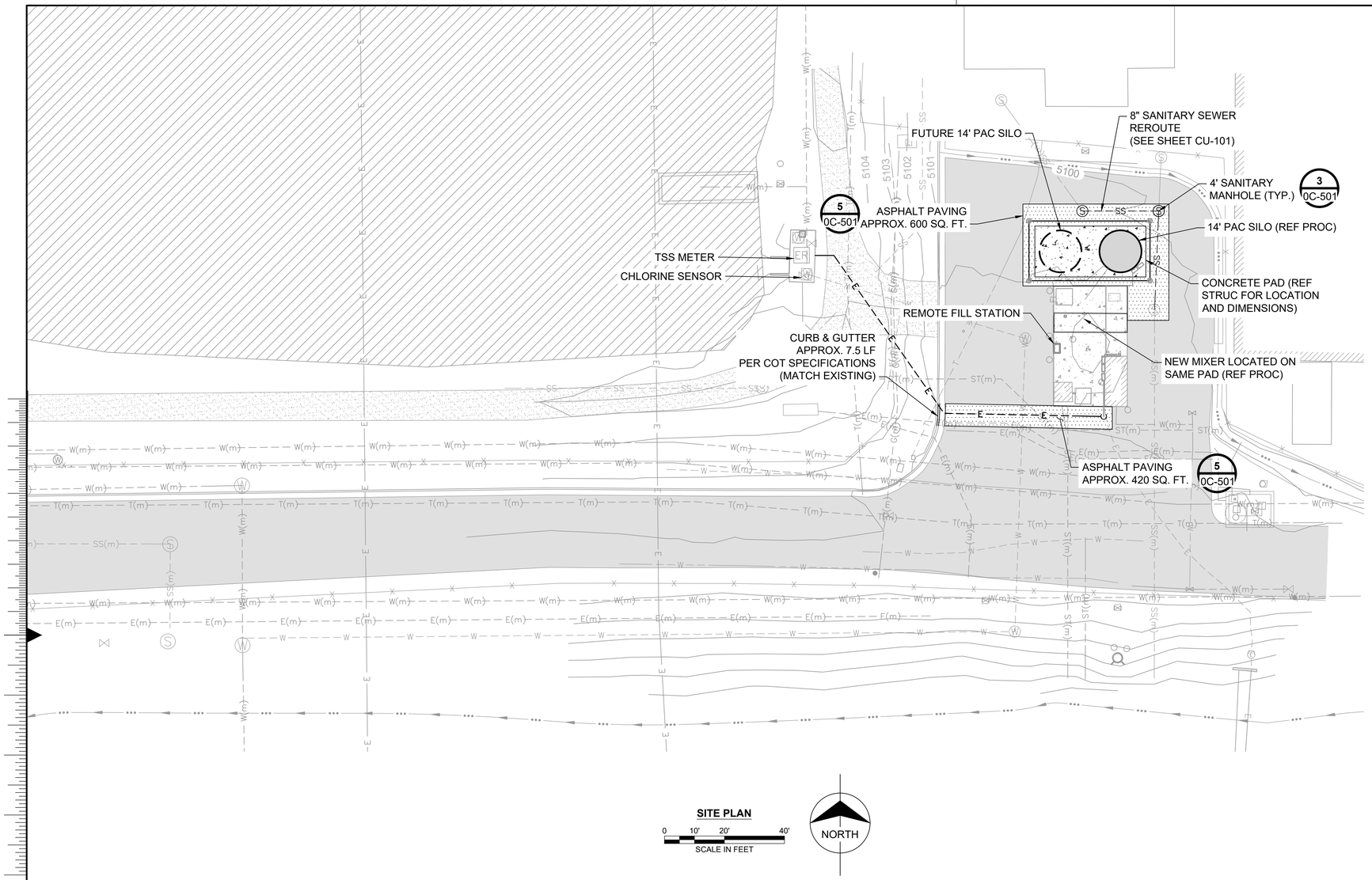
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DEMOLITION PLAN

project	contract
177918	

drawing 0CD-101 — **rev.** 0

sheet **of** **sheets**



Millimeters

Scale For Microfilming

Inches

SITE PLAN

0 10' 20' 40'

SCALE IN FEET

NORTH

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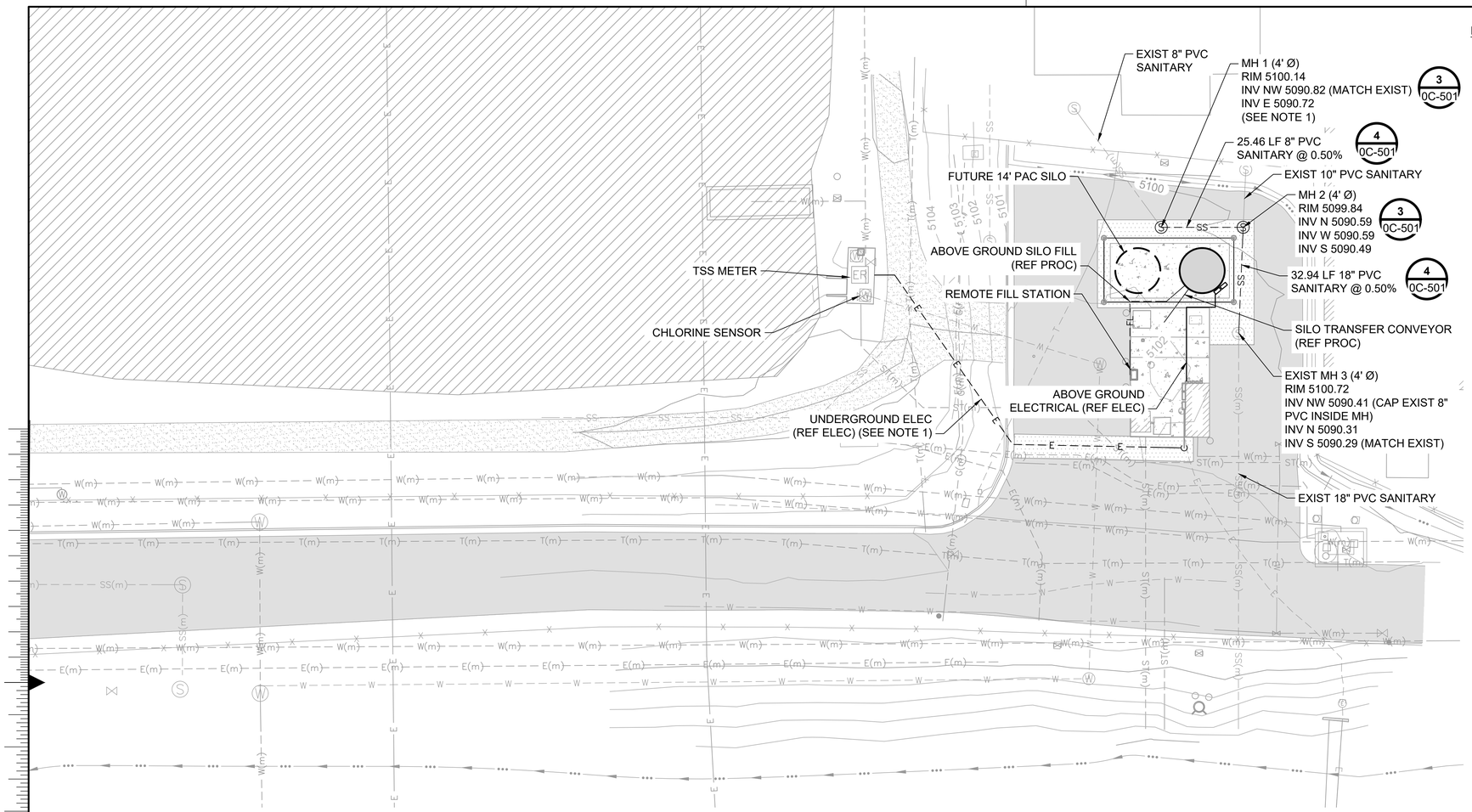
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SITE PLAN

project	contract
177918	

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sheet **of** **sheets**



UTILITY PLAN

0 10' 20' 40'

SCALE IN FEET

NORTH

NOTES:

1. CONTRACTOR TO FIELD VERIFY ELEVATIONS AND MATERIALS OF EXISTING PIPING BY POTHOLING PRIOR TO CONSTRUCTION.

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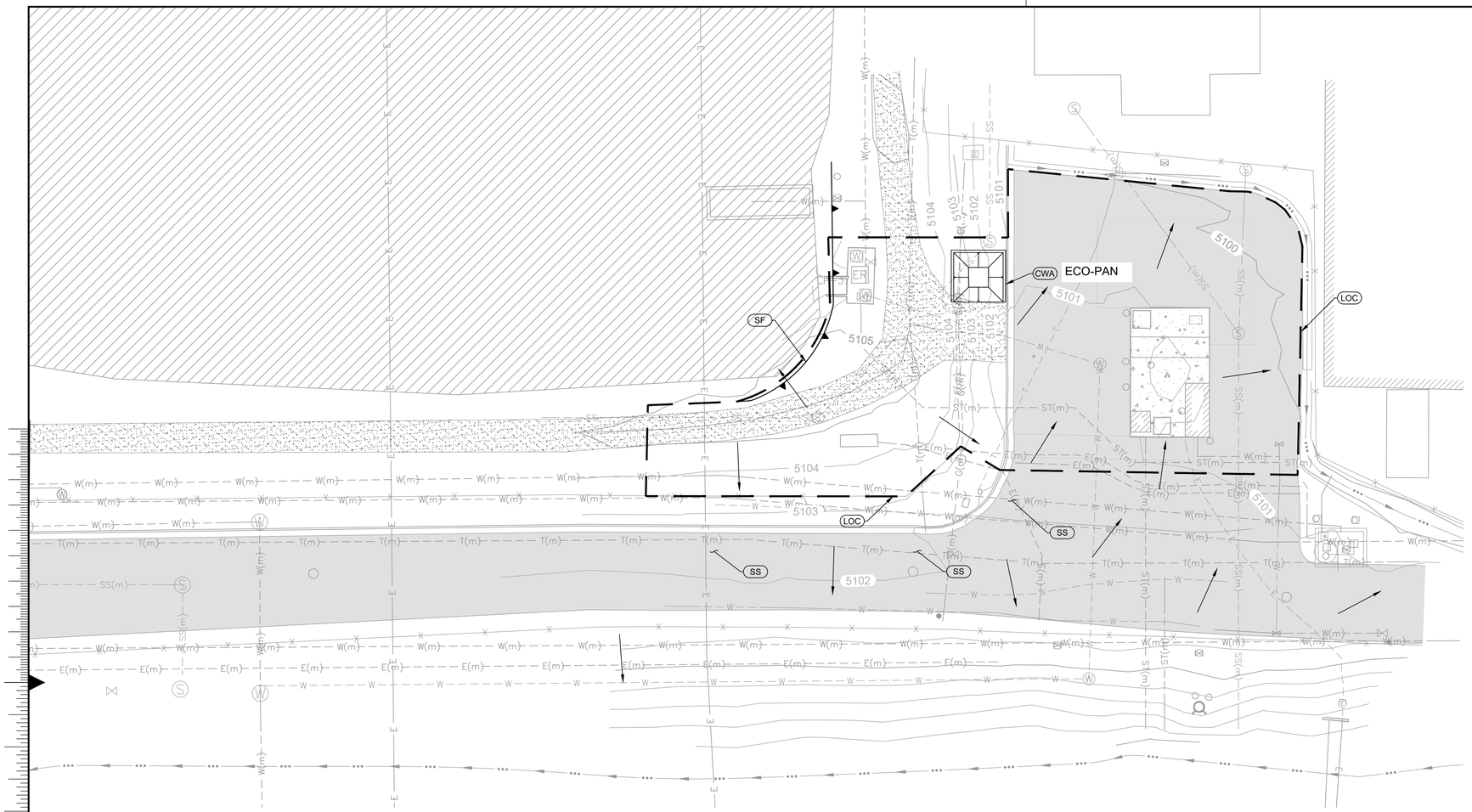
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UTILITY PLAN

project	contract
177918	

drawing 0CU-101 — **rev.** 0

sheet **of** **sheets**



Scale For Microfilming
Millimeters
Inches

INITIAL EROSION CONTROL PLAN

0 10' 20' 40'
SCALE IN FEET

NORTH

INITIAL EROSION CONTROL LEGEND:

CONCRETE WASHOUT AREA	CWA	1 / 0C-501
SILT FENCE	SF	2 / 0C-501
LIMITS OF CONSTRUCTION	LOC	
STREET SWEEPING	SS	

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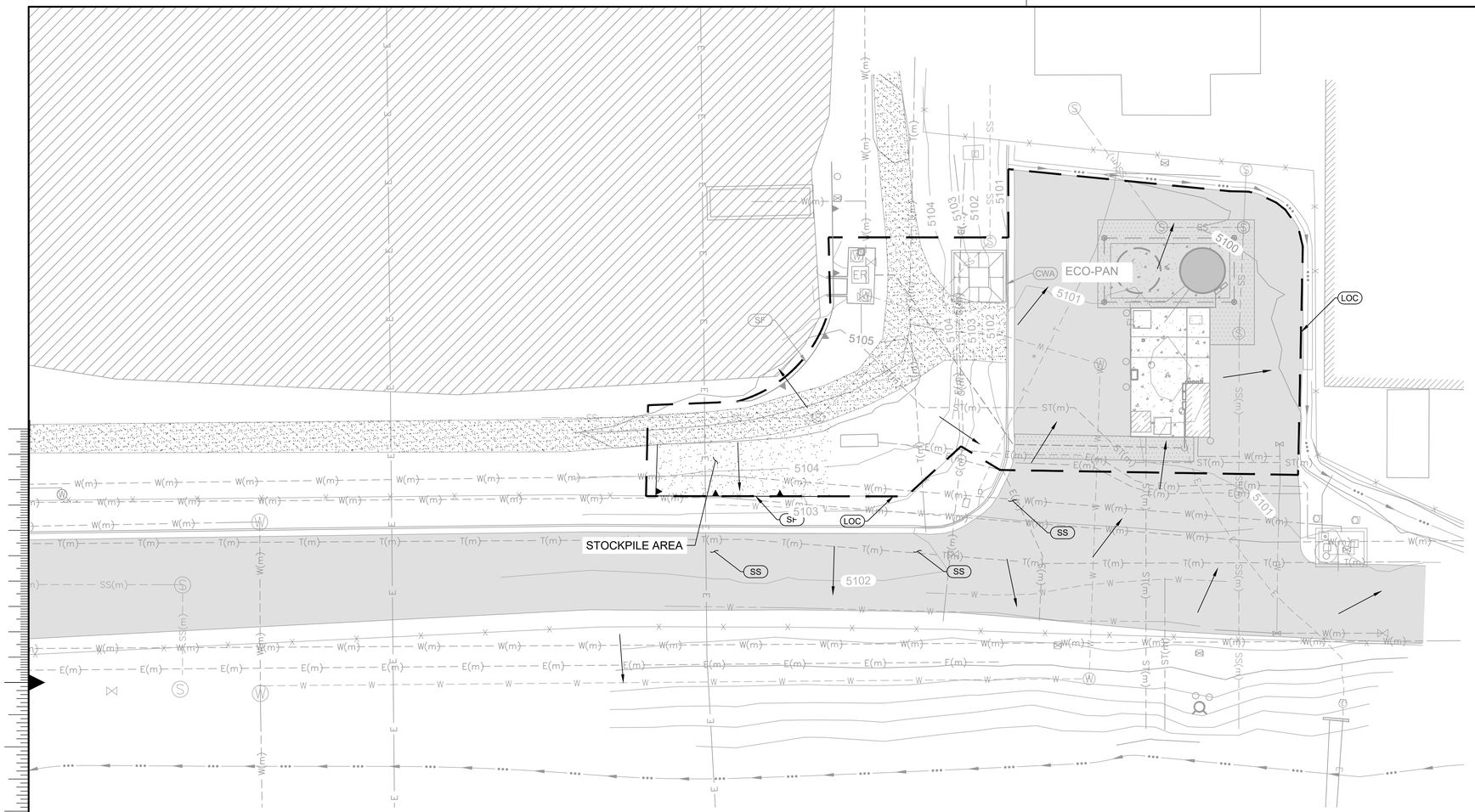
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INITIAL EROSION CONTROL PLAN

project	contract
177918	

drawing 0CE-101 — **rev.** 0

sheet **of** **sheets**



INTERIM EROSION CONTROL PLAN

0 10' 20' 40'

SCALE IN FEET

NORTH

INTERIM EROSION CONTROL LEGEND:

- STOCKPILE AREA
- SILT FENCE — SF — 2 / 0C-501
- LIMITS OF CONSTRUCTION — LOC
- STREET SWEEPING — SS

Millimeters

Scale For Microfilming

Inches

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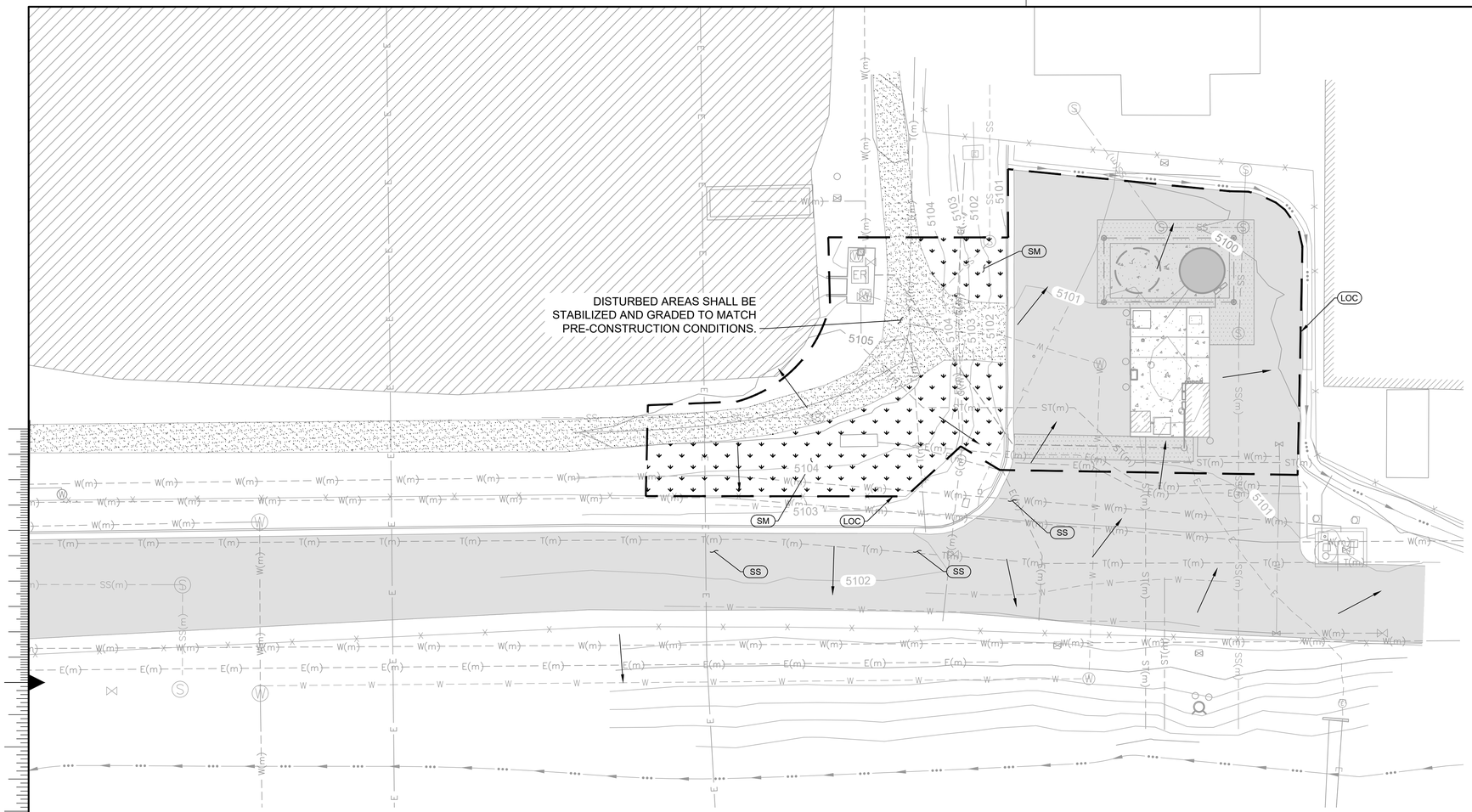
WBWTP PAC FACILITY

INTERIM EROSION CONTROL PLAN

project	contract
177918	

drawing 0CE-102 — **rev.** 0

sheet **of** **sheets**



Millimeters

Scale For Microfilming

Inches

FINAL EROSION CONTROL PLAN

0 10' 20' 40'

SCALE IN FEET

NORTH

INTERIM EROSION CONTROL LEGEND:

	SEEDING AND MULCHING	SM
	LIMITS OF CONSTRUCTION	LOC
	STREET SWEEPING	SS

no.	date	by	chk	description
0	10/14/26	HCH	JLL	ISSUED FOR BID

PRELIMINARY - NOT FOR CONSTRUCTION

BURNS McDONNELL
9191 S. JAMAICA STREET
ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

date OCTOBER 2026	**detailed by** C. HARRIS
designed by C. HARRIS	**checked by** J. LEE

CITY OF THORNTON

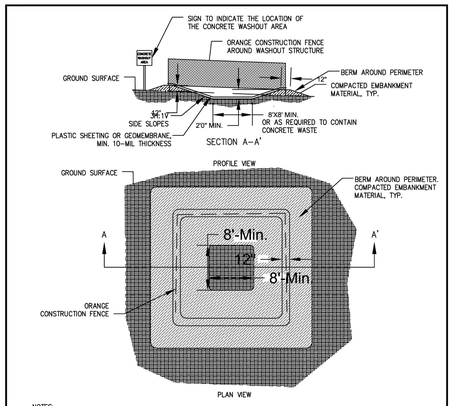
WBWTP PAC FACILITY

FINAL EROSION CONTROL PLAN

project 177918	**contract**

drawing 0CE-103 — **rev.** 0

sheet **of** **sheets**



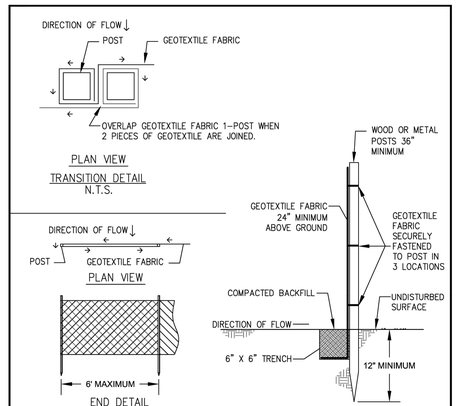
NOTES:
1. CONCRETE WASHOUT AREA SHALL BE INSTALLED PRIOR TO ANY CONCRETE PLACEMENT ON SITE; PLACED A MINIMUM 50' FROM STATE WATERS.
2. VEHICLE TRACKING CONTROL IS REQUIRED AT CONCRETE WASHOUT ENTRANCE IF ACCESS TO CONCRETE WASHOUT AREA IS OFF PAVEMENT.
3. A PLASTIC SHEETING OR GEOMEMBRANE LINER SHALL BE PLACED. MINIMUM 10-MIL THICKNESS..
4. THE CONCRETE WASHOUT AREA SHALL BE REPAIRED AND/OR ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR WASTE CONCRETE.
5. WASTE MATERIAL FROM CONCRETE WASHOUT OPERATIONS MUST BE REMOVED AND LEGALLY DISPOSED OF WHEN IT HAS ACCUMULATED TWO-THIRDS OF THE WET STORAGE CAPACITY OF THE STRUCTURE AND AT THE END OF CONSTRUCTION..
6. WHEN THE CONCRETE WASHOUT AREA IS REMOVED, THE DISTURBED AREA SHALL BE SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER ACCEPTED BY THE CITY.
7. NO STORMWATER RUN-OFF SHALL DRAIN INTO CONCRETE WASHOUT AREA.

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS
CONCRETE WASHOUT AREA DETAIL

ISSUED: MARCH 2005
REVISED: NOV 08
DRAWING NO. 400-6

CONCRETE WASHOUT AREA — **NOT TO SCALE** — 1 — 0C-501



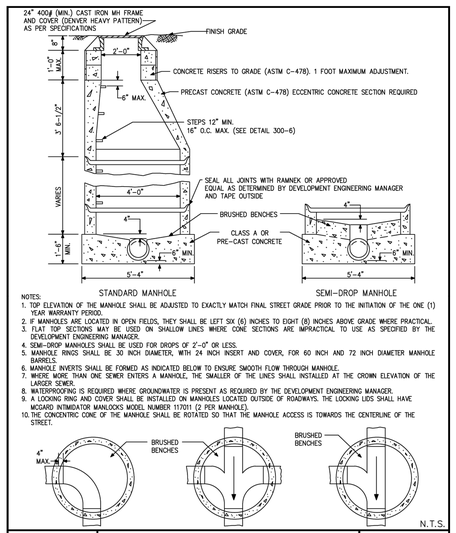
NOTES:
1. WOOD POSTS SHALL HAVE A MINIMUM DIAMETER OR CROSS-SECTION OF 2 INCHES. METAL POSTS SHALL BE STUDDED "T" OR "U" TYPE.
2. GEOTEXTILE FABRIC SHALL COMPLY WITH CDOT 712.08b.
3. GEOTEXTILE FABRIC SHALL EXTEND A MINIMUM OF 6" BELOW GRADE AND ANOTHER 6" HORIZONTALLY IN A "L" SHAPE BEFORE BACKFILLING AND COMPACTING THE TRENCH. (SLICING METHOD IS ALSO ACCEPTED)
4. SILT FENCE SHALL NOT BE USED IN CONCENTRATED FLOWS.
5. SILT FENCE SHALL ONLY BE PLACED PARALLEL TO SURFACE CONTOURS.
6. CLEAN AND REMOVE SILT WHEN THE SILT REACHES ½ THE HEIGHT OF THE GEOTEXTILE FABRIC.
7. UPON PERMANENT STABILIZATION OF AREAS UPSLOPE OF THE SILT FENCE, THE SILT FENCE SHALL BE REMOVED AND DISTURBED AREAS PERMANENTLY STABILIZED.

