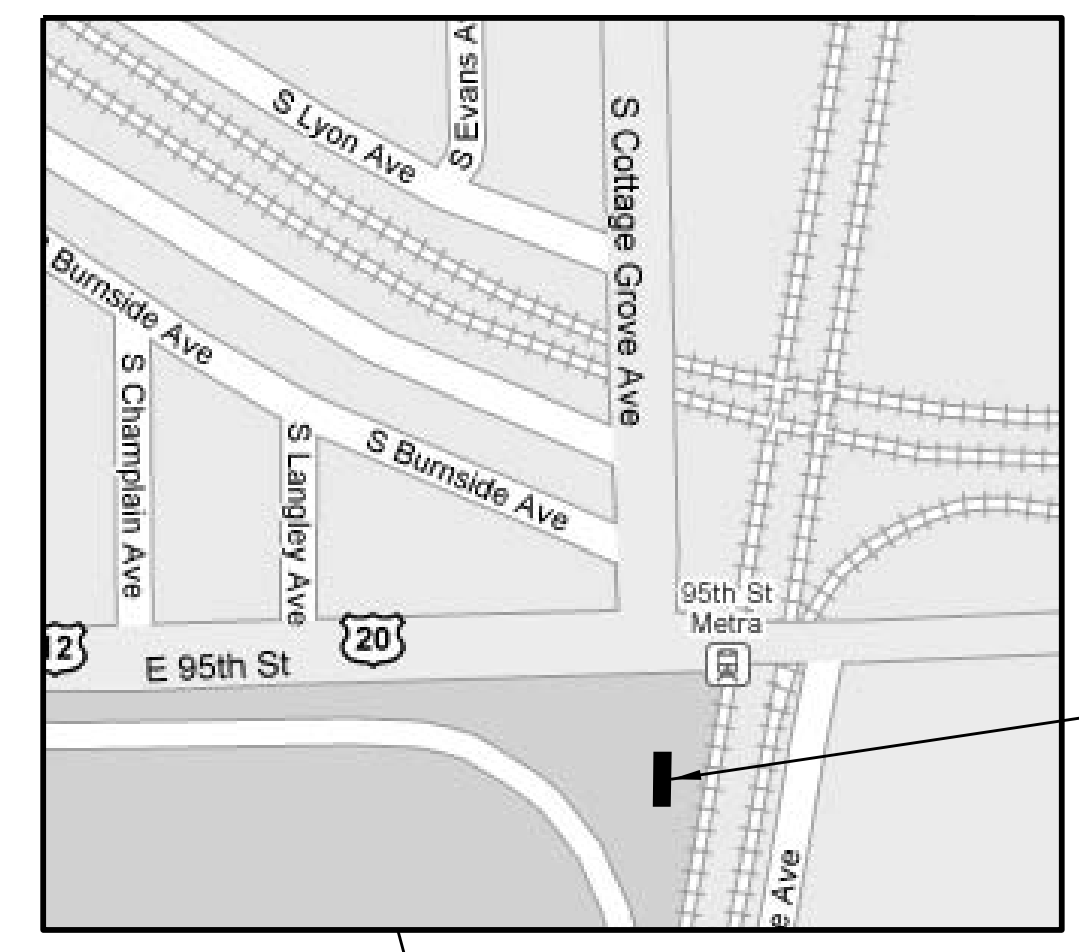


95TH. STREET SUBSTATION



SUBSTATION



95th STREET SUBSTATION

DRAWING LIST

- CS-11.9-1000 COVER SHEET
SS-11.9-1001 TOPOGRAPHICAL SURVEY
SS-11.9-1001G GENERAL NOTES
SS-11.9-1017 SITE PLAN
SS-11.9-1018 FRAMING PLAN AND DETAILS
SS-11.9-1019 DETAILS
SS-11.9-1050 SUBSTATION EQUIPMENT LAYOUT PLAN
SS-11.9-1070 ELECTRICAL SITE PLAN
SS-11.9-1071 DUCTBANK LAYOUT
SS-11.9-1072 DUCTBANK PROFILES
SS-11.9-1073 DUCTBANK DETAILS
SS-11.9-1074 NOT USED
SS-11.9-1075 SUBSTATION GROUNDING LAYOUT
SS-11.9-1080 ELECTRICAL NOTES & SYMBOLS
SS-11.9-1081 ELECTRICAL DETAILS
SS-11.9-1082 NEGATIVE AND DRAIN ENCLOSURES
SS-11.9-1085 TIE STATION INCOMING FEEDER & CONTROL CABLES PLAN & SECTIONS
SS-11.9-4001 12.5KV AC SINGLE LINE DIAGRAM
SS-11.9-4002 NOT USED
SS-11.9-4003 TRACTION POWER ONE LINE DIAGRAM
SS-11.9-4004 NOT USED
SS-11.9-4005 NOT USED
SS-11.9-4006 TRANSF'S, RECTIFIERS & DC SWGR SINGLE LINE DIAGRAM
SS-11.9-4101 12.5KV AC THREE LINE DIAGRAM, SHEET 1 OF 3
SS-11.9-4102 12.5KV AC THREE LINE DIAGRAM, SHEET 2 OF 3
SS-11.9-4103 12.5KV AC THREE LINE DIAGRAM, SHEET 3 OF 3
SS-11.9-4104 NOT USED
SS-11.9-4105 12.5KV AC SCHEMATIC DIAGRAM INC. LINE BKRS. 152-1 & 152-2
SS-11.9-4106 12.5KV AC SCHEMATIC DIAGRAM BUS TIE BKR. 52BT
SS-11.9-4107 12.5KV AC SCHEMATIC DIAGRAM RECT. TRANSF. BKR. 52-T1 & 52-T2
SS-11.9-4108 NOT USED
SS-11.9-4109 NOT USED
SS-11.9-4110 12.5KV AC SCHEMATIC DIAGRAM BUS-1 DIFFERENTIAL LOCKOUT
SS-11.9-4111 12.5KV AC SCHEMATIC DIAGRAM BUS-2 DIFFERENTIAL LOCKOUT
SS-11.9-4201 1500V DC SCHEMATIC DIAGRAM RECTIFIER-1 POWER & AUXILIARIES
SS-11.9-4202 1500V DC SCHEMATIC DIAGRAM RECTIFIER-1 CONTROLS & ANNUNCIATOR
SS-11.9-4203 NOT USED
SS-11.9-4204 1500V DC SCHEMATIC DIAGRAM RECTIFIER-2 POWER & AUXILIARIES
SS-11.9-4205 1500V DC SCHEMATIC DIAGRAM RECTIFIER-2 CONTROLS & ANNUNCIATOR
SS-11.9-4206 RECTIFIER PLC LOGIC DIAGRAM SHEET 1
SS-11.9-4207 RECTIFIER PLC LOGIC DIAGRAM SHEET 2
SS-11.9-4208 RECTIFIER PLC LOGIC DIAGRAM SHEET 3
SS-11.9-4209 RECTIFIER PLC LOGIC DIAGRAM SHEET 4
SS-11.9-4210 1500V DC SCHEMATIC DIAGRAM RECTIFIER-1 BREAKER 72-1
SS-11.9-4211 1500V DC SCHEMATIC DIAGRAM RECTIFIER-2 BREAKER 72-2
SS-11.9-4226 1500V DC SCHEMATIC DIAGRAM DC SWITCHGEAR GROUND RELAY
SS-11.9-4300A 1500V DC SWITCHGEAR DC FDR BKR SEC. 134 CUB. NO. 8 SCHEMATIC DIAGRAM
SS-11.9-4301A 1500V DC SWITCHGEAR DC FDR BKR SEC. 135 CUB. NO. 3 SCHEMATIC DIAGRAM
SS-11.9-4302A 1500V DC SWITCHGEAR DC FDR BKR SEC. 136 CUB. NO. 7 SCHEMATIC DIAGRAM
SS-11.9-4303A 1500V DC SWITCHGEAR DC FDR BKR SEC. 137 CUB. NO. 4 SCHEMATIC DIAGRAM
SS-11.9-4304A 1500V DC SWITCHGEAR DC FDR BKR SEC. 138 CUB. NO. 6 SCHEMATIC DIAGRAM
SS-11.9-4305A 1500V DC SWITCHGEAR DC FDR BKR SEC. 139 CUB. NO. 1 SCHEMATIC DIAGRAM
SS-11.9-4306A 1500V DC SWITCHGEAR DC FDR BKR SEC. 140 CUB. NO. 5 SCHEMATIC DIAGRAM
SS-11.9-4307A 1500V DC SWITCHGEAR DC FDR BKR SEC. 141 CUB. NO. 2 SCHEMATIC DIAGRAM
SS-11.9-4308A 1500V DC SWITCHGEAR DC FDR BKR SEC. T-BKR CUB. #10 SCHEMATIC DIAGRAM
SS-11.9-5000 STATION CONTROL ARCHITECTURE NEW BUILDING AND INTERFACES
SS-11.9-5001 STATION CONTROL ARCHITECTURE EXISTING BUILDING AND INTERFACES

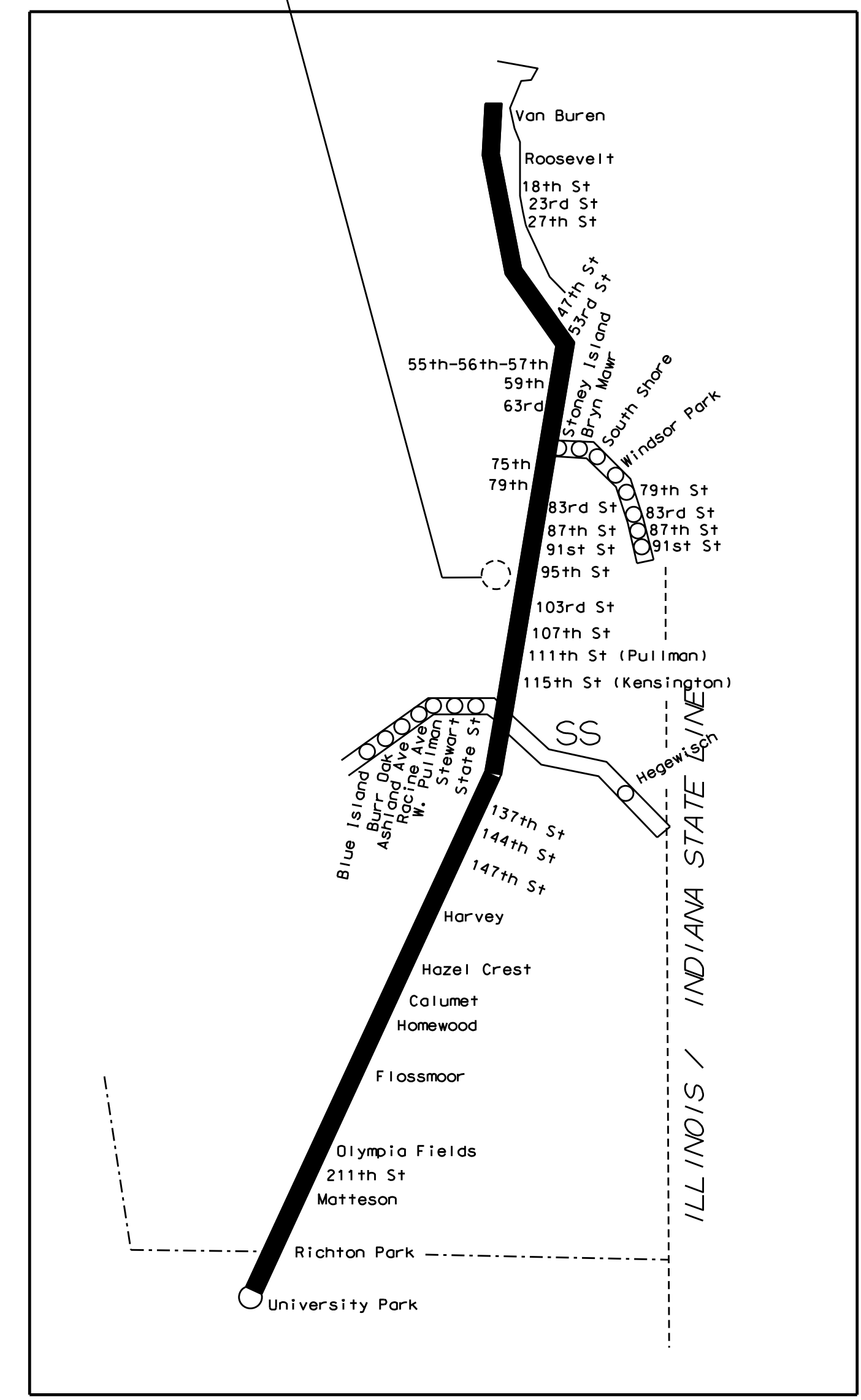
COMED REFERENCE DOCUMENTS

COMED STANDARDS

- C4050 CONDUIT RUN TRENCH PREPARATION, PAGES 1 & 2
C4090 CONDUIT RUN FORMATIONS, PAGES 1 & 2
C4171 CONDUIT RUN INSTALLATION, PAGES 1 THRU 7
C5285 ESS INSTALLATION REQUIREMENTS, PAGES 1 THRU 3
C5295 VEHICULAR BARRIER, PAGE 1
C5302 PAD MOUNTED SWITCHGEAR FOUNDATIONS, PAGES 1 THRU 12
C8550 GROUNDING INSTALLATION, PAGES 1 THRU 6

SERVICE ENTRANCE LOCATION SKETCHES

- SERVICE ENTRANCE LOCATION SKETCH 1 OF 5
SERVICE ENTRANCE LOCATION SKETCH 2 OF 5
SERVICE ENTRANCE LOCATION SKETCH 3 OF 5
SERVICE ENTRANCE LOCATION SKETCH 4 OF 5
SERVICE ENTRANCE LOCATION SKETCH 5 OF 5



SYSTEM MAP
ELECTRIC DISTRICT

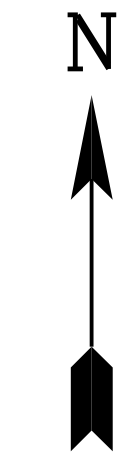


Table with columns: REV, DATE, BY, APP, DESCRIPTION, REV, DATE, BY, APP, DESCRIPTION. Includes revision history for the drawing.

LTK Engineering Services logo and contact information.

KMI logo and contact information for Katsouni Mehdi, Inc.

IDP logo and contact information for Gannett Fleming.

Metra logo and contact information for the Engineering Department.

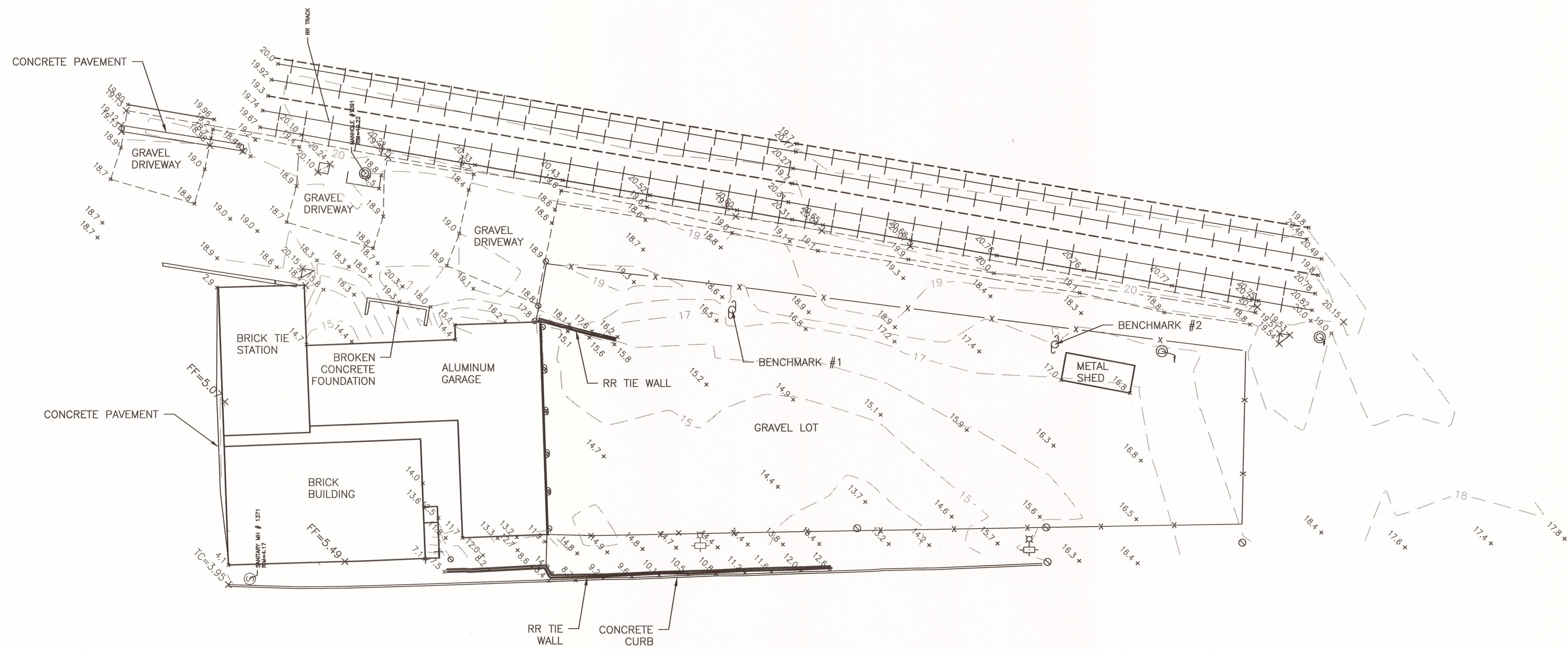
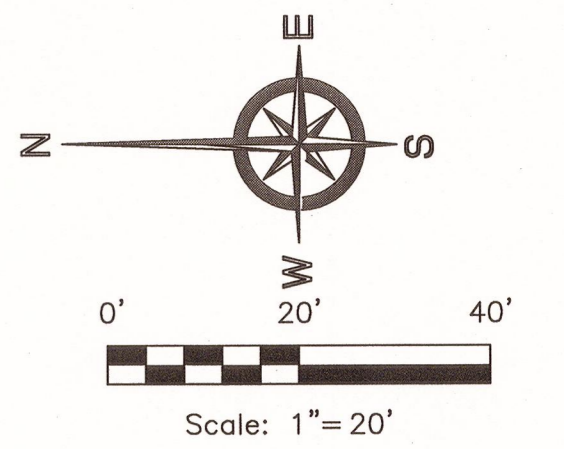
Location name: 95TH. STREET SUBSTATION. Title: COVER SHEET.

