ADDENDUM NO. 01
February 13, 2026

PROJECT: **CITY OF ARCHER CITY**
DOWNTOWN REVITALIZATION PROJECT

BID DATE: **February 26, 2026**

The following changes and/or additions shall be made to the Plans, Specifications, and Contract Documents for the above referenced project. Bidder shall acknowledge receipt of this Addendum by signing below and returning this Addendum with the Bid.

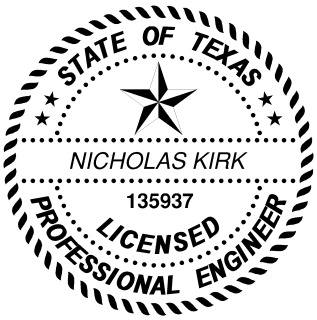
1) **GENERAL**
   a) **The bid schedule has been updated to reflect the electrical design addressed further in this addendum.**

2) **PLAN SHEETS**
   a) **Added plan sheets for electrical design. Attached is the entire plan set, including the additional sheets for electrical design.**

3) **SPECIFICATIONS**
   a) **Added specifications for electrical design. Attached is the entire specification set, including the additional specifications for electrical design.**

Prepared by:
Nic Kirk, P.E.

JACOB | MARTIN
TBPE Firm No. 2448



_____
Bidder's Acknowledgment

_____
Date

CITY OF ARCHER CITY
DOWNTOWN REVITALIZATION PROJECT
BASE BID SCHEDULE

Show prices in numerals. Round off unit prices to two decimal places only.

These Bid Prices must include all labor, materials, equipment, insurance, overhead, superintendence, transportation, taxes, permits, profits & incidentals to cover the finished Work called for in the Contract Documents.

For all Labor, Materials, Equipment and Incidentals to Furnish and Install the Following:

Bid Item	Description	Est. Qty.	Unit	Unit Price	Extended Amount
1	Mobilization	1	LS	$	$
2	Sidewalk Flatwork Concrete	484	SY	$	$
3	Asphalt Pavement	68	SY	$	$
4	Concrete Curb and Gutter	570	LF	$	$
5	ADA Ramp	145	LF	$	$
6	Hand Rail	400	LF	$	$
7	Truncated Domes	6	EA	$	$
8	Stairs	2	EA	$	$
9	Entryway Refurbishment	8	EA	$	$
10	#12 AWG wiring	7,380	LF	$	$
11	#10 AWG wiring	1,410	LF	$	$
12	1” PVC Sch 40 Conduit	2,930	LF	$	$

13	Type “A” light fixtures and poles	13	EA	$	$
14	frame panel “C” with breakers and associated wiring and conduit	1	EA	$	$
15	Meter can, mast, and other electrical service costs	1	EA	$	$
16	120V, 20A single pole breakers	6	EA	$	$
17	120V, 20A tandem breakers	2	EA	$	$
	TOTAL BASE BID A (Items 1 - 17)				$

NOTES: 1: All products used for this project must meet Build America, Buy America (BABAA) domestic preference requirements.

2: Owner reserves the right to select all, or any combination of, the above items for the final project at their sole discretion.

PLANS FOR

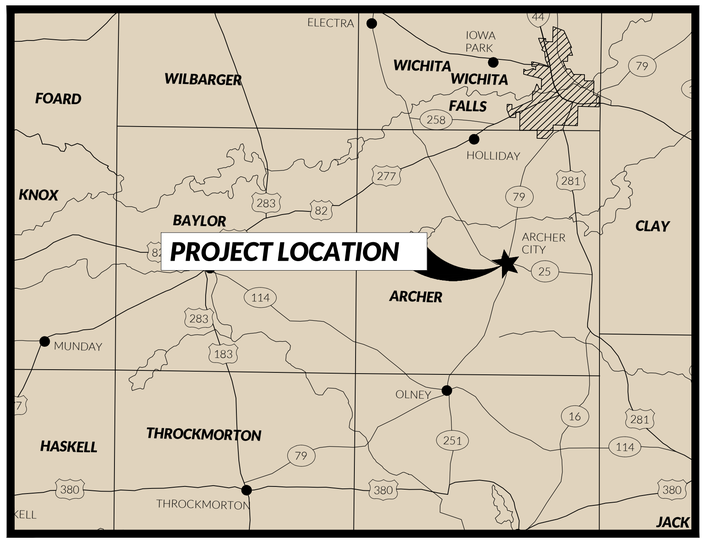
CITY OF ARCHER CITY, TEXAS

DOWNTOWN REVITALIZATION PROJECT

FUNDED BY: TDA, PROJECT No. CDM24-0087

JANUARY 2026

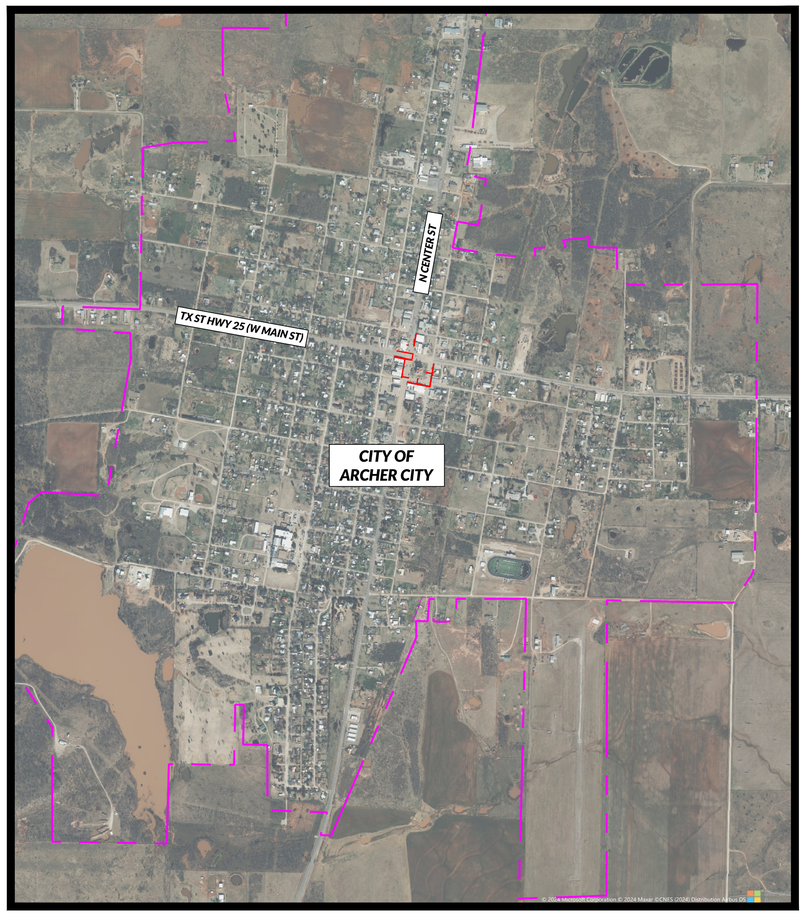
REVISIONS:	
DESCRIPTION	DATE



VICINITY MAP

SCALE: 1"=50,000'

NORTH



PROJECT LOCATIONS:

PROJECT LOCATION MAP

SCALE: 1"=1,000'

NORTH

Sheet List Table	
Sheet Number	Sheet Title
01	COVER SHEET
02	NOTES
03	INDEX SHEET
04	DEMOLITION PLAN
06	W MAIN ST STA.0+00-END & S CENTER ST STA.0+00-1+35 SIDEWALK PAVING PLAN
07	S CENTER ST STA.1+35-END & W WALNUT ST STA.0+00-END SIDEWALK PAVING PLAN
08	W MAIN ST SIDEWALK STA. 0+00 - END GRADING PLAN
09	S CENTER ST SIDEWALK STA. 0+00 - 1+35 GRADING PLAN
10	S CENTER ST SIDEWALK STA. 1+35 - END GRADING PLAN
11	W WALNUT ST SIDEWALK STA. 0+00 - END GRADING PLAN
12	BUILDING SAWCUT DETAILS
13	PAVING DETAILS

COUNCIL MEMBERS

STEVEN SCHROEDER.....MAYOR

NAME..... MAYOR PRO TEM

PAULA BRADLEY — LESLIE HASH

BILLY BURKS — MEGAN RANDALL

GREG ANDERSON

RONNIE MEYER.....CITY MANAGER

LAFONDA HUFFMAN.....CITY SECRETARY

JACOB MARTIN

1925 FORT WORTH HIGHWAY
WEATHERFORD, TX 76086
817-594-9880

TBPE FIRM # 2448 | TBAE FIRM # BR 2261 | TBPELS FIRM # 10194493

STATE OF TEXAS
NICHOLAS J. KIRK
135937
LICENSED PROFESSIONAL ENGINEER

01-29-2026

PLOTTED: 2/12/2026 8:30 AM PLOTTED BY: NIC KIRK
X:\CI ARCHER_CITY\24320 - 2024 TDA DOWNTOWN REVITALIZATION PROJECT - ARCHER CITY\DRAFTING_PLANS_C_CIVIL\24320 ARCI DRP 01_COVER.DWG

GENERAL NOTES

1. ACCESS TO RESIDENCES AND BUSINESS SHALL BE PROVIDED AT ALL TIMES. COST ASSOCIATED WITH THE CONSTRUCTION AND MAINTENANCE OF THIS ACCESS WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO OTHER BID ITEMS. THE WORK PERFORMED ON THIS CONTRACT WILL BE PERFORMED UNDER TRAFFIC AND IT IS IMPERATIVE THAT THE CONTRACTOR HAVE THE EQUIPMENT AND MANPOWER AVAILABLE AT ALL TIMES TO ENSURE THAT ACCESS IS AVAILABLE. THE CONTRACTOR IS TO MAINTAIN TWO-WAY TRAFFIC AT ALL TIMES.
2. THE CONTRACTOR SHALL APPOINT, IN WRITING, A SUPERINTENDENT FOR THIS PROJECT. SAID SUPERINTENDENT SHALL BE HIRED BY THE CONTRACTOR AND BE FULLY RESPONDENT TO THE ADMINISTRATION OF THE CONTRACT. HE/SHE WILL BE ON THE PROJECT DAILY. SHOULD THIS SUPERINTENDENT LEAVE THE EMPLOYER OR MOVE TO ANOTHER PROJECT, THE CONTRACTOR IS TO APPOINT ANOTHER SUPERINTENDENT IMMEDIATELY. CONTRACTOR SHALL PROVIDE 24HR/7DAY A WEEK PHONE NUMBER FOR SUPERINTENDENT IN CASE OF EMERGENCY.
3. THE CONTRACTOR WILL ENSURE THAT ALL EXISTING DRAINAGE WILL REMAIN UNALTERED UNLESS GRADES ARE SHOWN TO BE ADJUSTED AND OR DRAINAGE STRUCTURES ADDED OR ALTERED.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSAL AND REMOVAL OF SURPLUS MATERIAL OFF-SITE AT HIS OWN EXPENSE.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING ALL SURFACES DISTURBED TO A CONDITION THAT IS EQUAL TO OR BETTER THAN THE ORIGINAL CONDITION. THIS INCLUDES (BUT IS NOT LIMITED TO) EXISTING BUILDINGS, MAILBOXES, UTILITIES, PAVEMENT, CURBS, AND LANDSCAPE.
6. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY QUESTIONS THAT MAY ARISE CONCERNING THE INTENT, PLACEMENT OR LIMITS OF THE DIMENSIONS OR GRADES NECESSARY FOR CONSTRUCTION OF THIS PROJECT. ENGINEER SHALL PROVIDE CONSTRUCTION STAKING FOR THIS PROJECT.
7. CONTRACTOR SHALL BE REQUIRED TO LOCATE ALL PUBLIC OR PRIVATE UTILITIES INCLUDING BUT NOT LIMITED TO; WATER, SEWER, TELEPHONE AND FIBER OPTIC LINES, SITE LIGHTING LINES, SITE LIGHTING ELECTRIC, SECONDARY ELECTRIC, PRIMARY ELECTRIC, DUCT BANKS, LANDSCAPING IRRIGATION FACILITIES AND GAS LINES, ANY UTILITY CONFLICTS THAT ARISE SHOULD BE COMMUNICATED TO THE ENGINEER IMMEDIATELY AND PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL CONTACT 1-800-DIG-TESS A MINIMUM OF 48 HOURS PRIOR TO THE START OF CONSTRUCTION. ANY DAMAGES TO EXISTING UTILITIES SHALL BE AT THE CONTRACTORS SOLE EXPENSE WHETHER THE UTILITY IS SHOWN ON THE PLANS OR NOT.
8. ALL CONSTRUCTION SHALL CONFORM TO THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (NCTCOG) STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION AND STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION (LATEST-EDITIONS) UNLESS OTHERWISE NOTED. THE TECHNICAL SPECIFICATIONS CONTAINED IN THE CONTRACT DOCUMENTS OR OTHER SPECIFIC REFERENCE SHALL TAKE PRECEDENCE OVER NCTCOG STANDARDS.
9. THE CONTRACTOR SHALL HAVE AVAILABLE AT THE JOB SITE AT ALL TIMES A COPY OF ANY REQUIRED CONSTRUCTION PERMITS, EROSION CONTROL PLANS, SW3P WITH INSPECTION REPORTS, AND THE CONTRACT DOCUMENTS INCLUDING PLANS, SPECIFICATIONS, AND SPECIAL CONDITIONS.
10. CONTRACTOR SHALL VERIFY BENCHMARKS AND DATUM PRIOR TO COMMENCING CONSTRUCTION OR STAKING OF IMPROVEMENTS.
11. BARRICADES, SIGNS, AND TRAFFIC HANDLING. THIS PROJECT REQUIRES THE CONTRACTOR TO INSTALL CONSTRUCTION BARRICADES, SIGNS, AND TRAFFIC HANDLING ON THIS PROJECT. THERE MAY BE OTHER MINOR SIGNS AND/OR TRAFFIC MARKINGS THAT ARE DEEMED NECESSARY TO PROTECT THE TRAVELING PUBLIC AND CONSTRUCTION EMPLOYEES. PAYMENT FOR MISCELLANEOUS MINOR SIGNS WILL BE INCLUDED IN THE PRICE BID FOR THIS ITEM.

    ALL MARKERS, TRAFFIC CONTROL PLAN, AND OR OTHER TRAFFIC RELATED INCIDENTALS SHALL BE AS OUTLINED IN THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES. THE CONTRACTOR IS REQUIRED TO CONTROL TRAFFIC BY FLAG MEN WHEN PLACING CONCRETE OR USING EQUIPMENT IN THE TRAFFIC AREAS. PAY FOR THIS WILL BE SUBSIDIARY TO THE TRAFFIC HANDLING ITEM. FLAG MEN SHALL HAVE A LEGAL STOP/SLOW PADDLE (STANDARD) OR RED FLAG (ALTERNATE) AND WEAR A REFLECTIVE VEST WHILE PERFORMING THIS WORK.
12. SIGN LOCATIONS AND INSTALLATIONS SHALL BE IN ACCORDANCE WITH NCTCOG STANDARDS. THE CONTRACTOR SHALL REVIEW LOCATION OF ALL TRAFFIC CONTROL DEVICES WITH THE OWNER PRIOR TO INSTALLATION.
13. CONTRACTOR SHALL SUBMIT A SEQUENCE OF WORK PLAN AND A CONSTRUCTION SCHEDULE FOR APPROVAL AT THE PRE-CONSTRUCTION CONFERENCE. UPDATED CONSTRUCTION SCHEDULES WILL BE REQUIRED MONTHLY PRIOR TO PROGRESS PAYMENTS.
14. ALL EXCAVATION MORE THAN 5 FEET DEEP SHALL COMPLY WITH O.S.H.A. TRENCH SAFETY STANDARDS.
15. ANY WORK THAT WILL BE PERFORMED OUTSIDE THE RIGHT-OF-WAY WILL BE COORDINATED BY THE CONTRACTOR WITH THE PROPERTY OWNER PRIOR TO BEGINNING WORK.

ARCHEOLOGICAL DISCOVERIES AND CULTURAL RESOURCES

1. NO ACTIVITY WHICH MAY AFFECT PROPERTIES LISTED OR PROPERTIES ELIGIBLE FOR LISTING IN THE NATIONAL REGISTER OF HISTORIC PLACES, OR ELIGIBLE FOR DESIGNATION AS A STATE ARCHEOLOGICAL LANDMARK IS AUTHORIZED UNTIL THE OWNER HAS COMPLIED WITH THE PROVISIONS OF THE NATIONAL HISTORIC PRESERVATION ACT AND THE ANTIQUITIES CODE OF TEXAS. THE OWNER HAS PREVIOUSLY COORDINATED WITH THE APPROPRIATE AGENCIES AND IMPACTS TO KNOWN CULTURAL OR ARCHEOLOGICAL DEPOSITS HAVE BEEN AVOIDED OR MITIGATED.
2. IF ARCHEOLOGICAL SITES OR HISTORIC STRUCTURES WHICH MAY QUALIFY FOR DESIGNATION AS A STATE ARCHEOLOGICAL LANDMARK ACCORDING TO THE CRITERIA IN 13 TAC 41.6 - 41.10, OR THAT MAY BE ELIGIBLE FOR LISTING ON THE NATIONAL REGISTER OF HISTORIC PLACES IN ACCORDANCE WITH 36 CFR PART 800, ARE DISCOVERED AFTER CONSTRUCTION OPERATIONS ARE BEGUN, THE CONTRACTOR SHALL IMMEDIATELY CEASE OPERATIONS IN THAT PARTICULAR AREA AND NOTIFY THE OWNER, AND THE TEXAS ANTIQUITIES COMMITTEE, P.O. BOX 12276, CAPITOL STATION, AUSTIN, TEXAS 78711-2276. THE CONTRACTOR SHALL TAKE REASONABLE STEPS TO PROTECT AND PRESERVE THE DISCOVERIES UNTIL THEY HAVE BEEN INSPECTED BY THE OWNER'S REPRESENTATIVE. THE OWNER WILL PROMPTLY COORDINATE WITH THE STATE HISTORIC PRESERVATION OFFICER AND ANY OTHER APPROPRIATE AGENCIES TO OBTAIN ANY NECESSARY APPROVALS OR PERMITS TO ENABLE THE WORK TO CONTINUE. THE CONTRACTOR SHALL NOT RESUME WORK IN THE AREA OF DISCOVERY UNTIL AUTHORIZED TO DO SO BY THE OWNER.

ENDANGERED SPECIES

1. NO ACTIVITY IS AUTHORIZED THAT IS LIKELY TO JEOPARDIZE THE CONTINUED EXISTENCE OF A THREATENED OR ENDANGERED SPECIES AS LISTED OR PROPOSED FOR LISTING UNDER THE FEDERAL ENDANGERED SPECIES ACT (ESA), THE STATE OF TEXAS PARKS AND WILDLIFE CODE ON ENDANGERED SPECIES, AND/OR THE MIGRATORY BIRD TREATY ACT TO DESTROY OR ADVERSELY MODIFY THE HABITAT OF SUCH SPECIES.
2. IF A THREATENED OR ENDANGERED SPECIES IS ENCOUNTERED DURING CONSTRUCTION, THE CONTRACTOR SHALL IMMEDIATELY CEASE WORK IN THE AREA OF THE ENCOUNTER AND NOTIFY THE OWNER, WHO WILL IMMEDIATELY IMPLEMENT ACTIONS IN ACCORDANCE WITH THE ESA AND APPLICABLE STATE STATUTES. THESE ACTIONS SHALL INCLUDE REPORTING THE ENCOUNTER TO THE TWDB, THE U.S. FISH AND WILDLIFE SERVICE, AND THE TEXAS PARKS AND WILDLIFE DEPARTMENT, OBTAINING ANY NECESSARY APPROVALS OR PERMITS TO ENABLE THE WORK TO CONTINUE, OR IMPLEMENT OTHER MITIGATION ACTIONS. THE CONTRACTOR SHALL NOT RESUME WORK CONSTRUCTION IN THE AREA OF THE ENCOUNTER UNTIL AUTHORIZED TO DO SO BY THE OWNER.

EROSION AND POLLUTION CONTROL NOTES

1. ALL CONTRACTORS SHALL COMPLY WITH THE TEXAS POLLUTANT DISCHARGE ELIMINATION SYSTEM AS FURTHER DESCRIBED IN THE SPECIAL TECHNICAL SPECIFICATIONS.
2. THE CONTRACTOR SHALL INSTALL EROSION AND POLLUTION CONTROL MEASURES AS FIELD CONDITIONS WARRANT TO PREVENT OFF-SITE MIGRATION OF SOILS OR OTHER POLLUTANTS BY VEHICULAR TRACKING OR IN STORM WATER RUNOFF. PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITY, INSTALLATION OF CONTROL MEASURES, REPAIRS OR MODIFICATIONS TO THE MEASURES WILL BE MADE BY THE CONTRACTOR IF THE CONTROL MEASURES PROVE INEFFECTIVE OR IF ADDITIONAL CONTROL MEASURES ARE NECESSARY.
3. ALL STOCKPILED SOILS SHALL BE MAINTAINED IN A MANNER TO PROPERLY CONTROL SEDIMENT RUNOFF.
4. THE CONTRACTOR SHALL CONSTRUCT A BERM OR OTHER SPILL PROTECTION MEASURE FOR ANY TEMPORARY FUEL STORAGE TANK(S) ON SITE.
5. IF SUMP PUMPS ARE USED TO REMOVE WATER FROM EXCAVATED AREAS, THE DISCHARGE SHALL BE CONTAINED, FILTERED OR DISCHARGED TO A SETTLING BASIN TO REMOVE SEDIMENT AND OTHER POLLUTANTS BEFORE THE WATER ENTERS A STORM DRAIN OR LEAVES THE SITE.
6. THE CONTRACTOR SHALL STABILIZE, WITH SOME FORM OF GROUND COVER, ANY AREA WHERE CONSTRUCTION ACTIVITY IS TO BE CEASED (TEMPORARILY OR PERMANENTLY) FOR MORE THAN TWENTY-ONE (21) DAYS. RE-VEGETATION OF ALL DISTURBED SOIL SHALL BE INITIATED WITHIN TWENTY-ONE (21) DAYS OF FINAL CONSTRUCTION OPERATIONS.
7. AT THE CONCLUSION OF THE PROJECT, ALL CHANNELS, DRAINAGE WAYS AND BORROW DITCHES IN THE WORK ZONE SHALL BE CLEARED OF ANY SEDIMENT AND DEBRIS GENERATED BY THE PROJECT OR DEPOSITED AS A RESULT OF THE EROSION AND POLLUTION CONTROL MEASURES.
8. CONTRACTOR SHALL INSTALL EROSION CONTROL DEVICES ON UPSTREAM SIDE OF ALL CULVERTS, INLETS AND AT DOWNSTREAM GUTTER FLOW EXIT POINTS. EROSION CONTROL DEVICES WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS. LOCATIONS FOR EROSION CONTROL DEVICES ARE THE MINIMUM REQUIRED. CONTRACTOR IS RESPONSIBLE FOR PROVIDING A STORM WATER POLLUTION PREVENTION (SW3P) PLAN FOR THE PROJECT FOR APPROVAL AT THE PRE-CONSTRUCTION CONFERENCE.

CONCRETE PAVING NOTES

1. PORTLAND CEMENT SHALL BE AS PER NCTCOG ITEM 303.2.2 SPECIFICATIONS.
2. AGGREGATES SHALL BE AS PER NCTCOG ITEM 303.2 SPECIFICATIONS.
3. CONCRETE FOR ALL PAVING SHALL HAVE A MINIMUM STRENGTH OF 3,600 PSI WHEN TESTED AT 28 DAYS.
4. FOR HAND FORMED PAVING, ALLEYS, SIDEWALKS, AND DRIVEWAYS SLUMP SHALL BE AN AVERAGE OF FOUR INCHES WITH A MAXIMUM OF FIVE INCHES. REFER TO NCTCOG ITEM 303.3.4.4 SPECIFICATIONS.
5. THE CONTRACTOR SHALL USE A LIQUID MEMBRANE-FORMING COMPOUND AS PER NCTCOG ITEM 303.2.13.1.1 SPECIFICATIONS.
6. CONCRETE PAVEMENT SHALL BE CLASS C (3,600 PSI MIN.) AS SPECIFICIED IN THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (NCTCOG) PUBLIC WORKS CONSTRUCTION STANDARD SPECIFICATIONS ITEM 303. PORTLAND CEMENT CONCRETE PAVEMENT WITH A MAXIMUM WATER/CEMENT RATIO OF 0.53 AND A MAXIMUM COARSE AGGREGATE SIZE OF 1-1/2".
7. SLUMP FOR SLIP FORM PAVING SHALL BE AN AVERAGE OF 3-INCHES WITH A MAXIMUM OF 4-INCHES.
8. ALL REINFORCING STEEL FOR PAVING SHALL BE GRADE 60 BARS PER NCTCOG ITEM 303.2.9 AND SUPPORTED WITH THE APPROPRIATE BAR CHAIRS PER NCTCOG ITEM 303.2.11. WHERE REINFORCING BARS ARE SPLICED, A 30 DIAMETER LAP SHALL BE USED.
9. WITH APPROVAL OF THE OWNER, FLY ASH CONFORMING TO ASTM C618 MAY BE USED IN ALL CLASSES OF CONCRETE TO REPLACE A PORTION OF THE PORTLAND CEMENT IN THE MIX DESIGN UP TO A MAXIMUM OF 25% BY WEIGHT PER CUBIC YARD OF CONCRETE.
10. EXPANSION JOINTS IN PAVEMENT SHALL BE LOCATED AT INTERSECTION P.C.'S AND P.T.'S AND ALL STRUCTURES OR MANHOLES PROTRUDING THROUGH OR ADJACENT TO THE PAVEMENT. EXPANSION JOINTS SHALL BE SPACED AT 500 FEET MAXIMUM.
11. SAWED CONTRACTION JOINTS SHALL BE SPACED BETWEEN 15 AND 20 FEET IN PAVEMENT. JOINTS SHALL SAWED INTO THE COMPLETED PAVEMENT SURFACE AS SOON AFTER INITIAL CONCRETE SET AS POSSIBLE SO THAT SOME RAVELING OF THE GREEN CONCRETE IS OBSERVED IN ORDER FOR THE SAWING PROCESS TO PREVENT UNCONTROLLED SHRINKAGE CRACKING.
12. ALL JOINTS SHALL BE SEALED WITH HOT POURED POLYMER OR READY-MIXED COLD-APPLIED SEALANT CONFORMING TO NCTCOG ITEM 302.2.14.
13. EXISTING ASPHALT SHALL BE REMOVED AND HAULED OFF AS NECESSARY TO MEET THE FINAL PAVEMENT GRADE. EXISTING EXCAVATED BASE SHALL BE USED AS FILL UNDER CONCRETE PAVEMENT AS NECESSARY.
14. INITIAL DENSITY AND CONCRETE TESTING SHALL BE PROVIDED BY THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RETESTING AFTER FAILED TESTS.

PROTECTION OF HISTORIC FEATURES DURING CONSTRUCTION

WHERE PROPOSED WORK IS IN PROXIMITY TO HISTORIC BUILDINGS OR OTHER STRUCTURES (WALLS, CANOPIES, FENCES, ETC.) AND PLANTING BEDS, AND VEGETATION/GROUNDCOVER, FOLLOW THE PROCEDURES LISTED BELOW FOR DEMOLITION, PROTECTION, AND CONSTRUCTION:

1. TO MINIMIZE POTENTIAL DAMAGE TO HISTORIC STRUCTURES AND MATERIALS, CONTRACTOR TO SAW-CUT EXISTING SIDEWALK 8 TO 12 INCHES AWAY FROM THE HISTORIC STRUCTURE, CANOPY SUPPORTS, FENCE, WALL, ETC.
2. CONTRACTOR TO CONSTRUCT NEW SIDEWALK NEXT TO THE SAW-CUT EDGE WITH INSTALLATION OF EXPANSION JOINT IN BETWEEN. IF EXISTING SIDEWALK IS TO BE REMOVED ENTIRELY, THE REMAINING 8 TO 12 INCHES NEXT TO THE HISTORIC STRUCTURE, CANOPY SUPPORTS, MATERIAL, FENCE, OR WALL WILL BE REMOVED BY HAND. EXPANSION JOINT TO BE PLACED BETWEEN HISTORIC STRUCTURE, CANOPY SUPPORT, MATERIAL, FENCE, OR WALL AND NEW SIDEWALK.
3. CONTRACTOR IS RESPONSIBLE FOR PREVENTING DAMAGE TO HISTORIC STRUCTURES, CANOPY SUPPORTS AND THEIR AWNING, MATERIALS, FENCES, WALLS, GARDEN ELEMENTS (INCLUDING PLANTING BEDS, PLANTINGS, ETC.) DURING THE ENTIRE CONSTRUCTION PROJECT, ESPECIALLY DURING REMOVAL OF EXISTING PAVEMENT, CURB, OR SIDEWALK. DURING THE SAW-CUT AND HAND REMOVAL PROCESS, CONTRACTOR WILL EXERCISE UTMOST CAUTION AND WILL PHYSICALLY PROTECT HISTORIC STRUCTURE FOUNDATION, CANOPY SUPPORTS, MATERIALS, ELEVATIONS, ENTRYWAYS WITH DECORATIVE FLOORING, FENCES, WALLS, AND LANDSCAPE ELEMENTS.
4. CONTRACTOR TO REPAIR OR REPLACE IN KIND, AT HIS OWN EXPENSE, ANY HISTORIC MATERIALS DAMAGED IN THE COURSE OF EXECUTING THE WORK. CONTRACTOR IS RESPONSIBLE FOR LOCATING REPLACEMENT SOURCE FOR HISTORIC MATERIALS DAMAGED IN THE COURSE OF THE WORK. TEXAS HISTORICAL COMMISSION TO BE INFORMED OF DAMAGE AND PROPOSED REPAIRS PRIOR TO EXECUTION OF REPAIR WORK.

LEGEND

W W	PROPOSED WATER LINE
W W	EXISTING WATER LINE
	GATE VALVE
	WATER TAP
	FIRE HYDRANT
	FLUSH VALVE
	AIR RELEASE VALVE
WM	WATER METER
	POWER POLE
	GUY WIRE
OE OE OE	OVERHEAD ELECTRIC
E	ELECTRIC BOX
UE UE UE	UNDERGROUND ELECTRIC
X	FENCE LINE
GAS	GAS LINE
G	GAS METER
S S	PROPOSED SEWER LINE
S S	EXISTING SEWER LINE
MH	SEWER MANHOLE
CO	SEWER CLEAN-OUT
	EASEMENT
	PROPERTY LINE
	GRAVEL ROAD
	ASPHALT PAVING
	CONCRETE PAVING
	CONCRETE CURB & GUTTER
	SIDEWALK LANDING
	SIDEWALK RAMP
	SIDEWALK DETECTABLE WARNING SURFACE
	SIGN AND POST
T	TELEPHONE PEDESTAL
UT UT	UNDERGROUND TELEPHONE

ABBREVIATIONS

FF	FINISHED FLOOR
FFG	FINISHED FLOOR GARAGE
FGTW	FINISHED GRADE TOP OF WALL
FGBW	FINISHED GRADE BOTTOM OF WALL
GFL	GUTTER FLOW LINE
BOC	BACK OF CURB
PT	POINT OF TANGENCY
PI	POINT OF INTERSECTION
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVE
PRC	POINT OF REVERSE CURVE
FL	FLOWLINE
VG	VALLEY GUTTER
EL	ELEVATION
ExTP	EXISTING TOP OF PAVEMENT
TP	TOP OF PAVEMENT

STATE OF TEXAS
NICHOLAS J. KIRK
135937
LICENSED
PROFESSIONAL ENGINEER
01-29-2026
ISSUED FOR REVIEW

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT

NOTES

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320 | SCALE N.T.S.

SEQ. 02 | SHEET 02 / 22

STATE OF TEXAS
NICHOLAS J. KIRK
135937
LICENSED PROFESSIONAL ENGINEER
01-29-2026

ISSUED FOR REVIEW

JACOB MARTIN

TBPELS FIRM # 10194493 | TBAE FIRM # BR 2261 | TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS

DOWNTOWN REVITALIZATION PROJECT

INDEX SHEET

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT #	SCALE
24320	1" = 30'

SEQ.	SHEET
03 / 22	03

X:\C_Archer_City\24320 – 2024 TDA Downtown Revitalization Project – Archer City\Drafting_Plans_C_Civil\24320_ARC_DRP_03_INDEX.dwg Saved By: svanderpool Save Time: 8/21/2025 4:53 PM Plotted by: nic kirk Plot Date: 2/12/2026 8:30 AM

DEMO AND REMOVE EXISTING SIDEWALK

EXISTING PAVEMENT STRIPING AND MARKINGS ADJACENT TO PROJECT AREA TO BE REMOVED

EXISTING POWER POLE (TO REMAIN)

SAWCUT 8"-12" FROM BUILDING FACE AND REMOVE AREA WITHIN 8" BY HAND TYP.

EXISTING OUTSIDE FURNITURE (TO BE REINSTALLED)

EXISTING BUILDINGS

EXISTING PLANTERS (TO REMAIN)

LIMITS OF EXISTING PAVING TO BE DEMOLISHED

SAWCUT 8"-12" FROM BUILDING FACE AND REMOVE AREA WITHIN 8" BY HAND TYP.

EXISTING OUTSIDE FURNITURE (TO BE REINSTALLED)

EXISTING POWER POLE (TO BE RELOCATED)

EXISTING BUILDINGS

EXISTING OUTSIDE FURNITURE (TO BE REINSTALLED)

DEMO AND REMOVE EXISTING SIDEWALK

EXISTING OUTSIDE FURNITURE (TO BE REINSTALLED)

EXISTING PAVEMENT STRIPING AND MARKINGS ADJACENT TO PROJECT AREA TO BE REMOVED

EXISTING POWER POLE (TO BE RELOCATED)

EXISTING BUILDINGS

W. MAIN ST. (TX ST HWY 25) (CONCRETE)

S. CENTER ST. (CONCRETE)

EXISTING ARCHER COUNTY COURTHOUSE

S. SYCAMORE ST. (CONCRETE)

EXISTING BUILDINGS

W. WALNUT ST. (CONCRETE)

LIMITS OF EXISTING PAVING TO BE DEMOLISHED

APPROX. LOCATION OF EXISTING FIRE HYDRANT (TO REMAIN)

DEMO AND REMOVE EXISTING SIDEWALK

EXISTING PAVEMENT STRIPING AND MARKINGS ADJACENT TO PROJECT AREA TO BE REMOVED

EXISTING WATER METER AND WATER VALVE (TO BE RELOCATED OR ADJUSTED)

APPROX. LOCATION OF EXISTING CUT OFF PIPES (TO BE ADJUSTED OR REMOVED

EXISTING BUILDING COLUMN (TO REMAIN)

SAWCUT 8"-12" FROM BUILDING FACE AND REMOVE AREA WITHIN 8" BY HAND TYP.

EXISTING BUILDINGS

NORTH

20 0 20 40

HORIZ. SCALE IN FEET

Texas 811

EXERCISE C.A.R.E. :
C...CALL 811 BEFORE YOU DIG
A...ALLOW THE REQUIRED 48 HOURS
R...RESPECT THE MARKS
E...EXCAVATE WITH CAUTION

NOTES:
1. EXISTING PAVEMENT STRIPING AND MARKINGS TO BE REMOVED PER TXDOT SPECIFICATIONS ITEM 677-ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS.
2. EXISTING OUTSIDE FURNITURE TO BE CAREFULLY REMOVED AND STORED DURING DEMOLITION AND CONSTRUCTION;TO BE REINSTALLED AT COMPLETION OF CONSTRUCTION.

STATE OF TEXAS
NICHOLAS J. KIRK
135937
LICENSED PROFESSIONAL ENGINEER
01-29-2026
ISSUED FOR REVIEW

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT
DEMOLITION PLAN

NO.	REVISION	DATE

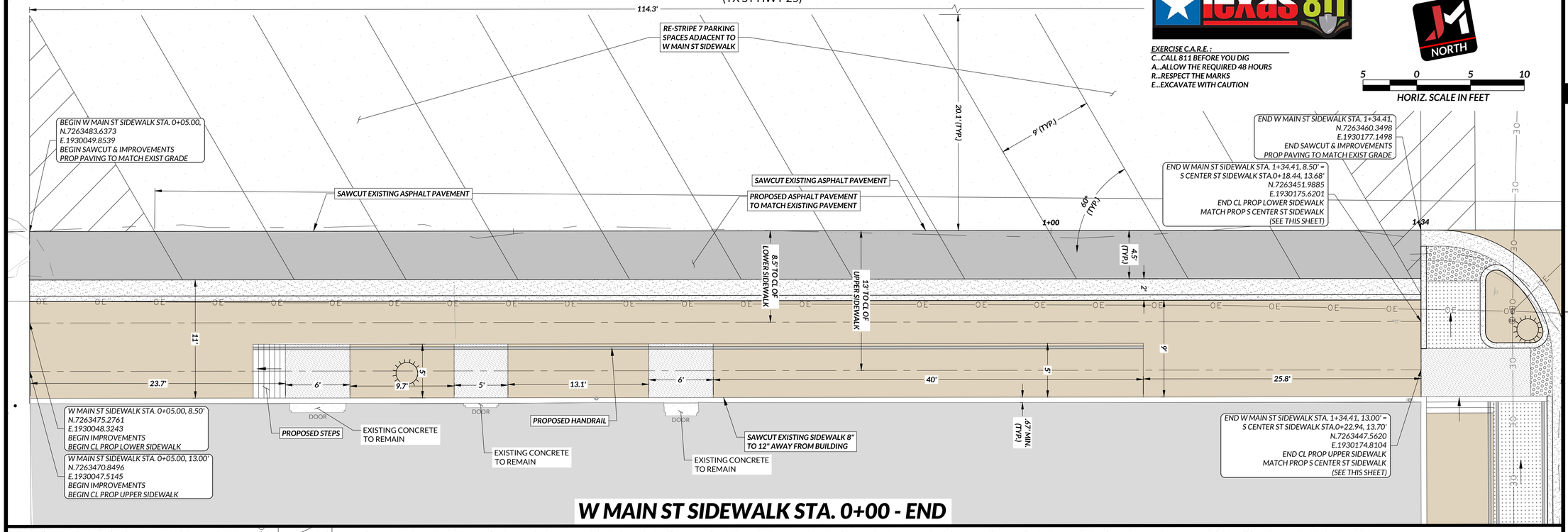
PROJECT # 24320 | SCALE 1" = 20'

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

SEQ. 04 | SHEET 04

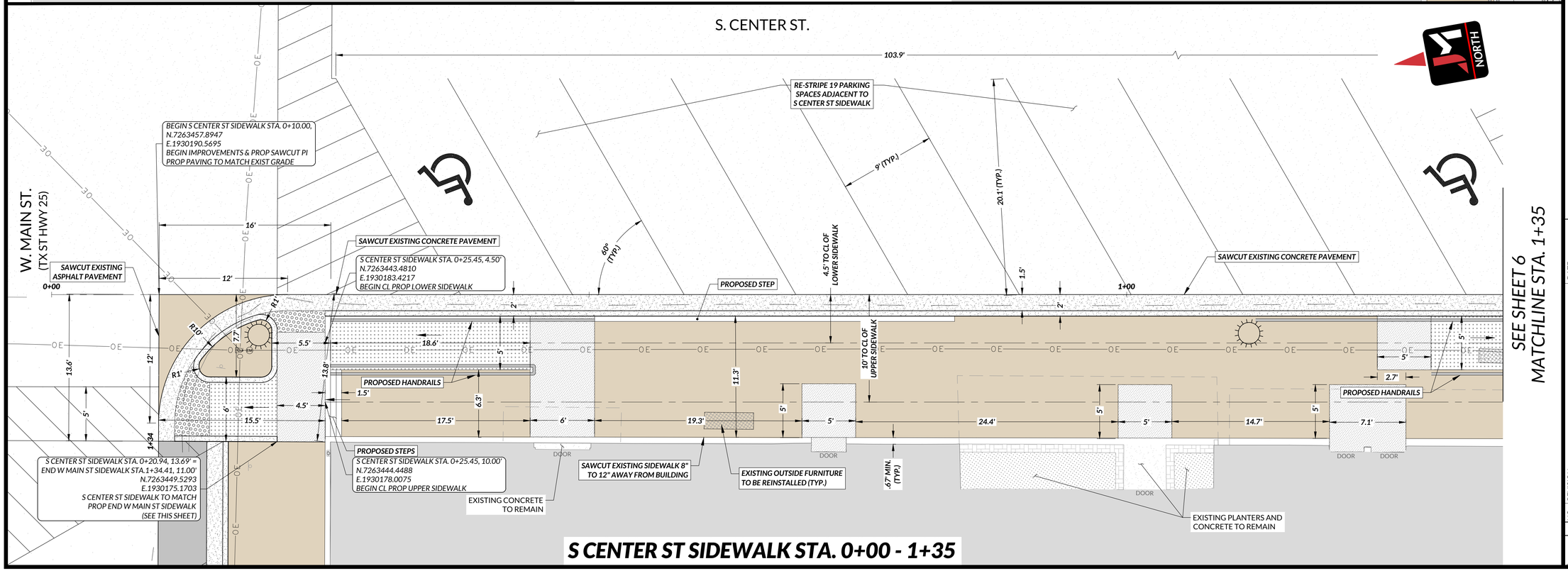
22

W. MAIN ST. (TX ST HWY 25)



W MAIN ST SIDEWALK STA. 0+00 - END

S. CENTER ST.



S CENTER ST SIDEWALK STA. 0+00 - 1+35

EXERCISE C.A.R.E. :
C...CALL 811 BEFORE YOU DIG
A...ALLOW THE REQUIRED 48 HOURS
R...RESPECT THE MARKS
E...EXCAVATE WITH CAUTION

NORTH

5 0 5 10
HORIZ. SCALE IN FEET

STATE OF TEXAS
NICHOLAS J. KIRK
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TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT

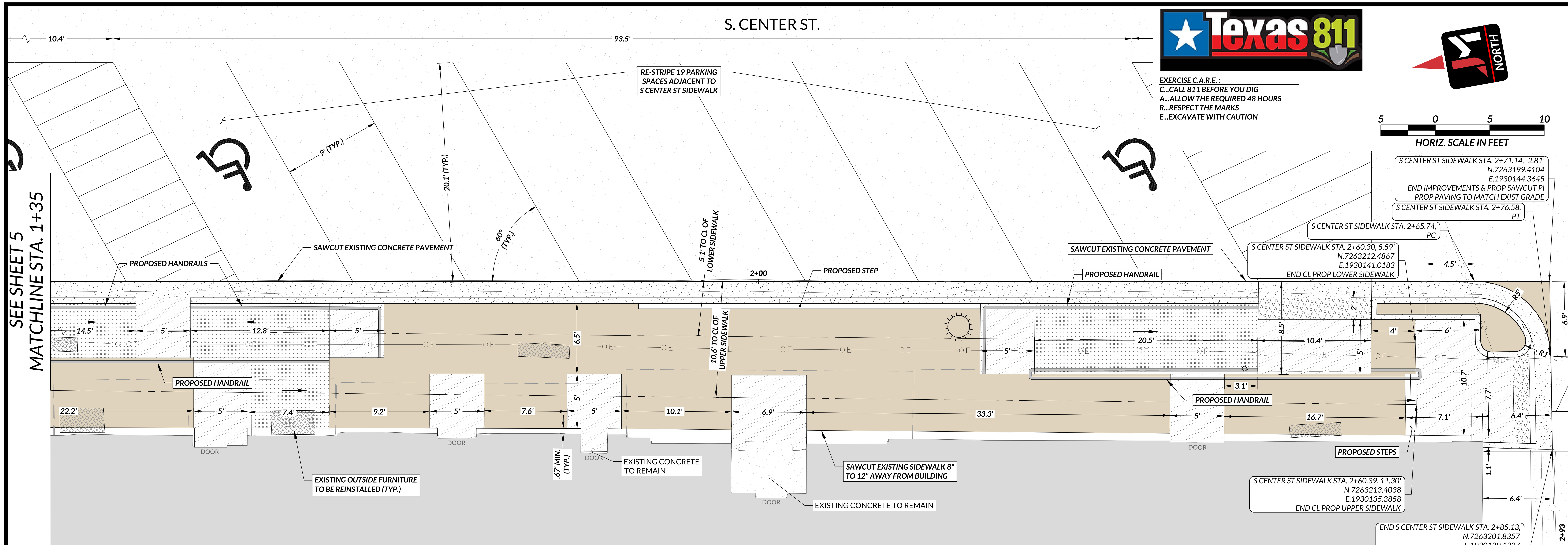
W MAIN ST STA.0+00-END & S CENTER ST STA.0+00-1+35 SIDEWALK PAVING PLAN

NO.	REVISION	DATE

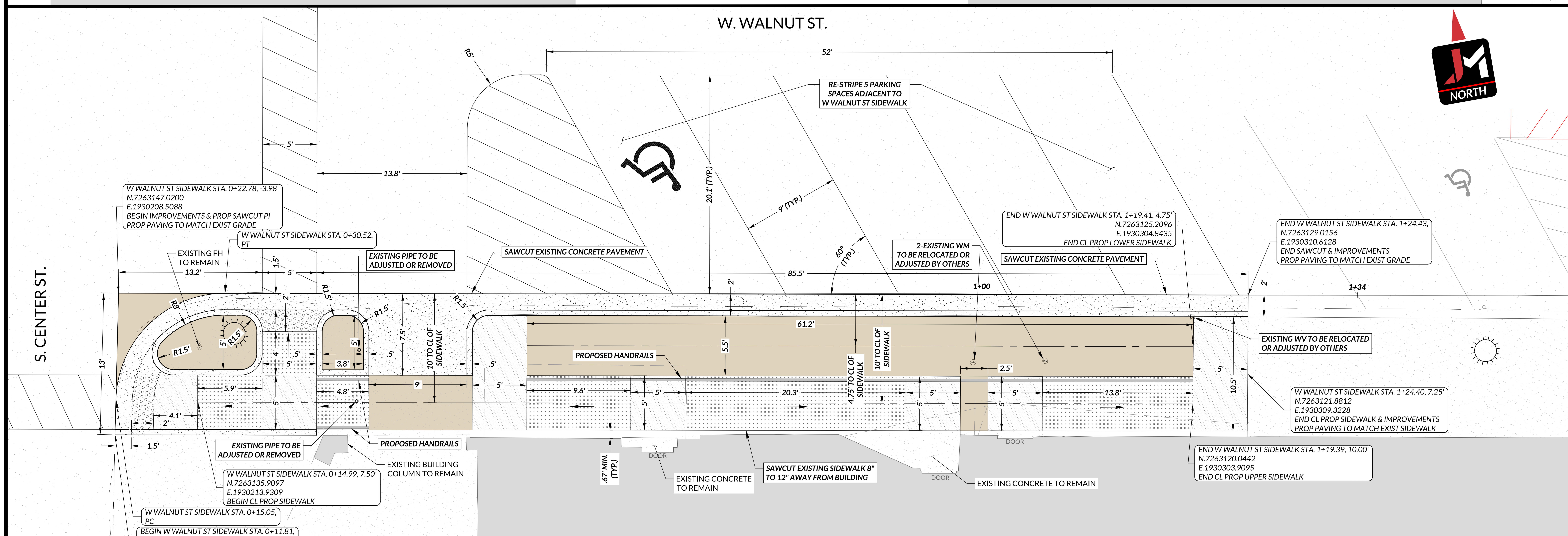
BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320
SCALE 1" = 5'

SEQ. 05/22
SHEET 05


S. CENTER ST.
10.4'
93.5'
EXERCISE C.A.R.E. :
C...CALL 811 BEFORE YOU DIG
A...ALLOW THE REQUIRED 48 HOURS
R...RESPECT THE MARKS
E...EXCAVATE WITH CAUTION
NORTH
5 0 5 10
HORIZ. SCALE IN FEET
RE-STRIPE 19 PARKING SPACES ADJACENT TO S CENTER ST SIDEWALK
9' (TYP.)
20.1' (TYP.)
60° (TYP.)
5.1' TO CL OF LOWER SIDEWALK
10.6' TO CL OF UPPER SIDEWALK
SEE SHEET 5
MATCHLINE STA. 1+35
SAWCUT EXISTING CONCRETE PAVEMENT
PROPOSED HANDRAILS
PROPOSED STEP
2+00
PROPOSED HANDRAIL
PROPOSED HANDRAIL
PROPOSED STEPS
S CENTER ST SIDEWALK STA. 2+71.14, -2.81'
N.7263199.4104
E.1930144.3645
END IMPROVEMENTS & PROP SAWCUT PI
PROP PAVING TO MATCH EXIST GRADE
S CENTER ST SIDEWALK STA. 2+76.58, PT
S CENTER ST SIDEWALK STA. 2+65.74, PC
S CENTER ST SIDEWALK STA. 2+60.30, 5.59'
N.7263212.4867
E.1930141.0183
END CL PROP LOWER SIDEWALK
14.5'
5'
12.8'
5'
6.5'
20.5'
5'
8.5'
10.4'
2'
5'
4'
6'
4.5'
R5'
R1'
6.9'
10.7'
7.7'
3.1'
22.2'
5'
7.4'
9.2'
5'
7.6'
5'
5'
10.1'
6.9'
33.3'
5'
16.7'
7.1'
6.4'
1.1'
6.4'
.67' MIN. (TYP.)
DOOR
DOOR
DOOR
DOOR
DOOR
EXISTING OUTSIDE FURNITURE TO BE REINSTALLED (TYP.)
EXISTING CONCRETE TO REMAIN
SAWCUT EXISTING SIDEWALK 8" TO 12" AWAY FROM BUILDING
EXISTING CONCRETE TO REMAIN
S CENTER ST SIDEWALK STA. 2+60.39, 11.30'
N.7263213.4038
E.1930135.3858
END CL PROP UPPER SIDEWALK
END S CENTER ST SIDEWALK STA. 2+85.13,
N.7263201.8357
E.1930129.1327
END SAWCUT & IMPROVEMENTS
PROP PAVING TO MATCH EXIST GRADE
2+93