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS
SILT FENCE

ISSUED: NOV 08
REVISED:
DRAWING NO. 400-08

SILT FENCE — **NOT TO SCALE** — 2 — 0C-501

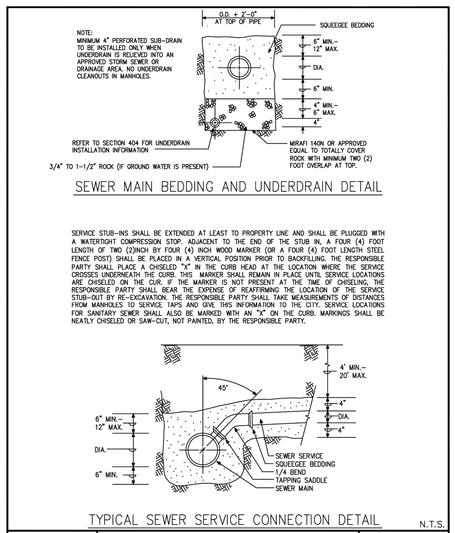


NOTES:
1. TOP ELEVATION OF THE MANHOLE SHALL BE ADJUSTED TO EXACTLY MATCH FINAL STREET GRADE PRIOR TO THE INITIATION OF THE ONE (1) YEAR WARRANTY PERIOD.
2. IF MANHOLES ARE LOCATED IN OPEN FIELDS, THEY SHALL BE LEFT SIX (6) INCHES TO EIGHT (8) INCHES ABOVE GRADE WHERE PRACTICAL.
3. FLAT TOP SECTIONS MAY BE USED ON SHALLOW LINES WHERE CONE SECTIONS ARE IMPRACTICAL TO USE AS SPECIFIED BY THE DEVELOPMENT ENGINEERING MANAGER.
4. SEMI-DROP MANHOLES SHALL BE USED FOR DROPS OF 2'-0" OR LESS.
5. MANHOLE RINGS SHALL BE 30 INCH DIAMETER, WITH 24 INCH INSERT AND COVER, FOR 60 INCH AND 72 INCH DIAMETER MANHOLE BARRELS.
6. MANHOLE INVERTS SHALL BE FORMED AS INDICATED BELOW TO ENSURE SMOOTH FLOW THROUGH MANHOLE.
7. WHERE MORE THAN ONE SEWER ENTERS A MANHOLE, THE SMALLER OF THE LINES SHALL INSTALLED AT THE CROWN ELEVATION OF THE LARGER SEWER.
8. WATERPROOFING IS REQUIRED WHERE GROUNDWATER IS PRESENT AS REQUIRED BY THE DEVELOPMENT ENGINEERING MANAGER.
9. A LOCKING RING AND COVER SHALL BE INSTALLED ON MANHOLES LOCATED OUTSIDE OF ROADWAYS. THE LOCKING LIDS SHALL HAVE MCGARD INTIMIDATOR MANLOCKS MODEL NUMBER 117011 (2 PER MANHOLE).
10. THE CONCENTRIC CONE OF THE MANHOLE SHALL BE ROTATED SO THAT THE MANHOLE ACCESS IS TOWARDS THE CENTERLINE OF THE STREET.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS
STANDARD AND SEMI-DROP MANHOLE DETAIL

ISSUED: APRIL 1992
REVISED: APRIL 2010
DRAWING NO. 300-3

SANITARY MANHOLE — **NOT TO SCALE** — 3 — 0C-501



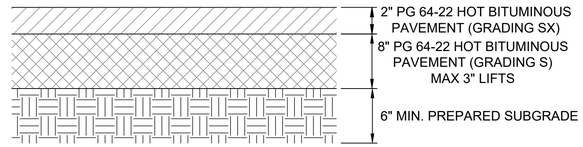
NOTE:
MINIMUM 4" PERFORATED SUB-DRAIN TO BE INSTALLED ONLY WHEN UNDERDRAIN IS RELIEVED INTO AN APPROVED STORM SEWER OR DRAINAGE AREA. NO UNDERDRAIN CLEANOUTS IN MANHOLES.

SERVICE STUB-INS SHALL BE EXTENDED AT LEAST TO PROPERTY LINE AND SHALL BE PLUGGED WITH A WATERTIGHT COMPRESSION STOP. ADJACENT TO THE END OF THE STUB IN, A FOUR (4) FOOT LENGTH OF TWO (2)INCH BY FOUR (4) INCH WOOD MARKER (OR A FOUR (4) FOOT LENGTH STEEL FENCE POST) SHALL BE PLACED IN A VERTICAL POSITION PRIOR TO BACKFILLING. THE RESPONSIBLE PARTY SHALL PLACE A CHISELED "X" IN THE CURB HEAD AT THE LOCATION WHERE THE SERVICE CROSSES UNDERNEATH THE CURB. THIS MARKER SHALL REMAIN IN PLACE UNTIL SERVICE LOCATIONS ARE CHISELED ON THE CUR. IF THE MARKER IS NOT PRESENT AT THE TIME OF CHISELING, THE RESPONSIBLE PARTY SHALL BEAR THE EXPENSE OF REAFFIRMING THE LOCATION OF THE SERVICE STUB-OUT BY RE-EXCAVATION. THE RESPONSIBLE PARTY SHALL TAKE MEASUREMENTS OF DISTANCES FROM MANHOLES TO SERVICE TAPS AND GIVE THIS INFORMATION TO THE CITY. SERVICE LOCATIONS FOR SANITARY SEWER SHALL ALSO BE MARKED WITH AN "X" ON THE CURB. MARKINGS SHALL BE NEATLY CHISELED OR SAW-CUT, NOT PAINTED, BY THE RESPONSIBLE PARTY.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS
SEWER MAIN BEDDING, UNDERDRAIN AND SERVICE CONNECTION DETAIL

ISSUED: APRIL 1992
REVISED: APRIL 2010
DRAWING NO. 300-2

SANITARY BEDDING — **NOT TO SCALE** — 4 — 0C-501



NOTES:

1. ASPHALT MIX DESIGN TO MEET COT STANDARDS AND SPECIFICATIONS SECTION 504 - HOT MIX ASPHALT (HMA).

ASPHALT PAVEMENT — **NOT TO SCALE** — 5 — 0C-501

no.	date	by	chk	description
0	10/14/26	HCH	JLL	ISSUED FOR BID

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ENGLEWOOD, CO 80112
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designed by	**checked by**
C. HARRIS	J. LEE

CITY OF THORNTON

WBWTP PAC FACILITY

CIVIL DETAILS

project	contract
177918	

drawing 0C-501 — **rev.** 0

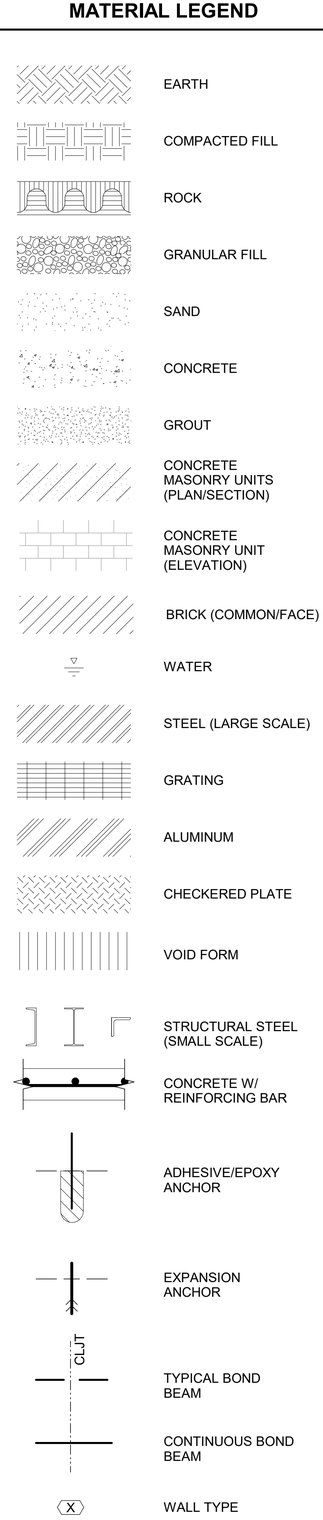
sheet — **of** — **sheets**

Millimeters
Inches
Scale For Microfilming

STANDARD ABBREVIATIONS

AA	- ALUMINUM ASSOCIATION
AB	- ANCHOR BOLT
ABT	- ABOUT
ACI	- AMERICAN CONCRETE INSTITUTE
ADH	- ADHESIVE
AGGR	- AGGREGATE
AHR	- ANCHOR
AISI	- AMERICAN IRON AND STEEL INSTITUTE
AISC	- AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AL, ALUM	- ALUMINUM
ALTN	- ALTERNATE
ANSI	- AMERICAN NATIONAL STANDARDS INSTITUTE
ARCH	- ARCHITECT
ASTM	- AMERICAN SOCIETY FOR TESTING OF MATERIALS
AWS	- AMERICAN WELDING SOCIETY
(B)	- BOTTOM
BC	- BOLT CIRCLE
BETW	- BETWEEN
BLDG	- BUILDING
BM	- BEAM
BO	- BOTTOM OF
BOC	- BOTTOM OF CONCRETE
BOS	- BOTTOM OF STEEL
BOT	- BOTTOM
B/P	- BASE OF PIER
BRG	- BEARING
BRKT	- BRACKET
C/C	- CENTER TO CENTER
CL OR ℄	- CENTER LINE
CF	- CUBIC FEET
CHKR	- CHECKER
CIR	- CIRCLE
CJ	- CONSTRUCTION JOINT
CLR	- CLEAR
CLJT	- CONTROL JOINT
CMU	- CONCRETE MASONRY UNIT
CO	- CONCRETE OPENING
CONC	- CONCRETE
CONT	- CONTINUOUS
COL	- COLUMN
COTR	- CONTRACTING OFFICER
COR	- CORNER
COORD	- COORDINATE
CRSI	- CONCRETE REINFORCING STEEL INSTITUTE
CTR	- CENTER
CTRD	- CENTERED
CY	- CUBIC YARD
DBL	- DOUBLE
DET	- DETAIL
DIAG	- DIAGONAL
DIA	- DIAMETER
DIM	- DIMENSION
DK	- DECKING
DL	- DEAD LOAD
DN	- DOWN
DWL	- DOWEL
DWG	- DRAWING
E	- EAST
EA	- EACH
EF	- EACH FACE
EJ	- EXPANSION JOINT
EL	- ELEVATION
ELEC	- ELECTRICAL
EMBED	- EMBEDMENT
EQ	- EQUAL
EQUIV	- EQUIVALENT
EQ SP	- EQUALLY SPACED
EQUIP	- EQUIPMENT
EXIST	- EXISTING
EW	- EACH WAY
FD	- FLOOR DRAIN
FDN	- FOUNDATION
FTG	- FOOTING
FF	- FAR FACE
FL	- FLOOR
FNSH	- FINISH
FS	- FAR SIDE, FLAT SLAB
FT	- FEET
GA	- GAGE
GALV	- GALVANIZE
GB	- GRADE BEAM
GND	- GROUND
GR	- GRADE
GRTG	- GRATING
HG	- HIGH
HR	- HANDRAIL
HPT	- HIGH POINT
HORIZ	- HORIZONTAL
HS	- HIGH STRENGTH
IBC	- INTERNATIONAL BUILDING CODE
ID	- INSIDE DIAMETER
IF	- INSIDE FACE
IJ	- ISOLATION JOINT
IN	- INCHES
JT	- JOINT
KSI	- KIPS PER SQUARE INCH
L	- ANGLE
LB	- POUND
LD	- DEVELOPMENT LENGTH
LG	- LONG
LL	- LIVE LOAD
LLH	- LONG LEG HORIZONTAL
LLO	- LONG LEG OUTSTANDING
LLV	- LONG LEG VERTICAL
LONG	- LONGITUDINAL
LPT	- LOW POINT
LS	- LAP SPLICE
MATL	- MATERIAL
MAX	- MAXIMUM
MC	- MOMENT CONNECTION
MECH	- MECHANICAL
MFR	- MANUFACTURER
MH	- MANHOLE
MIN	- MINIMUM
MISC	- MISCELLANEOUS
MK	- MARK
NA	- NOT APPLICABLE
NF	- NEAR FACE
NOM	- NOMINAL
NIC	- NOT IN CONTRACT
NTS	- NOT TO SCALE
NO	- NUMBER
NS	- NEAR SIDE
OC	- ON CENTER
OD	- OUTSIDE DIAMETER
OF	- OUTSIDE FACE
OPNG	- OPENING
OPP	- OPPOSITE
OSHA	- OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OZ	- OUNCE
PCF	- POUNDS PER CUBIC FOOT
PERP	- PERPENDICULAR
PL	- PLATE
PLC	- PLACES
PLF	- POUNDS PER LINEAR FOOT
PREFAB	- PREFABRICATED
PS	- PIPE SUPPORT
PSF	- POUNDS PER SQUARE FOOT
PSI	- POUNDS PER SQUARE INCH
PVC	- POLYVINYL CHLORIDE
RAD	- RADIUS
RD	- ROOF DRAIN
REF	- REFERENCE
REINF	- REINFORCE
REQD	- REQUIRED
REV	- REVISION
RM	- ROOM
S	- SOUTH
SB	- SHEAR BAR
SCHED	- SCHEDULE
SH	- SHEET
SIM	- SIMILAR
SLP	- SLOPE
SP	- SPACE
SPEC	- SPECIFICATION
SQ	- SQUARE
SST	- STAINLESS STEEL
STD	- STANDARD
STL	- STEEL
STIF	- STIFFENER
STR	- STRAIGHT
STRL	- STRUCTURAL
STRUC	- STRUCTURE
SYMM	- SYMMETRICAL
T	- TON
TEMP	- TEMPORARY
THK	- THICK
THRU	- THROUGH
(T)	- TOP
T/	- TOP OF
TOA	- TOP OF ALUMINUM
TOB	- TOP OF BOLT
TOC	- TOP OF CONCRETE
TOG	- TOP OF GRATING
TOM	- TOP OF MASONRY
TOS	- TOP OF STEEL
T/P	- TOP OF PIER
T&B	- TOP AND BOTTOM
TYP	- TYPICAL
UNO	- UNLESS NOTED OTHERWISE
VAR	- VARIES
VERT	- VERTICAL
VEF	- VERTICAL EACH FACE
WD	- WIDE
W/	- WITH
W/O	- WITHOUT
WP	- WORK POINT
WS	- WATERSTOP
WT	- WEIGHT
WWF	- WELDED WIRE FABRIC
@	- AT
&	- AND
#	- POUNDS OR NUMBER
%	- PERCENT

MATERIAL LEGEND



NOTES:

1. STATEMENT OF SPECIAL INSPECTIONS AND TESTING REQUIREMENTS
   A. THIS "STATEMENT OF SPECIAL INSPECTIONS" HAS BEEN PREPARED IN ACCORDANCE WITH IBC 2024, SECTION 1704.
   B. OWNER SHALL RETAIN PRE-COORDINATED AND GOVERNMENT-APPROVED THIRD-PARTY QUALITY ASSURANCE AGENCIES TO PROVIDE SPECIAL INSPECTIONS DURING CONSTRUCTION IN ACCORDANCE WITH IBC REQUIREMENTS.
   C. EACH SPECIAL INSPECTOR SHALL BE A QUALIFIED PERSON WHO SHALL DEMONSTRATE COMPETENCE, TO THE SATISFACTION OF THE CONTRACTING OFFICER'S REPRESENTATIVE, FOR INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATION REQUIRING SPECIAL INSPECTION.
   D. SPECIAL INSPECTION AGENCY SHALL SUBMIT INSPECTION REPORTS DURING CONSTRUCTION FOR VERIFICATION, INCLUDING FINAL REPORTS IN ACCORDANCE WITH IBC SECTION 1704.2.4.
   E. SPECIAL INSPECTOR SHALL USE THE LATEST ISSUE OF THE STRUCTURAL DRAWINGS FOR ALL INSPECTIONS. SHOP FABRICATION DRAWINGS SHALL NOT BE USED FOR SUCH PURPOSES.
   F. THE TABLE ON THIS SHEET IDENTIFIES THE MATERIALS, SYSTEMS, AND COMPONENTS FOR WHICH SPECIAL INSPECTION IS REQUIRED.
   G. CONTRACTOR SHALL RETAIN PRE-COORDINATED AND GOVERNMENT-APPROVED THIRD-PARTY TESTING AGENCIES TO PROVIDE STRUCTURAL TESTING DURING CONSTRUCTION IN ACCORDANCE WITH IBC REQUIREMENTS.
   H. TESTING AGENCY SHALL SUBMIT TEST RESULTS DURING CONSTRUCTION FOR VERIFICATION INCLUDING A FINAL REPORT IN ACCORDANCE WITH IBC SECTION 1704.2.4.
   I. THE TABLE ON THIS SHEET IDENTIFIES THE STRUCTURAL TESTS REQUIRED FOR THIS PROJECT.
2. STRUCTURAL OBSERVATIONS
   A. A REGISTERED DESIGN PROFESSIONAL SHALL PROVIDE STRUCTURAL OBSERVATIONS DURING CONSTRUCTION IN ACCORDANCE WITH IBC REQUIREMENTS.
   B. EACH STRUCTURAL OBSERVER SHALL SUBMIT WRITTEN STATEMENTS IDENTIFYING FREQUENCY AND EXTENT OF STRUCTURAL OBSERVATIONS AND ANY REPORTED DEFICIENCIES WHICH, TO THE BEST OF THE STRUCTURAL OBSERVER'S KNOWLEDGE, HAVE NOT BEEN RESOLVED.

SPECIAL INSPECTION REQUIREMENTS

MATERIAL/SYSTEM	TYPE & EXTENT OF SPECIAL INSPECTION	CONT/PERIODIC INSPECTION	TYPE & EXTENT OF TESTING	CODE REFERENCE
CONCRETE FORMWORK	SHAPE, LOCATION, AND DIMENSIONS OF CONCRETE MEMBER	P		
REINFORCEMENT	SIZE AND PLACEMENT	P		ACI 318
CONCRETE MIX DESIGN	VERIFICATION OF PROPERTIES	P		ACI 318
CAST-IN-PLACE CONCRETE	PLACEMENT OF CONCRETE	C	TEMPERATURE, STRENGTH, SLUMP, AIR ENTRAINMENT	ACI 318
CONCRETE CURING	MAINTENANCE OF CURING TEMPERATURE AND TECHNIQUES	P		ACI 318
ANCHORS CAST IN CONCRETE	SIZE AND PLACEMENT	P		ACI 318
ANCHORS POST INSTALLED IN HARDENED CONCRETE	SIZE, PLACEMENT, AND CONFORMANCE TO MFR'S INSTALLATION PROCEDURES	C		ACI 318
CAST-IN-PLACE DEEP FOUNDATIONS	INSPECT DRILLING OPERATIONS, VERIFY PLACEMENT LOCATIONS AND TOLERANCES	C	SEE NOTE REGARDING "GEOTECHNICAL REPRESENTATIVE"	IBC 1705.5.8

STRUCTURAL GENERAL NOTES

1. THESE NOTES, AND OTHER DRAWING NOTES CONTAINED WITHIN, ARE PROVIDED TO MEET SPECIFIC REQUIREMENTS AND TO SUPPLEMENT THE CONTRACT SPECIFICATIONS. THESE NOTES NEITHER REPLACE NOR OVERRIDE THE PROVISIONS AND REQUIREMENTS OF THE CONTRACT SPECIFICATIONS.
2. COORDINATE ALL STRUCTURAL WORK WITH WORK SHOWN ON ALL OTHER DRAWINGS.
3. VERIFY ALL DIMENSIONS OF EXISTING CONSTRUCTION AND REPORT ANY DISCREPANCIES FROM THE CONTRACT OR REFERENCE DRAWINGS TO THE ENGINEER PRIOR TO COMMENCING WITH WORK. IN NO CASE SHALL WORKING DIMENSIONS BE SCALED FROM THE STRUCTURAL DRAWINGS.
4. THE CONTRACT DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. CONTRACTOR SHALL BE RESPONSIBLE FOR MEANS AND METHODS OF CONSTRUCTION INCLUDING, BUT NOT LIMITED TO, SHORING AND TEMPORARY BRACING TO PROVIDE STRUCTURAL STABILITY DURING CONSTRUCTION.
5. IF CERTAIN FEATURES ARE NOT FULLY SHOWN OR CALLED FOR ON THE CONTRACT DRAWINGS OR SPECIFICATIONS, THEIR CONSTRUCTION SHALL BE OF THE SAME CHARACTER AS FOR SIMILAR CONDITIONS THAT ARE SHOWN OR CALLED FOR, WITH THE APPROVAL OF THE ENGINEER. WHERE SECTIONS VARY, CONTRACTOR SHALL PROVIDE FOR SMOOTH TRANSITIONS BETWEEN THEM, UNLESS NOTED OTHERWISE.
6. ALL PRODUCTS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND RECOMMENDATIONS, UNLESS NOTED OTHERWISE.
7. SPECIAL INSPECTIONS RELATED TO CAST-IN-PLACE DEEP FOUNDATIONS ARE TO BE PERFORMED BY THE "GEOTECHNICAL REPRESENTATIVE" REFERENCED IN SPECIFICATION 31 63 29.

BUILDING CODES AND DESIGN STANDARDS

1. STRUCTURAL DESIGN WAS PREPARED USING THE FOLLOWING CODES AND DATA:
   A. INTERNATIONAL BUILDING CODE, 2024 EDITION AS MODIFIED BY THE CITY OF THORNTON
   B. ASCE 7 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES, 2022 EDITION
   C. ACI 318, BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE

no.	date	by	chk	description
0	10/14/26	JJK	MNC	ISSUED FOR BID

PRELIMINARY - NOT FOR CONSTRUCTION

BURNS McDONNELL
9191 S. JAMAICA STREET
ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

date	detailed by
OCTOBER 2026	J. KIENHOLZ
designed by	**checked by**
J. KIENHOLZ	M. NEIL CARROLL

CITY OF THORNTON

WBWTP PAC FACILITY

ABBREVIATIONS, LEGEND, & SPECIAL INSPECTIONS

project	contract
177918	

drawing	rev.
0S-001	0

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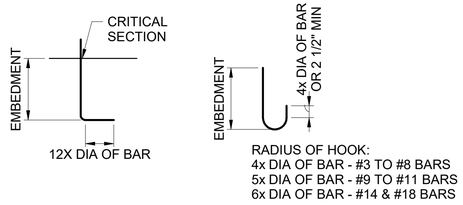
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CONCRETE REINFORCEMENT SPLICE AND EMBEDMENT TABLE (ACI 318, f'c ≥ 4000 PSI)					
BAR SIZE	SPLICES (IN)		EMBEDMENT (IN)		
	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS	HOOKED BARS
3	16	12	12	12	6
4	21	16	16	13	8
5	26	20	20	16	9
6	31	24	24	19	11
7	51	40	40	31	13
8	65	50	50	39	15
9	80	61	61	47	17
10	98	75	75	58	19
11	116	90	90	69	21
14	NOT ALLOWED		121	93	35
18			192	148	46

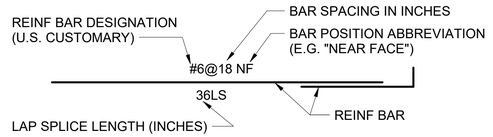
REINFORCING SPLICE AND EMBEDMENT TABLE NOTES:

1. REINFORCING BAR EMBEDMENT AND LAP SPLICE LENGTHS SHALL BE AS SHOWN IN THE ABOVE TABLE UNLESS NOTED OTHERWISE ON THE DRAWINGS.
2. THE LENGTHS SHOWN IN THE TABLE ARE BASED ON THE FOLLOWING CONCRETE COVERAGE AND REINFORCING C-C SPACING:
   A. BEAMS OR COLUMNS: COVER ≥ 1-1/2" CENTER TO CENTER (C-C) SPACING ≥ 6"
   B. ALL OTHERS: COVER ≥ 1-1/2" CENTER TO CENTER SPACING ≥ 6"
3. TOP BARS ARE DEFINED AS HORIZONTAL REINFORCEMENT PLACED SUCH THAT MORE THAN 12" OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW THE DEVELOPMENT LENGTH OR SPLICE.
4. THE DEVELOPMENT AND SPLICE LENGTHS SHOWN SHALL NOT APPLY IF ANY OF THE FOLLOWING CONDITIONS OCCUR:
   A. f'c < 4000 psi
   B. fy > 60,000 psi
   C. THE COVER OR C-C BAR SPACING IS NOT AS LISTED ABOVE.
   D. THE REINFORCING STEEL IS EPOXY COATED.
   E. LIGHT WEIGHT CONCRETE IS USED.
5. WHERE BAR SPLICES ARE STAGGERED SUCH THAT ONE-HALF OR LESS OF TOTAL REINFORCEMENT IS SPLICED WITHIN REQUIRED LAP LENGTH, SPLICE LENGTH MAY EQUAL EMBEDMENT LENGTH.

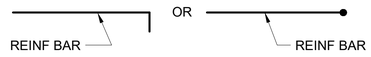


LAP SPLICE TABLE
NOT TO SCALE

BAR IDENTIFICATION



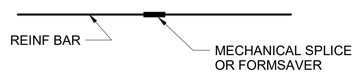
STANDARD 90° HOOK



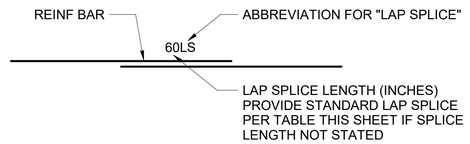
STANDARD 180° HOOK



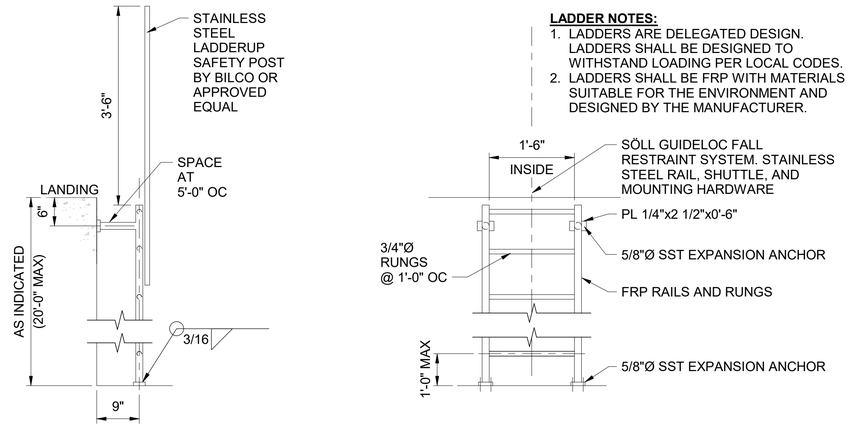
MECHANICAL SPLICE



LAP SPLICE



CONCRETE REINFORCING NOMENCLATURE
NOT TO SCALE



WITH LADDER SAFETY EXTENSION

LADDER NOTES:

1. LADDERS ARE DELEGATED DESIGN. LADDERS SHALL BE DESIGNED TO WITHSTAND LOADING PER LOCAL CODES.
2. LADDERS SHALL BE FRP WITH MATERIALS SUITABLE FOR THE ENVIRONMENT AND DESIGNED BY THE MANUFACTURER.