CAD file number: CS-11.9-1000.DGN. Scale: NTS. District: MED. Project No: GW4254-57102002. Mile Post No: 11.9. Sheet No: CS-11.9-1000.



**SURVEYOR'S NOTES:**

1. ALL DIMENSIONS ARE GIVEN IN FEET AND DECIMAL PARTS THEREOF.
2. BEARINGS BASED ON ILLINOIS STATE PLANE COORDINATES, EAST ZONE, NAD83(2011), GPS DERIVED.
3. VERTICAL DATUM IS CITY OF CHICAGO DATUM.
4. ONLY THOSE BUILDING LINE SETBACKS AND EASEMENTS WHICH ARE SHOWN ON THE RECORDED PLAT OF SUBDIVISION ARE SHOWN HEREON. UNLESS OTHERWISE INDICATED, REFER TO THE DEED, TITLE INSURANCE POLICY AND LOCAL ORDINANCES FOR OTHER RESTRICTIONS WHICH MAY OR MAY NOT EXIST.
5. COMPARE DEED DESCRIPTION AND SITE CONDITIONS WITH THE DATA GIVEN ON THIS PLAT AND REPORT ANY DISCREPANCIES TO THE SURVEYOR AT ONCE.
6. NO DIMENSIONS SHALL BE DERIVED FROM SCALE MEASUREMENT.
7. DISTANCES ALONG CURVES ARE ARC DISTANCES UNLESS OTHERWISE NOTED.
8. THIS SURVEY WAS PERFORMED ON THE GROUND AND COMPLETED 05/05/17.
9. ONLY THE IMPROVEMENTS THAT WERE VISIBLE FROM ABOVE GROUND AT TIME OF SURVEY AND THROUGH A NORMAL SEARCH AND WALK THROUGH OF THE SITE ARE SHOWN ON THE FACE OF THIS PLAT. LAWN SPRINKLER SYSTEMS, IF ANY, ARE NOT SHOWN ON THIS SURVEY.
10. SURFACE INDICATIONS OF UTILITIES ON THE SURVEYED PARCEL HAVE BEEN SHOWN. UNDERGROUND AND OFFSITE OBSERVATIONS HAVE NOT BEEN MADE TO DETERMINE THE EXTENT OF UTILITIES SERVING OR EXISTING ON THE PROPERTY. PUBLIC AND/OR PRIVATE RECORDS HAVE NOT BEEN SEARCHED TO PROVIDE ADDITIONAL INFORMATION. OVERHEAD WIRES, IF ANY, ARE EXISTING AND THEIR POLES HAVE BEEN SHOWN, HOWEVER THEIR FUNCTION AND DIMENSIONS HAVE NOT BEEN NOTED.
11. OTHER THAN VISIBLE OBSERVATIONS NOTED HEREON, THIS SURVEY MAKES NO STATEMENT REGARDING THE ACTUAL PRESENCE OR ABSENCE OF ANY SERVICE OR UTILITY LINE. CONTROLLED UNDERGROUND EXPLORATORY EFFORT TOGETHER WITH DIGGER IS RECOMMENDED TO DETERMINE THE FULL EXTENT OF UNDERGROUND SERVICE AND UTILITY LINES. CONTACT DIGGER AT 1-312-744-7000.



BENCHMARK #1  
BENCH TIE NAIL IN UTILITY POLE  
ELEV. = 20.02 CCD

BENCHMARK #2  
BENCH TIE NAIL IN UTILITY POLE  
ELEV. = 20.95 CCD

| LEGEND   |                              |
|----------|------------------------------|
| SYMBOL   | DESCRIPTION                  |
| ΔBM      | BENCHMARK LOCATION           |
| ⊗        | WATER VALVE                  |
| ⊠        | ELECTRIC METER               |
| ⊙        | GUY WIRE ANCHOR              |
| ⊕        | POWER POLE                   |
| ⊙        | SANITARY MANHOLE             |
| ⊙        | MANHOLE                      |
| ⊙        | STORM MANHOLE                |
| ○        | DRAIN                        |
| ○        | BOLLARD                      |
| ⊙        | STREET LIGHT STANDARD        |
| ⊙        | STREET LIGHT W/MAST ARM      |
| +        | SIGN                         |
| ○        | STEEL POST                   |
| ⊙        | SHRUB                        |
| ⊙        | DECIDUOUS TREE W/SIZE        |
| X 100.00 | SPOT GRADE                   |
| (R)      | RECORD BEARING OR DISTANCE   |
| (M)      | MEASURED BEARING OR DISTANCE |
| TC       | TOP OF CURB                  |
| FL       | FLOWLINE                     |
| TW       | TOP OF WALL                  |
| FF       | FINISHED FLOOR               |
| —>—      | COMBINATION SEWER LINE       |
| —OHW—    | OVERHEAD WIRES               |
| —X—      | CHAINLINK FENCE LINE         |
| —        | WOOD/IRON FENCE LINE         |
| —        | STEEL GUARDRAIL              |

STATE OF ILLINOIS)  
JSS  
COUNTY OF COOK)

THIS IS TO CERTIFY THAT THE TOPOGRAPHIC IMPROVEMENTS DEPICTED HEREON WERE SURVEYED UNDER THE DIRECT SUPERVISION OF AN ILLINOIS PROFESSIONAL LAND SURVEYOR, AND THAT THIS PLAT REPRESENTS THE CONDITIONS FOUND AT THE TIME OF SAID SURVEY.

GIVEN UNDER MY HAND AND SEAL THIS 17TH OF JANUARY, 2018 IN CHICAGO, ILLINOIS.

ENVIRONMENTAL DESIGN INTERNATIONAL, INC.  
PROFESSIONAL DESIGN FIRM NO. 184-001224

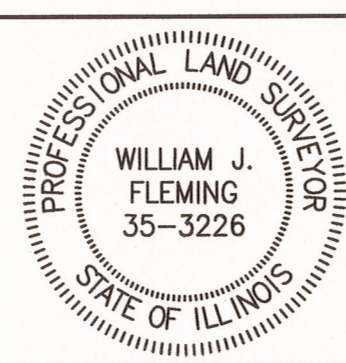
*William J. Fleming*  
WILLIAM FLEMING, IPLS NO. 035.003226  
LICENSE EXPIRES: 11/30/2018

THIS PROFESSIONAL SERVICE CONFORMS TO THE CURRENT ILLINOIS MINIMUM STANDARDS FOR TOPOGRAPHIC SURVEYS.

THIS PLAT IS VALID ONLY WITH AN ORIGINAL SIGNATURE AND EMBOSSED SEAL.

PRINTED ON: 01/17/2018

| REV | DATE       | BY | APP | DESCRIPTION    | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|----|-----|----------------|-----|------|----|-----|-------------|
| 0   | 01-17-2018 | MW | WF  | ISSUED FOR BID |     |      |    |     |             |



**EDI**  
Environmental Design International, inc.  
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Chicago, IL 60603  
Ph: (312) 345-1400 Fax: (312)345-0529  
www.envdesign.com MBE/WBE/DBE

DESIGNED: WF  
DRAWN: MW  
CHECKED: WF  
METRA P.M.: R.CERANT  
DATE: JANUARY 17, 2018

**Metra**  
ENGINEERING DEPARTMENT  
547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

LOCATION NAME: **95TH STREET SUBSTATION**  
TITLE: **TOPOGRAPHIC SURVEY**

CAD FILE NUMBER: SS-11.9-1001.DGN  
SCALE: AS SHOWN  
PROJECT NO. GW4254-57102002  
MILE POST NO. 11.9  
DISTRICT: MED  
SHEET NO. **SS-11.9-1001**



GENERAL NOTES:

- 1. ALL ITEMS OF THIS PROJECT SHALL BE GOVERNED BY THE CODES AND SPECIFICATIONS LISTED BELOW:
A. INTERNATIONAL BUILDING CODE-2012
B. CHICAGO BUILDING CODE-2017
C. "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" PREPARED BY THE DEPARTMENT OF TRANSPORTATION OF THE STATE OF ILLINOIS AND ADOPTED BY SAID DEPARTMENT (LATEST VERSION).
D. "SUPPLEMENTAL SPECIFICATIONS AND RECURRING SPECIAL PROVISIONS" ADOPTED BY THE ILLINOIS DEPARTMENT OF TRANSPORTATION (LATEST VERSION).
E. "STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL" (LATEST VERSION).
F. "STANDARD SPECIFICATIONS FOR WATER AND SEWER MAIN CONSTRUCTION IN ILLINOIS" (LATEST VERSION).
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING AND PAYING FOR ALL REQUIRED PERMITS INCLUDING MUNICIPAL PERMITS.
3. ALL IMPROVEMENTS WILL BE SUBJECT TO OBSERVATION BY METRA AUTHORIZED REPRESENTATIVE AND/OR QUALIFIED AGENTS ACTING ON BEHALF OF METRA BOTH DURING THE COURSE OF CONSTRUCTION AND AFTER CONSTRUCTION IS COMPLETE.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS, DIMENSIONS AND ELEVATIONS AT THE SITE AND MUST ADAPT HIS WORK TO ACTUAL CONDITIONS IN A MANNER APPROVED BY THE ENGINEER AT NO ADDITIONAL COST TO THE OWNER.
5. ALL EXISTING UTILITIES SHALL BE FIELD VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.
6. TRAFFIC SHALL BE MAINTAINED ON ALL STREETS AT ALL TIMES.
7. IN THE EVENT, THE COUNTY/CITY STANDARD DETAILS CONFLICT WITH "TYPICAL SITE DETAILS", THE COUNTY/CITY STANDARD DETAILS SHALL GOVERN.
8. DUST SHALL BE CONTROLLED BY THE UNIFORM APPLICATION OF SPRINKLED WATER AS DIRECTED BY THE ENGINEER.
9. ALL ADJACENT ROADWAYS SHALL BE CLEANED OF CONSTRUCTION DEBRIS AT THE END OF EACH CONSTRUCTION DAY.
10. CONTRACTOR SHALL COORDINATE WITH IDOT, METRA, AND THE CITY/VILLAGE TO LOCATE SIGNAL CABLES.
11. SPOT ELEVATIONS SHOWN ARE AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED ON PLAN.
12. ALL DEBRIS SHALL BE REMOVED PRIOR TO CONSTRUCTION OF NEW WORK & LEGALLY DISPOSED OF OFFSITE.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONSTRUCTION LAYOUT STAKING. THE COST FOR ALL ASSOCIATED WORK SHALL BE INCLUDED IN THE CONTRACT SUM.

UTILITY WARNING:

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. KMI MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. KMI FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. KMI HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. CALL J.U.L.I.E. (1-800-892-0123) AND/OR DIGGER (312-744-7000) PRIOR TO CONSTRUCTION OR EXCAVATION.

TEMPORARY EXCAVATION SUPPORT:

- 1. TEMPORARY EXCAVATION SUPPORT, SHALL BE DESIGNED BY CONTRACTOR AND APPROVED BY THE RAILROAD OWNER. EXCAVATION SUPPORT IS SHOWN SYMBOLICALLY ON THE DRAWINGS, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE TYPE, SIZE, AND LOCATION OF ALL REQUIRED SUPPORTS.
2. REFER TO SPECIFICATION SECTION 02260-EXCAVATION SUPPORT AND PROTECTION AND APPENDIX "A"-METRA SHORING GUIDELINES FOR ADDITIONAL REQUIREMENTS.

MINIMUM DESIGN LOADS:

Table with 3 columns: FLOOR LOADS, ROOF LOADS, WIND LOAD. Values include DL= 75 LB/SQ.FT., LL= 100 LB/SQ.FT., and WL= 25 LB/SQ.FT.

EXCAVATION AND EARTHWORK:

- 1. ALL FOOTING EXCAVATIONS SHALL BE INSPECTED, PRIOR TO CONCRETE PLACEMENT, BY A SOILS ENGINEER TO VERIFY SUITABLE BEARING MATERIAL OF CAPACITY AS SPECIFIED.
2. NOTIFY THE OWNER'S REPRESENTATIVE WHEN ADDITIONAL EXCAVATION IS REQUIRED TO REACH SUITABLE BEARING MATERIAL.
3. THE SOILS ENGINEER SHALL CERTIFY IN WRITING THAT ALL FOUNDATIONS WERE PLACED ON SOIL WITH THE BEARING VALUE AS SPECIFIED.
4. WITHIN THE EXCAVATION AREA OF THE FOUNDATIONS, ALL VEGETATION, TOPSOIL, PREVIOUSLY PLACED FILL AND UNSUITABLE SOILS SHALL BE REMOVED. ALL FOOTINGS TO BEAR ON VIRGIN SOIL OR PROPERLY PLACED AND COMPACTED ENGINEERED FILL.
5. FOUNDATION DESIGN DOES NOT ACCOUNT FOR WINTER CONSTRUCTION. ANY UNENCLOSED/UNHEATED SPACES SHALL BE ADEQUATELY PROTECTED AGAINST FROST DURING WINTER CONSTRUCTION BY CONTRACTOR.

CONCRETE NOTES:

- 1. MATERIAL: NORMAL WEIGHT CONCRETE. f'c= 4000psi AT 28 DAYS.
2. ALL REINFORCED CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE ACI BUILDING CODE 318, AREMA, CHAPTER 8 AND SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS ACI 301.
3. CONTRACTOR SHALL SUBMIT MIX DESIGN FOR APPROVAL PRIOR TO ORDERING CONCRETE.
4. ALL REINFORCING BARS SHALL BE ASTM A615, GRADE 60, EPOXY COATED.
5. ALL WELDED WIRE FABRIC SHALL BE ASTM A185, EPOXY COATED.
6. THE ARRANGEMENT OF ACCESSORIES SHALL BE IN ACCORDANCE WITH THE ACI MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES. ANY PART OF AN ACCESSORY WHICH WILL BE EXPOSED ON THE CONCRETE SURFACE AFTER REMOVAL OF THE FORMS SHALL BE GALVANIZED OR PLASTIC TIPPED.
7. SUPPORT BARS SHALL BE MINIMUM #4 IN SIZE AND SPACED NOT MORE THAN 3'-6" O.C. HIGH CHAIRS SHALL BE PLACED NOT MORE THAN 3'-0" O.C. THERE SHALL BE A MINIMUM OF THREE CHAIRS PER BAR.
8. CONTINUOUS BARS SHALL BE LAPPED MIN. 40 BAR DIAMETERS AT ALL SPLICES.
9. THE MINIMUM PROTECTIVE COVERING FOR MAIN REINFORCING STEEL SHALL BE AS FOLLOWS:
A. 3" WHERE THE CONCRETE IS PLACED AGAINST THE GROUND
B. 2" WHERE THE CONCRETE IS PLACED AGAINST FORM
C. 1 1/2" FOR STIRRUPS AND TIES
10. ALL SLABS ON GRADE, EXCEPT AS SHOWN OR NOTED OTHERWISE, SHALL BE REINFORCED WITH 6x6-W2.1xW2.1 WELDED WIRE FABRIC USING 1'-0" LAPS AT SPLICES. REINFORCING SHALL BE PLACED 1 1/2" CLEAR FROM THE TOP OF THE SLAB.