S CENTER ST SIDEWALK STA. 1+35 - END


W. WALNUT ST.
NORTH
S. CENTER ST.
52'
R5'
RE-STRIPE 5 PARKING SPACES ADJACENT TO W WALNUT ST SIDEWALK
5'
13.8'
20.1' (TYP.)
9' (TYP.)
60° (TYP.)
W WALNUT ST SIDEWALK STA. 0+22.78, -3.98'
N.7263147.0200
E.1930208.5088
BEGIN IMPROVEMENTS & PROP SAWCUT PI
PROP PAVING TO MATCH EXIST GRADE
W WALNUT ST SIDEWALK STA. 0+30.52, PT
EXISTING FH TO REMAIN
EXISTING PIPE TO BE ADJUSTED OR REMOVED
SAWCUT EXISTING CONCRETE PAVEMENT
END W WALNUT ST SIDEWALK STA. 1+19.41, 4.75'
N.7263125.2096
E.1930304.8435
END CL PROP LOWER SIDEWALK
2-EXISTING WM TO BE RELOCATED OR ADJUSTED BY OTHERS
SAWCUT EXISTING CONCRETE PAVEMENT
END W WALNUT ST SIDEWALK STA. 1+24.43,
N.7263129.0156
E.1930310.6128
END SAWCUT & IMPROVEMENTS
PROP PAVING TO MATCH EXIST GRADE
13.2'
1.5'
5'
85.5'
2'
1+00
2'
1+34
R8'
R1.5'
R1.5'
R1.5'
R1.5'
R1.5'
7.5'
10' TO CL OF SIDEWALK
61.2'
5.5'
4.75' TO CL OF SIDEWALK
10' TO CL OF SIDEWALK
2.5'
5'
10.5'
3.8'
5.9'
4.8'
9'
9.6'
5'
20.3'
5'
5'
13.8'
4.1'
2'
13'
1.5'
PROPOSED HANDRAILS
PROPOSED HANDRAILS
EXISTING WV TO BE RELOCATED OR ADJUSTED BY OTHERS
W WALNUT ST SIDEWALK STA. 1+24.40, 7.25'
N.7263121.8812
E.1930309.3228
END CL PROP SIDEWALK & IMPROVEMENTS
PROP PAVING TO MATCH EXIST SIDEWALK
EXISTING PIPE TO BE ADJUSTED OR REMOVED
EXISTING BUILDING COLUMN TO REMAIN
W WALNUT ST SIDEWALK STA. 0+14.99, 7.50'
N.7263135.9097
E.1930213.9309
BEGIN CL PROP SIDEWALK
W WALNUT ST SIDEWALK STA. 0+15.05, PC
BEGIN W WALNUT ST SIDEWALK STA. 0+11.81,
N.7263134.2707
E.1930205.9497
BEGIN SAWCUT & IMPROVEMENTS
PROP PAVING TO MATCH EXIST GRADE
0+00
.67' MIN. (TYP.)
DOOR
DOOR
DOOR
EXISTING CONCRETE TO REMAIN
SAWCUT EXISTING SIDEWALK 8" TO 12" AWAY FROM BUILDING
EXISTING CONCRETE TO REMAIN
END W WALNUT ST SIDEWALK STA. 1+19.39, 10.00'
N.7263120.0442
E.1930303.9095
END CL PROP UPPER SIDEWALK

W WALNUT ST SIDEWALK STA. 0+00 - END

STATE OF TEXAS
NICHOLAS J. KIRK
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TBAE FIRM # BR 2261
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CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT

S CENTER ST STA.1+35-END & W WALNUT ST STA.0+00-END SIDEWALK PAVING PLAN

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320
SCALE 1" = 5'

SEQ. 06
22
SHEET 06

Plotted by: nic kirk Plot Date: 2/12/2026 8:31 AM
Saved By: nkirk Save Time: 2/12/2026 8:29 AM
X:\C_Archer_City\24320 - 2024 TDA Downtown Revitalization Project - Archer City\Drafting_Plans_C_Civil\24320_ARC_DRP_PLAN_PAVE.dwg

W. MAIN ST.
(TX ST HWY 25)

Texas 811

EXERCISE C.A.R.E. :
C...CALL 811 BEFORE YOU DIG
A...ALLOW THE REQUIRED 48 HOURS
R...RESPECT THE MARKS
E...EXCAVATE WITH CAUTION

NORTH

5 0 5 10
HORIZ. SCALE IN FEET

BEGIN W MAIN ST SIDEWALK STA.0+05.00,
N.7263483.6373
E.1930049.8539
BEGIN IMPROVEMENTS
PI TP:1061.71
MATCH EXISTING ELEV

END W MAIN ST SIDEWALK STA.1+34.41 =
S CENTER ST SIDEWALK STA.0+09.94, 13.64'
N.7263460.3498
E.1930177.1498
END IMPROVEMENTS
TP:1064.93
MATCH EXISTING ELEV

W MAIN ST SIDEWALK STA.1+34.41, 8.50' =
S CENTER ST SIDEWALK STA.0+18.44, 13.68'
END CL PROP LOWER SIDEWALK
MATCH PROP SIDEWALK ELEV
TP:1065.60

TP:1062.21 MATCH EXISTING ELEV
TP:1062.76 MATCH EXISTING ELEV
TP:1063.38 MATCH EXISTING ELEV
TP:1064.06 MATCH EXISTING ELEV

GFL:1061.83 BOC:1062.33
GFL:1062.33 BOC:1062.83
GFL:1062.88 BOC:1063.38
GFL:1063.50 BOC:1064.00
GFL:1064.18 BOC:1064.68
GFL:1065.09 BOC:1065.59

TP:1062.99 *TP:1063.19* *TP:1063.31* *TP:1063.79* *TP:1063.64* *TP:1064.87*
TP:1062.82 *TP:1062.88* *TP:1065.61*

PROPOSED CL OF LOWER SIDEWALK
PROPOSED CL OF UPPER SIDEWALK

W MAIN ST SIDEWALK STA.0+05.00, 8.50'
BEGIN IMPROVEMENTS
BEGIN CL PROP LOWER SIDEWALK
TP:1062.37

W MAIN ST SIDEWALK STA.0+05.00, 13.00'
BEGIN IMPROVEMENTS
BEGIN CL PROP UPPER SIDEWALK
TP:1062.45
TP:1062.50
ExTP:1063.63

TP STEP:1063.33 *TP STEP:1063.83* *TP STEP:1064.33* *TP STEP:1064.83* *TP STEP:1065.33* *TP STEP:1065.83* *TP:1066.00* *TP:1066.28*
ExTP:1066.33
ExTP:1066.40
TP:1066.27 *TP:1066.30*
ExTP:1066.31
TP:1066.27 *TP:1066.29*
ExTP:1066.34
TP:1066.30 *TP:1066.33*
TP:1066.75 *TP:1066.78*
ExTP:1066.83
TP:1066.81 *TP:1066.83*
ExTP:1066.96
ExTP:1067.20
ExTP:1066.90
TP:1064.87 *TP:1064.87*
TP:1065.63
TP:1065.70
ExTP:1066.91

S CENTER ST SIDEWALK
SEE SHEET 08

W MAIN ST SIDEWALK STA. 0+00 - END

W MAIN ST SIDEWALK
H: 1" = 5'
V: 1" = 1'

PROPOSED FINISHED GROUND @ 13' OFFSET TO CL OF UPPER SIDEWALK
EXISTING GROUND @ 13' OFFSET TO CL OF SIDEWALK
PROPOSED FINISHED GROUND @ 8.5' OFFSET TO CL OF LOWER SIDEWALK
PROPOSED FINISHED GROUND @ BOC
EXISTING GROUND @ SAWCUT
PROPOSED FINISHED GROUND @ SAWCUT

GRADE BREAK STA = 0+05.00 ELEV = 1061.71
GRADE BREAK STA = 0+19.17 ELEV = 1061.99
GRADE BREAK STA = 0+44.18 ELEV = 1062.49
GRADE BREAK STA = 0+96.18 ELEV = 1063.78
GRADE BREAK STA = 1+32.00 ELEV = 1064.91
GRADE BREAK STA = 1+34.41 ELEV = 1064.93

+2.00% +1.97% +2.49% +3.15% +0.74%

1070 1065 1060
0+00 1+00 1+40

CL EG: 1061.63 CL FG:
CL EG: 1061.82 CL FG: 1061.81
CL EG: 1062.02 CL FG: 1062.01
CL EG: 1062.18 CL FG: 1062.21
CL EG: 1062.46 CL FG: 1062.40
CL EG: 1062.63 CL FG: 1062.63
CL EG: 1062.92 CL FG: 1062.88
CL EG: 1063.14 CL FG: 1063.13
CL EG: 1063.39 CL FG: 1063.38
CL EG: 1063.64 CL FG: 1063.63
CL EG: 1063.92 CL FG: 1063.90
CL EG: 1064.20 CL FG: 1064.22
CL EG: 1064.49 CL FG: 1064.53
CL EG: 1064.83 CL FG: 1064.85

STATE OF TEXAS
NICHOLAS J. KIRK
135937
LICENSED PROFESSIONAL ENGINEER
01-29-2026

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

ISSUED FOR REVIEW

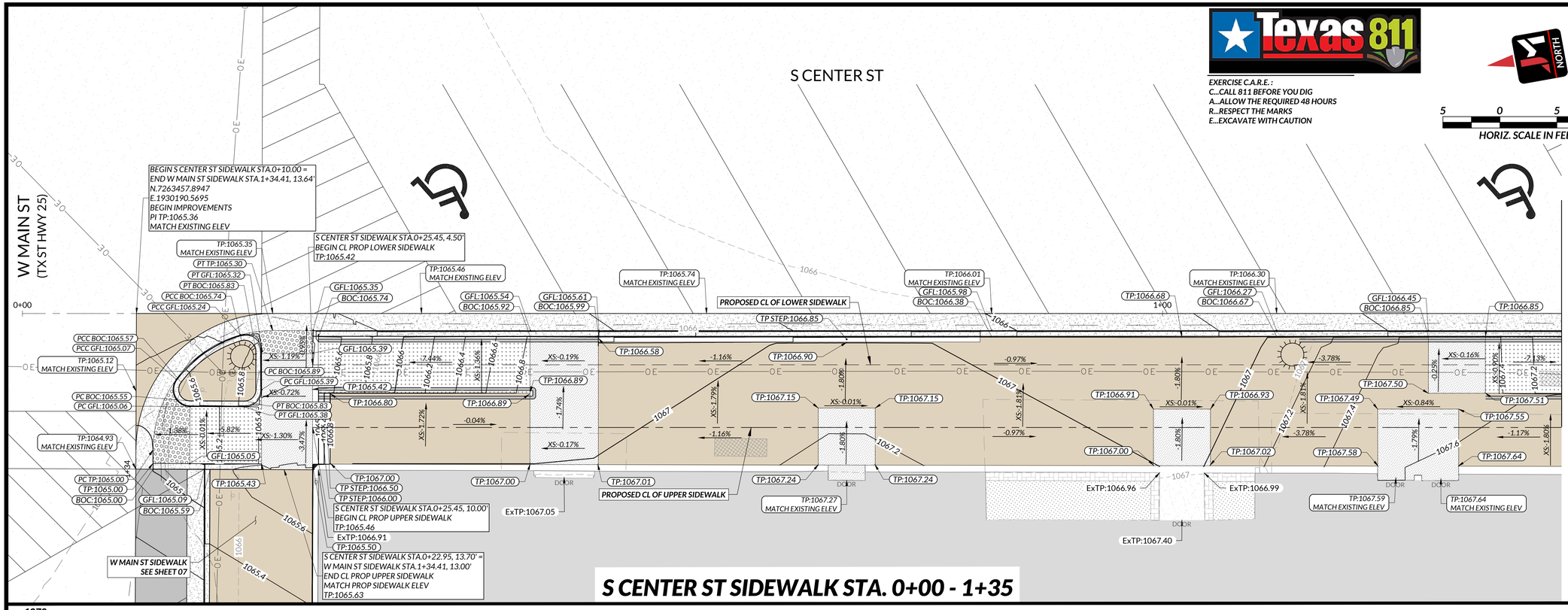
CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT
W MAIN ST SIDEWALK STA. 0+00 - END
GRADING PLAN

NO.	REVISION	DATE

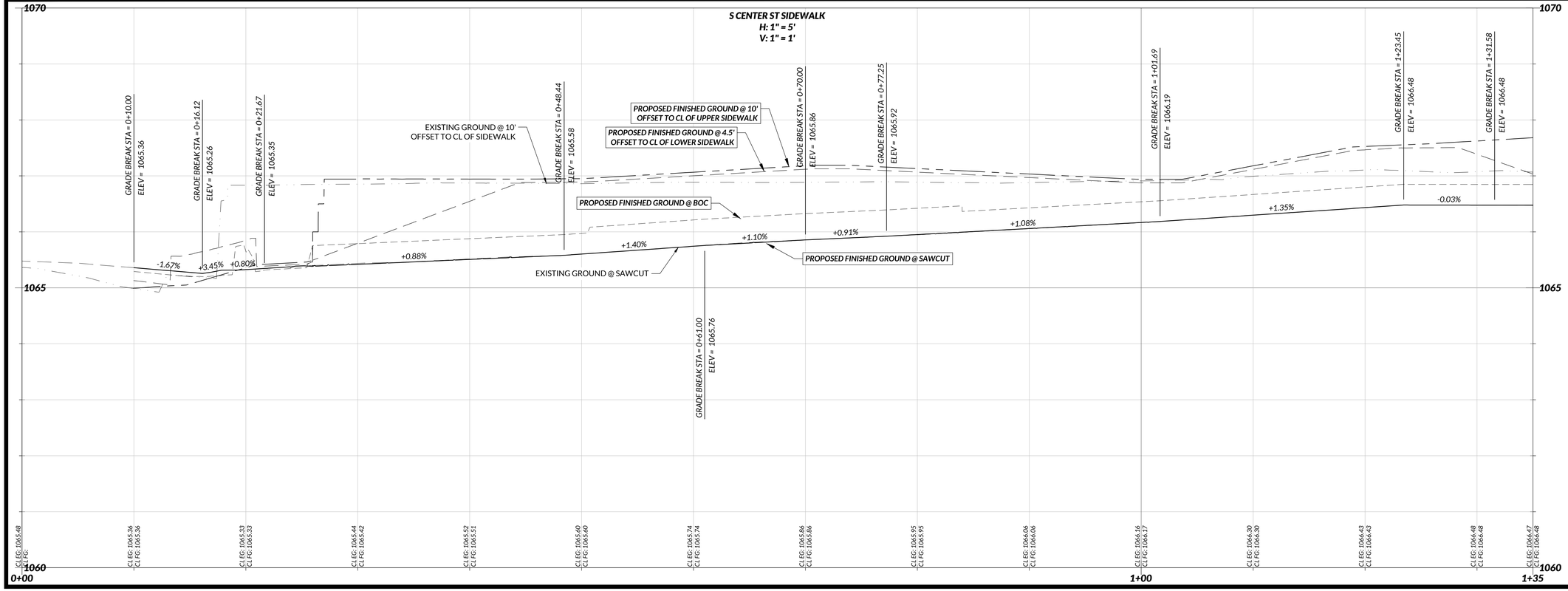
PROJECT # 24320 | SCALE 1" = 5'

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

SEQ. 07 / 22 | SHEET 07



S CENTER ST SIDEWALK STA. 0+00 - 1+35



STATE OF TEXAS
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CITY OF ARCHER CITY, TEXAS

DOWNTOWN REVITALIZATION PROJECT

S CENTER ST SIDEWALK STA. 0+00 - 1+35
GRADING PLAN

NO.	REVISION	DATE

PROJECT # 24320 | SCALE 1" = 5'

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

SEQ. 08 | SHEET 08

SEE SHEET 8
MATCHLINE STA. 1+35

S CENTER ST

W WALNUT ST

EXERCISE C.A.R.E.:
C...CALL 811 BEFORE YOU DIG
A...ALLOW THE REQUIRED 48 HOURS
R...RESPECT THE MARKS
E...EXCAVATE WITH CAUTION

5 0 5 10
HORIZ. SCALE IN FEET

PROPOSED CL OF LOWER SIDEWALK
PROPOSED CL OF UPPER SIDEWALK

S CENTER ST SIDEWALK STA.2+71.14, -2.81'
END IMPROVEMENTS & PROFILE
PI TP:1065.42
MATCH EXISTING ELEV

S CENTER ST SIDEWALK STA.2+60.30, 5.59'
END CL PROP LOWER SIDEWALK
TP:1065.42

S CENTER ST SIDEWALK STA.2+60.39, 11.30'
END CL PROP UPPER SIDEWALK
TP:1065.43

END S CENTER ST SIDEWALK STA.2+85.13,
N.7263201.8357
E.1930129.1327
END IMPROVEMENTS
TP:1065.33
MATCH EXISTING ELEV

S CENTER ST SIDEWALK STA. 1+35 - END

S CENTER ST SIDEWALK
H: 1" = 5'
V: 1" = 1'

EXISTING GROUND @ 10' OFFSET TO CL OF SIDEWALK
PROPOSED FINISHED GROUND @ 10' OFFSET TO CL OF UPPER SIDEWALK
PROPOSED FINISHED GROUND @ 4.5' OFFSET TO CL OF LOWER SIDEWALK
PROPOSED FINISHED GROUND @ BOC
EXISTING GROUND @ SAWCUT
PROPOSED FINISHED GROUND @ SAWCUT

GRADE BREAK STA = 1+49.02, ELEV = 1066.48
GRADE BREAK STA = 1+62.76, ELEV = 1066.38
GRADE BREAK STA = 1+80.95, ELEV = 1066.24
GRADE BREAK STA = 2+00.00, ELEV = 1066.01
GRADE BREAK STA = 2+12.64, ELEV = 1065.90
GRADE BREAK STA = 2+35.51, ELEV = 1065.69
GRADE BREAK STA = 2+56.29, ELEV = 1065.44
GRADE BREAK STA = 2+68.61, ELEV = 1065.43

+0.01% -0.75% -0.73% -1.22% -0.91% -0.90% -1.22% -0.04% -0.65%

1+35 2+00 2+75

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CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT
S CENTER ST SIDEWALK STA. 1+35 - END
GRADING PLAN

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320 | SCALE 1" = 5'

SEQ. 09/22 | SHEET 09

W WALNUT ST

S CENTER ST

EXERCISE C.A.R.E. :
C...CALL 811 BEFORE YOU DIG
A...ALLOW THE REQUIRED 48 HOURS
R...RESPECT THE MARKS
E...EXCAVATE WITH CAUTION

NORTH

5 0 5 10
HORIZ. SCALE IN FEET

W WALNUT ST SIDEWALK STA.0+22.78, -3.98'
BEGIN IMPROVEMENTS & PROFILE
PI TP:1066.08
MATCH EXISTING ELEV

W WALNUT ST SIDEWALK STA.0+58.23, 4.75'
BEGIN CL PROP LOWER SIDEWALK
TP:1066.93

PROPOSED CL OF LOWER SIDEWALK

W WALNUT ST SIDEWALK STA.1+19.41, 4.75'
END CL PROP LOWER SIDEWALK
TP:1066.68

END W WALNUT ST SIDEWALK STA.1+24.43,
N.7263129.0156
E.1930310.6128
END IMPROVEMENTS
TP:1066.05
MATCH EXISTING ELEV

W WALNUT ST SIDEWALK STA.1+24.45, 7.25'
END IMPROVEMENTS & PROP SIDEWALK
TP:1066.68
MATCH EXIST ELEV

PROPOSED CL OF SIDEWALK

W WALNUT ST SIDEWALK STA.0+14.99, 7.50'
BEGIN CL PROP UPPER SIDEWALK
TP:1066.27

W WALNUT ST SIDEWALK STA.1+19.39, 10.00'
END CL PROP UPPER SIDEWALK
TP:1066.74

PROPOSED CL OF UPPER SIDEWALK

BEGIN W WALNUT ST SIDEWALK STA.0+11.81,
N.7263134.2707
E.1930205.9497
BEGIN IMPROVEMENTS
PI TP:1066.12
MATCH EXISTING ELEV

W WALNUT ST SIDEWALK STA. 0+00 - END

W WALNUT ST SIDEWALK
H: 1" = 5'
V: 1" = 1'

GRADE BREAK STA = 0+34.66 ELEV = 1066.19
GRADE BREAK STA = 0+59.33 ELEV = 1066.29
GRADE BREAK STA = 0+70.78 ELEV = 1066.29
GRADE BREAK STA = 0+81.32 ELEV = 1066.37
GRADE BREAK STA = 0+97.02 ELEV = 1066.29
GRADE BREAK STA = 1+15.51 ELEV = 1066.14
GRADE BREAK STA = 1+27.16 ELEV = 1066.03

EXISTING GROUND @ 10' OFFSET TO CL OF SIDEWALK
PROPOSED FINISHED GROUND @ BOC
PROPOSED FINISHED GROUND @ 10' OFFSET TO CL OF SIDEWALK
PROPOSED FINISHED GROUND @ 4.75' OFFSET TO CL OF SIDEWALK
EXISTING GROUND @ SAWCUT
PROPOSED FINISHED GROUND @ SAWCUT

+0.90% +0.43% +0.01% +0.73% -0.50% -0.79% -0.80% -1.02%

1070 1065 1060
0+20 1+00 1+35

Texas 811

STATE OF TEXAS
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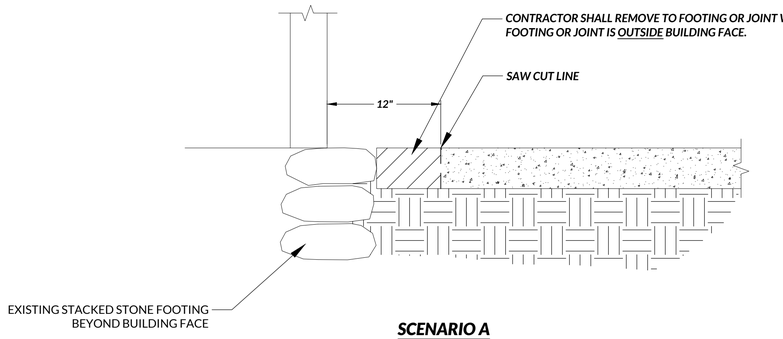
CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT
W WALNUT ST SIDEWALK STA. 0+00 - END
GRADING PLAN

NO.	REVISION	DATE

PROJECT # 24320 | SCALE 1" = 5'
BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

SEQ. 10/22 | SHEET 10



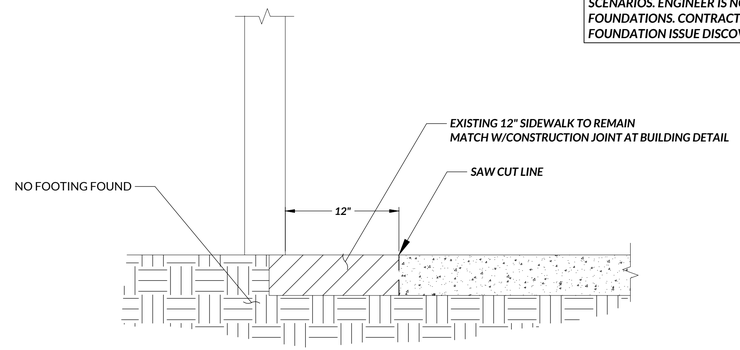
SCENARIO A

NOTE:

1. REMOVE & REPLACE SIDEWALK TO STONE FOOTING.
2. STONE FOOTING EXTENDS BEYOND FACADE.

NOTE:

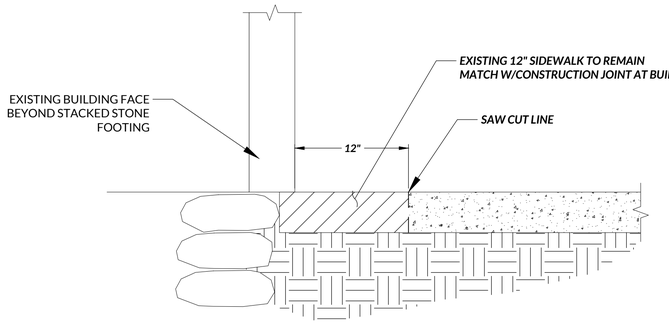
THE SCENARIOS ON THIS SHEET ARE APPROXIMATE AND MAY OR MAY NOT BE ENCOUNTERED IN THE FIELD. NO GUARANTEE IS MADE OF ANY FOUNDATION SCENARIOS. ENGINEER IS NOT RESPONSIBLE FOR ERRORS MADE DUE TO FOUNDATIONS. CONTRACTOR TO IMMEDIATELY CONTACT ENGINEER FOR FOUNDATION ISSUE DISCOVERED DURING CONSTRUCTION.



SCENARIO D

NOTE:

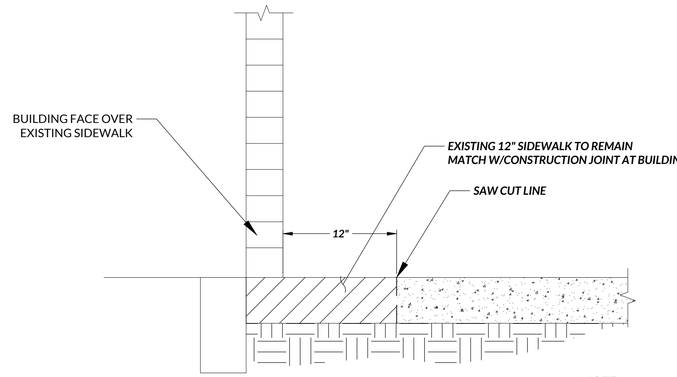
1. NO GRADE BEAM OR PERIMETER FOOTING FOUND.



SCENARIO B

NOTE:

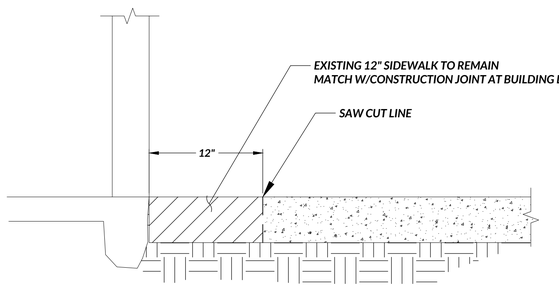
1. PLASTER W/BRICK FACADE OR WINDOW FRAMES SET OVER THE EDGE OF EXISTING SIDEWALK.



SCENARIO E

NOTE:

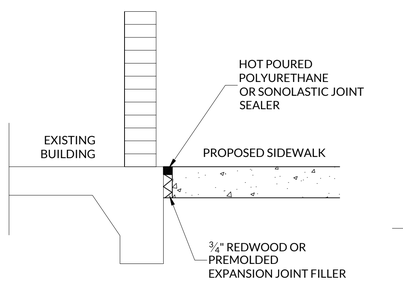
1. VERTICAL FACE FOUND, APPEARS TO BE CONCRETE FOOTING OF INDETERMINATE SIZE.
2. FACADE BUILT OVER SIDEWALK.



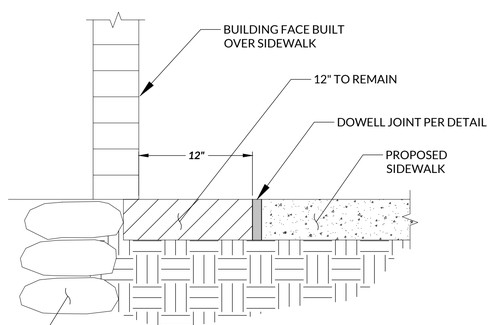
SCENARIO C

NOTE:

1. 6"x6" TOE DOWN AT EDGE OF BUILDING & SIDEWALKS.



EXPANSION JOINT AT BUILDING
N.T.S.



DOWELL JOINT AT BUILDING
N.T.S.

THIS SCENARIO OCCURS WHEN BUILDING FACE IS ON SIDEWALK, OVER STONE OR CONCRETE FOOTING, OR IN CASES WHERE FOOTING NOT AVAILABLE.

STATE OF TEXAS
NICHOLAS J. KIRK
135937
LICENSED PROFESSIONAL ENGINEER

01-29-2026

ISSUED FOR REVIEW

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT

BUILDING SAWCUT DETAILS

NO.	REVISION	DATE

PROJECT # 24320 | SCALE N.T.S.

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

SEQ. 11 / 22 | SHEET 11

Plotted by: nic. kirk Plot Date: 2/12/2026 8:32 AM
Saved By: nkirk Save Time: 2/12/2026 8:27 AM
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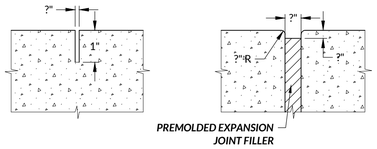
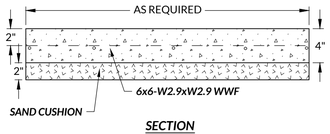


CONTRACTION JOINT
REQUIRED 5'-0" C.C. MAX.

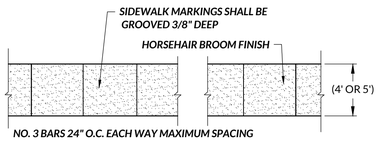
EXPANSION JOINT
REQUIRED 40'-0" C.C. MAX.



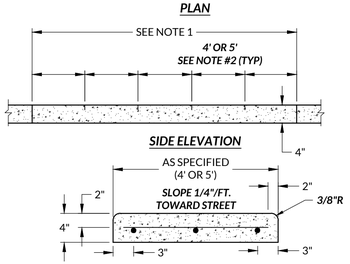
SECTION

SIDEWALK JOINT DETAILS

N.T.S.



PLAN



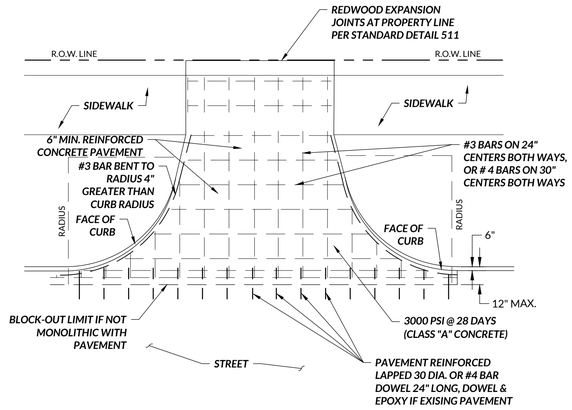
SIDE ELEVATION

SECTION

NOTES:
1. 1/2" EXPANSION JOINTS SHALL BE SPACED AT 60' MAXIMUM INTERVALS. OR AS OTHERWISE SPECIFIED. JOINTS SHALL BE REDWOOD WITH THREE (3) #3 2' SLIP DOWELS WITH END CAPS AT EQUAL SPACING.
2. TOOL GROOVE EVERY 5' ON 5' WALKS AND EVERY 4' ON 4' WALK.
3. SIDEWALKS SHALL BE CLASS "A" CONCRETE.
4. WHEN CONCRETE SIDEWALK IS ADJACENT TO EXISTING CONCRETE, DEPTH OF BITUMINOUS EXPANSION JOINT FILLER SHALL BE SUFFICIENT TO PREVENT CONCRETE TO CONCRETE CONTACT BETWEEN SIDEWALK AND CONCRETE. WHEN SIDEWALK IS LOCATED AT THE BACK OF CURB THE NO. 3 REBAR AT 24" O.C. FOR THE SIDEWALK SHOULD EXTEND TO A DEPTH APPROXIMATELY 3" INTO THE BACK OF THE CURB AND SHOULD BE ANCHORED IN PLACE WITH EPOXY RESIN.
5. SIDEWALK SUBGRADE SHALL BE COMPACTED TO MINIMUM 95% STANDARD PROCTOR DENSITY.
6. A MAXIMUM OF 1" OF SAND MAY BE USED FOR LEVEL UP ONLY.
7. NO "WHIRLEY BIRD" TYPE FINISHING MACHINES WILL BE ALLOWED.
8. MAXIMUM CROSS SLOPE IS 2%.

CONCRETE SIDEWALK DETAILS

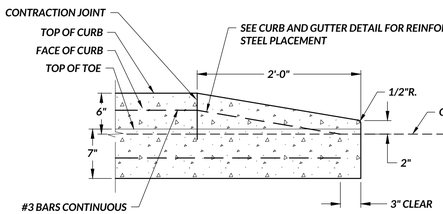
N.T.S.



NOTES:
1. DRIVEWAY SHALL NOT HAVE GREATER THAN 12% SLOPE.
2. IF SIDEWALK IS AT THE RADIUS, THE 6" SIDEWALK SHALL BE POURED MONOLITHICALLY WITH THE DRIVEWAY ONE JOINT EITHER SIDE.

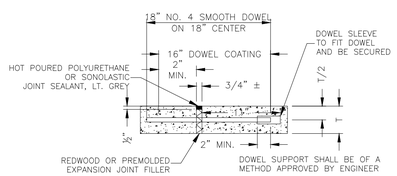
DRIVEWAY APPROACH RADIUS RETURN TYP.

N.T.S.



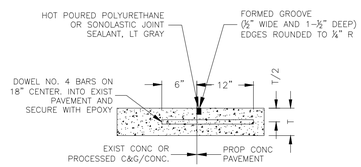
CURB TERMINAL DETAIL

N.T.S.



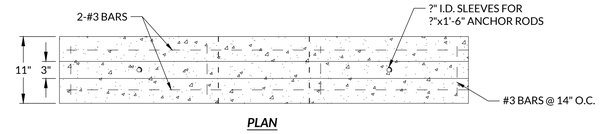
EXPANSION JOINT

N.T.S.

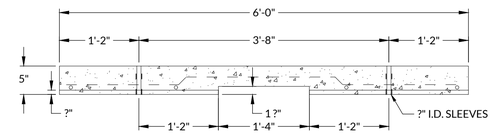


CONSTRUCTION OR DOWEL JOINT

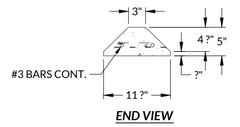
N.T.S.



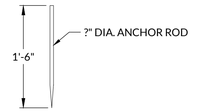
PLAN



ELEVATION



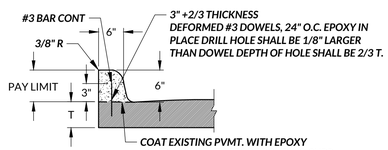
END VIEW



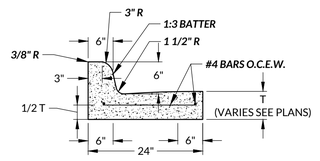
ANCHOR ROD

WHEEL STOP DETAIL

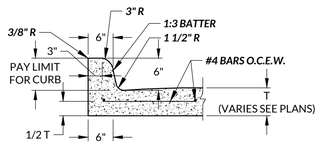
N.T.S.



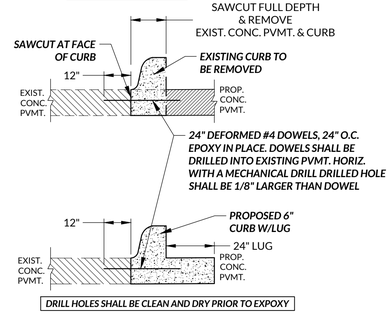
DOWEL ON CURB



SEPARATE CURB AND GUTTER



INTEGRAL CURB AND GUTTER



SAWCUT AND REMOVE CURB CONNECTION TO EXISTING PAVEMENT

CONCRETE CURB DETAILS

N.T.S.

STATE OF TEXAS
NICHOLAS J. KIRK
135937
LICENSED PROFESSIONAL ENGINEER
01-29-2026

ISSUED FOR REVIEW

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT
PAVING DETAILS

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320 | SCALE N.T.S.

SEQ. 12 | SHEET 12 / 22

Plotted by: nic. kirk Plot Date: 2/12/2026 8:32 AM
Save Time: 2/12/2026 8:27 AM Saved By: nkirk
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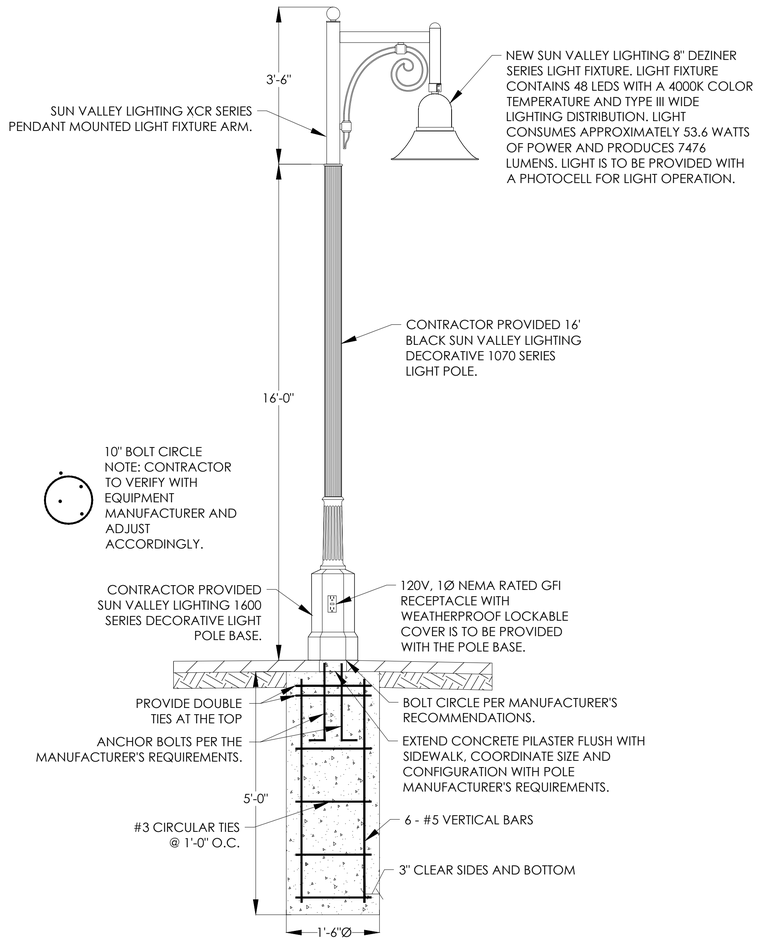
ELECTRICAL LEGEND

(A)	NEW LED POLE MOUNTED LIGHT PER SCHEDULE
UE	EXISTING UNDERGROUND ELECTRICAL
OE	EXISTING OVERHEAD ELECTRICAL
UE	NEW UNDERGROUND ELECTRICAL
	EXISTING POWER POLE
	EXISTING POWER POLE WITH UTILITY OWNED LIGHT
W	EXISTING WATER LINE. REFERENCE CIVIL PLANS
GAS	EXISTING GAS LINE. REFERENCE CIVIL PLANS

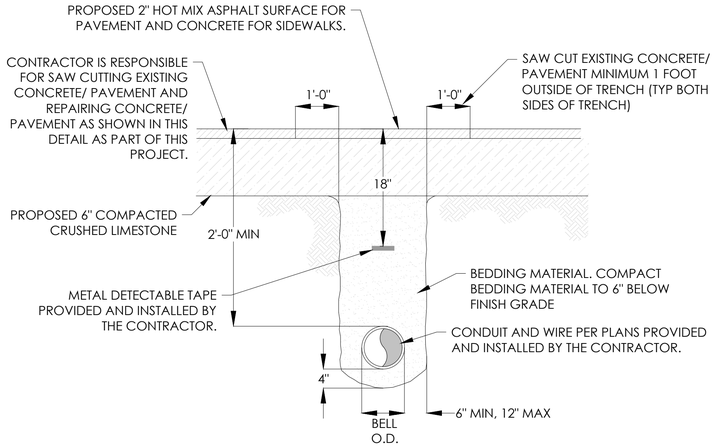
PANEL — BREAKER # — *A-1,3* — HOMERUN

NOTE: X DENOTES FIXTURES SCHEDULE DESIGNATION



LIGHT POLE & FOUNDATION DETAIL

N.T.S.



TRENCH WITHIN CONCRETE/ PAVED AREAS CONDUIT DETAIL

N.T.S.

GENERAL ELECTRICAL NOTES:

1. ALL ELECTRICAL COMPONENTS OF THIS PROJECT SHALL COMPLY WITH: NFPA 70 - NATIONAL ELECTRICAL CODE: MOST RECENT EDITION ADOPTED BY AUTHORITY HAVING JURISDICTION, INCLUDING ALL APPLICABLE AMENDMENTS AND SUPPLEMENTS.
2. ALL CIRCUITS SHALL BE A MINIMUM SIZE OF 12 GAUGE AND A MINIMUM 3/4" CONDUIT.
3. ALL CIRCUITS SHALL CONTAIN A GROUND WIRE.
4. EACH CIRCUIT SHALL CONTAIN ITS OWN NEUTRAL WIRE. NO NEUTRAL SHARING SHALL BE ALLOWED.
5. ALL CONDUCTORS SHALL BE COPPER UNLESS OTHERWISE SHOWN ON PLAN. USE THHW, THW, THWN, OR XHHW.
6. CLEAR, READABLE PANEL DIRECTORIES ARE REQUIRED FOR ALL PANELS.
7. LABEL ALL NEW PANELS, TRANSFORMERS, & DISCONNECT SWITCHES WITH ENGRAVED PLASTIC SIGNS, RED BACKGROUND WITH WHITE LETTERS. USE MINIMUM SIZE OF 4"X2". SCREW OR RIVET TO PANEL. SIGN NEEDS TO GIVE PANEL NAME, AMPERAGE, VOLTAGE, & PHASE.
8. ELECTRICAL DESIGN PROVIDES A NUMBER OF BRANCH CIRCUITS, PHASES, AMPACITY, AND OVERCURRENT PROTECTION CONFORMING TO MANUFACTURER'S SPECIFICATIONS AVAILABLE AT TIME OF DESIGN. IF REQUIREMENTS OF EQUIPMENT ACTUALLY PROVIDED UNDER CONTRACT FOR CONSTRUCTION ARE DIFFERENT, CONTRACTOR SHALL MAKE ALL CHANGES REQUIRED. SUCH CHANGES MAY INCLUDE, BUT ARE NOT LIMITED TO: SIZE OF WIRES, SIZE OF CONDUIT, NUMBER, TYPE AND SIZE OF CIRCUIT BREAKERS, FUSE PROTECTION, AND ADDITIONAL DISCONNECT SWITCHES. CONTRACTOR SHALL VERIFY ALL EQUIPMENT SIZES PRIOR TO INSTALLATION OF CONDUIT AND WIRING.
9. CONTRACTOR SHALL FIELD VERIFY LOCATIONS OF EXISTING UTILITIES AND EQUIPMENT PRIOR TO CONSTRUCTION. COORDINATE THE LOCATIONS OF ALL ELECTRICAL EQUIPMENT, DEVICES, FIXED EQUIPMENT, ETC. WITH THE OWNER PRIOR TO ROUGH-IN-WORK. CONTRACTOR IS RESPONSIBLE TO REPAIR ANY DAMAGE TO UTILITIES OR EQUIPMENT, WHETHER SHOWN ON THESE PLANS OR NOT.
10. CONTRACTOR SHALL PROVIDE SUITABLE MATERIALS AND CONSTRUCTION METHODS TO PREVENT DAMAGE TO CONDUIT SWEEPS RESULTING FROM INSTALLATION OF LARGE CONDUCTORS.
11. CONTRACTOR IS TO MAINTAIN 3' MINIMUM WORKING SPACE IN FRONT OF ELECTRICAL EQUIPMENT PER NEC CODE. CONTRACTOR IS TO REFERENCE NEC TABLE 110.26(A)(1) FOR ADDITIONAL CLEARANCE REQUIREMENTS AND ADJUST AS NECESSARY.
12. CONTRACTOR IS TO PROVIDE AND INSTALL PVC SCHEDULE 40 CONDUIT BELOW GRADE. BELOW GRADE CONDUIT IS TO BE A MINIMUM OF 24" DEEP UNLESS NOTED OTHERWISE ON THE PLANS. GALVANIZED RIGID CONDUIT (GRC) IS TO BE USED FOR INSTALLATIONS TO ELECTRICAL EQUIPMENT ABOVE GRADE. CONTRACTOR IS TO TRANSITION FROM PVC TO GRC CONDUIT AT 12" BELOW GRADE.

LIGHTING FIXTURE SCHEDULE

FIXTURE MARK	MANUFACTURER & CATALOG NUMBER	QUANTITY	TYPE	LAMPS BULBS	VOLTAGE	SUPPORT	NOTES
A	SUN VALLEY LIGHTING MODEL #: DS8C/PLED-III-W/ 48LED-350MA/40K/UNV/ XCR-1/RAL-9005-T/PC120V	13	POLE MOUNTED DEZINER SERIES LIGHT	LED	UNV	POLE MOUNTED	LIGHT IS TO BE PROVIDED WITH SUN VALLEY LIGHTING MODEL #: XCR-1 MOUNTING ARM AND SUN VALLEY LIGHTING MODEL #: 16-1070-16'-PT27/GFI/RAL-9005-T POLE AND BASE. LIGHT IS TO IS BE CONTROLLED VIA PHOTOCELL PROVIDED WITH THE LIGHT.

STATE OF TEXAS — COLE W. CARPENTER — 156124 — LICENSED PROFESSIONAL ENGINEER

02/03/26

ISSUED FOR CONSTRUCTION

JACOB MARTIN — TBPELS FIRM # 10194493 — TBAE FIRM # BR 2261 — TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS

DOWNTOWN REVITALIZATION PROJECT

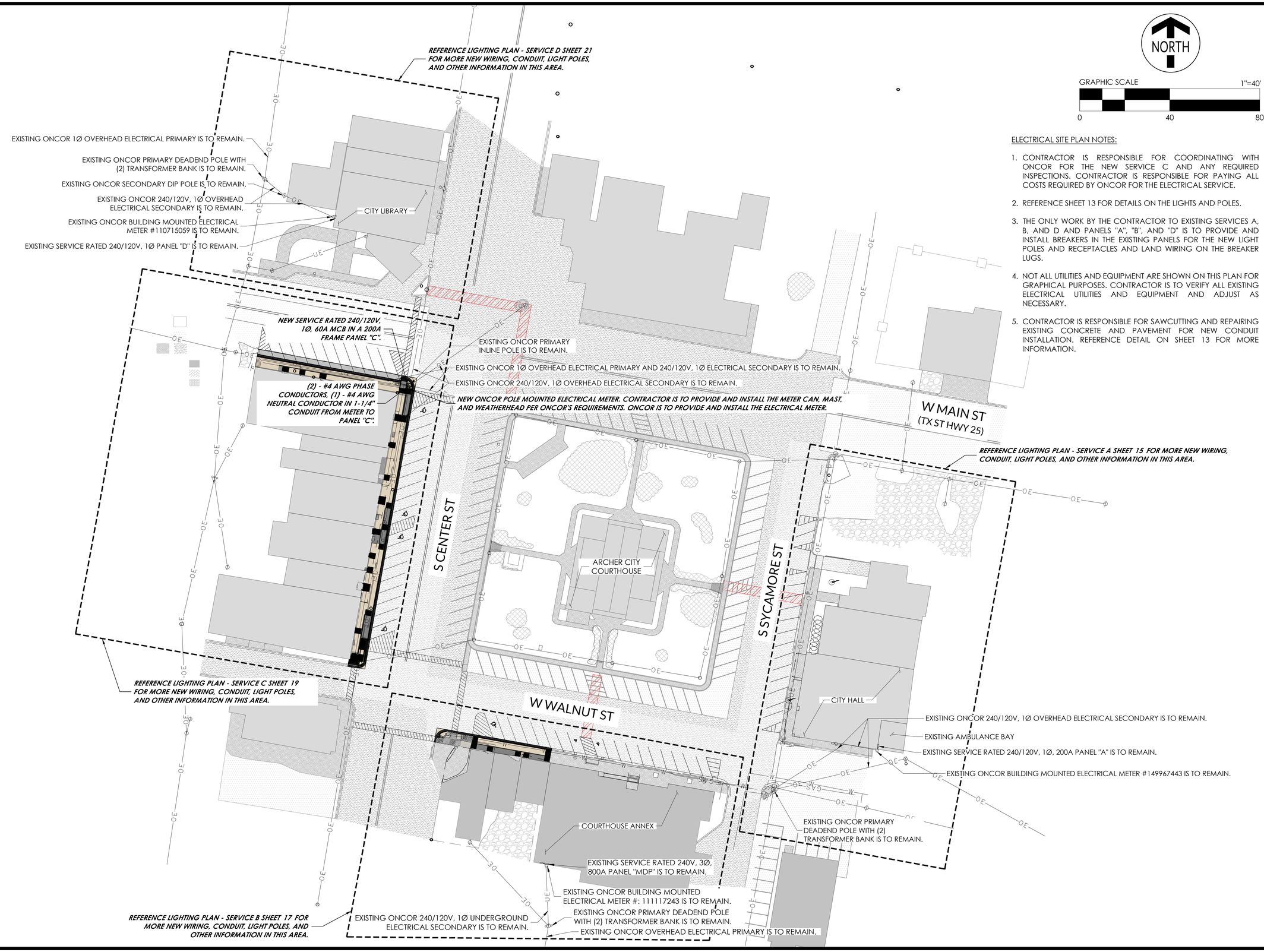
LIGHTING DETAILS AND SCHEDULES

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320 | SCALE NTS

SEQ. 13 / 22 | SHEET 13



ELECTRICAL SITE PLAN NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH ONCOR FOR THE NEW SERVICE C AND ANY REQUIRED INSPECTIONS. CONTRACTOR IS RESPONSIBLE FOR PAYING ALL COSTS REQUIRED BY ONCOR FOR THE ELECTRICAL SERVICE.
2. REFERENCE SHEET 13 FOR DETAILS ON THE LIGHTS AND POLES.
3. THE ONLY WORK BY THE CONTRACTOR TO EXISTING SERVICES A, B, AND D AND PANELS "A", "B", AND "D" IS TO PROVIDE AND INSTALL BREAKERS IN THE EXISTING PANELS FOR THE NEW LIGHT POLES AND RECEPTACLES AND LAND WIRING ON THE BREAKER LUGS.
4. NOT ALL UTILITIES AND EQUIPMENT ARE SHOWN ON THIS PLAN FOR GRAPHICAL PURPOSES. CONTRACTOR IS TO VERIFY ALL EXISTING ELECTRICAL UTILITIES AND EQUIPMENT AND ADJUST AS NECESSARY.
5. CONTRACTOR IS RESPONSIBLE FOR SAWCUTTING AND REPAIRING EXISTING CONCRETE AND PAVEMENT FOR NEW CONDUIT INSTALLATION. REFERENCE DETAIL ON SHEET 13 FOR MORE INFORMATION.

STATE OF TEXAS
COLE W. CARPENTER
156124
LICENSED PROFESSIONAL ENGINEER
02/03/26

ISSUED FOR CONSTRUCTION

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT

ELECTRICAL SITE PLAN

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320 | SCALE 1" = 40'

SEQ. 14 | SHEET 14 of 22

Plotted by: nic. kirk Plot Date: 2/12/2026 8:32 AM
Saved By: ccarpenter Save Time: 2/12/2026 8:27 AM
X:\CL_Archer_City\24320 - 2024 TDA Downtown Revitalization Project - Archer City\Drafting_Plans_E_Electrical\14 ELECTRICAL SITE PLAN.dwg

W WALNUT ST

S SYCAMORE ST

NORTH

GRAPHIC SCALE 1"=10'

0 10 20

LIGHTING PLAN - SERVICE A NOTES:

1. REFERENCE SHEET 13 FOR DETAILS ON THE LIGHTS AND POLES.
2. THE ONLY WORK BY THE CONTRACTOR TO EXISTING SERVICE A AND PANEL "A" IS TO PROVIDE AND INSTALL TANDEM BREAKERS IN THE EXISTING PANEL FOR THE NEW LIGHT POLES AND RECEPTACLES, RE-WIRE AN EXISTING LOAD TO A NEW TANDEM BREAKER, AND LAND WIRING ON THE BREAKER LUGS. CONTRACTOR IS TO VERIFY ALL PANEL LOADS AND ADJUST AS NECESSARY.
3. NOT ALL UTILITIES AND EQUIPMENT ARE SHOWN ON THIS PLAN FOR GRAPHICAL PURPOSES. CONTRACTOR IS TO VERIFY ALL EXISTING ELECTRICAL UTILITIES AND EQUIPMENT AND ADJUST AS NECESSARY.
4. CONDUIT ROUTE IS SHOWN FOR ILLUSTRATION PURPOSES ONLY. CONTRACTOR IS TO VERIFY THE CONDUIT ROUTE AND ADJUST AS NECESSARY.
5. CONTRACTOR IS RESPONSIBLE FOR SAWCUTTING AND REPAIRING EXISTING CONCRETE AND PAVEMENT FOR NEW CONDUIT INSTALLATION. REFERENCE DETAIL ON SHEET 13 FOR MORE INFORMATION.

EXISTING ONCOR 3 WIRE ELECTRICAL PRIMARY IS TO REMAIN.

EXISTING ONCOR DEADEND POLE WITH (2) TRANSFORMER BANK IS TO REMAIN.

EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY IS TO REMAIN.

(1)- #12 AWG PHASE CONDUCTOR, (1)- #12 AWG NEUTRAL CONDUCTOR, (1)- #12 AWG GROUND IN 1" CONDUIT FROM PANEL "A" TO POLE MOUNTED RECEPTACLES.