L-3
NOT TO SCALE

CONCRETE FORMWORK

1. CONTRACTOR IS RESPONSIBLE FOR DESIGN, ENGINEERING, STRUCTURAL ADEQUACY AND CONSTRUCTION OF CONCRETE FORMWORK IN ACCORDANCE WITH CONTRACT SPECIFICATIONS.
2. COORDINATE CONCRETE WORK WITH PLACEMENT OF PIPING, INSERTS, FLOOR DRAINS AND OTHER EMBEDDED ITEMS INDICATED ON CONTRACT DRAWINGS OR IN CONTRACT SPECIFICATIONS.
3. SLEEVE NEW OR EXISTING PIPING OR UTILITIES PASSING THROUGH NEW CONCRETE, UNLESS NOTED OTHERWISE. SEE OTHER DISCIPLINE DRAWINGS FOR SLEEVE DETAILS. ENSURE SLEEVES REMAIN FREE OF DEBRIS AND WATER DURING CONSTRUCTION.
4. ALL EXPOSED CORNERS SHALL BE CHAMFERED 3/4", UNO.
5. FOOTINGS MAY BE EARTH-FORMED USING UNDISTURBED NATIVE SOIL. MINIMUM EXCAVATION WIDTH SHALL BE 2" LARGER THAN FOOTING SIZE INDICATED.

REINFORCING STEEL

1. ALL REINFORCING BARS SHALL BE ASTM A615, GRADE 60.
2. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A1064 AND SHALL BE FLAT SHEET. ROLLED FABRIC WILL NOT BE ALLOWED.
3. REINFORCE ALL CONCRETE UNLESS SPECIFICALLY MARKED "NOT REINFORCED" OR "UNREINFORCED".
4. DETAIL AND PLACE REINFORCEMENT IN ACCORDANCE WITH ACI SP-66, ACI 301, ACI 318 AND CRSI MANUAL OF STANDARD PRACTICE.
5. DO NOT INSERT REINFORCEMENT INTO FRESH OR PARTIALLY HARDENED CONCRETE.
6. THE FOLLOWING CONCRETE COVER SHALL BE PROVIDED FOR REINFORCEMENT (UNLESS OTHERWISE NOTED). SEE ACI 117 FOR CONSTRUCTION TOLERANCES:
   A. CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH..... 3"
   B. CONCRETE EXPOSED TO EARTH, LIQUID, WEATHER OR CAST AGAINST A CONCRETE WORK MAT:
      a. SLABS, WALLS & FOOTINGS..... 2"
      b. BEAMS & COLUMNS:
         • STIRRUPS, SPIRALS & TIES..... 2"
         • PRIMARY REINFORCEMENT..... 2 1/2"
   C. CONDITIONS NOT COVERED IN "A" OR "B":
      a. SLABS AND WALLS..... 1 1/2"
      b. BEAMS AND COLUMNS:
         • STIRRUPS, SPIRALS & TIES..... 1 1/2"
         • PRIMARY REINFORCEMENT..... 2"
7. THE MINIMUM LENGTH OF LAP SPLICES AND EMBEDMENT SHALL BE AS NOTED IN THE TABLES AND DETAILS ON THE CONTRACT DRAWINGS.
8. HEATING OF REINFORCING BARS SHALL NOT BE ALLOWED.
9. PROVIDE ADDITIONAL REINFORCEMENT AT OPENINGS AND CORNER BARS AT WALLS, GRADE BEAMS, AND CURBS IN ACCORDANCE WITH DETAILS PROVIDED ON THE CONTRACT DOCUMENTS.
10. REPOSITIONING OF REINFORCING TO AVOID INTERFERENCE WITH EMBEDDED ITEMS SHALL BE APPROVED BY THE ENGINEER PRIOR TO WORK.

REINFORCED CAST-IN-PLACE CONCRETE

1. ALL CONCRETE SHALL BE PREPARED AND PLACED IN ACCORDANCE WITH ACI 301 AND ACI 117 AND AS MODIFIED BY CONTRACT DOCUMENTS.
2. ALL CONCRETE SHALL MEET THE FOLLOWING REQUIREMENTS (UNO):
   • MINIMUM 28-DAY COMPRESSIVE STRENGTH (f'_c): 4,500 PSI
   • NORMALWEIGHT CONCRETE SHALL BE USED, UNO
3. BEFORE CONCRETE WORK BEGINS, THE PROPOSED CONCRETE MIX DESIGN, ALONG WITH COLLABORATING DATA SHOWING COMPLIANCE WITH PROJECT REQUIREMENTS, SHALL BE SUBMITTED FOR APPROVAL.

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ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

date	detailed by
OCTOBER 2026	J. KIENHOLZ
designed by	**checked by**
J. KIENHOLZ	M. NEIL CARROLL

CITY OF THORNTON

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STANDARD CONCRETE DETAILS AND NOTES

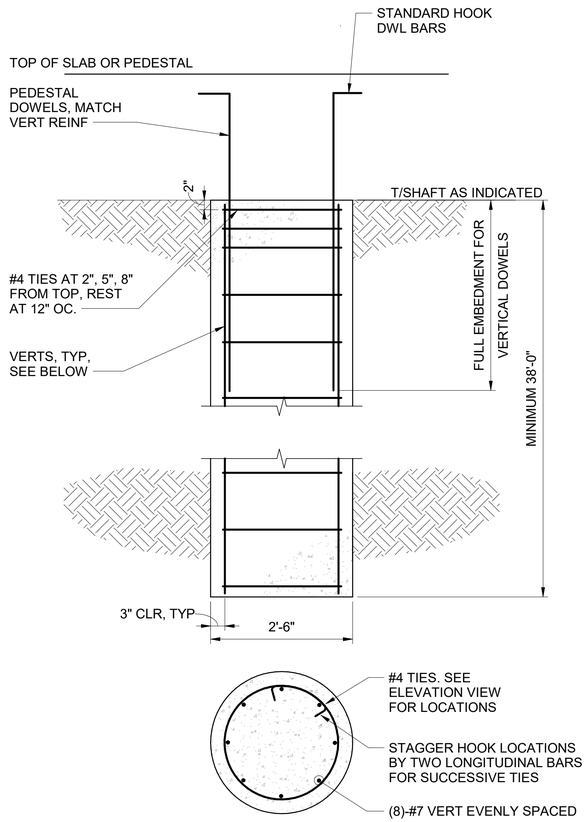
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DRILLED SHAFT
NOT TO SCALE

GEOTECHNICAL INFORMATION

1. GEOTECHNICAL INFORMATION PROVIDED ON THESE DRAWINGS IS A SUMMARY OF THE INFORMATION PROVIDED IN THE PROJECT GEOTECHNICAL REPORT AND IS USED AS THE BASIS OF FOUNDATION DESIGN.
2. THE FOUNDATION DESIGN ASSUMES THAT THE SITE AND SUBGRADE HAVE BEEN PREPARED AND TESTED IN ACCORDANCE WITH THE RECOMMENDATIONS PROVIDED ON THE CONTRACT DRAWINGS AND IN THE CONTRACT SPECIFICATIONS. IN ADDITION, THE PROJECT GEOTECHNICAL REPORT WILL BE PROVIDED UPON REQUEST.
3. PROJECT GEOTECHNICAL REPORT:
   A. REPORT TITLE: GEOTECHNICAL ENGINEERING STUDY AND PAVEMENT THICKNESS DESIGN PROPOSED WES BROWN WASTEWATER TREATMENT PLANT SILO AND EQUIPMENT BUILDING
   B. PROJECT NO.: 25-3-175
   C. ISSUED DATE: OCTOBER 23, 2025
   D. PREPARED BY: KUMAR & ASSOCIATES, INC
4. SITE & SUBGRADE PREPARATION
   A. PROVIDE EXCAVATION, FILL AND BACKFILL IN ACCORDANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS, DIVISION 31.
   B. NOTIFY ENGINEER WHEN LOOSE OR SOFT SOILS ARE EXPOSED WHERE SLABS, MATS, OR FOOTINGS ARE TO BE PLACED SO THAT A DETERMINATION MAY BE MADE REGARDING IMPROVEMENT OF THIS POTENTIALLY UNDESIRABLE CONDITION.
5. FROST DEPTH = 36 INCHES
6. DEEP FOUNDATIONS - DESIGN PARAMETERS
   A. PROVIDE IN ACCORDANCE WITH DRAWINGS AND SPECIFICATION SECTION 31 63 29.
   B. DRILLED SHAFT FOUNDATION SHALL CONFORM TO ACI 336.1 AND 336.3, UNLESS NOTED OTHERWISE.
   C. DESIGN PARAMETERS:
      a. MAXIMUM AXIAL LOAD (ULTIMATE) = 130 KIPS
      b. MAXIMUM SHEAR LOAD (ULTIMATE) = 15 KIPS

STRUCTURAL DESIGN LOADING/CRITERIA

1. THE FOUNDATIONS FOR THE PAC SILO WERE PREPARED USING THE BELOW DESIGN CRITERIA. THE MANUFACTURERS FOR THE PAC SILO SHALL VERIFY THEIR PRODUCTS ARE ADEQUATE TO RESIST LOADING BASED ON THIS INFORMATION.
2. RISK CATEGORY: III (TYPICAL FOR ALL STRUCTURES WITHIN PROJECT SCOPE.)
3. DEAD LOADS
   A. SELF WEIGHT OF MATERIALS OF CONSTRUCTION
   B. WEIGHT OF FIXED SERVICE EQUIPMENT
      a. AS INDICATED ON THE STRUCTURAL DRAWINGS FOR EQUIPMENT WEIGHING IN EXCESS OF 300 LBS. FRAMING AND FOUNDATIONS ARE DESIGNED FOR EQUIPMENT WHICH SATISFIES THE CONTRACT SPECIFICATIONS.
      b. IF EQUIPMENT FURNISHED IS HEAVIER THAN THE WEIGHTS INDICATED, OR REQUIRES STRUCTURAL CHANGES FOR ANY OTHER REASON, PROVIDE ENGINEERING DESIGN CALCULATIONS AND ADDITIONAL STRUCTURAL WORK NECESSARY TO SUPPORT ALL LOADS IN ACCORDANCE WITH THE DESIGN STANDARDS SPECIFIED ABOVE, AT NO ADDITIONAL COST TO THE OWNER AND WITH NO INCREASE IN CONTRACT TIME.
4. LIVE LOADS:
   A. ROOF LIVE LOAD..... 20 PSF
   B. PAC SLAB..... 300 PSF
5. SNOW LOADS:
   A. GROUND SNOW LOAD (P_g)..... 61 PSF
   B. FLAT-ROOF SNOW LOAD..... BY MFR
   C. SNOW EXPOSURE FACTOR (C_e)..... 1.0
   D. THERMAL FACTOR (C_t)..... BY MFR
   E. SLOPE FACTOR (C_s)..... BY MFR
   F. DRIFT SURCHARGE LOADS..... N/A
   G. WINTER WIND PARAMETER (W_2)..... 0.45
6. WIND DESIGN DATA:
   A. ULTIMATE DESIGN WIND SPEED (V_{ult})..... 113 MPH
   B. NOMINAL DESIGN WIND SPEED (V_{asd})..... 88 MPH
   C. EXPOSURE CATEGORY..... C
   D. INTERNAL PRESSURE COEFFICIENTS..... BY MFR
7. SEISMIC DESIGN DATA:
   A. SEISMIC IMPORTANCE FACTOR (I_e)..... 1.25
   B. MAPPED SPECTRAL RESPONSE PARAMETERS:
      a. S_S..... 0.180
      b. S_1..... 0.043
   C. SOIL SITE CLASS..... D
   D. DESIGN SPECTRAL RESPONSE PARAMETERS:
      a. S_{DS}..... 0.150
      b. S_{D1}..... 0.064
   E. SEISMIC DESIGN CATEGORY..... A
   F. BASIC SEISMIC FORCE-RESISTING SYSTEMS..... BY MFR
   G. DESIGN BASE SHEARS(S)..... BY MFR
   H. SEISMIC RESPONSE COEFFICIENT(S) (C_S)..... BY MFR
   I. RESPONSE MODIFICATION COEFFICIENT(S) (R).... BY MFR
   J. ANALYSIS PROCEDURE USED..... EQUIVALENT LATERAL FORCE
8. ROOF RAIN LOAD DATA:
   A. RAIN INTENSITY (i)..... 6.71 (IN/HR, 15 MIN DURATION)
9. FLOOD DESIGN DATA:
   A. FLOOD DESIGN CLASS..... X (UNSHADED)
   B. DESIGN FOR FLOOD LOADS IS NOT REQUIRED.
10. TSUNAMI DATA:
    A. SITE IS NOT LOCATED IN A TSUNAMI ZONE. DESIGN FOR TSUNAMI LOADS IS NOT REQUIRED.
11. TORNADO DATA:
    A. TORNADO WIND SPEED (V_T)..... 50 MPH
    B. EFFECTIVE AREA (A_e)..... <2000 SF
    C. DESIGN FOR TORNADO LOADS IS NOT REQUIRED.

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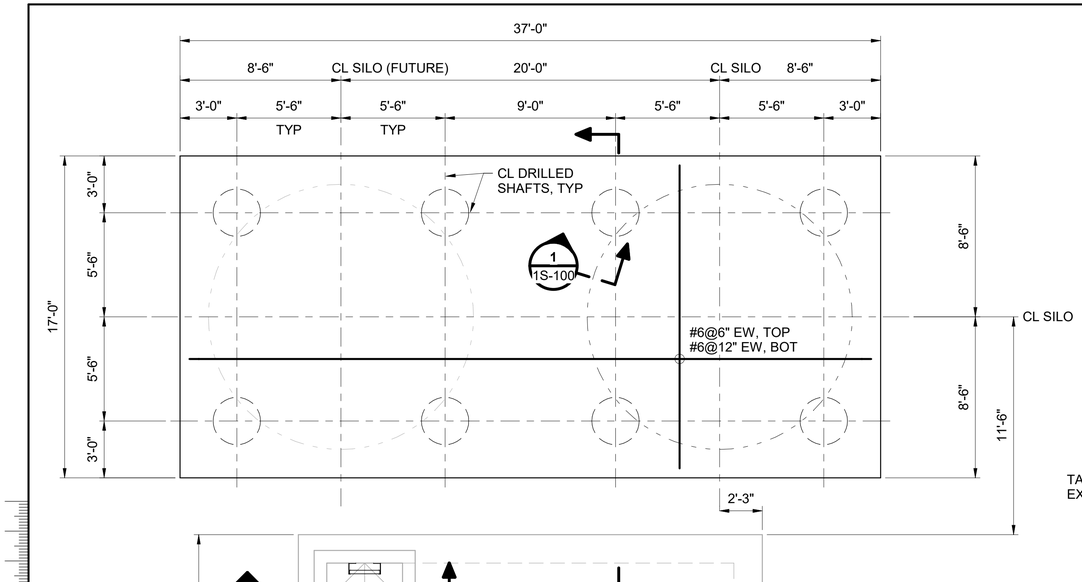
DESIGN CRITERIA, GEOTECH INFORMATION, AND STANDARD DRILLED SHAFT DETAIL

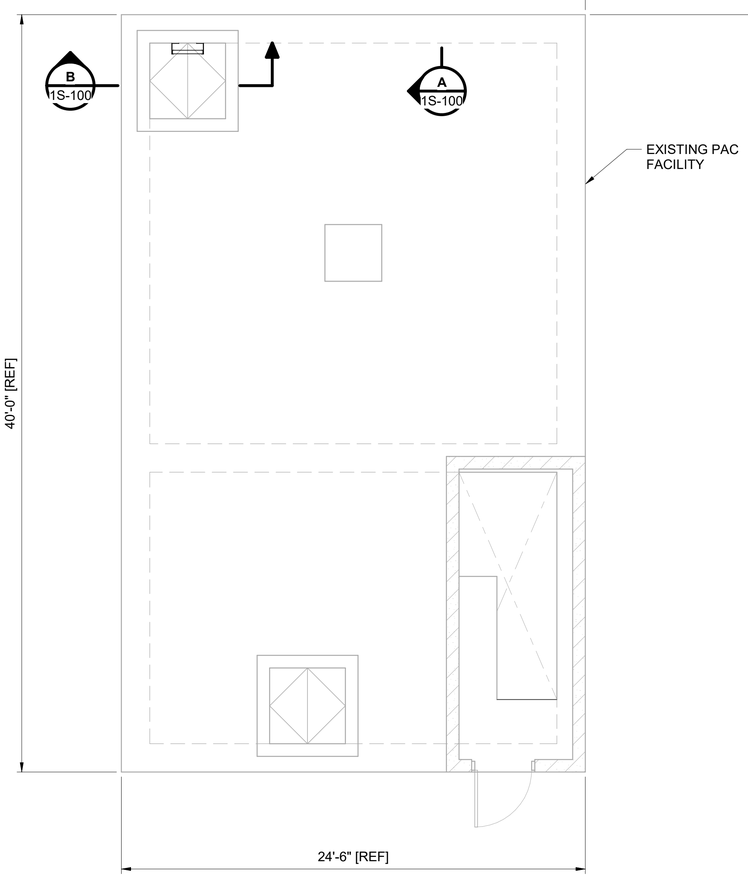
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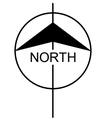


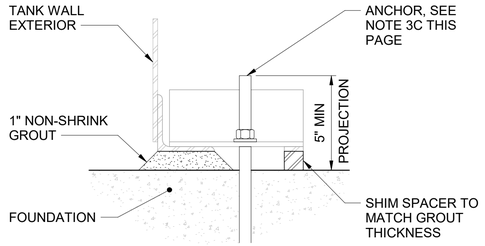


FOUNDATION PLAN

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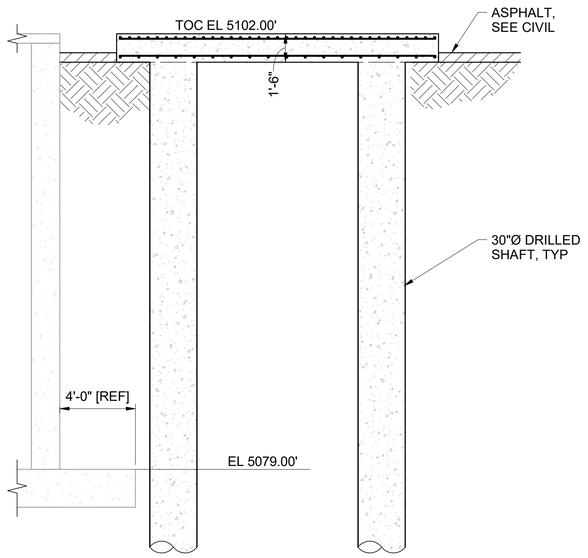
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DETAIL 1 / 1S-100

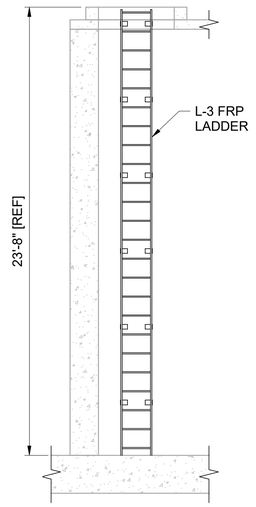
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SECTION A / 1S-100

0 2' 4' 8'

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SECTION B / 1S-100

0 2' 4' 8'

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NOTES:

1. [REF] - INDICATES REFERENCE DIMENSION TAKEN FROM EXISTING DRAWINGS OR REFERENCE DOCUMENTS. DIMENSIONS SHALL BE VERIFIED IN THE FIELD PRIOR TO PROCUREMENT, INSTALLATION, OR CONSTRUCTION.
2. SEE 0S-XXX DRAWING SERIES FOR ABBREVIATIONS, SPECIAL INSPECTION REQUIREMENTS, AND STANDARD DETAILS.
3. PAC SILO NOTES:
   A. SEE GENERAL NOTES ON 0S-003 FOR DESIGN CRITERIA.
   B. INSTALL PAC SILO IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
   C. ANCHORS: (20) - 1 1/4"Ø F1554 GRADE 36 HEAVY HEX HEADED ANCHORS WITH A MINIMUM 10" EMBEDMENT (TOP OF CONCRETE TO TOP OF HEAD). ANCHORS AND HARDWARE SHALL BE HOT DIPPED GALVANIZED.
      a. SPECIFIED ANCHORS ARE BASED ON A STRENGTH LEVEL LOADS OF 28,420 LBS OF TENSION AND 2,520 LBS OF SHEAR PER BOLT.
   D. WEIGHTS:
      a. EMPTY SILO: 32,500 LBS
      b. FULL SILO: 195,400 LBS
   E. SKIRT TO BE FULLY GROUTED AT BASE. PAC SILO MANUFACTURER TO PROVIDE APPROPRIATE DETAILS.

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PAC SILO FOUNDATION AND SECTIONS

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SINGLE LINE PIPING

- 18" — PIPE SIZE AND DIRECTION OF FLOW
- GATE VALVE (GV) OR MUD VALVE (MV)
- GLOBE VALVE
- BUTTERFLY VALVE (BFV)
- CHECK VALVE (CV)
- STOP CHECK VALVE
- PLUG VALVE (PV)
- 3-WAY VALVE
- ANGLE VALVE
- RELIEF OR BACKPRESSURE VALVE
- HOSE GATE DRAIN VALVE
- PINCH VALVE
- NEEDLE VALVE
- DIAPHRAGM VALVE
- BALL VALVE (BV)
- P — SELF-CONTAINED PRESSURE REDUCING (REGULATING VALVE)
- S — SOLENOID VALVE
- BP — BACKFLOW PREVENTER
- VB — VACUUM BREAKER
- MS — MOISTURE SEPARATOR
- T — IN-LINE TOTALIZING FLOW METER
- LOCKED OPEN
- LOCKED CLOSED
- NO — NORMALLY OPEN
- NC — NORMALLY CLOSED
- FLEXIBLE HOSE
- EXPANSION ELEMENT (JOINT)
- FLEXIBLE BALL JOINT
- BASKET TYPE STRAINER
- TEE TYPE STRAINER
- Y-TYPE STRAINER
- FLANGED COUPLING ADAPTER (FCA)
- RETAINER FLANGE
- DRAINER ASSEMBLY
- INSULATING FLANGE (I.F.)
- RESTRICTING ORIFICE
- SIGHT FLOW INDICATOR
- ELBOW TURNING DOWN
- ELBOW TURNING UP
- TYPICAL PIPE BREAK
- PIPES IN SECTION
- TEE TURNING DOWN
- TEE TURNING UP
- ABOVE / PIPES CROSSING / BELOW
- ABOVE / PIPES CROSSING WITH BREAK-OUT TO SHOW PIPES OR EQUIPMENT BELOW / BELOW

- M — IN-LINE FLOW METER
- CLEANOUT (CO)
- DISCHARGE ELBOW ASSEMBLY
- STRAIGHTENING VANE
- REMOVABLE PLUG
- REMOVABLE CAP
- WELDED CAP
- BF — BLIND FLANGE
- DRIP POCKET ASSEMBLY
- STEAM TRAP ASSEMBLY
- AC — AIR COCK
- HB — HOSE BIBB
- WH — WALL HYDRANT
- PIPE ANCHOR
- PIPE GUIDE
- REDUCER
- UNION
- QUICK DISCONNECT COUPLING
- VENT THROUGH ROOF
- INJECTOR
- CENTRIFUGAL PUMP
- PROGRESSIVE CAVITY PUMP
- BLOWER
- POSITIVE DISPLACEMENT BLOWER
- FAN
- DIAPHRAGM METERING PUMP
- V — VACUUM TRAP
- WATER SURFACE (WS)
- PULSATION DAMPENER W/ ISOLATION BALL VALVE
- STATIC MIXER
- GAUGE SEAL
- DIAPHRAGM PROTECTED PRESSURE SWITCH
- PC — CHEMICAL APPLICATION POINT
- PIPE SUPPORT LOCATION
- PRV — PRESSURE REDUCING VALVE
- AIR RELEASE VALVE
- WEIR

DOUBLE LINE PIPING

- GATE VALVE
- BUTTERFLY VALVE
- FLANGED COUPLING ADAPTOR
- REDUCER
- FLANGED PIPING
- DOUBLE BOLTED SLEEVE COUPLING
- EXPANSION JOINT
- MECHANICAL JOINT PIPING
- HARNESSED SLEEVE COUPLING
- CHECK VALVE
- BALL VALVE
- A/O — AIR/OIL CYLINDER
- PLUG VALVE
- INLINE STRAINER
- DISMANTLING JOINT
- ELBOW TURNING DOWN
- ELBOW TURNING UP
- ABOVE / PIPES CROSSING / BELOW
- TYPICAL PIPE BREAK
- ABOVE / PIPES CROSSING WITH BREAK-OUT TO SHOW PIPES OR EQUIPMENT BELOW / BELOW
- PIPES IN SECTION

- AIR VAC
- GLOBE VALVE
- STRAINER
- MAG METER
- BLIND FLANGE
- WALL PIPE PENETRATION

LINETYPES

- EXISTING
- NEW CONSTRUCTION
- FUTURE CONSTRUCTION

MARKER

- XX — EQUIPMENT MARKER
- XX — VALVE MARKER

PROCESS TAGGING SYSTEM:

AREA EQUIPMENT LOOP NUMBER

XXXX-XXXX-####

LOOP NUMBER:

SYSTEM TRAIN QUANTITY/SEQUENCE

GENERAL ABBREVIATIONS

AAG	ABOVE AT GRADE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
BD	BLOWDOWN
BOC	BOTTOM OF CONCRETE
BOW	BOTTOM OF WEIR
CI	CAST IRON
CL	CENTERLINE
CO	CLEANOUT
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DR	DRAIN
DV	DRAIN VALVE
EL	ELEVATION
FCA	FLANGED COUPLING ADAPTER
FF	FINISHED FLOOR
FM	FORCE MAIN
FP	FIRE PROTECTION
FRP	FIBER REINFORCED PLASTIC
HGL	HYDRAULIC GRADE LINE
HWL	HIGH WATER LEVEL
ID	INNER DIAMETER
IE	INVERT ELEVATION
INV	INVERT
LWL	LOWER WATER LEVEL
MAX	MAXIMUM
MG	MILLION GALLONS
MGD	MILLION GALLONS PER DAY
MIN	MINIMUM
NG	NATURAL GAS
NIC	NOT IN CONTRACT
OC	ON CENTER
OVE	OVERHEAD ELECTRIC
OVF	OVERFLOW
PAC	POWDER ACTIVATED CARBON
PCW	POTABLE COLD WATER
PD	PROCESS DRAIN
PS	PIPE SUPPORT
PSI	POUNDS PER SQUARE INCH
PV	PLUG VALVE
RED	REDUCER
SS	SANITARY SEWER
SCH	SCHEDULE
SQ	SQUARE
SST	STAINLESS STEEL
TBD	TO BE DETERMINED
TBR	TO BE REMOVED
TEMP	TEMPORARY
THRU	THROUGH
TOC	TOP OF CONCRETE
TOS	TOP OF STEEL
TOW	TOP OF WALL
UGE	UNDERGROUND ELECTRIC
UGT	UNDERGROUND TELEPHONE
UNO	UNLESS NOTED OTHERWISE
VT	VERTICAL TURBINE
W	WATER SUPPLY LINE
WS	WATER SURFACE

PROCESS PIPE IDENTIFICATION:

AIR	AIR PIPING
FA	FOUL AIR
BFF	BIOFILTER FILTRATE
CA	COMPRESSED AIR
DS	DIGESTED SOLIDS
DF	DEWATERING FEED
FCI	FINAL CLARIFIER INFLUENT
FCU	FINAL CLARIFIER UNDERFLOW
FEFF	FINAL EFFLUENT
GINF	GRIT INFLUENT
GR	GRIT RETURN
INF	PLANT INFLUENT
IRW	IRRIGATION WATER
ML	MIXED LIQUOR
NPW	NON-POTABLE WATER
POS	POLYMER SOLUTION
PR	PRESSATE RETURN
PW	POTABLE WATER
RAS	RETURN ACTIVATED SLUDGE
SC	SCUM
SEFF	SECONDARY EFFLUENT
SINF	SECONDARY INFLUENT
SNT	SUPERNATANT
SSW	SANITARY SEWER
UR	UV RETURN STREAM
WAS	WASTE ACTIVATED SLUDGE
WSC	COMBINED WAS AND SCUM

GENERAL NOTES:

1. THIS IS A STANDARD PROCESS LEGEND AND NOT ALL ITEMS OR EQUIPMENT AS DESIGNATED HEREON ARE USED ON THIS PROJECTED
2. THIS SHEET APPLIES TO PROCESS DRAWINGS LABELED DXXX AND PROCESS AND INSTRUMENTATION DRAWINGS LABLED IXXX.