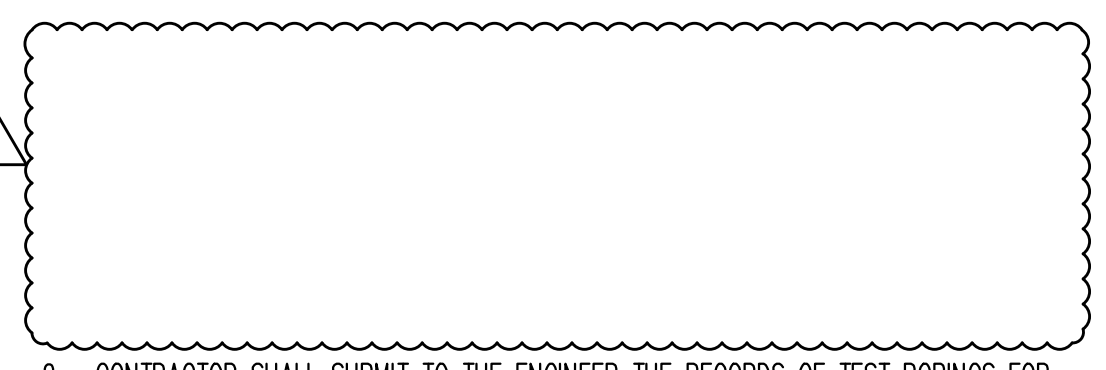
CONCRETE NOTES CONTINUED:

- 11. SIZE OF THE CONCRETE POUR SHALL NOT EXCEED 2,000 S.F. FOR SLABS ON GRADE AND 90 FEET FOR WALLS, UNLESS CONSTRUCTION JOINTS ARE PROVIDED.
12. EACH CONTRACTOR AND SUBCONTRACTOR SHALL PROVIDE SLEEVES IN CONCRETE FORM WORK FOR HIS OWN WORK. NO CORING OF THE CONCRETE WILL BE ALLOWED WITHOUT THE WRITTEN CONSENT OF THE STRUCTURAL ENGINEER.
13. NO REINFORCEMENT SHALL BE CUT TO ACCOMMODATE ANY OPENINGS. NO OPENING LARGER THAN ONE SQUARE FOOT IS TO BE PROVIDED UNLESS SHOWN ON THE STRUCTURAL DRAWINGS OR APPROVED BY THE STRUCTURAL ENGINEER.
14. PRIOR TO POURING CONCRETE, CONTRACTOR SHALL ARRANGE FOR AN INSPECTION OF REINFORCING STEEL (PLACEMENT) BY THE STRUCTURAL ENGINEER.
15. PRIOR TO THE PLACEMENT OF ANY PIPE SLEEVES, BOX-OUTS OR OTHER SLAB PENETRATIONS, EACH MECHANICAL OR ELECTRICAL TRADE SHALL PREPARE AND SUBMIT SHOP DRAWINGS OF PROPOSED SLEEVE LAYOUT FOR STRUCTURAL ENGINEER'S REVIEW AND APPROVAL.
16. ALL CONCRETE SURFACES EXPOSED TO WEATHERING SHALL BE SEALED AS SPECIFIED IN SPECIFICATIONS.
17. FRESHLY PLACED CONCRETE SHALL BE PROTECTED FROM PREMATURE DRYING AND EXCESSIVELY HOT OR COLD TEMPERATURES, AND SHALL BE MAINTAINED WITH MINIMUM MOISTURE LOSS AT A RELATIVELY CONSTANT TEMPERATURE FOR THE TIME REQUIRED FOR PROPER SETTING AND HARDENING OF CONCRETE.
18. DESIGN SOIL BEARING PRESSURE IS ASSUMED TO BE 3000 PSF.
19. CONCRETE SLAB ON GRADE SHALL HAVE A MINIMUM OF 600 PSF LOADING CAPACITY.
20. CONCRETE TESTS:
A. COMPRESSION TESTS: ASTM C31 AND C39.
B. SLUMP TESTS: ASTM C143.

EROSION CONTROL NOTES:

- 1. ALL EROSION AND SEDIMENT CONTROL WORK SHALL CONFORM TO THE ILLINOIS URBAN MANUAL STANDARDS AND PROCEDURES FOR EROSION CONTROL AND WITH ALL COUNTY ORDINANCES PERTAINING TO EROSION CONTROL.
2. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND OPERATIONAL PRIOR TO ANY GROUND DISTURBANCE.
3. SILT FILTER FABRIC SHALL BE PLACED BETWEEN FRAME AND GRATE OF SEWER STRUCTURES UNTIL VEGETATION IS ESTABLISHED.
4. ALL DISTURBED AREAS SHALL BE TEMPORARILY STABILIZED WITHIN 7 DAYS OF ACTIVE DISTURBANCE.
5. UTILIZE EXCELSIOR BLANKET ON ALL SLOPES OF 4:1 OR GREATER.
6. ALL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE MAINTAINED AND REPAIRED AS NEEDED TO ENSURE EFFECTIVE PERFORMANCE OF THE REQUIRED EROSION CONTROL MEASURES.
7. DURING THE CONSTRUCTION OPERATION, WHEN ANY LOOSE MATERIAL IS DEPOSITED IN THE FLOW LINE OF DITCHES, GUTTERS OR DRAINAGE STRUCTURES SO THE NATURAL FLOW OF WATER IS OBSTRUCTED, THE MATERIAL SHALL BE REMOVED AT THE END OF EACH CONSTRUCTION DAY.
8. ALL EROSION CONTROL MEASURES SHALL BE DISPOSED OF WITHIN 30 DAYS OF FINAL STABILIZATION OF THE SITE.
9. GROUND COVER FOR 3:1, 4:1, & 5:1 SLOPES SHALL BE ESTABLISHED WITHIN SEVEN DAYS OF FINAL GRADING.
10. ALL TOPSOIL SHALL BE STRIPPED AND STOCKPILED PRIOR TO FILLING.
11. CONTRACTOR SHALL PLACE STOCKPILED TOPSOIL OR IMPORTED MATERIAL ON ALL DISTURBED AREAS WITH 6" TOPSOIL UNLESS OTHERWISE NOTED ON PLANS, RAKED SMOOTH TO BE READY FOR SEEDING (LANDSCAPING, ETC.).
12. SEEDING SHALL BE PER I.D.O.T. MANUAL, SECTION 250 STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST REVISION.
13. ALL NEW SEEDED AREA TO BE WATERED BY THE CONTRACTOR UNTIL GRASS IS A MINIMUM OF 5" HIGH OR METRA HAS RELEASED THE WATERING REQUIREMENTS.

CAISSON NOTES:



- 2. CONTRACTOR SHALL SUBMIT TO THE ENGINEER THE RECORDS OF TEST BORINGS FOR REVIEW & EXAMINATION PRIOR TO CONSTRUCTION.
3. IF ANY EXISTING SERVICE LINES, UTILITIES AND UTILITY STRUCTURES WHICH ARE TO REMAIN IN SERVICE ARE UNCOVERED OR ENCOUNTERED DURING CONSTRUCTION, THEY SHALL BE SAFEGUARDED, PROTECTED FROM DAMAGE AND SUPPORTED IF NECESSARY.
4. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN THE EVENT ANY EXISTING UTILITIES, UTILITY STRUCTURES OR ANY OBSTRUCTION WHICH INTERFERES WITH THE PROPER INSTALLATION OF THE FOUNDATION WORK.
5. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR APPROVAL, THE CAISSON CONSTRUCTION METHOD (INCLUDING THE SEQUENCE OF OPERATIONS), METHOD OF EXCAVATION, DETAILS OF CASING AND LINER REQUIRED, METHOD OF POURING CONCRETE, ETC.
6. ALL TEMPORARY AND PERMANENT CASINGS SHALL EXTEND ABOVE THE GROUND. TEMPORARY LINER MUST EXTEND BELOW SOFT CLAY MATERIAL.
7. NO CAISSON EXCAVATION SHALL BE LEFT UNSUPPORTED OR NOT FILLED FOR MORE THAN EIGHT HOURS.
8. ALL CAISSONS SHALL BEAR ON THE MATERIAL CAPABLE OF SAFELY SUPPORTING THE CAISSON LOAD LISTED ON DRAWINGS.
9. ALL CAISSON CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 4000 P.S.I. AT 28 DAYS.
10. ALL REINFORCING BARS SHALL BE A.S.T.M. A615, GRADE 60, EPOXY COATED.
11. CONCRETE SHALL BE VIBRATED IN UPPER 10"-0" OF CAISSON SHAFT.
12. THE CAISSON CONTRACTOR SHALL REMOVE ALL LAITANCE FROM THE TOP OF THE CAISSON SHAFT A MINIMUM OF 24 HOURS AFTER THE CONCRETE POUR FOR EACH CAISSON.
13. SUBMIT THE ACTUAL CAISSON LOCATION PLAN PREPARED BY A REGISTERED SURVEYOR IN STATE OF ILLINOIS AND FULL DETAILS OF CORRECTIVE MEASURES FOR CAISSONS EXCEEDING THE TOLERANCE LIMIT OF PLUS OR MINUS 3".
14. THE CONTRACTOR SHALL SETUP REFERENCE POINTS FOR OBSERVING OF FOUNDATION SETTLEMENT ON ALL BUILDINGS CLOSER THAN 50 FEET PRIOR TO ANY CAISSON INSTALLATION.
15. PUMPING OF WATER FROM THE CAISSON SHAFT SHALL NOT BE PERMITTED UNLESS APPROVED BY THE GEOTECHNICAL ENGINEER.

STRUCTURAL STEEL NOTES:

- 1. ALL STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST A.I.S.C. SPECIFICATIONS AND AREMA, CHAPTER 15.
2. ELEVATIONS SHOWN FOR STRUCTURAL STEEL ARE TO THE TOP OF STEEL MEMBERS. (U.N.O.)
3. STRUCTURAL STEEL WIDE FLANGE SHAPES SHALL BE ASTM A992 (Fy=50 KSI). STRUCTURAL TUBES SHALL BE ASTM A500, GRADE B (Fy=46 KSI). STRUCTURAL PIPES SHALL BE ASTM A53, GRADE B, TYPE S (Fy=35 KSI). ALL OTHER STRUCTURAL STEEL SHALL BE ASTM A36 (Fy=36 KSI).
4. ALL STEEL SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
5. ALL BOLTS SHALL BE ASTM A325. ALL BOLTS SHALL BE 3/4" DIA. UNLESS NOTED OTHERWISE.
6. WELDING SHALL BE DONE BY MANUAL SHIELDED METAL ARC PROCESS USING A.W.S. A5.1 OR A5.5, E70XX ELECTRODES OR BY SUBMERGED ARC WELDING USING A.W.S. A5.17, F7X3XXX, FLUX ELECTRODE COMBINATION.
7. WELDS NOT OTHERWISE SPECIFIED SHALL BE CONTINUOUS 1/4" FILLET WELDS BUT NOT LESS THAN MINIMUM SIZE REQUIRED BY A.I.S.C. SPECIFICATIONS.
8. NO CONNECTION SHALL CONSIST OF LESS THAN 2-3/4" DIA. BOLTS OR WELD DEVELOPING LESS THAN 10 KIPS.
9. CUTS, HOLES, OPENINGS, ETC., REQUIRED IN STRUCTURAL STEEL MEMBERS FOR THE WORK OF OTHER TRADE SHALL BE SHOWN ON SHOP DRAWINGS FOR STRUCTURAL STEEL AND SHALL BE MADE IN THE SHOP. BURNING OF HOLES, OR CUTS IN STRUCTURAL STEEL MEMBERS IN THE FIELD WILL NOT BE PERMITTED EXCEPT BY THE WRITTEN PERMISSION FROM THE STRUCTURAL ENGINEER.

STRUCTURAL STEEL NOTES CONTINUED:

- 10. SHOP AND FIELD TESTING OF WELDS SHALL BE AS FOLLOWS:
A. VISUAL INSPECTION SHALL BE MADE ON 100% OF ALL WELDS.
B. MAGNETIC PARTICLE TEST SHALL BE MADE ON 100% OF ALL FILLET WELDS.
C. ULTRASONIC TESTS SHALL BE MADE ON 100% OF ALL FULL PENETRATION WELDS.
D. TWENTY FIVE (25) PERCENT OF BOLTS IN EACH SHEAR CONNECTION BUT NOT LESS THAN TWO (2) BOLTS PER CONNECTION SHALL BE CHECKED BY CALIBRATED TORQUE WRENCH.
11. SUBMIT REQUIRED CALCULATIONS AND SHOP DRAWINGS PREPARED AND SEALED BY A STRUCTURAL ENGINEER LICENSED IN THE STATE OF ILLINOIS FOR REVIEW AND APPROVAL BY THE ENGINEER.
12. SHOP DRAWINGS SHALL BE PREPARED USING ACTUAL FIELD SURVEY OF CAISSON LOCATIONS. CONTACT METRA FOR ANY DISCREPANCIES BETWEEN FIELD LOCATION OF CAISSONS AND DESIGN DRAWINGS.

STEEL BAR GRATE NOTES

- 1. STEEL SHALL BE ASTM-A569 OR ASTM-A36 FOR BARS IN THICKNESS OF 3/16" OR LESS AND ASTM-A36 FOR ALL OTHERS.
2. PANELS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
3. GRATING IS TO SAFELY SUSTAIN A UNIFORMLY DISTRIBUTED LOAD OF 150 PSF ON A 6'-0" SPAN.
4. ATTACHMENT TO SUPPORTING STEEL SHALL BE WITH STAINLESS STEEL SADDLE CLIPS AND #12 SELF-TAPPING SCREWS AT 1'-6" CENTER TO CENTER (MAXIMUM).
5. UNLESS NOTED OTHERWISE, STEEL BAR GRATE SHALL BE 1 1/4"x 3/16" BARS SPACED AT 1 3/16" O.C. WITH WELDED LOCK BARS AT 4" O.C. (M&NICHOLS "GW-125" OR EQUAL)

STANDARD ABBREVIATIONS

Table with 2 columns: Abbreviation and Description. Includes B.C. (BACK OF CURB), C.B. (STORM CATCH BASIN), O.C. (CENTER TO CENTER), CONCRETE, CONT. (CONTINUOUS), DIA. (DIAMETER), DET. (DETAIL), ELEC. (ELECTRIC), ELEV. (ELEVATION), EXIST. (EXISTING), EXT. (EXTERIOR), FT. (FOOT/FEET), GALV. (GALVANIZED), IDOT (ILLINOIS DEPARTMENT OF TRANSPORTATION), LT (LEFT), MAX. (MAXIMUM), M.E. (MATCH EXISTING), M.H. (MANHOLE), MIN. (MINIMUM), NO. OR # (NUMBER), N.T.S. (NOT TO SCALE), P.C.C. (PORTLAND CEMENT CONCRETE), REINF. (REINFORCED), R.O.W. (RIGHT OF WAY), R.R. (RAILROAD), RT (RIGHT), SIM. (SIMILAR), S.S. (STAINLESS STEEL), STA. (STATION), STD. (STANDARD), STL. (STEEL), T&B (TOP AND BOTTOM), T.C. (TOP OF CURB), TH. (THICK), TYP. (TYPICAL), V.I.F. (VERIFY IN FIELD), W/ (WITH)

PRINTED ON: 06/05/2018

Revision table with columns: REV, DATE, BY, APP, DESCRIPTION, REV, DATE, BY, APP, DESCRIPTION

Table with 2 columns: CONSULTANT SEAL & SIGNATURE, CONSULTANT

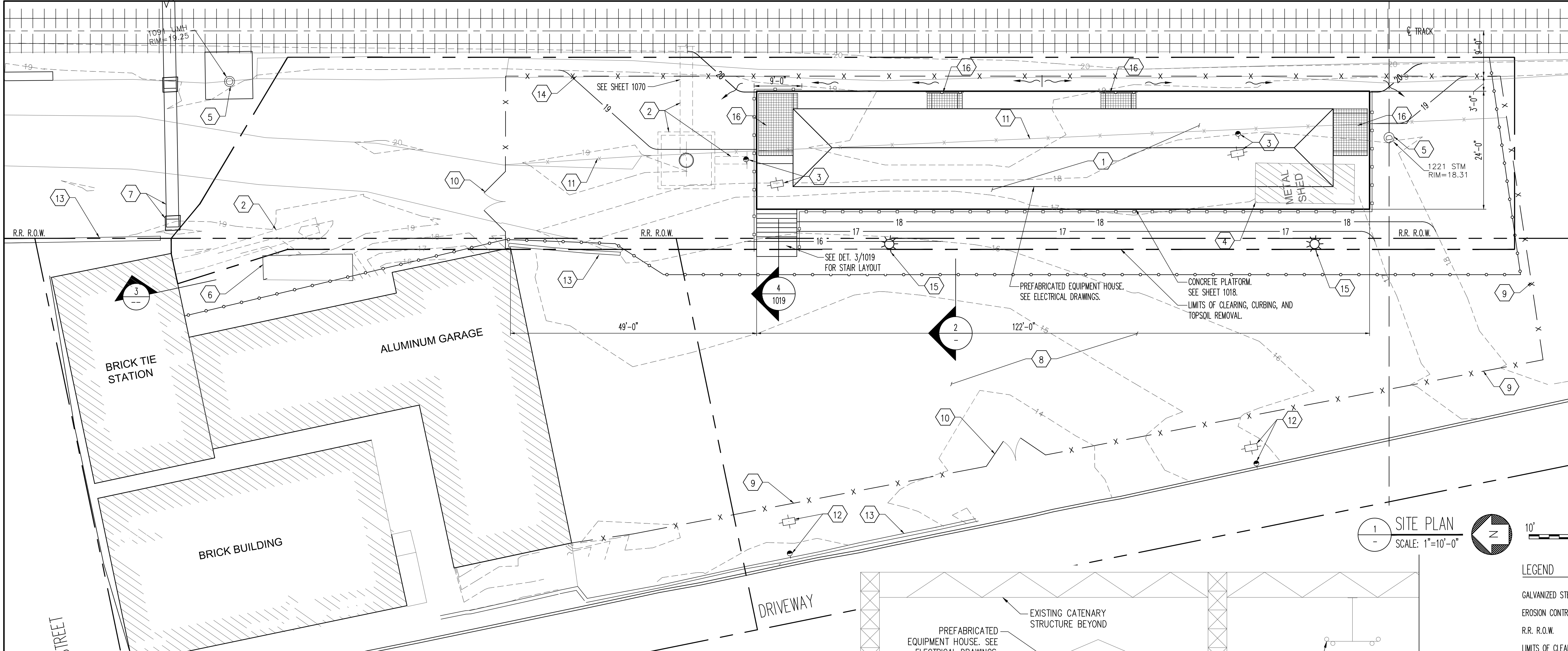


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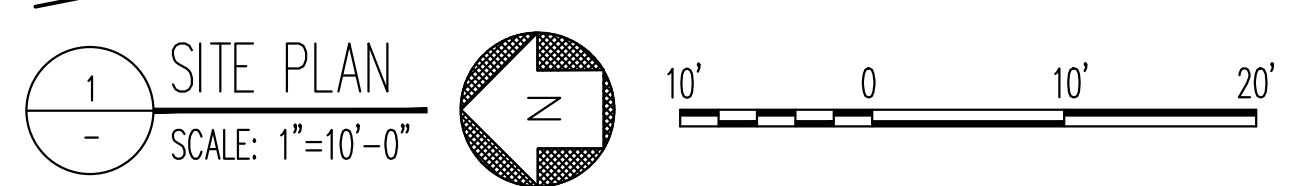
Metra ENGINEERING DEPARTMENT 547 W. JACKSON BOULEVARD CHICAGO, ILLINOIS 60661

Table with 2 columns: LOCATION NAME: 95TH STREET SUBSTATION, TITLE: GENERAL NOTES

Table with 2 columns: CAD FILE NUMBER: SS-11-9-1001G.DGN, SCALE: AS SHOWN, DISTRICT: MED, PROJECT NO., SHEET NO., GW4254-57102002, MILE POST NO. 11.1, SS-11.1-1001G



**CHAIN LINK FENCE:**  
 CHAIN LINK FENCE AND GATES SHALL BE DESIGNED AND INSTALLED AS SPECIFIED IN SPECIFICATION SECTION 02443. REFER TO SHEET SS-17.5-1020B AND SS-17.5-1020C FOR TYPICAL FENCE AND SWING GATE DETAILS. REFER TO SHEET SS-11.9-1019 FOR OPTIONAL SLIDING GATE DETAILS.