(1)- #12 AWG PHASE CONDUCTOR, (1)- #12 AWG NEUTRAL CONDUCTOR, (1)- #12 AWG GROUND IN 1" CONDUIT FROM PANEL "A" TO POLE MOUNTED LIGHTS.

NEW TYPE "A" POLE MOUNTED LIGHT PER LIGHTING SCHEDULE, TYP.

EXISTING ONCOR OVERHEAD NEUTRAL WIRE IS TO REMAIN.

(1)- #12 AWG PHASE CONDUCTOR, (1)- #12 AWG NEUTRAL CONDUCTOR, (1)- #12 AWG GROUND IN 1" CONDUIT FROM PANEL "A" TO POLE MOUNTED RECEPTACLES.

(1)- #12 AWG PHASE CONDUCTOR, (1)- #12 AWG NEUTRAL CONDUCTOR, (1)- #12 AWG GROUND IN 1" CONDUIT FROM PANEL "A" TO POLE MOUNTED LIGHTS.

BOTH NEW LIGHTING CIRCUITS ARE TO BE TIED INTO THE NEW TANDEM BREAKER IN SPACE 2

A-2A

A-2B

EXISTING SERVICE RATED 240/120V, 1Ø, 175A MAIN DISCONNECT IS TO REMAIN.

EXISTING WIRING AND CONDUIT FROM ELECTRICAL METER TO THE DISCONNECT IS TO REMAIN.

EXISTING ONCOR BUILDING MOUNTED ELECTRICAL METER #172600176 IS TO REMAIN.

EXISTING ONCOR 240V, 1Ø ELECTRICAL SECONDARY ATTACHES TO THE BUILDING AND SPLITS IN CONDUITS TO THE TWO SEPARATE ELECTRICAL METERS. CONDUIT AND ELECTRICAL SECONDARY IS TO REMAIN.

CITY HALL

EXISTING ONCOR BUILDING MOUNTED ELECTRICAL METER #149967443 IS TO REMAIN.

EXISTING WIRING AND CONDUIT FROM ELECTRICAL METER TO PANEL "A" IS TO REMAIN.

EXISTING SERVICE RATED 240/120V, 1Ø, 200A PANEL "A" IS TO REMAIN. THE ONLY WORK BY THE CONTRACTOR TO THIS PANEL IS TO PROVIDE AND INSTALL TWO TANDEM BREAKERS AND LAND WIRING ON THE BREAKER LUGS.

TOOT'S BEAUTY SHOP

EXISTING BUILDING

EXISTING AMBULANCE BAY

EXISTING ONCOR SECONDARY POLE WITH ONCOR LIGHT IS TO REMAIN.

EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY IS TO REMAIN.

STATE OF TEXAS
COLE W. CARPENTER
156124
LICENSED PROFESSIONAL ENGINEER

02/03/26

ISSUED FOR CONSTRUCTION

JACOB MARTIN

TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS

DOWNTOWN REVITALIZATION PROJECT

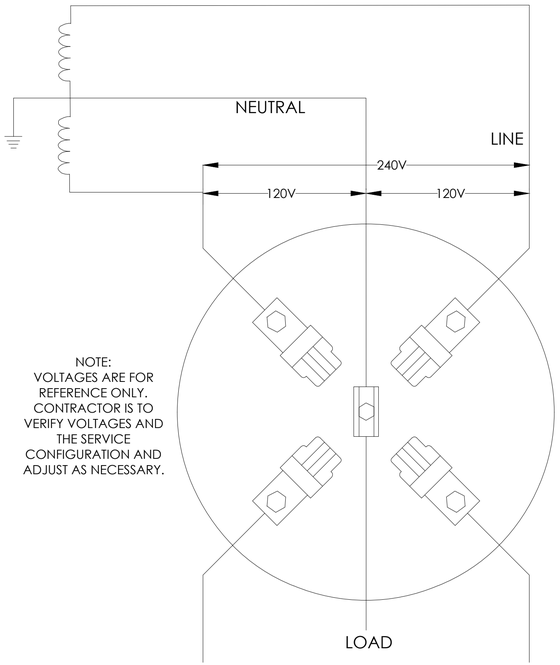
LIGHTING PLAN - SERVICE A

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320
SCALE 1" = 10'

SEQ. 15 / 22
SHEET 15



NOTE:
VOLTAGES ARE FOR REFERENCE ONLY. CONTRACTOR IS TO VERIFY VOLTAGES AND THE SERVICE CONFIGURATION AND ADJUST AS NECESSARY.

3 WIRE 240/120 VOLT SINGLE PHASE SELF CONTAINED

EXISTING ONCOR ELECTRICAL SERVICE DETAIL

N.T.S.

Archer City Downtown Revitalization
Existing Panel "A" Schedule

Main Breaker Rating: 200 AMPS
M.L.O. Bus Rating: 200 AMPS
Sym. Inter. Cap.: AMPS

1 Phase 3 Wire
120/240 VAC

Surface Mount.: ____ NEMA 1: X
Flush Mount.: X NEMA 3R: ____

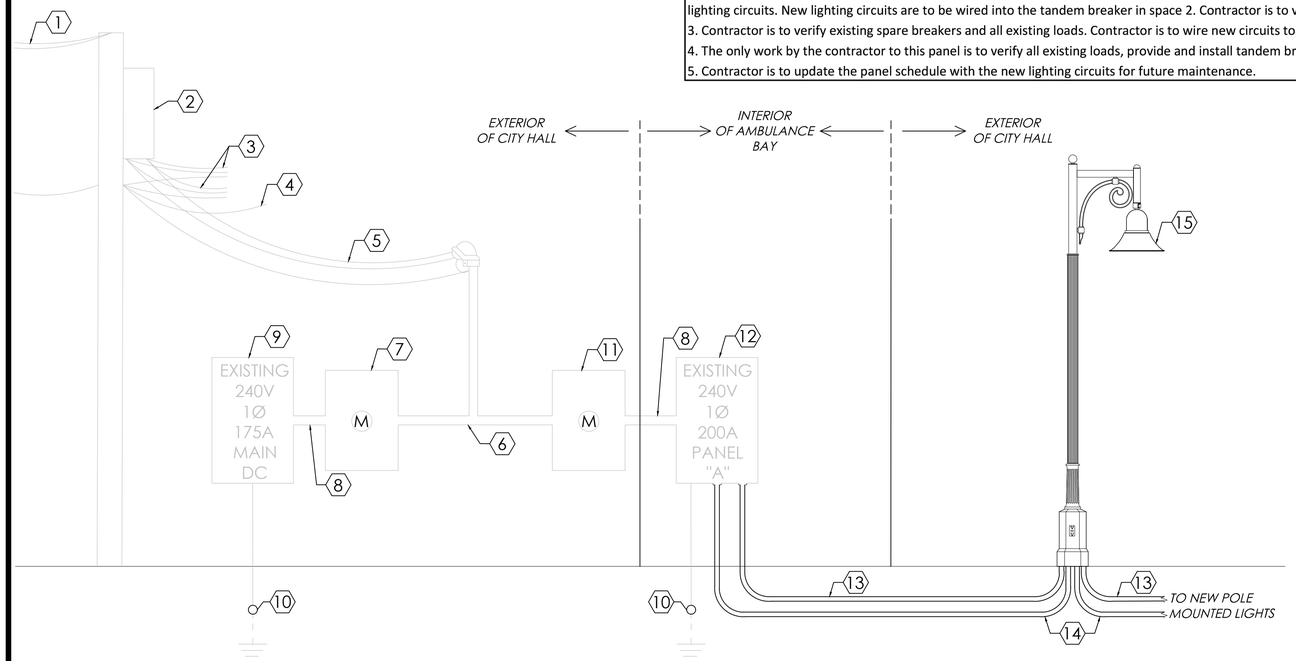
Conductor Color Code
Line 1 ---------- BLACK
Line 2 ---------- RED
Neutral ---------- WHITE or GRAY
Ground ---------- GREEN

	Load
Phase 1 Load:	8
Phase 2 Load:	0

POLE	SERVICE	W	LOAD LINE 1	LOAD LINE 2	BREAKER POLES	POLE	1	2	POLE	SERVICE	W	LOAD LINE 1	LOAD LINE 2	BREAKER POLES	POLE
1	Existing City Hall Back A/C				40 / 2	1	X		2	New Pole Mounted Lights and Receptacles (Note 2)	934	8		20 / 1	2
3	"					3		X	4	Existing Breaker (Note 2)				20 / 1	4
5	Existing City Hall Front A/C				70 / 2	5	X		6	Existing Breaker				20 / 1	6
7	"					7		X	8	Existing Kitchen Lights in Old Hall				20 / 1	8
9	Existing Breaker				30 / 2	9	X		10	Existing Breaker				20 / 1	10
11	"					11		X	12	Existing Breaker				20 / 1	12
13	Existing CM Office				20 / 1	13	X		14	Existing East Side Receptacles				20 / 1	14
15	Existing Breaker				20 / 1	15		X	16	Existing Breaker				20 / 1	16
17	Existing Breaker				20 / 1	17	X		18	Existing East Shop Receptacles				20 / 1	18
19	Existing Water Heater				30 / 2	19		X	20	Existing Door Receptacles				20 / 1	20
21	"					21	X		22	Existing Office Receptacles				20 / 1	22
23	Existing CM Office Receptacles				20 / 1	23		X	24	Existing Upstairs Light Receptacles (Note 1)				20 / 1	24
25	Existing West Shop Receptacles				20 / 1	25	X		26	Existing Upstairs Receptacles (Note 1)				20 / 1	26
27	Existing Oven				30 / 2	27		X	28	Existing Breaker				50 / 2	28
29	"					29	X		30	"					30
31	Existing Back A/C				40 / 2	31		X	32	Exsting Bathroom Storeroom and Shop Lights (Note 1)				20 / 1	32
33	"					33	X		34	Existing Office Light and North Shop Receptacles (Note 1)				20 / 1	34
35	Existing Spare Breaker (Note 3)				20 / 1	35		X	36	Existing 30A Receptacles				30 / 1	36
37	Existing Back Furnace				60 / 2	37	X		38	Existing 30A Receptacles				30 / 1	38
39	"					39		X	40	Existing Spare Breaker (Notes 1, 3)				20 / 1	40

Notes:

1. Existing Breakers are Tandem Breakers.
2. Contractor is to provide and install (2) 20A, single pole tandem breakers to replace the 20A, single pole breakers in spots 2 and 4. Contractor is to re-wire the existing load in space 2 into the tandem breaker in space 4 to make space for the new lighting circuits. New lighting circuits are to be wired into the tandem breaker in space 2. Contractor is to verify the existing loads in spaces 2 and 4 and adjust breaker spaces as necessary.
3. Contractor is to verify existing spare breakers and all existing loads. Contractor is to wire new circuits to any un-used breakers before utilitizing tandem breakers.
4. The only work by the contractor to this panel is to verify all existing loads, provide and install tandem breakers if necessary, re-wire existing loads if panel space is needed, and land new wiring on the breaker lugs.
5. Contractor is to update the panel schedule with the new lighting circuits for future maintenance.



ELECTRICAL RISER DIAGRAM

N.T.S.

GENERAL ELECTRICAL RISER DIAGRAM NOTES

1 ELECTRICAL RISER DIAGRAM IS SHOWN AS REFERENCE ONLY AND MAY NOT INCLUDE THE FULL ELECTRICAL SYSTEM. CONTRACTOR IS TO VERIFY ALL ITEMS FOR THE EXISTING ELECTRICAL SERVICE AND ADJUST AS NECESSARY.

ELECTRICAL RISER DIAGRAM NOTES BY REFERENCE (#)

1. EXISTING ONCOR 3 WIRE OVERHEAD ELECTRICAL PRIMARY IS TO REMAIN.
2. EXISTING ONCOR PRIMARY DEADEND POLE WITH (2) TRANSFORMER BANK IS TO REMAIN.
3. EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY SERVING DIFFERENT CUSTOMERS IS TO REMAIN.
4. EXISTING ONCOR OVERHEAD NEUTRAL WIRE IS TO REMAIN.
5. EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY IS TO REMAIN.
6. EXISTING SECONDARY WIRING AND CONDUIT FROM THE WEATHERHEAD TO ELECTRICAL METERS IS TO REMAIN.
7. EXISTING ONCOR BUILDING MOUNTED ELECTRICAL METER #: 172600176 IS TO REMAIN.
8. EXISTING WIRING AND CONDUIT IS TO REMAIN.
9. EXISTING SERVICE RATED 240/120V, 1Ø, 175A MAIN DISCONNECT IS TO REMAIN.
10. EXISTING GROUND RODS ARE TO REMAIN.
11. EXISTING ONCOR BUILDING MOUNTED ELECTRICAL METER #: 149967443 IS TO REMAIN.
12. EXISTING SERVICE RATED 240/120V, 1Ø, 200A PANEL "A" IS TO REMAIN. THE ONLY WORK BY THE CONTRACTOR TO THIS PANEL IS TO PROVIDE AND INSTALL TWO TANDEM BREAKERS AND LAND WIRING ON THE BREAKER LUGS.
13. (1) - #12 AWG PHASE CONDUCTOR, (1) - #12 AWG NEUTRAL CONDUCTOR, AND (1) - #12 AWG GROUND IN 1" CONDUIT FROM PANEL "A" TO NEW POLE MOUNTED LIGHTS.
14. (1) - #12 AWG PHASE CONDUCTOR, (1) - #12 AWG NEUTRAL CONDUCTOR, AND (1) - #12 AWG GROUND IN 1" CONDUIT FROM PANEL "A" TO NEW POLE MOUNTED RECEPTACLES.
15. NEW TYPE "A" POLE MOUNTED LIGHT PER LIGHTING SCHEDULE. REFERENCE SHEET 13 FOR MORE INFORMATION ON THE LIGHTS AND LIGHT POLES.

STATE OF TEXAS
COLE W. CARPENTER
156124
LICENSED PROFESSIONAL ENGINEER
02/03/26

ISSUED FOR CONSTRUCTION

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT

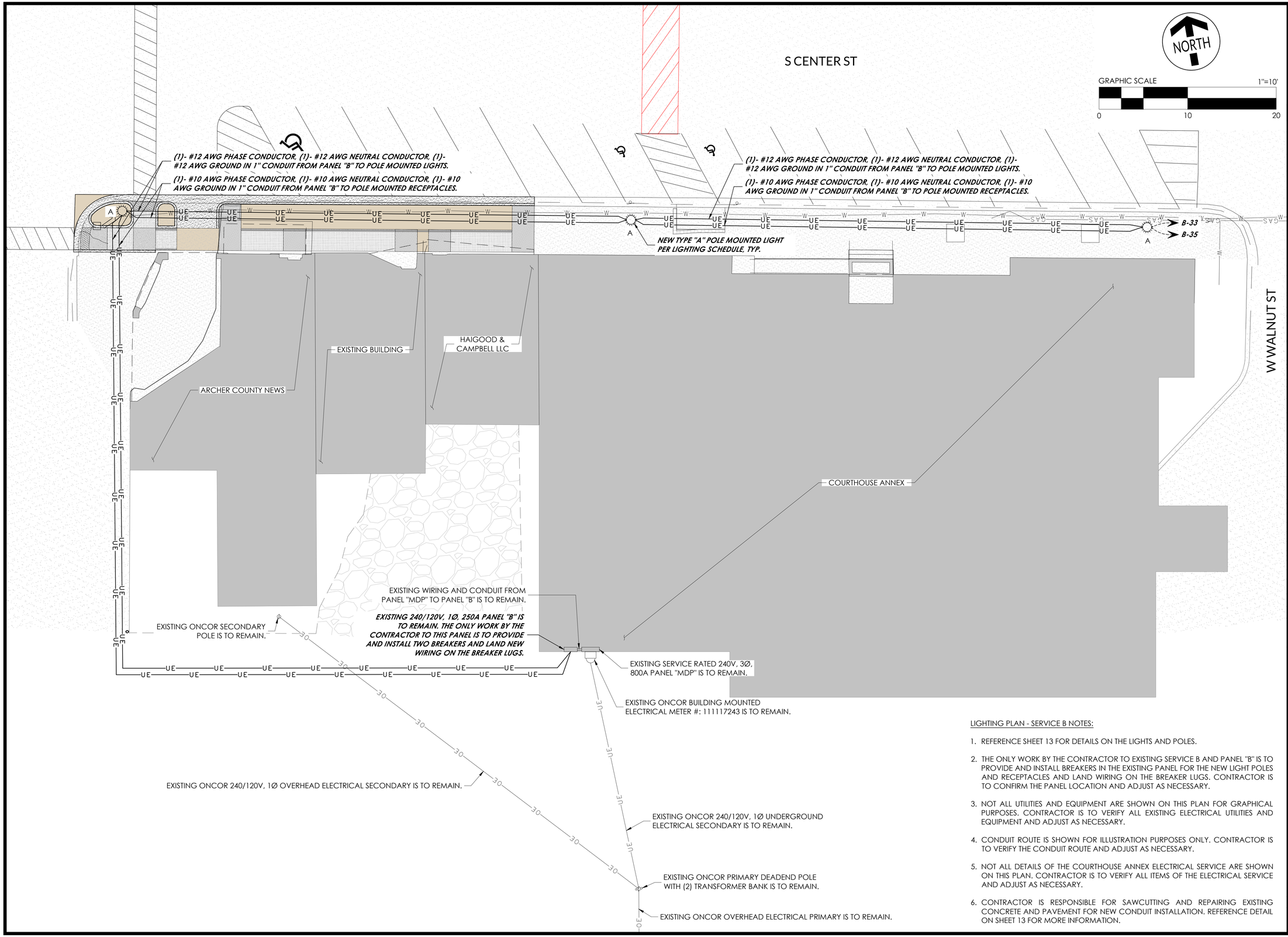
ELECTRICAL RISER DIAGRAM AND PANEL SCHEDULE - SERVICE A

NO.	REVISION	DATE

PROJECT # 24320 | SCALE NTS

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

SEQ. 16 | SHEET 16 / 22



LIGHTING PLAN - SERVICE B NOTES:

1. REFERENCE SHEET 13 FOR DETAILS ON THE LIGHTS AND POLES.
2. THE ONLY WORK BY THE CONTRACTOR TO EXISTING SERVICE B AND PANEL "B" IS TO PROVIDE AND INSTALL BREAKERS IN THE EXISTING PANEL FOR THE NEW LIGHT POLES AND RECEPTACLES AND LAND WIRING ON THE BREAKER LUGS. CONTRACTOR IS TO CONFIRM THE PANEL LOCATION AND ADJUST AS NECESSARY.
3. NOT ALL UTILITIES AND EQUIPMENT ARE SHOWN ON THIS PLAN FOR GRAPHICAL PURPOSES. CONTRACTOR IS TO VERIFY ALL EXISTING ELECTRICAL UTILITIES AND EQUIPMENT AND ADJUST AS NECESSARY.
4. CONDUIT ROUTE IS SHOWN FOR ILLUSTRATION PURPOSES ONLY. CONTRACTOR IS TO VERIFY THE CONDUIT ROUTE AND ADJUST AS NECESSARY.
5. NOT ALL DETAILS OF THE COURTHOUSE ANNEX ELECTRICAL SERVICE ARE SHOWN ON THIS PLAN. CONTRACTOR IS TO VERIFY ALL ITEMS OF THE ELECTRICAL SERVICE AND ADJUST AS NECESSARY.
6. CONTRACTOR IS RESPONSIBLE FOR SAWCUTTING AND REPAIRING EXISTING CONCRETE AND PAVEMENT FOR NEW CONDUIT INSTALLATION. REFERENCE DETAIL ON SHEET 13 FOR MORE INFORMATION.

STATE OF TEXAS
COLE W. CARPENTER
156124
LICENSED PROFESSIONAL ENGINEER
02/03/26

ISSUED FOR CONSTRUCTION

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

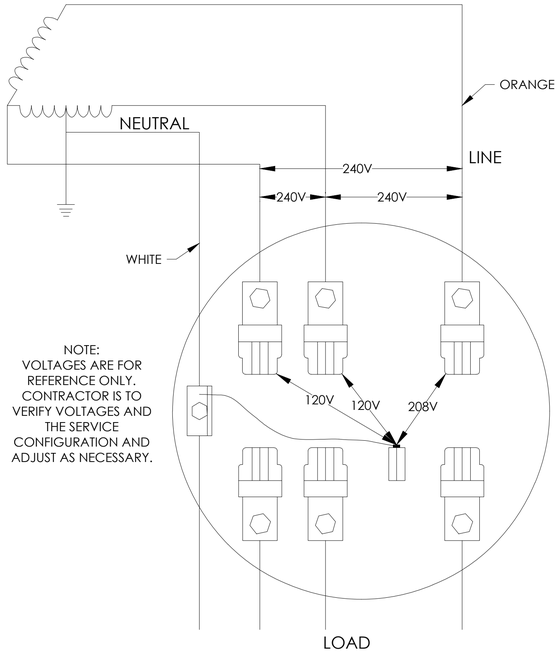
CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT
LIGHTING PLAN - SERVICE B

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320 | SCALE 1" = 10'

SEQ. 17 / 22 | SHEET 17



NOTE:
VOLTAGES ARE FOR REFERENCE ONLY. CONTRACTOR IS TO VERIFY VOLTAGES AND THE SERVICE CONFIGURATION AND ADJUST AS NECESSARY.

4 WIRE DELTA 240/120 VOLT THREE PHASE SELF CONTAINED

ON A 4 WIRE DELTA CONNECTION, THE PHASE HAVING THE HIGHEST VOLTAGE TO GROUND (HIGH LEG OR WILD LEG) MUST BE CONNECTED TO THE RIGHT HAND TERMINALS OF THE METER SOCKET. IN OTHER LOCATIONS, SUCH AS SERVICE ENCLOSURES, DISCONNECTS, ETC. THE "HIGH LEG" IS CONNECTED TO THE CENTER TERMINAL.

EXISTING ONCOR ELECTRICAL SERVICE DETAIL

N.T.S.

Archer City Downtown Revitalization
Existing Panel "B" Schedule

Main Breaker Rating: 250 AMPS
M.L.O. Bus Rating: 250 AMPS
Sym. Inter. Cap.: AMPS

1 Phase 3 Wire
120/240 VAC

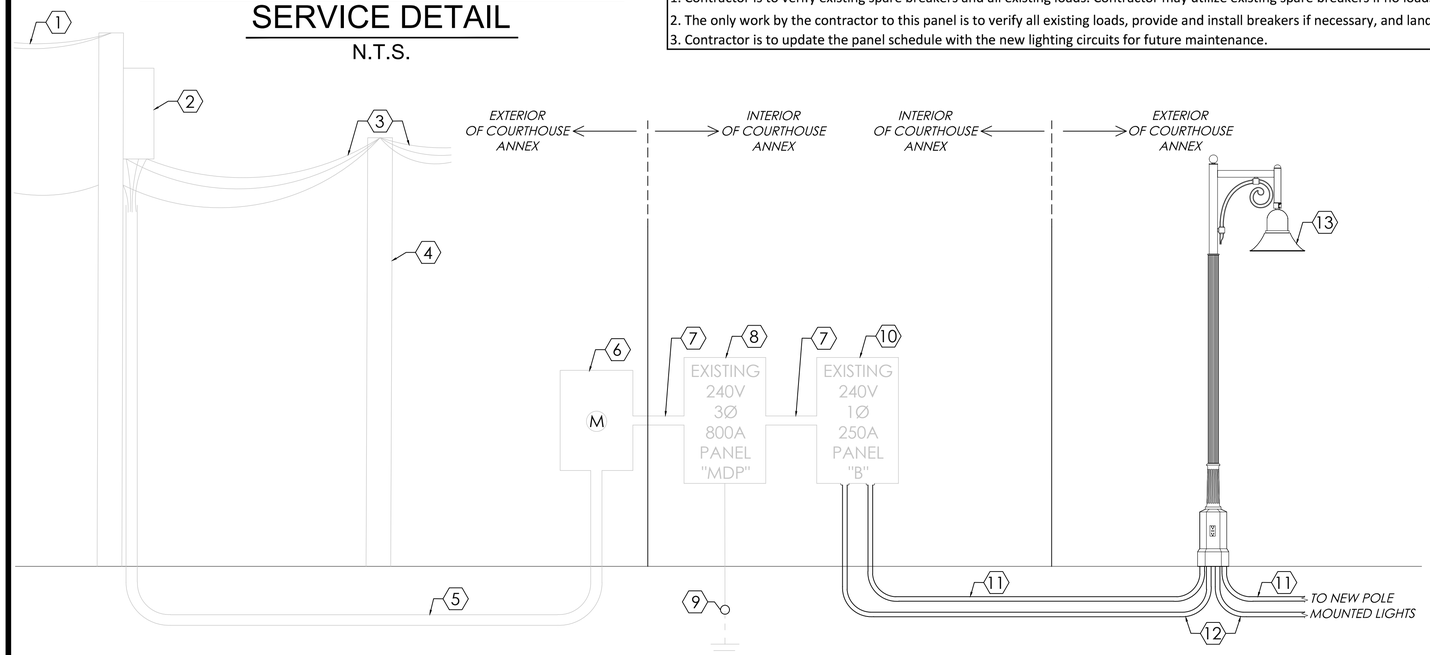
Surface Mount.: ____ NEMA 1: X
Flush Mount.: X NEMA 3R: ____

Conductor Color Code
Line 1 ---------- BLACK
Line 2 ---------- RED
Neutral ---------- WHITE or GRAY
Ground ---------- GREEN

	Load
Phase 1 Load:	1
Phase 2 Load:	5

POLE	SERVICE	W	LOAD LINE 1	LOAD LINE 2	BREAKER POLES	POLE	1	2	POLE	SERVICE	W	LOAD LINE 1	LOAD LINE 2	BREAKER POLES	POLE
1	Existing Receptacles - Rm 146, 147, 148				20 / 1	1	X		2	Existing Receptacles - Rm 151				20 / 1	2
3	Existing Receptacles - Rm 150				20 / 1	3		X	4	Existing Receptacles - Rm 144, 145				20 / 1	4
5	Existing Receptacles - Rm 143, 144, 152				20 / 1	5	X		6	Existing Receptacles - Rm 137, 142, 141, 140				20 / 1	6
7	Existing Receptacles - Rm 141, 142, 145				20 / 1	7		X	8	Existing Receptacles - Rm 140, 138, 137				20 / 1	8
9	Existing Receptacles - Rm 138, 139				20 / 1	9	X		10	Existing Receptacles - Rm 135, 136				20 / 1	10
11	Existing Receptacles - Rm 100, 132, 133, 134				20 / 1	11		X	12	Existing Receptacles - Rm 153				20 / 1	12
13	Existing Computers - Rm 150				20 / 1	13	X		14	Existing Copier - Rm 150				20 / 1	14
15	Existing Computers - Rm 144				20 / 1	15		X	16	Existing Computers - Rm 143, 144, 152				20 / 1	16
17	Existing Computers - Rm 144, 145				20 / 1	17	X		18	Existing Computers - Rm 138				20 / 1	18
19	Existing Computers - Rm 138				20 / 1	19		X	20	Existing Computers - Rm 136				20 / 1	20
21	Existing Computers - Rm 153, 133, 139				20 / 1	21	X		22	Existing Copier - Rm 134				20 / 1	22
23	Existing Copier - Rm 138				20 / 1	23		X	24	Existing Computers				20 / 1	24
25	Existing Spare Breaker (Note 1)				20 / 1	25	X		26	Existing Spare Breaker (Note 1)				20 / 1	26
27	Existing Receptacles - Rm 150				20 / 1	27		X	28	Existing Spare Breaker (Note 1)				20 / 1	28
29	Existing Spare Breaker (Note 1)				20 / 1	29	X		30	Existing Spare Breaker				20 / 2	30
31	Existing Spare Breaker (Note 1)				20 / 1	31		X	32	"					32
33	New Pole Mounted Lights (Note 1)	161	1		20 / 1	33	X		34						34
35	New Pole Mounted Receptacles (Note 1)	540		5	20 / 1	35		X	36						36
37						37	X		38						38
39						39		X	40						40
41						41	X		42						42

Notes:
1. Contractor is to verify existing spare breakers and all existing loads. Contractor may utilize existing spare breakers if no loads are connected to them.
2. The only work by the contractor to this panel is to verify all existing loads, provide and install breakers if necessary, and land new wiring on the breaker lugs.
3. Contractor is to update the panel schedule with the new lighting circuits for future maintenance.



ELECTRICAL RISER DIAGRAM

N.T.S.

GENERAL ELECTRICAL RISER DIAGRAM NOTES

1 ELECTRICAL RISER DIAGRAM IS SHOWN AS REFERENCE ONLY AND MAY NOT INCLUDE THE FULL ELECTRICAL SYSTEM. CONTRACTOR IS TO VERIFY ALL ITEMS FOR THE EXISTING ELECTRICAL SERVICE AND ADJUST AS NECESSARY.

ELECTRICAL RISER DIAGRAM NOTES BY REFERENCE (#)

1. EXISTING ONCOR 3 WIRE OVERHEAD ELECTRICAL PRIMARY IS TO REMAIN.
2. EXISTING ONCOR PRIMARY DEADEND POLE WITH (2) TRANSFORMER BANK IS TO REMAIN.
3. EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY SERVING DIFFERENT CUSTOMERS IS TO REMAIN. CONTRACTOR IS TO VERIFY THE ELECTRICAL METERS THIS SECONDARY SERVES IF NECESSARY.
4. EXISTING ONCOR SECONDARY POLE IS TO REMAIN.
5. EXISTING ONCOR 240/120V, 1Ø UNDERGROUND ELECTRICAL SECONDARY IS TO REMAIN.
6. EXISTING ONCOR BUILDING MOUNTED ELECTRICAL METER #: 111117243 IS TO REMAIN.
7. EXISTING WIRING AND CONDUIT IS TO REMAIN.
8. EXISTING SERVICE RATED 240/120V, 3Ø, 800A PANEL "MDP" IS TO REMAIN. THIS PANEL IS SHOWN FOR REFERENCE ONLY. NO WORK IS REQUIRED TO THIS PANEL AS PART OF THIS CONTRACT.
9. EXISTING GROUND ROD IS TO REMAIN.
10. EXISTING 240/120V, 1Ø, 250A PANEL "B" IS TO REMAIN. THE ONLY WORK BY THE CONTRACTOR TO THIS PANEL IS TO PROVIDE AND INSTALL TWO BREAKERS AND LAND NEW WIRING ON THE BREAKER LUGS.
11. (1) - #12 AWG PHASE CONDUCTOR, (1) - #12 AWG NEUTRAL CONDUCTOR, AND (1) - #12 AWG GROUND IN 1" CONDUIT FROM PANEL "A" TO NEW POLE MOUNTED LIGHTS.
12. (1) - #10 AWG PHASE CONDUCTOR, (1) - #10 AWG NEUTRAL CONDUCTOR, AND (1) - #10 AWG GROUND IN 1" CONDUIT FROM PANEL "A" TO NEW POLE MOUNTED RECEPTACLES.
13. NEW TYPE "A" POLE MOUNTED LIGHT PER LIGHTING SCHEDULE. REFERENCE SHEET 13 FOR MORE INFORMATION ON THE LIGHTS AND LIGHT POLES.

STATE OF TEXAS
COLE W. CARPENTER
156124
LICENSED PROFESSIONAL ENGINEER
02/03/26
ISSUED FOR CONSTRUCTION

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT

ELECTRICAL RISER DIAGRAM AND PANEL SCHEDULE - SERVICE B

NO.	REVISION	DATE

PROJECT # 24320
SCALE NTS
BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

SEQ. 18 / 22
SHEET 18

S CENTER ST

EXISTING ONCOR 1Ø OVERHEAD ELECTRICAL PRIMARY AND 240/120V, 1Ø ELECTRICAL SECONDARY IS TO REMAIN.

EXISTING ONCOR POLE MOUNTED METER #161015704 AND DISCONNECT ARE TO REMAIN.

NEW TYPE "A" POLE MOUNTED LIGHT PER LIGHTING SCHEDULE, TYP.

EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY IS TO REMAIN.

EXISTING ONCOR PRIMARY INLINE POLE IS TO REMAIN.

(1)- #12 AWG PHASE CONDUCTOR, (1)- #12 AWG NEUTRAL CONDUCTOR, (1)- #12 AWG GROUND IN 1" CONDUIT FROM PANEL "C" TO POLE MOUNTED LIGHT.

NEW ONCOR POLE MOUNTED ELECTRICAL METER. CONTRACTOR IS TO PROVIDE AND INSTALL THE METER CAN, MAST, WEATHERHEAD, AND WIRE PER ONCOR'S REQUIREMENTS. ONCOR IS TO PROVIDE AND INSTALL THE ELECTRICAL METER.

(2) - #4 AWG PHASE CONDUCTORS, (1) - #4 AWG NEUTRAL CONDUCTOR IN 1-1/4" CONDUIT FROM METER TO PANEL "C".

NEW SERVICE RATED 240/120V, 1Ø, 60A MCB IN A 200A FRAME PANEL "C".

(1)- #12 AWG PHASE CONDUCTOR, (1)- #12 AWG NEUTRAL CONDUCTOR, (1)- #12 AWG GROUND IN 1" CONDUIT FROM PANEL "C" TO POLE MOUNTED RECEPTACLE.

(1)- #12 AWG PHASE CONDUCTOR, (1)- #12 AWG NEUTRAL CONDUCTOR, (1)- #12 AWG GROUND IN 1" CONDUIT FROM PANEL "C" TO POLE MOUNTED RECEPTACLES.

(1)- #12 AWG PHASE CONDUCTOR, (1)- #12 AWG NEUTRAL CONDUCTOR, (1)- #12 AWG GROUND IN 1" CONDUIT FROM PANEL "C" TO POLE MOUNTED LIGHTS.

EXISTING ONCOR SECONDARY POLE IS TO REMAIN.

EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY IS TO REMAIN.

EXISTING ONCOR LIGHT POLE IS TO BE REMOVED BY ONCOR AND REPLACED WITH A SECONDARY POLE

C-3

C-4

NEW TYPE "A" POLE MOUNTED LIGHT PER LIGHTING SCHEDULE, TYP.

EXISTING ONCOR 1Ø OVERHEAD ELECTRICAL PRIMARY AND 240/120V, 1Ø ELECTRICAL SECONDARY IS TO REMAIN.

W MAIN ST
(TX ST HWY 25)

W WALNUT ST

ABANDONED BUILDING

ARCHER CITY NUTRITION & ENERGY BUILDING

MOSSY OAK PROPERTIES BUILDING

ALLSTATE BUILDING

PAUL WYLIE, CPA BUILDING

HAT CREEK STORE

LEGACY REALTY AND ARCHER CITY CHIROPRACTIC BUILDING

C-1

C-2

EXISTING ONCOR SECONDARY POLE IS TO REMAIN.

EXISTING ONCOR SECONDARY POLE IS TO REMAIN.

EXISTING ONCOR OVERHEAD 240/120V, 1Ø ELECTRICAL SECONDARIES ARE TO REMAIN.

EXISTING ONCOR 1Ø OVERHEAD ELECTRICAL PRIMARY AND 240/120V, 1Ø ELECTRICAL SECONDARY IS TO REMAIN.

EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY IS TO REMAIN.

EXISTING ONCOR PRIMARY INLINE AND 90 DEGREE POLE IS TO REMAIN.

EXISTING ONCOR PRIMARY INLINE POLE WITH (3) TRANSFORMER BANK IS TO REMAIN.

EXISTING ONCOR 1Ø OVERHEAD ELECTRICAL PRIMARY IS TO REMAIN.

EXISTING ONCOR 1Ø OVERHEAD ELECTRICAL PRIMARY IS TO REMAIN.

NORTH

GRAPHIC SCALE 1"=10'

0 10 20

LIGHTING PLAN - SERVICE C NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH ONCOR FOR THE NEW SERVICE C AND ANY REQUIRED INSPECTIONS. CONTRACTOR IS RESPONSIBLE FOR PAYING ALL COSTS REQUIRED BY ONCOR FOR THE ELECTRICAL SERVICE.
2. REFERENCE SHEET 13 FOR DETAILS ON THE LIGHTS AND POLES.
3. NOT ALL UTILITIES AND EQUIPMENT ARE SHOWN ON THIS PLAN FOR GRAPHICAL PURPOSES. CONTRACTOR IS TO VERIFY ALL EXISTING ELECTRICAL UTILITIES AND EQUIPMENT AND ADJUST AS NECESSARY.
4. CONDUIT ROUTE IS SHOWN FOR ILLUSTRATION PURPOSES ONLY. CONTRACTOR IS TO VERIFY THE CONDUIT ROUTE AND ADJUST AS NECESSARY.
5. CONTRACTOR IS RESPONSIBLE FOR SAWCUTTING AND REPAIRING EXISTING CONCRETE AND PAVEMENT FOR NEW CONDUIT INSTALLATION. REFERENCE DETAIL ON SHEET 13 FOR MORE INFORMATION.
6. CONTRACTOR IS TO PROVIDE MOUNTING FOR THE NEW ELECTRICAL METER AND PANEL "C" IF THE EQUIPMENT CANNOT BE MOUNTED ON THE EXISTING PRIMARY INLINE POLE.

STATE OF TEXAS
COLE W. CARPENTER
156124
LICENSED PROFESSIONAL ENGINEER
02/03/26

ISSUED FOR CONSTRUCTION

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT

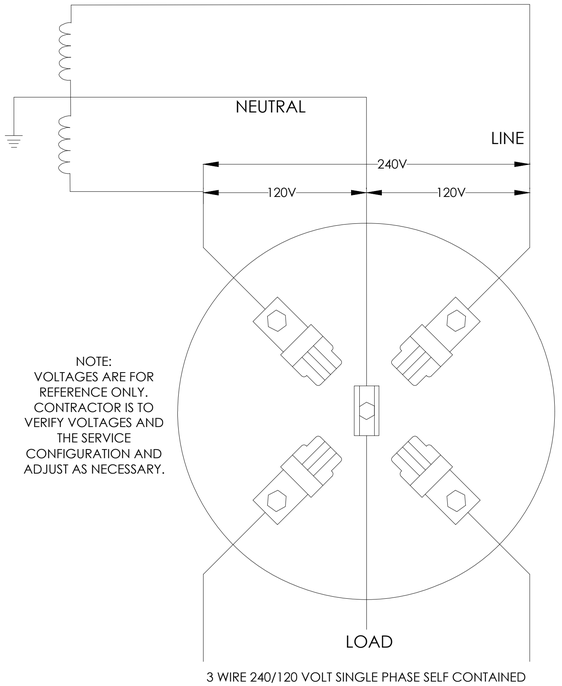
LIGHTING PLAN - SERVICE C

NO.	REVISION	DATE

PROJECT # 24320 | SCALE 1" = 10'

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

SEQ. 19 / 22 | SHEET 19

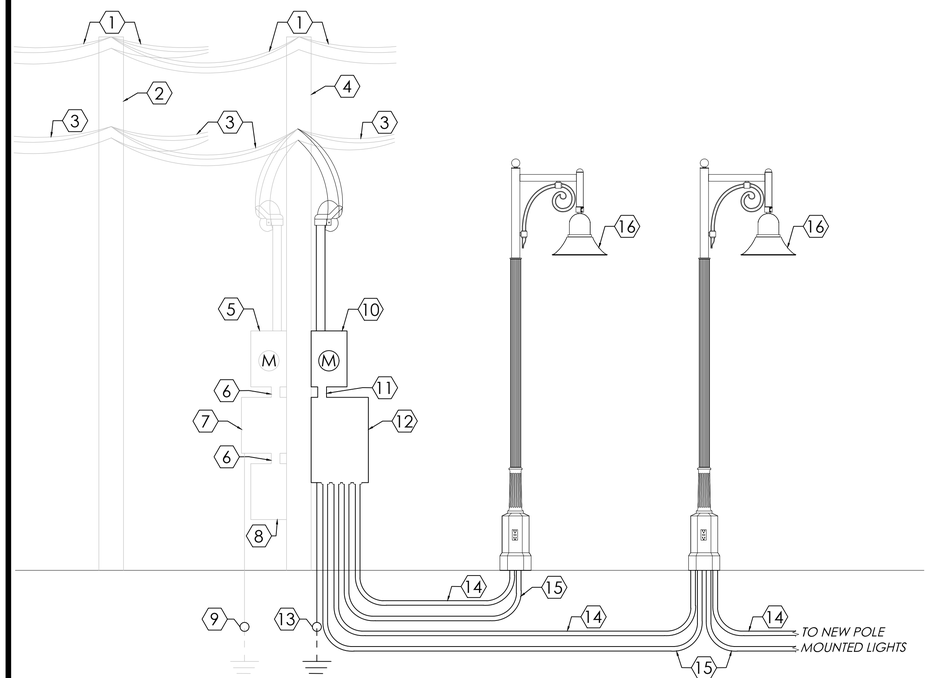


NOTE:
VOLTAGES ARE FOR REFERENCE ONLY. CONTRACTOR IS TO VERIFY VOLTAGES AND THE SERVICE CONFIGURATION AND ADJUST AS NECESSARY.

3 WIRE 240/120 VOLT SINGLE PHASE SELF CONTAINED

EXISTING ONCOR ELECTRICAL SERVICE DETAIL

N.T.S.



ELECTRICAL RISER DIAGRAM

N.T.S.

Archer City Downtown Revitalization
New Panel "C" Schedule

Main Breaker Rating: 60 AMPS
M.L.O. Bus Rating: 200 AMPS
Sym. Inter. Cap.: AMPS

1 Phase 3 Wire
120/240 VAC

Surface Mount.: X
Flush Mount.:

NEMA 1:
NEMA 3R: X

Conductor Color Code
Line 1 ---------- BLACK
Line 2 ---------- RED
Neutral ---------- WHITE or GRAY
Ground ---------- GREEN

	Load
Phase 1 Load:	5
Phase 2 Load:	6

Contractor is to provide and install a Surge Protection Device (SPD) with this panel.

POLE	SERVICE	W	LOAD LINE 1	LOAD LINE 2	BREAKER POLES	POLE	1	2	POLE	SERVICE	W	LOAD LINE 1	LOAD LINE 2	BREAKER POLES	POLE
1	New Pole Mounted Lights	107	2		20 / 1	1	X		2	New Pole Mounted Receptacles	360	3		20 / 1	2
3	New Pole Mounted Lights	161		1	20 / 1	3		X	4	New Pole Mounted Receptacles	540		5	20 / 1	4
5						5	X		6						6
7						7		X	8						8
9						9	X		10						10
11						11		X	12						12
13						13	X		14						14
15						15		X	16	SPD		X			16
17						17	X		18	SPD			X		18

GENERAL ELECTRICAL RISER DIAGRAM NOTES

1 ELECTRICAL RISER DIAGRAM IS SHOWN AS REFERENCE ONLY AND MAY NOT INCLUDE THE FULL ELECTRICAL SYSTEM. CONTRACTOR IS TO VERIFY ALL ITEMS FOR THE EXISTING ELECTRICAL SERVICE AND ADJUST AS NECESSARY.

2 CONTRACTOR IS TO PROVIDE MOUNTING FOR THE NEW ELECTRICAL METER AND PANEL "C" IF THE EQUIPMENT CANNOT BE MOUNTED ON THE EXISTING PRIMARY INLINE POLE.

ELECTRICAL RISER DIAGRAM NOTES BY REFERENCE (#)

(1) EXISTING ONCOR 1Ø OVERHEAD ELECTRICAL PRIMARY IS TO REMAIN.

(2) EXISTING ONCOR PRIMARY INLINE AND 90 DEGREE POLE IS TO REMAIN.

(3) EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY IS TO REMAIN.

(4) EXISTING ONCOR PRIMARY INLINE POLE IS TO REMAIN.

(5) EXISTING ONCOR POLE MOUNTED METER #: 161015704, MAST, WEATHERHEAD, AND ELECTRICAL SECONDARY IS TO REMAIN.

(6) EXISTING WIRING AND CONDUIT IS TO REMAIN.

(7) EXISTING SERVICE RATED 240/120V, 1Ø POLE MOUNTED DISCONNECT IS TO REMAIN.

(8) EXISTING POLE MOUNTED CONTROL PANEL IS TO REMAIN.

(9) EXISTING GROUND ROD IS TO REMAIN.

(10) NEW ONCOR POLE MOUNTED ELECTRICAL METER. CONTRACTOR IS TO PROVIDE AND INSTALL THE METER CAN, MAST, WEATHERHEAD, AND WIRE PER ONCOR'S REQUIREMENTS. ONCOR IS TO PROVIDE AND INSTALL THE ELECTRICAL METER.

(11) (2) - #4 AWG PHASE CONDUCTORS AND (1) - #4 AWG NEUTRAL CONDUCTOR IN 1-1/4" CONDUIT FROM METER TO PANEL "C".

(12) NEW SERVICE RATED 240/120V, 1Ø, 60A MCB IN A 200A FRAME PANEL "C". BOND NEUTRAL TO GROUND IN THIS PANEL.

(13) (1) - #8 AWG GROUND IN 1 / 2" PVC CONDUIT. CADWELD TO 5 /8" x 10'-0" COPPER CLAD STEEL GROUND ROD.

(14) (1) - #12 AWG PHASE CONDUCTOR, (1) - #12 AWG NEUTRAL CONDUCTOR, AND (1) - #12 AWG GROUND IN 1" CONDUIT FROM PANEL "C" TO NEW POLE MOUNTED LIGHTS.

(15) (1) - #12 AWG PHASE CONDUCTOR, (1) - #12 AWG NEUTRAL CONDUCTOR, AND (1) - #12 AWG GROUND IN 1" CONDUIT FROM PANEL "C" TO NEW POLE MOUNTED RECEPTACLES.

(16) NEW TYPE "A" POLE MOUNTED LIGHT PER LIGHTING SCHEDULE. REFERENCE SHEET 13 FOR MORE INFORMATION ON THE LIGHTS AND LIGHT POLES.

STATE OF TEXAS
COLE W. CARPENTER
156124
LICENSED PROFESSIONAL ENGINEER
02/03/26

ISSUED FOR CONSTRUCTION

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT

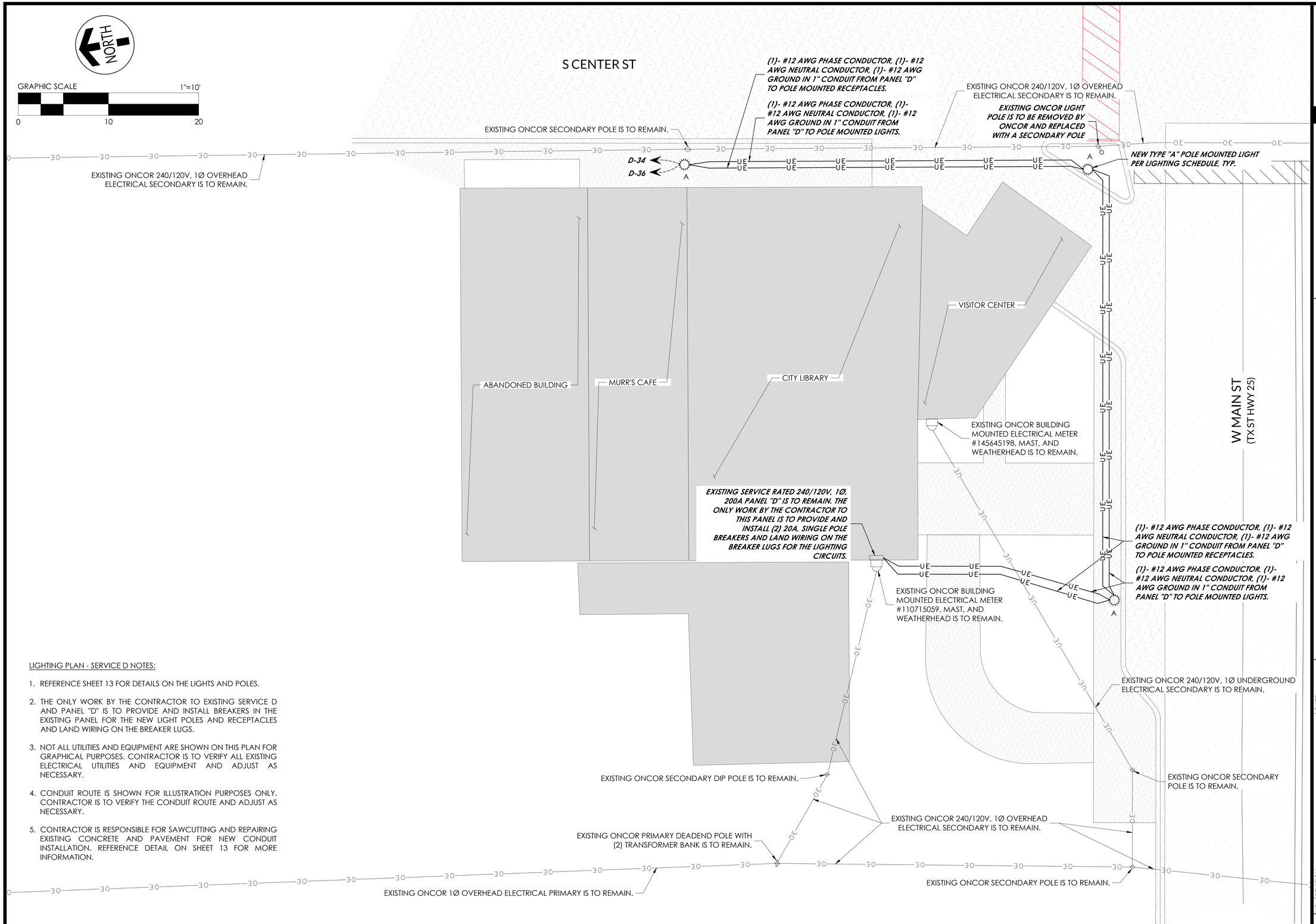
ELECTRICAL RISER DIAGRAM AND PANEL SCHEDULE - SERVICE C

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320 | SCALE NTS

SEQ. 20/22 | SHEET 20



LIGHTING PLAN - SERVICE D NOTES:

1. REFERENCE SHEET 13 FOR DETAILS ON THE LIGHTS AND POLES.
2. THE ONLY WORK BY THE CONTRACTOR TO EXISTING SERVICE D AND PANEL "D" IS TO PROVIDE AND INSTALL BREAKERS IN THE EXISTING PANEL FOR THE NEW LIGHT POLES AND RECEPTACLES AND LAND WIRING ON THE BREAKER LUGS.
3. NOT ALL UTILITIES AND EQUIPMENT ARE SHOWN ON THIS PLAN FOR GRAPHICAL PURPOSES. CONTRACTOR IS TO VERIFY ALL EXISTING ELECTRICAL UTILITIES AND EQUIPMENT AND ADJUST AS NECESSARY.
4. CONDUIT ROUTE IS SHOWN FOR ILLUSTRATION PURPOSES ONLY. CONTRACTOR IS TO VERIFY THE CONDUIT ROUTE AND ADJUST AS NECESSARY.
5. CONTRACTOR IS RESPONSIBLE FOR SAWCUTTING AND REPAIRING EXISTING CONCRETE AND PAVEMENT FOR NEW CONDUIT INSTALLATION. REFERENCE DETAIL ON SHEET 13 FOR MORE INFORMATION.