PROCESS AREA IDENTIFICATION:

AB	AERATION BASIN
ADMN	ADMINISTRATION BUILDING
BLWR	BLOWER BUILDING
BIOF	BIOFILTER
GEN	BACKUP GENERATOR SYSTEM
DIG	DIGESTOR
EFFL	EFFLUENT STRUCTURE
SITE	GENERAL SITE
HDWK	HEADWORKS BUILDING
INFL	INFLUENT LIFT STATION
OD	OXIDATION DITCH
PCLR	PRIMARY CLARIFIER
SCLR	SECONDARY CLARIFICIER
SB	STORAGE BUILDING
SLDS	SOLIDS HANDLING AND DEWATERING BUILDING
SPB	SLUDGE PUMPING BUILDING
UV	UV BUILDING
WHLD	WAS HOLDING TANK

PROCESS SYSTEM IDENTIFICATION:

1 = CFS	COARSE AND FINE SCREEN
2 = GR	GRIT REMOVAL
3 = INF	INFLUENT CONTROL
4 = PC	PRIMARY CLARIFICATION
5 = AB	AERATION BASIN
6 = OD	OXIDATION DITCH
7 = SC	SECONDARY CLARIFICATION
8 = DIS	UV DISINFECTION
9 = AER	AEROBIC DIGESTION
10 = RAS	RETURN ACTIVATED SLUDGE
11 = WAS	WASTE ACTIVED SLUDGE
12 = SCR	SCUM REMOVAL
13 = SR	SLUDGE THICKENING
14 = DW	DEWATERING
15 = EL	ELECTRICAL
16 = HVAC	HEATING, VENTILATION, AND AIR CONDITIONING

PROCESS EQUIPMENT IDENTIFICATION:

AER	AERATOR
AC	AIR COMPRESSOR
AR	AIR RECIEVER
ARV	AIR RELEASE VALVE
ATS	AUTOMATIC TRANSFER SWITCH
AVR	AIR VACUUM RELIEF VALVE
BDP	BIOFILTER DRAIN PUMP
BST	BASKET STRAINER
BFV	BUTTERFLY VALVE
BNK	UV BANK
BT	BLADDER TANK
BV	BALL VALVE
CP	PROCESS CONTROL PANEL
CV	CHECK VALVE
FT	FLOCCULATION TANK
FE	FLOW ELEMENT
G	GENERATOR
GV	GATE VALVE
GR	GRINDER
HCS	HYDRAUILIC CLEANING SYSTEM
LP	208/120V POWER DISTRIBUTION
M	MOTOR
MCC	MOTOR CONTROL CENTER
MIX	MIXER
PP	480 V POWER DISTRIBUTION
PDC	POWER DISTRIBUTION CENTER
P	PUMP
PRV	PRESSURE REDUCING VALVE
PV	PLUG VALVE
RDR	RADAR
RTU	REMOTE TERMINAL UNIT WIT OIT
SC	SCREW CONVEYOR
SG	SLIDE GATE
SP	STOP PLATE
SV	SURGE RELIEF VALVE
UF	UNIVERSAL AIR FILTER
VFD	VARIABLE FREQUENCY DRIVE
WG	WEIR GATE
XFM	TRANSFORMER

no.	date	by	chk	description
0	10/14/26	CRC	NKR	ISSUED FOR BID

PRELIMINARY - NOT FOR CONSTRUCTION

BURNS McDONNELL
9191 S. JAMAICA STREET
ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

date	detailed by
OCTOBER 2026	A.BENSON
designed by	**checked by**
C. CAMPO	N. RACHELSON

CITY OF THORNTON

WBWTP PAC FACILITY

PROCESS GENERAL NOTES, LEGEND, AND ABBREVIATIONS

project	contract
177918	

drawing	rev.
0D-001	0

sheet of sheets

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DESIGN CRITERIA

POWDERED ACTIVATED CARBON (PAC) PRETREATMENT FACILITY CAPACITY

MAXIMUM PLANT FLOW (MGD)	50
PAC PRETREATMENT FACILITY BASIN VOLUME (GAL)	73,700
PAC BULK DELIVERY VOLUME (LBS)	40,000

PAC SILO STORAGE

SILO STORAGE CAPACITY (LBS)	162,900
NUMBER OF SILOS	1 + 1 (FUTURE)
PAC DRY DENSITY (LBS/GAL)	3.34
SILO DELIVERY POINT(S)	PRETREATMENT SLURRY BASIN
DRY FEEDER TYPE	SCREW CONVEYOR
SLURRY RATIO PAC / WATER (LBS / GAL)	1 / 1
MAXIMUM TRANSFER RATE (LBS/HR)	8,300
MAXIMUM TRANSFER TIME (HR/DAY)	5.0
CHEMICAL MAXIMUM DOSE (MG/L)	40
USAGE AT MAXIMUM FLOW, MAXIMUM DOSE (LBS/DAY)	16,691
STORAGE AT MAXIMUM FLOW, MAXIMUM DOSE (DAYS)	9.8

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WBWTP PAC FACILITY

DESIGN CRITERIA

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drawing 0D-002	**rev.** 0
sheet	**of** **sheets**

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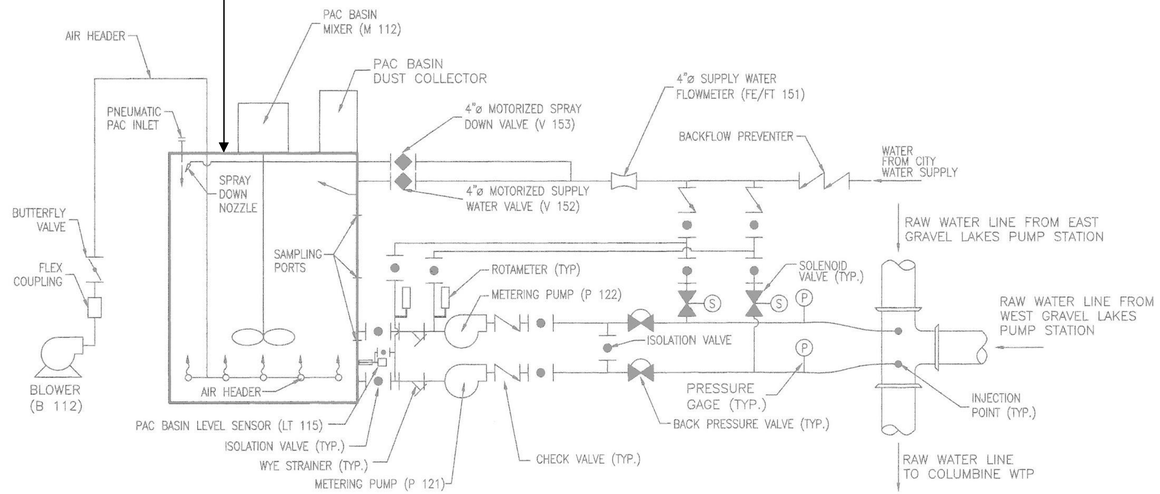
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GENERAL NOTES

1. PROCESS FLOW DIAGRAM FOR EXISTING PAC PRETREATMENT FACILITY FROM CoT PROJECT 99-116 "PRETREATMENT FACILITIES EAST AND WEST GRAVEL LAKES PUMP STATION." CONTRACTOR TO VERIFY ACCURACY.

PAC SILO WITH SCREW FEED CONVEYOR SYSTEM; REFERENCE 1I-601



PAC PRETREATMENT FACILITY SCHEMATIC
NOT TO SCALE

RECORD DRAWINGS
FROM INFORMATION PROVIDED BY
B R B CONTRACTORS, INC.
FEBRUARY, 2003

PAC SYSTEM PFD
NOT TO SCALE

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C. CAMPO	N. RACHELSON

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WBWTP PAC FACILITY

PROCESS FLOW DIAGRAM

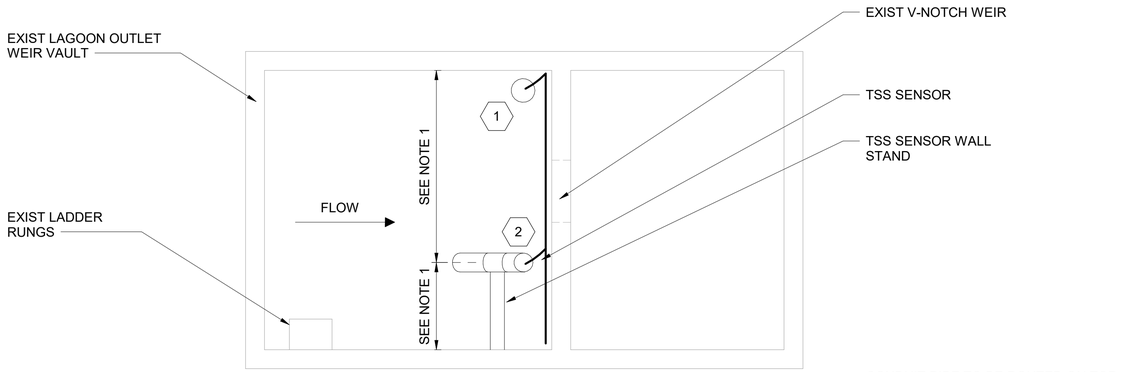
project	contract
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drawing	rev.
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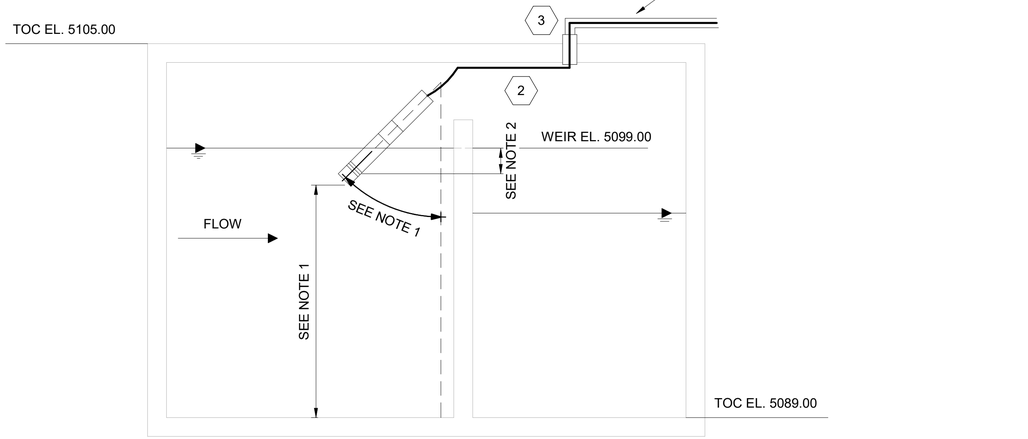
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TSS SENSOR INSTALLATION - PLAN VIEW
NOT TO SCALE



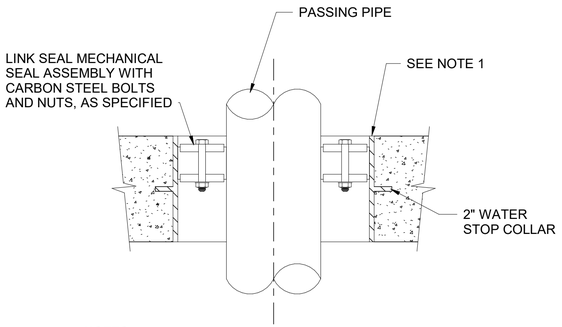
TSS SENSOR INSTALLATION - SECTION VIEW
NOT TO SCALE

GENERAL NOTES

1. INSTALL TSS SENSOR AND WALL MOUNTING ASSEMBLY ON UPSTREAM SIDE OF WEIR. COORDINATE SENSOR INSTALLATION REQUIREMENTS WITH MANUFACTURER.
2. CONFIRM MINIMUM PROBE SUBMERGENCE REQUIREMENTS WITH THE MANUFACTURER. SET PROBE ELEVATION BELOW WEIR TO MAINTAIN THE REQUIRED MINIMUM SUBMERGENCE.
3. STRUCTURE ELEVATIONS FROM CoT PROJECT 05-467 LAGOON IMPROVEMENTS CIP RECORD DRAWINGS.

KEYED NOTES

1. INSTALL CHLORINE SENSOR WITH FLOTATION ATTACHMENT, INSTALL PER MFR REQUIREMENTS.
2. ROUTE CHLORINE ANALYZER CABLE WITH TSS SENSOR CABLE.
3. 5" DIAMETER CORE. COAT CUT REBAR WITH SIKA ARMATEC-10ZR. USE SIKAGARD-62 AS TOP COAT OVER THE ENTIRE CORED SURFACE. INSTALL 3' DIAMETER SCHED 10S 316 SST PASSING PIPE. ADD 316 SST PLATE, 1/4" AT TOP OF CORE.



NOTES:
1. CENTURY LINE MODEL CS HDPE SLEEVE FOR PIPE SIZES LESS THAN 12". PIPING GREATER THAN OR EQUAL TO 12" SHALL UTILIZE A STAINLESS STEEL SLEEVE. ALL SLEEVES SHALL BE PER LINK SEAL MANUFACTURER'S RECOMMENDATIONS.

FLOOR PENETRATION
NOT TO SCALE

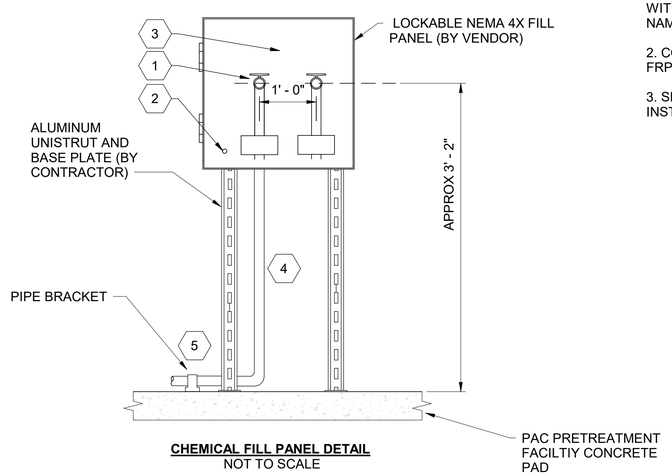
KEYED NOTES:
1. CHEMICAL FILL VALVES & PIPING.

2. 3/4" COMPRESSED AIR, UNIVERSAL STYLE DOUBLE LUG COUPLING.

3. INDICATING LIGHTS AND SILO FILTER TIMER. ACCESSORIES BY VENDOR, WIRING BY CONTRACTOR.

4. SILO FILL PIPING; 4" SCH 40 STEEL PIPE (ASTM A53, BLACK) WITH COMPRESSION COUPLINGS, NEOPRENE GASKETS, AND 90° SCH 40 WEARBACK ELBOWS (9" TANGENTS). CONTRACTOR TO PROVIDE PIPING CONNECTION FROM CHEMICAL FILL PANEL TO SIDE OF SILO. ASSUME SILO PIPING CONNECTION TO BE 3' ABOVE TOP OF CONCRETE.

5. ROUTE FILL PIPING ALONG PAC PRETREATMENT FACILITY CONCRETE PAD AND SECURE TO WITH BRACKETS. BRACKETS TO BE 4" EATON B-LINE B3180-4 SS6 WITH AISI TYP 316 SST MATERIAL, OR ENGINEER APPROVED EQUAL. INSTALL 1/8" EATON B-LINE B1999 VIBRA-STRIP OR ENGINEER APPROVED EQUAL BETWEEN THE PIPE WALL AND BRACKET.



CHEMICAL FILL PANEL DETAIL
NOT TO SCALE

GENERAL NOTES:
1. CONTRACTOR TO PROVIDE FRP SIGN WITH 3" LETTERS INDICATING CHEMICAL NAME.

2. CONTRACTOR TO PROVIDE BRADY 16X16 FRP DIAMOND

3. SEE 1D-102 FOR ADDITIONAL INSTALLATION DETAILS.

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WBWTP PAC FACILITY

PROCESS DETAILS I

project	contract
177918	

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EQUIPMENT SCHEDULE				
NO.	**DESCRIPTION**	**TAG**	**SPECIFICATION SECTION**	**NOTES**
1	PAC PRETREATMENT FACILITY MIXER	M-111	46 41 41	REPLACE EXISTING
2	PAC SILO 1	PAC-1	46 36 15	PROVIDED BY MANUFACTURER
3	PAC SILO 2	PAC-2	N/A	FUTURE
4	ARCH BREAKER UNLOADER	AB-132	46 36 15	PROVIDED BY MANUFACTURER
5	SILO SCREW CONVEYOR 1	SC-133	46 36 15	PROVIDED BY MANUFACTURER
6	SILO SCREW CONVEYOR 2	SC-134	46 36 15	PROVIDED BY MANUFACTURER
7	MOISTURE ISOLATION INJECTOR	MII-135	46 36 15	PROVIDED BY MANUFACTURER
8	SILO FILTER	FLT-144	46 36 15	PROVIDED BY MANUFACTURER

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WBWTP PAC FACILITY

EQUIPMENT SCHEDULE

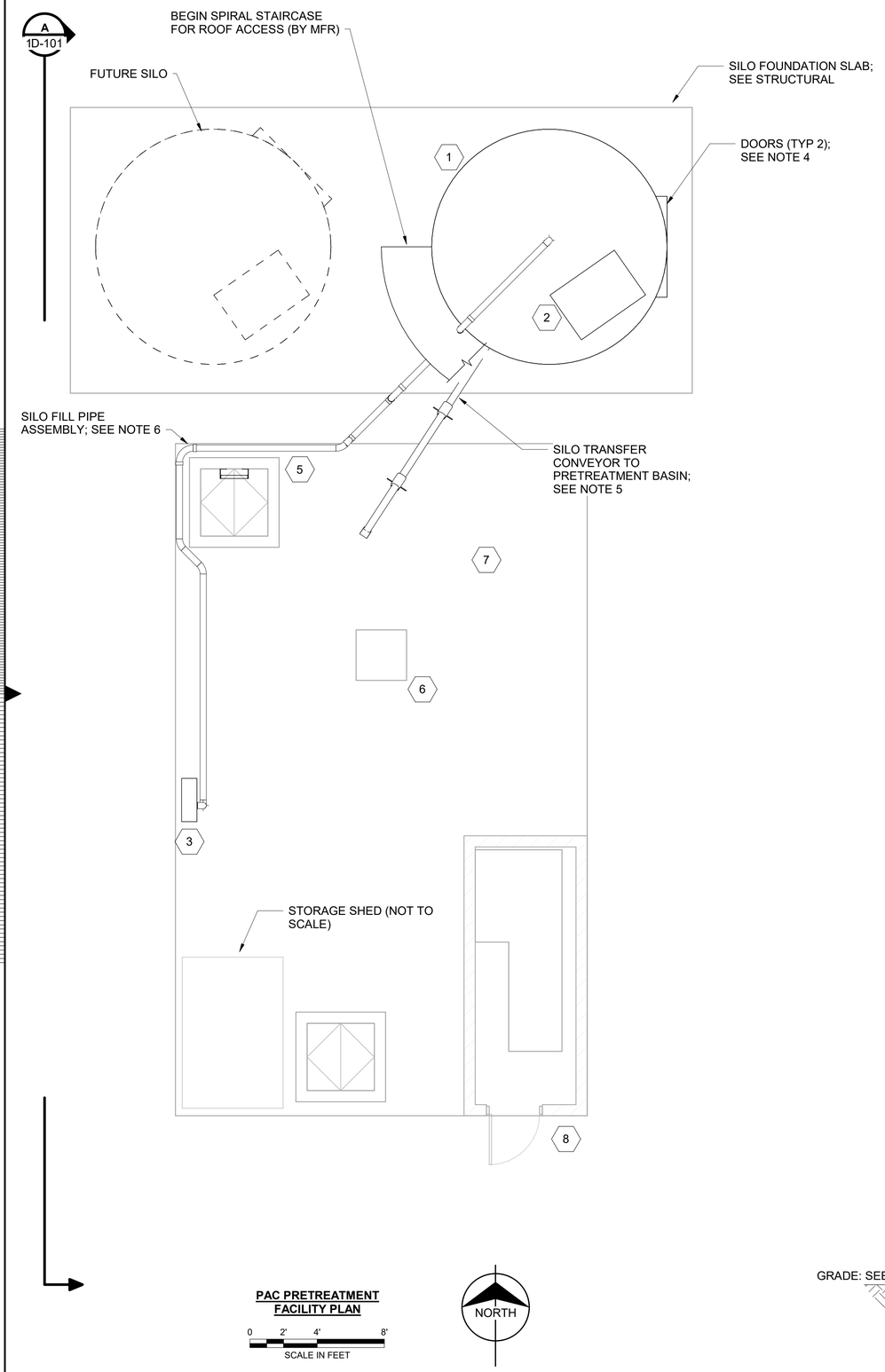
project	contract
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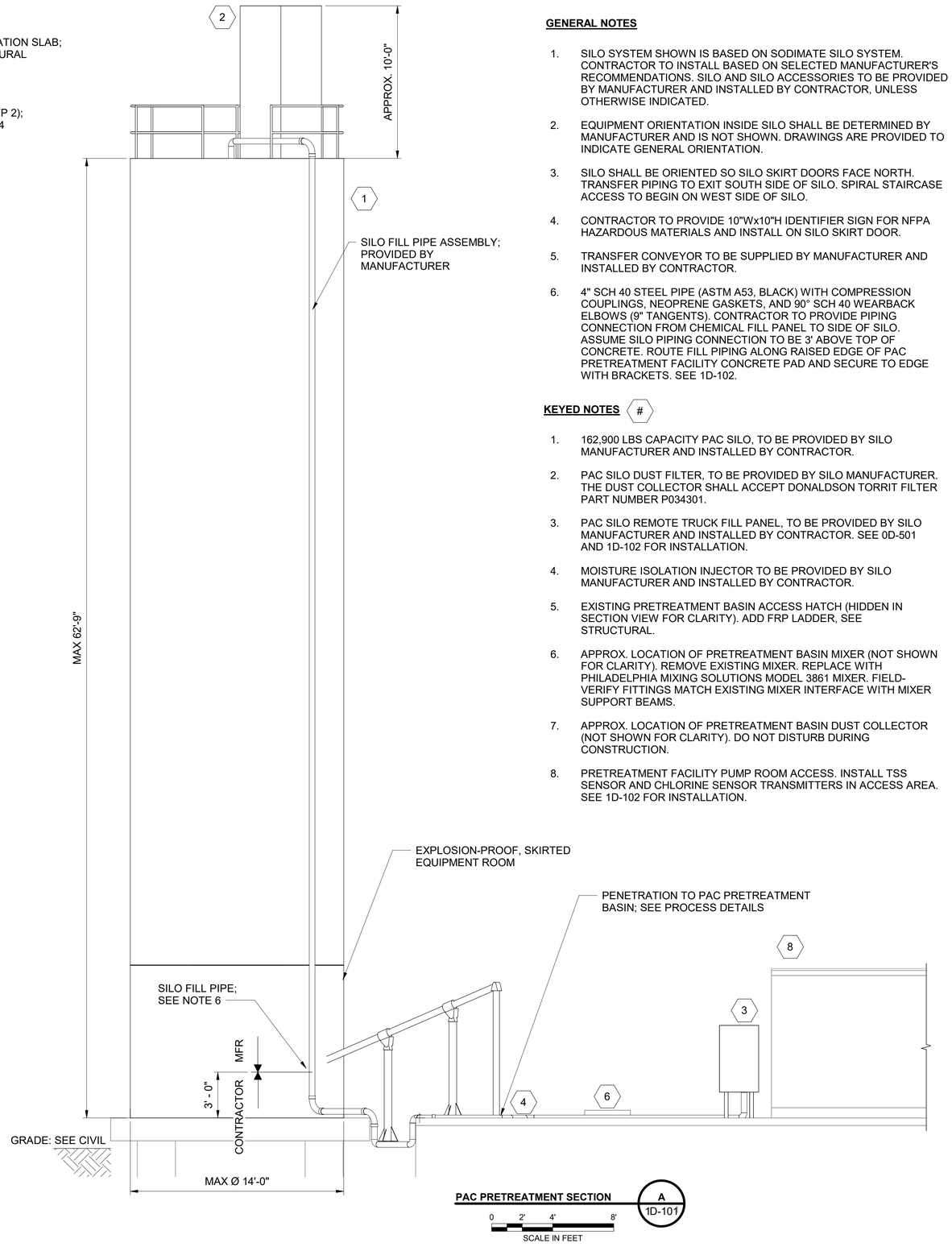
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PAC PRETREATMENT FACILITY PLAN

0 2' 4' 8'

SCALE IN FEET



PAC PRETREATMENT SECTION A 1D-101

0 2' 4' 8'

SCALE IN FEET

GENERAL NOTES

1. SILO SYSTEM SHOWN IS BASED ON SODIMATE SILO SYSTEM. CONTRACTOR TO INSTALL BASED ON SELECTED MANUFACTURER'S RECOMMENDATIONS. SILO AND SILO ACCESSORIES TO BE PROVIDED BY MANUFACTURER AND INSTALLED BY CONTRACTOR, UNLESS OTHERWISE INDICATED.
2. EQUIPMENT ORIENTATION INSIDE SILO SHALL BE DETERMINED BY MANUFACTURER AND IS NOT SHOWN. DRAWINGS ARE PROVIDED TO INDICATE GENERAL ORIENTATION.
3. SILO SHALL BE ORIENTED SO SILO SKIRT DOORS FACE NORTH. TRANSFER PIPING TO EXIT SOUTH SIDE OF SILO. SPIRAL STAIRCASE ACCESS TO BEGIN ON WEST SIDE OF SILO.
4. CONTRACTOR TO PROVIDE 10"Wx10"H IDENTIFIER SIGN FOR NFPA HAZARDOUS MATERIALS AND INSTALL ON SILO SKIRT DOOR.
5. TRANSFER CONVEYOR TO BE SUPPLIED BY MANUFACTURER AND INSTALLED BY CONTRACTOR.
6. 4" SCH 40 STEEL PIPE (ASTM A53, BLACK) WITH COMPRESSION COUPLINGS, NEOPRENE GASKETS, AND 90° SCH 40 WEARBACK ELBOWS (9" TANGENTS). CONTRACTOR TO PROVIDE PIPING CONNECTION FROM CHEMICAL FILL PANEL TO SIDE OF SILO. ASSUME SILO PIPING CONNECTION TO BE 3' ABOVE TOP OF CONCRETE. ROUTE FILL PIPING ALONG RAISED EDGE OF PAC PRETREATMENT FACILITY CONCRETE PAD AND SECURE TO EDGE WITH BRACKETS. SEE 1D-102.