**LEGEND**

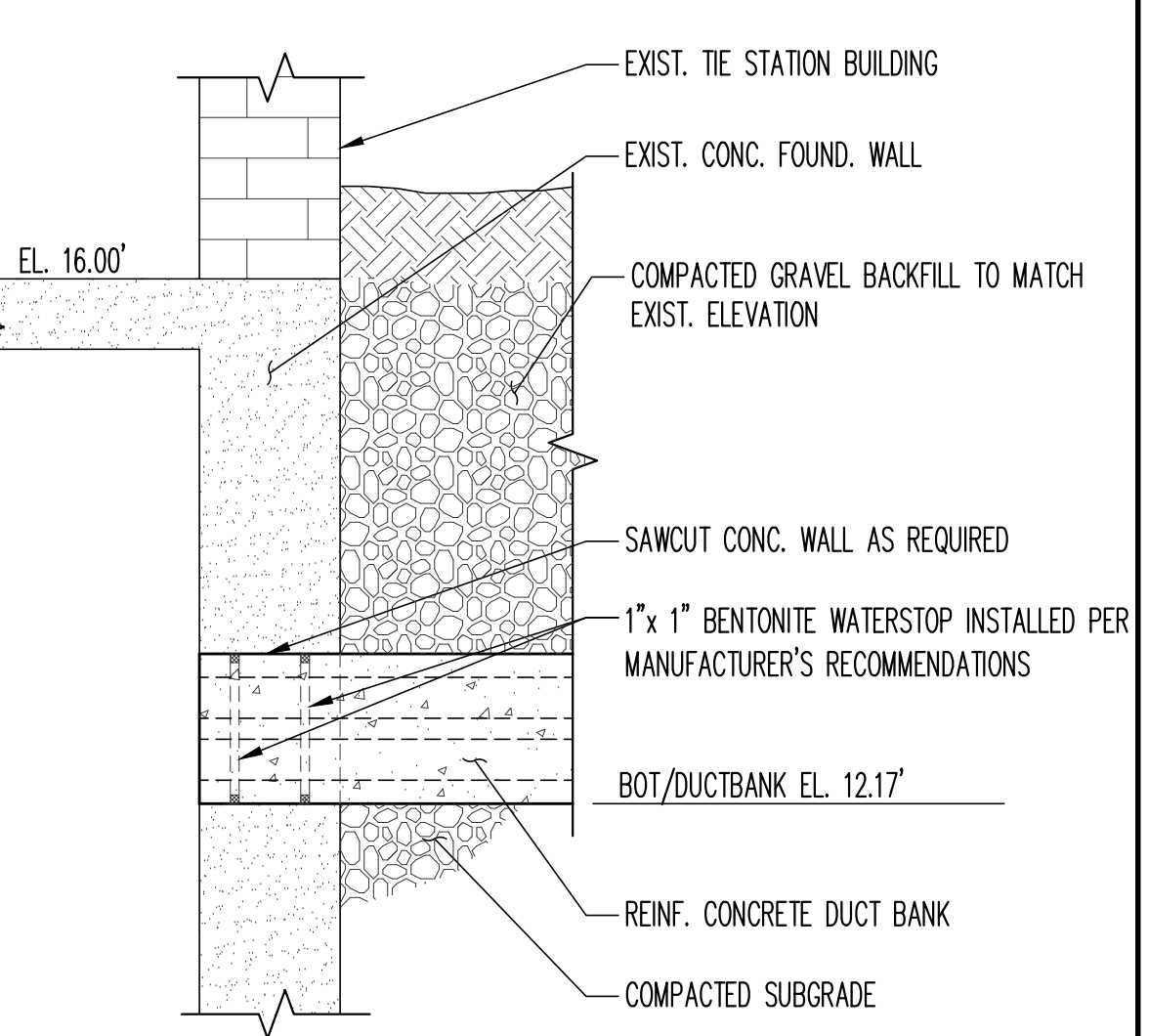
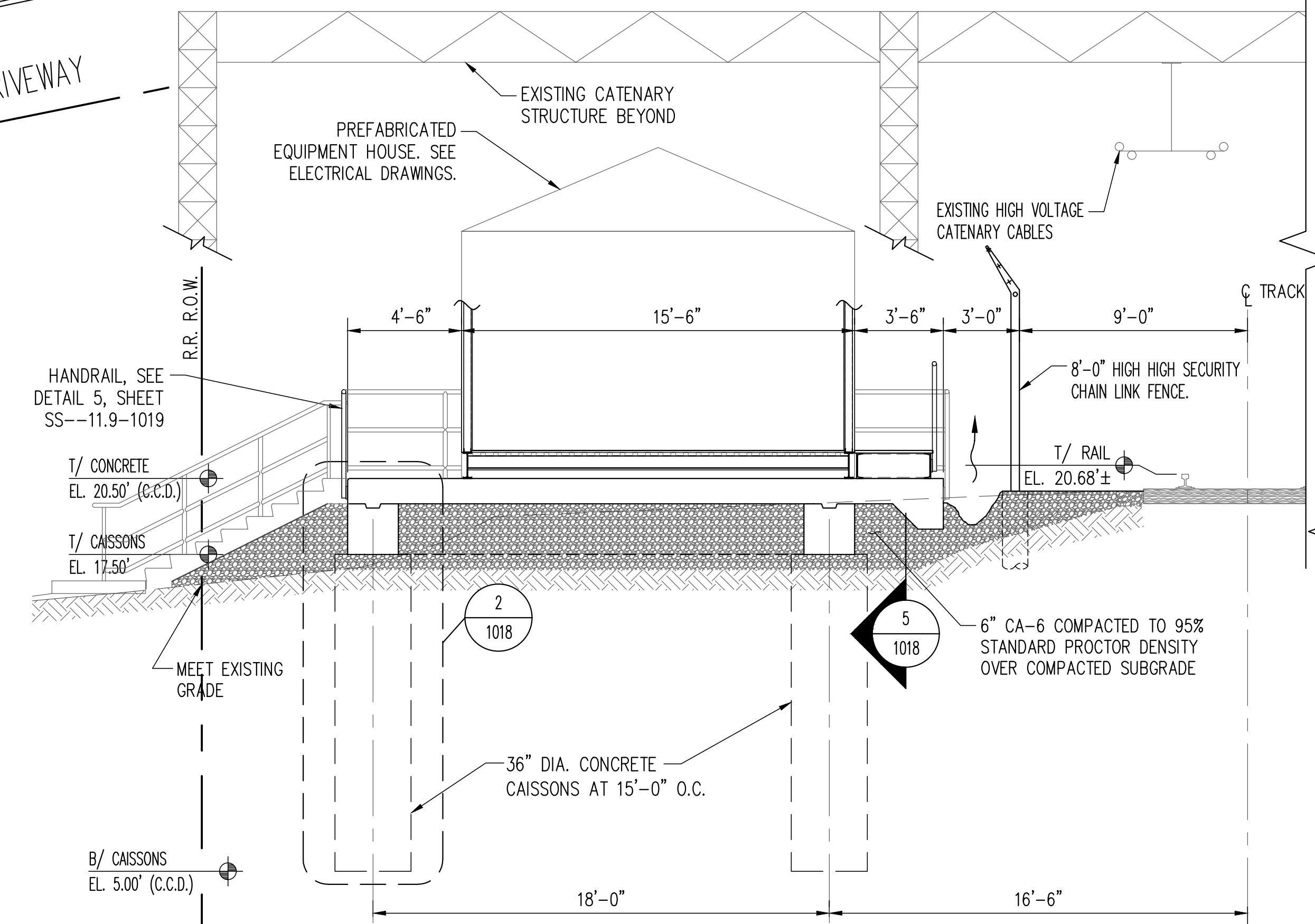
|   |  |
|---|--|
| GALVANIZED STEEL HANDRAIL                       |  |
| EROSION CONTROL SILT FENCE                      |  |
| R.R. R.O.W.                                     |  |
| LIMITS OF CLEARING, CURBING AND TOPSOIL REMOVAL |  |
| 6" COMP. CA-6 AGGREGATE OVER WEED BARRIER       |  |
| EXISTING GRADE TO REMAIN                        |  |

**SYMBOLS**

|  |                               |
|--|-------------------------------|
|  | EXISTING GRADE CONTOUR        |
|  | FINISHED GRADE CONTOUR        |
|  | DIRECTION OF DRAINAGE FLOW    |
|  | FINISHED GRADE SPOT ELEVATION |

- KEY NOTES**
- 1 REMOVE TREES, SHRUBS, TOPSOIL, FENCE WITHIN THE REMOVAL AREA.
  - 2 ELECTRICAL MANHOLE AND DUCTBANK. SEE SHEETS 1070, 1071.
  - 3 RELOCATE EXISTING LIGHT POLE AND REROUTE ASSOCIATED OVERHEAD POWER LINES AND GUY WIRES. RELOCATE BENCHMARKS PRIOR TO POLE RELOCATION.
  - 4 EXISTING METAL SHED (TO BE RELOCATED BY METRA FORCES)
  - 5 EXISTING STORM SEWER AND CATCH BASIN TO REMAIN. PROTECT DURING CONSTRUCTION
  - 6 CONCRETE FOOTING TO REMAIN
  - 7 EXISTING CATENARY STRUCTURE AND FOUNDATIONS TO BE PROTECTED DURING CONSTRUCTION
  - 8 EXISTING PARKING LOT. RESTORE TO ORIGINAL CONDITION.
  - 9 EXISTING CHAIN LINK FENCE TO BE REMOVED AND REPLACED WITH NEW SECURITY FENCE AT THE SAME LOCATION
  - 10 EXISTING CHAIN LINK GATE TO BE REMOVED AND REPLACED WITH NEW 12-FT WIDE BY 8-FT HIGH SECURITY GATE
  - 11 EXISTING CHAIN LINK FENCE TO BE REMOVED
  - 12 EXISTING LIGHT POLE AND GUY WIRE TO REMAIN
  - 13 EXISTING TIMBER TIE RETAINING WALL TO REMAIN
  - 14 NEW 8-FT HIGH SECURITY FENCE
  - 15 RELOCATED LIGHT POLE
  - 16 DOOR LANDING, SEE DETAIL 5/1018

- DEMOLITION/REMOVAL NOTES:**
1. REMOVE EXISTING VEGETATION, TREES, STUMPS AND TOPSOIL WITHIN THE AREA SHOWN ON PLAN. REGRADE AFTER CAISSON INSTALLATION, INSTALL VEGETATION BARRIER FABRIC AND 6" TH. CA-6 ON TOP OF FABRIC.
  2. EXACT EXTENT OF REMOVAL MAY NOT BE FULLY INDICATED BY THE DRAWINGS. THE CONTRACTOR SHALL CONFIRM WITH METRA AND DETERMINE THE NATURE AND EXTENT OF REMOVAL THAT WILL BE REQUIRED BY COMPARING THE DRAWINGS WITH THE EXISTING FIELD CONDITIONS. IT IS EXPRESSLY UNDERSTOOD THAT THIS CONTRACT INCLUDES ALL WORK OF A REMOVAL NATURE THAT MAY BE REQUIRED OR NECESSARY FOR A FULL AND COMPLETE EXECUTION OF THE WORK, WHETHER PARTICULARLY REFERRED TO HEREIN OR NOT.



**2 SECTION**  
 SCALE: 1/4"=1'-0"

**3 WALL PENETRATION DETAIL**  
 SCALE: N.T.S.

PRINTED ON: 07/28/2017

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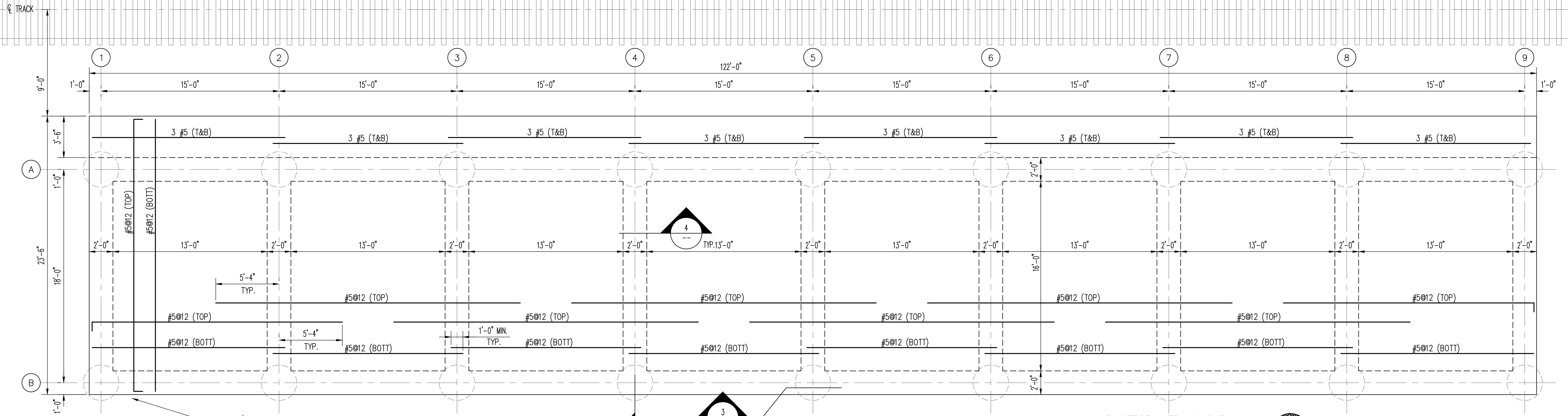
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**KMI**  
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 ARCHITECTS ■ ENGINEERS  
 223 W. Jackson Blvd., Suite 1010 Chicago, IL 60606  
 Tel.: (312)987-9800 Fax.: (312)987-9892