STATE OF TEXAS
COLE W. CARPENTER
156124
LICENSED PROFESSIONAL ENGINEER
02/03/26

ISSUED FOR CONSTRUCTION

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT
LIGHTING PLAN - SERVICE D

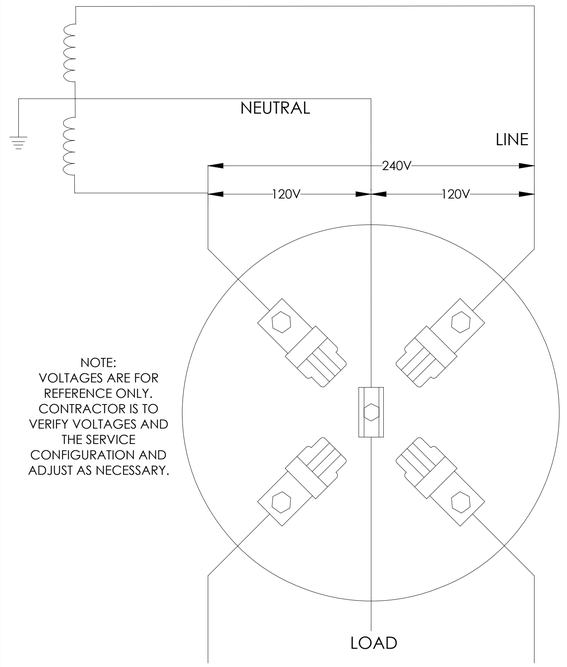
NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 24320 | SCALE 1" = 10'

SEQ. 21/22 | SHEET 21

Plot Date: 2/12/2026 8:33 AM
Plotted by: nic. kirk
Save Time: 2/12/2026 8:28 AM
Saved By: ccarpenter
X:\CL_Archer_City\24320 - 2024 TDA Downtown Revitalization Project - Archer City\Drafting_Plans_E_Electrical\18 LIGHTING PLAN - SERVICE D.dwg



NOTE:
VOLTAGES ARE FOR REFERENCE ONLY. CONTRACTOR IS TO VERIFY VOLTAGES AND THE SERVICE CONFIGURATION AND ADJUST AS NECESSARY.

3 WIRE 240/120 VOLT SINGLE PHASE SELF CONTAINED

EXISTING ONCOR ELECTRICAL SERVICE DETAIL

N.T.S.

Archer City Downtown Revitalization
Existing Panel "D" Schedule

1 Phase 3 Wire
120/240 VAC

Main Breaker Rating: 200 AMPS
M.L.O. Bus Rating: 200 AMPS
Sym. Inter. Cap.: AMPS

Surface Mount.: X NEMA 1: X
Flush Mount.: NEMA 3R:

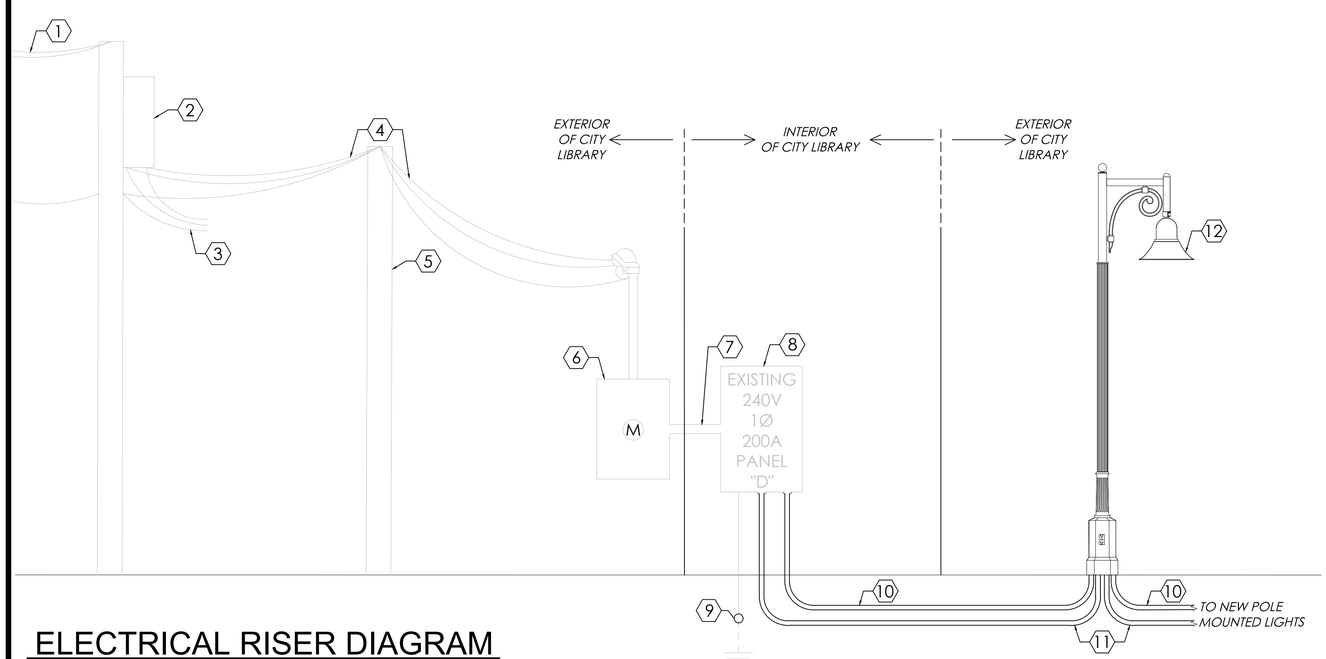
Conductor Color Code
Line 1 ---------- BLACK
Line 2 ---------- RED
Neutral ---------- WHITE or GRAY
Ground ---------- GREEN

	Load
Phase 1 Load:	1
Phase 2 Load:	5

POLE	SERVICE	W	LOAD LINE 1	LOAD LINE 2	BREAKER POLES	POLE	1	2	POLE	SERVICE	W	LOAD LINE 1	LOAD LINE 2	BREAKER POLES	POLE
1						1	X		2	Existing Server				20 / 1	2
3						3		X	4	Existing Computer				20 / 1	4
5	Existing North Furnace (Note 1)				80 / 2	5	X		6	Existing Breaker				20 / 1	6
7	"					7		X	8	Existing Breaker				20 / 1	8
9	"					9	X		10	Existing Back Room (Storage)				20 / 1	10
11	"					11		X	12	Existing Breaker				20 / 1	12
13	Existing South Furnace (Note 1)				80 / 2	13	X		14	Existing Breaker				20 / 1	14
15	"					15		X	16	Existing Breaker				20 / 1	16
17	"					17	X		18	Existing Breaker				20 / 1	18
19	"					19		X	20	Existing Breaker				20 / 1	20
21						21	X		22	Existing Breaker				20 / 1	22
23						23		X	24	Existing Water Heater				20 / 1	24
25						25	X		26	Existing Breaker				20 / 1	26
27						27		X	28	Existing Breaker				20 / 1	28
29						29	X		30	Existing Breaker				20 / 1	30
31	Existing East Air Conditioner				40 / 2	31		X	32	Existing Breaker				20 / 1	32
33	"					33	X		34	New Pole Mounted Lights (Note 2)	161	1		20 / 1	34
35	Existing West Air Conditioner				50 / 2	35		X	36	New Pole Mounted Receptacles (Note 2)	540		5	20 / 1	36
37	"					37	X		38						38
39						39		X	40						40

Notes:

1. The 2 pole breaker for these circuits occupies four panel spaces.
2. The only work by the contractor to this panel is to provide and install two new 20A, single pole breakers for the new lighting circuits and land wiring on the breaker lugs. Contractor is to verify the existing circuits in this panel and adjust the new lighting circuits as necessary.



ELECTRICAL RISER DIAGRAM

N.T.S.

GENERAL ELECTRICAL RISER DIAGRAM NOTES

1 ELECTRICAL RISER DIAGRAM IS SHOWN AS REFERENCE ONLY AND MAY NOT INCLUDE THE FULL ELECTRICAL SYSTEM. CONTRACTOR IS TO VERIFY ALL ITEMS FOR THE EXISTING ELECTRICAL SERVICE AND ADJUST AS NECESSARY.

ELECTRICAL RISER DIAGRAM NOTES BY REFERENCE (#)

1. EXISTING ONCOR 1Ø OVERHEAD ELECTRICAL PRIMARY IS TO REMAIN.
2. EXISTING ONCOR PRIMARY DEADEND POLE WITH (2) TRANSFORMER BANK IS TO REMAIN.
3. EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY SERVING DIFFERENT CUSTOMERS IS TO REMAIN.
4. EXISTING ONCOR 240/120V, 1Ø OVERHEAD ELECTRICAL SECONDARY IS TO REMAIN.
5. EXISTING ONCOR SECONDARY POLE IS TO REMAIN.
6. EXISTING ONCOR BUILDING MOUNTED ELECTRICAL METER #: 110715059, MAST, AND WEATHERHEAD IS TO REMAIN.
7. EXISTING WIRING AND CONDUIT IS TO REMAIN.
8. EXISTING SERVICE RATED 240/120V, 1Ø, 200A PANEL "D" IS TO REMAIN. THE ONLY WORK BY THE CONTRACTOR TO THIS PANEL IS TO PROVIDE AND INSTALL (2) 20A, SINGLE POLE BREAKERS AND LAND NEW WIRING ON THE BREAKER LUGS.
9. EXISTING GROUND ROD IS TO REMAIN.
10. (1) - #12 AWG PHASE CONDUCTOR, (1) - #12 AWG NEUTRAL CONDUCTOR, AND (1) - #12 AWG GROUND IN 1" CONDUIT FROM PANEL "D" TO NEW POLE MOUNTED LIGHTS.
11. (1) - #12 AWG PHASE CONDUCTOR, (1) - #12 AWG NEUTRAL CONDUCTOR, AND (1) - #12 AWG GROUND IN 1" CONDUIT FROM PANEL "D" TO NEW POLE MOUNTED RECEPTACLES.
12. NEW TYPE "A" POLE MOUNTED LIGHT PER LIGHTING SCHEDULE. REFERENCE SHEET 13 FOR MORE INFORMATION ON THE LIGHTS AND LIGHT POLES.

STATE OF TEXAS
COLE W. CARPENTER
156124
LICENSED PROFESSIONAL ENGINEER
02/03/26

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JACOB MARTIN
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CITY OF ARCHER CITY, TEXAS
DOWNTOWN REVITALIZATION PROJECT

ELECTRICAL RISER DIAGRAM AND PANEL SCHEDULE - SERVICE D

NO.	REVISION	DATE

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PROJECT # 24320 | SCALE NTS

SEQ. 22 / 22 | SHEET 22

TABLE OF CONTENTS

SECTION 01 00 01 - DEFINITIONS AND TERMINOLOGY

PART 1 GENERAL

1.1 ABBREVIATIONS

A. Whenever any of the following abbreviations appear in these Specifications and Contract Documents, their meanings shall be as follows:

OWNER	City of Archer City
ENGINEER	Jacob & Martin, LLC
ASTM	American Society for Testing Materials
AWWA	American Water Works Association
AASHTO	American Association of State Highway and Transportation Officials
A.C.	Asbestos Cement
C.I.	Cast Iron
C.S.	Commercial Standards
D.I.	Ductile Iron
EPA	Environmental Protection Agency
GPM	Gallons Per Minute
NSF	National Sanitation Foundation
TDA	Texas Department of Agriculture
OSHA	Occupational Safety and Health Administration
PVC	Polyvinyl Chloride
TCDP	Texas Community Development Program
TCF	Texas Capital Fund
TXDOT	Texas Department of Transportation
TCEQ	Texas Commission on Environmental Quality
TWDB	Texas Water Development Board
USDA/RD	United States Department of Agriculture - Rural Development *Latest Revision

1.2 DOCUMENT ORGANIZATION

A. Section GENERAL REQUIREMENTS govern the execution of all sections of the Specifications.
B. Organization of Contract Documents is not intended to control or to lessen the responsibility of the Contractor in dividing work among his subcontractors, or in establishing extent of work to be performed by any trade.

1.3 SPECIFICATION SENTENCE STRUCTURE

A. Specifications are written in modified brief style. Requirements indicated and specified apply to all work of same kind, class, and type even though word "all" is not stated.
B. Simple imperative mood of sentence structure is used in Specification sections which places verb as first word sentence. Where such words as "perform", "provide", "install", "erect", "furnish", "connect", "test", or words similar import are used, it shall be understood that such words include meanings of phrase "The CONTRACTOR shall..." before each word.
C. Standard paragraph titles and other identifications of subject matter in Specifications are intended as aid in locating and recognizing various requirements in the Specifications. Titles do not define, limit, or otherwise restrict Specification text. Capitalizing of words in text does not signify or mean that such words convey special or unique meanings that have precedence over

other parts of the Contract Documents. Specification text shall govern over titling and shall be understood to be interpreted as a whole.

1.4 SPECIFICATION TERMINOLOGY

A. Terms such as "directed", "designated", "requested", "authorized", "approved", "selected", or words of similar value shall mean by the Engineer unless otherwise stated. Use of these terms does not extend the ENGINEERS's responsibility for construction supervision or responsibilities defined in the General conditions.

B. "Required" and words of similar value mean as required to complete the work, unless otherwise stated.

C. "Perform" shall mean CONTRACTOR, at his own expense, shall perform operations necessary to complete work.

D. "Provide" shall mean CONTRACTOR, at his own expense, shall furnish and install work complete in place and ready to use.

E. "Other acceptable manufacturer", "Approved equal", or words of similar meaning shall be understood to be followed by expression "in sole opinion of the ENGINEER" even though such words may not appear in print, unless otherwise stated.

F. "Acceptance", "acceptable", or words of similar meaning shall mean acceptable to ENGINEER or OWNER. OWNER shall have jurisdiction and may override decisions of others.

G. "At no extra cost to Owner", "With no extra compensation to CONTRACTOR", "At CONTRACTOR's own expense", or words of similar meaning shall be understood to mean the CONTRACTOR shall perform or provide specified operation of work at no increase to CONTRACTOR Sum in the executed Contract.

H. "Indicated" refers to graphic representations, notes, or schedules on drawings, or other paragraphs or schedules in specifications, and similar requirements in Contract Documents. Where terms such as "shown", "noted", "scheduled" and "specified" are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.

I. "Accepted" where used in conjunction with ENGINEER's action on CONTRACTORS submittals, and requests, is limited to responsibilities and duties of ENGINEER. Such approval does not release CONTRACTOR from responsibility to fulfill Contract Document requirements.

J. "Regulation" includes Federal, State and Local Laws, statutes, ordinances, and lawful orders issued by authorities have jurisdiction, as well as, rules, conventions, and agreements within construction industry that control performance of work, whether they are lawfully imposed by authorities having jurisdiction or not.

K. "Furnish" is used to mean to supply and deliver to project site, ready for unloading, unpacking, assembly, installation, and similar operation.

L. "Install" is used to describe operations at project site including actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

M. "Installer" is an entity engaged by CONTRACTOR, either as an employee, subcontractor, or sub-subcontractor for performance of particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

N. The term "experienced", when used with the term "installer", means having minimum five (5) previous projects similar in size and scope to this project, and familiar with precautions required, and has complied with requirements of authority having jurisdiction.

O. "Project site" is the space available to the CONTRACTOR for performance of work, either exclusively or in conjunction with others performing construction as part of the project.

P. "Testing Laboratory" is an independent entity engaged to perform specific inspections or test, either at the project site or elsewhere, and to report on, or to interpret results of those inspections or tests as required. Unless otherwise indicated, testing laboratories shall be hired by the CONTRACTOR at no additional cost to the OWNER.

Q. Equipment is "Listed" if of a kind mentioned in a list which:
   1. Is published by a nationally recognized laboratory which makes periodic inspection of production of such equipment.
   2. States that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

R. Equipment is "Labeled" if:
   1. It embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc.
   2. Production is periodically inspected in accordance with nationally recognized standards or tests to determine safe use in a specified manner.

S. Equipment is "Certified" if:
   1. Equipment has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner.
   2. Production is periodically inspected by a nationally recognized testing laboratory.
   3. It bears a label, tag, or other record of certification.

1.5 REFERENCE STANDARDS

A. Applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents regardless of lack of reference within the Contract Documents. Where Contract Documents include more stringent requirements than the reference standards, the Contract Documents shall apply.
   1. Standards referenced directly in the Contract documents take precedence over standards that are not referenced but recognized in the construction industry as applicable.
   2. Except as otherwise limited by the Contract Documents, enforce standards not referenced but recognized in industry as applicable for performance of the work. The ENGINEER shall decide whether code or standard is applicable, or which of several are applicable.

B. Consider a reference standard to be the latest edition with supplements or amendments when standard is referred to in an individual Specification Section but is not listed by the title and date.

C. Maintain copies of reference standards at project site throughout construction period. Make copies of reference standards available as requested by ENGINEER or OWNER.

D. Enforce the most stringent requirements where compliance with two (2) or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, unless Contract Documents indicate otherwise.
   1. Quantity or quality level shown or indicated shall be minimum to be provided or performed in every instance.
   2. Actual installation may comply exactly with minimum quality indicated,or it may exceed that minimum within reasonable limits.
   3. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for context of requirements.
   4. Refer instances of uncertainty to the Engineer for decision before proceeding.

E. Trade association names and titles of general standards are frequently abbreviated. Where acronyms or abbreviations are used in specifications or other Contract Documents they mean recognized name of trade association, standards generating organization, authority having jurisdiction, or other entity applicable to context of text provision. Refer to "Encyclopedia of Associations", published by Gale Research Company.

PART 2 NOT USED

PART 3 NOT USED

-- END OF SECTION --

SECTION 01 01 01 - SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK INCLUDED

A. Construct work as described in the Contract Documents.
   1. Provide materials, equipment, and incidentals required to make the project completely operable.
   2. Provide the labor, equipment, tools, and consumable supplies required for a complete project.
   3. Provide the civil, architectural, structural, mechanical, electrical, instrumentation and all other work required for a complete and operable project.
   4. Test and place the completed project in operation.
   5. Provide the special tools, spare parts, lubricants, supplies, or other materials as required for the operation and maintenance of the Project.
   6. Drawings and Specifications may not indicate or describe all of the work required to complete the project. Additional details required for the completion of the project are to be provided by the CONTRACTOR and coordinated with the ENGINEER.

1.2 REFERENCE STANDARDS

1.3 JOB CONDITIONS

A. The General Conditions, the Special Conditions, and Division One Specifications apply to each Specification section.
B. Comply with all applicable federal, state and local codes and regulations pertaining to the nature and character of the work being performed.

1.4 DESCRIPTION OF WORK

A. This sidewalk improvements project consist of replacement of approximately 484 SY of sidewalk and alleyway, 68 SY of Asphalt Pavement, 570 LF of Concrete Curb and Gutter, install light poles and all associated incidentals. The sidewalk replacements include the installation of 145 LF of ADA Ramp sections, 400 LF of Hand Rails, 6 sets of Truncated Domes, 2 sets of Stairs, 8 Entryway Refurbishments, and all associated incidentals.

1.5 TIME OF COMPLETION

A. The time to be allowed under this Contract to complete all work is per the Contract Documents. Work time established allows for the normal delays associated with bad weather, etc. and shall begin ten (10) days after the issuance of the Notice to Proceed by the OWNER. Requests for extension to time of completion shall be made by the CONTRACTOR to the ENGINEER, in writing, on a monthly basis corresponding with the submission of a partial payment requests. Requests for time extensions received more than 60 days following a requested date will not be considered.

1.6 SCHEDULE AND SEQUENCE OF CONSTRUCTION

A. Within 10 days prior to submission of the first partial payment request, the CONTRACTOR shall submit to the ENGINEER for approval six copies of the schedule under which the CONTRACTOR proposes to complete the project. Seven days prior to the start of construction, the CONTRACTOR shall submit to the ENGINEER for approval an electronic copy of a schedule under which the CONTRACTOR proposes to complete the project. The CONTRACTOR shall submit an updated schedule with each payment request.
B. If, in the opinion of the ENGINEER, construction progress falls behind the schedule, the CONTRACTOR shall take such action as necessary to improve his progress, and the CONTRACTOR shall submit to the ENGINEER a revised schedule demonstrating his proposed

plan to make up the lag in scheduled progress and complete the project within the contract time.

1.7 WORK BY OWNER

A. The OWNER may perform items of work which are not included in this Contract, but may impact construction scheduling. CONTRACTOR to coordinate construction activities through the ENGINEER.

1.8 CONSTRUCTION OF UTILITIES

A. Coordinate with Utility Companies or their contractors to provide all required utilities for this project. Construction of permanent utilities will be paid for by the OWNER.
B. Power and Electrical Services
   1. Pay for temporary construction power, including but not limited to construction cost, meter connection, fees and permits.

1.9 OCCUPANCY

A. As soon as any portion of the Project is ready to use, the OWNER shall have the right to operate the portion upon written notice to the CONTRACTOR.
B. Testing of Controls, including specified test periods, training, and start-up does not constitute acceptance for operation.
C. OWNER may accept the facility for continued use after start-up and testing at the option of the OWNER. If acceptance is delayed at option of the OWNER, shut down facilities per approved Operation and Maintenance procedures.
D. The execution of bonds is understood to indicate the consent of surety.
E. Conduct operations to insure the least inconvenience to the OWNER and general public.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide materials and products per the individual sections of the Specifications.

PART 3 EXECUTION

3.1 NOT USED

-- END OF SECTION --

SECTION 01 02 01 - SPECIAL TECHNICAL SPECIFICATIONS AND CONDITIONS

PART 1 GENERAL

1.1 PRIORITY OF INTERPRETATION

A. The Contract Documents are complementary, and what is called for by one document shall be binding as if called for by all. In case of conflict between any of the Contract Documents, priority of interpretation shall be in the following order:
   1. General Conditions
   2. Agreement
   3. Performance and Payment Bonds
   4. Special Bonds, if any
   5. Bid
   6. Special Technical Specifications and Conditions
   7. Plans
   8. Technical Specifications

1.2 REFERENCE STANDARDS

1.3 SALES TAX EXEMPTION

A. The OWNER qualifies as an exempt agency pursuant to the provisions of the Texas Limited Sales, Excise and Use Tax Act, and is not subject to any State or City sales tax on materials and labor used in the performance for this project. The CONTRACTOR shall issue a resale exemption certificate when purchasing said materials. Said exemption certificate complying with Section 151.155 (Exemption Certificate) and 151.309 (Government Entities) of Texas Limited Sales, Excise and Use Tax Act, as amended. Any sales taxes applicable to equipment purchases, rentals, leases, or consumable supplies or other taxable services not incorporated into the project shall be the responsibility of the CONTRACTOR.

1.4 MINIMUM WAGE SCALE

A. The minimum wage scale shall be according to local prevailing wage rates, if not already listed in the Contract Section.

1.5 METHODS OF OPERATION

A. The CONTRACTOR shall inform the ENGINEER in advance concerning his plans for carrying on each part of the work, but the CONTRACTOR alone shall be responsible for safety, adequacy, and efficiency of his plant, equipment, and methods.

B. The OWNER and ENGINEER will not be responsible for any act or omission of the CONTRACTOR, or any subcontractor, or any of the agents or employees, or any other persons performing any of the work. The OWNER and ENGINEER will not be responsible for any failure of the CONTRACTOR or his subcontractors or any other persons to perform the work in accordance with the requirements of the contract documents.

C. Review by the OWNER or ENGINEER of any plan or method of work proposed by the CONTRACTOR shall not relieve the CONTRACTOR of any responsibility therefore, and such review shall not be considered as an assumption of any risk or liability by the OWNER or ENGINEER, or any officer, agent, or employee thereof.

1.6 SUBCONTRACTORS

A. Subcontractors who may be used by the CONTRACTOR will not be approved by the ENGINEER prior to award of the contract. After award, if approval is given for a subcontractor to perform certain items of the work, the CONTRACTOR will remain completely and totally responsible for all work under this contract. If directed by the ENGINEER, the CONTRACTOR

will also be responsible for correcting any defects and/or removing any defective work completely from the site and satisfactorily replacing the work.

1.7 EVALUATION OF BIDS

A. The bid schedule lists the various divisions of construction contemplated in the Plans and Specifications, together with an estimate of the units of each. With these units as the basis, the Bidder will extend each item using the cost he sets in the unit price column. Any total cost found to be inconsistent with the net cost when the bids are evaluated will be deemed in error and corrected to agree with the unit cost, which shall be considered correct. The written unit price shall be used in case of conflict with the numerical unit price.

1.8 AWARD OF THE CONTRACT

A. The OWNER reserves the right to hold all bids for the number of days specified in the Contract Documents before making an award of the Contract.

1.9 WORKMANSHIP

A. These specifications contain detailed instructions and descriptions covering the major items of construction and workmanship necessary to construct the above mentioned project. The specifications are intended to be so written that only first class workmanship and finish of the best grade and quality will result. The fact that these specifications may fail to be so complete as to cover all details will not relieve the CONTRACTOR of full responsibility for providing a completed project of high quality, first class finish and appearance and satisfactory for operation, all within the apparent intent of the plans and specifications.

1.10 ESTIMATED QUANTITIES

A. The Contract Documents are intended to show clearly all work to be done and materials to be furnished. Where the estimated quantities are shown for the various classes of work to be done and material to be furnished under this contract, they are approximate and are to be used only as a basis for estimating the probable cost of the work and for comparing the proposals offered for the work. It shall be understood that the actual amount of work to be done and material to be furnished under this contract may differ from these estimates, and where the basis for payment under this contract is the unit price method, payment shall be for the actual amount of such work and material furnished.

B. Where payment is based on the unit price method, the CONTRACTOR agrees that he will make no claim for damages, anticipated profits or otherwise on account of any differences which may be found between the quantities of work actually done, the material actually furnished under this contract and the estimated quantities contemplated and contained in the proposal. However, in case the actual quantity of any major item becomes as much as 25% more than or 25% less than the estimated or contemplated quantity for such item, then either party to this Agreement, upon demand, shall be entitled to a revised consideration upon the portion of the work above or below 25% of the estimated quantity. The OWNER will not pay for increased material prices for any quantity increase within the 25% allowable. Therefore, the CONTRACTOR should endeavor to have his material quote cover up to 25% more than the bid quantity.

C. A "Major Item" shall be construed to be any individual bid item included in the proposal that has a total cost equal to or greater than10% of the total contract cost, computed on the basis of the proposal quantities and contract unit prices. Any revised consideration is to be determined by Agreement between the parties, otherwise by terms of the Agreement, as provided under Changes in Contract Price in the General Conditions.

1.11 FINAL QUANTITIES INSTALLED

A. Should there be a discrepancy between the CONTRACTOR'S claim for quantity of materials installed and the quantity measured by the ENGINEER, the discrepancy may be resolved as follows:
   1. The plans shall be thoroughly checked by the ENGINEER and CONTRACTOR to assure that all changes in work have been recorded and no errors exist in the material take-off.
   2. Should the quantity discrepancy not be resolved by means of plan sheet examination, then at the CONTRACTOR'S request, segments of lines may be re-measured: however, if the CONTRACTOR'S figures are not proven to be accurate by re-measurement, then the CONTRACTOR shall pay for cost of re-measurement.
   3. Any deviations in straight-line routing of pipeline not approved by the ENGINEER and/or OWNER shall be paid only for the footage of pipe which would have been required for a straight line installation.

1.12 PROTECTION OF LIVES AND PROPERTY

A. In order to protect the lives and health of his employees, the CONTRACTOR shall comply with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General CONTRACTOR of America, Inc. The CONTRACTOR shall maintain an accurate record of all cases of death, occupational disease and injuries requiring medical attention or causing loss of time from work arising out of and in the course of work under this contract. The CONTRACTOR alone shall be responsible for the safety, efficiency and adequacy of his plant, appliances and methods and for any damage which may result from their failure, improper construction, maintenance or operation.

1.13 SANITARY FACILITIES

A. The CONTRACTOR shall provide adequate toilet facilities for use by workmen in accordance with O.S.H.A. provisions, and shall maintain such facilities throughout the construction period.

1.14 EXISTING UTILITIES

A. It shall be the entire responsibility of the CONTRACTOR to locate all existing underground utilities ahead of the work, whether or not shown on the Plans, and to protect and preserve such utilities from any damage from the proposed construction operations. In the event an underground water, oil, gas, telephone line, or other utility is damaged, the respective OWNER of said utility shall be notified immediately by the CONTRACTOR. It shall be the CONTRACTOR'S entire responsibility to see that said utilities are repaired to the satisfaction of the ENGINEER and utility OWNER. If the CONTRACTOR shows a complete disregard for existing utilities, the CONTRACTOR will pay the OWNER, $1,000.00 per occurrence in addition to paying all costs for repairing damage to existing utilities. Continued disregard for existing utilities may result in suspension or termination of the Construction Contract. Where overhead poles or anchors are encountered, or are necessary to be disturbed or moved, the CONTRACTOR shall contact the OWNER of the utility and arrange to have the necessary adjustments made, at no additional cost to the OWNER. When signs are disturbed or damaged, the CONTRACTOR shall restore them to the same or better condition that existed prior to construction.

1.15 SATURDAY AND SUNDAY WORK

A. Construction work on Saturdays or Sundays will not be permitted on the project except to maintain barricades, warning signs and flares. In the event the CONTRACTOR is prevented from working on the project for two or more days in any one calendar week, he may work the following Saturday if approval is given by the ENGINEER and OWNER.

1.16 TPDES GENERAL PERMIT

A. The CONTRACTOR shall fully comply with the Texas Pollutant Discharge Elimination System Permit TXR 150000. All construction activities shall fully comply with all aspects of this permit, and the CONTRACTOR shall certify to the OWNER said compliance before the certificate of construction completion is issued. The CONTRACTOR shall apply for and obtain the permit before construction. The CONTRACTOR shall be responsible for the permit fee and all other costs associated with the referenced permit.

B. At least three (3) days before commencement of construction, the CONTRACTOR shall file a Notice of Intent (NOI) with the TCEQ. The notice shall be sent to the TCEQ, Storm Water & Processing Center: MC-228, P.O. Box 13087, Austin, Texas 78711-3087. One copy of the NOI shall be sent to the ENGINEER and one copy shall be posted at the site. The NOI form and permit requirement may be obtained from the TCEQ or on their website www.tceq.state.tx.us The CONTRACTOR shall prepare a Stormwater Pollution Prevention Plan (SWPPP), obtain, and fully comply with the Texas Pollutant Discharge Elimination System Permit TXR 150000. Questions concerning this permit may be addressed to TCEQ at 512-239-3700.

1.17 CONSTRUCTION SURVEYING

A. The construction surveying described in Paragraph 1 below shall be provided by the OWNER. The surveying work contained in Paragraphs 2, 3, and 4 shall be considered subsidiary to the overall project and no separate payment shall be made for this work. Work contained in Paragraphs 2, 3, and 4 shall be accomplished by the CONTRACTOR.

1. The surveyor shall obtain copies of all private property easements, and public right of way permits. From these easements and permits, the surveyor shall set alignment lathes, stakes, and hubs as needed and benchmarks as needed, plus alignment stakes at every horizontal PI. Also, alignment lathes, stakes, and hubs shall be set at every property line or ROW line crossing. The CONTRACTOR shall notify the ENGINEER at least 24 hours before each segment is to be staked. Each segment to be staked shall be a minimum of 1000 feet in length. Staking will be provided one time only. Stakes that are lost or damaged shall be replaced by the CONTRACTOR at his own cost.
2. Locate and protect control points prior to starting the site work and preserve permanent reference points during construction. The CONTRACTOR shall not change or relocate points without prior approval of the ENGINEER. Notify ENGINEER when the reference point is lost, destroyed, or requires relocation. Replace project control points on the basis of the original survey.
3. Provide complete engineering layout of the work needed for construction.
   a. Provide competent personnel. Provide equipment including accurate surveying instruments, stakes, platforms, tools, and materials.
   b. Record data and measurements per standards.
4. Construction lines and grades, as well as base lines and bench marks provided by the CONTRACTOR, shall be subject to such checks and reviews as the ENGINEER may, from time to time, desire to make.

1.18 WATER USED DURING CONSTRUCTION PERIOD

A. The CONTRACTOR shall pay to the City of Archer City,$10.00 per thousand gallons for all water used for filling the lines, flushing, testing, leaks, etc.

B. The OWNER shall furnish water (at the nearest fire hydrant or flush valve) at no cost to the CONTRACTOR for testing, disinfection and flushing as required by these Specifications.

1.19 UTILITIES DURING CONSTRUCTION

A. The CONTRACTOR will be required to make arrangements for and pay for the electrical power and any other utilities required during construction.

1.20 STATE HISTORIC PRESERVATION

A. If cultural materials are encountered during construction, work must cease in the immediate area. Work can continue in the project area where no cultural materials are present. The Secretary of Interior (202-343-4101) must be contacted in accordance with 36 CFR 8007. Also, the State Historic Preservation Officer (512-463-6100) must be notified.

1.21 UNCLASSIFIED EXCAVATION

A. All excavation on this project will be considered to be unclassified, and no extra payment will be made for the removal of any rock, shale, roots and any other material or substance that may be encountered in the construction work as set out on the Drawings and in the Technical Specifications.

1.22 TEXAS DEPARTMENT OF TRANSPORTATION RIGHT-OF-WAY

A. The OWNER has received, and will make available to the CONTRACTOR, permits authorizing construction work on the State Highway Department right-of-way. The CONTRACTOR shall perform all construction operations and clean up in accordance to the permit issued by the Texas State Department of Highways, and under the supervision of the representative of the Department of Highways, as well as in accordance with the Technical Specification of this contract as directed by the ENGINEER. All highway crossings or paralleling in highway right-of-way shall have right-of-way markers installed at the entrance and exit points and a detectable metal wire or tape shall be installed in the pipeline ditch while in the highway right-of-way.

B. It shall be the responsibility of the CONTRACTOR to notify the proper highway official 48 hours prior to any construction activity on highway right-of-way. The CONTRACTOR shall have a copy of the appropriate permits on site at all times.

1.23 CONSTRUCTION ON COUNTY OR CITY RIGHT-OF-WAY

A. The OWNER has received authorization from the County authorizing pipeline construction in County road right-of-way in the locations indicated on the Plans. It shall be the CONTRACTOR'S entire responsibility to notify the appropriate Precinct Commissioner 48 hours prior to any construction work on County right-of-way, and conduct construction operations in full cooperation with Precinct Commissioner.

B. Where necessary to cross a county road or install pipeline within the County road riding surface, all ditch backfilling shall be as noted or required per County Precinct Commissioner, base material replaced as directed by the Precinct Commissioner, and the road left in a condition equal to that prior to crossing. In areas where pavements exists or where new construction is being proposed, and the County Commissioner requires the crossing to be bored, the CONTRACTOR shall bore and encase the pipeline in the same manner required by the Texas Highway Department for highway crossings and payment will be made at the unit price bid for Bore and Encasement as set out in the Bid Schedule. All paved county roads shall be bored. No paved county road shall be open cut unless written approval is obtained from the appropriate Precinct Commissioner.

C. All County road crossings or paralleling in County right-of-way shall have right-of-way markers installed at the entrance and exit points and a detectable metal tape shall be installed in the pipeline ditch while in the County right-of-way.

D. **No extra payment shall be made for special backfill in county roads and no extra payment shall be made for any gravel or asphalt repair. All paved driveways and approaches shall be slick bored for no extra pay as noted on the Plans.**

1.24 TRENCH SETTLEMENT

A. The CONTRACTOR shall be responsible for all settlement of backfill, fills, and embankments which may occur within one (1) year after final completion of the contract under which the work was performed.

B. The CONTRACTOR shall make, or cause to be made, all repairs or replacements made necessary by settlement, within thirty (30) days after notice from the ENGINEER or OWNER.

1.25 RESTORATION OF SURFACES

A. The CONTRACTOR shall replace all surface material (including topsoil in original thickness), and shall restore gravel drives and roadways, fencing, sod and other surfaces disturbed, to a condition equal to that before the work began, furnishing all labor and material incidental thereto.

1.26 SURPLUS EARTH

A. Surplus excavated materials from all trenching, manholes, and structures shall be disposed of by the CONTRACTOR, at no cost to OWNER, as approved by the OWNER and ENGINEER .

1.27 FENCES AND SIGNS

A. When necessary for the CONTRACTOR to take down signs, fences or other obstructions, this shall be done at his own expense and replaced in the original condition after construction operations. Fences which are taken loose by the Contactor shall be done in a manner to prevent slacking of the remainder of the wire. The CONTRACTOR, prior to taking down any fence shall have complete approval of the Project Representative as to the width of the fence gap to be made and the manner in which existing posts are to be placed. **No fences shall be cut without authorization in writing from OWNER or ENGINEER.**

1.28 BARRICADES, WARNING SIGNS AND PUBLIC CONVENIENCE

A. The convenience of access of the adjoining property OWNERS on the streets herein scheduled for improvements is of prime importance in the construction operations. In certain locations it may be necessary that property OWNERS use a portion of the roadway being improved to access their property. In such cases, the CONTRACTOR shall schedule his operations to provide such access to the property OWNERS in a safe and convenient manner. The CONTRACTOR shall provide courteous, English speaking and well informed flagmen for directing traffic. Flagmen shall wear a bright red coat and shall use a bright red flag to signal traffic.

B. At each section of street and each cross street intersecting the section of street under construction, the CONTRACTOR shall provide barricades and other warning signs as necessary. Detour signs shall be placed at all intersections where traffic is diverted from the section under construction and at other intersections of the detour to provide complete directions for detouring traffic around the section under construction. CONTRACTOR shall also provide any necessary special signs to signify any hazards or conditions. All barricades, detour and warning signs that remain in place at night shall be fully lighted by approved methods from sunset to sunrise. All signs shall be kept in a good state of repair and be plainly legible at all times. Upon completion of the project, all signs and evidence thereof shall be completely removed from the site of the work by the CONTRACTOR.

1.29 CLEARING AND CLEAN UP

A. All necessary clearing shall be done by the CONTRACTOR, at no cost to OWNER, as approved by the OWNER and ENGINEER . All tree branches, limbs and roots shall be

removed and disposed of by the CONTRACTOR in order that the right-of-way may be left in a neat and presentable condition. Any damage resulting to trees, grass and shrubbery must be paid for, by the CONTRACTOR, and damage claims, if any, settled by the CONTRACTOR.

B. Prior to final acceptance of the project, the CONTRACTOR shall clean and smooth up the site of the work and remove all rock, debris, material, etc., leaving the project site with a neat appearance to the satisfaction of the OWNER. Disposed of debris, rubbish, etc. shall be made in an area which shall meet the approval of the OWNER and ENGINEER. The CONTRACTOR shall comply fully with all applicable EPA and TCEQ regulations.

1.30 FEDERAL AND/OR STATE AGENCY'S APPROVAL AND INSPECTION

A. The written approval of the appropriate state agency having jurisdiction over the facility must be secured prior to payment of the final percentage retained under this contract.

B. The project site and premises as well as any records required shall be available at all reasonable times for inspection by authorized representatives of the State or Federal Agencies having jurisdiction over the project. The CONTRACTOR shall provide all necessary facilities for these inspections.

1.31 "RECORD DRAWING" INFORMATION

A. The CONTRACTOR shall be responsible for recording and providing all information concerning changes from the original plans as to valve, meter, and/or pipeline location for transfer to the "As-Built" or "Record Drawings" Plans. Final payment will not be released until "Record Drawings" are approved by the ENGINEER.

1.32 AFFIDAVIT OF BILLS PAID

A. Prior to final acceptance of the project by the OWNER, the CONTRACTOR shall execute a Release by Claimants and an affidavit which states all bills for labor, materials and incidentals incurred in the construction of the project have been paid in full and that there are no claims pending of which he has been notified.

1.33 LIQUIDATED DAMAGES

A. It is understood and agreed between the parties hereto that time is of the essence under this Contract, and that for each calendar day of delay beyond the stipulated number of calendar days awarded under this Contract, the CONTRACTOR shall pay the OWNER as liquidated damages per the amount specified in the Contract Documents. It is also understood between the parties hereto that such sum shall be treated as liquidated damages and not as a penalty, and the OWNER may withhold from the CONTRACTOR'S final payment such sum as liquidated damages.

1.34 WARRANTY

A. The CONTRACTOR shall guarantee the work performed under this contract against defective materials and workmanship of a period of one (1) year year from the date of final acceptance of the work by the OWNER. The CONTRACTOR shall arrange to have his Performance Bond remain in effect for a period of one (1) year year after the date of completion of construction work to cover his guarantee as stipulated under this item and in the General Conditions.

B. If defective materials and/or workmanship are discovered which require repairs made under this guarantee, all such repairs shall be done by the CONTRACTOR at his own expense within ten days after written notice of such defect. Should the CONTRACTOR fail to repair or correct such deficiency within ten days after notification, the OWNER may make the necessary repairs and charge the CONTRACTOR with the applicable costs of all labor and materials required to correct the deficiency.

PART 2 NOT USED

PART 3 NOT USED

-- END OF SECTION --

SECTION 01 03 01 - MEASUREMENT AND PAYMENT

PART 1 PAYMENT ITEMS

1.1 LUMP SUM PAYMENT ITEMS

A. Payment items for the work of this contract for which contract lump sum payments will be made are listed in the BIDDING SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.2 MOBILIZATION, BONDS, AND INSURANCE

A. PAYMENT
Mobilization, Bonds & Insurance shall be measured and paid for according to the lump sum in the proposal. Payment shall constitute full reimbursement for mobilization of personnel, equipment, and supplies to the project site in preparation for beginning work on contract items to be performed by the CONTRACTOR. Payment shall include, but is not limited to, movement of equipment, personnel, materials, supplies, bonding, insurance fees, application and permit fees (if necessary), and establishment of CONTRACTOR's facilities prior to beginning work. Also included in this item are any de-mobilization costs at project completion. The cost of required insurance and bonding shall also be included in this item. The cost of this item shall not exceed 10% of the total bid amount.

B. Unit of measure: LUMP SUM

1.3 UNIT PRICE PAYMENT ITEMS

A. Payment items for the work of this contract on which the contract unit price payments will be made are listed in the BIDDING SCHEDULE and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

PART 2 NOT USED

PART 3 NOT USED

-- END OF SECTION --

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SECTION 01 04 01 - SUBMITTALS

PART 1 GENERAL

1.1 SUMMARY

The CONTRACTOR shall submit descriptive information to:

1. Allow the ENGINEER to advise the OWNER whether the materials and equipment proposed for the project are in general conformance with the design concepts and in conformance with the drawings and specifications.
2. Provide a record for the OWNER of the materials and equipment which have been incorporated into the project.
3. Provide a guide for operations and maintenance of equipment.
4. Provide information required for the administration of the Contract for construction of the project.
5. All submittals, shop drawing and other related documents include under this specification section shall be submitted electronically to the Engineer unless directed otherwise by the Engineer. The only exception being the Operation and Maintenance Manuals, which shall be submitted as directed under that item.

1.2 REFERENCE STANDARDS

PART 2 PROCEDURES

2.1 CONTRACTOR'S RESPONSIBILITIES

A. The CONTRACTOR shall be responsible for the accuracy and completeness of the information contained in each submittal and shall insure that the values, material, equipment, or method of work shall be as described in the submittal. All submittals must be stamped by the CONTRACTOR, indicating that they have been checked by the CONTRACTOR for compliance with the Contract Documents and approved by the CONTRACTOR, or contain certifications as required by the Contract Documents. Submittals that do not have the stamp applied or include the required certifications will be returned without processing to the CONTRACTOR.

B. The CONTRACTOR shall ensure that there is no conflict with other submittals and notify the ENGINEER of each case where the proposed change may affect the work of another CONTRACTOR or OWNER. The CONTRACTOR shall ensure coordination of submittals among the related crafts and Subcontractors. Submittals shall not be accepted from Subcontractors or suppliers.

2.2 MARKING OF SUBMITTALS

A. The CONTRACTOR shall assign a number to each submittal provided to the ENGINEER to allow each submittal to be tracked while processing through the review procedures.

B. Assignment of numbers shall be by means of a letter prefix, a sequence number, and letter suffix to indicate resubmittal's.

C. The sequence number shall be issued in chronological order for each submittal in a division. Resubmittal's shall be followed by a letter of the alphabet to indicate the number of times a submittal has been sent to the ENGINEER for processing, As an example, a submittal with the number SD-03-01 indicates that the submittal is the first in Division 3 submitted. Submittal number SD-11-04-AA indicates the submittal is the fourth shop drawing submitted in Division 11 and is being submitted for the second time. Operation and maintenance manuals submitted shall be identified with the same number as its corresponding equipment submittal. For example, OM-11-04 indicates that this is the operation and maintenance manual for the equipment submitted as SD-11-04.

D. Correct assignment of numbers is essential as different submittal types are processed in different ways. Some submittals received do not require that any response be given for the material. CONTRACTOR and ENGINEER shall both maintain a log of submissions to allow the

processing of CONTRACTOR's submittals to be monitored. Logs will be reviewed periodically to determine that all submittals are received and processed.

E. Submittals shall be marked to show clearly the applicable sections of the specification and sheet number of drawings.

F. Submittals shall be accompanied by a Submittal Transmittal Form to be provided by the CONTRACTOR. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate discrete sections, etc. for which a submittal is required. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that they should be checked as a unit.

2.3 CONTRACTOR MODIFICATION REQUEST/PROPOSED CONTRACT MODIFICATION

A. Any change in the contract documents that is requested will be initiated by the CONTRACTOR issuing a Contractor's Modification Request or by ENGINEER issuing a Proposed Contract Modification. Proposals will be considered and if found acceptable will be incorporated in a Field Order in accordance with the General Conditions or Change Order in accordance with the General Conditions.

2.4 SHOP DRAWINGS

A. DEFINITION

1. As defined in the General Conditions, shop drawings consist of all drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the CONTRACTOR to illustrate some portion of the work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams, and other information prepared by a supplier and submitted by CONTRACTOR to illustrate material or equipment for some portion of the Work.
2. Shop drawings shall indicate the kind, exact model, size, arrangement, and operation of component materials and devices; materials of construction, external connections, anchorages and supports required; performance characteristics; dimensions, weights, and other information required for installation and correlation with other materials and equipment.

B. SCHEDULE OF SUBMITTAL OF SHOP DRAWINGS

1. The CONTRACTOR shall submit, in accordance with the General Conditions, a schedule indicating the time and sequence in which Shop Drawings are to be submitted. This schedule shall consider the dates for incorporation of the materials or equipment into the project and take into consideration time for delivery and a reasonable time for review of shop drawings. Proposed order and delivery dates shall be incorporated in the Progress Schedule.
2. Shop drawings will generally be reviewed in the order in which they are received. Drawings marked "Priority" will be reviewed ahead of other shop drawing submittals not so marked which have already been received but are not yet being reviewed. CONTRACTOR shall be aware that checking of "Priority" shop drawings may delay the review of other drawings which have already been submitted by the CONTRACTOR and the use of this designation is to be used with discretion.

C. CONTRACTOR'S REVIEW AND CERTIFICATION

The CONTRACTOR shall verify that the material and equipment in each shop drawing conforms to the requirements of the Contract Documents. Shop drawings shall be in strict compliance with the Contract Documents and shall bear an executed statement to that effect by the CONTRACTOR. Shop Drawings without this stamp applied will be returned without review.

D. DEVIATIONS FROM CONTRACT DOCUMENTS

Requests for deviation from the Contract Documents shall be by Contractor's Modification Request as outlined in Paragraph 2.03 of this section of the specifications. The CONTRACTOR'S Modification Request shall fully identify and describe the deviations and state

the reason the change is requested. Any savings in cost related to the substitution is to be stated in the request for consideration.

E. REQUIREMENT FOR COMPLETE SHOP DRAWINGS
   1. Material in shop drawings shall be in sufficient detail to demonstrate compliance with all requirements of the Contract Documents. Shop drawings shall address material and/or methods of construction, design criteria, performance characteristics, and special provisions of the Specifications.
   2. Shop drawings for systems and related equipment shall include information for all components required for a complete and operational system, including electrical, mechanical, and any other information required to indicate how the various components of the system function, and shall be included in the same submittal.
   3. Where statements of certification, written guarantees, extended service agreements or extended warranties as defined in Paragraph J are required, they will be provided with the shop drawing. The effective date of the guarantee and service agreements, however, shall not be until the date of acceptance for the project.
   4. Shop drawings shall be clearly marked to show the applicable sections of the specifications and sheet in the drawings. Other identification may also be required on drawings such as layout drawings or schedules to allow the reviewer to determine where a particular item is to be used in the project.
   5. One (1) electronic copy of each shop drawing shall be submitted to the ENGINEER and OWNER.
   6. Shop drawings which do not have all of the information required for evaluation will be returned without benefit of review and comment.

F. CHECKING AND REVIEW OF SHOP DRAWINGS
   1. The ENGINEER will review the data for general conformity to the Contract Documents. Comments will be made on items called to the attention of the ENGINEER for review and verification. Markings will be based on this examination and do not constitute a blanket review of the shop drawing. The ENGINEER's review does not relieve the CONTRACTOR from any responsibility for errors or deviations from the Contract requirements. Shop drawings which contain substantial error or omissions, or which are not clearly legible, will be returned without benefit of review.
   2. Shop drawings will be marked in one of the three following ways:
      a. Approved: Shop drawings are acceptable without correction and may be distributed for construction and/or manufacture.
      b. Approved as Noted: Shop drawings are acceptable with minor corrections as marked and may be used with the corrections noted.
      c. Rejected: Material or equipment described is not acceptable.

G. APPROVAL OF EQUAL SUBSTITUTIONS

   Where Contract Documents allow substitution of material or equipment as an approved equal to the specified product, shop drawings shall be provided. Shop drawings shall include supporting data to indicate specifically, on a point-by-point basis for each feature of the design, how the proposed product is equal to or better than the specified product. Deviations from the Contract Documents must be requested and approved as described in Paragraph D.

H. SHOP DRAWINGS REQUIRED

   Shop drawings are required for only those items of equipment or materials where submittals are listed in the individual specification section and for the determination of substitutions for approval as described in Paragraph G of this section. Only these shop drawings will be reviewed. Shop drawings which are not required may be returned with the notation "NOT REQUIRED BY THIS CONTRACT."

I. OWNER SELECTED OPTIONS

   Where selections are to be made by the OWNER for color, texture or finish and shop drawings are required for that product, shop drawings will be submitted for approval of the materials of construction, composition, etc., prior to the selection of finishes by the OWNER. Items requiring

selection of finish for which shop drawings are not required shall be furnished as record data. Selection of finish for materials shall be determined as described in Paragraph 2.13.

J. CERTIFICATIONS, WARRANTIES AND OTHER REQUIREMENTS

Where indicated in the Contract Documents the following items as defined below are to be provided as part of the shop drawing:

1. Certified Test Report - A report prepared by an approved testing agency on the results of tests performed on materials to indicate their compliance with the specifications. Reports are to be numbered consecutively for reference. Retest required to verify compliance with Contract Documents shall be identified with the same number as the original test with a letter to indicate retest, similar to the numbering system used for Shop Drawings.
2. Certification of Local Field Service - A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300-mile radius of the project site.
3. Extended Warranty - A guarantee of performance for the product or system beyond the one-year warranty described in the General Conditions. The Warranty Certificate is to be issued in the name of the OWNER.
4. Extended Service Agreement - A contract to provide operations and maintenance for equipment as specified beyond that required to fulfill requirements for warranty repairs; or to perform routine maintenance at some period beyond the warranty period. The Service Agreement is to be issued in the name of the OWNER.
5. Certification of Adequacy of Design - A certified letter from the manufacturer of the equipment stating that they have designed the equipment offered to account for structural stability to withstand all imposed loads without deformation, failure or adversely affecting the operational requirements of the unit; and operational capability, including mechanical and electrical equipment sizing to be fully operational in accordance with the conditions specified.
6. Certification of Applicator/Subcontractor Qualifications - A certified letter stating that the applicator/subcontractor proposed to perform a specified item of work is duly designated as factory-authorized and trained for the application or installation of the specified product.