KEYED NOTES (#)

1. 162,900 LBS CAPACITY PAC SILO, TO BE PROVIDED BY SILO MANUFACTURER AND INSTALLED BY CONTRACTOR.
2. PAC SILO DUST FILTER, TO BE PROVIDED BY SILO MANUFACTURER. THE DUST COLLECTOR SHALL ACCEPT DONALDSON TORRIT FILTER PART NUMBER P034301.
3. PAC SILO REMOTE TRUCK FILL PANEL, TO BE PROVIDED BY SILO MANUFACTURER AND INSTALLED BY CONTRACTOR. SEE 0D-501 AND 1D-102 FOR INSTALLATION.
4. MOISTURE ISOLATION INJECTOR TO BE PROVIDED BY SILO MANUFACTURER AND INSTALLED BY CONTRACTOR.
5. EXISTING PRETREATMENT BASIN ACCESS HATCH (HIDDEN IN SECTION VIEW FOR CLARITY). ADD FRP LADDER, SEE STRUCTURAL.
6. APPROX. LOCATION OF PRETREATMENT BASIN MIXER (NOT SHOWN FOR CLARITY). REMOVE EXISTING MIXER. REPLACE WITH PHILADELPHIA MIXING SOLUTIONS MODEL 3861 MIXER. FIELD-VERIFY FITTINGS MATCH EXISTING MIXER INTERFACE WITH MIXER SUPPORT BEAMS.
7. APPROX. LOCATION OF PRETREATMENT BASIN DUST COLLECTOR (NOT SHOWN FOR CLARITY). DO NOT DISTURB DURING CONSTRUCTION.
8. PRETREATMENT FACILITY PUMP ROOM ACCESS. INSTALL TSS SENSOR AND CHLORINE SENSOR TRANSMITTERS IN ACCESS AREA. SEE 1D-102 FOR INSTALLATION.

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ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

date	detailed by
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designed by	**checked by**
C. CAMPO	N. RACHELSON

CITY OF THORNTON

WBWTP PAC FACILITY

PAC PRETREATMENT FACILITY PLAN AND SECTION

project	contract
177918	

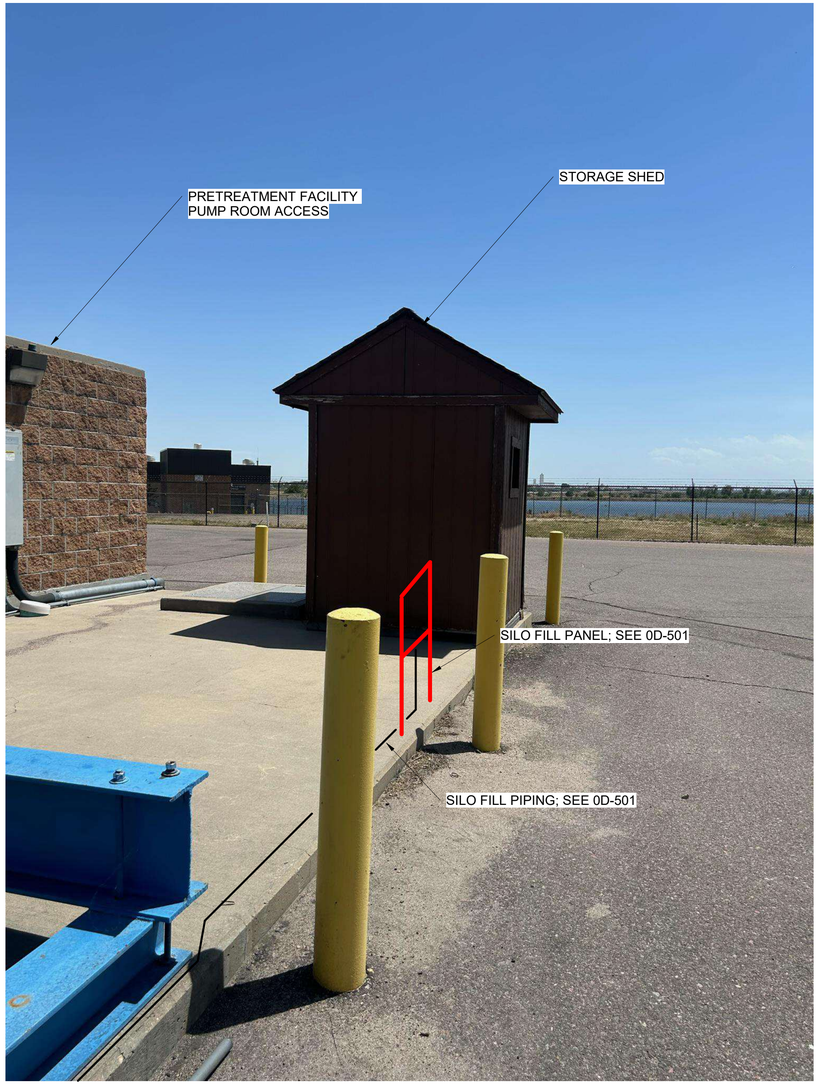
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SILO FILL STATION AND PIPING
NOT TO SCALE



PAC PRETREATMENT ACCESS AREA
NOT TO SCALE

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PAC PRETREATMENT FACILITY DETAILS

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SYMBOLS AND LINE TYPES FOR PLANS

GROUNDING/LIGHTNING PROTECTION

- GROUND CABLE
- BOLTED CONNECTION
- WELDED CONNECTION
- BI-METALIC CONNECTION
- GROUND ROD
- GROUND TEST WELL
- AIR TERMINAL
- GROUND BUS BAR

EQUIPMENT

- NEW EQUIPMENT
- EXISTING EQUIPMENT
- FUTURE EQUIPMENT
- DEMOLITION EQUIPMENT
- LIGHTING PANEL
- POWER PANEL
- DISCONNECT SWITCH
- FUSED DISCONNECT SWITCH
- COMBINATION DISCONNECT/ MAGNETIC MOTOR STARTER
- REDUCED VOLTAGE COMBINATION DISCONNECT/MAG MOTOR STARTER
- MOTOR
- MISC. ELECTRICAL LOAD
- JUNCTION BOX
- PULL BOX

LINES

- NEW CONSTRUCTION
- EXISTING CONSTRUCTION
- CONDUIT EXPOSED
- CONDUIT CONCEALED IN WALL, CEILING OR HIDDEN FROM VIEW
- CONDUIT CONCEALED IN FLOOR
- HOMERUN TO PANEL
- FLEXIBLE CONDUIT
- FO — FIBER-OPTIC CABLE
- UNDERGROUND ELECTRICAL ON BUILDING PLANS
- UGE — UNDERGROUND ELECTRICAL ON SITE PLANS
- OHE — OVERHEAD ELECTRICAL
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- CONDUIT TERMINATED AND CAPPED
- CONDUIT WITH BUSHING
- CONDUIT PASSING THRU ELEVATION

LIGHTING

- RECTANGULAR LUMINAIRE
- RECTANGULAR LUMINAIRE WITH EMERGENCY BACK-UP
- CIRCULAR LUMINAIRE
- CIRCULAR LUMINAIRE WITH EMERGENCY BACK-UP
- EMERGENCY WALL PACK UNIT
- CEILING MOUNTED EXIT SIGN
- WALL MOUNTED EXIT SIGN
- POLE-MOUNTED AREA LIGHT
- S — SINGLE POLE SWITCH
- S_3 — THREE-WAY SWITCH
- S_4 — FOUR-WAY SWITCH
- S_{WP} — WEATHERPROOF SWITCH
- S_D — DIMMER SWITCH
- S_{EXP} — EXPLOSIONPROOF SWITCH
- OS — CEILING MOUNTED OCCUPANCY SENSOR
- OS — WALL MOUNTED OCCUPANCY SENSOR
- PC — CEILING/ROOF MOUNTED PHOTOCELL
- PC — WALL MOUNTED PHOTOCELL

RECEPTACLES

- 208/240V RECEPTACLE
- 480V RECEPTACLE
- SURFACE, SIMPLEX RECEPTACLE
- SURFACE, SIMPLEX, GFI RECEPTACLE
- FLUSH, SIMPLEX RECEPTACLE
- FLUSH, SIMPLEX, GFI RECEPTACLE
- SURFACE, DUPLEX RECEPTACLE
- SURFACE, DUPLEX, GFI RECEPTACLE
- FLUSH, DUPLEX RECEPTACLE
- FLUSH, DUPLEX, GFI RECEPTACLE
- SURFACE, QUADPLEX RECEPTACLE
- SURFACE, QUADPLEX, GFI RECEPTACLE
- FLUSH, QUADPLEX RECEPTACLE
- FLUSH, QUADPLEX, GFI RECEPTACLE

DATA JACKS

- RECESSED DATA JACK
- RECESSED TELEPHONE / DATA JACK
- RECESSED TELEPHONE JACK
- SURFACE DATA JACK
- SURFACE TELEPHONE / DATA JACK
- SURFACE TELEPHONE JACK

INSTRUMENTS

- ACTUATED VALVE
- CONTROL STATION
- INSTRUMENT
- H — HORN
- X — STROBE LIGHT, COLOR AS INDICATED
- H — STROBE LIGHT AND HORN COMBINATION

ABBREVIATIONS	DESCRIPTION
(E)	EXISTING
(F) / FU	FUTURE
A	AMPERES
AF	AMP FRAME
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHF	ACTIVE HARMONIC FILTER
AIC	AMPS INTERRUPTING CURRENT
AT	AMP TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
BC	BARE COPPER WIRE
BF	BOTTOM FEED
BG	BELOW GRADE
BKR	BREAKER
BWPS	BACKWASH PUMP STATION/CLEAR WELL
C	CONDUIT
CHL	CHLORINE
COND	CONDUCTIVITY
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CTRL	CONTROL
EL	ELEVATION
EO	ELECTRICALLY OPERATED
EOT	END OF TRAVEL
ES	ETHERNET SWITCH, MANAGED
EX	EXPOSED
EXP	EXPLOSION-PROOF (CLASS1, DIV1, GROUP D)
EXT	EXTERIOR
FACP	FIRE ALARM CONTROL PANEL
GND	GROUND
GRC	GALVANIZED RIGID CONDUIT
GRC-C	GALVANIZED RIGID CONDUIT - COATED
HD-GALV	HOT-DIPPED GALVANIZED
HH	HANDHOLES
HME	HOME
INDUST	INSUSTRIAL
IO	INPUT/OUTPUT
LC	LIGHTING CONTACTOR
LFMC	LIQUIDTITE FLEXIBLE METAL CONDUIT
LGHT	LIGHT/ LIGHTING
LR	LINE REACTOR
MCC	MOTOR CONTROL CENTER
MTS	MANUAL TRANSFER SWITCH
MUN	MUNICIPAL
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
NIC	NETWORK INTERFACE CARD
OIT	OPERATOR INTERFACE TERMINAL
OM3	MULTI-MODE FIBER OM3 GRADE
P	POLE
PCS	PVC COATED STEEL
PLC	PROGAMMABLE LOGIC CONTROLLER
PP	POWER PANEL
PWR	POWER
REC	RECEPTACLE
RGS	RIGID GALVANIZED STEEL
RIO	REMOTE I/O
RW	RAW WATER
SDBC	SOLID DRAWN BARE COPPER WIRE
SP	SPARE
SPD	SURGE PROTECTIVE DEVICE
SW	SWITCH
T	CAT-6 CABLE
TF	TOP FEED
TM	THERMAL MAGNETIC
TYP.	TYPICAL
UE	UNDERGROUND ELECTRICAL
UPS	UNINTERRUPTIBLE POWER SUPPLY
VFD	VARIABLE FREQUENCY DRIVE
VLT	VAULT
WAP	WIRELESS ACCESS POINT
WP	WEATHERPROOF
WPIU	WEATHERPROOF IN-USE
XFMR	TRANSFORMER

GENERAL NOTES:

1. THIS IS A STANDARD ELECTRICAL LEGEND AND NOT ALL DEVICES AND DEVICE DESIGNATIONS ARE USED ON THIS PROJECT.

TAG DESIGNATION SCHEMES FOR PLANS

LUMINAIRE TAG SCHEME

LXX	LUMINAIRE TYPE
XXX-PNL-XXX-XX	CIRCUIT
SXXX	SWITCHING DEVICE(S)
XX'-XX" AFF	ELEVATION TO BOTTOM OF FIXTURE

RECEPTACLE TAG SCHEME

XXX-PNL-XXX	POWER SOURCE TAG
XX	CIRCUIT NUMBER
XXX	MODIFIER (IF APPLICABLE)

CABLE TRAY TAG SCHEME

XXX-CT-XXX	CABLE TRAY TAG
XX" x XX"	HEIGHT x WIDTH
XX'-XX" AFF	ELEVATION TO BOTTOM OF TRAY

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A. MORRONI	V. PATWARI

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ELECTRICAL GENERAL NOTES, SYMBOLS, AND ABBREVIATIONS I

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SYMBOLS AND LINE TYPES FOR ONE-LINES AND CONTROL DIAGRAMS

TRANSFORMERS

- POWER TRANSFORMER (XFMR)
- (2) — POTENTIAL TRANSFORMER (SHOWN WITH QUANTITY)
- 200:5 / (2) — CURRENT TRANSFORMER, SINGLE RATIO (SHOWN WITH QUANTITY)
- CONTROL POWER TRANSFORMER (ONE-LINE DIAGRAMS)
- CONTROL POWER TRANSFORMER (CONTROL SCHEMATIC DIAGRAMS)

PROTECTION/DISCONNECTS

- XX / XX — PROTECTION DEVICE (ANSI C37.2 DEVICE NUMBER AS INDICATED)
- CIRCUIT BREAKER
- FUSE
- FUSED DISCONNECT SWITCH
- DISCONNECT SWITCH
- POLE MOUNTED FUSED DISCONNECT SWITCH
- PLUG-IN OR DRAWOUT CONNECTION
- CAPACITOR
- THERMAL OVERLOADS
- O.L. (3) — THERMAL OVERLOAD RELAY (SHOWN WITH QUANTITY)

MOTOR CONTROLLERS FOR ONE-LINE DIAGRAMS

LABELS USED ON ONE-LINE DIAGRAMS REFER TO SCHEMATIC SHEETS USING LABELS AS USED BELOW:

- MNR## - SINGLE SPEED NON-REVERSING MANUAL MOTOR STARTER
- FVNR## - SINGLE SPEED NON-REVERSING MAGNETIC MOTOR START
- FVR## - SINGLE SPEED REVERSING MAGNETIC MOTOR STARTER
- 2FVNR## - TWO SPEED NON-REVERSING MAGNETIC MOTOR STARTER
- RVSS## - REDUCED-VOLTAGE SOLID-STATE
- VFD## - VARIABLE FREQUENCY DRIVE

FULL VOLTAGE MOTOR CONTROLLERS
(SYMBOLS ROTATED 90° FROM ACTUALL USAGE)

MNR## FVNR## FVR## 2FVNR##

SOLID-STATE MOTOR CONTROLLERS

- RVSS## / RVSS — SOFTSTART MOTOR CONTROLLER
- VFD## — CONTROLLER SCHEMATIC NUMBER
- INPUT FILTER — INPUT FILTER (IF USED)
- VFD CT/VT — VFD (VARIABLE FREQUENCY DRIVE)
- CT = CONSTANT TORQUE; VT = VARIABLE TORQUE
- OUTPUT FILTER — OUTPUT FILTER (IF USED)

INPUT & OUTPUT VFD FILTERS:

- AFE - ACTIVE FRONT END
- #% L.R. - LINE/LOAD REACTOR, DEPENDS ON LOCATION SHOWN
- DV/DT - DV/DT FILTER
- SINE - SINE WAVE/SINUS FILTER

LOADS/SOURCES

- GENERATOR
- ## — ELECTRIC MOTOR - APPROX. HORSEPOWER AS INDICATED
- EQUIPMENT AS NOTED ON DIAGRAM

PROTECTION/DISCONNECTS

- ARMS — ARC FLASH REDUCTION MAINTENANCE SWITCH
- TU — ELECTRONIC TRIP UNIT
- LSIG — LONG TIME, SHORT TIME, INSTANTANEOUS, AND GROUND TRIP SETTINGS

MISC ONE-LINE SYMBOLS

- (X) — "X" INDICATES NUMBER OF DEVICES WHEN MORE THAN ONE
- DELTA WINDING CONNECTION
- GROUNDING WYE WINDING CONNECTION
- MEDIUM VOLTAGE CABLE TERMINATION
- GROUNDING CONNECTION
- LIGHTNING ARRESTOR

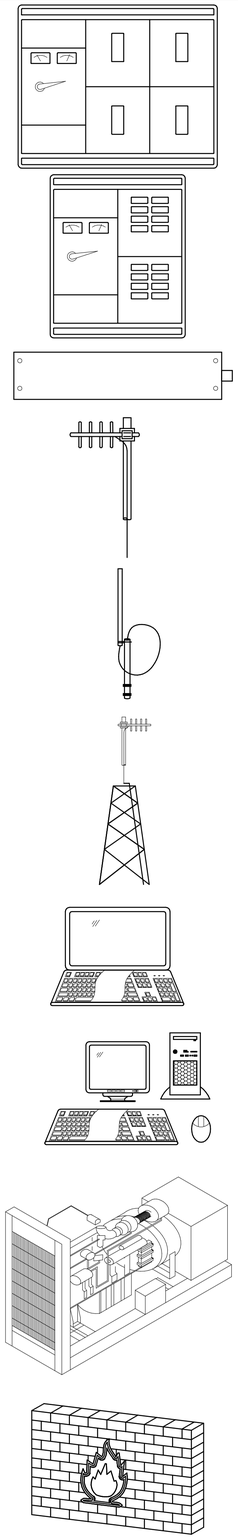
METERING/NETWORKING

- A — AMMETER
- V — VOLTMETER
- PQM — POWER QUALITY METER
- NSW — NETWORK SWITCH
- PSU — POWER SUPPLY UNIT

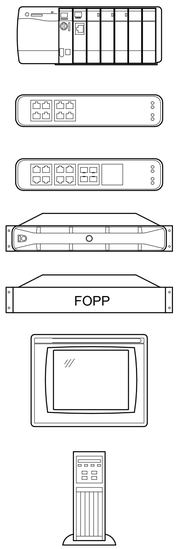
CONTROL DEVICES

- A / B — (A) LEVEL SWITCH - CLOSES WITH RISING LEVEL; (B) LEVEL SWITCH - OPENS WITH RISING LEVEL
- A / B — (A) FLOW SWITCH - CLOSES WITH INCREASING FLOW; (B) FLOW SWITCH - OPENS WITH INCREASING FLOW
- A / B — (A) MAINTAINED PUSH-BUTTON - N.O.; (B) MAINTAINED PUSH-BUTTON - N.C.
- A / B — (A) LIMIT SWITCH - N.C.; (B) LIMIT SWITCH - N.C. HELD OPEN
- A / B — (A) LIMIT SWITCH - N.O.; (B) LIMIT SWITCH - N.O. HELD CLOSED
- A / B — (A) PRESSURE SWITCH - CLOSES WITH INCREASING PRESSURE; (B) PRESSURE SWITCH - OPENS WITH INCREASING PRESSURE
- A / B — (A) MOMENTARY PUSH-BUTTON - N.O.; (B) MOMENTARY PUSH-BUTTON - N.C.
- A / B — (A) TEMP. SWITCH - CLOSES WITH RISING TEMP.; (B) TEMP. SWITCH - OPENS WITH RISING TEMP.
- A / B — (A) N.O. TIME DELAY CONTACT; (B) N.C. TIME DELAY CONTACT
- X / X / XO — TWO POSITION SELECTOR SWITCH
- X / X / X / XOO — THREE POSITION SELECTOR SWITCH
- X / X / X / XOOO — FOUR POSITION SELECTOR SWITCH
- SOLENOID VALVE
- PHOTOCELL
- X — INDICATING LIGHT, COLOR AS INDICATED
- X — PUSH-TO-TEST INDICATING LIGHT, COLOR AS INDICATED

SYMBOLS AND LINE TYPES FOR NETWORK ARCHITECTURE DIAGRAMS



- SWITCHGEAR
- SWITCHBOARD
- ETHERNET RADIO
- YAGI ANTENNA
- OMNI ANTENNA
- RADIO TOWER
- OPERATOR LAPTOP
- OPERATOR WORKSTATION
- GENERATOR
- NETWORK FIREWALL



- PLC
- NETWORK SWITCH
- NETWORK SWITCH (WITH SFP PORTS)
- SERVER RACK
- FIBER OPTIC PATCH PANEL
- OIT
- UPS

TAGGING DESIGNATION SCHEMES AND LINE TYPES FOR ONE-LINES AND DIAGRAMS

INSTRUMENT TAG SCHEME

EQUIPMENT/INSTRUMENT IDENTIFIER
FACILITY AREA OR SYSTEM
LOOP NUMBER — XXX-XXX / XXX

NOTES

1. INSTRUMENT ELEVATION ASSOCIATED CONTROL PANEL

WIRE TAG SCHEME

WIRE TYPE — (W)##
WIRE NUMBER — (W)## / (W)## / (W)##

NOTES

1. OPTIONAL CONFIGURATIONS SHOWN.

LINE TYPES AND TERMINALS

- POWER CIRCUIT AND EQUIPMENT INSTALLED BY THIS CONTRACT
- EXISTING CIRCUIT AND EQUIPMENT
- FUTURE POWER CIRCUIT AND EQUIPMENT
- EQUIPMENT ENCLOSURE
- REMOTE WIRING
- CAT 6 / ETHERNET
- ENCLOSURE
- FUTURE
- BUILDING OUTLINE
- SKID / VENDOR PROVIDED ENCLOSURE
- + (A) / - (B) — (A) POSITIVE TERMINAL; (B) NEGATIVE TERMINAL
- A / B — (A) CONDUCTOR CONNECTION; (B) NO CONNECTION
- SM — FIBER OPTIC CABLE - SINGLE MODE
- MM — FIBER OPTIC CABLE - MULTI-MODE

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BURNS McDONNELL
9191 S. JAMAICA STREET
ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

date	detailed by
OCTOBER 2026	A. BENSON
designed by	checked by
A. MORRONI	V. PATWARI

CITY OF THORNTON

WBWTP PAC FACILITY

ELECTRICAL GENERAL NOTES, SYMBOLS, AND ABBREVIATIONS II

project	contract
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drawing	rev.
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Millimeters / Inches — Scale For Microfilming

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AREA CLASSIFICATION TABLE

LOCATION	AREA CLASSIFICATION	DESCRIPTION OF CLASSIFIED AREA	NFPA REFERENCE	AIR CHANGES PROVIDED	CONDUIT AND FITTING	FLEXIBLE TYPE	ENCLOSURE NEMA RATING	RACEWAY SUPPORTS	HARDWARE
PAC SILO STORAGE (INSIDE SILO)	DIVISION 1, CLASS 2	ENTIRE SPACE	NFPA 70, 500.5(C)(1)	NONE	C-GRC	LFMC	NEMA 4X, SS	316 STAINLESS STEEL	316 STAINLESS STEEL
PAC SILO SKIRTED AREA (DIRECTLY UNDER SILO)	DIVISION 2, CLASS 2	ENTIRE SPACE, INCLUDING ROOF EQUIPMENT	NFPA 70,500.5(C)(2)	NONE	C-GRC	LFMC	NEMA 4X, SS	316 STAINLESS STEEL	316 STAINLESS STEEL
SLUDGE LAGOON	UNCLASSIFIED, WET	N/A	N/A	N/A	GRC	FMC	NEMA 4X, SS	316 STAINLESS STEEL	316 STAINLESS STEEL
INDOOR NON-PROCESS AREA	UNCLASSIFIED	N/A	N/A	N/A	GRC	FMC	NEMA 4X, SS	316 STAINLESS STEEL	316 STAINLESS STEEL
OUTDOORS, NON-PROCESS AREA	UNCLASSIFIED, WET	N/A	N/A	N/A	GRC	LFMC	NEMA 4X, SS	316 STAINLESS STEEL	316 STAINLESS STEEL
VAULTS	UNCLASSIFIED, WET	N/A	N/A	N/A	PVC	LFMC	NEMA 6P	316 STAINLESS STEEL	316 STAINLESS STEEL
ELECTRICAL ROOMS	UNCLASSIFIED, DRY	N/A	N/A	N/A	GRC	FMC	NEMA 12	GALVANIZED	

POWER CABLE / CONDUIT SIZES

CONDUIT DESCRIPTOR	WIRE/CONDUIT		CONDUIT DESCRIPTOR	WIRE/CONDUIT
P1*	2-#12, #12 GND, 3/4"C		P21	2 SETS - 3-300KCMIL, #1/0 GND, 2-1/2"C
P2*	3-#12, #12 GND, 3/4"C		P21N	2 SETS - 4-300KCMIL, #1/0 GND, 3"C
P3*	2-#10, #12 GND, 3/4"C		P22	3-350KCMIL, #2 GND, 2-1/2"C
P4*	3-#10, #12 GND, 3/4"C		P22N	4-350KCMIL, #2 GND, 3"C
P5*	2-#8, #10 GND, 3/4"C		P23	2 SETS - 3-350KCMIL, #1/0 GND, 2-1/2"C
P6*	3-#8, #10 GND, 1"C		P23N	2 SETS - 4-350KCMIL, #1/0 GND, 3"C
P7*	2-#6, #8 GND, 3/4"C		P24	3-500KCMIL, #2 GND, 4"C
P8*	3-#6, #8 GND, 1"C		P24N	4-500KCMIL, #2 GND, 4"C
P9*	2-#4, #8 GND, 3/4"C		P25	2 SETS - 3-500KCMIL, #1/0 GND, 4"C
P10*	3-#4, #8 GND, 1-1/4"C		P25N	2 SETS - 4-500KCMIL, #1/0 GND, 4"C
P11*	2-#2, #6 GND, 1"C		P26	3 SETS - 3-500KCMIL, #2/0 GND, 4"C
P12*	3-#2, #6 GND, 1-1/4"C		P26N	3 SETS - 4-500KCMIL, #2/0 GND, 4"C
P13*	2-#1/0, #6 GND, 1-1/4"C		P27	4 SETS - 3-500KCMIL, #4/0 GND, 4"C
P14*	3-#1/0, #6 GND, 1-1/2"C		P27N	4 SETS - 4-500KCMIL, #4/0 GND, 4"C
P15*	3-#2/0, #6 GND, 2"C		P28	5 SETS - 3-500KCMIL, 250KCMIL GND, 4"C
P16*	3-#3/0, #6 GND, 2"C		P28N	5 SETS - 4-500KCMIL, 250KCMIL GND, 4"C
P17*	3-#4/0, #4 GND, 2"C		P29	6 SETS - 3-500KCMIL, 350KCMIL GND, 4"C
P18	3-250KCMIL, #4 GND, 2"C		P29N	6 SETS - 4-500KCMIL, 350KCMIL GND, 4"C
P18N	4-250KCMIL, #4 GND, 2"C		P30	7 SETS - 3-500KCMIL, 500KCMIL GND, 4"C
P19	2 SETS - 3-250KCMIL, #4 GND, 2"C		P30N	7 SETS - 4-500KCMIL, 500KCMIL GND, 4"C
P19N	2 SETS - 4-250KCMIL, #4 GND, 2-1/2"C		P31	8 SETS - 3-500KCMIL, 500KCMIL GND, 4"C
P20	3-300KCMIL, #4 GND, 2-1/2"C		P31N	8 SETS - 4-500KCMIL, 500KCMIL GND, 4"C
P20N	4-300KCMIL, #4 GND, 2-1/2"C			

NOTE *: WHERE "N" IS USED ON THE DRAWINGS APPENDED TO THE DESCRIPTORS SHOWN ABOVE AN ADDITIONAL CONDUCTOR EQUAL TO THE PHASE CONDUCTORS IS TO BE PROVIDED.