DESIGNED: EG  
 DRAWN: DC  
 CHECKED: MK  
 METRA P.M.: R. CERANT  
 DATE: JUNE 12, 2017

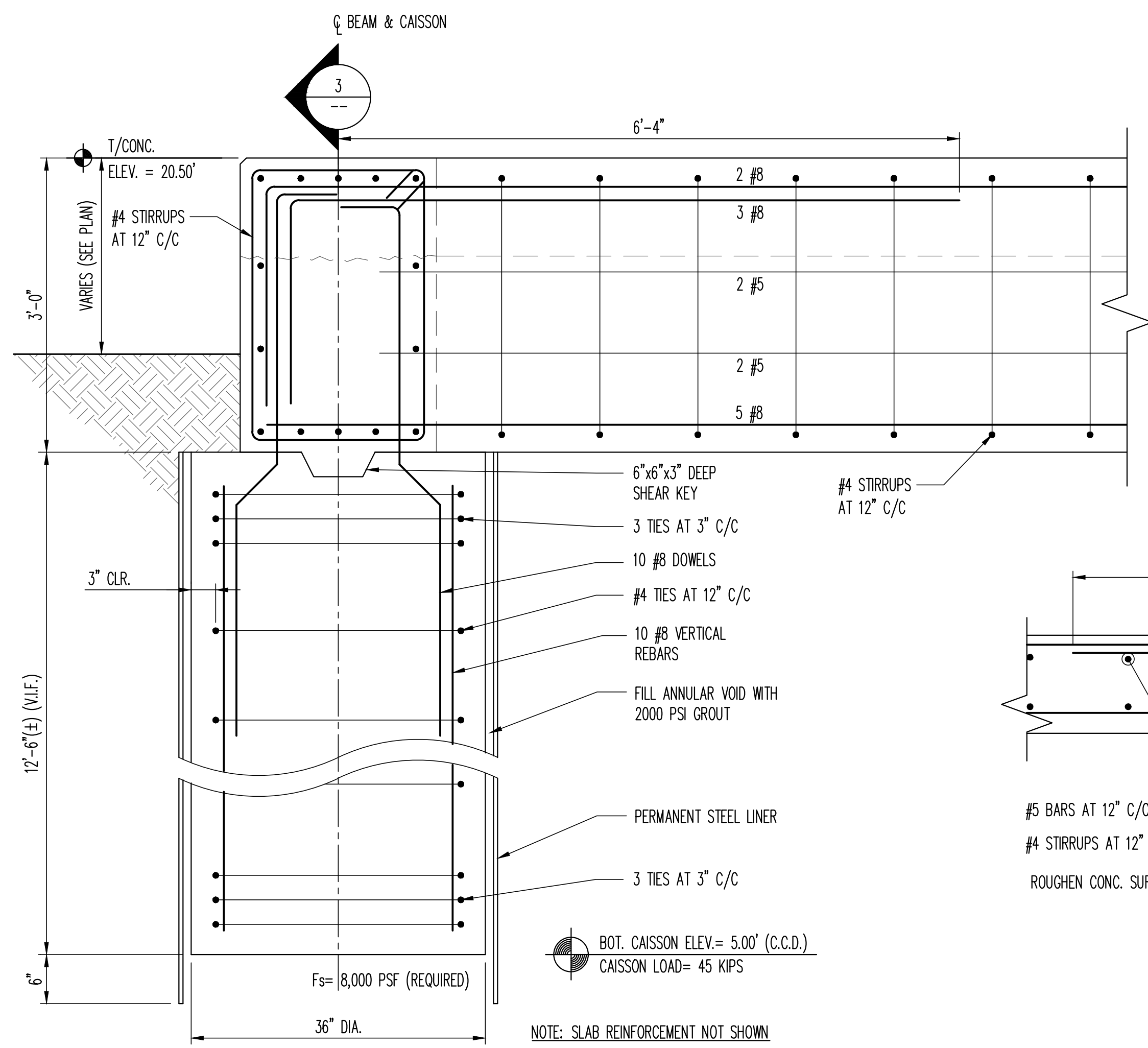
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 TITLE: **SITE PLAN**

CAD FILE NUMBER: SS-11...1017.DGN  
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 PROJECT NO. GW4254-57102002  
 MILE POST NO. 11.1  
 DISTRICT: MED  
 SHEET NO. **SS-11.1-1017**

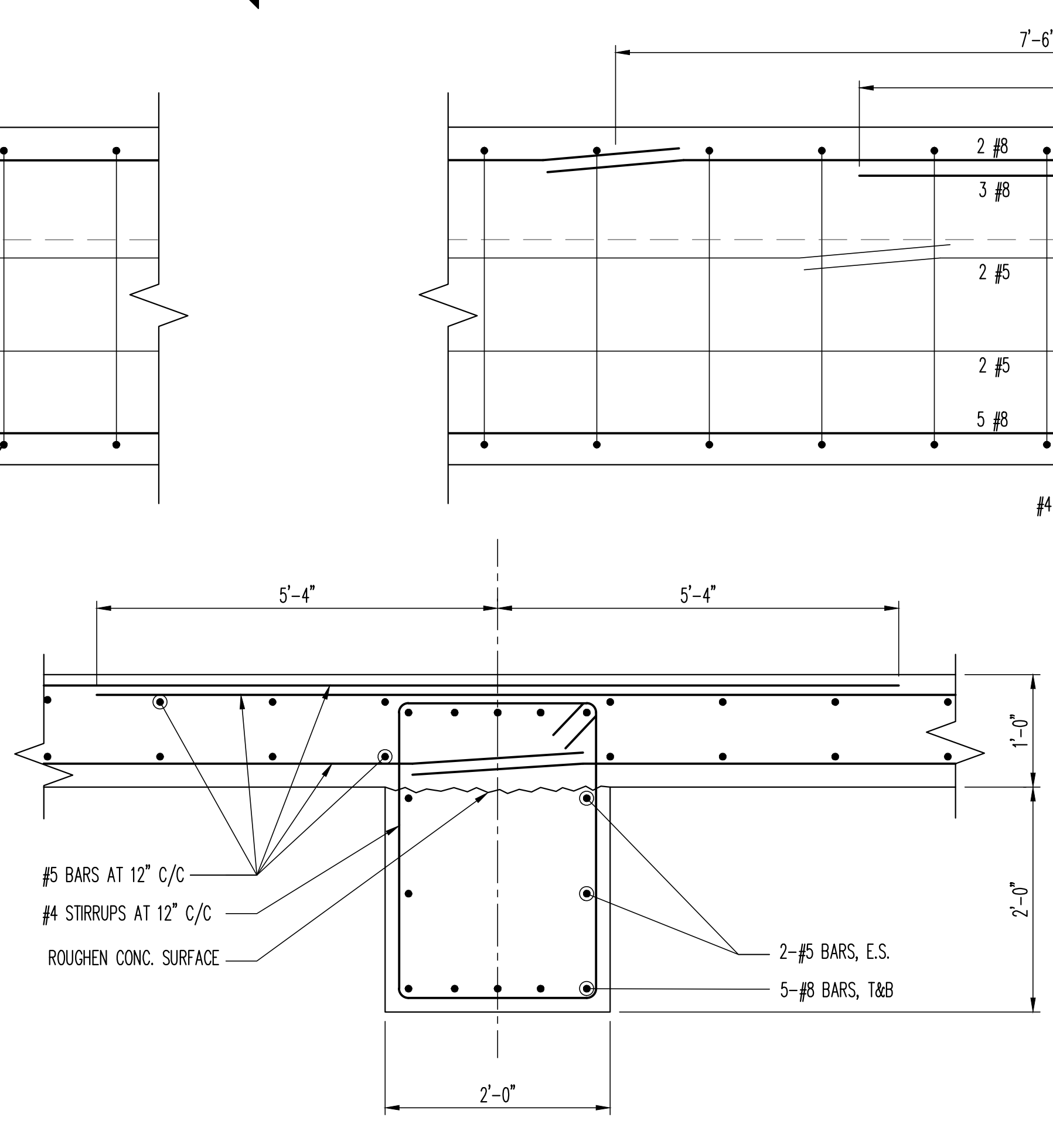




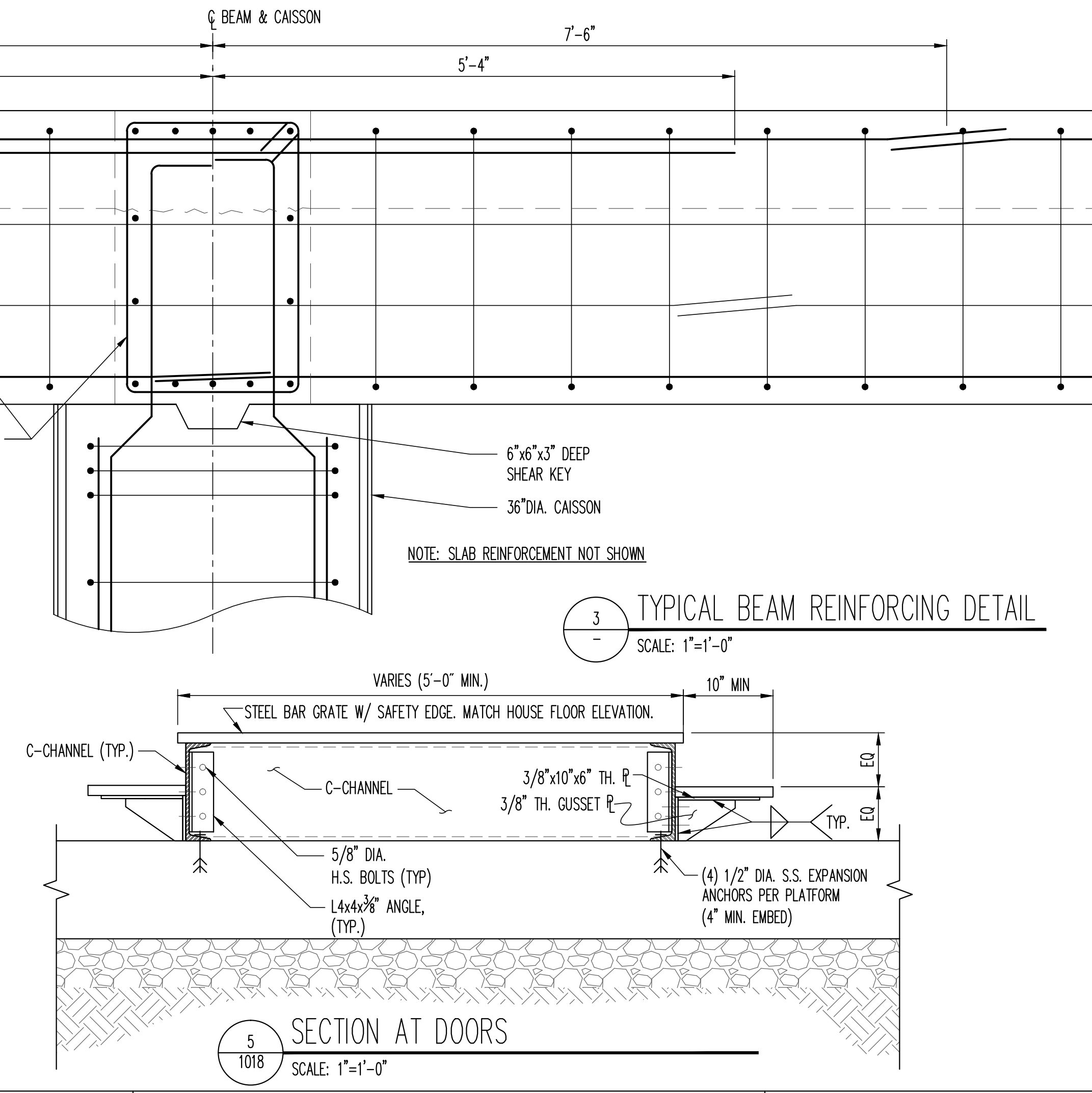
1 PLATFORM FRAMING PLAN  
SCALE: 1/4"=1'-0"