2.5 RECORD DATA

A. Record data shall be submitted to provide information as to the general character, style and manufacturer of the equipment to allow the OWNER to adequately identify the materials or equipment incorporated into the project. Record data shall be provided for all equipment and materials of construction. Record data are not required for items for which Shop Drawings and/or operations and maintenance manuals are required.

B. Record data shall be complete to indicate where the material was incorporated into the project, provide schedules of materials and their use, colors, model numbers and other information which would allow this material to be replaced at some future date. Record data will be received by the ENGINEER and logged for transmittal to the OWNER. Record data will not be reviewed for comment and no response will be made to the CONTRACTOR.

2.6 OPERATIONS AND MAINTENANCE MANUALS

A. For each type of equipment to be furnished and installed under this contract, the CONTRACTOR shall prepare an operation and maintenance manual covering:

1. Name, address, and telephone number of nearest competent service organization who can supply parts and service.
2. Equipment function, normal operating characteristics, and limiting conditions, which reflect "as-built" conditions for the equipment furnished.
3. Assembly, installation, alignment, adjustment, and checking instructions, including field modifications made during installation, startup and testing.
4. Operating instructions for startup, routine and normal operation, regulation and control, shutdown, and emergency conditions.
5. Lubrication and maintenance instructions, with lists of acceptable lubricants.

6. Guide to "Troubleshooting".
7. Parts lists, predicted life of parts subject to wear, list of recommended spare parts, and list of maintenance tools furnished with equipment.
8. Outline, cross-section, and assembly drawings; engineering data; control schematics and point-to-point wiring diagrams, and reproductions of all equipment nameplates.
9. A copy of the shop drawing submittal information, description of the equipment, specifications, test data, and performance curves, where applicable.
10. Specified warranties and service agreements.
11. A listing of the manufacturer's identification, including order number, model, and serial number and reproduction of equipment nameplate.

B. The above information, as applicable, shall be provided for the equipment as indicated in individual specification sections.

C. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

D. Manuals shall be furnished in Adobe PDF Format and printed on heavy, first quality paper, 8-1/2x 11-inch size with standard 3-hole punching. Drawings and diagrams shall be reduced to 8-1/2x 11 inches. Where reduction is not practicable, larger drawings shall be folded separately, and placed in envelopes which are bound into the manual. Each envelope shall bear suitable identification on the outside. Indicate applicable specification number and location within plant that equipment will be installed on cover of each manual. Provide "Table of Contents" and "Index Tabs" for each manual.

E. Two preliminary copies of each manual, temporarily bound in heavy paper covers bearing suitable identification, shall be submitted to the ENGINEER at the time of submittal of the shop drawings. CONTRACTOR shall organize all equipment O&Ms, and submit draft covers of all manuals required, in order of process treatment. All volumes shall be numbered sequentially. After review by the ENGINEER, CONTRACTOR shall prepare three (3) hard copies and two (2) electronic copies (on CD) of each operation and maintenance manual and deliver to the ENGINEER not later than 90 days prior to placing the equipment into operation.

2.7 PROJECT INFORMATION REQUEST

A. When it is necessary for the CONTRACTOR to request additional information, interpretation of the Contract Documents, or when the CONTRACTOR believes there is a conflict between the drawings and specifications, he shall identify the conflict and request clarification using the Project Information Request form. Use of this form will allow requests for information to be routed to OWNER, design engineers, design consultants or others through the ENGINEER and allow these requests to be monitored to determine that clarification is provided when needed. Sufficient information shall be attached to permit a written response without further information.

B. The ENGINEER will log each request and will review the request to determine that the information provided is adequate. If information is not adequate, the request will be returned for additional information. When adequate information is provided, the request will be reviewed and a response made. If a change is required, the ENGINEER will initiate a Proposed Contract Modification. If no change is required, the ENGINEER will provide additional information required to help the CONTRACTOR comply with the Contract Documents.

2.8 SCHEDULE OF VALUES AND PAYMENT ESTIMATES

A. For contracts based on lump sum amounts, the CONTRACTOR is to submit to the ENGINEER for approval, a breakdown of cost for the Project. The breakdown is to provide adequate detail to allow easy determination of the percentage of completion for periodic payment review by the ENGINEER. Specification sections and add or deduct items in the proposal are to be used as a guide for preparing the breakdown. This breakdown is to be incorporated onto a form for the

submission of payment request provided by the ENGINEER or in a form approved by the ENGINEER.

B. The CONTRACTOR is to submit a schedule showing the anticipated schedule of payments for the CONTRACTOR to assist the OWNER in determining when funds are to be made available for payment of periodic payment requests.

2.9 PROGRESS SCHEDULES

A. As required in the General Conditions, within 10 days prior to the submission of the first periodical estimate for partial payment, the CONTRACTOR shall prepare and submit to the ENGINEER an electronic copy of the schedule in which the CONTRACTOR proposes to carry on the work. The schedule is to include the date on which work will be started on each major activity, including procurement of materials and equipment, and the anticipated date for the completion of each activity. The CONTRACTOR shall be responsible for developing the construction schedule and monitoring progress. The CONTRACTOR shall consider and include the schedules of all subcontractors, material and equipment suppliers to ensure that all necessary information is incorporated into the construction schedule.

1. Give early warning of delays in time for correction.
2. Require that detailed plans for the execution of the work be prepared in the form of future activities and events in sequential relationships.
3. Establish interrelationships of significant planned work activities and provide a logical sequence of interdependence of planned work activities.
4. Provide continuous current status information.
5. Allow analysis of the CONTRACTOR's program for the completion of the Project.
6. Permit preparation of new schedules when an existing schedule is not achievable.
7. Log the progress of the work as it actually occurs.

2.10 SUPPLIERS AND SUBCONTRACTORS

The Contractor is to provide a written list of subcontractors and suppliers prior to the preconstruction conference described in the General Conditions.

2.11 EQUIPMENT INSTALLATION REPORT

A. A written report shall be submitted by the equipment supplier performing the installation check for all major equipment. This report shall certify that 1) The equipment has been properly installed and lubricated, 2) is in accurate alignment, 3) is free from any undue stress imposed by connecting piping, equipment, or anchor bolts, and 4) has been operated under full load conditions and that it is operating satisfactorily.

2.12 NOTIFICATION BY CONTRACTOR

Written notification of the need for testing, observation work by ENGINEER, intent to work outside of regular working hours, or the request to shut down the facilities or make utility connections shall be given to the ENGINEER by issuance of a Notification By Contract or on a form provided by the ENGINEER.

2.13 SELECTION OF FINISH BY OWNER

Items that require that the OWNER select the finish, color, texture, fabric or make other choices related to the appearance of some material or equipment to be provided are to be determined as soon as possible to allow OWNER adequate time to consider available options for selection. Color chips, samples, etc., for all items are to be assembled and submitted to the OWNER through the ENGINEER for selection of finishes at the same time to allow all options to be considered and allow selections to be coordinated with other items of finish. The ENGINEER will meet with the OWNER who will determine the finish to be used within 2 weeks, unless additional samples are required for selection. Materials for which shop drawings are required are to be submitted for approval of material quality prior to selection of finish. CONTRACTOR's

bid shall include costs to match existing colors and furnish non-standard colors at OWNER's selection.

PART 3 NOT USED

-- END OF SECTION --

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SECTION 01 08 01 - GENERAL DEMOLITION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

29 CFR 1910 - Occupational Safety and Health Standards; current edition.

1.2 DEFINITIONS

A. Abandoned: Refers to items that are no longer in use and are to be taken out of service and left in place.
B. Removed: Refers to items that are to be disconnected and removed from project site.
C. Salvaged: Refers to items which are disconnected, taken out of service and turned over to OWNER.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide all materials necessary for work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field measurements and layouts as shown on drawings, or as existing.
B. Verify that abandoned piping, wiring, equipment, etc. serve only abandoned facilities.
C. Demolition drawings are based on field observations and existing record documents. Report discrepancies to OWNER's Representative before disturbing existing installation. Drawings are for CONTRACTOR's convenience, and accuracy or exactness is not guaranteed.
D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Coordinate utility service outages with utility company, OWNER's representative, and OWNER's Representative ten (10) days prior to outage.
B. Provide temporary piping, wiring, equipment, etc. as required to maintain existing system in service during construction. When CONTRACTOR elects to perform work on energized equipment or circuits, use personnel experienced in such operations.

3.3 DEMOLITION AND EXTENSION OF EXISTING ITEMS

A. All equipment shown on the Plans to be demolished shall be completely removed along with all associated devices.
B. The CONTRACTOR shall relocate all existing piping, circuitry (conduit and wiring), etc., which impedes the installation of new materials and equipment, unless otherwise specified and/or shown on the Plans.
C. Repair adjacent construction and finishes damaged during demolition and extension work.
D. Maintain access to existing installations which remain active. Modify installation or provide access as appropriate.
E. Remove with care all equipment to be relocated. Repair or replace damaged equipment as required.
F. Provide temporary barricades and other forms of protection as required for safety and security.
G. Provide barriers and appropriate signs meeting requirements of 29 CFR 1910 for size and color where necessary to restrict pedestrians from wandering into construction areas.
H. Completely backfill below-grade areas and voids resulting from demolition work, all backfill must be compacted and stabilized to earthwork specifications. Unless otherwise specified and /or shown on the Plans.

I. Use water as necessary to lay dust when chipping, coring, or sawing concrete, masonry, or similar materials.
J. Demolish and remove existing construction only to extent required, as indicated on the Plans.
K. CONTRACTOR is responsible for disposal of all materials generated as a result of demolition.

-- END OF SECTION --

SECTION 02 01 01 - SITE CLEARING

PART 1 GENERAL

1.1 WORK INCLUDED

All paving and surface debris shall be removed, and the work area shall be cleared of plant life and grass. Trees and shrubs not in conflict with the proposed structure shall not be removed, except as designated by the OWNER.

1.2 REGULATORY REQUIREMENTS

CONTRACTOR shall conform to all applicable codes for the disposal of debris. Clearing work shall be coordinated with the appropriate utility companies.

1.3 REFERENCE STANDARDS

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 PREPARATION

Verify that existing trees, plant life, and features designated to remain are tagged or identified. Provide written notification of intent to begin clearing operation. Document trees that are to be protected.

3.2 PROTECTION

CONTRACTOR shall protect existing trees, plant growth, fences and other features designated to remain during clearing procedures. All benchmarks and structures shall be protected from damage or displacement.

3.3 CLEARING

All areas required for access to the site and execution of the Work, except as indicated in paragraph 3.2, shall be cleared.

Trees and shrubs shall be removed within the limits of excavation required. Stumps, main root balls and the root system to a depth of twelve (12) inches below finished grade shall be removed. CONTRACTOR shall clear undergrowth and deadwood without disturbing the subsoil and shall apply herbicide to any remaining stumps to inhibit growth.

All debris, rocks larger than three inches, and extracted plant life shall be promptly removed from the site by CONTRACTOR, at no cost to OWNER, as approved by the OWNER and ENGINEER.

-- END OF SECTION --

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SECTION 03 01 01 - CONCRETE FORMWORK

PART 1 GENERAL

1.1 REFERENCES STANDARDS

ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2016).
ACI 347R - Guide to Formwork for Concrete; 2014.
COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.
NIST PS 1 (2007) DOC Voluntary Product Standard PS 1-07, Structural Plywood

1.2 WORK INCLUDED

The work performed under this section of the Specifications shall consist of furnishing and installing formwork for cast-in-place concrete, with shoring, bracing, anchorage and all necessary accessories. Openings in the formwork for other work shall be provided. All stripping activities shall be included under this section.

1.3 RELATED WORK AND SPECIFICATIONS

A. Section 03 02 01 - Concrete Reinforcement.
B. Section 03 09 01 - General Concrete.

1.4 DESIGN REQUIREMENTS

CONTRACTOR shall be responsible for the design, engineering and construction of formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension. Design and construction of formwork shall take into account live loads, dead loads, weight of moving equipment operating on formwork, concrete mix, height of concrete drop, vibrator frequency, temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to the safety of personnel and structures. CONTRACTOR shall provide shores, struts, and trussed supports as necessary.

1.5 QUALITY ASSURANCE

Work shall be performed in accordance with the standards referenced in Part 1.01 of this specification.

1.6 REGULATORY REQUIREMENTS

Conform to applicable codes for design, fabrication, erection and removal of formwork.

1.7 COORDINATION

Coordinate this section with other sections of the Work which require attachment of components to formwork. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, replace formwork or reset reinforcing to provide minimum specified concrete cover.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

Form Materials: At the discretion of the CONTRACTOR.

2.2 PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16-gage (1.5 mm) matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

C. Pan Type: Steel glass fiber of sizes and profile required.
D. Tubular Column Type: Round, spirally wound laminated fiber, wood or glass fiber material, surface treated with release agent, non-reusable, of sizes and profile required.
E. Void Forms: Voids formed under beams and slabs where indicated on the Plans or general notes may be formed through the use of 8-inch thick corrugated fiberboard boxes as manufactured by Voidco, Savway Carton Forms, Jay Void Carton or approved equivalent. Void forms shall be moisture resistant, biodegradable and structurally sufficient to support the weight of wet concrete mix until initial set. For slab, form boxes shall be covered with sheathing of the same material and shall be taped at the joints.

2.3 FORMWORK ACCESSORIES

A. Form Ties:
1. Metal form ties of the removable or snap-off type, steel, fixed or adjustable length cone type with waterproof washer (for water bearing structures or basements) shall be used to hold forms in place. Such ties shall have provision to permit ease of removal of the metal as hereinafter specified. The use of wire form ties will not be permitted. All metal appliances used inside of the forms to hold them in correct alignment shall be removed to a depth of at least 1/2-inch from the surface of the concrete and shall be so constructed that metal may be removed without undue injury to the surface from chipping or spalling. Such devices, when removed, shall leave a smooth opening in the concrete surface not larger than 7/8-inch in diameter. Burning off of rods, bolts, or ties will not be permitted. Metal ties shall be held in place by devices attached to walls. Each device shall be capable of developing the strength of the tie. Metal and wooden spreaders which are separate from the forms shall be wired to the top of form and shall be entirely removed as the concrete is being placed. The use of metal form ties of a type that are encased in paper or other material to allow the removal of complete tie, leaving a hole through the concrete structure, will not be permitted in the construction of basement or water bearing walls.
   After the tie rods are broken back or removed, the holes shall be thoroughly cleaned to remove all grease and loose particles; then the mortar (non-shrink cement-sand mortar, as dry as practicable) shall be carefully placed into the holes in small quantities. After the holes are completely filled, all excess mortar shall be struck off flush and the surface finished in such a manner as to render the filled hole as inconspicuous as possible, If these patches appear to be darker than the other surface of the concrete, white cement shall be used in the mortar as required.
2. "Supertie" fiberglass form tie system as manufactured by RJD Industries, Inc., 26945 Cabot Road, Suite 107, Leguna Hill, California, 800/344-4753. Provide spreader rod, ties, gripper and all necessary accessories and installation devices. Provide gray color rod. Install Supertie in accordance with supplier's instructions. After removal of forms, grind Supertie flush to wall.

B. Form Release Agent: Colorless mineral oil which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.
C. Corners: Chamfered, rigid plastic or wood strip type; 3/4" x 3/4" size; maximum possible lengths. Accurately formed to produce uniformly straight lines and tight edge joints.
D. Nails, Spikes, Lag bolts, Through bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
E. Waterstops:
1. Plastic water stop
   a. Extruded from elastomeric plastic compound of which basic resin shall be prime virgin polyvinyl chloride (PVC). Compound shall not contain scrapped material, reclaimed material, or pigment.
   b. Specific Gravity: Approximately 1.37.
   c. Shore Durometer Type A Hardness: Approximately 80.

d. Performance Requirements:COE CRD-C 572 .
e. Type: Center bulb with parallel ribs or protrusions on each side of strip center.
f. Corrugated or tapered type water stops are not acceptable.
g. Thickness: Constant from bulb edge to outside stop edge.
h. Minimum Weight per Foot of Water Stop:
    1) 1.60 pounds for 3/8 inch by 6-inch.
    2) 2.30 pounds for 3/8-inch by 9-inch.
i. Factory Fabrications: Use only factory fabrications for intersections,transitions, and changes of direction.
j. Manufacturers and Products:
    1) Vinylex Corp., Knoxville, TN; Catalog No.032504/VIN: No. RB6-38H (6 inches by 3/8 inch) and No. RB9-38H (9 inches by 3/8-inch).
    2) Greenstreak Plastic Products, St. Louis, MO; Catalog No.03150/GRD: Style 732 (6 inches by 3/8-inch) and Style 735 (9 inches by 3/8 inch).

2. Hydrophilic water stop
    a. For use at construction joints only, where new concrete is placed against existing concrete and as shown on Drawings.
    b. Material shall be a nonbentonite hydrophilic rubber compound.
    c. Manufacturers and Products:
        1) Greenstreak Plastic Products, St. Louis, MO; Hydrotite CJ-1020-2K with Leakmaster LV-1 adhesive and sealant.
        2) Adeka Ultra Seal, JLM Associates, Spearfish, SD; MC-2010M with 3M-2141 adhesive and P-201 sealant.

PART 3 EXECUTION

3.1 EXAMINATION

Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Plans.

3.2 EARTH FORMS

Earth forms shall not be used without specific, written approval from ENGINEER. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.3 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with the requirements of ACI 301.
B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
D. Align joints and make watertight. Keep form joints to a minimum.
E. Obtain approval from ENGINEER before framing openings in structural members which are not indicated on Plans.
F. Provide chamfer strips on external corners of beams, joists, columns, elevated slabs and walls.
G. Void forms shall be installed in accordance with the manufacturer's recommendations and in such a manner so as to provide tight joints. Void forms shall be anchored to prevent displacement or flotation during concrete placement. Forms shall be protected from moisture or crushing prior to placement. Damaged forms shall be replaced prior to concrete placement.

3.4 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS AND EMBEDDED PARTS

Provide form openings where required for items to be embedded in or passing through concrete work. Locate and set in place items which will be cast directly into concrete.

3.6 FORM CLEANING

A. Clean and remove foreign matter within forms as erection proceeds.
B. Clean formed cavities of debris prior to placing concrete.
C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts to clean out forms. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

Construct formwork so as to maintain tolerances required by ACI 347R, Chapter 3.3, except as otherwise noted.

3.8 FIELD QUALITY CONTROL

Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure. Do not reuse split, frayed, delaminated or otherwise damaged formwork.

3.9 FORM REMOVAL

A. The time for removal of forms shall comply with ACI 318. If curing temperatures are below 50 Degrees F (15 Degrees C), the time for removal shall be increased by fifty percent (50%). In no case shall forms or bracing be removed until concrete has gained sufficient strength to carry its own weight and imposed loads.
B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

-- END OF SECTION --

SECTION 03 02 01 - CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 REFERENCES STANDARDS

ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2016).
ACI SP-66 - ACI Detailing Manual; 2004.
ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.
ASTM A722/A722M - Standard Specification for High-Strength Steel Bars for Prestressed Concrete; 2015.
AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
CRSI 10MSP - Manual of Standard Practice; (2009; 28TH Ed)
CRSI 63 - Recommended Practice for Placing Reinforcing Bars
CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature

1.2 WORK INCLUDED

The work included in this Section of the Specifications shall consist of furnishing and installing reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.3 RELATED WORK AND SPECIFICATIONS

A. Section 03 09 01 - General Concrete.
B. Section 03 01 01 - Concrete Formwork.

1.4 SUBMITTALS

A. Submittals shall meet the requirements of Section 01 04 01, CONTRACTOR's Submittals.
B. Record Data: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel, bending and cutting schedules, supporting and spacing devices, and joint and splice locations.
C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
D. Comply with ACI SP-66.
E. Manufacture's specifications and installation instructions for all proprietary products, including sleeves for welded splices.
F. Shop Drawings are required. Provide to scale drawing showing the fabrication and placement requirements for all reinforcing. Include all details required to clearly show placement of bars. Shop Drawings to be sealed by a Texas Licensed P.E.

1.5 QUALITY ASSURANCE

Perform work in accordance with referenced standards. Submit certified copies of mill test report of reinforcement materials analysis.

1.6 COORDINATION

Coordinate work with other trades, placement of formwork, formed openings and other work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Bars: New, deformed billet steel conforming to ASTM A615/A615M, Grade 60 for nonweldable bars and ASTM A706/A706M, Grade 60 for weldable bars.

B. Welded Wire Fabric: ASTM A1064/A1064M for smooth wire andASTM A722/A722M for deformed wire.
C. High Strength Reinforcing Bar (DYWIDAG Thread Bar) Meeting ASTM A722/A722M for Anchoring in Rocks.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16-gage annealed type.
B. Supports for Reinforcement: Conform to CRSI STANDARDS.
C. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent settling or vapor barrier puncture.
D. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel or stainless steel type, size and shape as required.
E. Splices
    1. Mechanical Connections:
        a. Compression: Gateway Building Products "G-Loc" or approved equivalent.
        b. Tension: Lenton Anchor or approved equivalent. Connection device shall develop 125 percent of yield strength of bar.
    2. Welded Splices: "Cadweld," "Thermoweld" or approved equivalent. Size device to develop 125 percent of yield strength of bar.

2.3 FABRICATION

Fabricate concrete reinforcing in accordance with CRSI Manual of Practice. Locate reinforcing splices not indicated on Plans at point of minimum stress. Review location of splices with ENGINEER.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement by means of accepted spacers, chairs or hangers. Do not deviate from required position.
B. Do not displace or damage vapor barrier.
C. Accommodate placement of formed openings.
D. Conform to ACI 318 code for concrete cover over reinforcement. Concrete surfaces in contact with liquids shall have 2-inch cover.
E. Clean reinforcement to remove loose rust, mill scale, oil, earth, ice, and other materials which might reduce or destroy bond with concrete.

3.2 FIELD QUALITY CONTROL

Concrete shall not be placed until reinforcing steel is inspected by OWNER'S Representative. All concrete placed in violation of this provision will be rejected. The CONTRACTOR shall give OWNER'S Representative a minimum of 24 hours notice after completion of reinforcement placement prior to placement of concrete.

-- END OF SECTION --

SECTION 03 05 01 - GROUT

PART 1 GENERAL

1.1 REFERENCE STANDARDS

ASTM C1018 - Standard Test Method for Flexural Toughness and First-Crack Strength of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading); Current Edition.
ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.
ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).
ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
ASTM C191 - Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle; Current Edition.
ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.
COE CRD-C-588 - Corps of Engineers Specification for Nonshrink Grout; Current Edition.

1.2 RELATED WORK AND SPECIFICATIONS

A. Section 07 01 01 - Sealants and Caulking.

1.3 SCOPE

Provide grout as shown on the Plans and as specified herein:

A. Grout shall be placed at the following locations:
   1. Column and equipment bases.
   2. Handrails and railings.
   3. Topping in concrete tanks.
   4. Foundation grouting.
   5. Tunnel grouting.
   6. Equipment bases.
   7. Wherever so indicated on the Plans.
B. The types of grout used shall include the following:
   1. Non-shrink, epoxy type.
   2. Non-shrink, non-metallic type.
   3. Ordinary cement-sand.

1.4 QUALITY ASSURANCE

1.5 SUBMITTALS

In addition to all other appropriate requirements of Section 01 04 01, the CONTRACTOR shall submit the following:

A. Record Data:
   1. Submit copies of manufacturer's specifications and installation instructions for all proprietary materials.
B. Reports and Certifications:
   1. For proprietary materials, submit copies of reports on quality control tests.
   2. For nonproprietary materials, submit certification that materials meet specification requirements.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials: Grout materials from manufacturers shall be delivered in unopened containers and shall bear intact manufacturer's labels.
B. Storage of Materials: Grout materials shall be stored in a dry shelter and shall be protected from moisture.

PART 2 PRODUCTS

2.1 MATERIALS

A. Non-metallic, 100 percent solids, high strength epoxy grout.
   1. Use clean, well-graded sand with epoxy resins suitable for use on dry or damp surfaces.
   2. Product and Manufacturer:
      a. Euco High Strength Grout by The Euclid Chemical Company.
      b. Sikadur Hi-Mod Grout by Sike Chemical Company.
      c. Or, Approved Equal.

B. Non-Shrink, Non-Metallic Grout:
   1. Pre-mixed non-staining cementitious grout requiring only the addition of water at the jobsite.
   2. Product and Manufacturer:
      a. Euco N-S by the Euclid Chemical Company.
      b. Masterflow 713 by Master Builders Company.
      c. Or, Approved Equal.

C. Ordinary Cement-Sand Grout:
   1. Except where otherwise specified, use one part cement to three parts sand complying with the following:
      a. Cement: ASTM C150/C150M, Type II.
      b. Sand: ASTM C33/C33M.
   2. Where water repelling and shrinkage reducing requirements are shown or specified, use admixtures.
   3. Product and Manufacturer:
      a. Integral Waterpeller by the Euclid Chemical Company.
      b. Omicron, Type OM by Master Builders Company.
      c. Hydrocide Powder by Sonneborn-Contech.
      d. Or, Approved Equal.
   4. Grout to consist of cement and sand to produce a minimum 28-day strength of 4000 psi with maximum slump of 5 inches. Use 2-inch cube strength test to confirm the design mix strength. Use 2-inch cube strength test on job cured cubes.

D. Water:
   1. Use clean, fresh, potable water free from injurious amounts of oils, acids, alkalis or organic matter.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
   1. Place grout as shown and in accordance with manufacturer's instructions. If manufacturer's instructions conflict with the Specifications, do not proceed until ENGINEER provides clarification.
   2. Drypacking will not be permitted.
   3. It shall be the CONTRACTOR'S responsibility to obtain the services of a qualified, full time employee of the manufacturer to aid in assuring proper use of the product under job conditions.
   4. Placing grout shall conform to temperature and weather limitations as stated in manufacturer's instructions.

B. Equipment Bases:
   1. After shimming equipment to proper grade, securely tighten anchor bolts.
   2. Properly form around the base plates, allowing sufficient room around the edges for placing the grout.
   3. Adequate depth between the bottom of the base plate and the top of concrete base must be provided to assure that the void is completely filled with nonmetallic epoxy grout.

C. Column Bases:

1. After shimming columns to proper grade, securely tighten anchor bolts.
2. Properly form around the base plates allowing sufficient room around the edges for placing the grout.
3. Adequate depth between the bottom of the base plate and the top of concrete base must be provided to assure that the void is completely filled with nonshrink non-metallic grout.

D. Fiber Reinforced Concrete Topping
1. Cement: Type II.
2. Components: Screened graded sand, water, water reducer, fiber reinforcing, admixtures, and cement.
3. Bonding Agent: Cement-water slurry mixture, nonsegregating, thick enough to broom into place just immediately prior to placement of topping to provide approximate 1/4-inch thickness.
4. Aggregate Gradings: Combine aggregates for grout in proportions providing mixture within grading limits below:

Sieve Sizes	Percent Passing Sand for Grout
No. 4	9 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 60
No. 50	10 - 30
No. 100	2 - 10
No. 200	

5. Fiber Reinforcing:
   a. 100 percent virgin polypropylene fibrillated fibers manufactured for concrete reinforcing to provide greater control of cracking.
   b. ASTM C1116/C1116M, Type III.
   c. Fiber reinforced grout in accordance with ASTM C1018, toughness Index I5.
   d. Polypropylene Fibers:
      1) Specific Gravity: 0.91.
      2) Tensile Strength: 80 to 110 ksi.
      3) Fiber Length: Graded by manufacturer for aggregate size.
      4) Quantities: Minimum 1.5 pounds per cubic yard.
      5) Add fibers at time of batching and mixing grout.
      6) Manufacturer: Fibermesh Co., Chattanooga, TN.
6. Fiber Reinforced Concrete Topping Mix Design:
   a. Design, select, proportion ingredients and test mix independent testing laboratory.
   b. Prepare trial mixes and cube tests for each design mix.
   c. Design Strength: 5,000 psi at 28 days (cube strength).
   d. Minimum Cement Content: 658 pounds per cubic yard, regardless of strength.
   e. Air Content: 4 to 6 percent.
   f. Use Water-reducing admixture.
   g. Slump as required to maintain homogeneous mix and to allow placement to meet equipment manufacturer's placing tolerance.
   h. Mix fiber-reinforced concrete topping in concrete plant.
   i. Mix fiber-reinforced concrete topping to consistency, easily screened, but not too thin that topping will not stand to required thickness.

-- END OF SECTION --

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SECTION 03 09 01 - GENERAL CONCRETE

PART 1 GENERAL

1.1 REFERENCE STANDARDS

AASHTO M85 - Standard Specification for Portland Cement; Current Edition.
ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.
ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).
TxDot Item 423, (2004) Hydraulic Cement Concrete
THD Bulletin C-11, Construction Bulletin Procedures for the Design and Control of Portland Cement Concrete Mixtures

1.2 WORK INCLUDED

Concrete shall consist of Portland cement, aggregates, and water which shall conform to the requirements as hereinafter specified. All concrete placed under this contract shall be in conformity with this specification.

1.3 SUBMITTALS

A. Submit complete information for each concrete mix proposed. Include location for mix and proposed finishes.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cement shall be a standard brand of Portland cement, Type I, in conformity with AASHTO M85. Only one brand of cement may be used in any one structure.
B. Coarse Aggregate shall comply fully with the minimum requirements of ASTM C33/C33M, for 1 ½ inch maximum size aggregate.
C. Fine Aggregate shall comply fully with the minimum requirements of ASTM C33/C33M.
D. Reinforcing Steel shall be new deformed reinforcing bars, ASTM A1064/A1064M, of sizes and shapes noted on the Plans.
E. Premolded Expansion Joint Material shall conform with the requirements of ASTM D1751.

2.2 CLASSIFICATIONS & PROPORTIONS

A. Concrete shall be proportioned using methods outlined in the THD Bulletin C-11 for design of a concrete batch to meet the requirements hereinafter set forth. It shall be the entire responsibility of the CONTRACTOR to procure the strength as set out below for the respective class of concrete. All concrete shall be Class C unless otherwise shown on Plans. The concrete shall be uniform and workable. The minimum cement content, maximum allowable water content, and maximum slump shall conform to the following:

Class of Concrete	Minimum Cement (Bags / Cu. Yd.)	Maximum Water (Net Gal / Bag)	Maximum Slump for Hand Tamping	Maximum Slump for Machine Vibration
A	5.00	7.0	4"	3-1/2"
B	4.50	7.5	4"	3-1/2"
C	5.25	6.5	4"	3-1/2"

B. The concrete mix will be designed with the intent of producing concrete which, when cured and tested as outlined in THD Bulletin C-11, will have strength equal to or greater than the following:

Class of Concrete	Compressive Strength (1lb per Sq. In.)		7-Day Flexural Strength (1 lbs psi)
	28 - Day	7 - Day	
A	3,000	2,250	500
B	2,500	1,875	470
C	3,500	2,600	650

C. If the strength required for the concrete being produced is not secured with the minimum cement content specified, additional cement shall be used or other aggregates provided at the CONTRACTOR's expense.

D. Air entrainment shall be used for all exterior concrete.

2.3 CONSTRUCTION JOINTS

Construction joints shall be made only where located on the Plans, unless otherwise approved by the ENGINEER.

2.4 FORMS

All forms shall be of wood or metal and shall be built mortar tight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incident to the construction operations. Forms shall be constructed and maintained to prevent warping and opening of joints due to shrinkage of the lumber.

2.5 STEEL REINFORCEMENT

A. Reinforcing steel in the sizes, shapes and lengths as shown shall be placed in the positions as indicated on the Plans. Minimum cover of not less than 1" of concrete shall be provided over the surface of all reinforcing steel.

B. Stirrups and hoops shall pass around the main reinforcement members and shall be securely attached thereto. The reinforcing steel shall be spaced and secured in the forms by means of approved galvanized metal spacers or precast motor blocks. Steel shall be wired together at all intersections; and when completed, the reinforcement mat shall present practically a rigid cage of steel which will not be distorted or shifted from position in any way by workmen walking on the mat or by concrete placement operations. Reinforcing steel in horizontal slabs shall be supported by chairs to ensure accurate placement. Do not lift reinforcement during concrete placement.

C. Splicing of bars will be permitted only where shown on the Plans or with the specific approval of the ENGINEER. The bar splice, when so made, shall not be less than 36 bar diameters with the spliced bars securely tied.

D. Steel bars, when placed in the work, shall be completely free of dirt, grease, loose rust, scale or other foreign matter. After placement, care shall be exercised to keep the steel free of mud, dried concrete or other material. No concrete whatsoever shall be deposited in the forms until the ENGINEER has inspected the final placement and condition of the reinforcement and approved the work for placement of concrete.

PART 3 EXECUTION

3.1 MIXING CONCRETE

A. Mixing at Site: Concrete shall be thoroughly mixed in a batch mixer of an approved size and type which will insure a uniform distribution of the materials throughout the mass, equipped with

adequate water storage and a device for accurately measuring and automatically controlling the amount of water used in each batch.

B. Truck Mixing: Truck mixers shall be of the revolving drum type, water tight, and so constructed that the concrete can be mixed to insure uniform distribution of materials throughout the mass.

C. Time of Hauling and Placing Mixed Concrete: Concrete transported in a truck mixer shall be placed in its final position in the forms within 1 ½ hours after the introduction of the mixing water to the cement and aggregate.

D. Delivery Rate of Concrete during concrete operations shall be such as to provide for the proper handling, placing and finishing of the concrete, and the interval between batches shall not exceed 20 minutes. Concrete which has partially hardened shall not be retempered or remixed.

3.2 HANDLING AND PLACING OF CONCRETE

A. During and immediately after depositing, concrete shall be thoroughly compacted by mechanical vibration with satisfactory equipment and in a manner and to the extent as may be approved by the ENGINEER. Concrete shall not be poured in weather below freezing.

B. In preparation for placement of concrete, all sawdust, chips or other construction debris and extraneous matter shall be completely removed from the interior of the forms. When placing concrete on previously placed construction joints, the surface shall be cleaned by compressed air or vacuum methods, if so directed, and the surface of the existing joint shall be completely free of dust, dirt, sawdust or other foreign material. Concrete shall not be placed in any form prior to specific inspection and approval by the ENGINEER.

C. Foundations and footings shall be placed on firm, undisturbed earthen subgrade which is free of mud or excessive moisture. If groundwater is encountered, prior to placement of concrete the area shall be dewatered sufficiently for the subgrade to be firm and stable with the last 6 inches of excavation being removed immediately ahead of the concrete placement. Concrete for footing and/or foundations will not be placed on unstable, soggy or otherwise unsatisfactory earthen subgrade.

D. Concrete shall be placed in a manner to avoid segregation of the materials and the displacement of reinforcement. All chutes, troughs, tremies and pipes shall be kept clean and free from coatings of hardened concrete. When placing operations involving dropping the concrete more than 5 feet, the concrete shall be deposited through approved pipes or tremies. In walls less than 11 feet in height and widths less than 12 inches, tremies will not be required.

E. During and immediately after depositing, the concrete shall be thoroughly compacted by mechanical vibrating equipment and in a manner and to the extent as may be approved by the ENGINEER. Where placed in sidewalks, pavement or driveways, satisfactory hand methods for compaction and consolidation may be used.

F. Concrete shall be placed in horizontal layers not more than 12" thick except as provided herein. When less than a complete layer is placed in one operation, it shall be terminated in a vertical bulk head. Each layer shall be placed and compacted before the preceding batch has taken initial set to avoid surfaces of separation between the batches and to avoid the formation of construction joint with a preceding layer and surfaces of separation between batches.

G. When placement of concrete is unavoidably temporarily discontinued, the concrete, after becoming firm enough to retain its form, shall be cleaned of laitance and other objectionable material to a sufficient depth to expose sound concrete, and the top surface of the concrete adjacent to the forms shall be smoothed with a trowel. Where a "feather" edge might be produced at a construction joint, an inset formwork shall be used to produce an edge thickness of not less than 6" in the succeeding layer. Work shall not be discontinued within 18" of the top of any face, unless provisions have been made for a coping less than 18" thick, in which case,

and if permitted by the ENGINEER, the construction joint may be made at the underside of the coping.

H. CYLINDER OR BEAM TESTS: During work progress, the OWNER, at his discretion, shall have cylinders or beam tests performed as specified herein. The laboratory testing and services shall be provided by the OWNER. The OWNER does hereby reserve the right to collect all cylinder samples himself, if desired, and deliver same to the testing laboratory approved to perform the tests prior to the placement of concrete. The tests will be performed to maintain a check on the compressive or flexural strength of the concrete that is actually placed. The test shall be defined as the average of the breaking of two cylinders or two beams as the case may be. Test beam or cylinder specimens shall be required for each 167.5 cubic yards, or a portion thereof, placed each day. For smaller concrete placements, the OWNER's Representative may vary the test specimen to 25 cubic yard placement, over a several day period. Cylinders or beam specimens shall be field protected per THD Bulletin C-11 until transported to the testing laboratory. The test specimens shall be cured in accordance with THD Bulletin C-11

3.3 CURING & FINISHING

A. Concrete surfaces exposed to conditions causing premature drying shall be protected by covering as soon as possible with approved curing compound, burlap, sand, or other satisfactory material and kept moist. Curing shall continue for a period of not less than 7 days after placing the concrete.

B. Surface finishes shall be classified as follows:
   1. Class I - Ordinary Surface Finish
   2. Class II- Rubbed Finish
   3. Class III - Broom Finish
   4. Class IV - Steel Trowel Surface Finish
   5. Class V - Adhesive Grout Finish
   6. Class VI - Sidewalk Finish

   All concrete shall be given Class I, ordinary surface finish, and in addition, if further finishing is required, such other types of finish as specified. If not otherwise specified, the following surfaces shall be given Class II -Rubbed Finish: exposed faces of structures; outside faces of slabs, brackets, curbs, headwalls, railings. Slab surfaces shall be given Class III - Broom Finish and Class IV - Steel Trowel Surface Finish.

C. Inspector to approve all finishes for slabs prior to their installations. Contractor to acquire from Engineer written instruction of finishing slabs in each specific area of building and exterior slabs.
   1. Class I, Ordinary Surface Finish: Immediately following the removal of forms, all fins and irregular projections shall be removed from all surfaces except from those which are not to be exposed. On ALL surfaces, the cavities produced by form ties and other holes, honey comb spots, broken corners or edges and other defects shall be thoroughly cleaned, carefully pointed and cured with a mortar of cement and fine aggregate. The resulting surface shall be to the satisfaction of the ENGINEER.
   2. Class II, Rubbed Finish: After removal of forms, the rubbing of concrete shall be started as soon as its condition will permit. Immediately before starting this work, the concrete shall be kept thoroughly saturated with water for a minimum period of three hours. Surfaces to be finished shall be rubbed with a medium carborundum stone, using a small amount of mortar on its face. The mortar shall be composed of cement and fine sand mixed in proportions used in the concrete being finished. Rubbing shall be continued until all form marks, projections and irregularities have been removed, all voids filled, and a uniform surface has been obtained. The final finish shall be obtained by rubbing with a fine carborundum stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform color.

3. Class III, Broom Finish: After the concrete is compacted, the surface shall be carefully rodded and struck off with a strike board to conform to the cross-section and grade shown on the Plans. After striking off and consolidating as specified above, the surfaces shall be made uniform by longitudinal or transverse floating, or both. When the concrete has hardened sufficiently, the surface shall be given a broom finish with a broom of an approved type. The strokes shall be square across the slab, from edge to edge with adjacent strokes slightly overlapped. The surface when finished shall be uniform, free of porous spots, irregularities, depressions and small pockets or rough spots.
4. Class IV, Steel Trowel Finish: The concrete surface shall be struck off and given a float finish as outlined for Class III finish above. After the surface has been tested with a straight edge and irregularities corrected, the entire system shall be finished with an acceptable steel bladed rotary type mechanical finishing machine to a smooth and uniformly finished condition. Hand troweling methods with a steel trowel will be used to finish corners or other areas inaccessible to the finishing machine and to remove all blade marks, burrs and other irregularities left by the machine, and the entire surface completed in a smooth and workmanlike manner, of uniform texture, and to the entire satisfaction of the ENGINEER.
5. Class 5, Adhesive Grout Finish: The surface of the concrete shall be given an Class 1 finish, chamfer lines lightly rubbed, irregularities corrected, and then covered with an adhesive grout textured coating a minimum of 1/16" thickness. Coating shall be composed of one part white cement, one part natural (gray) cement, two parts masonry and, one part (latex) emulsion and enough water to form a viscous slurry of a consistency that may be applied by spray gun, brush or roller with appreciable running or sagging. The proportions of white and gray cement may be varied slightly to obtain the desired color. Gradation of the masonry sand shall be as required to product a texture satisfactory to the ENGINEER. Prepackaged materials meeting these requirements and acceptable to the ENGINEER as to color, texture and appearance will be permitted. The adhesive grout coating shall be applied to the moistened concrete surface in a manner which will provide a uniform texture and color, in the thickness specified, and shall be completely protected from rain and/or freezing for a period of 24 hours minimum.
   The adhesive grout type coating shall meet the test requirements of TxDot Item 423 for Adhesive Grout Type Coatings. If requested, the CONTRACTOR shall furnish the ENGINEER a certificate from the manufacturer stating the product furnished complies with these specifications.
6. Class 6, sidewalk Finish: After the concrete has been deposited in place, it shall be compacted, the surface struck off by means of a strike board, and then finished with a steel trowel. An edging tool shall be used on all edges and at all expansion joints and dummy joints. The surface shall not vary more than 1/8" under a 10 foot straight edge. The surface shall then be given a granular or matted texture by light brushing with a wetted brush or broom to provide a non-skid surface when wet and meeting the entire approval of the ENGINEER.

D. Temperature of Concrete: When placing concrete at a temperature below 45 degrees F., the concrete shall have a temperature not lower than 50 degrees F. and not higher than 95 degrees F. Suitable means shall be provided to maintain the concrete at a temperature not less than 50 degrees F. for the first five days after placement, or until it has hardened sufficiently, or until the first three days if high early strength concrete is used. The method of heating the materials at all times shall be subject to the ENGINEER's approval. No salt, chemical or other foreign matter shall be mixed with the concrete for the purpose of preventing freezing. If warm water is used, the cement shall be put in before other aggregates to prevent a flash set.
   If concrete is placed when weather is such that the temperature of the concrete would exceed 95 degrees F., as determined by the ENGINEER, the CONTRACTOR shall employ effective means, such as placing early in the day, as necessary to maintain the temperature of the concrete as it is placed below 95 degrees F.

-- END OF SECTION --

SECTION 03 10 01 - CONCRETE CURB AND GUTTER, VALLEY GUTTER AND CHANNELS

PART 1 GENERAL

1.1 DESCRIPTION

Concrete curb and gutter shall be non-reinforced formed or machine laid and built as monolithic curb and gutter and according to the dimensions and designs shown on the plans and shall be composed of Class "A" concrete as specified in Section 03 09 01. All concrete curb and gutter, valley gutter, alley aprons, driveways and sidewalks constructed as part of this project or on any City street or alley shall be constructed with high quality materials and workmanship and shall conform to these material specifications. Concrete valleys, radius fillets and drainage channels shall be reinforced as shown on the Plans.

1.2 REFERENCE STANDARDS

TxDot Item 420, (2004) CONCRETE STRUCTURES
TxDot Item 440, (2004) REINFORCING STEEL

PART 2 PRODUCTS

2.1 MATERIALS

Concrete materials for curb and gutter, valley gutter, driveways and other concrete work shall be in accordance with Section 03 09 01.

A. Forms: Outside forms for this work shall be constructed of wood or metal, shall be of the depth of concrete, straight, free from warp and of sufficient strength when staked to resist the pressure of the concrete without springing. The face of the gutter shall be sloped 1/4" toward the street where a gutter drains into a valley gutter crossing the street. The forms to be used shall be approved by the Project Representative.
B. Expansion Joint Material shall be prepared asphalt filler or Redwood expansion joint filler 1/2 inch or 3/4 inch thick as shown on plans and shall conform with the provisions of TxDot ITEM 420,.2, E. Where new concrete joins old concrete and at the beginning and ending of radius a 1/2 inch expansions joint shall be required.
C. Reinforcing Steel shall conform with the requirements of TxDot Item 440 for new billet or rail street reinforcing.

PART 3 EXECUTION

3.1 CONSTRUCTION METHODS

The subgrade shall be excavated and shaped to line, grade and cross section, and loose material or fill shall be wetted and thoroughly tamped. If dry, the subgrade shall be lightly sprinkled immediately before concrete is deposited thereon. The workability of the concrete and method of placement shall be such that finished concrete work shall be dense and free of honeycombs. All driveway leave-outs shall be constructed with a part of the driveway curb return of 7" radius; and the curb shall be laid down, giving a total width of 2.0 feet on the gutter. Where existing driveway approaches have no radius on the curb return, the new curb and gutter shall be formed the same as for regular driveway leave-outs except a radius of 2 feet minimum shall be constructed on the leave-out. Curb ends at leave-outs shall be ended with a vertical face and not sloped off, where proposed curb and gutter ends without tying to existing, the top of curb shall be sloped 6 to 1 to the flow line. No sharp or abrupt changes in grade will be allowed on any adjustment of any existing structures.

A. Curb and Gutter of either the stand-up or laid-down type shall be formed or machine laid. Expansion joints will be placed at the beginning and end of every curb return at intersections

and alleys. In areas where walks or other concrete improvements join the curb, a 1/2" expansion joint shall be placed at the back of the curb. For hand placed curb expansion joints shall be placed no more than 50 feet apart.

Dummy joints shall be placed 10 feet apart along the length of each section, and the back of the curb shall be scored to promote controlled cracking.

No curb which would allow vehicular traffic across corners shall be laid down at intersections. An island and curb return must be maintained in order to provide pedestrian safety. Corner curb returns may be tear shaped if first approved by the City as to shape.

Before the concrete has reached the stage of initial set the exposed surface may be covered approximately 3/8" to 1/2" thick with cement-sand mortar in the ratio of one part cement to two parts sand, and shaped to the sections indicated on the Plans. Curb and gutter shall not be placed during a sandstorm, and a heavy coating of dust between the concrete and mortar topping will not be permitted. The surface shall receive a hand trowel finish, and the exposed edges rounded by use of an edging tool with the radius as indicated on the Plans. After all edging has been completed, the surface shall be brushed at right angles to the center line of the street.

B. Valley Gutters and Driveway Approaches shall be spaded and tamped until mortar entirely covers and forms the top surface. The surface of the concrete shall be floated smooth and all edges rounded to 1/2" radius. Before the concrete is given final finishing, the surface shall be tested with a 10 foot straight edge and any irregularities of more than 1/4" in 10 feet shall be eliminated.

   Valley gutters and all concrete flatwork shall be reinforced with 6 x 6 x 10 ga. welded wire mesh or No. 4 rebar as shown on the Plans. Curb and gutter radii which is poured monolithic with concrete valley gutters shall be reinforced; however, all other curb and gutter shall be formed or machine laid and shall not be reinforced.

C. Sidewalks - Sidewalk subgrade shall be prepared as described in the first paragraph of 3.01 of this section. A 3" cushion of granular material (blow sand) shall be placed on the subgrade unless otherwise specified. The concrete shall be spaded and tamped until it is consolidated and then screeded off to the finished elevation.

   After sufficient cement mortar has been brought to the surface by approved methods, the concrete shall be darbied and floated by means of hand or mechanical floats to a true even surface. Any low spots shall be filled with fresh concrete and again floated. The concrete shall then be steel troweled at the proper time and a sufficient number of times to produce a smooth hard surface which is free of waves, sandy spots or other defects. Cement or sand-cement mixture will not be dusted on the wet surface unless permission is given by the ENGINEER. After the surface has been worked to a true plane, the section of slab markings shall be made every 4 feet unless otherwise specified by the ENGINEER or by the plans. Each slab marking shall be cut entirely through the slab with a pointing trowel or other suitable tool. The top coat shall be floated to an even surface and the edges rounded on all sides to a radius of 1/2". The surface shall be left with a uniform, lightly brushed finish. Reinforcing steel shall be required only where specified on the Plans. Sidewalk thickness shall be as specified on the plans.

3.2 PROTECTION - CURING

All concrete must be protected from premature drying, and freshly placed concrete shall be protected against rain, washing and marking. The following methods of curing will be permitted.

A. Water Cure - For a water cure, the concrete must be covered with cotton mats or two thicknesses of 10 to 12 oz. burlap and kept thoroughly wet for a period of four days, at which time the covering may be removed; or the finished work shall be wetted and thoroughly covered with at least 2 inches of earth. Earth covering shall be sprinkled twice a day for four days.
B. Membrane curing compound may be used if approved by the ENGINEER.

3.3 PROTECTION FROM TRAFFIC

The work shall be protected from vehicular traffic for at least 7 days. Immediately after the removal of forms, the curb and gutter shall be backfilled. No heavy equipment will be permitted on any concrete work for 7 days after day of placement.

3.4 CLEAN-UP

During construction, all gutters shall be kept open. Material stored on pavement shall be boxed in. Upon completion of the work, all building material and accumulated debris shall be removed and the job site left in a presentable condition.

3.5 WORK TO BE SUPERVISED BY THE CITY

All work shall be performed under the supervision and subject to the direction and approval of the City and the Project Representative, whose decision shall be final.

3.6 LIGHTS AND BARRICADES

During construction the Contactor shall erect barricades where required and place red lanterns or flares to protect pedestrians and vehicular traffic as specified in the Section 01 02 01.

3.7 INSPECTION

All curb and gutter forms shall be inspected by the Project Representative prior to placement of concrete. The CONTRACTOR shall not place concrete into forms which have not been inspected and approved by the Project Representative. The CONTRACTOR shall request inspections by the Project Representative a minimum of 24 hours prior to inspection time.

-- END OF SECTION --

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SECTION 07 01 01 - SEALANTS AND CAULKING

PART 1 GENERAL

1.1 DESCRIPTION

Requirements specified in Conditions of the Contract and Division 01 form a part of this Section. Provide all sealant and caulking work, complete as indicated, specified and required.

A. Work included in this Section. Principal items are:
   1. This Specification is intended to be general in scope as to locations of caulking and sealants. CONTRACTOR shall examine all Drawings and Details thoroughly and familiarize himself with the extent of the caulking and sealing involved. Only a complete and absolutely watertight and weathertight job will be accepted.
   2. Additional informatíon pertaining to sealing and/or caulking will be found in the various specifíc trade sections and shall be coordinated with the work of this Section.

B. Related Work Not in This Section. Concrete Work, Masonry Work, Doors and Frames, Painting, Gypsum Drywall, Weatherstripping and Sound Sealing integral to manufactured items, and caulking required for piping, conduit or other mechanical or electrical work.

1.2 REFERENCE STANDARDS

ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.

1.3 SUBMITTALS

Prior to purchase or delivery of materials, submit the following, and obtain ENGINEER acceptance.

A. Samples and Technical Data
   1. Submit technical data by all manufacturers of proposed materials.
   2. Submit material manufacturers' printed preparation and application instructions to ENGINEER and furnish copies to all trades concerned.

B. Shop Drawings and Mock-Ups. When requested, submit the following in accordance with these specifications:
   1. Full-size details indicating all the necessary components for each type of joint to be sealed.
   2. Observed field conditions and measurements. Mock-up units or test sections shall be also scheduled after receiving written approval of shop drawings by the ENGINEER.

PART 2 PRODUCTS

2.1 CAULKING

A. Pelseal 8028 Caulking
   1. Color: Black
   2. Application: Pelseal products should be applied at, or as close to, 70 degrees F as possible. Higher temperatures will promote faster release of solvent, quicker curing and shorter pot-lives. Lower temperatures can increase the viscosity of the material and make application difficult. Make sure the Pelseal product is at the same temperature as the substrate.