ANALOG CABLE / CONDUIT SIZES

CONDUIT DESCRIPTOR	WIRE/CONDUIT
A1	1-#16/2 TSP, 3/4"C
A2	2-#16/2 TSP, #18 GND, 3/4"C
A3	3-#16/2 TSP, #18 GND, 3/4"C
A4	4-#16/2 TSP, #18 GND, 1"C
A5	5-#16/2 TSP, #18 GND, 1"C
A6	6-#16/2 TSP, #18 GND, 1-1/4"C
A7	7-#16/2 TSP, #18 GND, 1-1/4"C
A8	8-#16/2 TSP, #18 GND, 1-1/4"C
A9	9-#16/2 TSP, #18 GND, 1-1/4"C
A10	10-#16/2 TSP, #18 GND, 1-1/4"C
A11	11-#16/2 TSP, #18 GND, 1-1/2"C
A12	12-#16/2 TSP, #18 GND, 1-1/2"C
A13	13-#16/2 TSP, #18 GND, 1-1/2"C
A14	14-#16/2 TSP, #18 GND, 2"C
A15	15-#16/2 TSP, #18 GND, 2"C
A16	16-#16/2 TSP, #18 GND, 2"C
A17	17-#16/2 TSP, #18 GND, 2"C
A18	18-#16/2 TSP, #18 GND, 2"C
A19	19-#16/2 TSP, #18 GND, 2"C
A20	20-#16/2 TSP, #18 GND, 2"C
A21	21-#16/2 TSP, #18 GND, 2"C
A22	22-#16/2 TSP, #18 GND, 2"C
A23	23-#16/2 TSP, #18 GND, 2-1/2"C
A24	24-#16/2 TSP, #18 GND, 2-1/2"C
A25	25-#16/2 TSP, #18 GND, 2-1/2"C

DISCRETE CABLE / CONDUIT SIZES

CONDUIT DESCRIPTOR	WIRE/CONDUIT
C1	NOT USED
C2	2-#14, 3/4"C
C3	3-#14, 3/4"C
C4	4-#14, 3/4"C
C5	5-#14, 3/4"C
C6	6-#14, 3/4"C
C7	7-#14, 3/4"C
C8	8-#14, 3/4"C
C9	9-#14, 3/4"C
C10	10-#14, 3/4"C
C11	11-#14, 3/4"C
C12	12-#14, 1"C
C13	13-#14, 1"C
C14	14-#14, 1"C
C15	15-#14, 1"C
C16	16-#14, 1"C
C17	17-#14, 1"C
C18	18-#14, 1"C
C19	19-#14, 1"C
C20	20-#14, 1-1/4"C
C21	21-#14, 1-1/4"C
C22	22-#14, 1-1/4"C
C23	23-#14, 1-1/4"C
C24	24-#14, 1-1/4"C
C25	25-#14, 1-1/4"C

MULTICONDUCTOR CABLE / CABLE SIZES

CONDUIT DESCRIPTOR	WIRE/CONDUIT
M2	1-(2-#14), 3/4"C
M3	1-(3-#14), 3/4"C
M4	1-(4-#14), 3/4"C
M5	1-(5-#14), 3/4"C
M6	1-(6-#14), 3/4"C
M7	1-(7-#14), 3/4"C
M8	1-(8-#14), 3/4"C
M9	1-(9-#14), 1"C
M10	1-(10-#14), 1"C
M11	1-(11-#14), 1"C
M12	1-(12-#14), 1"C
M13	1-(13-#14), 1"C
M14	1-(14-#14), 1"C
M15	1-(15-#14), 1-1/4"C
M16	1-(16-#14), 1-1/4"C
M17	1-(17-#14), 1-1/4"C
M18	1-(18-#14), 1-1/4"C
M19	1-(19-#14), 1-1/4"C
M20	1-(20-#14), 1-1/4"C

NETWORK CABLE / CONDUIT SIZES

CONDUIT DESCRIPTOR	WIRE/CONDUIT
N1	1 - CAT 6 NETWORK, 3/4"C
N2	2 - CAT 6 NETWORK, 3/4"C
N3	3 - CAT 6 NETWORK, 1"C
N4	4 - CAT 6 NETWORK, 1"C
N5	1 - 6 STR MM FIBER, 1"C
N6	1 - 12 STR MM FIBER, 1"C
N7	1 - 24 STR MM FIBER, 1"C
N8	1 - 6 STR SM FIBER, 1"C
N9	1 - 12 STR SM FIBER, 1"C
N10	1 - 24 STR SM FIBER, 1"C

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9191 S. JAMAICA STREET
ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

date	detailed by
OCTOBER 2026	A. BENSON
designed by	**checked by**
A. MORRONI	V. PATWARI

CITY OF THORNTON

WBWTP PAC FACILITY

ELECTRICAL MATERIALS, DESIGNATION, AND HAZARDOUS CLASSIFICATION

project	contract
177918	

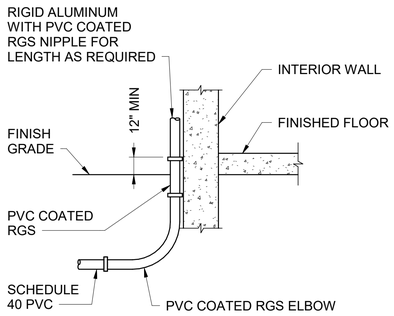
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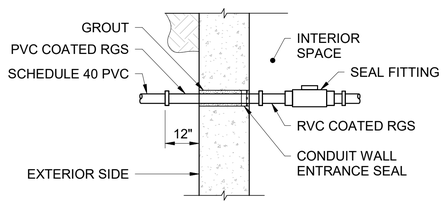


GENERAL NOTES:

1. COORDINATE CONDUIT TYPE WITH TABLE ON 0E-003.

EXTERIOR STUB-UP — EC-0020

NOT TO SCALE

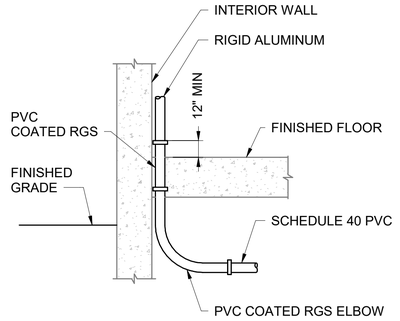


GENERAL NOTE:

1. TYPICAL BELOW GRADE CONDUIT THROUGH EXISTING CONCRETE WALL DETAIL

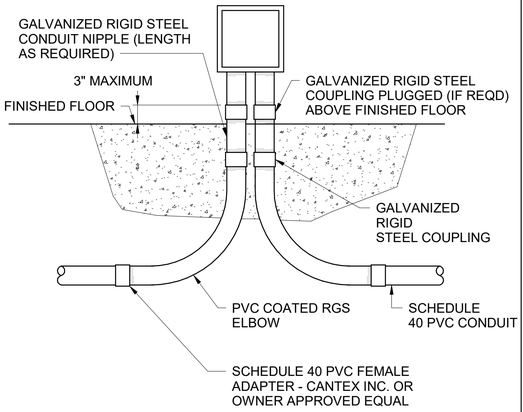
BELOW GRADE CONDUIT THROUGH EXISTING WALL — EC-0011

NOT TO SCALE



INTERIOR STUB-UP - ALTERNATIVE — EC-0022

NOT TO SCALE

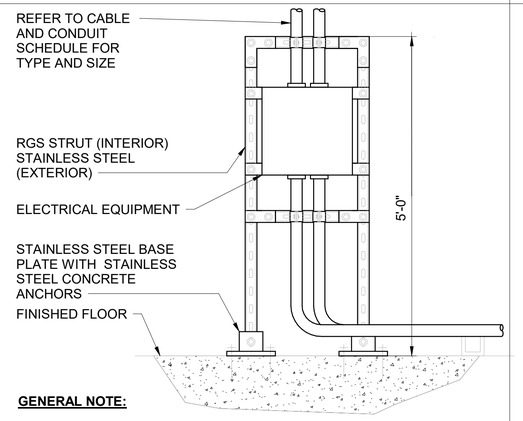


GENERAL NOTES:

1. BACKFILL -
   A. OBTAIN BACKFILL MATERIALS FROM TRENCHES AND OTHER EXCAVATION IN THIS CONTRACT AND/OR FROM THE ON SITE BORROW AREAS AS DESIGNATED BY THE RESIDENT PROJECT REPRESENTATIVE.
   B. BACKFILL MATERIALS INCLUDE MATERIAL THAT IS FREE OF DEBRIS, ROOTS, ORGANIC MATTER, REFUSE, CINDERS, FROZEN MATTER, AND ALSO FREE OF ROCK, WITH A DIMENSION GREATER THAN 2 INCHES.
2. COMPACTION -
   A. PLACE BACKFILL MATERIAL IN LEVEL LAYERS NOT EXCEEDING 4 TO 8 INCHES.
   B. USE HAND METHODS TO A HORIZONTAL PLANE OF 12 INCHES ABOVE TOP OF CONDUIT.
   C. USE APPROVED MECHANICAL METHODS WHERE HAND BACKFILL IS NOT REQUIRED.
   D. FOR BACKFILL COMPACTION AND MOISTURE CONTENT REQUIREMENTS SEE STRUCTURAL AND CIVIL SPECIFICATIONS.
3. DETAIL ALSO APPLIES TO MULTIPLE CONDUIT INSTALLATION AND DIRECT BURIED CABLE.
4. BACKFILL AND COMPACTION REQUIREMENTS ALSO APPLY TO ROADWAY LIGHTING FOUNDATIONS.
5. COORDINATE CONDUIT TYPE TABLE ON 0E-003.

TWO CONDUIT RISER — EC-0031

NOT TO SCALE

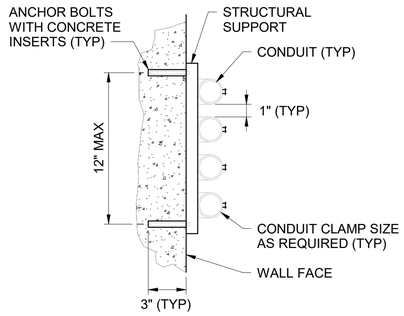


GENERAL NOTE:

1. RACK SIZE IS FOR INFORMATION PURPOSES ONLY. RACK SIZES SHALL BE SIZED TO SUPPORT EQUIPMENT SHOWN ON PLANS.

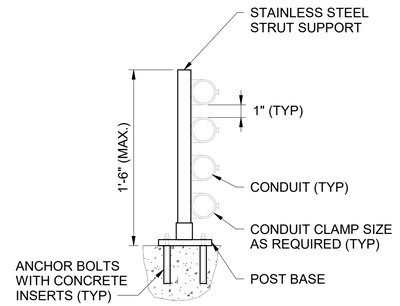
RACK ELEVATION — EC-0351

NOT TO SCALE



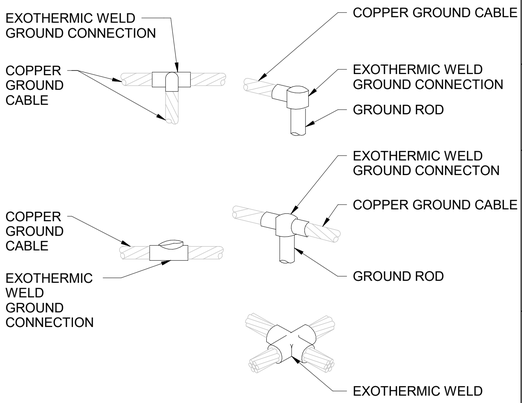
EXPOSED CONDUIT ROUTING (WALL) — EC-0141

NOT TO SCALE



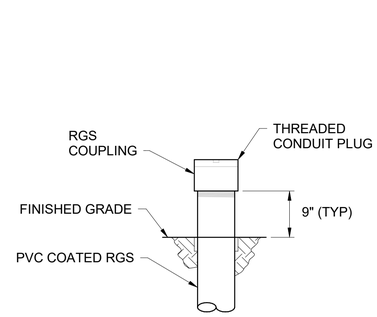
EXPOSED CONDUIT ROUTING (STRUT) — EC-0142

NOT TO SCALE



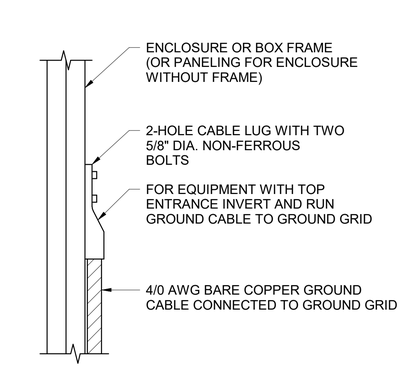
EXOTHERMIC WELDS — EG-0010

NOT TO SCALE



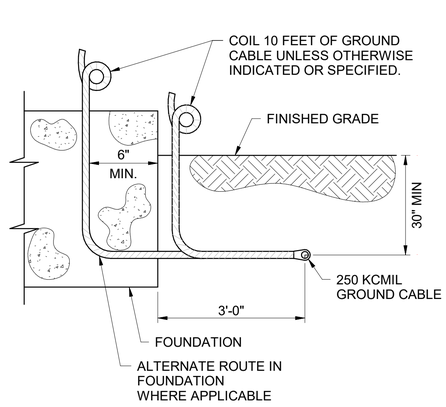
EXTERIOR CONDUIT CAP — EC-0391

NOT TO SCALE



EQUIPMENT ENCLOSURE GROUNDING — EG-0009

NOT TO SCALE



BURIED GROUND GRID — EG-0001

NOT TO SCALE

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BURNS McDONNELL
9191 S. JAMAICA STREET
ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

date	detailed by
OCTOBER 2026	A. BENSON
designed by	**checked by**
A. MORRONI	V. PATWARI

CITY OF THORNTON

WBWTP PAC FACILITY

ELECTRICAL DETAILS I

project	contract
177918	

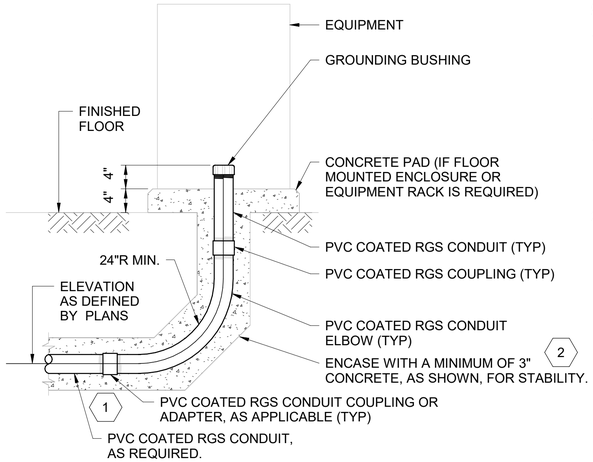
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GENERAL NOTE:

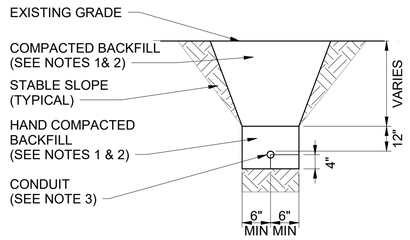
1. THIS DETAIL IS TYPICAL FOR SINGLE AND MULTI-DUCT ARRANGEMENTS.

KEYED NOTES: (#)

1. USE PVC COATED RGS CONDUITS WHERE A DUCT BANK CROSSES UNDER DEFINED ROADWAYS, RAILROADS AND FOR A DISTANCE OF 10 FEED BEYOND EACH SIDE.
2. ALL DUCT BANKS SHALL BE REINFORCED AS SHOWN IN DETAIL ED-0010 ON THIS SHEET.

EXTERIOR DUCT BANK RISER — ED-0011

NOT TO SCALE

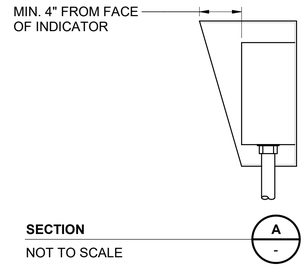


GENERAL NOTES:

1. BACKFILL -
   A. OBTAIN BACKFILL MATERIALS FROM TRENCHES AND OTHER EXCAVATION IN THIS CONTRACT AND/OR FROM THE ON SITE BORROW AREAS AS DESIGNATED BY THE RESIDENT PROJECT REPRESENTATIVE.
   B. BACKFILL MATERIALS INCLUDE MATERIAL THAT IS FREE OF DEBRIS, ROOTS, ORGANIC MATTER, REFUSE, CINDERS, FROZEN MATTER, AND ALSO FREE OF ROCK, WITH A DIMENSION GREATER THAN 2 INCHES.
2. COMPACTION -
   A. PLACE BACKFILL MATERIAL IN LEVEL LAYERS NOT EXCEEDING 4 TO 8 INCHES.
   B. USE HAND METHODS TO A HORIZONTAL PLANE OF 12 INCHES ABOVE TOP OF CONDUIT.
   C. USE APPROVED MECHANICAL METHODS WHERE HAND BACKFILL IS NOT REQUIRED.
   D. FOR BACKFILL COMPACTION AND MOISTURE CONTENT REQUIREMENTS SEE STRUCTURAL AND CIVIL SPECIFICATIONS.
3. DETAIL ALSO APPLIES TO MULTIPLE CONDUIT INSTALLATION AND DIRECT BURIED CABLE.
4. BACKFILL AND COMPACTION REQUIREMENTS ALSO APPLY TO ROADWAY LIGHTING FOUNDATIONS.

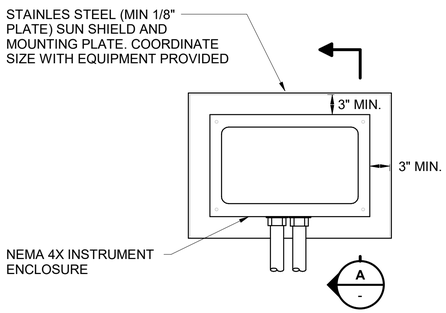
BURIED CONDUIT — EC-0500

NOT TO SCALE



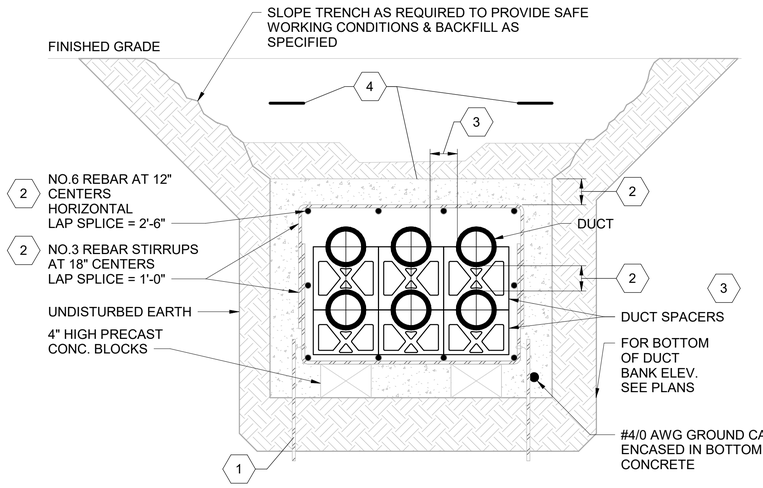
SECTION — A -

NOT TO SCALE



INSTRUMENT SUNSHADE — IN-0008

NOT TO SCALE



GENERAL NOTES:

1. ALL DUCT BANKS SHALL BE ENCASED IN CONCRETE PER SPECIFICATIONS AND SHALL BE SMOOTH FORMED A MINIMUM OF 3'-0" FROM THE TOP OF THE STUB-UPS. DUCT BANKS MAY BE EARTH FORMED WITH UNDISTRUBED EARTH PROVIDED THE EARTH WILL STAND TO A NEAR VERTICAL SLOPE. IF TRENCH IS OVER-EXCAVATED, COMPACT PER SITEWORK PREPARATION AND EARTHWORK SPECIFICATIONS.
2. REFER TO DUCT BANK SECTIONS FOR DUCT QUANTITY, SIZE AND CONFIGURATION.
3. WHERE DUCT BANKS TERMINATE AT A MANHOLE, HANDHOLE OR OTHER UNDERGROUND STRUCTURE THE DUCTS SHALL BE SLOPED A MINIMUM OF 1/8 IN./FT/ UNLESS OTHERWISE NOTED TO PROVIDE DRAINAGE BACK TO THE STRUCTURE.

KEYED NOTES: (#)

1. TIE DOWN DUCTS AS REQUIRED TO PREVENT FLOATING DURING CONCRETE PLACEMENT. IF TIED TO REINFORCING, USE FRP, SST, OR COATED ANCHORS SO ANCHORS DO NOT ACT AS A PATH FOR CORROSION FOR THE REINFORCING.
2. REINFORCING STEEL SHALL BE USED IN ALL DUCT BANKS UNLESS OTHERWISE NOTED. DO NOT ALLOW REINFORCING STEEL TO BE IN CONTACT WITH DUCTS & PROVIDE A MINIMUM OF 3" OF CONCRETE COVER OVER THE REINFORCING STEEL.
3. INSTALL INTERLOCKING TYPE PLASTIC DUCT SPACERS AT INTERVALS PER SPECIFICATIONS TO MAINTAIN A 3 INCH MINIMUM HORIZONTAL AND VERTICAL SPACING BETWEEN DUCTS.
4. USE A RED DYE ADDITIVE MIXED INTO THE CONCRETE AND PROVIDE METALLIC WARNING TAPES ABOVE THE OUTSIDE EDGES ON BOTH SIDES OF THE DUCT BANK AS CAUTIONARY MARKINGS.