2 TYPICAL CAISSON/BEAM REINFORCING DETAIL  
SCALE: 1"=1'-0"



4 TYPICAL BEAM/SLAB REINFORCING DETAIL  
SCALE: 1"=1'-0"



5 SECTION AT DOORS  
SCALE: 1"=1'-0"

PRINTED ON: 07/28/2017

| REV | DATE       | BY | APP | DESCRIPTION    |
|-----|------------|----|-----|----------------|
| 0   | 07-28-2017 | OT | EG  | ISSUED FOR BID |
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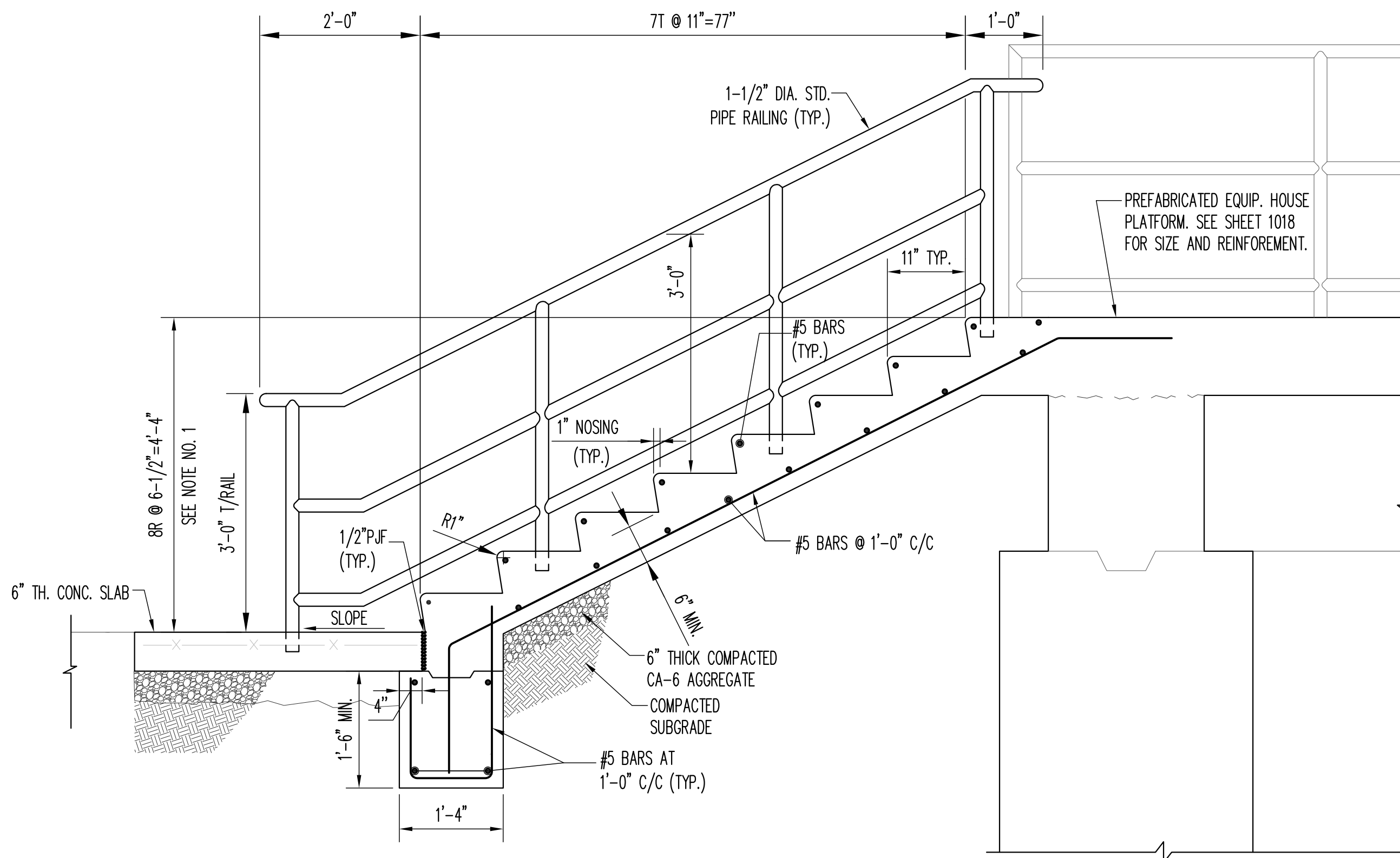
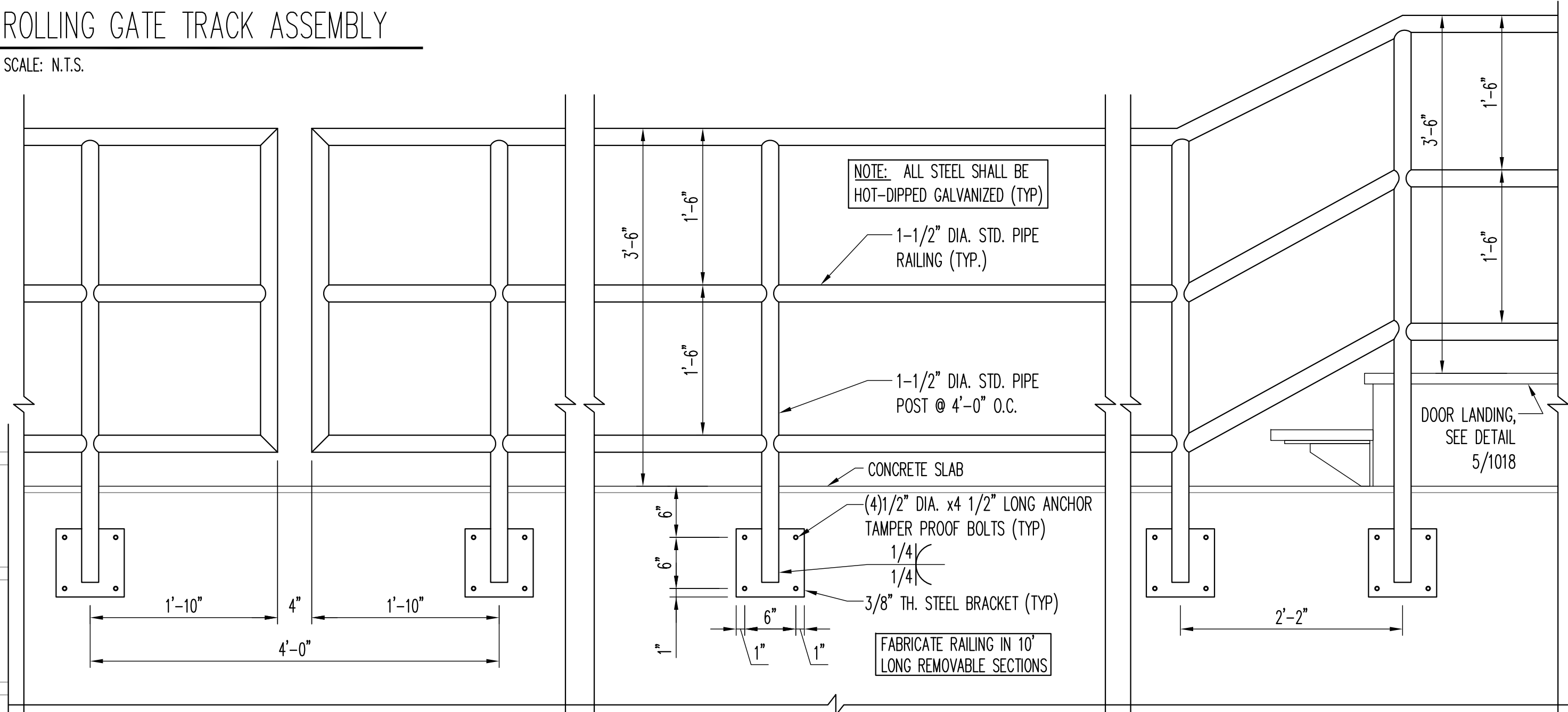
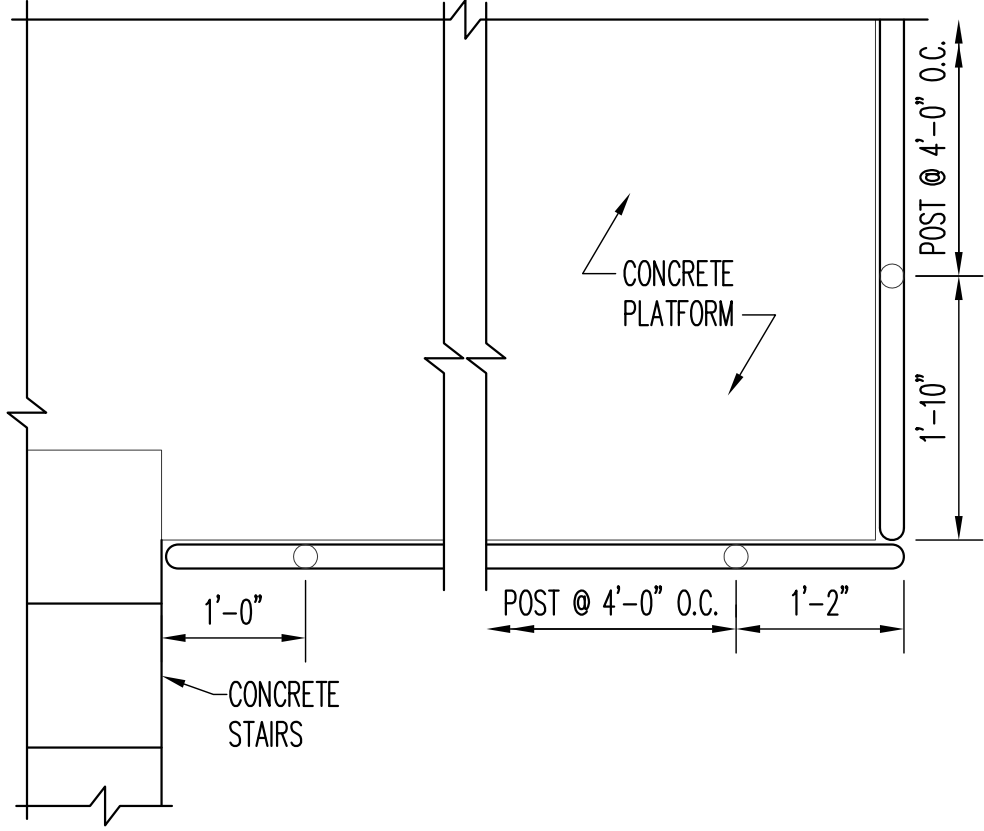
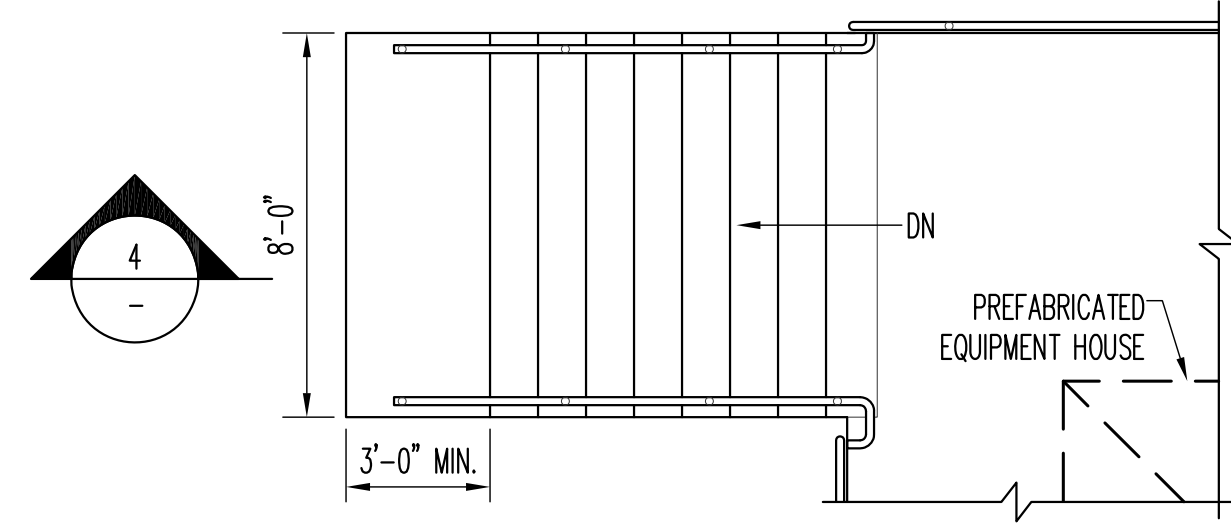
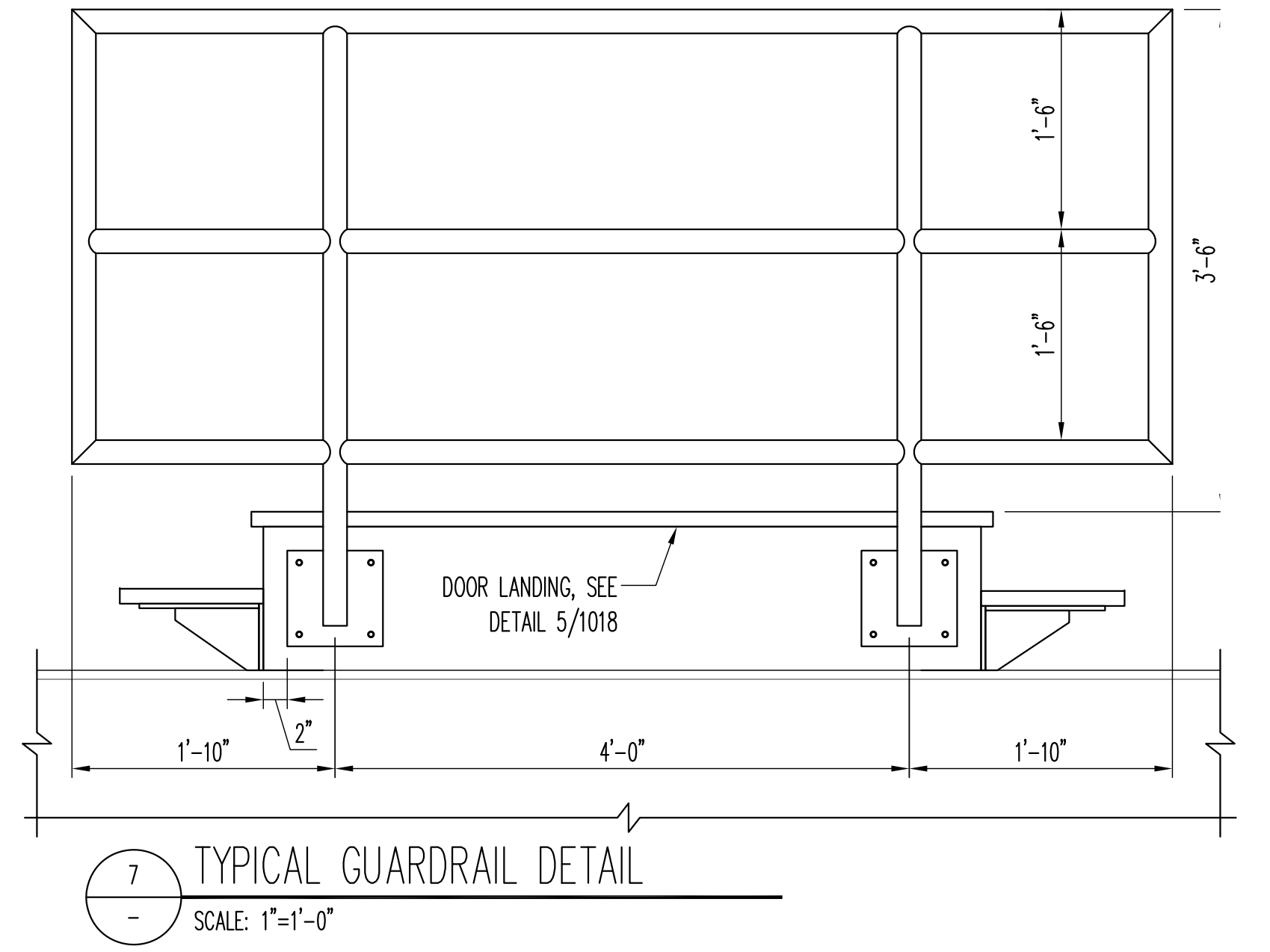
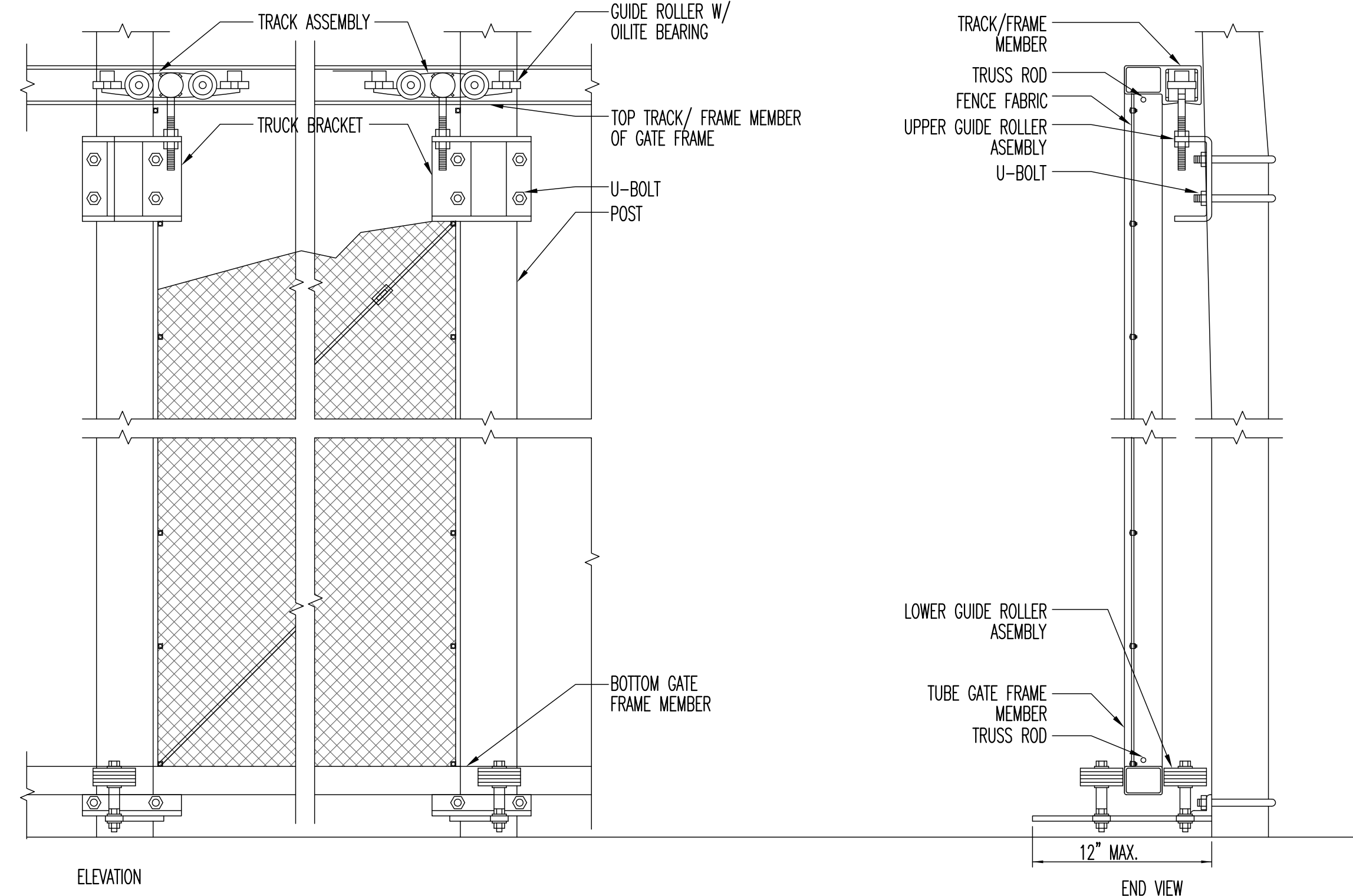
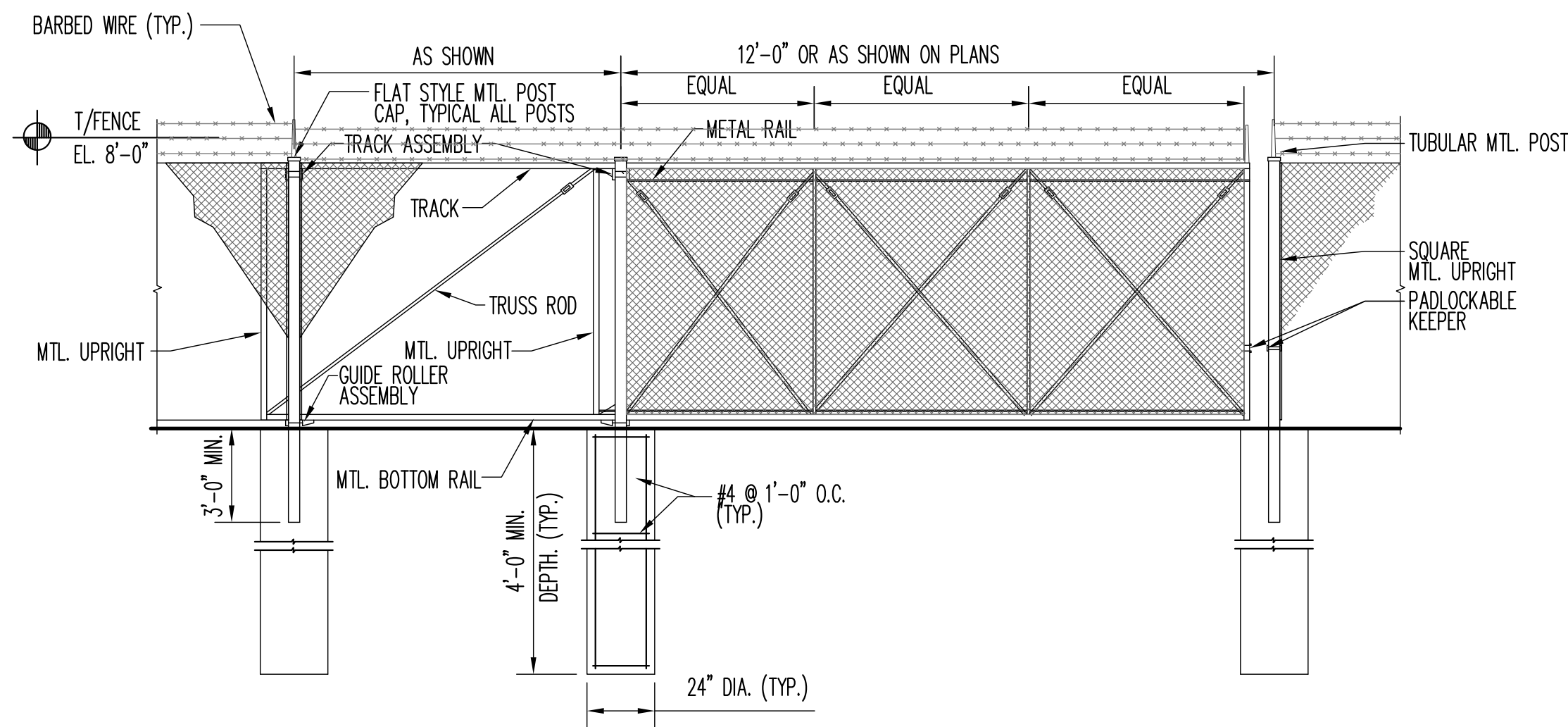
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| DESIGNED: EG          |
| DRAWN: DC             |
| CHECKED: MK           |
| METRA P.M.: R. CERANT |
| DATE: JUNE 12, 2017   |