      After the surface has been prepared, carefully plan the application and make sure all necessary tools are available before beginning. Different products and different jobs will require specific tools. Read application data sheets related to the specific Pelseal product, and become familiar with the consistency of the product before proceeding.

      Do not apply the caulk thicker than 1/4" - 3/8" in any one pass. Thick applications can pull away from the sides of the joint as the product dries. Thick applications are also more prone to trapping air pockets. Make two or three passes with at least 8 hours between passes for thick applications.

To further reduce voids, cover sealant with polyethylene sheet or tape immediately after application. This will prevent the surface from skinning too quickly and allow air to escape. Avoid direct contact between the polyethylene and sealant. Remove the polyethylene approximately four hours after application.

During application, keep the product covered whenever possible to prevent solvent release. In their liquid state, Pelseal products are extremely flammable and should never be exposed to any source of flame or spark. Keep area well ventilated, and use appropriate respirators. Carefully read and follow all instructions in the MSDS.

3. Application Method: Unscrew red cartride seal and put aside. Do not throw away seal. Screw in plastic nozzle and snip off end of nozzle to desired opening. Load cartridge into appropriate size caulking gun and apply. Reseal cartridge to preserve unused portion.
4. Substrate Preparation: A clean, dry surface is essential for maximum adhesion. Gritblasing and degreasing with oil-free solvents is recommended.
5. Drying: Although tack free in approximately five minutes at 75 degrees F, allow a minimum of 72 hours for solvent to evaporate. Dried compound will be stiff and chemically resistive. For best results, cure compound at elevated temperatures.
6. Curing: Curing can be accomplished by heating solvent free material to 300 F for at least one hour. If solvent is present during heating, blistering may result. Gradual temperature elevation will help prevent blistering.
7. Successive Coats: Allow for solvent evaporation prior to making multiple coats, or blisters may result. Product adheres well to itself.
8. Shelf Life: 12 months from Date of Certification for unopened containers.
9. Clean Up: MEK, MIBK and Acetone can be used.
10. Safety: FLAMMABLE LIQUID Use in accordance with the Material Safety Data Sheet.

2.2 SEALANT

A. Pelseal PLV 6032 Sealant

1. Mixing Ratios: The mixing ratio is 50 to 1 by weight. This means that 1 gram of Accelerator #4 should be used for every 50 grams of base material. Appropriate size Accelerator #4 bottles are provided, so no measurement is required if the entire container of base material will be used. Appropriate sizes are shown below:

PLV 6032	Accelerator #4
Half Pint Sample	5g. (6ml)
One Quart	20g. (25ml)
One Gallon	77g. (98ml)
Five Gallon	386g. (491ml)

2. Mixing: Product may settle during storage. Before adding Accelerator #4, stir the base material with a broad spatula or paint stick. Scrape the bottom and sides of the can thoroughly, and feel for any undispersed, thicker material clinging to the spatula. Slowly add Accelerator #4 to the base material and mix thoroughly. Avoid any mixing method which introduces substantial amounts of air into the liquid. After adding the accelerator, put the lid on the container and do not disturb for 10 minutes. This will allow trapped air to escape prior to application. It is important to keep the lid on the container when the material is not being actively applied. Air exposure allows evaporation of the solvent and increase the viscosity of the material.
3. Color: Black
4. Pot Life: Once mixed, the liquid has a useful life of approximately 8 hours at 75 degrees F.
5. Application Method: Brushing, dipping, rolling, spraying.
6. Substrate Preparation: A clean, dry surface is essential for maximum adhesion. Gritblasing and degreasing with oil-free solvents is recommended.

7. Drying: Surface will dry very quickly (generally 20 minutes or less), but thick applications will trap solvent beneath the surface. Make sure all solvent has escaped before heating product.
8. Curing: Thin applications will cure in approximately 24 - 48 hours at 75 degrees F. Faster cures are possible by heating solvent free coatings for 20 minutes at 300 F. Thick applications or low temperatures may increase cure time.
9. Successive Coats: Allow for solvent evaporation prior to making multiple coats, or blisters may result. Product adheres to itself. TWO COATS REQUIRED.
10. Shelf Life: 12 months from the Date of Certification for unopened containers.
11. Clean Up: MEK, MIBK and Acetone can be used.
12. Safety: FLAMMABLE LIQUID Use in accordance with Material Safety Data Sheet.

2.3 MATERIALS

A. Delivery: Deliver sealant and caulking compounds in unopened factory labeled containers; labels bearing statement of conformance to standards specified for each material; and bearing manufacturer's name and product designation.

B. Colors: As selected to match adjoining surfaces. Special colors may be required.

C. Sealant Compounds: Materials shall conform to Fed. Spec. TT-S-00227E(3) for multi-component sealant, or to Fed. Spec. TT-S-00230C(2) for single component sealant. Properties and adhesion of 1-part sealants shall be equal to 2-part materials. Sealants shall be Type I or Type II, as applicable. Sealants shall be limited to acceptable compounds compositions which are polysulfide, polyurethane, and silicone. For metal buildings, use Class "A" sealants, and for other locations, use Class "B" sealants each conforming with above referenced Federal Specificatíons or with ASTM C920 like characteristics. Above grade sealants shall be resistant to ultra violet deteriorations.
   1. For joints in water-bearing surfaces, use only polyurethane sealants certified and approved by manufacturer for continuous or intermittent submergence in water or sewage.
   2. Silicone type sealant shall be used only on above grade joínts which are not subject to vehicular or pedestrian traffic.
   3. Acoustical Sealant. Where designated or required at interior and acoustic partititions, use: "Acoustical Sealant" produced by USG, Tremco, or equal products.
   4. For Traffic (Vehicular or Pedestrian) Horizontal Sealant Joints. Sealant shall be MAMECO International's No. 45, or equal. Provide with Shore "4" Hardness Range of 25-35.

D. Primer: where required, shall be used as recommended in writing by the sealant manufacturer. Primer shall have been tested for non-staining characteristics and durability on samples of actual surfaces to be sealed.

E. Back-up Materials and Preformed Joint Fillers: Use non-staining material, compatible with sealant and primer, and of a resilient nature, such as closed cell polyethylene rod, or elastomeric tubing or rod (neoprene, butyl, or EDPM). Materials impregnated with oil, bitumen, or similar shall not be used. Size and shape shall be as indicated by joint details in Drawings and shall be as recommended by sealant manufacturer in writing. Sealant shall not adhere to back-up material.

F. Bond Breakers: where required, shall be polyethylene tape, aluminum foil or other material as recommended by sealant manufacturer in writing.

PART 3 EXECUTION

3.1 GENERAL

A. Perform work of this Section by material manufacturer's approved applicator in strict conformance with manufacturer's printed instructions, or perform such operations under direct supervision of qualified representative of material manufacturer.

B. Applicator shall examine all surfaces and report to the General CONTRACTOR all conditions not acceptable.

3.2 PREPARATION

A. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt, frost and old caulking materials. Sealant must be applied to the base surface. Previously applied paint or primer must be entirely removed.

B. Porous materials such as concrete masonry or stone should be cleaned where necessary by grinding, blast-cleaning, mechanical abrading, acid washing or combination of these methods to provide a clean, sound base surface for sealant adhesion.
   1. Laitance shall be removed by acid washing, grinding, or mechanical abrading.
   2. Form oils shall be removed by blast-cleaning.
   3. Loose particles present or resulting from grinding, abrading or blastcleaning shall be removed by blowing out joints with oil-free compressed air (or vacuuming) prior to application of primer or sealant.

C. Non-porous surfaces, such as metal and glass, shall be cleaned either mechanically or chemically. Protective coatings such as methacrylate lacquer on metallic surfaces shall be removed by a solvent that leaves no residue. Solvent shall be used with clean cloths or lintless paper towels. Do not allow solvent to air dry without wiping. Wipe dry with clean, dry cloth, or lintless paper towels.

D. Joint areas to be protected with masking tape or strippable films shall be cleaned before application of tape or film.

E. All joints to receive sealant shall be as indicated on shop or Project Drawings. Do not seal joints until they are in compliance with drawings or are acceptable to the ENGINEER.
   1. Joints to receive sealant shall be a minimum of 1/4 inch wide by 1/4 inch deep, unless otherwise approved.
   2. For joints in concrete, masonry, or stone: depth of the sealant may be equal to the width of joints up to l/2 inch wide. For joints l/2 inch to 1 inch wide: depth shall be 1/2 inch. For expansion and other joints, 1 to 2 inches wide: depth shall be no greater than 1/2 the applied sealant width. For joints exceeding 2 inches (5 cm) in width: depth shall be as directed by sealant manufacturer.
   3. For joints in metal, glass, and other non-porous surfaces: sealant depth shall be a minimum of 1/2 the applied sealant width, and shall in no case exceed the applied sealant width.

F. Joints to receive sealant, back-up material or pre-formed joint filler shall be cleaned out, raked to full width and depth as required by Applicator.

G. Joints shall be of sufficient width and depth to accommodate specified back-up material or pre-formed joint filler and sealant.

3.3 APPLICATION

A. Install back-up material or joint filler, of type and size specified, at proper depth to provide sealant dimensions as detailed. Back-up material shall be of suitable size and shape; and compressed 25-50 percent to fit joints as required. Sealant shall not be applied without back-up material and/or bond breaker strip. When using back-up tubes avoid lengthwise stretching. Tube or rod shall not be twisted or braided.

B. Apply masking tape, where required, in continuous strips in alignment with joint edge.

C. Prime surfaces, where required, wíth primer as recommended by sealant manufacturer.

D. Follow sealant manufacturer's instruction regarding mixing (if required), surface preparation, priming, and application procedure.

E. Apply sealant under pressure with hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as designed. All joint surfaces shall be tooled to provide the contour as indicated on Drawings. When tooling joints, use tooling solution recommended by manufacturer. Remove masking tape immediately after joints have been tooled.

1. For sealant application when air temperature is below forty degrees (40) Fahrenheit (four degrees (4) Centigrade), consult sealant manufacturer for recommendations.

3.4 CLEAN-UP AND PROTECTION

Clean adjacent surfaces of sealant as work progresses. Use solvent or cleaning agent as recommended by sealant manufacturer. All finished work shall be left in a neat, clean condition.

3.5 QUALITY CONTROL

The sealant joints shall be uniformly smooth, free of wrinkles, flush with adjacent surfaces and absolutely watertight. Adjacent surfaces which have been soiled by the application of the sealing compound shall be wiped clean and be left neat. The work will be judged defective due to the sealant's hardening, cracking, crumbling, melting, shrinking, leaking, or running.

-- END OF SECTION --

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SECTION 26 00 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including DIVISION 01 Specification Sections apply to this Section.

1.2 DESCRIPTION OF WORK

A. This Section specifies the basic requirements for electrical installations and includes requirements common to more than one section of DIVISION 26. It expands and supplements the requirements specified in sections of DIVISION 01.

1.3 REFERENCE STANDARDS

1.4 WARRANTIES

A. Refer to DIVISION 01 for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.
B. Compile and assemble the warranties specified in DIVISION 26, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.
C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.5 ELECTRICAL SUBMITTALS

Refer to SECTION 01 04 01 SUBMITTALS for submittal definitions, requirements, and procedures.

PART 2 PRODUCTS

2.1 NAMEPLATE DATA

A. Provide permanent operational data nameplate on each item of power operated equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

PART 3 EXECUTION

3.1 GENERAL

A. SPACE REQUIREMENTS:
   1. CONTRACTOR shall verify that each electrical panel, light fixture, device, and each other item of work furnished by him shall fit into the available space before ordering same. Any required changes due to the CONTRACTOR's failure to verify that each item of his equipment will fit into the available space shall be made by the CONTRACTOR furnishing the equipment, all at no additional cost to the OWNER.
   2. The routing of piping, ductwork, conduits, etc., indicated on the drawings is approximate and where light fixtures or other items of work are to be recessed in ceiling, piping, ductwork, conduits, etc., shall be routed around the light fixtures or other items of work where there is not sufficient space for same to be routed above such item of work with the recessed item properly installed. Any required changes due to the CONTRACTOR's failure to properly coordinate his work with recessed items shall be made by the CONTRACTOR installing such piping, ductwork, conduits, etc., all at no additional cost to the OWNER.
   3. All conduits and all other items of work supported from the structure above shall be installed as high as physically possible (not just as convenient) considering all work required to be installed in the available space. If any such work is installed lower than it

could have been installed, the CONTRACTOR shall furnish all labor, equipment and materials to remove same and reinstall the work as high as possible, all at no additional cost to the OWNER.

B. PRECEDENCE:

The mechanical and electrical work shall have precedence over each other in accordance with the following sequence:

1. Light fixtures and air conditioning ceiling outlets.
2. Soil and waste piping.
3. Ductwork.
4. Electric conduit and wiring.

C. FLASHING AND COUNTERFLASHING:

Each CONTRACTOR installing conduit, passing through the roof shall provide all flashing and counterflashing required for his work.

D. STRUCTURAL CONDITIONS:

1. These specifications and the drawings accompanying same are intended to cover an installation which will not interfere with the structural of the building, which will fit into the several available spaces, and which will insure a complete and satisfactory mechanical and electrical system.
2. Each bidder shall therefore carefully examine the plans for all branches of the work and shall be responsible for the proper fitting of his material and apparatus into the building.
3. Should the particular equipment which any bidder proposes to install require other space conditions than those shown on the drawings, he shall arrange for such space with the ARCHITECT before submitting his bid. Should changes become necessary on account of failure to comply with this clause, the CONTRACTOR shall make such necessary changes at his (the CONTRACTOR's) own expense.

E. WALL, FLOOR AND CEILING PLATES:

1. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve.
2. Locations: Use where conduit penetrates floors, walls and ceilings in exposed locations.

F. ROUGH-IN:

1. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
2. Refer to equipment specifications in DIVISIONS 02 through 23 for rough-in requirements.

G. SLEEVES AND PENETRATIONS:

1. General: Proper openings through floors, walls, roofs, etc., for the passage of conduits shall be provided. All conduit penetrations of concrete floors, walls, etc., must pass through sleeves or be cast in place. Sleeves shall be set in new construction before a concrete slab is poured, as cutting holes through any part of the concrete will not be permitted.
2. The minimum clearance between horizontal penetrations and sleeve shall be 1/4" except that the minimum clearance shall be 2" where piping contacts the ground. Sleeves through walls and partitions shall be installed flush with exposed surfaces. Penetrations through floors shall be fitted with sleeves of the next larger pipe size, grouted in place, and extended 2" above the finish floor.
3. Materials: Sleeves shall be of standard weight galvanized iron pipe, except heavy gauge galvanized iron sleeves may be utilized in concrete pours where acceptable to the ARCHITECT for size, and metal gauge. Sleeves in footings and grade beams, where pipes enter or leave the building, pass through concrete or masonry shall be Schedule 80 PVC along the pipe route from the underground installation to the coupling installed above the ground.
4. Vermin-Proofing: The open space around all conduits, etc., passing through the ground floor and/or exterior walls, shall be sealed with a continuous bead of sealant.

H. TRENCHING AND BACKFILL:

1. Provide trenching and backfill for installation of all underground electrical work set out in DIVISION 26.
2. Trenching and backfill shall be in accordance with applicable provisions of EARTHWORK, DIVISION 31, Section 31 03 01, TRENCHING, BACKFILLING AND COMPACTING.

3.2 ELECTRICAL INSTALLATIONS

A. Coordinate electrical equipment and materials installation with other building components.
B. Verify all dimensions by field measurements.
C. Arrange for chases, slots, and openings in other building components to allow for electrical installations.
D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
E. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
F. Where mounting heights are not detailed or dimensioned, install electrical services and overhead equipment to provide the maximum headroom possible.
G. Install electrical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
H. Coordinate the installation of electrical materials and equipment above ceilings with suspension system, mechanical equipment and systems, and structural components.
I. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

3.3 CLEANING

Clean all light fixtures, lamps and lenses prior to final acceptance. Replace all inoperative lamps.

3.4 ELECTRICAL IDENTIFICATION

A. Degrease and clean surfaces to receive nameplates.
B. Install nameplates parallel to equipment lines.
C. Secure nameplates to equipment fronts using screws. Secure nameplate to inside face of recessed panelboard doors in finished locations.
D. Embossed tape will not be permitted for any application.
E. Provide wire markers on each conductor in panelboard gutters, pull boxes, motor control centers, and at load connections. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring.
F. Provide nameplates to identify all electrical distribution and control equipment, and loads served. Letter height: 1/8 inch for individual switches and loads served, 1/4 inch for distribution and control equipment.
G. Provide nameplates of minimum letter height as scheduled below:
    1. Panelboards, Switchboards, Motor Control Centers, Identify equipment designation, 1/4 inch.
    2. Identify voltage rating and source, 1/8 inch.
    3. Individual circuit breakers, switches, motor starters in panelboards, switchboards, and motor control centers, identify circuit and load served, include location, 1/8 inch.
    4. Individual circuit breakers, enclosed switches and motor starters, identify load, 1/8 inch.

5. Transformers, identify equipment designation, identify primary and secondary voltage, primary source, and secondary load and location, 1/8 inch.

-- END OF SECTION --

SECTION 26 01 01 - GENERAL ELECTRICAL FOR SMALL BUILDINGS AND FACILITIES

PART 1 GENERAL

1.1 GENERAL

This item of the Specifications covers the furnishing of all labor, materials, tools, equipment, and incidentals necessary for the installation of a complete electrical wiring and control system as shown on the Plans, specified under other items of the Specifications, and required for a finished project.

1.2 REFERENCE STANDARDS

ANSI C62.2 - GUIDE FOR THE APPLICATION OF VALVE-TYPE SURGE ARRESTERS FOR ALTERNATING-CURRENT SYSTEMS; Latest Edition.
ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.
NEMA PB 1 - Panelboards; 2011.
NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R2015).
NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
UL 67 - Panelboards; Current Edition, Including All Revisions.

1.3 CODES AND STANDARDS

The performance of all work, testing, and completed installations covered by this contract shall conform to current standards, rules, regulations, and specifications of the following authorities:

A. National Board of Fire Underwriters (National Electric Code)
B. Bureau of Standards (National electrical Safety Code)
C. National Electrical Manufacturer's Association (NEMA)
D. National electrical Contractors Association (NECA)
E. City Codes

1.4 WORKMANSHIP

All work shall be performed in a first class manner by mechanics skilled in their respective trades. The standards of work required throughout shall be such grade as will bring results of the first class only.

1.5 SUBMITTALS

The CONTRACTOR shall furnish to the ENGINEER for approval detailed electrical shop drawings cross-referenced with a schedule of materials listing all equipment the CONTRACTOR contemplates incorporating in the work. The CONTRACTOR shall also furnish

to the ENGINEER four (4) sets of final electrical drawings showing all new and existing controls, equipment, and fixtures.

1.6 FIELD QUALITY CONTROL

A. **WIRE AND CABLE**
1. Perform field inspection and testing.
2. Inspect wire and cable for physical damage and proper connections.
3. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
4. Verify continuity of each branch circuit conductor.

B. **WIRING DEVICES**
1. Inspect each wiring device for defects.
2. Operate each wall switch with circuit energized and verify proper operation.
3. Verify that each receptacle device is energized.
4. Test each receptacle device for proper polarity.
5. Adjust devices and wall plates to be flush and level.

C. **SECONDARY GROUNDING**
1. Inspect all grounding on bonding system conductors and connections for tightness and proper installation.
2. Measure ground resistance from system ground connections at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 10 ohms.

PART 2 MATERIALS

2.1 GENERAL

All proposed materials shall be new unless otherwise specified, of the latest manufacture, and first class in every respect. All materials of a type for which the Underwriters Laboratories have established a standard shall be listed by the Underwriters Laboratories, Inc., and shall have their label. Samples of materials shall be submitted for approval when so directed. Equipment, materials, and articles installed or used without such approval shall be at the risk of subsequent rejection. The schedule of materials shall include catalog numbers and specifications and shall not relieve the CONTRACTOR of the responsibility for the satisfactory performance of the equipment as furnished and installed.

2.2 CONDUIT

A. DELIVERY, STORAGE, AND HANDLING
1. Deliver, store, protect, and handle products on site.
2. Accept conduit on site. Inspect for damage, remove any damaged conduit from site.
3. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
4. Protect PVC from sunlight.

B. PROJECT CONDITIONS
1. Verify that field measurements are as shown on the Drawings.
2. Verify routing and termination locations of conduit prior to rough-in.
3. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

C. CONDUIT REQUIREMENTS
1. Minimum size: 3/4 inch unless otherwise specified.
2. Underground Installation:
   a. In or Under Slab on Grade: Use rigid steel conduit or thick walled PVC nonmetallic-conduit as shown on drawings.
   b. Minimum Size: 3/4 inch.

3. Outdoor Locations, Above grade: Use rigid steel conduit.
4. In slab Above Grade:
   a. Use rigid steel conduit.
   b. Minimum size conduit in slab: 3/4 inch to include for conduits crossing each other.
5. Wet and damp locations: Use rigid steel or schedule 40 or 80.

D. METAL CONDUIT
1. Rigid steel conduit conforming to ANSI C80.1.
2. Intermediate Metal Conduit (IMC): Rigid Steel.
3. Fittings and conduit bodies: NEMA FB 1; material to match conduit, except aluminum fittings may be used with steel conduit.

E. LIQUID-TIGHT FLEXIBLE METAL CONDUIT
1. Description: Interlocked steel construction with VC jacket.
2. Fittings: NEMA FB 1.

F. ELECTRICAL METALLIC TUBING (EMT)
1. Description: Galvanized tubing conforming to ANSI C80.3.
2. Fittings and conduit bodies: Steel compression type meeting NEMA FB 1.

G. NONMETALLIC CONDUIT
1. Description: Schedule 80 PVC meeting NEMA TC 2.
2. Fittings and conduit bodies: shall meet NEMA TC 3.

2.3 METER LOOP

The CONTRACTOR shall furnish and install the meter loop, including Weatherhead and conductors, for three phase, 480 volt, 60-cycle service at the location shown on the Plans. Service shall be taken from the meter pole to be set by the electric company in front of the building as indicated on the Plans.

2.4 PANELBOARDS

Panelboards shall conform with NEMA PB 1 and UL 67. CONTRACTOR shall provide dead front, safety-type panel boards with voltage ratings as scheduled. Panelboards shall be circuit breaker type and suitable for the short circuit ratings specified. Panel boards shall be UL listed and manufactured by General Electric, Cutler-Hammer, Square D, Westinghouse, or equal. Enclose panelboards located indoors in a single sheet metal cabinet with hinged front doors, catches, and locks. Provide holder for the directory on the inside of the door. Panelboard locks shall be keyed alike. Enclose panelboards located outdoors in a sheet metal cabinet without front door. Mount panel within a NEMA 4X fiberglass enclosure. Provide metal trim on panelboard to cover wire terminations. Provide space for controls, such as timeclocks and contactors, in a separate compartment with hinged doors within respective panel boards. Where limited by the height of the panels, locate controls in a separate cabinet adjacent to the respective panel board.

Molded-case breakers shall be provided with quick-male and quick-break toggle mechanism, inverse-time trip characteristics, and trip free operation on overload or short circuit. Automatic tripping shall be indicated by a handle position between the manual OFF and ON position. Provide trip ratings as indicated in the panelboard schedules. Provide lock-on or lock-off devices where indicated in the drawings. Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multiple circuit breakers shall be of the common-trip type having a single operating handle. The CONTRACTOR shall furnish ground fault interrupter (GFI), 5-ma trip, 10,000-ampere interrupting capacity circuit breakers where indicated.

A. The CONTRACTOR shall provide 30-ampere mechanically held contactors, 100% rated for ballast and tungsten lighting loads, with coil-clearing contacts. Provide quantity of poles as indicated in the drawings.
B. The CONTRACTOR shall provide timeclocks with astro-dial, manual on/off lever, skip-a-day feature, spring-wound carryover, and NEMA 1 surface-mounted enclosure. Timing motor shall be 120 volts, 60 hertz, and switch rating shall be 40 amperes, DPST. Provide Paragon 4214-27SZ or equal.
C. Circuit breaker current-carrying connections to the bus shall be plug-in type.
D. Bus bars shall be copper or aluminum. Provide a copper ground bus bar installed on the panel board frame, bonded to the box, and containing at least 10 terminal screws.
E. Where "space only" is noted in the drawings, provide connectors and mounting brackets for the future insertion of an overcurrent device of the size indicated.
F. The CONTRACTOR shall provide typed circuit directories on the inside face of the door of each panel. Do not provide handwritten directories.
G. Panel boards shall be suitable as service entrance equipment where noted in the drawings. A factory-installed service-entrance type UL label shall be provided.
H. The CONTRACTOR shall provide nameplates as specified in 2.06 and designate the identifying nomenclature, voltage, and phase of the panel as shown in the drawings; for example, "PANEL LA, 277/480-volt, 3-phase, 4-wire, 225-ampere bus."
I. The CONTRACTOR shall stub up from the top of flush-mounted panels four 1-inch conduits to the nearest ceiling space or other accessible location and cap for future use.
J. Panelboards shall be installed so that the top of the highest circuit breaker is not more than 6 feet 6 inches above the floor or working platform.
K. Each circuit breaker shall be operated and it shall be verified that all phases of each load are disconnected.
L. CONTRACTOR shall verify that loads turn on and off at the selected times.

2.5 SWITCHBOARDS

A. Switchboards shall be manufactured by General Electric, Square D, Westinghouse, or equal.
B. Main service and distribution switchboards shall be NEMA Class 1 metal clad floor standing, dead front and rear enclosure, requiring front access only. Switchboards installed outdoors shall be provided with a NEMA 3R nonwalk-in type enclosure. A 10-inch-minimum front access space between the exterior door and the front of the interior switchboard door shall be provided. Construct sections with a minimum thickness of 12-USSG formed sheet steel and of overall dimensions that will fit within the space limitation indicated in the drawings. Service switchboards shall be provided with metering and current transformer space, pull sections, and fully removable front covers of the widths, depths, and heights required by the service utility and as necessitated by the physical requirements of the conduits and cables entering the sections. Distribution switchboards shall be provided with circuit breakers, fusible switches, space for controls behind hinged lockable doors (common keyed with panelboards), motor starters, transformers, and other equipment as indicated. Circuit breakers and fusible switches shall be provided with fault current ratings equal to or larger than the switchboard rating shown in the drawings. Switchboards shall comply with NEMA, UL, and ANSI standards for industrial control. Provide UL label on each switchboard section.
C. Switchboards shall be provided with rectangular copper bussing. Cross bussing shall be full capacity. Vertical bussing shall be full height and rated for the load to be carried, but in no case less than one-third the capacity of the main bus. Horizontal and vertical bussing shall be

braced to withstand 50,000 amperes symmetrical fault current. Ground bus with a cross section meeting code requirement shall extend the entire length of the distribution sections of the switchboards. Connections shall be tin plated. Belleville dished spring washers shall be provided at each bolted joint. Heavy-duty pressure-type terminal lugs for connections of incoming and outgoing cables shall be provided. Support cables and internal wiring with bolted cleats.

D. The main disconnect device shall be as located in the Drawings. The device shall be capable of being padlocked in the off position. Phase monitoring relay shall be provided to protect against undervoltage, single-phase voltage, and incorrect phase rotation. The disconnect shall be permanently marked to identify it as a service disconnecting means, in accordance with NEC Article 230, part F.

E. Fusible switches shall be of the quick-make, quick-break, visible-blade type and shall be UL listed and horsepower rated. Provisions for padlocking external disconnect handles in the OFF position shall be provided. Switches shall have rejection-type fuse clips. Provide time delay, current limiting, NEMA Class RK5 fuses.

F. Circuit breakers shall be molded-case type. Quick-make and quick-break toggle mechanism, inverse time trip characteristics, and trip-free operation on overload or short circuit.

G. Automatic tripping shall be indicated by a handle position between the manual OFF and ON position. Trip ratings and number of poles shall be provided. Provide provisions for padlocking external disconnect handles in the OFF position.

H. Power circuit breakers shall be provided with the frame size and trip rating shown, fixed mounting, manually operated, with a solid-state trip device having an adjustable long time delay, adjustable instantaneous trip, and a stored-energy close and trip mechanism.

I. Power circuit breakers of the molded or insulated case type shall be provided with the frame size and trip rating shown, fixed mounting, manually or electrically operated, with a solid-state trip device having an adjustable long time delay, adjustable instantaneous trip, and a stored-energy close and trip mechanism.

J. A nameplate shall be provided for each circuit breaker or fusible switch to indicate load served. The main nameplate shall give the switchboard designation in 1/2-inch-high letters. A second line in 1/4-inch-high letters shall indicate the voltage and phases.

K. Voltmeters and ammeters shall be switchboard class with 250-degree scale and scale range indicated in drawings. Selector switches shall be 3 phase, four position.

L. Surge arrester shall be 650-volt rated, secondary arrester complying with ANSI C62.2. Arrester shall be three-pole version suitable for indoor and outdoor use, sealed in LEXAN housing. Include mounting bracket for switchboard mounting. Arrester shall be UL listed. General Electric Model 9L 15ECCOO 1 or equal.

M. The CONTRACTOR may, in lieu of individual phase monitor relay, ammeter, voltmeter, and selector switches, provide a microprocessor-based monitoring and protective device providing electrical metering and system voltage protection. Device shall be Westinghouse IQ Data Plus, Multilin MTM Plus, or equal.

N. The CONTRACTOR shall secure switchboards rigidly to walls and floors or mounting pads with anchor bolts or Phillips Drill Company concrete anchors. Anchor bolts or concrete anchors shall be carbon steel per ASTM A307, Grade B.

O. When the installation is essentially complete and the plant is in operation, check the voltage at the point of termination of the power company supply system to the project. Check voltage amplitude and balance between phases for loaded and unloaded conditions.

P. If the unbalance (as defined by NEMA) exceeds 1%, or if the voltage varies throughout the day and from loaded to unloaded conditions more than .5% of nominal, make a written request to the power company that the condition be corrected. If corrections are not made, request from a responsible power company official a written statement that the voltage variations and/or unbalance are within their normal standards.

Q. Operate each switch and circuit breaker at least three times, demonstrating satisfactory operation each time.

R. Provide six (6) spare fuses of each type and ampere rating installed.

2.6 BUILDING LOAD CENTER AND ELECTRICAL

A. The CONTRACTOR shall furnish and install a building load center at the location shown on the Plans. The load center shall have adequate 120 volt and 230 volt breakers for control of the circuit runs required. Individual breakers for outside circuits shall be ground fault type and all multiple breakers shall have an internal common trip. Load center panel shall be NEMA 3R constructed with door, and breaker ratings and circuit numbers shall be readily visible when viewing the panel directly from the front. The load center shall have a complete, detailed directory.

B. The CONTRACTOR shall furnish and install receptacles, switches and fixtures as shown on the Plans. Interior 115 volt receptacles shall be straight blade, 3-wire grounding duplex outlets, General Electric, Bryant, or equal, with decorative wall plates. Exterior 115-V receptacles shall be straight blade, 3-wire grounding duplex outlets General Electric, Bryant or equal, with weatherproof cover. Where 220-V receptacles are called for, they shall be flush type range and dryer outlets, 2 pole, 3-wire, 30 amps, General Electric, Bryant or equal.

C. Switches shall be 15, 20 or 30 amp as required, toggle type, General Electric, Bryant or equal, with decorative wall plates.

D. Lighting fixtures shall be in accordance with the fixture schedule shown on the Plans. The CONTRACTOR shall also furnish and install telephone jacks, complete with decorative wall plate, 2 in the office and 2 in the laboratory at locations designated by the OWNER. Telephone wiring shall terminate in the junction box, furnished and installed by the CONTRACTOR, located adjacent to the electrical control center.

E. The CONTRACTOR may use enclosed breakers in lieu of safety switches for the building load.

2.7 WIRE AND CABLE

A. PROJECT CONDITIONS
   1. Verify that field measurements are as shown on Drawings.
   2. Conductor sizes are based on copper unless indicated as aluminum or "AL".
   3. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions. Include wire and cable lengths within 10 feet of length as shown.
   4. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

B. WIRE AND CABLE
   1. Description: Single conductor insulated wire.
   2. Conductor: Copper.
   3. Insulation Voltage Rating: 600 volts.
   4. Insulation: NFPA 70, type THHN, THW, or THWN.

C. SERVICE ENTRANCE CABLE
   1. Description: NFPA 70, TYPE se.
   2. Conductor: Copper.

3. Insulation voltage rating: 600 volts.
4. Insulation: Type THHN, THW, or THWN.

2.8 BOXES

A. PROJECT CONDITIONS
1. Verify that field measurements are as shown on Drawings.
2. Electrical boxes are as shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. Include installation within 10 feet of location shown.

B. OUTLET BOXES
1. Sheet metal outlet boxes: shall be galvanized steel meeting NEMA OS 1.
2. Luminair and Equipment Supporting Boxes: Rated for weight of equipment supported, include 1/2-inch male fixture studs where required.
3. Nonmetallic Outlet Boxes: Shall meet NEMA OS 2.
4. Cast Boxes: Shall meet NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded bolts.

C. PULL AND JUNCTION BOXES
1. Sheet Metal Boxes: Shall be galvanized steel meeting NEMA OS 1.
2. Surface-Mounted Cast Metal Box: NEMA EN 10250, type 4, flat-flanged, surface-mounted junction box, cast aluminum.
3. In-Ground Cast Metal Box: NEMA EN 10250, Type 6, outside flanged, recessed cover box for flush mounting. Cast aluminum nonskid cover with neoprene gasket and stainless steel cover screws and the word "Electric" on front.

2.9 WIRING DEVICES

A. WALL SWITCHES
1. Description: NEMA WD 1, heavy duty, AC only general use snap switch.
2. Device body: Ivory plastic with toggle handle.
3. Voltage rating: 120 volts AC.
4. Current rating: 20 amperes.
5. Ratings: Match branch circuit and load characteristics.

B. RECEPTACLES
1. Description: NEMA WD 1, heavy duty general use receptacle.
2. Device body: White Plastic.
3. Configuration: NEMA WD 6, Type as specified and indicated.
4. Convenience Receptacle: Type 5-20.

C. WALL PLATES
1. Cover Plate: Galvanized Steel.

2.10 SUPPORTING DEVICES

A. MATERIAL
1. Support Channel: Galvanized or painted steel.
2. Hardware: Corrosion Resistant.

2.11 ELECTRICAL IDENTIFICATION

A. MATERIAL
1. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
2. Tape Labels: Not allowed.
3. Wire and Cable Markers: Split sleeve or tubing type, tape acceptable provided abrasion, Heat/Cold, UV, waterproof, and spill proof resistant.

2.12 SECONDARY GROUNDING

A. SYSTEM DESCRIPTION

1. Ground electrical service system at service entrance equipment to metallic water service and to supplementary grounding electrodes as shown on Drawings.
2. Ground each separately derived system neutral to nearest effectively grounded building structural steel member or separate grounding electrode.
3. Bond together system neutrals, service equipment enclosures exposed non-current carry metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and piping systems.

B. MATERIALS
1. Ground rods: Copper encased steel, 5/8-inch diameter, minimum length 8 feet.

PART 3 EXECUTION

3.1 CONDUIT

A. Install conduit in accordance with NECA "Standard of Installation".
B. Install nonmetallic conduit in accordance with manufacturer's instructions.
C. Arrange supports to prevent misalignment during wiring installation.
D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
E. Group related conduit, support using conduit rack. Construct rack using steel channel, provide space on each for 25 percent additional conduits.
F. Fasten conduit supports to building structure and surfaces.
G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
H. Do not attach conduit to ceiling support wires.
I. Arrange conduit to maintain head room and present neat appearance.
J. Route exposed conduit parallel and perpendicular to walls.
K. Route conduit in and under slab from point-to-point.
L. Maintain adequate clearance between conduit and piping.
M. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
N. Cut conduit square using saw or pie cutter, de-bur cut ends.
O. Bring conduit to shoulder of fittings, fasten securely.
P. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum or per manufacturer recommendations.
Q. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
R. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch size.
S. Avoid moisture traps, provide junction box with drain fitting at low points in conduit system.
T. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joins.
U. Provide suitable pull string in each empty conduit except sleeves and nipples.
V. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
W. Ground and bond conduit.

3.2 WIRE AND CABLE

A. Verify that mechanical work likely to damage wire and cable has been completed.

B. Completely and thoroughly swab raceway before installing wire.
C. Concealed and Dry locations: Use only building wire, Type THHN/THWN insulation in raceway.
D. Exposed Dry interior location: Use only building wire, Type THHN/THWN insulation in raceway.
E. Wet or Damp interior locations: Use only building wire, Type THW/THWN insulation in raceway or underground feeder and branch-circuit cable.
F. Exterior locations: Use only building wire, Type THW/THWN insulation in raceway, underground feeder, and branch-circuit cable or service-entrance cable.
G. Underground installations: Use only Type THW/THWN insulation in raceway, underground feeder, and branch-circuit cable.
H. Use wiring methods indicated on Drawings.
I. Install products in accordance with manufacturer's instructions.
J. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
K. Use stranded conductors for control circuits.
L. Use conductor not smaller than 12 AWG for power and lighting circuits.
M. Use conductor not smaller than 16 AWG for control circuits.
N. Use 10 AWG conductors for 20 amperes, 120 volt branch circuits longer than 75 feet.
O. Pull all conductors into raceway at same time.
P. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
Q. Protect exposed cable from damage.
R. Use suitable cable fittings and connectors.
S. Neatly train and lace wiring inside boxes, equipment and panelboards.
T. Clean conductor surfaces before installing lugs and connectors.
U. Make splices, taps and terminations to carry full ampacity of conductors with no perceptible temperature rise.
V. Terminate aluminum conductors with tin-plated aluminum-bodied compression connectors only. Fill with anti-oxidant compound before installing conductor.
W. Use suitable reducing connectors or mechanical connector adapters for connecting aluminum conductors to copper conductors.
X. Use split bolt connectors for copper conductor splices and taps 6 AWG or larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
Y. Use solderless pressure connectors with insulating covers of copper conductor splices and taps 8 AWG and smaller.
Z. Use insulated spring wire connectors with plastic caps or copper inductor splices on taps 10 AWG and smaller.

3.3 BOXES

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
B. Install electrical boxes to maintain headroom and to present a neat mechanical appearance.
C. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
D. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
E. Use adjustable steel channel fasteners for hung ceiling outlet box.
F. Support boxes independently of conduit except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

G. Use gang box where more than one device is mounted together. Do not use sectional box.
H. Use cast outlet box in exterior locations exposed to weather and inside pump houses.
I. Large Pull boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
   1. Interior Dry Locations: Use screw cover enclosure.
   2. Other Locations: Use surface-mounted cast metal box.

3.4 WIRING DEVICES

A. Verify conditions.
B. Verify outlet boxes are installed at proper height.
C. Verify wall openings are neatly cut and will be completely covered by wall plates.
D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
E. Clean debris from outlet boxes.
F. Install products in accordance with manufacturer's instructions.
G. Install devices plumb and level.
H. Install switches with OFF position down.
I. Install receptacles with grounding pole on bottom.
J. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
K. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
L. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.5 SUPPORTING DEVICES

A. Fasten hanger rods, conduit clamps, and outlet junction boxes to building structure using expansion anchors or beam clamps. Do not use spring steel clips and clamps.
B. Use toggle bolts or hollow wall fasteners in hollow masonry, or gypsum board partitions and walls, expansion anchors or preset inserts in solid masonry walls, self-drilling anchors or expansion anchor on concrete surfaces, sheet metal screws in sheet metal studs, and wood screws in wood construction.
C. Do not fasten supports to piping, ductwork, mechanical equipment,or conduit.
D. Do not use powder-actuated anchors.
E. Do not drill structural steel members.
F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
G. In wet locations install free-standing electrical equipment on concrete pads.
H. Install surface-mounted cabinets and panelboard with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.

3.6 ELECTRICAL IDENTIFICATION

A. Degrease and clean surfaces to receive nameplates.
B. Install nameplates parallel to equipment lines.
C. Secure nameplates to equipment fronts using screws. Secure nameplate to inside face of recessed panelboard doors in finished locations.
D. Embossed tape will not be permitted for any application.
E. Provide wire markers on each conductor in panelboard gutters, pull boxes, motor control centers, and at load connections. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring.

F. Provide nameplates to identify all electrical distribution and control equipment, and loads served. Letter height: 1/8 inch for individual switches and loads served, 1/4 inch for distribution and control equipment identification.
G. Provide nameplates of minimum letter height as scheduled below:
    1. Panelboards, Switchboards, Motor Control Centers, Identify equipment designation, 1/4 inch.
    2. Identify voltage rating and source, 1/8 inch.
    3. Individual circuit breakers, switches, motor starters in panelboards, switchboards, and motor control centers, identify circuit and load served, include location, 1/8 inch.
    4. Individual circuit breakers, enclosed switches and motor starters, identify load, 1/8 inch.
    5. Transformers, identify equipment designation, identify primary and secondary voltages, primary source, and secondary load and location, 1/8 inch.

3.7 SECONDARY GROUNDING

A. Provide a separate, insulated equipment grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing.
B. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp.
C. Supplementary Grounding Electrode: Use driven ground rod on exterior of building. Install ground rod in suitable recessed well, fill with gravel after connection is made use effectively grounded metal from building.
D. Provide grounding and bonding at Utility Company's metering equipment.

-- END OF SECTION --

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SECTION 26 05 19 - WIRES AND CABLES, LOW VOLTAGE (600 VOLTS AND BELOW)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including DIVISION 01 Specification Sections apply to this Section.
B. Section 26 00 00, BASIC ELECTRICAL REQUIREMENTS.
C. This section is a Division 26 Basic Electrical Materials and Methods section, and is part of each Division 26 section making reference to wires and cables, low voltage (600 volts and below) specified herein.

1.2 DESCRIPTION OF WORK

A. This section includes the furnishing, installation, and connection of the low voltage power and lighting wiring.
B. Unless otherwise specified in other sections of these specifications, control wiring shall be provided, installed, and connected to perform the functions specified in other sections of these specifications.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Submit catalog cuts and descriptive literature for approval in accordance with Section 01 04 01, SUBMITTALS
   2. Include sufficient information, clearly presented, to determine compliance with drawings and specifications.

1.4 REFERENCE STANDARDS

NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire and cable properly packaged in factory-fabricated type containers, or wound on NEMA-specified type wire and cable reels. Containers and reels shall be unbroken and each shall bear a tag giving the name of the manufacturer, the trade name of the wire and a UL label.
B. Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.
C. Handle wire and cable carefully to avoid abrasing, puncturing and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wire and cable shall be equal to that manufactured by General Cable, Phelps Dodge Cable and Wire Corp., Rome Cable Corp., Southwire Company and Triangle PWC, Inc.

2.2 MATERIALS

A. Cable and Wire (Power and Lighting):

1. Cable and wire shall be in accordance with UL, NEC, as shown on the Drawings, and as hereinafter specified.
2. Conductors:
   a. Shall be annealed copper.
   b. Shall be single conductor.
   c. Shall be stranded for sizes No. 8 and larger. Sizes No. 10, and smaller shall be solid.
   d. All control conductors shall be stranded.
   e. Size shall be not less than shown on the Drawings. Minimum size
   f. 20 amp branch lighting and power circuits with farthest outlet more than 50' from their distribution panelboard shall have conductors not less than No. 10 AWG.
3. Insulation: Unless otherwise shown on the Drawings, insulation shall be as follows:
   a. THW, XHHW, or dual rated THHN-THWN.
4. Color code:
   a. All conductors and branch circuits shall be color coded as herein specified and strictly in accordance with Articles 210 and 310 of the N.E. Code.
      1) All conductors connected to a 120/208 volt power distribution system shall be color coded as follows:
         Phase 1 - Black
         Phase 2 - Red
         Phase 3 - Blue
         Neutral - White
         Ground - Green
      2) All conductors connected to a 277/480 volt power follows:
         Phase 1 - Brown
         Phase 2 - Yellow
         Phase 3 - Purple
         Neutral - Grey
         Ground - Green
      3) All conductors intended solely for grounding of equipment and devices shall be green unless indicated on the drawings to be bare. Green colored conductors shall not be used for other than grounding purposes.
      4) Under no circumstances shall green or white be used for any conductors other than for ground or grounded neutral conductors, respectively.
   b. The insulation on all No. 12, No. 10, and No. 8 conductors shall have solid color compound or solid color coating.
   c. No. 6 AWG and larger conductors shall have either:
      1) Solid color compound or solid color coating.
      2) Stripes, bands, or hash marks of color specified above.
      3) Colored pressure-sensitive plastic tape. Tape shall be applied in half overlapping turns for a minimum of three inches for all terminal points, and in all junction boxes, pull boxes, and troughs. Tape shall be 3/4-inch wide with colors as specified above. The last two laps of tape shall be applied with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable stating size and insulation type.

B. Splices and Joints:
   1. Shall be in accordance with UL and NEC.
   2. Branch circuits (No. 10 AWG and smaller):
      a. Connectors shall be solderless, screw-on, pressure cable type, 600 volt, 105 degree C, with integral insulation. They shall be approved for copper and aluminum conductors, and shall be reusable.
      b. The integral insulator shall have a skirt to completely cover the stripped wires.
      c. The number, size, and combination of conductors, as listed on the manufacturers packaging shall be strictly complied with.

3. Feeder Circuits (conductors #8 AWG and Larger):
    a. Connectors shall be indent, hex screw, or bolt clamp-type. Connector material shall be high conductivity and corrosion-resistant.
    b. Connectors for cable size 250 MCM and larger shall have not less than two clamping elements or compression indents.
    c. Splices and joints shall be insulated with materials approved for the particular use, location, voltage, and temperature. Insulation shall be not less than that of the conductors being joined.
    d. Plastic electrical insulating tape:
        1) Tape shall be flame retardant, cold and weather resistant.

C. Wire Lubricating Compound:
1. Shall be suitable for the wire insulation and conduit with which it is used, and shall not harden or become adhesive.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. Installation shall be in accordance with the NEC, as shown on the Drawings, and as hereinafter specified.
B. All wiring of every description shall be installed in raceway systems unless specifically noted or specified otherwise.
C. Splice cables and wires only in outlet boxes, junction boxes, and pull boxes.
D. All wiring inside panel cabinets shall be neatly arranged, run parallel and perpendicular to the lines of the cabinets, neatly laced to hold the wiring in place, and shall be arranged so that each conductor can be easily and readily traced from its circuit breaker to its conduit leaving the cabinet.
E. No wiring serving electrically sensitive equipment shall be run in the same conduit serving any other load for any other piece of electrically sensitive equipment.
F. No wiring for the sound signal, control, or communication system shall be run in the same conduit with any other system.
G. Seal cable and wire entering a building from underground between the wire and conduit, where the cable exits the conduit, with a nonhardening approved compound.
H. Wire Pulling:
1. Provide suitable installation equipment to prevent cutting or abrasion of conduits during pulling of feeders.
2. Ropes used for pulling feeders shall be made of suitable nonmetallic material.
3. Attach pulling lines for feeders by means of either woven basket grips or pulling eyes attached directly to the conductors.
4. All cables in a single conduit shall be pulled in together.
I. Where 3-phase circuits are connected to 3-phase motors, temporary connections shall be made at motor terminals to determine proper rotation and any reversing of phases shall be done at the motor terminals in order to maintain proper color coding of phase conductors.

3.2 FEEDER IDENTIFICATION

A. In each pullbox and junction box, containing more than one circuit install tags on all circuit cable and wires to clearly designate their circuit identification and voltage.

-- END OF SECTION --

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SECTION 26 05 26 - GROUNDING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including DIVISION 01 Specification Sections apply to this Section.
B. Section 26 00 00, BASIC ELECTRICAL REQUIREMENTS.
C. DIVISION-26 Basic Materials and Methods sections apply to work specified in this section.
D. See also Section 26 05 19, WIRES AND CABLES, LOW VOLTAGE (600 VOLTS AND BELOW).

1.2 DESCRIPTION OF WORK

A. System Grounding: Secondary service neutrals shall be grounded at the supply side of the main service disconnecting means.
B. Equipment Grounding: All metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be grounded for personnel safety and to provide a low impedance path for possible ground fault currents.

1.3 REFERENCE STANDARDS

NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.
UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

1.4 QUALITY ASSURANCE

Test Reports: Submit certified test reports of ground resistance to the ARCHITECT for approval.

1.5 SUBMITTALS

A. Shop Drawings:
   1. None required for this Section.

PART 2 PRODUCTS

2.1 GROUNDING CONDUCTORS

A. Shall be UL and NEC approved types, copper, with THW insulation color identified green, except where otherwise shown on the Drawings, or specified.
B. Wire size shall not be less than shown on the drawings and not less than required by the NEC.

2.2 GROUND RODS

Shall be copper clad steel, 3/4-inch diameter by 10 feet long.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. Grounding shall be in accordance with the NEC, as shown on the Drawings, and as hereinafter specified.
B. Metallic Conduit: Metallic conduits which terminate without mechanical connection (locknut and bushings or adaptors at the housing of electrical equipment shall be provided with grounding bushings. Bushings shall be connected with a bare grounding conductor to the equipment ground bus.

3.2 SECONDARY EQUIPMENT AND CIRCUITS

A. Main Bonding Jumper: Connect the secondary service neutral to the ground bus at the Main Disconnect Switch.
B. Water Pipe and Supplemental Electrode:
   1. Grounding electrode: Provide a connection between the service equipment ground bus and the metallic water pipe system.
   2. Provide a supplemental ground electrode and bond to the service equipment ground bus.
C. Main Service Disconnect: Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors.
D. Conduit Systems:
   1. Ground all metallic conduit systems.
   2. All conduit systems shall contain a grounding electrode.
E. Feeders and Branch Circuits: Install green grounding electrode with all feeders and branch circuits as follows:
   1. All feeders.
   2. All receptacle outlets.
   3. All toggle (light) switches.
   4. All lighting circuits.
   5. All motors and motor controllers.
   6. All fixed equipment and appliances.
   7. All items of equipment where the final connection is made with flexible metal conduit shall have a grounding electrode.
   8. All additional locations and systems as shown on the drawings.
F. Metal Boxes, Cabinets, Enclosures, and Panelboards:
   1. Bond grounding conductors to each pullbox, junction box, outlet box, cabinets, and other enclosures through which the ground conductors pass.
   2. Provide lugs in each box and enclosure for ground wire termination.
   3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs for terminating the ground electrode.
G. Motors and Starters:
   1. Provide lugs in motor terminal box and starter housing for ground electrode termination.
   2. Make ground electrode connections to ground bus in motor control centers.
H. Lighting Fixtures: Shall be grounded with green grounding electrode.
I. Electrical Appliances and Equipment: Fixed electrical appliances and equipment shall have a ground lug installed for termination of the green ground electrode.

3.3 GROUND RESISTANCE

The grounding system shall be tested to ensure that the ground resistance does not exceed 5 ohms. Test information shall be sent to the ENGINEER for his approval.

3.4 GROUND ROD INSTALLATION

A. Distance: Drive each rod vertically for not less than ten feet.
B. Multiple Rods: Where required to obtain the specified ground resistance, install multiple rods.
C. Where ground connections will be permanently concealed, make the connections by the exothermic process to form solid metal joints. Make accessible ground connections with mechanical pressure type ground connectors.
D. Call for inspection before concealed connections are covered.

-- END OF SECTION --

SECTION 26 05 35 - ELECTRICAL BOXES AND FITTINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including DIVISION 01 Specification Sections apply to this Section.
B. Section 26 00 00, BASIC ELECTRICAL REQUIREMENTS.
C. This section is a DIVISION 26 Basic Electrical Materials and Methods section, and is part of each DIVISION 26 section making reference to electrical boxes and fittings specified herein.