DUCT BANK TRENCH — ED-0010

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ELECTRICAL DETAILS II

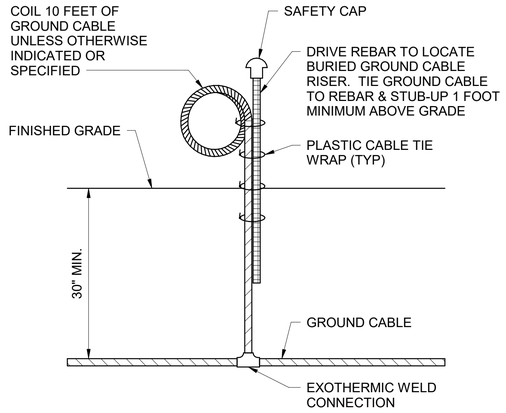
project	contract
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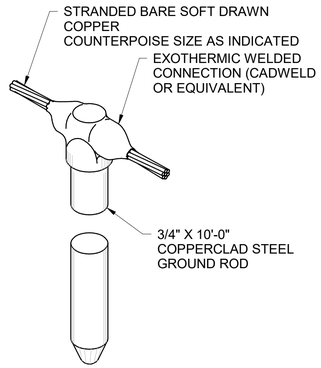
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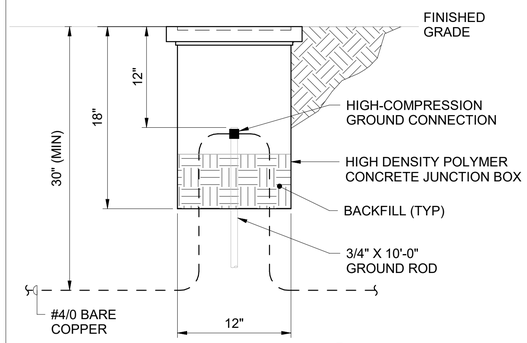
GROUND CABLE RISER — EG-0014

NOT TO SCALE



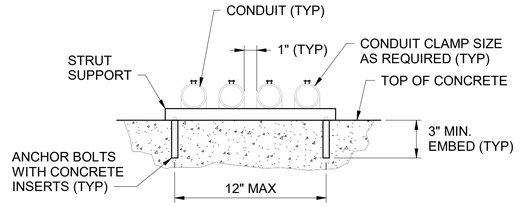
GROUND ROD WELD — EG-0018

NOT TO SCALE



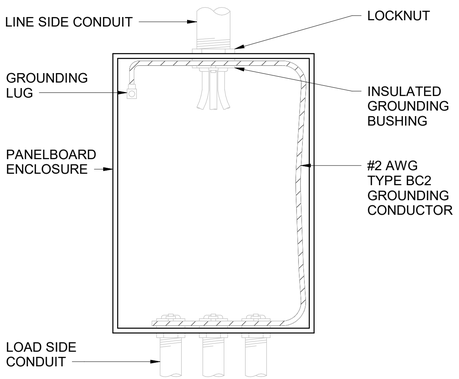
SECTION — A

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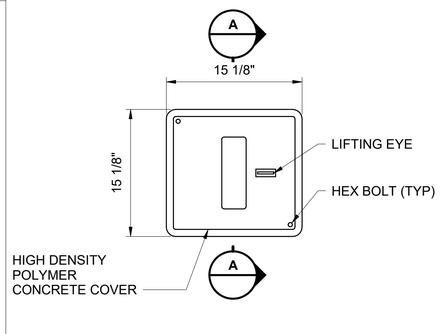
EXPOSED CONDUIT ROUTING (FLOOR) — EC-0140

NOT TO SCALE



PANELBOARD GROUNDING — EG-0022

NOT TO SCALE



GROUND TEST WELL — EG-0019

NOT TO SCALE

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ELECTRICAL DETAILS III

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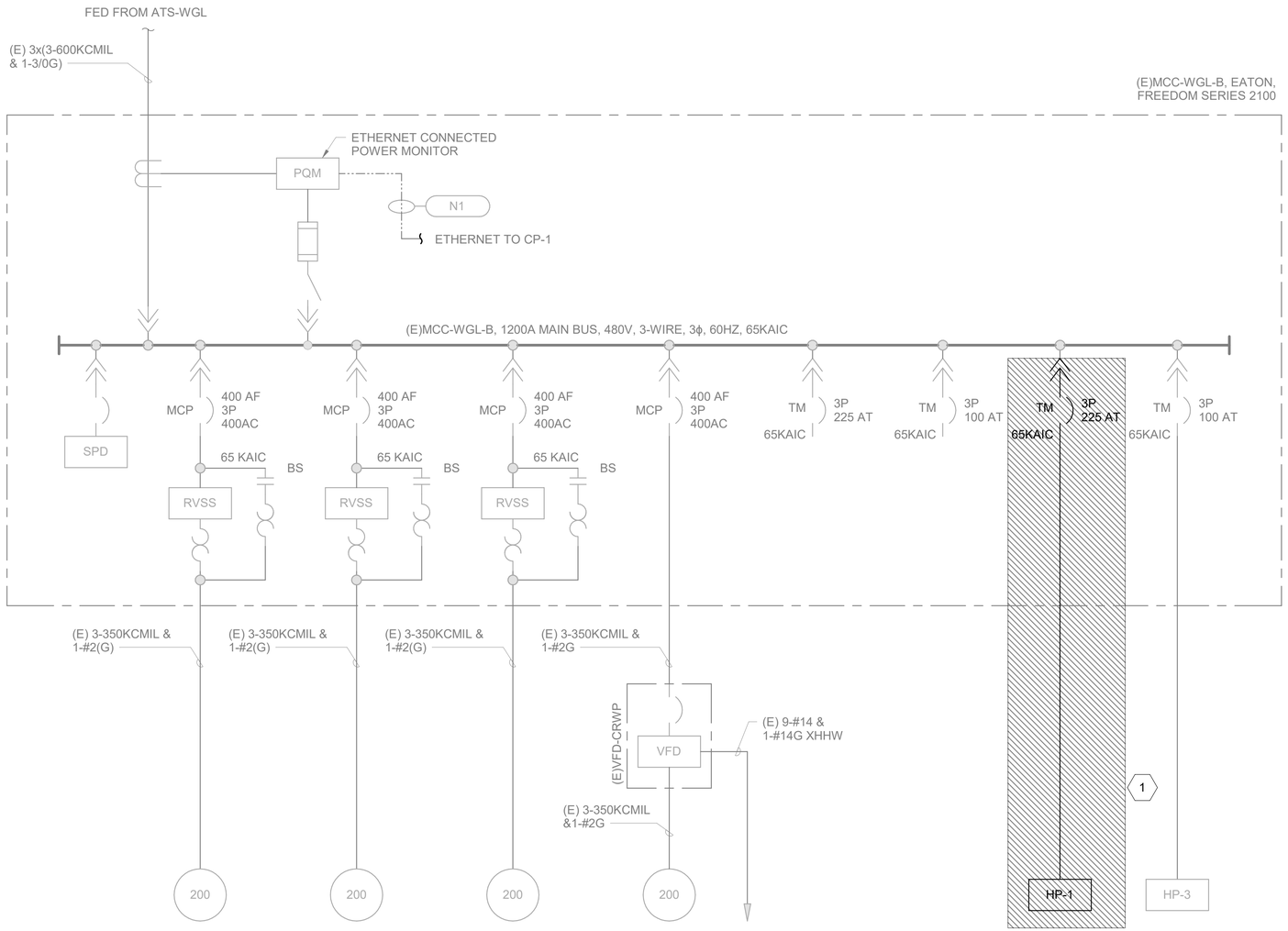
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DEMOLITION EXISTING MCC-WGL-B ONE-LINE I

NOT TO SCALE

GENERAL NOTES

1. REFER TO 0E-001 FOR ELECTRICAL LEGENDS & ABBREVIATIONS.
2. REFER TO 0E-003 FOR CONDUIT DESIGNATIONS AND CABLE SCHEDULE.
3. DRAWING BASED ON AS BUILT DRAWINGS PROVIDED BY OWNER. CONTRACTOR TO FIELD VERIFY FOR ACCURACY.

KEYED NOTES (#)

1. DEMOLISH EXISTING 225AT BREAKER FOR HP-1, CONDUCTORS ROUTED FROM MCC-WGL-B TO HP-1, AND HP-1. PROTECT CONDUIT IN PLACE AND REUSE TO REFEED NEW HP-1 FROM NEW 400AT BREAKER IN MCC-WGL-B.

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WBWTP PAC FACILITY

DEMOLITION ONE-LINE DIAGRAM I

project	contract
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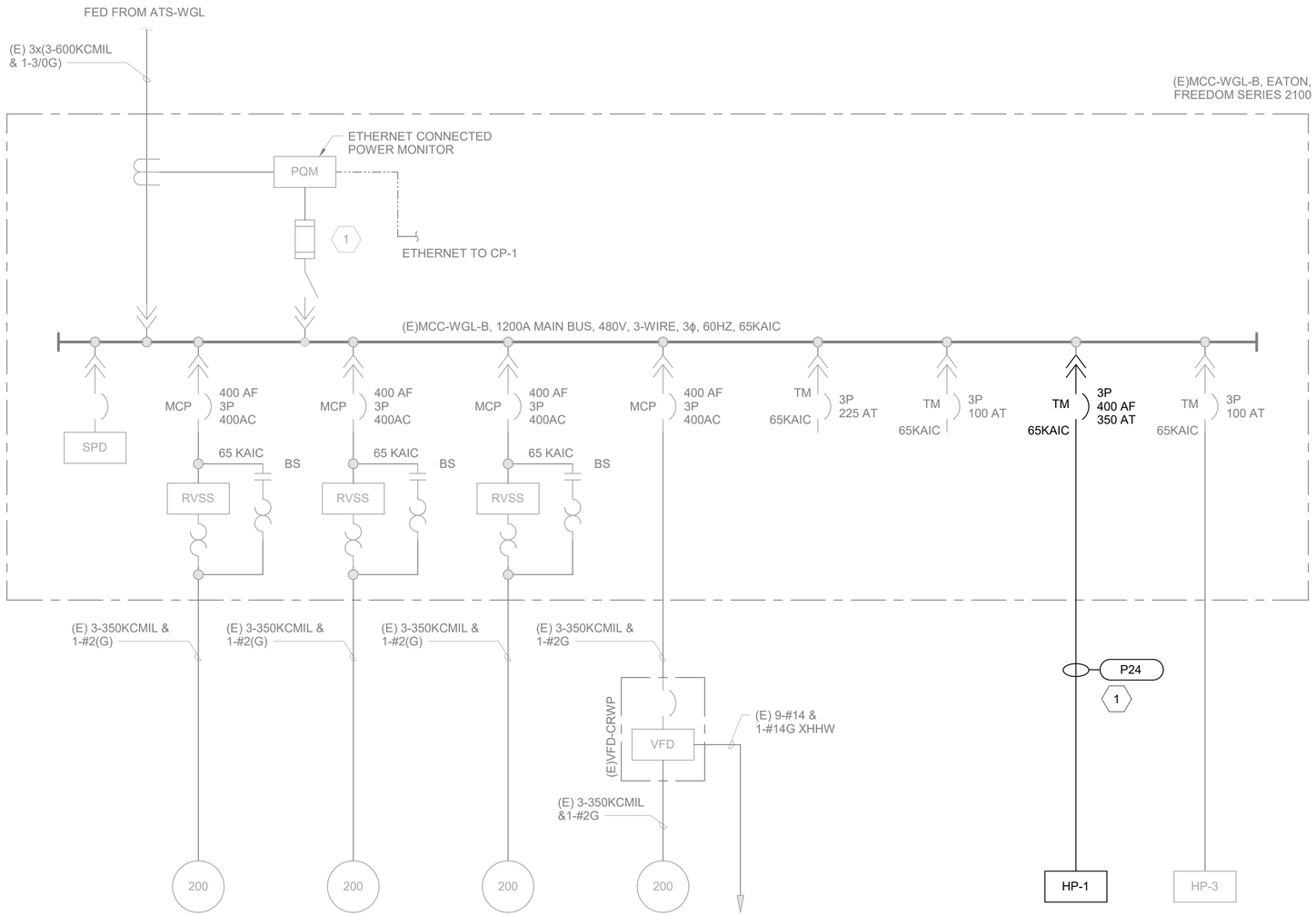
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EXISTING MCC-WGL-B ONE-LINE I

NOT TO SCALE

GENERAL NOTES

1. REFER TO 0E-001 FOR ELECTRICAL LEGENDS & ABBREVIATIONS.
2. REFER TO 0E-003 FOR CONDUIT DESIGNATIONS AND CABLE SCHEDULE.
3. DRAWING BASED ON AS BUILT DRAWINGS PROVIDED BY OWNER. CONTRACTOR TO FIELD VERIFY FOR ACCURACY.

KEYED NOTES (#)

1. PROTECT CONDUIT IN PLACE AND REUSE TO REFEED NEW HP-1 FROM NEW 350AT BREAKER IN MCC-WGL-B. UTILIZE EXISTING SPACE UNDER EXISTING HP-1 FEEDER BREAKER FOR LARGER FRAME BREAKER AS REQUIRED. CONTRACTOR TO FIELD VERIFY EXISTING CONDUIT'S CONDITION FOR REUSE.

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ONE-LINE DIAGRAM I

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ELECTRICAL EQUIPMENT	VOLTAGE (Y/V)	PHASE	WIRE	MAIN BUS (A)	MAIN BREAKER	MOUNTING	LOCATION	NEMA RATING	SHORT CIRCUIT (KAIC)	FED VIA	
MCC-WGL-B (E)	480	3	3	1200	1200	PAD MOUNT	OUTDOORS	NEMA 3R	65	ATS-WGL	* G = GASKETED

LOAD DESCRIPTION	PHASE	RPM	ENCLOSURE	HP	VOLTS	CURRENT	KVA	LOAD TYPE	CONTINUOUS/ INTERMITTENT/ SPARE	STARTER TYPE	DEMAND FACTOR	DEMAND KVA
CRWP-1 (E)	3	1800	SELF	200	480	240.00	191.2	M	C	RVSS	100%	191.2
CRWP-2 (E)	3	1800	SELF	200	480	240.00	191.2	M	C	RVSS	100%	191.2
CRWP-3 (E)	3	1800	SELF	200	480	240.00	191.2	M	S	RVSS	0%	0.0
CRWP-4 (E)	3	1800	SELF	200	480	240.00	191.2	M	S	VFD	0%	0.0
HP-1	3	1800	SELF		480	172.47	143.3	M	C	FEEDER	100%	143.3
HP-3 (E)	3	1800	SELF		480	55.57	46.2	M	C	FEEDER	100%	46.2

TOTAL CONNECTED KVA:	954.4	DEMAND AT FULL PLANT OUTPUT (KVA):	571.9
TOTAL CONNECTED AMPS:	1188.0	FEEDER CALC NEC 215 (KVA):	714.9
MIN BUS SIZE:	859.9	FEEDER CALC NEC 430 (KVA):	619.7
BUS SIZE:	1200	TOTAL FEEDER AMPS (A):	859.9
		DIVERSITY LOAD (A):	688.3

LOAD TYPES:
M = MOTOR
F = FEEDER
B = BRANCH
C = CONTINUOUS
I = INTERMITTENT
S = STANDBY

GENERAL NOTES:

1. IT HAS BEEN CONFIRMED WITH THE CITY THAT ONLY TWO CRWP PUMPS CAN OPERATE CONCURRENTLY WITH THE EXISTING ELECTRICAL CAPACITY AT THE WGL FACILITY.

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LOAD SCHEDULES I

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PANELBOARD:	HP-1				MAIN BUS:	400 A					MAIN BREAKER/MLO:		350AT
VOLTS:	480V				PHASE:	3					SYM. A.I.C. MIN.:		65KAIC
FED FROM:	MCC-WGL-B				WIRE:	3					ENCLOSURE:		NEMA 4X
LOCATION:	PAC PRETREATMENT FACILITY										MOUNTING:		SURFACE

DESCRIPTION	NO. POLES	TRIP AMPS	POLE NO.		LOAD - VA A	LOAD - VA B	LOAD - VA C	POLE NO.		TRIP AMPS	NO. POLES	DESCRIPTION
DUST COLLECTOR DC118 (EXISTING)	3	15	1	<--	1266.67				2	125	3	MIXER (REPLACE IN KIND)
					20433.33			-->				
			3	<--		1266.67			4			
						20433.33		-->				
			5	<--			1266.67		6			
							20433.33	-->				
SPARE	3	80	7	<--	0.00				8	50	3	LP 1 (EXISTING)
					3333.33			-->				
			9	<--		0.00			10			
						3333.33		-->				
			11	<--			0.00		12			
							3333.33	-->				
PAC SILO 1 PAC-MCP	3	50	13	<--	9750.00				14	15	3	UNIT HEATER 1 (EXISTING)
					1666.67			-->				
			15	<--		9750.00			16			
						1666.67		-->				
			17	<--			9750.00		18			
							1666.67	-->				
PAC SILO 2 (FUTURE)	3	50	19	<--	9750.00				20	15	3	UNIT HEATER 2 (EXISTING)
					1666.67			-->				
			21	<--		9750.00			22			
						1666.67		-->				
			23	<--			9750.00		24			
							1666.67	-->				
SPARE	3	15	25	<--	0.00				26	80	3	SPARE
					0.00			-->				
			27	<--		0.00			28			
						0.00		-->				
			29	<--			0.00		30			
							0.00	-->				
SPARE	3	15	31	<--	0.00				32	30	3	SPARE
					0.00			-->				
			33	<--		0.00			34			
						0.00		-->				
			35	<--			0.00		36			
							0.00	-->				
SPARE	3	15	37	<--	0.00				38	80	3	SPARE
					0.00			-->				
			39	<--		0.00			40			
						0.00		-->				
			41	<--			0.00		42			
							0.00	-->				
SPARE	3	100	43	<--	0.00				44	125	3	SPARE
					0.00			-->				
			45	<--		0.00			46			
						0.00		-->				
			47	<--			0.00		48			
							0.00	-->				
SPARE	3	100	49	<--	0.00				50	30	3	SPD
					0.00			-->				
			51	<--		0.00			52			
						0.00		-->				
			53	<--			0.00		54			
							0.00	-->				
Total kVA Per Phase Load (Including Existing)=					47.87	47.87	47.87			Demand Factor		100.0%
Unbalance load					0.0%	0.0%	0.0%					
Maximum Unbalance load =					0.0%	0.0%	0.0%					

Total Connected Load		Est. Demand Load	
143.60 kVA	172.73 A	143.60 kVA	172.73

GENERAL NOTES:

1. PRESERVE EXISTING CABLES IN PLACE. RETERMINATE EXISTING CABLES TO NEW BREAKERS.

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PANEL SCHEDULES I

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PANELBOARD:	EXISTING LP-1			MAIN BUS:	30 A			MAIN BREAKER/MLO:	30 A				
VOLTS:	240/120V			PHASE:	1			SYM. A.I.C. MIN.:	22KAIC				
FED FROM:	HP-1			WIRE:	3			ENCLOSURE:	NEMA 4				
LOCATION:	PAC BUILDING							MOUNTING:	SURFACE				

DESCRIPTION	NO. POLES	TRIP AMPS	POLE NO.		LOAD - VA A	LOAD - VA B	LOAD - VA C		POLE NO.	TRIP AMPS	NO. POLES	DESCRIPTION
SECONDARY MAIN	2	30	1	<--	0.00				2		1	SPACE
					0.00			-->				
			3	<--		0.00			4	20	1	SPARE (TURNED ON)
						0.00		-->				
LIGHTING	1	20	5	<--	1010.00				6	20	1	RECEPTACLES
					600.00			-->				
SUMP PUMP	1	20	7	<--		828.00			8	15	1	VALVE 153
						400.00		-->				
GEARBOX HEATER	1	20	9	<--	250.00				10	15	1	VALVE 152
					400.00			-->				
AIT-191 TSS ANALYZER	1	15	11	<--		100.00			12	20	1	EXHAUST FAN (EF1)
						1200.00		-->				
AIT-192 CHLORINE ANALYZER	1	15	13	<--	100.00				14	15	1	SPARE (TURNED ON)
					0.00			-->				
DUST COLLECTOR	1	20	15	<--		0.00			16	20	1	FLOW METER
						30.00		-->				

Total kVA Per Phase Load (Including Existing)=	2.36	2.56	0.00	Demand Factor	100.0%
Unbalance load	44.0%	56.0%			
Maximum Unbalance load =		56.0%			

Total Connected Load			Est. Demand Load		
4.92 kVA	20.50 A		4.92	kVA	20.50

GENERAL NOTES:

1. EXISTING LP-1 IS A CUTLER-HAMMER MINI POWER CENTER P48G11S07P.

KEYED NOTES: #

1. REPLACE EXISTING TWO POLE BREAKER WITH TWO, 15A, SINGLE POLE BREAKERS FOR INSTRUMENTATION POWER.



1

EXISTING LP
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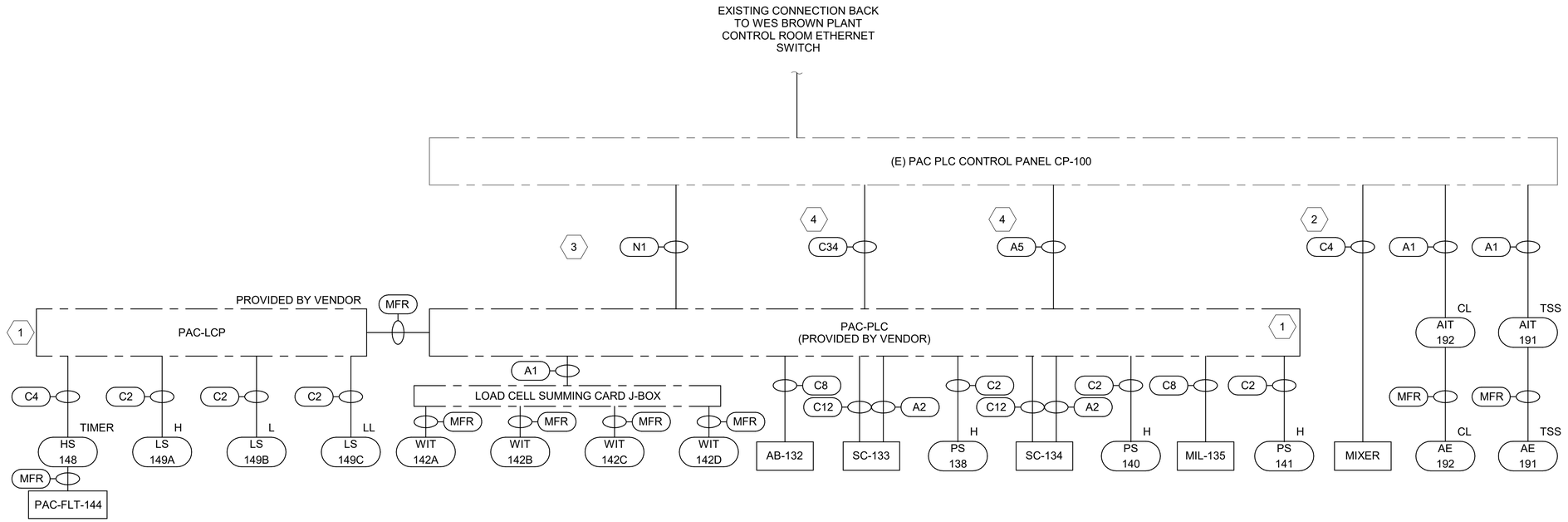
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GENERAL NOTES

1. REFER TO 0E-001 FOR ELECTRICAL LEGENDS & ABBREVIATIONS.
2. REFER TO 0E-003 FOR CONDUIT DESIGNATIONS AND CABLE SCHEDULE.
3. CONNECTION DIAGRAM ONLY SHOWS NEW IO AND CONNECTIONS ASSOCIATED WITH THIS PROJECT. REFERENCE AS-BUILTS OR FIELD VERIFY TO SEE ALL EXISTING CONNECTIONS.

KEYED NOTES (#)

1. COORDINATE FINAL CONNECTION REQUIREMENTS WITH SELECTED VENDOR.
2. MIXER TO BE REPLACED IN KIND WITH IDENTICAL REQUIRED SIGNALS AS EXISTING. (SLOW SPEED STATUS, FAST SPEED STATUS). CONTRACTOR TO FIELD VERIFY AND ADJUST THE QUANTITY OF CABLES. REPLACE EXISTING CABLES WITH NEW.
3. IT IS ASSUMED THERE ARE 4 SPARE ETHERNET PORTS AND 1 SPARE FIBER OPTIC PORT IN CP-100. CONTRACTOR TO FIELD VERIFY AND PROVIDE ADDITIONAL COMPONENTS AS NEEDED FOR THE SELECTED SYSTEMS.
4. CONTRACTOR TO PROVIDE ADDITIONAL OR LARGER COUNT I/O CARDS AS NEEDED IN CP-100 TO PROVIDE CLIENT REQUESTED HARDWIRED SIGNALS BETWEEN PAC-PLC AND CP-100.



MAIN CONNECTION DIAGRAM

NOT TO SCALE

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Burns & McDonnell Engineering Co, Inc

date	detailed by
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designed by	**checked by**
A. MORRONI	V. PATWARI

CITY OF THORNTON

WBWTP PAC FACILITY

MAIN CONNECTION DIAGRAM

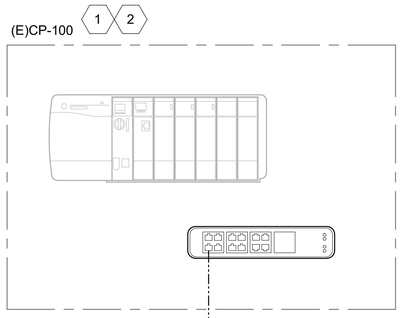
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NETWORK ARCHITECTURE DIAGRAM

NOT TO SCALE

GENERAL NOTES

1. REFER TO 0E-001 FOR ELECTRICAL LEGENDS & ABBREVIATIONS.
2. REFER TO 0E-003 FOR CONDUIT DESIGNATIONS AND CABLE SCHEDULE.

KEYED NOTES (#)

1. CP-100 IS AN EXISTING PAC AREA CONTROL PANEL. NOT ALL EQUIPMENT IS SHOWN. FIELD VERIFY FOR ALL INCLUDED COMPONENTS.
2. UPGRADE CP-100 AS NEEDED PER SELECTED VENDOR COMMUNICATION REQUIREMENTS.
3. THE PAC SILO PLC CONTROL PANEL IS PROVIDED BY VENDOR. COORDINATE WITH FINAL SELECTED VENDOR AND OWNER FOR ALL REQUIRED SIGNALS BACK TO CP-100.

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NETWORK ARCHITECTURE DIAGRAM

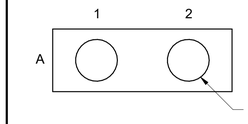
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DUCT SCHEDULE A				
DUCT ID	DUCT SIZE	CIRCUIT DESCRIPTION	ORIGIN	DESTINATION
A1	2	A6	CP-100	AIT-191 & AIT-192
A2	2	2 X P2	LP-1	AIT-191 & AIT-192

DUCT BANK TO LAGOON INSTRUMENTATION FROM PAC BUILDING — A

NOT TO SCALE

GENERAL NOTES

1. REFER TO E-001 FOR ELECTRICAL LEGENDS & ABBREVIATIONS.
2. REFER TO E-003 FOR AREA CLASSIFICATION CONDUIT DESIGNATIONS AND CABLE SCHEDULE. PROVIDE PROPER MATERIALS IN CLASSIFIED AREAS AND PROVIDE REQUIRED SEALS ANY TIME TRANSITIONING THROUGH A CLASSIFIED SPACE PER THE SPECIFICATIONS.
3. DRAWING BASED ON AS BUILT DRAWINGS PROVIDED BY OWNER. CONTRACTOR TO FIELD VERIFY FOR ACCURACY.

KEYED NOTES (#)

1. PROTECT CONDUIT IN PLACE AND REUSE TO REFEED NEW HP-1 FROM NEW 350AT BREAKER IN MCC-WGL-B. CONTRACTOR TO FIELD VERIFY EXISTING CONDUIT'S CONDITION FOR REUSE. CONDUIT RUN IS ESTIMATED TO BE APPROXIMATELY 375'.
2. REPLACE THE MIXER IN KIND. REUSE EXISTING CONDUITS FOR POWER AND CONTROLS BACK TO HP-1 AND CP-100.
3. GROUND THE PAC SILO SYSTEM AND TANK TO THE EXISTING GROUND GRID PER NEC AND SPECIFICATIONS. REPAIR EXISTING GROUND RING IF DISTURBED BY NEW CONSTRUCTION. PROVIDE GROUNDING PROVISIONS FOR THE FUTURE PAC SILO #2 FOR FUTURE USE.
4. THE REMOTE FILL STATION, PAC LCP, LOCATION SHALL BE COORDINATED WITH THE OWNER AND SYSTEM SUPPLIER. THE PAC-LCP SHALL BE POWERED FROM THE PAC-MCP AND CONTROLLED FROM THE PAC-PLC. ROUTE REQUIRED CONDUIT EXPOSED WITH THE FILL LINE ABOVE GRADE. COORDINATE REQUIRED POWER AND CONTROLS WITH PAC SYSTEM SUPPLIER.
5. CONDUITS FOR THE PAC SILOS TO BE ROUTED EXPOSED ON TOP OF CONCRETE FROM THE PAC BUILDING TO THE SILO AREA. PROVIDE 2 - 2" SPARE CONDUITS FROM THE CORNER OF THE PAC BUILDING TO THE PAC MCP.