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547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

|  |
|--|
| LOCATION NAME: <b>95TH STREET SUBSTATION</b> |
| TITLE: <b>FRAMING PLAN AND DETAILS</b>       |

|                                  |                    |                               |
|----------------------------------|--------------------|-------------------------------|
| CAD FILE NUMBER: SS-11.-1018.DGN | SCALE: AS SHOWN    | DISTRICT: MED                 |
| PROJECT NO. GW4254-57102002      | MILE POST NO. 11.1 | SHEET NO. <b>SS-11.1-1018</b> |





- NOTES:
1. ADJUST NUMBER OF STEPS BASED ON FIELD CONDITIONS AS REQUIRED.
  2. SLOPE TREADS TO DRAIN.
  3. PROVIDE BROOM NON-SLIP FINISH IN TREADS.

|     |            |    |     |                |     |      |    |     |             |
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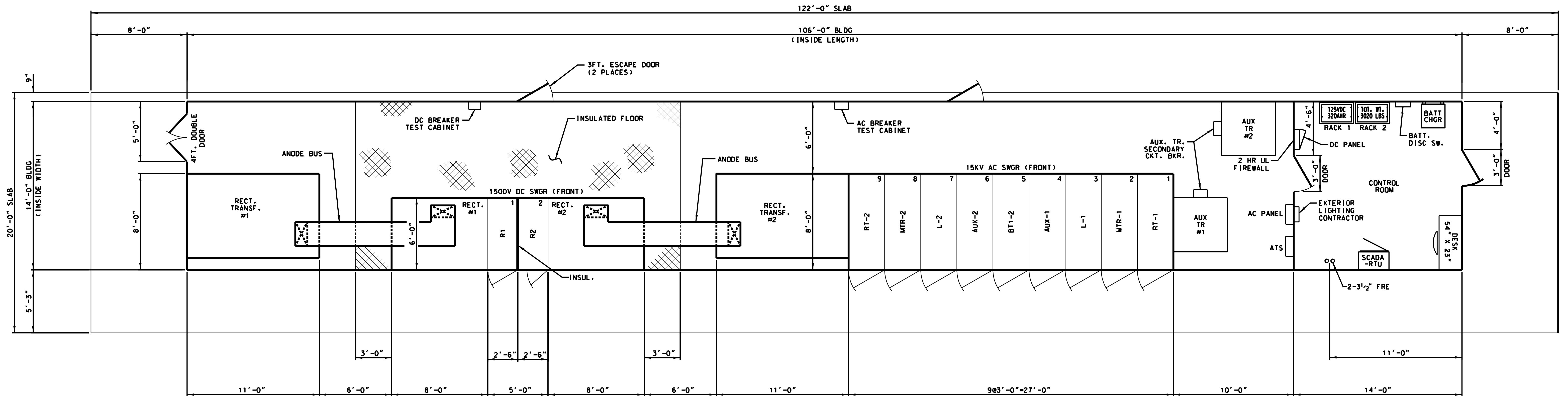
DESIGNED: EG  
DRAWN: DC  
CHECKED: MK  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017



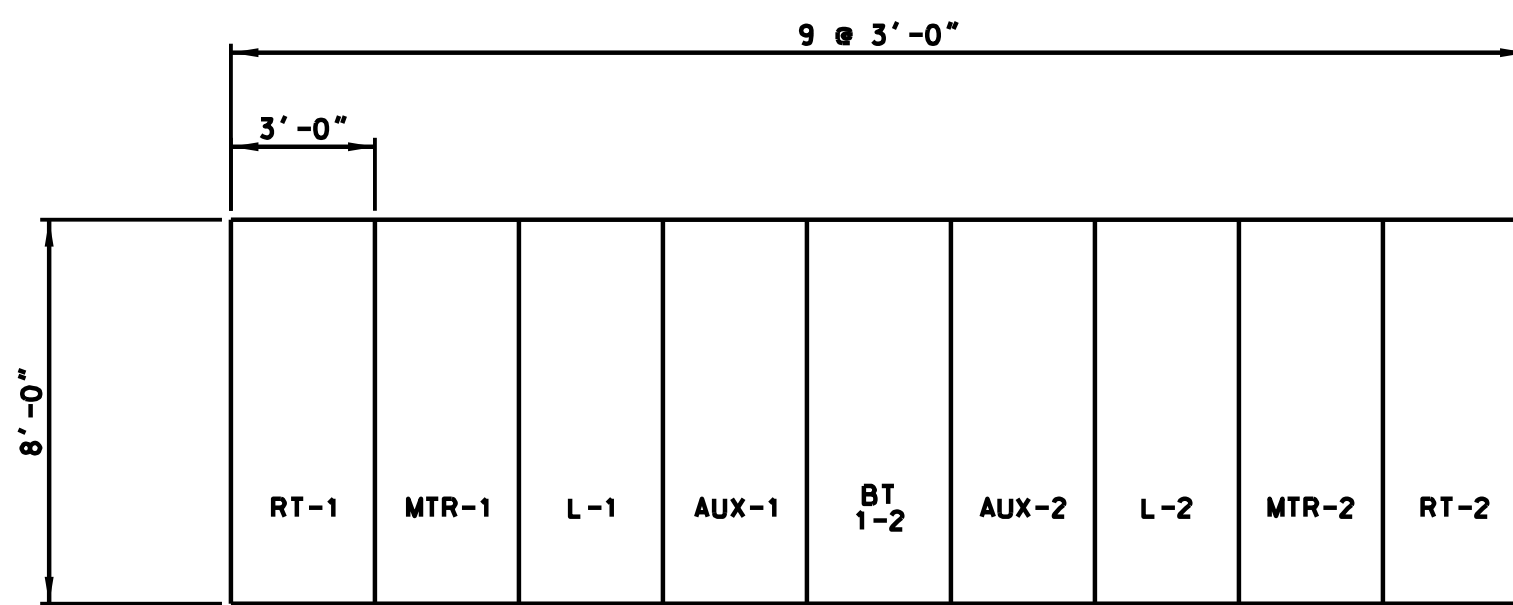
LOCATION NAME: **95TH STREET SUBSTATION**  
TITLE: **DETAILS**

CAD FILE NUMBER: SS-11.9-1019.DGN  
SCALE: AS SHOWN  
PROJECT NO. GW4254-57102002  
MILE POST NO. 11.9  
DISTRICT: MED  
SHEET NO. **SS-11.9-1019**





PLAN  
SCALE: 1/4" = 1'-0" N



15kV AC SWITCHGEAR ELEVATION  
SCALE: 1/4" = 1'-0"

NOTES:

1. SUBSTATION BUILDING ENCLOSURE SHALL BE MAXIMUM 14 FEET HIGH.
2. FOR UNDERGROUND DUCTBANKS SEE DWG. SS-11.9-1071.
3. THE REAR OF TRANSFORMER AND RECTIFIER SHALL BE PROVIDED WITH REMOVABLE PANELS.

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DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017



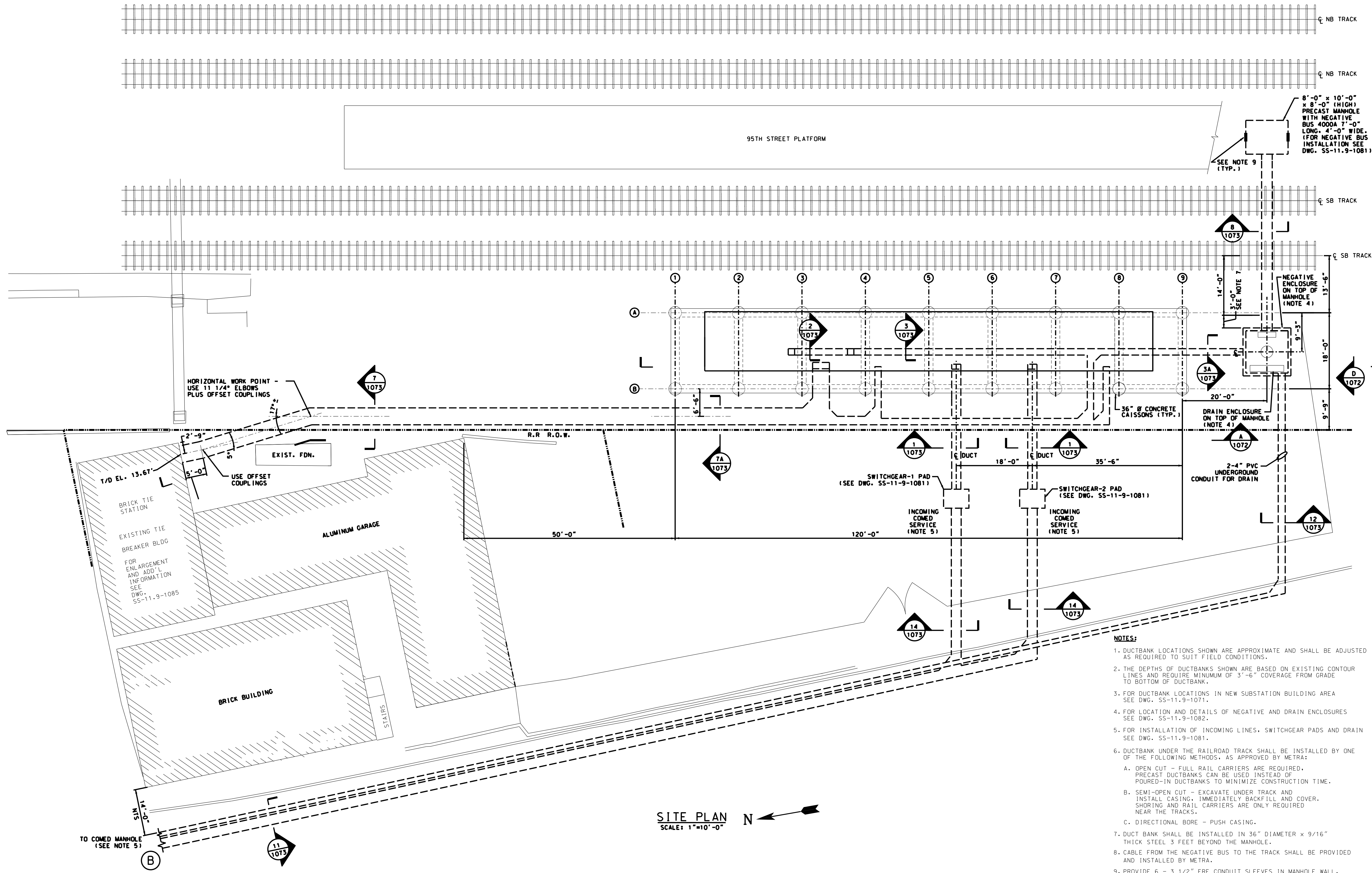
LOCATION NAME:  
95TH. STREET SUBSTATION

TITLE:  
SUBSTATION EQUIPMENT LAYOUT PLAN

CAD FILE NUMBER: SS-11.9-1050.DGN

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|--------------------------------|---------------------------|
| SCALE:<br>1/4" = 1'-0"         | DISTRICT:<br>MED          |
| PROJECT NO.<br>GW4254-57102002 | SHEET NO.<br>SS-11.9-1050 |
| MILE POST NO.<br>11.9          |                           |





- NOTES:**
1. DUCTBANK LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE ADJUSTED AS REQUIRED TO SUIT FIELD CONDITIONS.
  2. THE DEPTHS OF DUCTBANKS SHOWN ARE BASED ON EXISTING CONTOUR LINES AND REQUIRE MINIMUM OF 3'-6" COVERAGE FROM GRADE TO BOTTOM OF DUCTBANK.
  3. FOR DUCTBANK LOCATIONS IN NEW SUBSTATION BUILDING AREA SEE DWG. SS-11.9-1071.
  4. FOR LOCATION AND DETAILS OF NEGATIVE AND DRAIN ENCLOSURES SEE DWG. SS-11.9-1082.
  5. FOR INSTALLATION OF INCOMING LINES, SWITCHGEAR PADS AND DRAIN SEE DWG. SS-11.9-1081.
  6. DUCTBANK UNDER THE RAILROAD TRACK SHALL BE INSTALLED BY ONE OF THE FOLLOWING METHODS, AS APPROVED BY METRA:
    - A. OPEN CUT - FULL RAIL CARRIERS ARE REQUIRED. PRECAST DUCTBANKS CAN BE USED INSTEAD OF POURED-IN DUCTBANKS TO MINIMIZE CONSTRUCTION TIME.
    - B. SEMI-OPEN CUT - EXCAVATE UNDER TRACK AND INSTALL CASING. IMMEDIATELY BACKFILL AND COVER. SHORING AND RAIL CARRIERS ARE ONLY REQUIRED NEAR THE TRACKS.
    - C. DIRECTIONAL BORE - PUSH CASING.
  7. DUCT BANK SHALL BE INSTALLED IN 36" DIAMETER x 9/16" THICK STEEL 3 FEET BEYOND THE MANHOLE.
  8. CABLE FROM THE NEGATIVE BUS TO THE TRACK SHALL BE PROVIDED AND INSTALLED BY METRA.
  9. PROVIDE 6 - 3 1/2" FRE CONDUIT SLEEVES IN MANHOLE WALL.

**SITE PLAN**  
SCALE: 1"=10'-0"

| REV | DATE       | BY  | APP | DESCRIPTION           | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|-----|-----|-----------------------|-----|------|----|-----|-------------|
| 2   | 06-08-2018 | JMC | HS  | ISSUED FOR BID        |     |      |    |     |             |
| 1   | 03-30-2018 | JMC | HS  | ISSUED FOR ADDENDUM 1 |     |      |    |     |             |
| 0   | 12-19-2017 | HS  | HS  | ISSUED FOR BID        |     |      |    |     |             |

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DESIGNED: HS  
DRAWN: JMC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

ENGINEERING DEPARTMENT  
547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

LOCATION NAME:  
**95TH STREET SUBSTATION**

TITLE:  
**ELECTRICAL SITE PLAN**

CAD FILE NUMBER: SS-11.9-1070.DGN

SCALE:  
1" = 10'-0"