1.2 DESCRIPTION OF WORK

A. Electrical boxes and associated fittings as required by the work indicated.
B. Types of electrical boxes and fittings specified in this section include the following: outlet boxes, junction boxes, pull boxes, floor boxes, bushings, locknuts, and knockout closures.

1.3 REFERENCE STANDARDS

A-A-50563 - CONDUIT OUTLET BOXES, BODIES, AND ENTRANCE CAPS, ELECTRICAL: CAST METAL; Latest Edition.
ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.
UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
UNDERWRITERS LABORATORIES (UL)

1.4 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.
B. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.
C. UL Compliance: Comply with applicable requirements of UL 50, UL 514A, UL 514B, UL 514C, and UL 1203 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.
D. NEMA Compliance: Comply with applicable requirements of NEMA OS 1, NEMA OS 2 and NEMA EN 10250 pertaining to outlet and device boxes, covers and box supports.
E. Federal Specification Compliance: Comply with applicable requirements of A-A-50563.

1.5 SUBMITTALS

Product Data: Submit manufacturer's data on electrical boxes and fittings.

PART 2 PRODUCTS

2.1 FABRICATED MATERIALS

A. Outlet Boxes: Provide galvanized coated flat rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.
   1. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, box extension rings, fixture studs, and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.

B. Device Boxes: Provide galvanized coated flat rolled sheet-steel non-gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide corrosion-resistant screws for equipment type grounding.
   1. Device Box Accessories: Provide device box accessories as required for each installation, including mounting brackets, device box extensions, and switch box supports which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering outlet boxes which may be incorporated in the work include, but are not limited to, the following: Appleton Electric; Emerson Electric Co., RACO Div; Harvey Hubbell Inc., and Thomas & Betts Co.

D. Raintight Outlet Boxes: Provide corrosion-resistant cast-metal raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring-hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering raintight outlet boxes which may be incorporated in the work include, but are not limited to, the following: Appleton Electric; Emerson Electric Co., Harvey Hubbell, Inc., and OZ/Gedney; General Signal Co.

E. Junction and Pull Boxes: Provide galvanized code-gauge sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering junction and pull boxes which may be incorporated in the work include, but are not limited to, the following: Appleton Electric; Emerson Electric Co., Arrow-Hart Div; Crouse-Hinds Co., and OZ/Gedney Co.; General Signal Co.
   2. Approved PVC Junction and Pull Box are allowed on PVC conduit runs.

PART 3 EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
   1. Provide weathertight outlets for interior and exterior locations exposed to weather or moisture.
   2. Provide knockout closures to cap unused knockout holes where blanks have been removed.
   3. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surfaces.
   4. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.
   5. Outlet boxes shall be firmly anchored in place and shall be provided with approved fixture studs where required. Fixture studs shall be applied to boxes from rear and securely bolted to box.
   6. Only such holes as are to be used for entering conduits shall be open; all other holes must be properly closed.
   7. Four inch boxes shall not be used where more than one switch or receptacle is installed, solid gang boxes with suitable covers shall be used.
   8. All outlet boxes which require covers shall be provided with covers and they shall be of such construction and design as to fit exactly and match the outlet box on which they are installed. Switch boxes, etc., shall have covers so arranged as to be easily adjustable for alignment with the walls and finish. Pull boxes, etc., junction boxes, and all other outlet boxes to which no fixture or device is to be attached shall be fitted with blank covers.
   9. Provide special outlet boxes where space conditions limit the use of standard boxes.
   10. Junction boxes, pull boxes, and outlet boxes shall be of the size required to terminate all required conduits and wiring, but not smaller than the sizes indicated on the Drawings. Where larger boxes are required, the larger boxes shall be provided by the CONTRACTOR at no additional cost to the OWNER.
   11. Provide electrical connections for installed boxes.
   12. Subsequent to installation of boxes, protect boxes from construction debris and damage.

B. LOCATION:
   1. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
   2. The drawings indicate the approximate location of outlets and their grouping on the various circuits with "home runs" to respective distribution panels. The exact location shall be carefully laid out by this CONTRACTOR at the building in conference with the ENGINEER. The ENGINEER reserves the right to change the location of any outlet, before work is roughed in, a distance of 6 feet from the location shown without extra charge.
   3. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.
   4. Boxes shall not be installed back-to-back in walls. Provide not less than 6" separation.
   5. Where outlet boxes are located in suspended ceiling, the boxes shall be bolted to a steel bar of sufficient length to sustain firmly and securely the box in the ceiling construction.
   6. Unless otherwise shown, specified, or requested, outlet boxes, etc., shall be located in compliance with the requirements of ADA Standards. They shall be located with the center of their coverplates at the following elevations above the finished floor lines:

		CENTER OF BOX
Wall Switches	(Toggle Type)	48"
Wall Receptacles	(Duplex Type)	16"
Wall Telephone Outlets		16"
Thermostats		48"

All heights above the finished floor indicated on the drawings for devices shall be from the finished floor to the center of the coverplate. All heights below the finished ceiling indicated on the drawings for devices shall be from the finished ceiling down to the center of the coverplate.

7. Outlet boxes for receptacles for wall mounted electric water coolers shall be behind and completely concealed by the electric water cooler cabinet.
8. Any outlets shown where cabinet work, work benches, etc., are located shall be installed above the cabinet work or work bench whether indicated at that height on the Drawings or not. The exact location shall be as approved by the OWNER's representative.
9. Boxes for Concealed Conduits:
   a. Shall be flush mounted.
   b. Provide raised covers for boxes to suit the wall or ceiling construction and finish.

-- END OF SECTION --

SECTION 26 05 39 - UNDERGROUND ELECTRICAL CONSTRUCTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including DIVISION 01 Specification Sections apply to this Section.
B. Section 31 03 01, TRENCHING, BACKFILLING AND COMPACTING.
C. Section 26 00 00, BASIC ELECTRICAL REQUIREMENTS.
D. DIVISION 26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK

This Section includes the furnishing, construction and installation of conduits to form a complete underground raceway system.

1.3 REFERENCE STANDARDS

ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2016).
ASTM F512 - Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation; 2012.
NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
NEMA BI 50063 - Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installations; 2025.
NEMA TC 9 - Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation; 2004 (R2012).
NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
UL 651A - Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Shop Drawings:
   1. Submit drawings, catalog cuts, and descriptive literature in accordance with Section 01 04 01 SUBMITTALS.
   2. Include duct materials, and hardware. Proposed deviations from details on the Drawings shall be clearly marked on the submittals.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete: ACI 318. Concrete shall have 3000 psi minimum 28 day compressive strength.
B. Underground Conduits:
   1. Size: Conduits shall be sized as indicated.
   2. Conduits:
      a. Heavy Wall PVC Conduit: Schedule 40 PVC, UL 651 and NEMA TC 2. Duct shall be suitable for use with 90 degree C rated cables. Conduit shall be made from quality PVC resin, compounded to provide physical and mechanical properties as defined in ASTM F512, NEMA BI 50063 and/or UL 651A.

b. Rigid metal conduit: UL6 galvanized rigid steel.
   1) Where metal conduit is shown on drawings, or hereinafter specified, conduit shall have a coating of 20 mil bonded PVC, or shall be coated with two layers of half-lapped PVC tape.
3. Manufactured bends shall not be less than 36 inches in radius for conduits 4-inch diameter or larger.

PART 3 EXECUTION

3.1 EXCAVATING, TRENCHING AND BACKFILL

A. General:
1. All excavation, fill, and backfill and related work required by this Section of the Specifications is to be provided as a part of the work of DIVISION 26.
2. All excavation, fill, backfill and related work required by this Section of the Specifications is to be performed in accordance with the applicable requirements of Section 31 03 01, TRENCHING, BACKFILLING AND COMPACTION of the DIVISION 31 Specifications.
3. Work with extreme care near existing ducts, conduits, cables, and other utilities to avoid damaging them.
4. Cut the trenches neatly and uniformly.

3.2 CONDUITS INSTALLATION

A. General:
1. Underground conduits shall be in accordance with the NEC, as shown on the drawings, and as specified.
2. Upon completion of the conduits installation, a standard flexible mandrel shall be pulled through each duct to loosen particles of earth, sand, or foreign material left in the line. The mandrel shall be not less than twelve (12) inches long, and shall have a diameter 1/2-inch less than the inside diameter of the duct. A brush with stiff bristles shall then be pulled through each duct to remove the loosened particles. The diameter of the brush shall be the same as, or slightly larger than, the diameter of the duct.
3. Seal the ducts and conduits at building entrances, and at outdoor terminations for equipment, with a suitable nonhardening compound to prevent the entrance of moisture and gases.

B. Direct Burial Conduits:
1. Install direct burial conduits only where shown on the drawings.
2. Conduits shall be joined and terminated with proper fittings as recommended by conduit manufacturer.
3. Direct buried conduits may be PVC. Bends at stub-ups shall be galvanized rigid steel, either with 20 PVC coating or taped or specified.
4. Clearance between power and signal conduits shall be not less than six (6) inches.
5. Do not kink the ducts or conduits.
6. Place continuous strip of heavy gauge plastic approximately twelve (12) inches wide at twelve (12) inches above conduits before backfilling trenches. Plastic strip shall be marked "Electrical Conduits Below".

C. Concrete Encased Conduits:
1. Install concrete encased conduits for buried electrical circuits unless otherwise shown on the Drawings.
2. Duct banks shall consist of single or multiple conduits encased in concrete, and installed with top of duct bank not less than the indicated distance below established grade. Duct banks shall be uniform in size and material throughout the installation, unless otherwise shown or specified.
3. Rigid, unplasticized, polyvinyl chloride spacers shall securely support and maintain uniform spacing of the conduit assembly a minimum of three inches above bottom of trench during the concrete pour. Spacer spacing shall not exceed five (5) feet.
4. Clearances between individual conduits:

a. Clearances between individual conduits shall be not less than two (2) inches.
b. Provide plastic spacers to maintain clearances.
c. Provide nonferrous tie wires to prevent displacement of the conduits during pouring of concrete. Tie wires shall not act as substitute for spacers.

5. Couple the conduits with proper couplings. Couplings shall be staggered in rows and layers to insure maximum strength and rigidity of the duct bank.
6. The concrete envelope encasing the conduits shall extend not less than three (3) inches beyond the outside walls of the outer conduits.
7. Conduits shall be kept clean of earth, sand, or gravel during construction, and sealed with tapered plugs upon completion of each portion of the work.
8. Place continuous strip of heavy gage plastic approximately twelve (12) inches wide at twelve (12) inches above conduits before backfilling trenches. Plastic strip shall be marked “Electrical Conduits Below”.

-- END OF SECTION --

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SECTION 31 01 01 - FLOWABLE FILL

PART 1 GENERAL

1.1 REFERENCE STANDARDS

ACI 229R - Report on Controlled Low-Strength Materials; Latest Edition.
ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.
ASTM C138/C138M - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete; 2016a.
ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.
ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2016.
ASTM C495/C495M - Standard Test Method for Compressive Strength of Lightweight Insulating Concrete; 2012.
ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2016a.

1.2 WORK INCLUDED

A. Scope: This Section governs flowable fill or controlled low strength material for pipe embedment, encasement, and backfill. Flowable fill shall be utilized for all encasement and pipe caps for yard piping.
B. Flowable fill shall be described as a low cement content ready-mix material with high flow properties. Where flowable fill is shown for use on the Plans or described in the Specifications, it is intended that such fill be able to be removed at a later date if so desired with the use of ordinary trenching equipment or by hand excavation, High Air Generators shall be used with flowable fill to reduce shrinkage and/or facilitate pumping and/or limit compressive strength potential for future excavations.

1.3 RELATED SECTIONS

A. Section 01 04 01 - CONTRACTOR's Submittals.
B. Section 03 09 01 - General Concrete.
C. DIVISION 2 - Sitework.

1.4 QUALITY ASSURANCE

Material suppliers shall demonstrate experience in the manufacture of ready-mix concrete and flowable fill. Mix design submittal shall include quality statement on flowable fill performance, documented strengths, and previous applications.

1.5 SUBMITTALS

A. Submit mix designs with proportions of each component; strengths at 7 days and 28 days, materials descriptions with types and classifications, test results, density in-place and of wet mixture, air content, viscosity, setting time, shrinkage, yields, and flowability and pumpability characteristics. Mix design shall include batch proportions with unit weight measurements. Furnish information on methods and procedures proposed for grouting, and blocking and bulkhead designs and locations.
B. Suppliers utilizing materials to reduce shrinkage and/or lower compressive strength potential shall submit manufacturer's data on properties in comparative mixtures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

DaraFill Flowable Fill Performance Additive - Grace Construction Products or approved equivalent.

2.2 MATERIALS

A. Cement - Type I - ASTM C150/C150M or blended cement with flyash meeting the requirements for use in concrete.
B. Aggregate shall be free of organics and shall conform to ASTM C33/C33M.
C. Admixtures: DaraFill as manufactured by Grace Construction Products, or approved equivalent. Material shall be added per manufacturer's recommendations to achieve strength, flowability and pumpability requirements.

2.3 CONCRETE MIXES

A. CONTRACTOR shall develop mix designs of flowable fill for each application required and shall coordinate flowability, pumpability, unit weight, strength, and air content for each application. Air contents shall be between 15 percent and 30 percent. Minimum cementitious content shall be 200 pounds per cubic yard. Concrete mixtures shall provide high flow properties without segregation. Shrinkage shall be less than 1 percent by volume.
B. Unless otherwise noted, flowable fill shall be designed for between 200 psi and 500 psi at 28 days. In absence of test data, provide mixtures with materials described above and having wet unit weight measurements in the range of 95 to 115 lbs/cu ft.
C. Flowable fill may be completely mixed in a concrete truck or manufactured at the job site by mixing cement-sand slurry with a preformed foam.

PART 3 EXECUTION

3.1 GENERAL

A. For annular space grouting, the entire annular space and length of the space shall be filled with grout, produced and placed by experienced personnel, using manufacturer's approved methods and equipment.
B. General procedure shall be to bulkhead both ends of the annular space or piping or trench to be filled. In long closures, provide ventilation taps where necessary. Secure flumes and pipe to prevent floatation during placement of flowable fill. Secure members mechanically, or bed with short lift of stiff flowable fill.
C. Fill for pipe encasement shall be done in lifts unless otherwise approved by the ENGINEER. CONTRACTOR shall coordinate fill locations and grouting pressures with flowable fill design such that specified grouting pressures are not exceeded. Removable internal stiffeners may be installed provided no internal modification or damage is done to the Pipe.
D. The annular volume or pipe volume to be filled shall be calculated and utilized as a verification that the entire space has been filled. The consumed volume shall also be monitored and shall be acceptable if within 10 percent of the calculated volume.
E. For all applications, the CONTRACTOR shall plan deliveries and/or production of flowable fill to ensure continuous grouting operation for the entire segment until completed.
F. For grouting other than annular spaces and for use of flowable fill as trench backfill under paved areas, CONTRACTOR shall block and anchor pipe to grade and alignment to prevent floatation or movement during placement and flowable fill shall be placed in a minimum of 2 lifts, the first one below and to not more than D/4 on the sides of the pipe.

3.2 TESTING

For every flowable fill application, CONTRACTOR shall obtain three (3) samples of each batch and test compressive strength in accordance with ASTM C495/C495M or ASTM C109/C109M for 7-day and 28-day strengths.

-- END OF SECTION --

SECTION 31 02 01 - STRUCTURAL EXCAVATING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.1 REFERENCE STANDARDS

29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2015.
ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.
ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.
TxDot Item 247 (2004) Flexible Base

1.2 WORK INCLUDED

A. Excavation, backfill and compaction around structures.
B. Site excavation and backfilling.
C. Excavation support systems.
D. Fill for over-excavation.
E. Groundwater and surface water control.
F. Excavation for paving and landscaping.

1.3 QUALITY ASSURANCE

Test material to be used as compacted fill, whether excavated onsite or imported as offsite borrow, for compliance with the requirements of Section 31 06 01 prior to placement.

PART 2 PRODUCTS

2.1 MATERIALS

A. Excavation Support System: CONTRACTOR's option, suited for purpose.
B. Fill Materials: In accordance with schedule in Section 31 06 01, and as shown on the Plans. Material Specifications in Section 31 06 01 shall be met.

PART 3 EXECUTION

3.1 PREPARATION AND LAYOUT

A. Establish extent of structural excavation by area and elevation; designate and identify datum elevation.
B. CONTRACTOR shall set required lines and levels.
C. Maintain benchmarks and other reference points.

3.2 PROTECTION

A. Protect, support and/or reroute existing utilities.
B. Protect adjacent work from damage by excavation and backfilling operations.
C. Protect adjacent structures from undermining.
D. Support sides of excavations to prevent soils movement which may diminish the excavation width below width required for working.
E. Support sides of excavation which interfere with normal 45 degree bearing splay of any foundation.

3.3 EXCAVATION SUPPORT SYSTEMS

A. Design, installation and maintenance of temporary excavation support systems is the responsibility of the CONTRACTOR. Provide support systems at no additional expense to OWNER.
B. Design and construct excavation support systems in accordance with OSHA Standards and interpretations 29 CFR 1926.
C. For excavation exceeding 20 feet, it will be required to have side slopes designed by professional ENGINEER licensed in the State of Texas.

3.4 GROUNDWATER AND SURFACE WATER CONTROL

A. CONTRACTOR is responsible for designing, providing and maintaining a system for control of groundwater at no additional expense to OWNER.
B. Provide adequate swales, dams, ditches and grades to prevent surface water from flowing into excavation.
C. Maintain water control until structure is complete and backfill is brought to final grade unless otherwise directed by ENGINEER.
D. Groundwater or water from other sources may be present in excavations regardless of whether shown on boring logs.

3.5 EXCAVATION

A. Excavate to lines and grades shown on the Drawings. Excavations shall be either braced or shored or laid back to a slope no steeper than two horizontal to one vertical unless specifically shown otherwise in CONTRACTOR's Trench Safety Plan.
B. When excavation is essentially complete, verify depths and dimensions as well as soil classification and bearing capacity.
C. Perform additional excavation only as approved by the OWNER.
D. Correct unauthorized excavation as directed at no cost to OWNER.
E. Fill over-excavated areas under structure bearing surfaces with lean concrete, flowable fill, or compacted Class 3 Aggregate Fill as required by the ENGINEER.
F. Excavate to within 1-foot of final grade, making final excavation immediately prior to placement of mud slab. Limit area of final excavation to that which is being prepared for concrete placement. Limit exposure of final excavated surface to eight hours. Keep excavations free of standing water until concrete and backfill operations are complete.
G. Mud slabs shall be used beneath all footings and slabs on grade.

3.6 BACKFILLING

A. Verify fill materials to be reused are acceptable.
B. Verify foundation perimeter drainage installation (if required on plans) has been inspected.
C. Verify underground tanks are anchored to their own foundation to avoid floatation after backfilling.
D. Generally, compact subgrade to density requirements for subsequent backfill materials.
E. Cut out soft areas of subgrade not capable of in-situ compaction. Backfill with Class 3 aggregate fill or compact to density equal to or greater than requirements for subsequent backfill material.
F. Prior to placement of aggregate base course material for paved areas, remove soft or unstable areas and replace with aggregate base course material, then scarify subgrade to a depth of 6 inches and compact to a minimum of 95 percent of ASTM D698 at a moisture content within 3

percent of optimum moisture. Density and moisture content of the compacted subgrade shall be maintained until it has been covered with base course material.

G. Backfill areas to contours and elevations with unfrozen materials.
H. Backfill around structures as soon as possible after approval by the ENGINEER.
I. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
J. Backfill with select fill within two feet of structure unless otherwise indicated on the Drawings.
K. Fill materials shall be as shown on the Plans and included in the Specifications. Materials are specified in Section 31 06 01. Place and compact in continuous layers not exceeding eight inches loose depth. Avoid heavy or intense compaction against and within five feet of structure.
L. Maintain specified moisture content of backfill materials to attain required compaction density.
M. Do not backfill against walls until concrete has been in place at least seven days. Water bearing structures shall not be backfilled until hydrostatic test results are acceptable.
N. Do not backfill against unsupported foundation walls or partially completed structures until after main floor slabs have been in place at least seven days and placement is approved by the ENGINEER. Water bearing structures shall not be backfilled until hydrostatic test results are acceptable.
O. Backfill simultaneously on each side of foundation walls and other structures to equalize soil pressures. Provide temporary bracing as required.
P. Take special care to prevent wedging action against structure. Bench or serrate slopes bounding excavation.
Q. Slope grade away from building minimum 1/4-inch per foot, unless noted otherwise.
R. Make grade changes gradual. Blend slope into level areas.
S. Relocate surplus backfill materials to location indicated on-site as directed by OWNER, at no cost to OWNER.
T. Tolerance for Top Surface of Backfilling: Plus or minus 1 inch from required elevations.

3.7 COMPACTION

A. Remove shoring and sheeting unless otherwise approved by the ENGINEER. The cost of abandoned shoring and sheeting is to be borne by the CONTRACTOR.
B. Compact fill materials in accordance with Section 31 06 01.
C. Remove and replace improperly compacted backfill material at no cost to OWNER.

3.8 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by OWNER'S Representative.
B. Tests and analysis of fill material will be performed in accordance with ASTM Standards.
C. Compaction testing will be performed in accordance with ASTM D698.
D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to OWNER.
E. Frequency of Field Density Tests:
    1. Sand Fill: One test per 3000 Square Feet, but not less than 3 tests per 6-inch compacted lifts.
    2. Select Fill: One test per 3000 Square Feet, but not less than 3 test per 6-inch compacted lift.
    3. Site Fill: One test per 3000 Square Feet, but not less than 3 test per 6-inch compacted lift.

3.9 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 02 01 01.
B. Recompact fills subjected to vehicular traffic.

3.10 CLEAN UP

Remove surplus fill materials to on-site spoil areas as directed by the OWNER at no cost to OWNER.

-- END OF SECTION --

SECTION 31 03 01 - TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.1 WORK INCLUDED

Trenching for buried piping systems as well as subsequent embedment, backfill and compaction operations, necessary to install the pipe as specified.

1.2 QUALITY ASSURANCE

1.3 REFERENCE STANDARDS

TxDOT Specification Item 247
TxDOT Specification 334

1.4 PROTECTION

A. Protect trees, shrubs, and lawn areas to receive planting, and other features remaining as part of final landscaping.
B. Protect benchmarks, existing structures, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic. Install and maintain bridging, planking and cants to provide access to Work.
C. Protect excavations by shoring, bracing, sheet piling, underpinning, or by other methods, as required to prevent cave-ins or loose soil from falling into excavations.
D. Underpin or otherwise support adjacent structures which may be damaged by excavation work. This includes service lines and pipe chases.
E. Notify the ENGINEER of unexpected subsurface conditions.
F. Where damage could result from continuing work, discontinue work in area until resident inspector notifies the CONTRACTOR of the required modifications.
G. Protect bottom of excavations and soil around and beneath foundations from frost, freezing, and excessive moisture changes.
H. Grade around trenches to prevent surface water runoff into excavated areas.
I. Protect above or below grade utilities including lateral lines, sprinkler system lines, and all other lines which are to remain. The cost of replacing damaged lines is to be borne by the CONTRACTOR.

PART 2 PRODUCTS

2.1 BED AND FILL MATERIALS

A. Refer to specifications Section 31 06 01, SITE GRADING AND EARTHWORK, for requirements of Aggregate Fill Classifications and to the Drawings for locations and dimensional requirements.
    1. Embedment and initial backfill for PVC pipe larger than 2 inches, steel pipe, and DIP pipe shall be Class 2 Aggregate Fill. If not shown on the Plans, embedment and initial backfill shall be Class 2 Aggregate fill. Embedment and initial backfill for small plastic pipe shall be sand fill.
    2. Embedment for RCCP and HCP shall be Class 3 Aggregate Fill. Initial backfill shall be non-expansive earthfill.
    3. Flowable fill (foam grout) shall conform to specifications Section 31 01 01, FLOWABLE FILL.
    4. Concrete shall conform to Section 03 09 01, GEENERAL CONCRETE.
    5. Trench backfill under paving and to 5 feet outside of pavement shall be sand to within top 1 foot. Top 1 foot shall be Flowable fill with top 2 inches being cold mix asphalt.

PART 3 EXECUTION

3.1 PREPARATION AND LAYOUT

A. Establish extent of excavation by line and elevation. Designate and identify datum elevations.
B. Set required lines and levels.
C. Maintain benchmarks, monuments and other reference points.

3.2 UTILITIES

A. Known underground utilities are indicated on the Drawings.
B. Before starting excavation, establish the location and extent of underground utilities occurring in the work area.
C. As excavation approaches utilities, hand excavate to uncover utilities.
D. Notify the ENGINEER for direction for removal and/or relocation of utility companies' lines which are in the way of excavation.
E. Maintain, re-route or extend as required, existing utility lines to remain which pass through work area with the approval of the OWNER. Relocations are at the CONTRACTOR's cost.
F. Protect utility services uncovered by excavation.
G. Accurately locate and record abandoned and active lines rerouted or extended on Project Record Documents.

3.3 TRENCHING

A. Ensure trenching does not interfere with normal 45 degree bearing splay of any foundation.
B. Excavate in accordance with lines and grades. Excavated material which meets respective backfill requirements may be used for backfilling, stockpile or remove as applicable.
C. Cut trenches sufficiently wide to enable proper installation of services and to allow for inspection. Minimum trench width shall be 6 inches wider than the pipe outside diameter. Pipe shall be installed in center of trench, with not more than 12-inch clearance nor less than 4-inch clearance between pipe wall and trench wall at any point. Trim and shape trench bottoms and leave free of irregularities, lumps and projections. Over excavated trench depths shall be filled to the proper grade with embedment material at no additional cost to the OWNER.
D. Existing pavement over trenches shall be removed to a width of 6 inches outside the trench on each side by sawing methods and to a neat line. Asphalt pavements shall be sawed for full depth. Concrete pavement shall be sawed to a depth which will allow the section to be removed smoothly without underbreakage. Brick pavement shall be removed by hand methods in a manner that will not damage bricks, and the bricks shall be delivered and hand stacked as designated by the OWNER.
E. Trench width shall be not more than 24 inches wider than outside diameter of pipes. Walls shall be vertical to elevation equal to 12 inches above the top of the pipe. Whenever the prescribed maximum trench width is exceeded, the CONTRACTOR shall use the next higher class of embedment, at no additional cost to the OWNER.
F. Do not disturb soil within branch spread of existing trees or shrubs that are to remain. If it is necessary to excavate through roots, perform work by hand and cut roots with a sharp axe.
G. When complete, request the resident inspector to inspect excavations. Correct unauthorized excavation as directed, at no cost to the OWNER.
H. If, in the opinion of the resident inspector, the undisturbed material at grade depth is unstable, the CONTRACTOR shall be required to remove the unstable material and fill the trench to the proper subgrade with embedment material. Payment will be made to the CONTRACTOR at the unit price per cubic yard set forth in the Bid Schedule.

I. Unsuitable excavated subsoil including perishable, spongy material, large rock, or other material designated by the resident inspector shall not be used in backfilling. Unsuitable material shall be disposed of by the CONTRACTOR, at no cost to the OWNER, in a manner approved by the OWNER.

3.4 SHEETING AND SHORING

A. In caving ground or in wet, saturated or flowing or otherwise unstable materials, the sides of all trenches and excavations shall be adequately sheeted and braced, to maintain the excavation from slides or cave-ins and to provide safety for workmen.

B. Sheeting and shoring shall be designed by professional ENGINEER, licensed in the State of Texas.

C. Sheeting, shoring, and bracing shall be removed unless otherwise approved by the ENGINEER. Removal of sheeting, shoring, and bracing shall be performed in a manner to prevent damage to new or existing structures and to avoid cave-ins or sliding of the banks. All holes and voids from the sheeting shall be immediately and completely filled and compacted with suitable materials. All costs associated with the abandonment of sheeting, shoring and bracing shall be borne by the CONTRACTOR.

3.5 DEWATERING

A. Keep trenches dry. Provide necessary equipment including pumps, piping and temporary drains. Maintain groundwater level a minimum of 3 feet below bottom of excavations during construction.

B. Direct surface drainage away from excavated areas. Provisions shall be made for the satisfactory disposal of water pumped to prevent damage to public or private property.

C. Control the grading in and adjacent to excavations to prevent water running into excavated areas or onto adjacent properties or thoroughfares.

D. Furnish and operate suitable pumps on a 24 hour basis to keep excavations free of water until services have been placed and backfilling is completed.

3.6 BEDDING

The CONTRACTOR shall install the pipe and complete the bedding so that the installation may be inspected prior to backfilling. The OWNER's inspector shall be notified by the CONTRACTOR when the bedding is complete for each particular segment. Any excavation areas backfilled without the OWNER's prior inspection will require uncovering and checking at the CONTRACTOR's expense.

Manually place and compact bedding material in layers not exceeding six inches.

Manually shape bedding material to conform to pipe barrel and bell or flanges such that the entire length of the pipe barrel is supported by the bedding material.

Embedment and initial backfill materials shall be placed as shown on the plans and compacted in six inch layers along sides of pipe and to a minimum depth of 12 inches over the top of the pipe.

3.7 SETTING VALVES, VALVE BOXES AND FITTINGS

Gate valves and pipe fittings shall be set joint to new pipe in the manner specified for cleaning, laying and jointing pipe.

Valve boxes shall be firmly supported and centered plumb over the wrench nut of the gate valve, with box cover flush with the surface of the finished pavement or at such level as directed.

Standard plugs shall be inserted into the bells of all dead ends of pipe, tees or crosses and spigot ends shall be capped. Plugs or caps shall be jointed to the pipe or fitting in the manner specified above.

Concrete blocking will be required at all tees, bends, crosses and fire hydrants as provide herein. Blocking shall be placed between solid ground and the fittings. The bearing on the pipe and ground to be as detailed or as may be directed.

3.8 BACKFILLING

After pipe has been laid on the specified bedding material and all joints have been made, the backfilling of the trench shall begin. All trenches as a minimum shall have the bedding material extended to the top of the pipe and select backfill to a point 6" above top of pipe. Except as specified for backfilling trenches in streets, the remainder of the trench shall be backfilled using material excavated. In areas where the natural terrain provides less than 2 feet of cover for the proposed line, the CONTRACTOR shall construct a backfill mound over the trench. This trench shall be no less than 6 feet wide, not greater than 14 inches tall, and shall provide 24 inches of cover over the proposed line. In areas where the proposed line crosses drainage channels, a 6 inch concrete cap shall be placed over the line to the satisfaction of the ENGINEER.

A. Do not start backfilling until services have been inspected.
B. Ensure trenches are free of building debris, snow, ice, and water and that ground surfaces are not in a frozen condition.
C. Backfill systematically and as early as possible to allow maximum time for natural settlement and compaction.
D. Place and compact backfill materials in continuous layers according to the approved method of compaction. Use a method which will not disturb or damage services. No excessively large rocks or debris of any sort shall be used as backfill.
E. Maintain moisture content and compaction density of fill materials as required.
F. Acceptable backfill shall be placed from eight inches over the pipe to the surface.
G. Excavated unsuitable material and excess material shall be disposed of by the CONTRACTOR, at no cost to the OWNER, in a manner approved by the OWNER.
H. Backfilling Trenches in Outside Paved Areas:
    1. After pipe has been placed to the grade, alignment and bedding to the top of pipe, the trench shall be backfilled with select material to a level 6 inches above the top of pipe. The select backfill shall be place carefully by depositing the backfill material vertically by hand or by machines in such a manner that the pipe will not be displaced laterally and the pipe will not be damaged by contact with the backfill material, tools or equipment. Above this level, backfill may be shoveled or pushed into the ditch by hand or machine, completely filling the trench.
    2. In no event shall the backfill material contain rocks larger than 4 inches.
    3. The backfill material shall be neatly rounded over the trench and smoothed such that the height of the backfill mound over the trench does not exceed 14 inches above the original ground surface. Any excess excavated material that is not required to make the mound over the pipe trench shall be disposed of to the satisfaction of the OWNER.
    4. Any deficiency of backfill material shall be supplied by the CONTRACTOR.
I. Backfilling Trenches in Asphalt Paved Areas:
    1. Where the trench crosses or lies within existing asphalt paved areas, the trench shall be backfilled with sand or granular material to 14 inches below the surface elevation. Compacted crushed base material shall then be added from the top of the backfill material to the surface. The base material for the 14 inch crushed base course shall meet the requirements of TxDOT Specification Item 247, Grade 1, Type A.
    2. In asphalt paved area, the top 2 inches of the base course shall be removed prior to application of the 2 inch asphalt surface layer. Then, the base course shall be primed with

0.25 gallon per square yard with MC-30. After allowing a minimum of 6 hours curing time, the areas shall receive 2 inches of Type "D" Hot Mix asphalt at a compacted density of 140 pounds per square yard and applied in a manner to be smooth and level with existing pavement. Asphalt shall meet the minimum requirements of TxDOT Specification 334.

J. Backfilling Trenches in Concrete Paved Area:
   1. Where the trench crosses or lies within existing concrete paved areas, the trench shall be backfilled with sand or granular material to 19 inches below the suface elevation. Compacted crushed base material shall then be added from the top of the backfill material to the surface. The base material for the 19 inch crushed base course shall meet the requirements fo TxDOT specification Item 247, Grade 1, Type A.
   2. The top 7 inches of the base course shall be removed prior to application of the concrete surface layer and replaced with 7 inches of 4500 psi concrete with reinforcement per the plan details. This concrete shall be doweled into existing surrounding concrete.

3.9 COMPACTION

A. Compact embedment and initial backfill materials per General Requirements.
B. Remove and replace improperly compacted backfill material at no cost to OWNER. Additional trench settlement following completion shall be restored to a level surface. Trench surfaces may be left crowned in open country.
C. Water jetting for consolidation will not be permitted within 25 feet of any structures, unless acceptable to the ENGINEER.

3.10 TRENCH SETTLEMENT

The CONTRACTOR shall be responsible for all settlement of backfills, fills, and embankments which may occur within one (1) year after final completion of the contract under which the work was performed.

The CONTRACTOR shall make, or cause to be made, all repairs or replacements made necessary by settlement, within thirty (30) days after notice from ENGINEER or OWNER at the CONTRACTOR's own expense.

3.11 CLEAN UP

The Contractor shall, at no cost to the OWNER, remove surplus fill materials to on-site spoil areas as directed by the OWNER .

-- END OF SECTION --

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SECTION 31 06 01 - SITE GRADING AND EARTHWORK

PART 1 GENERAL

1.1 REFERENCE STANDARDS

ASTM C131/C131M - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine; Latest Edition.
ASTM C535 - Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine; Latest Edition.
ASTM C88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate; Latest Edition.
ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.
ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
ASTM D4221 - STANDARD TEST METHOD FOR DISPERSIVE CHARACTERISTICS OF CLAY SOIL BY DOUBLE HYDROMETER; Latest Edition.
ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table; Latest Edition.
ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012.
ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.
TXDOT Item 247

1.2 WORK INCLUDED

A. General excavation and fill operations for buildings. Rough grading and contouring of site, and drainage ditches.
B. Aggregate fill and earth fill material classifications and requirements.
C. OWNER is responsible for payment of all soils test. ENGINEER is responsible for determining all tests necessary. CONTRACTOR is responsible for allowing time in the construction schedule for testing any required rework.

1.3 QUALITY ASSURANCE

A. All materials to be used whether excavated on-site or imported as offsite borrow, shall be tested for compliance with the requirements of this section prior to placement.
B. Notify OWNER and ENGINEER when bearing material (bottom of excavation) is reached for observation of founding strata.
C. Prior to furnishing any soils to the site, CONTRACTOR shall furnish a written, notarized certification from the landowner of each proposed offsite soil borrow source stating that to the best of the landowner's knowledge and belief, there has never been contamination at the borrow source site with hazardous toxic materials.

1.4 SUBMITTALS

Submit test reports for all specified parameters for each material classification used prior to placing material and at intervals of 2000 cy during placement. Obtain representative samples from multiple locations from stockpiles for each test.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Stockpile excavated materials and/or borrow in designated areas or in areas as approved by the ENGINEER. Do not stockpile material in the flood plain.

B. Lightly compact and slope top of stockpiles to prevent excessive erosion and ponding of water.

1.6 PROTECTION

A. Protect trees, shrubs, lawns, and other features remaining as portion of final landscaping.
B. Protect benchmarks, existing structures, fences, roads, sidewalks and paving.
C. Protect above or below grade utilities which are to remain. Do not take existing utilities out of service without specific authorization by the OWNER. Notify OWNER at least five working days prior to taking existing utilities out of service to make connections or for removal of utility.
D. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods, as required to prevent cave-ins or loose soil from falling into excavations.
E. Underpin adjacent structures which may be damaged by excavation work, including service lines and pipe chases.
F. Notify the ENGINEER of unexpected subsurface conditions.
G. Where damage could result from continuing work, discontinue work in area until ENGINEER notifies the CONTRACTOR of the required modifications.
H. Protect bottom of excavations and soil around and beneath foundations from frost, freezing, and excessive moisture changes.
I. Grade around excavations to prevent surface water runoff into excavated areas. During excavation, maintain grades for complete drainage. Install temporary drains or drainage ditches as needed to intercept or divert surface water and prevent interference or delay of the Work. Install groundwater pumping facilities and hoses/piping required to perform the work. The pumping of water shall be included in the appropriate lump sum bid items. No separate payment will be made for drainage control or ground water pumping.
J. Repair damage, promptly, at no cost to OWNER.

PART 2 PRODUCTS

2.1 MATERIALS

A. Class 1 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131/C131M or ASTM C535. When material is subjected to five (5) cycles of the sodium sulfate soundness test in accordance with ASTM C88, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the ENGINEER and shall meet the following gradation in accordance with ASTM D448, size number 57:

SIEVE SIZE SQUARE OPENING	PERCENT PASSING
1-1/2 inches	100
1-inch	95-100
1/2 inch	25-60
No. 4	0-10
No. 8	0-5

B. Class 2 Aggregate Fill: Consist of durable particles of crushed or weathered limestone free of unsuitable, soft, or organic material will be considered. The source of the material shall be approved by the ENGINEER. Bin #10 or chat material complying with the following gradation requirements:

SIEVE SIZE SQUARE OPENING	PERCENT PASSING
3/4-inch	100
1/2-inch	95-100

3/8-inch	90-100
1/4-inch	65-80
No. 4	30-40
No. 20	0-5

C. Class 3 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131/C131M or ASTM C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the ENGINEER and meet the following gradation:

SIEVE SIZE SQUARE OPENING	PERCENT PASSING
1-3/4-inch	100
7/8-inch	65-90
3/8-inch	50-70
No. 4	35-55
No. 40	15-30
No. 100	0-12 Wet Sieve Method

D. Crushed Limestone Base Material: Shall meet the requirements of 2004 TXDOT Item 247, Type A, Grade 2 or better.

E. Non-Expansive Earth Fill: Consist of soil materials with a liquid limit of 35 or less, a plasticity index between 5 and 15, a minimum of 35 percent passing the No. 200 sieve, a minimum of 85 percent passing the No. 4 sieve, and which are free of organics or other deleterious materials. When compacted to the recommended moisture and density, the material shall have a maximum free swell value of 0.5 percent and a maximum hydraulic conductivity (permeability) of 1 E-05 cm/sec, as determined by laboratory testing of remolded specimens of the actual materials proposed for the non-expansive earth fill.

F. General Earth Fill: Consist of any soil materials which have a minimum plasticity index of 8, a minimum of 20 percent passing the No. 200 sieve, a minimum of 75 percent passing the No. 4 sieve, and which are free of organics or other deleterious material. On-site soils are sometime suitable for use as general earth fill.

G. Select Fill:
   1. Non-organic, sandy clay or clayey sand.
   2. Liquid limit less than 36.
   3. Plasticity index ranging from 5 to 18.
   4. Sieve Analysis: Maximum percent retained on No.4 sieve = 25 to 50 and on No.40 sieve = 50 to 75.
   5. Maximum of 70 percent passing #200 sieve.
   6. Maximum size of aggregate 1-3/4 inches.
   7. On-site soils may be blended and utilized for select fill if approved by the ENGINEER and if the blended material complies with the select fill requirements above.

H. Sand Fill or Sandy Select:
   1. Granular material of uniformly graded crushed rock from 3/4-inch U.S. sieve downward.
   2. Plasticity Index: Maximum of 5.
   3. Sieve Analysis:

SIEVE NO.	MAX. PERCENT PASSING
1-inch	100

No. 10	50
No. 40	30
No. 200	8

I. Low-Permeability Earth Fill: Consist of soil materials classified as CH or CL in accordance with ASTM D2487. The materials also shall have a minimum liquid limit of 40, a minimum plasticity index of 20, a minimum of 50 percent passing the No. 200 sieve, and shall be free of organics or other deleterious materials. The material shall have a Percent Dispersion of less than 20 when tested in accordance with ASTM D4221. When compacted to the recommended moisture and density, the material shall have a maximum hydraulic conductivity of 1 E-07 cm/sec, as determined by laboratory testing of remolded specimens of the actual materials proposed for the low-permeability fill.

J. Unclassified Material: All material excavated from site not meeting the requirements for topsoil, or classified materials.

PART 3 EXECUTION

3.1 PREPARATION AND LAYOUT

A. Establish extent of site grading by area and elevation; designate and identify datum elevation.
B. CONTRACTOR shall set required lines and levels.
C. Maintain benchmarks, monuments and other reference points.

3.2 UTILITIES

A. Approximate locations of known underground utilities are indicated on the Drawings. The CONTRACTOR is responsible for locating all existing utilities prior to construction.
B. Before starting excavation, the CONTRACTOR is to establish location and extent of underground utilities occurring in work area.
C. Notify the ENGINEER for direction for removal and/or relocation of lines which are in the way of excavation.
D. Maintain, reroute or extend as required, existing utility lines to remain which pass through work area with the approval of the OWNER.
E. Support and protect utility services uncovered by excavation.
F. Accurately locate and record abandoned and active lines rerouted or extended, on Project Record Documents.
G. As excavation approaches utilities, hand excavate to uncover utilities.

3.3 EXCAVATION

A. Before starting excavation, clear and grade work area to minimum depth shown on Plans. Strip top soil approximately 6 inches to 12 inches, depending on location and stockpile.
B. Excavate in accordance with lines and levels required for construction of the Work.
C. When excavation is through paved areas, cut pavement to provide a square, uniform edge with minimum disturbance of remaining pavement and replace in accordance with the Drawings.
D. In all areas requiring rock excavation, the CONTRACTOR shall install the pipe and complete the "rock free" bedding so that the installation may be inspected prior to backfilling. The OWNER's inspector shall be notified by the CONTRACTOR when the bedding is complete for each particular segment. Any rock excavation areas backfilled without the OWNER's prior inspection will require uncovering and checking at the CONTRACTOR's expense.
E. Machine slope banks.
F. Hand trim excavations and leave free from loose or organic matter.

G. Provide and maintain surface and groundwater control until backfilling is complete. Keep excavations free from standing water.
H. Do additional excavation only by written authorization of ENGINEER.
I. Correct unauthorized excavation as directed, at no cost to OWNER. Areas that are excavated to elevations below those shown on the Plans shall be backfilled and compacted with crushed rock (Class 3 Aggregate Fill) if area is under aggregate fill, pipe, or structure, and otherwise with non-expansive earth fill.
J. Excavations should not interfere with normal 45 degree bearing splay of any foundation unless sheeting and/or shoring is designed and provided for excavation.
K. Stockpile excavated material in areas designated by ENGINEER according to classifications given under materials portion of this section.
L. Do not disturb soil within branch spread of existing trees or shrubs that are to remain.
M. Coordinate with OWNER's representative prior to reaching founding level for foundations and prior to placing mud slabs to request observation.

3.4 COMPACTED FILL

A. Preparation for Fill Placement:
   1. Do not start backfilling operations until structures have been inspected and backfilling authorized by OWNER's representative or the ENGINEER. Backfill against structures in accordance with Section 31 02 01, STRUCTURAL EXCAVATING, BACKFILLING AND COMPACTING.
   2. Ensure areas to be filled are free from debris, snow, ice and water, and that ground surfaces are not in a frozen condition.
   3. Do not place fill over existing subgrade surfaces which are porous, wet or spongy.
   4. Proofroll subgrade with minimum 25-ton pneumatic roller or loaded dump truck under observation of OWNER's representative. Remove soft or unstable areas and replace with select fill, then scarify subgrade to a depth of 6 inches and compact to a minimum of 95 percent of ASTM D698 at a moisture content within 3 percent of optimum moisture. Density and moisture content of the compacted subgrade shall be maintained until it has been covered with the next course of construction.
   5. Place compacted fill to grades, contours, levels and elevations shown on Drawings. After dumping, spread the material in horizontal layers. Place fill in maximum 6-inch compacted lifts compacted to a minimum of 95 percent Standard Proctor (ASTM D698) at a moisture content within 3 percent of optimum moisture. Density and moisture content of each lift of fill must be maintained until the next lift is placed.
   6. Existing hillsides or slopes which will receive fill should be loosened by scarifying or plowing to a depth of not less than 8 inches. The fill material shall be benched into the existing slope in such a manner as to provide adequate bonding between the fill and slope, as well as to allow the fill to be placed in horizontal lifts.
   7. Fills should extend a minimum of 5 feet outside of building lines and slope to natural grade.
B. Material Placement:
   1. General:
      a. Place fill in maximum 6-inch compacted lifts compacted to a minimum of 95 percent Standard Proctor (ASTM D698) at a moisture content within 3 percent of optimum moisture. Density and moisture content of each lift of fill must be maintained until the next lift is placed. Use a method so as not to disturb or damage completed work constructed in the excavations.
      b. If the surface is too smooth and hard to bond properly with a succeeding layer, the surface shall be roughened and loosened by disking before the succeeding layer is placed.

c. Where fill is to be placed next to existing fill, that fill shall be removed to unweathered, dense material. Each layer shall be benched and disked as adjoining lifts are placed. Material hauling equipment shall be so routed to prevent the formation of ruts.
d. The surface of the fill shall be graded to drain freely and maintained throughout construction. During the dumping and spreading process, all roots, debris and all rocks greater than 3 inches in maximum dimension shall be removed.
e. Following the spreading and mixing of the soil, it shall be processed by disking or pulverizing throughout its thickness to break up and reduce clod size, and provide additional blending of materials.
f. The moisture content of the soil shall be adjusted, if necessary, by either aeration or the addition of water to bring the moisture content within the recommended range. Water required for sprinkling to bring the fill material to the proper moisture content shall be applied evenly through each layer.
g. Any layers which become damaged by weather conditions shall be processed to meet recommended requirements. The compacted surface of a layer of fill shall be lightly loosened by disking before the succeeding layer is placed.

C. Compaction:
1. Compact fill materials listed below to required percentages of maximum dry density.
a. Compact non-expansive earth fill in top 12 inches under paving or building to a minimum of 95 percent of maximum dry density of an ASTM D1557 Modified Proctor at a moisture content with 3 percent of optimum moisture.
b. Compact non-expansive earth fill and general earth fill not under roads or in embankment and more than 1 foot beneath roads to a minimum of 95 percent of ASTM D698 at a moisture content within 3 percent of optimum moisture.
c. Compact non-expansive earth fill against underground walls to between 95 and 100 percent of ASTM D698 at a moisture content within 3 percent of optimum moisture.
d. Place Select Fill in maximum 6-inch compacted lifts compacted to a minimum of 95 percent Standard Proctor (ASTM D698) at a moisture content within 3 percent of optimum moisture.
e. Minimum Frequency of Density Tests:
1) Bearing: 1 test/3000 square feet per list or minimum of 2 tests per lift.
2) Structure Fills: 1 test/3000 square feet per lift, minimum 2 test per lift.
3) Backfill: 1 test/6000 square feet per lift, minimum 2 tests per lift.
4) Trench backfill: 1 test/150 Lf trench per lift, minimum 2 tests per lift.
f. The CONTRACTOR shall be responsible for the actual quality of the fill, in place. Satisfactory test results shall not be considered as the sole factor of the quality of the fill operation.
g. The moisture content and density of all fill shall be maintained at the specified range of moisture and density.
2. Compact aggregate fill material in maximum 6-inch thick lifts.
a. Aggregate fill for pipe bedding shall be compacted to a minimum of 95 percent of maximum density as determined by ASTM D4253. The moisture content shall be in a range that will accommodate efficient placement and compaction.
3. Prior to placement of aggregate base course material for paved areas, remove soft or unstable areas and replace with aggregate base course material, then scarify subgrade to a depth of 6 inches and compact to a minimum of 95 percent of ASTM D698 at a moisture content within 3 percent of optimum moisture. Density and moisture content of the compacted subgrade shall be maintained until it has been covered with base course material.

3.5 SUBGRADE

A. The CONTRACTOR shall excavate or fill to the top of proposed subgrade so that the specified thickness of base course material will be obtained across the section. After excavation or fill has been made to the subgrade elevation as shown on the Plans, the CONTRACTOR shall

prepare the subgrade for compaction by scarifying and disking the subgrade a minimum of 6 inches and a maximum of 8 inches. Water shall be added to the soil if necessary, and the soil disked again to obtain a uniform moisture content throughout the depth of the subgrade. Moisture of the compacted subgrade shall be at optimum moisture content or at a tolerance of +/- 3%, which will be determined by soil laboratory analysis. If it is determined the moisture content is not uniform or within the limits specified, water shall be added and the subgrade disked again; or the soil shall be disked to the extent necessary to dry the soil to the specified limits, all at the CONTRACTOR's expense.

B. After the subgrade has been prepared to the specified moisture content, subgrade shall be compacted for the full street section to 95% per ASTM D698 for a depth of 6 inches. Any areas of subgrade failing to meet the specified density shall be re-disked and recompacted until the correct density is obtained, all at the CONTRACTOR's expense. If determined by the ENGINEER or City Representative, a minimum of one density test per 6,000 square feet shall be made by an independent soil testing laboratory for Quality Control of the finished work.

C. Compaction of the subgrade shall be performed with sheep foot rollers, pneumatic rollers and flat steel wheel rollers to the extent necessary to obtain the specified soil density. Final compaction shall be made by flat steel wheel rollers or pneumatic tire rollers to leave a smooth surface on which to install the base course material.

D. The subgrade shall be shaped with a self-propelled grader, and all holes, ruts and depressions filled with an approved material and rolled to the extent directed by the ENGINEER. The surface of the subgrade shall be finished to the required lines and grade; and any deviation in excess of 1/4 inch, when checked with a 16 foot straight edge, shall be corrected by the CONTRACTOR.

3.6 SCHEDULE

A. General Earth Fill:
   1. Use under seeded areas, backfill at depths of more than 5 feet below and 5 feet outside of roads and in embankments (except for clay liner material) unless, otherwise shown on Drawings.
   2. Fill to within 4 inches of finished grade as backfill adjacent to structures.

B. Non-Expansive Earth Fill: Use as backfill for the top 5 feet depth under roads as shown on Drawings. Use to 5 feet outside the limits of roads.

C. Low Permeability Earth Fill: Use for top 2 feet of interior slope of embankments.

D. Select Fill: Use as backfill against structure walls and beneath structures.

E. Class I Aggregate Fill: Use for over excavated areas under structures and as otherwise shown on Drawings.

F. Class 2 Aggregate Fill: Use for pipe embedment and initial backfill per details in the Plans.

G. Sand Fill: Use for small pipe embedment (#2-inch diameter).

H. Topsoil: Use within limits of seeded areas after substantial completion of construction and other fill has been placed.

I. Unclassified Material: Dispose of on-site as directed by the OWNER .

3.7 TOLERANCES

A. Site grading to conform to Plans within the following tolerances:
   1. Drainage ditches: 0.10 feet.
   2. Excavations: plus zero to -0.10 feet.
   3. Compacted fill: 0.10 feet.