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ELECTRICAL SITE PLAN

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INSTRUMENT DEVICE AND FUNCTION SYMBOLS

TAG	•	PAC-BBBB-WXYZZ-****
EXAMPLE TAG	•	PAC-V-131
PAC	•	FACILITY IDENTIFIER, SOMETIMES HIDDEN FOR CLARITY
BBBB	•	EQUIPMENT, INSTRUMENT, AND VALVE IDENTIFIER, ASME AND ISA FUNCTIONAL DESIGNATIONS (ONE TO FOUR LETTERS)
WXYZZ	•	UNIT NUMBER - NUMBER TO CORRELATE PROCESS SERIES BELOW
****	•	OPTIONAL IDENTIFIERS MAY BE INCLUDED TO ADD CLARITY TO THE DRAWINGS (ONE TO FOUR CHARACTERS)

WXYZZ - SERIES	PROCESS
110	DRY PAC FEED TO BASIN AT PAC PRETREATMENT FACILITY (EXISTING)
120	PAC SLURRY FEED TO RAW WATER AT PAC PRETREATMENT FACILITY (EXISTING)
130-140	PAC SILO (NEW)
150-180	ANCILLARY EQUIPMENT AT PAC PRETREATMENT FACILITY (EXISTING)
190	LAGOON EFFLUENT INSTRUMENTS (NEW)

INSTRUMENT DEVICE AND FUNCTION SYMBOLS

DISPLAY OR CONTROL	DEVICES (INSTRUMENTS, SELECTOR SWITCHES, ETC.)	PHYSICAL STATUS INDICATION LIGHT MOUNTED ON PANEL	ACCESSIBILITY	
*** BBBB WXYZZ PPPP	*** BBBB WXYZZ PWR	*** BBBB WXYZZ	ACCESSIBLE IN FIELD	FIELD MOUNTED (INSTRUMENTS, VALVES, ETC.)
*** BBBB WXYZZ PPPP	*** BBBB WXYZZ PWR	*** BBBB WXYZZ	ACCESSIBLE TO OPERATOR	MAIN CONTROL ROOM (HMI) OR CONTROL PANEL (OIT)
*** BBBB WXYZZ PPPP	*** BBBB WXYZZ PWR	*** BBBB WXYZZ	INSIDE OR BEHIND PANEL DOOR	
*** BBBB WXYZZ PPPP	*** BBBB WXYZZ PWR	*** BBBB WXYZZ	ACCESSIBLE TO OPERATOR	REMOTE/ LOCAL CONTROL PANEL (OIT), MOTOR CONTROL CENTER, VFDs, ETC.
*** BBBB WXYZZ PPPP	*** BBBB WXYZZ PWR	*** BBBB WXYZZ	INSIDE OR BEHIND DOOR PANEL	

NOTES:

1. HMI AND OIT DISPLAY OR CONTROL, SYSTEMS INTEGRATOR (SI) SHALL STORE POINTS INDICATED IN THE HISTORIAN AND MAKE AVAILABLE ACROSS THE SCADA NETWORK AND THROUGH SYSTEM GRAPHICS.
2. BBBB = INSTRUMENT IDENTIFIER. REFER TO INSTRUMENT IDENTIFIERS TABLE.
3. WXYZZ = PROCESS IDENTIFIERS. REFER TO PROCESS IDENTIFIERS TABLE.
4. **** = OPTIONAL IDENTIFIER. REFER TO OPTIONAL IDENTIFIERS TABLE.
5. PPPP = PLC SUFFIX NAME. REFER TO PLC IDENTIFIERS TABLE.
6. PWR = POWER REQUIREMENTS AS IDENTIFIED.

VALVES

- 2-WAY DIVERTER VALVE
- 3-WAY VALVE
- AIR RELEASE AND VACUUM VALVE
- AIR RELEASE VALVE
- APERTURE VALVE
- BACKFLOW PREVENTER
- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- DIAPHRAGM VALVE
- DUCKBILL CHECK VALVE
- FOOT VALVE
- GATE VALVE
- GLOBE VALVE
- MUD VALVE
- PLUG VALVE
- PRESSURE AND VACUUM RELIEF VALVE
- PRESSURE RELIEF VALVE
- SLEEVE VALVE
- TELESCOPING VALVE

MOTOR STARTER SYMBOLS

ASD	ADJUSTABLE SPEED DRIVE
FVNR	FULL VOLTAGE - NON-REVERSING
FVR	FULL VOLTAGE - REVERSING
RVSS	REDUCED VOLTAGE SOLID-STATE STARTER
VFD	VARIABLE FREQUENCY DRIVE

LINE LABELS

TAG - SIZE-MATERIAL-PROCESS

MATERIAL TYPES

CPVC -	CHLORINATED POLYVINYL CHLORIDE
DIP -	DUCTILE IRON PIPE
HDPE -	HIGH-DENSITY POLYETHYLENE
PTFE -	POLYTETRAFLUOROETHYLENE
PVC -	POLYVINYL CHLORIDE
PVDF -	POLYVINYLIDENE FLOURIDE
RCP -	REINFORCED CONCRETE PIPE
SST -	STAINLESS STEEL
ST -	STEEL

P&IDs LINE TYPES AND EXAMPLES

- PROCESS LINE
- EXISTING PROCESS LINE
- FUTURE PROCESS LINE
- OPEN TROUGH
- EQUIPMENT / MISCELLANEOUS
- ENCLOSURE BOUNDARY
- SKID / VENDOR BOUNDARY
- ELECTRICAL SIGNAL - CONTROL
- ELECTRICAL SIGNAL - POWER
- SOFTWARE, DATA LINK, OR BUS
- MANUFACTURER'S CABLE
- PNEUMATIC TUBING
- DIRECTION OF FLOW
- POINT OF CONNECTION
- CROSSOVER - NO CONNECTION
- BROKEN SIGNAL LINE
- CONTROL INTERLOCK
- OFF-SHEET REFERENCE

EXTRA LINE OF TEXT
WWWW-100
DESCRIPTION OF THE LINE

VALVE OPERATORS (1)

- S — SOLENOID
- PNEUMATIC
- M — MOTOR
- DIAPHRAGM
- VANE
- I/P — VALVE POSITIONER

INSTRUMENTATION SYMBOLS

- NON-CONTACT TRANSMITTER
  - * = U - ULTRASONIC
  - * = R - RADAR
  - * = L - LASER
- CONTACTING LEVEL TRANSMITTER
  - * = GR - GUIDED WAVE RADAR
  - * = C - CAPACITANCE
  - * = A - AMPEROMETRIC
  - * = IR - INFRARED
- S — SUBMERSIBLE PRESSURE LEVEL TRANSMITTER
- STILLING BASIN
- FLOAT SWITCH
- ROTAMETER
- SIGHT FLOW INDICATOR
- AVERAGING PITOT TUBE FLOW ELEMENT
- TURBINE OR PROPELLER TYPE FLOW ELEMENT
- POSITIVE-DISPLACEMENT FLOW METER
- VORTEX FLOW SENSOR
- M — MAGNETIC FLOW METER
- SONIC FLOW METER DOPPLER OR TRANSIT TIME
- PITOT TUBE FLOW METER
- THERMAL MASS FLOW METER
- A — IN-LINE ANALYZER (FOR INSTRUMENT TYPE SEE IDENTIFIER)

GENERAL NOTES:

1. REFER TO THE CONTROL NARRATIVE SPECIFIED IN SECTION 40 91 60 FOR PROGRAMMING OF THE EQUIPMENT INDICATED ON THE P&IDS.
2. THIS IS A STANDARD LEGEND AND NOT ALL DESIGNATIONS ARE USED ON THIS PROJECT.

KEYED NOTES: (#)

1. IF NO VALVE ACTUATOR IS SHOWN, ASSUME MANUALLY ACTIVATED.

ANALOG AND DISCRETE I/O DESIGNATORS

DISCRETE INPUT	DISCRETE OUTPUT	ANALOG INPUT	ANALOG OUTPUT
BBBB WXYZZ	BBBB WXYZZ	BBBB WXYZZ	BBBB WXYZZ

PIPE AND EQUIPMENT ACCESSORIES

- AC — AIR COCK
- ANNULAR SEAL
- BF — BLIND FLANGE
- BUBBLE TRAP
- CALIBRATION COLUMN
- CO — CLEANOUT
- DIAPHRAGM SEAL
- DISCHARGE ELBOW ASSEMBLY
- DRAIN
- EJECTOR EDUCTOR
- EXPANSION JOINT
- FLEXIBLE BALL JOINT
- FLEXIBLE HOSE
- FLOW THROUGH CELL
- HOSE CONNECTION
- PIPE WITH HEAT TRACE CABLE
- PULSATION DAMPENER
- QUICK DISCONNECT COUPLING
- REDUCER - CONCENTRIC
- REDUCER - ECCENTRIC
- REMOVABLE CAP
- REMOVEABLE PLUG
- WH — WALL HYDRANT
- WELDED CAP
- YH — YARD HYDRANT

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PROCESS AND INSTRUMENTATION LEGEND

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COMMON PROCESS EQUIPMENT

- MOTOR
- AIR COMPRESSOR
- AIR RECEIVER TANK
- CENTRIFUGAL BLOWER
- POSITIVE DISPLACEMENT BLOWER
- ROTARY LOBE BLOWER
- CENTRIFUGAL PUMP
- DIAPHRAM PUMP
- HORIZONTAL END SUCTION PUMP
- HORIZONTAL SPLIT CASE PUMP
- PERISTALTIC PUMP
- PROGRESSIVE CAVITY PUMP
- ROTARY LOBE PUMP
- SUBMERSIBLE PUMP
- VERTICAL TURBINE PUMP
- AGITATOR/MIXER (PROPELLER OR TURBINE)
- AIR LANCE MIXER
- DRAFT TUBE MIXER
- IN-LINE STATIC MIXER
- LINEAR MOTION MIXER
- BELT FILTER PRESS
- CENTRIFUGE
- DISSOLVED AIR FLOTATION (DAF) UNIT
- DRYING BED
- GRAVITY THICKENER
- ROTARY DRUM THICKENER
- SCREW PRESS
- VOLUTE PRESS
- BELT CONVEYOR
- SHAFTLESS SCREW CONVEYOR
- CHEMICAL DRUM
- CHEMICAL TOTE
- CHEMICAL TANK
- TANK - DOUBLE WALL
- SCALE
- BASKET TYPE STRAINER
- TEE TYPE STRAINER
- Y-TYPE STRAINER
- CONICAL STRAINER
- DUPLEX STRAINER
- PADDLE LEVEL SWITCH
- WEIR
- CONTACT VESSEL (GAC, IX, RE-MINERALIZATION)
- SUBMERGED MEMBRANES
- REVERSE OSMOSIS (RO) MEMBRANE
- CARTRIDGE FILTER
- CLOSED VESSEL UV DISINFECTION
- PACKED TOWER SCRUBBER
- DUMPSTER
- FLOATING DECANTER
- SCUM SKIMMER
- SAFETY SHOWER / EYEWASH STATION
- INSTANTANEOUS WATER HEATER
- FLUME
- WEIR
- DEMISTER
- KNIFE GATE
- SLIDE GATE
- STOP PLATE
- WEIR GATE
- OIT — OPERATOR INSTRUMENT TERMINAL
- FILTER BOX — FILTER BOX

GENERAL NOTES:

1. THIS IS A STANDARD LEGEND AND NOT ALL DESIGNATIONS ARE USED ON THIS PROJECT.

WATER PROCESS EQUIPMENT

- PIPELINE FLASH REACTOR
- INJECTION NOZZLE
- WETTING CONE
- CHILLER
- LIQUID OXYGEN (LOX) TANK
- OZONE DESTRUCT UNIT
- OZONE GENERATOR
- MEMBRANE FILTER
- FLOCCULATOR - HORIZONTAL
- FLOCCULATOR - HORIZONTAL
- FLOCCULATOR - VERTICAL
- PLATE SETTLERS / LAMELLA CLARIFIERS
- UPFLOW CLARIFIER
- SLUDGE COLLECTOR
- SCREEN

SELF-ACTUATED REGULATORS AND VALVES

- PRESSURE REDUCING REGULATOR, SELF-CONTAINED, WITH HANDWHEEL ADJUSTABLE SET POINT
- DIFFERENTIAL-PRESSURE-REDUCING REGULATOR WITH INTERNAL AND EXTERNAL PRESSURE TAP
- BACKPRESSURE REGULATOR WITH EXTERNAL PRESSURE TAP
- PRESSURE-REDUCING REGULATOR WITH INTEGRAL OUTLET PRESSURE RELIEF VALVE AND OPTIONAL PRESSURE INDICATOR
- BACKPRESSURE REGULATOR, SELF CONTAINED
- PRESSURE-REDUCING REGULATOR WITH EXTERNAL PRESSURE TAP

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PROCESS AND INSTRUMENTATION LEGEND

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EQUIPMENT IDENTIFIERS (BBBB)	
ABBREVIATION	DISCRIPTION
AB	ARCH BREAKER
AC	AIR COMPRESSOR
AER	AERATION
AFILT	AIR FILTER
B	BLOWER
CBD	COARSE BUBBLE DIFFUSER
CNV	CONVEYOR
CU	CONDENSING UNIT
DAF	DISSOLVED AIR FLOTATION
DM	DEMISTER
DWT	DEWATERING EQUIPMENT
EF	EXHAUST FAN
F	FAN
FCU	FAN COIL UNIT
FBD	FINE BUBBLE DIFFUSER
FD	FLOATING DECANTER
FL	FLUME
FLC	FLOCCULATION
FLT	FILTER
FLR	GAS FLARE
G	GATE
GAC	GRANULAR ACTIVATED CARBON
GMF	GRANULAR MEDIA FILTER
GC	GRIT CLASSIFIER
GR	GRIT REMOVAL
GEN	GENERATOR
GRD	GRINDER
HTR	HEATER
IN	INJECTION NOZZLE
IVC	IN VESSEL COMPOSTER
LP	120 VAC PANEL BOARD
LCP	LOCAL CONTROL PANEL
LV	LOUVER
M	MOTOR, ELECTRIC
MAU	MAKEUP AIR UNIT
MCC	MOTOR CONTROL CENTER
MII	MOISTURE ISOLATION INJECTOR
MXR	MIXER
ODU	OZONE DESTRUCT UNIT
OFLT	ODOR FILTERS
OGEN	OZONE GENERATOR
OINJ	OZONE INJECTION
OU	OIL WATER SEPARATOR
P	PUMP
POLY	POLYMER SYSTEM
PP	480 VAC PANELBOARD
RO	REVERSE OSMOSIS
RTU	ROOFTOP AIR UNIT
SC	SCREW CONVEYOR
SCL	SCALE
SCR	SCREENS
SED	SEDIMENTATION
SF	SUPPLY FAN
SKD	SKID EQUIPMENT
SKM	SCUM SKIMMER
SSE	SAFETY SHOWER/EYEWASH
STR	STRAINER
SWBD	SWITCHBOARD
T	TANK
THK	THICKENER
TM	TUB MILL
UH	UNIT HEATER
UV	UV DISINFECTION
XFMR	TRANSFORMER

OPTIONAL IDENTIFIERS (****)	
ABBREVIATIONS	DISCRIPTION
%	PERCENT OPEN, PERCENT FULL SPEED
1/2	DIVERTER VALVE POSITION SELECTION
ABCD	UV BANK SELECTION
BD	BLOWDOWN
BRG	BEARING
CGD	COMBUSTIBLE GAS DETECTION
C	CLOSE
CH4	METHANE
CL	CHLORINE
CLO	CLEAN OUT
CO	CARBON MONOXIDE
COND	CONDUCTIVITY
D	DISCONNECT AUX
DEW	DEWPOINT
DND	DO NOT DISTURB
DO	DISSOLVE OXYGEN
DR	DRAIN
ES	EMERGENCY STOP
FAIL	FAILURE
F/R*	FORWARD / REVERSE
FCL	FREE CHLORINE
FLT	FAULT
F/O/R*	FORWARD / OFF / REVERSE
JAM	JAM / HIGH CURRENT SENSED
H, HH	HIGH, HIGH-HIGH
H/O/A*	HAND / OFF / AUTO (OR HAND / OFF / REMOTE)
HWL	HIGH WATER LEVEL
H2S	HYDROGEN SULFIDE
JAM	JAM / HIGH CURRENT SPEED
KVA	KILOVOLT-AMPERS
KW	KILOWATTS
L, LL	LOW, LOW-LOW
L/O/R*	LOCAL / OFF / REMOTE (OR LOCAL /STOP...
LWL	LOW WATER LEVEL
NG	NATURAL GAS
NWL	NORMAL WATER LEVEL
O/O	ON-OFF
O	OPEN
OL	OVERLOAD
ORP	OXIDATION REDUCTION POTENTIAL
O/S/C*	OPEN / STOP / CLOSE
OVF	OVERFLOW
OX	OXYGEN
O3	OZONE
O3G	OZONE GAS
PAH	PRESSURE ALARM HIGH
pH	pH
PWR	POWER
RC	RUN CONFIRM
RDR	RADAR
REM	REMOTE
RES	RESET
ROT	ROTATION
RPES	ROPE EMERGENCY STOP
RUN	RUN
SC	STREAMING CURRENT
SDI	SILT DENSITY INDEX
SIL	SILENCE
SPD	SPEED
SPI	SINGLE POINT INSERTION
S/S	START-STOP
STOP	STOP
TCL	TOTAL CHLORINE
TOC	TOTAL ORGANIC CARBON
TEMP	TEMPERATURE
TSS	TOTAL SUSPENDED SOLIDS
TURB	TURBIDITY
UV	ULTRAVIOLET
UVI	ULTRAVIOLET INTENSITY
UV254	ULTRAVIOLET ABSORBANCE AT 254 NM
ZERO	ZERO SPEED

* - INDICATORS MAY BE USED INDIVIDUALLY OR IN DIFFERENT COMBINATIONS.

VALVE IDENTIFIERS (BBBB)	
ABBREVIATION	DISCRIPTION
2DV	2-WAY DIVERTER VALVE
3V	3-WAY VALVE
APV	APERTURE VALVE
ARV	AIR RELEASE VALVE
ARVV	AIR RELEASE AND VACUUM VALVE
BFV	BUTTERFLY VALVE
BP	BACKFLOW PREVENTER
BV	BALL VALVE
CV	CHECK VALVE
DCV	DUCKBILL CHECK VALVE
DV	DIAPHRAGM VALVE
FTV	FOOT VALVE
GBV	GLOBE VALVE
GV	GATE VALVE
MV	MUD VALVE
PRV	PRESSURE RELIEF VALVE
PV	PLUG VALVE
PVRV	PRESSURE AND VACUUM RELIEF VALVE
SV	SLEEVE VALVE
TV	TELESCOPING VALVE
V	OTHER VALVE

INSTRUMENT IDENTIFIERS (BBBB)					
LETTER	FIRST LETTER(S)		SUCCEEDING LETTERS		
	PROCESS OR INITIATING VIARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS (*)		ALARM		
B	BURNER, COMBUSTION		USERS CHOICE (*)	CLOSE, STOP, DECREASE	USERS CHOICE (*)
C	CONDUCTIVITY	TEST	CLOSED	CONTROL	CLOSED
D	DENSITY(SG)	DIFFERENTIAL		OPEN, START, INCREASE	DEVIATION
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)	EMERGENCY	
F	FLOW RATE	RATIO / BIAS			
G			GLASS, VIEWING, GUAGE	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT (AMPS)		INDICATE		
J	POWER		SCAN		
K	TIME, SCHEDULE	RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	MOTION, MOTOR	MOMENTARY			MIDDLE, INTERMEDIATE
N	TORQUE		USERS CHOICE (*)	ISOLATOR	ON, OPERATE
O	USERS CHOICE (*)		ORIFICE, OPEN		OPENED
P	PRESSURE, VAC		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE, TOTALIZE	INTEGRATE, TOTALIZE		
R	RADIATION		RECORD		RUN
S	SPEED, FREQUENCY	SAFETY		SWITCH	STOP
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE (*)		MULTIFUNCTIONAL (*)		
V	VIBRATION			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL, PROBE		
X	UNCLASSIFIED (*)	X-AXIS	UNCLASSIFIED (*)	TRANSDUCER	
Y	EVENT, STATE (*)	Y-AXIS		RELAY, COMPUTER	
Z	POSITION, DIMENSION	Z-AXIS		DRIVE, ACTUATOR	

GENERAL NOTES:

1. REFER TO THE CONTROL NARRATIVE SPECIFIED IN SECTION 40 91 60 FOR PROGRAMMING OF THE EQUIPMENT INDICATED ON THE P&IDS.

2. THIS IS A STANDARD LEGEND AND NOT ALL DESIGNATIONS ARE USED ON THIS PROJECT.

no.	date	by	chk	description
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BURNS McDONNELL
9191 S. JAMAICA STREET
ENGLEWOOD, CO 80112
Burns & McDonnell Engineering Co, Inc

date	detailed by
OCTOBER 2026	A.BENSON
designed by	**checked by**
C. CAMPO	V. PATWARI

CITY OF THORNTON

WBWTP PAC FACILITY

PROCESS AND INSTRUMENTATION LEGEND
III

project	contract
177918	

drawing 0I-003 — **rev.** 0

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Millimeters
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GENERAL NOTES

1. SILO SYSTEM IS SHOWN FOR INFORMATION ONLY. SILO P&ID AND SYSTEM TO BE SUPPLIED BY MANUFACTURER.
2. ALL POWER REQUIREMENTS IN VENDOR SYSTEM TO BE PROVIDED THROUGH PAC-MCP.

KEYED NOTES (#)

1. POWER FOR THE VENDOR SYSTEM SHALL BE ROUTED THROUGH 480V PANEL, PAC-MCP, INTO THE PLC CONTROLS SYSTEM, PAC-PLC. POWER FOR PAC-MCP SHALL COME FROM HP-1. CONTROLS SHALL COMMUNICATE BACK TO EXISTING CP-100.
2. LOAD CELLS TO BE POSITIONED UNDER SILO AND PER MANUFACTURER'S RECOMMENDATIONS.
3. PROVIDE A NETWORK CONNECTION BETWEEN CP-100 AND PAC-PLC. COORDINATE REQUIRED HARDWIRED SIGNALS BETWEEN CP-100 AND PAC-PLC WITH OWNER AND SELECTED VENDOR.
4. MOTOR CONTROLLED BY VFD LOCATED WITHIN PAC-MCP.

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CP-100

3

HORN LA 147 | R/A/G YL 146 | E-STOP HS 145 | PAC SILO PLC CONTROL PANEL (PAC-PLC)

1 → 120V PAC-MCP

PAC SILO 480V CONTROL PANEL (PAC-MCP)

1 → 480V HP-1

TIMER HS 148 PAC-PLC

TIMER HS 148

PAC-FLT-144

SILO FILTER

H LA 149A PAC-PLC

H LS 149A

L LA 149B PAC-PLC

L LS 149B

LL LA 149C PAC-PLC

LL LS 149C

PIPING BY CONTRACTOR | PIPING BY MANUFACTURER

TRUCK FILL PANEL JUNCTION BOX (PAC-LCP)

4" SCH 40 STEEL | 4" SCH 40 STEEL

PAC-V-131

SILO ARCH BREAKER UNLOADER (PAC-AB-132)

ROT SE 133 | RC YS 133 | SC 133 | SI 133 | FLT YA 133 | OL YA 133 PAC-PLC

VFD 4

PAC-SC-133

PAC-AB-132

ROT SE 132 | RC YS 132 | OL YA 132 PAC-PLC

FVNR

ROT SE 134 | RC YS 134 | SC 134 | SI 134 | FLT YA 134 | OL YA 134 PAC-PLC

VFD 4

2

WE 142A

WE 142B

WE 142C

WE 142D

LBS WI 143 PAC-PLC

WQ 143 | WIT 143

SILO LOAD CELL JUNCTION BOX

PAC-SC-134

H PA 140 PAC-PLC

H PS 140

H PA 141 PAC-PLC

H PS 141

PAC-MII-135

FVNR

RC YS 135 | OL YA 135 PAC-PLC

H PA 138 PAC-PLC

H PS 138

PAC PRETREATMENT FACILITY UNDERGROUND BASIN

SKID/VENDOR BOUNDARY

Millimeters

Scale For Microfilming

Inches

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PAC SILO P&ID

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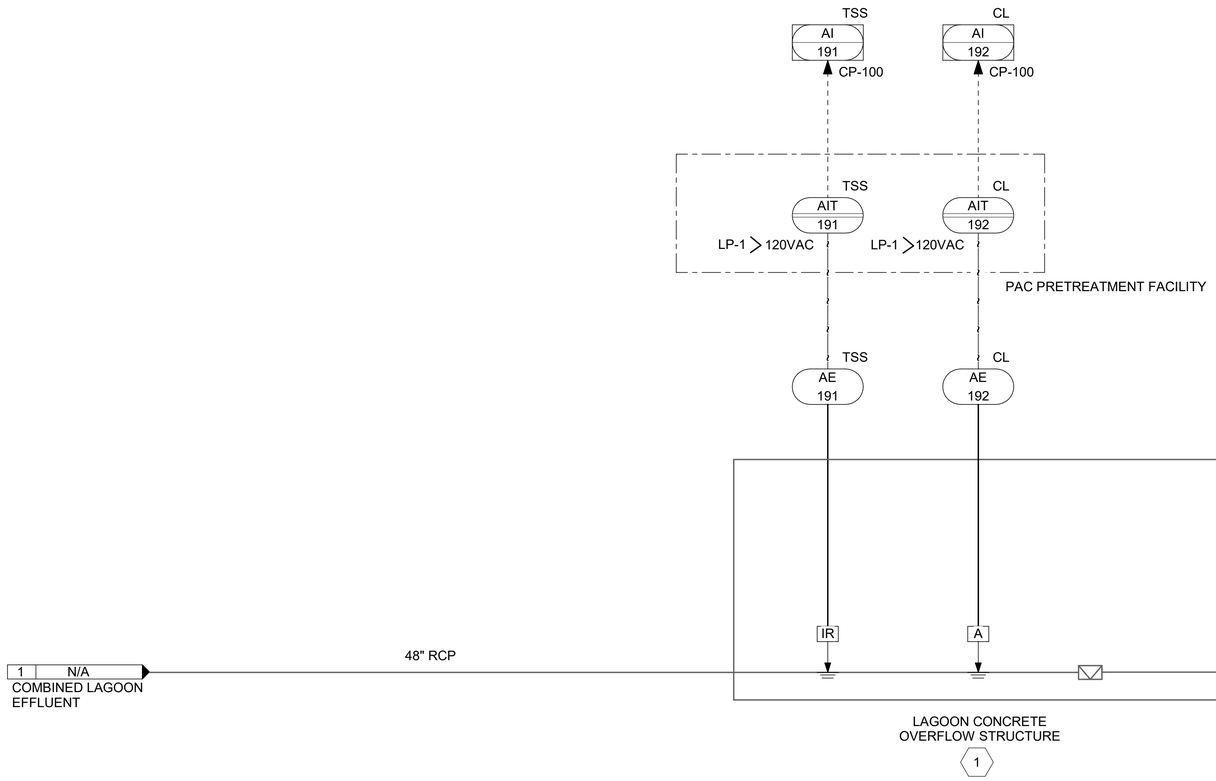
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KEYED NOTES (#)

1. SEE CIVIL FOR SITE LOCATION.

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SLUDGE LAGOON EFFLUENT P&ID

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