3.8 SURPLUS MATERIAL

A. CONTRACTOR shall, at no cost to the OWNER, dispose of unclassified material, surplus fill materials and excess topsoil on-site as directed by the OWNER.
B. Leave stockpile areas and entire jobsite clean and raked, ready to receive seeding.

3.9 WATER INJECTION

General specifications for water injection under the new building are included below. Compliance with this Specification is essential. The injection depth is a minimum of 10 feet below existing grade.

A. Injection process shall be observed on a full-time basis by a qualified inspector under the direction of the OWNER's designated geotechnical ENGINEER.
B. A surfactant (wetting agent) shall be added to the water. The amount of surfactant used should be in accordance with the manufacturer's recommendations.
C. The lower portion of the injection nozzle shall consist of a hole pattern that will uniformly disperse the water throughout the entire depth.
D. Injection pressures should be adjusted to disperse as large a volume of water as possible within a pressure range of 50 to 200 pounds per square inch.
E. Injection pipe shall be forced downward (not jetted or washed) in 12 to 18 inch intervals, injecting to refusal at each interval. For an injection depth of 10 feet a minimum of 7 intervals shall be used and for an injection depth of 5 feet a minimum of 4 intervals shall be used. Refusal will be determined on site by the inspector.
F. Spacing for the injections not to exceed five feet on center each way, and injections shall be carried at least five feet outside building lines. Subsequent injections should be offset from initial locations in a pattern that maximizes distribution of the mixture.
G. After the recommended number of injection passes the moisture content of the soils shall be evaluated by the OWNER's designated geotechnical ENGINEER on the basis of laboratory tests on tube samples (not cuttings) obtained from borings under his supervision following a twenty-four-hour curing period. This ENGINEER shall develop recommendations on the need for any additional injections.
H. In the event that more than three injections passes are required, the surface of the injected area shall be scarified to a depth of at least eight inches and re-compacted prior to the next injection.
I. The surface of the injected area should be sealed or otherwise protected against moisture loss as soon as possible after acceptance of the water injection process.

3.10 MAINTENANCE

Following the final shaping of material, the base course shall be maintained throughout its entire length by the use of a standard road machine or motor grade and rollers until such time as, in the judgment of the ENGINEER, base course meets the required density, is properly bonded and is suitable for priming. The base shall be properly drained at all times. During this maintenance period, any deficiencies in thickness, composition, smoothness or density shall be corrected in a satisfactory manner.

The CONTRACTOR shall be fully responsible for maintaining and preserving the completed base course during the period prior to surface treatment. Upon completion of the base course, if the asphaltic surface cannot be applied, the CONTRACTOR shall apply an emulsion of primer coat to the base surface in order to afford dust control and assist in base maintenance. CONTRACTOR shall return to the project as often as required to fill holes in the base surface and add primer as required or recommended by the ENGINEER.

-- END OF SECTION --

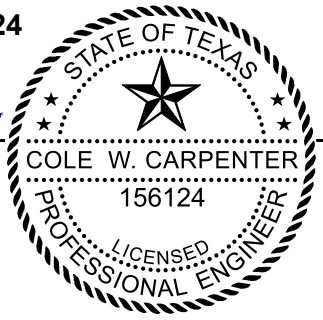
JACOB & MARTIN SPECIFICATIONS
ELECTRICAL – TABLE OF CONTENTS

DIVISION 26 - ELECTRICAL

These specifications were prepared by, or overseen, reviewed and approved by. The following Texas Licensed Professional Engineers.

Cole W. Carpenter, PE No. 156124

Cole Carpenter
Signature



02/03/2026
Date

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.
B. Nonmetallic-sheathed cable.
C. Underground feeder and branch-circuit cable.
D. Service entrance cable.
E. Armored cable.
F. Metal-clad cable.
G. Power and control tray cable.
H. Variable-frequency drive cable.
I. Manufactured wiring systems.
J. Wiring connectors.
K. Electrical tape.
L. Heat shrink tubing.
M. Oxide inhibiting compound.
N. Wire pulling lubricant.
O. Cable ties.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
C. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).
B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).
F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).
G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.
H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
I. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); 2008a (Validated 2019).
J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
K. NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.
L. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

M. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2024.
N. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
O. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
P. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
Q. UL 4 - Armored Cable; Current Edition, Including All Revisions.
R. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
S. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
T. UL 183 - Manufactured Wiring Systems; Current Edition, Including All Revisions.
U. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
V. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
W. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
X. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
Y. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
Z. UL 719 - Nonmetallic-Sheathed Cables; Current Edition, Including All Revisions.
AA. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
BB. UL 1277 - Electrical Power and Control Tray Cables with Optional Optical-Fiber Members; Current Edition, Including All Revisions.
CC. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
   3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   4. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
B. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.
C. Manufactured Wiring System Shop Drawings: Provide plan views indicating proposed system layout with components identified; indicate branch circuit connections.
D. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
G. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.
H. Maintenance Materials: Furnish the following for OWNER's use in maintenance of project.
    1. Extra Manufactured Wiring Systems Cable Assemblies: One of each configuration, 6 feet length.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect/Engineer and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
    1. Exceptions:
        a. Use manufactured wiring systems for branch circuits where concealed under raised floors.
            1) Exception: Provide single conductor building wire in raceway for circuit homerun from distribution box to panelboard.
        b. Use power and control tray cable or metal-clad cable for installation in cable tray.
C. Nonmetallic-sheathed cable is not permitted.
D. Underground feeder and branch-circuit cable is permitted only as follows:
    1. Where not otherwise restricted, may be used:
        a. For damp, wet, or corrosive locations as a substitute for NFPA 70, Type NMC nonmetallic-sheathed cable, when nonmetallic-sheathed cable is permitted.
    2. In addition to other applicable restrictions, may not be used:
        a. Where exposed to view.
        b. Where exposed to damage.
E. Service entrance cable is permitted only as follows:
    1. Where not otherwise restricted, may be used:
        a. For overhead service drop, installed in raceway to service head.

b. For underground service entrance, installed in raceway.
2. In addition to other applicable restrictions, may not be used:
a. Where exposed to damage.

F. Armored cable is permitted only as follows:
1. Where not otherwise restricted, may be used:
a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
1) Maximum Length: 6 feet.
b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
c. For general purpose, non-essential electrical systems in non-hazardous patient care areas of health care facilities, when provided with additional insulated grounding conductor for redundant grounding.
2. In addition to other applicable restrictions, may not be used:
a. Unless approved by OWNER.
b. Where not approved for use by the authority having jurisdiction.
c. Where exposed to damage.
d. For damp, wet, or corrosive locations.
e. For isolated ground circuits.

G. Metal-clad cable is permitted only as follows:
1. Where not otherwise restricted, may be used:
a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
1) Maximum Length: 6 feet.
b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
2. In addition to other applicable restrictions, may not be used:
a. Unless approved by OWNER.
b. Where not approved for use by the authority having jurisdiction.
c. Where exposed to damage.
d. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
e. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.
f. For patient care areas of health care facilities requiring redundant grounding.

H. Manufactured wiring systems are permitted only as follows:
1. Where not otherwise restricted, may be used:
a. For branch circuits where concealed under raised floors, where concealed above accessible ceilings for lighting, and in open ceiling areas for lighting.
1) Exception: Provide single conductor building wire in raceway for circuit homerun from distribution box to panelboard.
b. For general purpose, non-essential electrical systems in non-hazardous patient care areas of health care facilities, when provided with additional insulated grounding conductor for redundant grounding.
2. In addition to other applicable restrictions, may not be used:
a. Unless approved by OWNER.
b. Where not approved for use by the authority having jurisdiction.
c. Where exposed to view.
d. Where exposed to damage.
e. For damp, wet, or corrosive locations.

f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Provide new conductors and cables manufactured not more than one year prior to installation.
D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
E. Comply with NEMA WC 70.
F. Comply with FS A-A-59544 where applicable.
G. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
H. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
I. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
J. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.
K. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
L. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
M. Conductor Material:
    1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
    2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
    3. Tinned Copper Conductors: Comply with ASTM B33.
N. Minimum Conductor Size:
    1. Branch Circuits: 12 AWG.
        a. Exceptions:
            1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
            2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
            3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
    2. Control Circuits: 14 AWG.
O. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
P. Conductor Color Coding:
    1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
    2. Color Coding Method: Integrally colored insulation.
        a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
    3. Color Code:
        a. 240/120 V, 1 Phase, 3 Wire System:
            1) Phase A: Black.
            2) Phase B: Red.
            3) Neutral/Grounded: White.
        b. Equipment Ground, All Systems: Green.
        c. Isolated Ground, All Systems: Green with yellow stripe.
        d. Travelers for 3-Way and 4-Way Switching: Pink.

e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
f. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
1. Copper Building Wire:
a. Cerro Wire LLC: www.cerrowire.com/#sle.
b. Encore Wire Corporation: www.encorewire.com/#sle.
c. General Cable Technologies Corporation: www.generalcable.com/#sle.
d. Southwire Company: www.southwire.com/#sle.
e. Substitutions: Submit Manufacture's Data Sheet for Approval.
2. Aluminum Building Wire (only where specifically indicated or permitted for substitution):
a. Encore Wire Corporation: www.encorewire.com/#sle.
b. Southwire Company: www.southwire.com/#sle.
c. Stabiloy, a brand of General Cable Technologies Corporation; _____: www.stabiloy.com/#sle.
d. Substitutions: Submit Manufacture's Data Sheet for Approval.
B. Description: Single conductor insulated wire.
C. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.
2. Control Circuits: Stranded.
D. Insulation Voltage Rating: 600 V.
E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
a. Size 4 AWG and Larger: Type XHHW-2.
b. Installed Underground: Type XHHW-2.
c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.4 NONMETALLIC-SHEATHED CABLE

A. Manufacturers:
1. Cerro Wire LLC: www.cerrowire.com/#sle.
2. Encore Wire Corporation: www.encorewire.com/#sle.
3. Southwire Company: www.southwire.com/#sle.
4. Substitutions: Submit Manufacture's Data Sheet for Approval.
B. Description: NFPA 70, Type NM multiple-conductor cable listed and labeled as complying with UL 719, Type NM-B.
C. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.
D. Insulation Voltage Rating: 600 V.

2.5 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

A. Manufacturers:
1. Cerro Wire LLC: www.cerrowire.com/#sle.
2. Encore Wire Corporation: www.encorewire.com/#sle.
3. Southwire Company: www.southwire.com/#sle.
4. Substitutions: Submit Manufacture's Data Sheet for Approval.

B. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.
C. Provide equipment grounding conductor unless otherwise indicated.
D. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.
E. Insulation Voltage Rating: 600 V.
F. Cable Jacket: Listed and labeled as sunlight resistant.

2.6 SERVICE ENTRANCE CABLE

A. Manufacturers:
   1. Copper Service Entrance Cable:
      a. Cerro Wire LLC: www.cerrowire.com/#sle.
      b. Encore Wire Corporation: www.encorewire.com/#sle.
      c. Southwire Company: www.southwire.com/#sle.
      d. Substitutions: Submit Manufacture's Data Sheet for Approval.
B. Service Entrance Cable for Above-Ground Use: NFPA 70, Type SE multiple-conductor cable listed and labeled as complying with UL 854, Style R.
C. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44 Type RHH/RHW-2.
D. Conductor Stranding: Stranded.
E. Insulation Voltage Rating: 600 V.

2.7 ARMORED CABLE

A. Manufacturers:
   1. AFC Cable Systems Inc: www.afcweb.com/#sle.
   2. Encore Wire Corporation: www.encorewire.com/#sle.
   3. Southwire Company: www.southwire.com/#sle.
   4. Substitutions: Submit Manufacture's Data Sheet for Approval.
B. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.
C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.
D. Insulation Voltage Rating: 600 V.
E. Insulation: Type THHN.
F. Grounding: Combination of interlocking armor and integral bonding wire.
   1. Provide additional full-size integral insulated equipment grounding conductor for redundant grounding, suitable for general purpose, non-essential electrical systems in non-hazardous patient care areas of health care facilities.
G. Armor: Steel, interlocked tape.

2.8 METAL-CLAD CABLE

A. Manufacturers:
   1. AFC Cable Systems Inc: www.afcweb.com/#sle.
   2. Encore Wire Corporation: www.encorewire.com/#sle.
   3. Southwire Company: www.southwire.com/#sle.
   4. Substitutions: Submit Manufacture's Data Sheet for Approval.
B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.

2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.
E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
F. Provide oversized neutral conductors where indicated or required.
G. Provide dedicated neutral conductor for each phase conductor where indicated or required.
H. Grounding: Full-size integral equipment grounding conductor.
   1. Provide additional isolated/insulated grounding conductor where indicated or required.
I. Armor: Steel, interlocked tape.
J. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.9 POWER AND CONTROL TRAY CABLE

A. Manufacturers:
   1. Encore Wire Corporation: www.encorewire.com/#sle.
   2. General Cable Technologies Corporation: www.generalcable.com/#sle.
   3. Okonite: www.okonite.com/#sle.
   4. Southwire Company: www.southwire.com/#sle.
   5. Substitutions: Submit Manufacture's Data Sheet for Approval.
B. Description: NFPA 70, Type TC cable listed and labeled as complying with UL 1277.
C. Where exposed run cable is indicated between cable tray and utilization equipment in qualifying industrial establishments as determined by authorities having jurisdiction, provide tray cable marked as Type TC-ER in accordance with NFPA 70.
D. Conductor Stranding: Stranded.
E. Insulation Voltage Rating: 600 V.
F. Insulation: Type XHHW or XHHW-2.
G. Grounding: Full-size integral equipment grounding conductor.
H. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.10 MANUFACTURED WIRING SYSTEMS

A. Manufacturers:
   1. AFC Cable Systems Inc: www.afcweb.com/#sle.
   2. D&P Custom Lights & Wiring Systems, Inc: www.dandpcustomlights.com/#sle.
   3. RELOC Wiring Solutions, a brand of Acuity Brands, Inc: www.relocwiring.com/#sle.
   4. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   5. Substitutions: Submit Manufacture's Data Sheet for Approval.
B. Description: Manufactured wiring assemblies complying with NFPA 70 Article 604, and listed and labeled as complying with UL 183.
C. Provide components necessary to transition between manufactured wiring system and other wiring methods.
D. Branch Circuit Cables:
   1. Conductor Stranding (Size 10 AWG and Smaller): Solid.
   2. Insulation Voltage Rating: 600 V.
   3. Insulation: Type THHN.
   4. Provide dedicated neutral conductor for each phase conductor where indicated or required.
   5. Grounding: Full-size integral equipment grounding conductor.
      a. Provide additional isolated/insulated grounding conductor where indicated or required.
      b. Provide redundant grounding, suitable for general purpose, non-essential electrical systems in non-hazardous patient care areas of health care facilities<> where indicated or required.
   6. Armor: Steel, interlocked tape.

E. Connectors: Keyed and color-coded to prevent interconnection of different voltages.
F. Fixture Leads: Type TFN insulation.
G. Product(s):
    1. Substitutions: Submit Manufacture's Data Sheet for Approval.

2.11 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
C. Wiring Connectors for Splices and Taps:
    1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
    2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
D. Wiring Connectors for Terminations:
    1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
    2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
    3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
    4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
    5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
    6. Aluminum Conductors: Use compression connectors for all connections.
    7. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
    8. Conductors for Control Circuits: Use crimped terminals for all connections.
E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
    1. Manufacturers:
        a. 3M: www.3m.com/#sle.
        b. Ideal Industries, Inc: www.idealindustries.com/#sle.
        c. NSI Industries LLC: www.nsiindustries.com/#sle.
        d. Substitutions: Submit Manufacture's Data Sheet for Approval.
H. Push-in Wire Connectors: Rated 600 V, 221 degrees F.
    1. Manufacturers:
        a. Ideal Industries, Inc: www.idealindustries.com/#sle.
        b. NSI Industries LLC: www.nsiindustries.com/#sle.
        c. Wago Corporation: www.wago.us/#sle.
        d. Substitutions: Submit Manufacture's Data Sheet for Approval.
I. Mechanical Connectors: Provide bolted type or set-screw type.
    1. Manufacturers:
        a. Burndy LLC: www.burndy.com.
        b. Ilsco: www.ilsco.com/#sle.
        c. Thomas & Betts Corporation: www.tnb.com/#sle.

d. Substitutions: Submit Manufacture's Data Sheet for Approval.

J. Compression Connectors: Provide circumferential type or hex type crimp configuration.
1. Manufacturers:
a. Burndy LLC: www.burndy.com.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: Submit Manufacture's Data Sheet for Approval.

K. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
1. Manufacturers:
a. Burndy LLC: www.burndy.com.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: Submit Manufacture's Data Sheet for Approval.

2.12 WIRING ACCESSORIES

A. Electrical Tape:
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
c. Substitutions: Submit Manufacture's Data Sheet for Approval.
2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
a. Substitutions: Submit Manufacture's Data Sheet for Approval.
3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
a. Substitutions: Submit Manufacture's Data Sheet for Approval.
4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
a. Substitutions: Submit Manufacture's Data Sheet for Approval.
5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
a. Substitutions: Submit Manufacture's Data Sheet for Approval.
6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
a. Substitutions: Submit Manufacture's Data Sheet for Approval.
7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
a. Substitutions: Submit Manufacture's Data Sheet for Approval.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Burndy LLC: www.burndy.com.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: Submit Manufacture's Data Sheet for Approval.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
1. Manufacturers:

a. Burndy LLC: www.burndy.com.
b. Ideal Industries, Inc: www.idealindustries.com/#sle.
c. Ilsco: www.ilsco.com/#sle.
d. Substitutions: Submit Manufacture's Data Sheet for Approval.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. American Polywater Corporation: www.polywater.com/#sle.
c. Ideal Industries, Inc: www.idealindustries.com/#sle.
d. Substitutions: Submit Manufacture's Data Sheet for Approval.

E. Cable Ties: Material and tensile strength rating suitable for application.
1. Manufacturers:
a. Burndy LLC: www.burndy.com.
b. Substitutions: Submit Manufacture's Data Sheet for Approval.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.
B. Verify that work likely to damage wire and cable has been completed.
C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
D. Verify that field measurements are as indicated.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.
C. Perform work in accordance with NECA 1 (general workmanship).
D. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.
E. Install armored cable (Type AC) in accordance with NECA 120.
F. Install metal-clad cable (Type MC) in accordance with NECA 120.
G. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

H. Exposed Cable Installation (only where specifically permitted):
1. Route cables parallel or perpendicular to building structural members and surfaces.
2. Protect cables from physical damage.

I. Direct Burial Cable Installation:
1. Install cable with minimum cover of 24 inches unless otherwise indicated or required.
2. Protect cables from damage in accordance with NFPA 70.
3. Provide underground warning tape in accordance with Section 26 05 53 along entire cable length.

J. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

K. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

L. Terminate cables using suitable fittings.
1. Armored Cable (Type AC):
a. Use listed fittings and anti-short, insulating bushings.
b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
2. Metal-Clad Cable (Type MC):
a. Use listed fittings.
b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

M. Install conductors with a minimum of 12 inches of slack at each outlet.

N. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

O. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

P. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

Q. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

R. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
   1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
      b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
   2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
      b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
   3. Wet Locations: Use heat shrink tubing.

S. Insulate ends of spare conductors using vinyl insulating electrical tape.

T. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

U. Identify conductors and cables in accordance with Section 26 05 53.

V. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.4 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
   1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

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SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.
B. Conductors for grounding and bonding.
C. Connectors for grounding and bonding.
D. Ground bars.
E. Ground rod electrodes.
F. Chemically-enhanced ground electrodes.
G. Ground enhancement material.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
C. Section 26 56 00 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2025.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.
D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2026.
G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
C. Field quality control test reports.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 25 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Ground Ring:
      a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
      b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
      c. Provide ground enhancement material around conductor where indicated.
      d. Provide connection from ground ring conductor to:
         1) Perimeter columns of metal building frame.
         2) Ground rod electrodes located as indicated.
   4. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

F. Service-Supplied System Grounding:
   1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
   2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
   3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
   4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
   5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
   6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
   7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
      a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
   8. Provide bonding for metal building frame.
   9. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

H. Lightning Protection Systems, in Addition to Requirements of Section 26 41 13:
   1. Do not use grounding electrode dedicated for lightning protection system for component of building grounding electrode system provided under this section.
   2. Provide bonding of building grounding electrode system provided under this section and lightning protection grounding electrode system in accordance with NFPA 70 and NFPA 780.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).
   2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gage of specified conductors.

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
   1. Description: Copper rectangular ground bars with mounting brackets and insulators.
   2. Size: 5/8" diameter X 10' long copper clad ground rod unless otherwise indicated or required.

3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 5/8 inch diameter by 10 feet length, unless otherwise indicated.
4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.

F. Chemically-Enhanced Ground Electrodes:
1. Description: Copper tube factory-filled with electrolytic salts designed to provide a low-impedance ground in locations with high soil resistivity; straight (for vertical installations) or L-shaped (for horizontal installations) as indicated or as required.
2. Length: 10 feet.
3. Integral Pigtail: Factory-attached, sized not less than grounding electrode conductor to be attached.
4. Backfill Material: Grounding enhancement material recommended by electrode manufacturer.
5. Manufacturers:
a. Advanced Lightning Technology (ALT): www.altfab.com.
b. Erico International Corporation: www.erico.com.
c. Harger Lightning & Grounding: www.harger.com.
d. thermOweld®, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

G. Ground Enhancement Material:
1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.
2. Resistivity: Not more than 20 ohm-cm in final installed form.
3. Manufacturers:
a. Erico International Corporation: www.erico.com.
b. Harger Lightning & Grounding: www.harger.com.
c. thermOweld®, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.
B. Verify that field measurements are as indicated.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.
B. Inspect and test in accordance with NETA ATS except Section 4.
C. Perform inspections and tests listed in NETA ATS, Section 7.13.
D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

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SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
B. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
C. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
D. MFMA-4 - Metal Framing Standards Publication; 2004.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
C. Installer's Qualifications: Include evidence of compliance with specified requirements.
D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.
B. Comply with applicable building code.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.
C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch diameter.
      b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
      c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
      d. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
      e. Outlet Boxes: 1/4 inch diameter.
      f. Luminaires: 1/4 inch diameter.
F. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Plastic and lead anchors are not permitted.
   3. Hammer-driven anchors and fasteners are not permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive support and attachment components.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
H. Field-Welding (where approved by Architect): Comply with Section 05 50 00.
I. Equipment Support and Attachment:
    1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
    2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
    3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
J. Conduit Support and Attachment: Also comply with Section 26 05 33.13.
K. Box Support and Attachment: Also comply with Section 26 05 33.16.
L. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00.
M. Exterior Luminaire Support and Attachment: Also comply with Section 26 56 00.
N. Secure fasteners according to manufacturer's recommended torque settings.
O. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.
B. Inspect support and attachment components for damage and defects.
C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

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SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Intermediate metal conduit (IMC).
C. Flexible metal conduit (FMC).
D. Liquidtight flexible metal conduit (LFMC).
E. Electrical metallic tubing (EMT).
F. Rigid polyvinyl chloride (PVC) conduit.
G. Electrical nonmetallic tubing (ENT).
H. Reinforced thermosetting resin conduit (RTRC).
I. Conduit fittings.
J. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.
B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.
C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
    1. Includes additional requirements for fittings for grounding and bonding.
D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
E. Section 26 05 33.16 - Boxes for Electrical Systems.
F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
G. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2025.
B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.
F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
I. NEMA BI 50058 - Electrical Nonmetallic Tubing (ENT); 2014 (Reaffirmed 2019).
J. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
N. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
R. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
S. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
T. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.
U. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
   5. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
C. Underground:
   1. Under Slab on Grade: Use rigid PVC conduit.
   2. Exterior, Direct-Buried: Use rigid PVC conduit.
   3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.

5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.

D. Embedded Within Concrete:
1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use rigid PVC conduit.
2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.

E. Concealed Within Hollow Stud Walls: Use FMC or Nonmetallic sheathed cable. Where nonmetallic sheathed cables pass through factory or field punched holes in metal studs the cable shall be protedted with listed grobushings or grommets cover all metal edges and securley fastened in the opening..

F. Concealed Above Accessible Ceilings: Use FMC (Flexible Metal Conduit).

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
1. Locations subject to physical damage include, but are not limited to:
a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

J. Exposed, Exterior: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

L. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit, aluminum rigid metal conduit, or reinforced thermosetting resin conduit (RTRC).

M. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), aluminum rigid metal conduit, or PVC-coated galvanized steel rigid metal conduit.

N. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.

O. Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit.
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
3. Maximum Length: 6 feet unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
a. Transformers.
b. Motors.
c. HVAC.

P. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.2 CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
B. Electrical Service Conduits: Also comply with Section 26 21 00.
C. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.
D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
E. Provide products listed, classified, and labeled as suitable for the purpose intended.
F. Minimum Conduit Size, Unless Otherwise Indicated:
    1. Branch Circuits: 3/4 inch (21 mm) trade size.
    2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
    3. Control Circuits: 1/2 inch (16 mm) trade size.
    4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
    5. Underground, Interior: 3/4 inch (21 mm) trade size.
    6. Underground, Exterior: 1 inch (27 mm) trade size.
G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
    1. Allied Tube & Conduit: www.alliedeg.com.
    2. Republic Conduit: www.republic-conduit.com/#sle.
    3. Wheatland Tube Company: www.wheatland.com/#sle.
    4. Substitutions: Submit Manufacture's Data Sheet for Approval..
B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
C. Fittings:
    1. Manufacturers:
        a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
        b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
        c. Thomas & Betts Corporation: www.tnb.com/#sle.
        d. Substitutions: Submit Manufacture's Data Sheet for Approval..
    2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
    3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
    4. Material: Use steel or malleable iron.
        a. Do not use die cast zinc fittings.
    5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
    1. Allied Tube & Conduit: www.alliedeg.com/#sle.
    2. Republic Conduit: www.republic-conduit.com/#sle.
    3. Wheatland Tube Company: www.wheatland.com/#sle.
    4. Substitutions: Submit Manufacture's Data Sheet for Approval..
B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
C. Fittings:
    1. Manufacturers:
        a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: Not permitted.
e. Substitutions: Not permitted.
2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
4. Material: Use steel or malleable iron.
a. Do not use die cast zinc fittings.
5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.5 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.
4. Substitutions: Submit Manufacture's Data Sheet for Approval..
B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
C. Fittings:
1. Manufacturers:
a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: Submit Manufacture's Data Sheet for Approval..
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
a. Do not use die cast zinc fittings.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.
4. Substitutions: Submit Manufacture's Data Sheet for Approval..
B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
C. Fittings:
1. Manufacturers:
a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: Submit Manufacture's Data Sheet for Approval..
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
a. Do not use die cast zinc fittings.

2.7 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com.
2. Republic Conduit: www.republic-conduit.com/#sle.
3. Wheatland Tube Company: www.wheatland.com.
4. Substitutions: Submit Manufacture's Data Sheet for Approval..

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Manufacturers:
a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: Submit Manufacture's Data Sheet for Approval..
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use compression (gland) or set-screw type.
a. Do not use indenter type connectors and couplings.
5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
6. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.8 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
1. Cantex Inc: www.cantexinc.com/#sle.
2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
3. JM Eagle: www.jmeagle.com/#sle.
4. Substitutions: Submit Manufacture's Data Sheet for Approval..

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.9 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: Per manufacturer's recommendations.

C. Fittings: Same type and manufacturer as conduit to be connected.

2.10 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.
1. Substitutions: See Section 01 60 00 - Product Requirements.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
1. Substitutions: Submit Manufacture's Data Sheet for Approval..

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

E. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
F. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
G. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.
    1. Substitutions: Submit Manufacture's Data Sheet for Approval..

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive conduits.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
G. Install electrical nonmetallic tubing (ENT) in accordance with NECA 111.
H. Conduit Routing:
    1. Unless dimensioned, conduit routing indicated is diagrammatic.
    2. When conduit destination is indicated without specific routing, determine exact routing required.
    3. Conceal all conduits unless specifically indicated to be exposed.
    4. Conduits in the following areas may be exposed, unless otherwise indicated:
        a. Electrical rooms.
        b. Mechanical equipment rooms.
        c. Within joists in areas with no ceiling.
    5. Unless otherwise approved, do not route conduits exposed:
        a. Across floors.
        b. Across roofs.
        c. Across top of parapet walls.
        d. Across building exterior surfaces.
    6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
    7. Arrange conduit to maintain adequate headroom, clearances, and access.
    8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
    9. Arrange conduit to provide no more than 150 feet between pull points.
    10. Route conduits above water and drain piping where possible.
    11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
    12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
    13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
        a. Heaters.
        b. Hot water piping.
    14. Group parallel conduits in the same area together on a common rack.
I. Conduit Support:
    1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use of spring steel conduit clips for support of conduits is not permitted.
9. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

J. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

K. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Provide metal escutcheon plates for conduit penetrations exposed to public view.
9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

L. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 24 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
2. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.

M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
   3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
   4. Where conduits are subject to earth movement by settlement or frost.

N. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

O. Provide grounding and bonding in accordance with Section 26 05 26.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

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SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
C. Boxes for hazardous (classified) locations.
D. Floor boxes.
E. Underground boxes/enclosures.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.
B. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
E. Section 26 05 33.13 - Conduit for Electrical Systems:
    1. Conduit bodies and other fittings.
    2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
G. Section 26 27 26 - Wiring Devices:
    1. Wall plates.
    2. Floor box service fittings.
    3. Poke-through assemblies.
    4. Access floor boxes.
    5. Additional requirements for locating boxes for wiring devices.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).
F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
H. SCTE 77 - Specifications for Underground Enclosure Integrity; 2023.
I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

M. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. All boxes and cabinets shall be steel. Do not use plastic boxes.
C. Maintenance Materials: Furnish the following for OWNER's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Keys for Lockable Enclosures: Two of each different key.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
5. Use suitable concrete type boxes where flush-mounted in concrete.

6. Use suitable masonry type boxes where flush-mounted in masonry walls.
7. Use raised covers suitable for the type of wall construction and device configuration where required.
8. Use shallow boxes where required by the type of wall construction.
9. Do not use "through-wall" boxes designed for access from both sides of wall.
10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
12. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
13. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
14. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Communications Systems Outlets: Comply with Section 27 10 00.
    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
15. Wall Plates: Comply with Section 26 27 26.
16. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com.
    c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com.
    d. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
    e. Thomas & Betts Corporation: www.tnb.com.
    f. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    b. Back Panels: Painted steel, removable.
    c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
6. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
    b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com.
    c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.
1. Manufacturers:
    a. Appleton, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
    b. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
    c. Hubbell Incorporated; Killark Products: www.hubbell-killark.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

E. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Use cast iron floor boxes within slab on grade.
3. Use sheet-steel or cast iron floor boxes within slab above grade.
4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
5. Manufacturer: Same as manufacturer of floor box service fittings.

F. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
4. Provide logo on cover to indicate type of service.
5. Applications:
a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
a. Manufacturers:
1) Highline Products, a subsidiary of MacLean Power Systems: www.highlineproducts.com.
2) Hubbell Incorporated; Quazite Products: www.hubbellpowersystems.com.
3) Oldcastle Precast, Inc: www.oldcastleprecast.com.
4) Substitutions: See Section 01 60 00 - Product Requirements.
b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.
c. Product(s):
1) MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.
2) MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.
3) MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive boxes.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.
E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
H. Box Locations:
    1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
    2. Unless dimensioned, box locations indicated are approximate.
    3. Locate boxes as required for devices installed under other sections or by others.
        a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
        b. Communications Systems Outlets: Comply with Section 27 10 00.
    4. Locate boxes so that wall plates do not span different building finishes.
    5. Locate boxes so that wall plates do not cross masonry joints.
    6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
    7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
    8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
    9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
        a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
        b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
    10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
    11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
        a. Concealed above accessible suspended ceilings.
        b. Within joists in areas with no ceiling.
        c. Electrical rooms.
        d. Mechanical equipment rooms.
I. Box Supports:
    1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
    2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
    3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
    4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
J. Install boxes plumb and level.
K. Flush-Mounted Boxes:
    1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Floor-Mounted Cabinets: Mount on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

M. Install boxes as required to preserve insulation integrity.

N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

O. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

P. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches deep.
2. Flush-mount enclosures located in concrete or paved areas.
3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
4. Provide cast-in-place concrete collar constructed in accordance with Section 03 30 00, minimum 10 inches wide by 12 inches deep, around enclosures that are not located in concrete areas.
5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

Q. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

S. Close unused box openings.

T. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

U. Provide grounding and bonding in accordance with Section 26 05 26.

3.3 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.4 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

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SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.
B. Identification nameplates and labels.
C. Wire and cable markers.
D. Voltage markers.
E. Underground warning tape.
F. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.3 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.
B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
B. Sequencing:
    1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
    2. Do not install identification products until final surface finishes and painting are complete.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.6 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
    1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
        a. Panelboards:
            1) Identify ampere rating.
            2) Identify voltage and phase.
            3) Identify power source and circuit number. Include location when not within sight of equipment.
            4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
            5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
            6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Enclosed switches, circuit breakers, and motor controllers:
1) Identify voltage and phase.
2) Identify power source and circuit number. Include location when not within sight of equipment.
3) Identify load(s) served. Include location when not within sight of equipment.

2. Service Equipment:
a. Use identification nameplate to identify each service disconnecting means.
b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.

3. Emergency System Equipment:
a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.

4. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
a. Service equipment.
b. Industrial control panels.
c. Motor control centers.
d. Elevator control panels.
e. Industrial machinery.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Identification for Communications Conductors and Cables: Comply with Section 27 10 00.
3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
4. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
a. At each source and load connection.
b. Within boxes when more than one circuit is present.
c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
5. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
6. Use underground warning tape to identify direct buried cables.

C. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.

D. Identification for Devices:
1. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Manufacturers:
a. Brimar Industries, Inc: www.brimar.com/#sle.
b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
c. Seton Identification Products: www.seton.com.
d. Substitutions: Submit Manufacture's Data Sheet for Approval.

2. Materials:
    a. Indoor Clean, Dry Locations: Use plastic nameplates.
    b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
    a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Manufacturers:
    a. Brady Corporation: www.bradyid.com.
    b. Brother International Corporation: www.brother-usa.com/#sle.
    c. Panduit Corp: www.panduit.com/#sle.
    d. Substitutions: Submit Manufacture's Data Sheet for Approval.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
    a. Use only for indoor locations.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.3 WIRE AND CABLE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com.
2. HellermannTyton: www.hellermanntyton.com.
3. Panduit Corp: www.panduit.com/#sle.
4. Substitutions: Submit Manufacture's Data Sheet for Approval.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
1. Do not use handwritten text.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

B. Minimum Size:
1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

C. Legend:
1. Markers for Voltage Identification: Highest voltage present.

D. Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE

A. Manufacturers:

1. Brady Corporation: www.bradyid.com.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Seton Identification Products: www.seton.com.
4. Substitutions: Submit Manufacture's Data Sheet for Approval.

B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
   1. Exception: Use foil-backed detectable type tape where required by serving utility or where directed by Owner.
C. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.
D. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.
E. Legend: Type of service, continuously repeated over full length of tape.
F. Color:
   1. Tape for Buried Power Lines: Black text on red background.
   2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.6 WARNING SIGNS AND LABELS

A. Manufacturers:
   1. Brimar Industries, Inc: www.brimar.com/#sle.
   2. Clarion Safety Systems, LLC: www.clarionsafety.com.
   3. Seton Identification Products: www.seton.com.
   4. Substitutions: Submit Manufacture's Data Sheet for Approval.
B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
C. Warning Signs:
   1. Materials:
      a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
      b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches unless otherwise indicated.
D. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
      a. Do not use labels designed to be completed using handwritten text.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.

6. Interior Components: Legible from the point of access.
7. Conduits: Legible from the floor.
8. Conductors and Cables: Legible from the point of access.
9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.
D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
G. Secure rigid signs using stainless steel screws.
H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

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SECTION 26 05 83 - WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
B. Section 26 05 33.13 - Conduit for Electrical Systems.
C. Section 26 05 33.16 - Boxes for Electrical Systems.
D. Section 26 27 26 - Wiring Devices.
E. Section 26 28 16.16 - Enclosed Switches.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.
B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Conform to NEMA WD 1.
   2. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
B. Disconnect Switches: As specified in Section 26 28 16.16 and in individual equipment sections.
C. Wiring Devices: As specified in Section 26 27 26.
D. Flexible Conduit: As specified in Section 26 05 33.13.
E. Wire and Cable: As specified in Section 26 05 19.
F. Boxes: As specified in Section 26 05 33.16.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.
B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
D. Provide receptacle outlet to accommodate connection with attachment plug.
E. Provide cord and cap where field-supplied attachment plug is required.
F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
H. Install terminal block jumpers to complete equipment wiring requirements.
I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

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SECTION 26 21 00 - LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical service requirements.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
D. Section 26 05 33.13 - Conduit for Electrical Systems.
E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
F. Section 26 24 16 - Panelboards: Service entrance equipment.
G. Section 26 28 16.16 - Enclosed Switches: Service entrance equipment.
H. Section 26 43 00 - Surge Protective Devices: Service entrance surge protective devices.

1.3 PRICE AND PAYMENT PROCEDURES

A. Allowances:
   1. See Section 01 21 00 - Allowances, for allowances affecting this section.
   2. Include cash allowance for Utility Company charges associated with providing service.

1.4 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.5 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.6 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
B. Coordination:
   1. Verify the following with Utility Company representative:
      a. Utility Company requirements, including division of responsibility.
      b. Exact location and details of utility point of connection.
      c. Utility easement requirements.
      d. Utility Company charges associated with providing service.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
   3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect/Engineeer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
D. Utility Company charges associated with providing permanent service to be paid by Contractor and reimbursed by Owner.
E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:
   1. Where work of this section involves interruption of existing electrical service, arrange service interruption with OWNER.
   2. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.7 QUALITY ASSURANCE

A. Comply with the following:
   1. IEEE C2 (National Electrical Safety Code).
   2. NFPA 70 (National Electrical Code).
   3. The requirements of the Utility Company.
   4. The requirements of the local authorities having jurisdiction.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Products: Listed, classified, and labeled as suitable for the purpose intended.
D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
B. Electrical Service Characteristics: As indicated on drawings.
C. Utility Company: As indicated on drawings.
D. Division of Responsibility: Per Utility Company requirements.
E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Arrange equipment to provide minimum clearances and required maintenance access.
D. Provide required support and attachment components in accordance with Section 26 05 29.

E. Provide grounding and bonding for service entrance equipment in accordance with Section 26 05 26.
F. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 05 53.

3.4 PROTECTION

A. Protect installed equipment from subsequent construction operations.

END OF SECTION

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SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.
B. Lighting and appliance panelboards.
C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
D. Section 26 43 00 - Surge Protective Devices.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Revision E with Supplement 1, 2013.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2025.
D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
F. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).
G. NEMA PB 1 - Panelboards; 2011.
H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.
I. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
K. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
M. UL 67 - Panelboards; Current Edition, Including All Revisions.
N. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
O. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
P. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
Q. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
R. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.
S. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
B. Field Quality Control Test Reports.
C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
   2. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com.
B. General Electric Company: www.geindustrial.com.
C. Schneider Electric; Square D Products: www.schneider-electric.us.
D. Siemens Industry, Inc: www.usa.siemens.com.
E. Substitutions: Submit Manufacture's Data Sheet for Approval.

F. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 1,500 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
      b. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
      c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.

L. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
   1. Ampere Rating: Not less than ampere rating of panelboard bus.
   2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
   3. Coil Voltage: As required for connection to control system indicated.

M. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
   1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
   2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
      a. Use zero sequence ground fault detection method unless otherwise indicated.
      b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

N. Provide the following features and accessories where indicated or where required to complete installation:
   1. Feed-through lugs.
   2. Sub-feed lugs.

2.3 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Copper.
   2. Ground Bus Material: Copper.

D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
   2. Provide thermal magnetic circuit breakers unless otherwise indicated.
   3. Provide electronic trip circuit breakers where indicated.

E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.
   2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.4 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Copper.
   3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

F. Provide column-width panelboards with accessory column-width cable trough and pullbox where indicated.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Fusible Switches:
   1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA BS 31047, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
   2. Fuse Clips: As required to accept indicated fuses.
      a. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
   3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
   4. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Provide compression lugs where indicated.
      c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

B. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
         2) 14,000 rms symmetrical amperes at 480 VAC.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Provide compression lugs where indicated.
      c. Lug Material: Copper, suitable for terminating copper conductors only.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
      a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
      b. Provide interchangeable trip units where indicated.
   5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
      a. Provide the following field-adjustable trip response settings:
         1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
         2) Long time delay.
         3) Short time pickup and delay.
         4) Instantaneous pickup.
         5) Ground fault pickup and delay where ground fault protection is indicated.
   6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
   7. Provide the following circuit breaker types where indicated:
      a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
      b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
      c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.

d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.

8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.
10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
11. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2.6 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
C. Verify that mounting surfaces are ready to receive panelboards.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
E. Provide required supports in accordance with Section 26 05 29.
F. Install panelboards plumb.
G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
I. Provide grounding and bonding in accordance with Section 26 05 26.
    1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
    2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.
J. Install all field-installed branch devices, components, and accessories.
K. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
L. Set field-adjustable circuit breaker tripping function settings as indicated.
M. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
N. Provide filler plates to cover unused spaces in panelboards.
O. Identify panelboards in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.
B. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.
F. Test AFCI circuit breakers to verify proper operation.
G. Test shunt trips to verify proper operation.
H. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
B. Adjust alignment of panelboard fronts.
C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.
B. Wall dimmers.
C. Receptacles.
D. Wall plates.
E. Access floor boxes.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
C. Section 26 05 33.16 - Boxes for Electrical Systems.
D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
E. Section 26 05 83 - Wiring Connections: Cords and plugs for equipment.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Revision H, 2014.
B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Revision G, 2014.
C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.
M. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
    2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
    3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
    4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
    5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
    6. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
D. Provide GFCI protection for receptacles installed within 6 feet of sinks.
E. Provide GFCI protection for receptacles installed in kitchens.
F. Provide GFCI protection for receptacles serving electric drinking fountains.
G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.2 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.
B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
C. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
D. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.
F. Isolated Ground Convenience Receptacles: Orange.
G. Surge Protection Receptacles: Blue.
H. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.
I. Clock Hanger Receptacles: Brown with stainless steel wall plate.
J. Above-Floor Service Fittings: Gray wiring devices with satin aluminum housing.
K. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.
L. Flush Poke-Through Service Fittings: Gray wiring devices with aluminum cover and aluminum flange.
M. Access Floor Boxes: Gray wiring devices with gray steel cover with insert to match floor covering.

2.3 WALL SWITCHES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com.
   2. Leviton Manufacturing Company, Inc: www.leviton.com.
   3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
   4. Substitutions: Submit Manufacture's Data Sheet for Approval.
B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
D. Lighted Wall Switches: Industrial specification grade, 20 A, 120/277 V with illuminated standard toggle type switch actuator and maintained contacts; illuminated with load off; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.4 RECEPTACLES

A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com.
2. Leviton Manufacturing Company, Inc: www.leviton.com.
3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
5. Substitutions: Submit Manufacture's Data Sheet for Approval.
6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
3. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
a. Provide test and reset buttons of same color as device.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.5 WALL PLATES

A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com.
2. Leviton Manufacturing Company, Inc: www.leviton.com.
3. Lutron Electronics Company, Inc: www.lutron.com/sle.

4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
5. Substitutions: Submit Manufacture's Data Sheet for Approval.
6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Standard.
3. Screws: Metal with slotted heads finished to match wall plate finish.
4. Provide screwless wallplates with concealed mounting hardware where indicated.
5. Fill all wallplate holes as necessary

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

E. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

F. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that core drilled holes for poke-through assemblies are in proper locations.

H. Verify that openings in access floor are in proper locations.

I. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
1. Mounting Heights: Unless otherwise indicated, as follows:
a. Wall Switches: 48 inches above finished floor.
b. Wall Dimmers: 48 inches above finished floor.
c. Receptacles: 18 inches above finished floor or 6 inches above counter.
2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect/Engineer to obtain direction prior to proceeding with work.
5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.
D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.
I. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
J. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
K. Install wiring devices plumb and level with mounting yoke held rigidly in place.
L. Install wall switches with OFF position down.
M. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
N. Do not share neutral conductor on branch circuits utilizing wall dimmers.
O. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
P. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
Q. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
R. Identify wiring devices in accordance with Section 26 05 53.
S. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.
B. Inspect each wiring device for damage and defects.
C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
D. Test each receptacle to verify operation and proper polarity.
E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
F. Inspect each surge protection receptacle to verify surge protection is active.
G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.
B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect/Engineer.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

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SECTION 26 28 16.13 - ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed circuit breakers.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Revision E with Supplement 1, 2013.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted enclosed circuit breakers where indicated.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com.
B. General Electric Company: www.geindustrial.com.
C. Schneider Electric; Square D Products: www.schneider-electric.us.
D. Siemens Industry, Inc: www.usa.siemens.com.
E. Substitutions: Submit Manufacture's Data Sheet for Approval.
F. Source Limitations: Furnish enclosed circuit breakers and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
    1. Altitude: Less than 1,500 feet.
    2. Ambient Temperature: Between 23 degrees F and 104 degrees F.
D. Short Circuit Current Rating:
    1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.
E. Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
F. Conductor Terminations: Suitable for use with the conductors to be installed.
G. Provide thermal magnetic circuit breakers unless otherwise indicated.
H. Provide electronic trip circuit breakers where indicated.
I. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
J. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
    1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
        a. Indoor Clean, Dry Locations: Type 1.
        b. Outdoor Locations: Type 3R.
    2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
    3. Provide surface-mounted enclosures unless otherwise indicated.
K. Provide externally operable handle with means for locking in the OFF position.
L. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

2.3 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
B. Interrupting Capacity:
    1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
        a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
        b. 14,000 rms symmetrical amperes at 480 VAC.

2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
1. Provide mechanical lugs unless otherwise indicated.
2. Provide compression lugs where indicated.
3. Lug Material: Copper, suitable for terminating copper conductors only.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

E. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install enclosed circuit breakers plumb.

F. Install flush-mounted enclosed circuit breakers so that trims fit completely flush to wall with no gaps and rough opening completely covered.

G. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 26 05 26.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers used for service entrance. Tests listed as optional are not required.

D. Test GFCI circuit breakers to verify proper operation.

E. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 28 16.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).
D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com.
B. General Electric Company: www.geindustrial.com.
C. Schneider Electric; Square D Products: www.schneider-electric.us.
D. Siemens Industry, Inc: www.usa.siemens.com.
E. Substitutions: Submit Manufacture's Data Sheet for Approval.
F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy or general duty as indicated; ratings, configurations, and features as indicated on the drawings.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
    1. Altitude: Less than 1,500 feet.
    2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
D. Horsepower Rating: Suitable for connected load.
E. Voltage Rating: Suitable for circuit voltage.
F. Short Circuit Current Rating:
    1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
    2. Minimum Ratings:
        a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
H. Provide with switch blade contact position that is visible when the cover is open.
I. Conductor Terminations: Suitable for use with the conductors to be installed.
J. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
L. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
    1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
        a. Indoor Clean, Dry Locations: Type 1.
        b. Outdoor Locations: Type 3R.
    2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
N. Heavy Duty Switches:
    1. Comply with NEMA BS 31047.
    2. Conductor Terminations:
        a. Provide mechanical lugs unless otherwise indicated.
        b. Provide compression lugs where indicated.

c. Lug Material: Copper, suitable for terminating copper conductors only.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
   a. Provide means for locking handle in the ON position where indicated.

O. General Duty Switches:
1. Conductor Terminations:
   a. Provide mechanical lugs.
   b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
C. Verify that mounting surfaces are ready to receive enclosed safety switches.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
D. Provide required supports in accordance with Section 26 05 29.
E. Install enclosed switches plumb.
F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
G. Provide grounding and bonding in accordance with Section 26 05 26.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.
B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 43 00 - SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surge protective devices for service entrance locations.
B. Surge protective devices for distribution locations.
C. Surge protective devices for branch panelboard locations.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
B. Section 26 24 16 - Panelboards.

1.3 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.
B. SPD: Surge Protective Device.

1.4 REFERENCE STANDARDS

A. MIL-STD-220 - Method of Insertion Loss Measurement; 2009c (Validated 2024).
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. UL 1283 - Standard for Electromagnetic Interference Filters; Current Edition, Including All Revisions.
G. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to ordering equipment.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Factory-installed, Internally Mounted Surge Protective Devices:
   1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

B. Substitutions: Submit Manufacture's Data Sheet for Approval.
C. Source Limitations: Furnish surge protective devices produced by a single manufacturer and obtained from a single supplier.

2.2 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.
B. Protected Modes:
   1. Wye Systems: L-N, L-G, N-G, L-L.
   2. Delta Systems: L-G, L-L.
   3. Single Split Phase Systems: L-N, L-G, N-G, L-L.
   4. High Leg Delta Systems: L-N, L-G, N-G, L-L.
C. UL 1449 Voltage Protection Ratings (VPRs):
   1. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.
D. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
E. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   1. Indoor clean, dry locations: Type 1.
F. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:
   1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.
   2. Provide flush-mounted SPD where mounted in public areas or adjacent to flush-mounted equipment.
G. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
   1. Panelboards: See Section 26 24 16.

2.3 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Unless otherwise indicated, provide field-installed, externally mounted or factory-installed, internally mounted SPDs.
B. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.
D. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.
E. UL 1449 Nominal Discharge Current (I-n): 20 kA.
F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
G. Diagnostics:
   1. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
   2. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

2.4 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Unless otherwise indicated, provide field-installed, externally mounted or factory-installed, internally mounted SPDs.
B. List and label as complying with UL 1449, Type 1 or Type 2.

C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.
D. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.
E. UL 1449 Nominal Discharge Current (I-n): 20 kA.
F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
G. Diagnostics:
    1. Protection Status Monitoring: Provide indicator lights to report the protection status.
    2. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.
C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of drawings and manufacturer's instructions.
D. Verify system grounding and bonding is in accordance with Section 26 05 26, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
D. Provide conductors with minimum ampacity as indicated on the drawings, as required by NFPA 70, and not less than manufacturer's recommended minimum conductor size.
E. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.
F. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

3.4 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
C. Section 26 05 33.16 - Boxes for Electrical Systems.
D. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.

1.3 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
B. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
C. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.
D. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
F. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).
G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
H. UL 1598 - Luminaires; Current Edition, Including All Revisions.
I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Shop Drawings:
   1. Provide photometric calculations where luminaires are proposed for substitution upon request.
C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format upon request.
   3. Lamps: Include rated life and initial and mean lumen output.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

A. Manufacturers:
   1. Acuity Brands, Inc: www.acuitybrands.com.
   2. Sun Valley Lighting; www.usaltg.com.
   3. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com.
   4. Electro-Matic Visual, Inc; www.empvisual.com.
   5. Hubbell Lighting, Inc: www.hubbelllighting.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.
B. Provide products that comply with requirements of NFPA 70.
C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
D. Provide products listed, classified, and labeled as suitable for the purpose intended.
E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

PART 3 EXECUTION

3.1 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install products in accordance with manufacturer's instructions.
D. Install luminaires in accordance with NECA/IESNA 501.
E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
F. Install accessories furnished with each luminaire.
G. Bond products and metal accessories to branch circuit equipment grounding conductor.
H. Install lamps in each luminaire.

3.2 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.
B. Inspect each product for damage and defects.
C. Operate each luminaire after installation and connection to verify proper operation.
D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.3 ADJUSTING

A. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.4 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

END OF SECTION