DISTRICT:  
MED

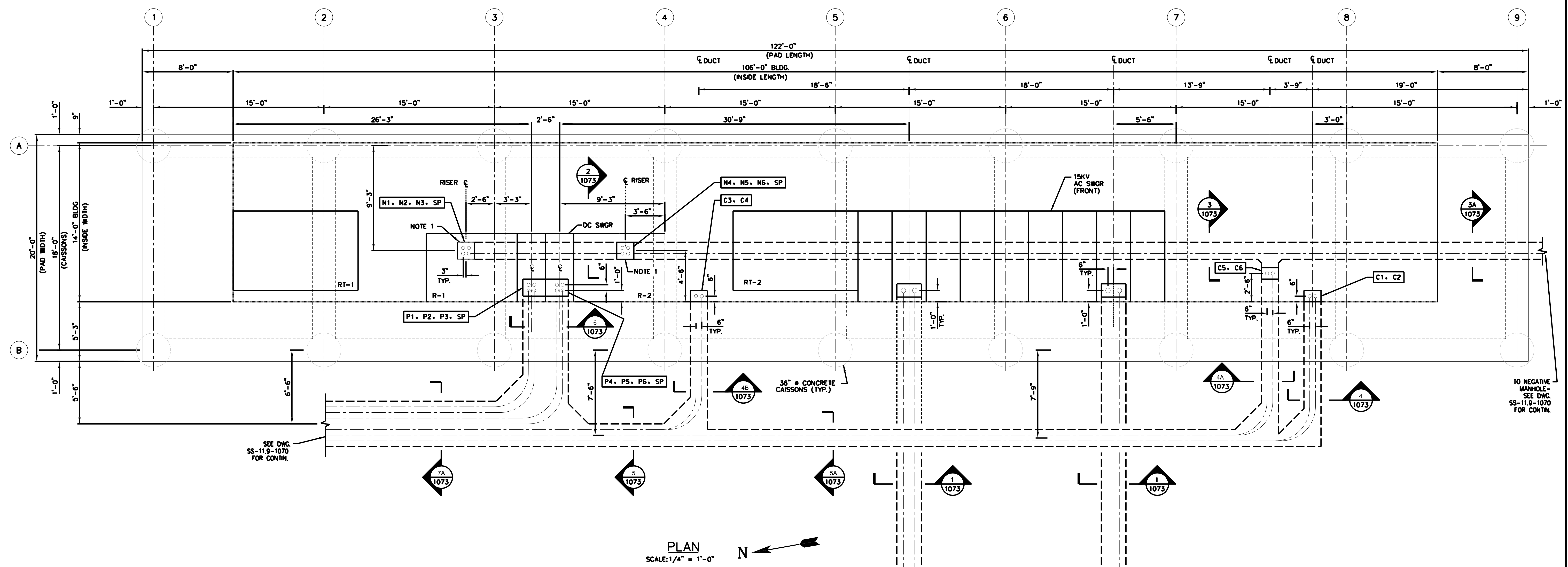
PROJECT NO.  
GW4254-57102002

MILE POST NO.  
11.9

SHEET NO.  
**SS-11.9-1070**

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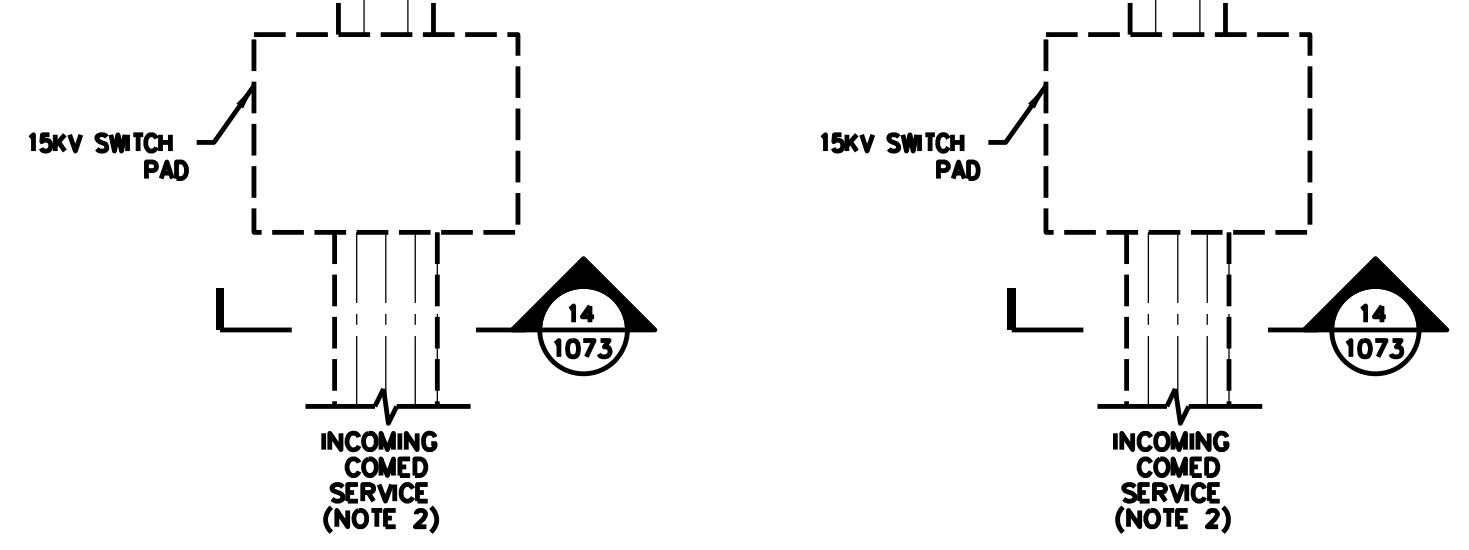


TO NEGATIVE MANHOLE - SEE DWG. SS-11.9-1070 FOR CONTIN.

SEE DWG. SS-11.9-1070 FOR CONTIN.

PLAN  
SCALE: 1/4" = 1'-0" N

- NOTES:**
1. LOCATE (4) 3 1/2" FRE CONDUITS IN AREA DESIGNATED FOR OUTGOING NEGATIVE FEEDERS - SEE RECTIFIER MFR'S. DWGS.
  2. FOR INSTALLATION OF INCOMING LINES AND SWITCHGEAR PADS SEE DWG. SS-11.9-1081
  3. THE CONTRACTOR SHALL SUBMIT FOR APPROVAL THE DUCTBANK LAYOUT AFTER THE EQUIPMENT MANUFACTURER'S DWGS ARE APPROVED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EXACT LOCATION OF CONDUIT RISER AT EACH PIECE OF EQUIPMENT.
  4. FOR UNDERGROUND CABLE TABULATION SEE DWG. SS-11.9-1073



| REV | DATE       | BY  | APP | DESCRIPTION           | REV | DATE | BY | APP | DESCRIPTION |
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| 0   | 12-19-2017 | HS  | HS  | ISSUED FOR BID        |     |      |    |     |             |

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CONSULTANT SEAL & SIGNATURE

CONSULTANT

**IDP** A Company of **Gannett Fleming**  
Consulting Engineers  
20 N. Wacker Dr. Ste. 1600 Chicago IL 60606

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| DRAWN: JMC            |
| CHECKED: FM           |
| METRA P.M.: R. CERANT |
| DATE: JUNE 12, 2017   |

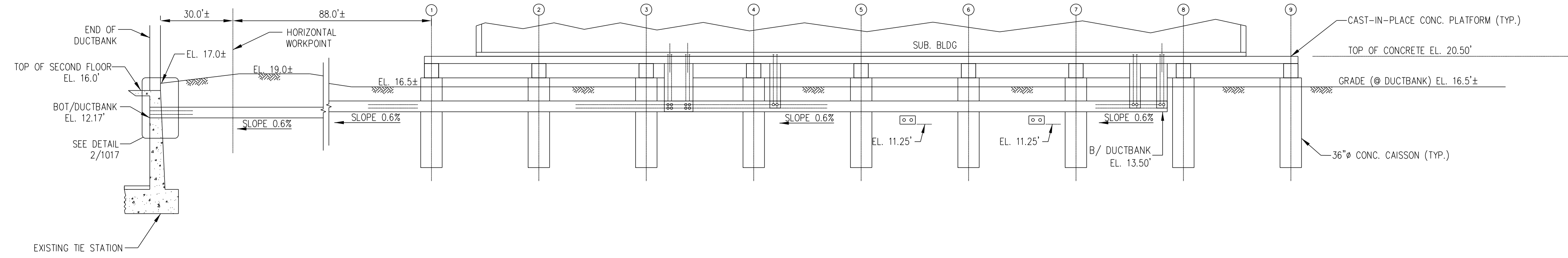
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547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

|   |
|---|
| LOCATION NAME:<br><b>95TH STREET SUBSTATION</b> |
| TITLE:<br><b>DUCTBANK LAYOUT</b>                |

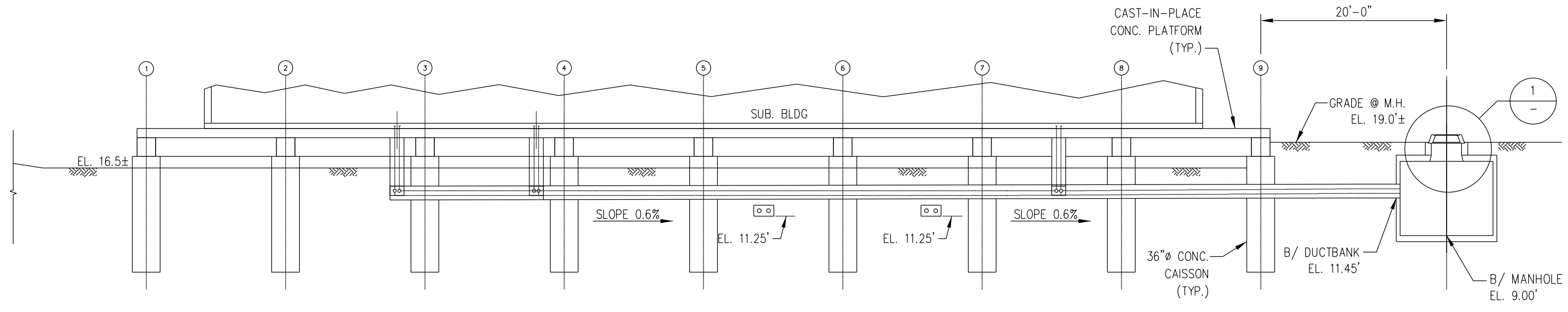
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| CAD FILE NUMBER: SS-11.9-1071.DGN | DISTRICT: MED          |
| SCALE: 1/4" = 1'-0"               | SHEET NO. SS-11.9-1071 |
| PROJECT NO. GW4254-57102002       |                        |
| MILE POST NO. 11.9                |                        |

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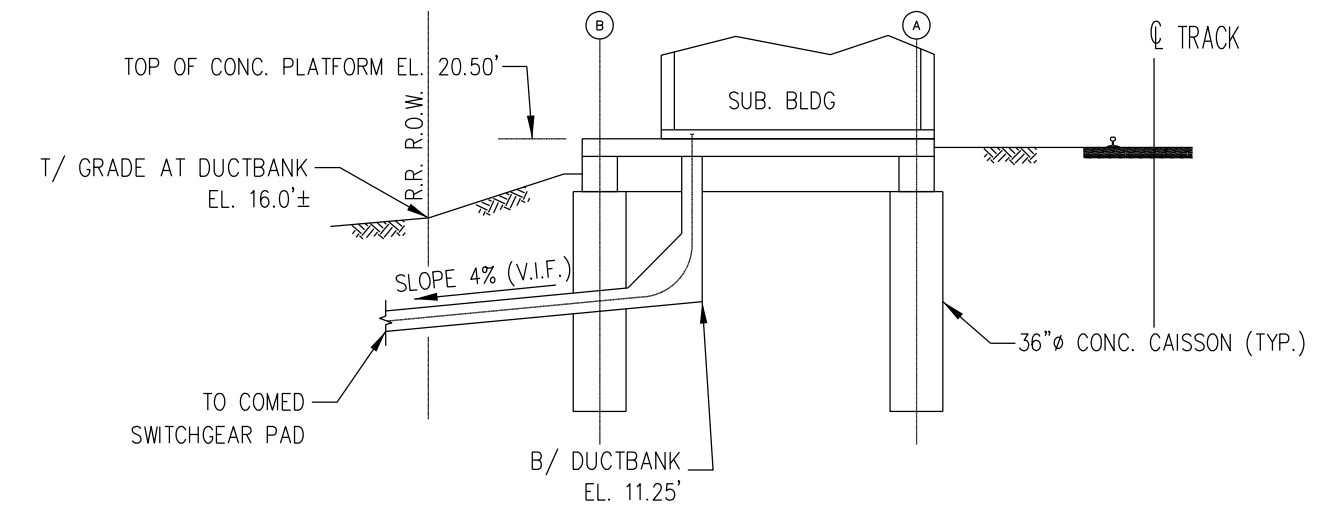




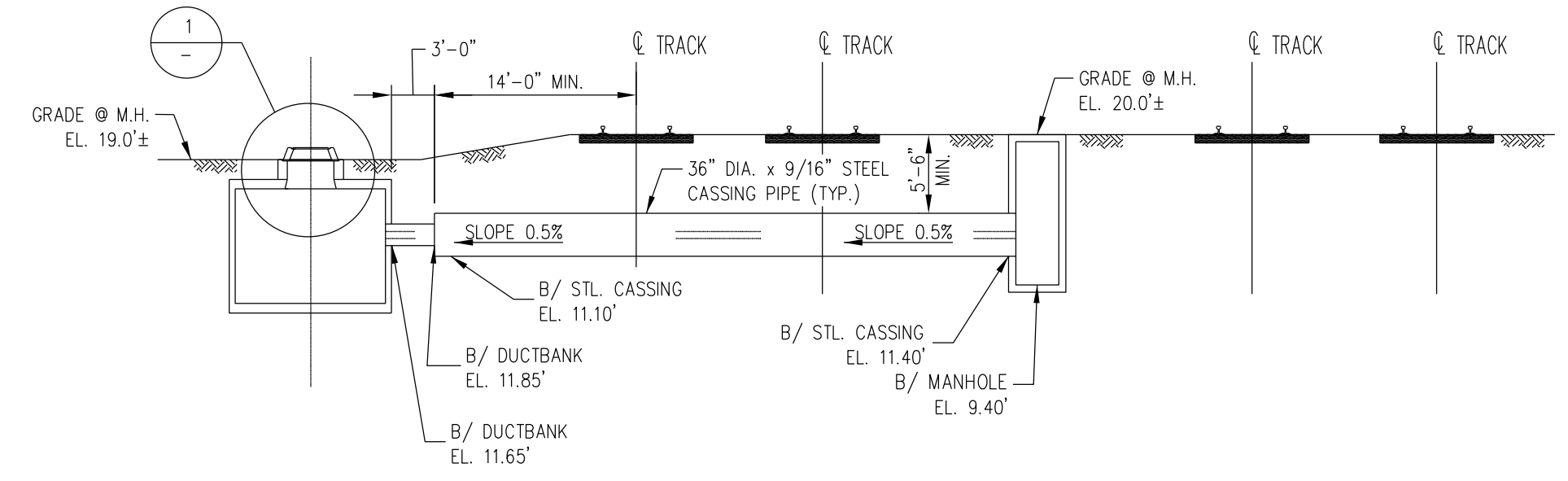
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10/70  
DUCTBANK PROFILE  
SCALE: 1"=10'-0"



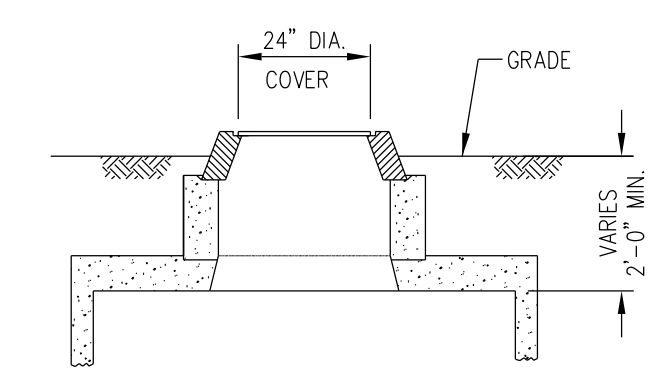
B  
10/70  
DUCTBANK PROFILE  
SCALE: 1"=10'-0"



C  
10/70  
AC DUCTBANK PROFILE  
SCALE: 1"=10'-0"



D  
10/70  
DUCTBANK PROFILE  
SCALE: 1"=10'-0"



1  
DETAIL  
SCALE: N.T.S.

- NOTES:**
1. DUCTBANK LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE ADJUSTED AS REQUIRED TO SUIT FIELD CONDITIONS.
  2. THE DEPTHS OF DUCTBANKS SHOWN ARE BASED ON EXISTING CONTOUR LINES AND REQUIRE MINIMUM OF 3'-6" COVERAGE FROM GRADE TO BOTTOM OF DUCTBANK.
  3. FOR DUCTBANK LOCATIONS IN NEW SUBSTATION BUILDING AREA SEE DWG. SS-11.9-1071.

PRINTED ON: \$DATES

| REV | DATE       | BY  | APP | DESCRIPTION           | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|-----|-----|-----------------------|-----|------|----|-----|-------------|
| 2   | 06-08-2018 | JMC | HS  | ISSUED FOR BID        |     |      |    |     |             |
| 1   | 03-30-2018 | HS  | HS  | ISSUED FOR ADDENDUM 1 |     |      |    |     |             |
| 0   | 07-28-2017 | HS  | HS  | ISSUED FOR BID        |     |      |    |     |             |

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**LDP** | **A Company of Gannett Fleming**  
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DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

**Metra**  
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547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

LOCATION NAME:  
**95TH STREET SUBSTATION**

TITLE:  
**DUCTBANK PROFILES**

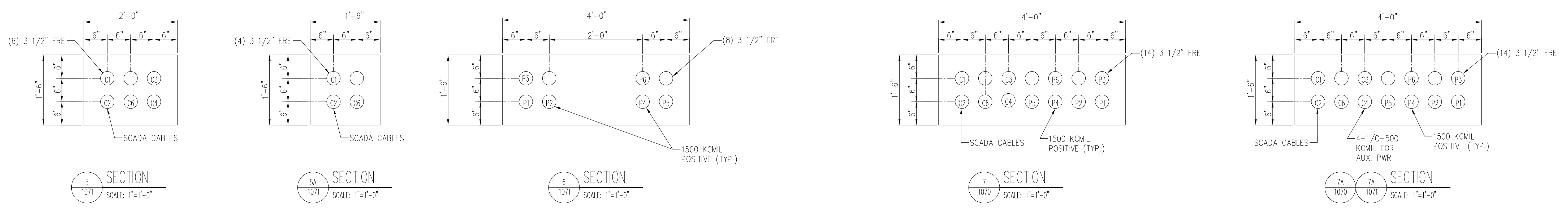
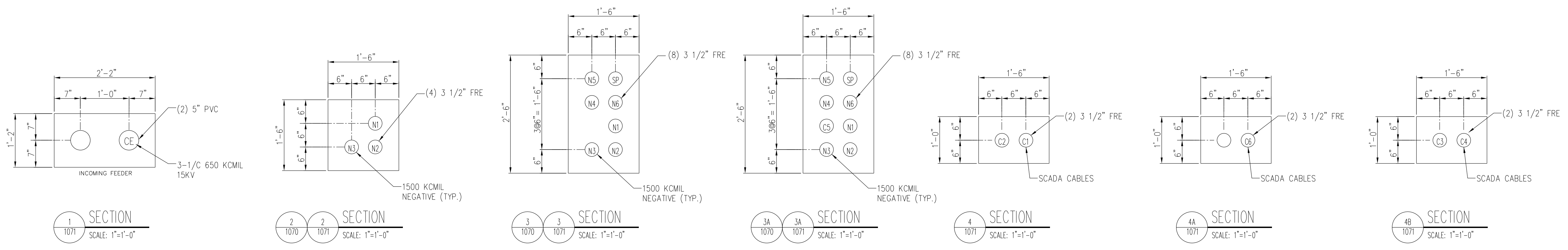
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DISTRICT: MED

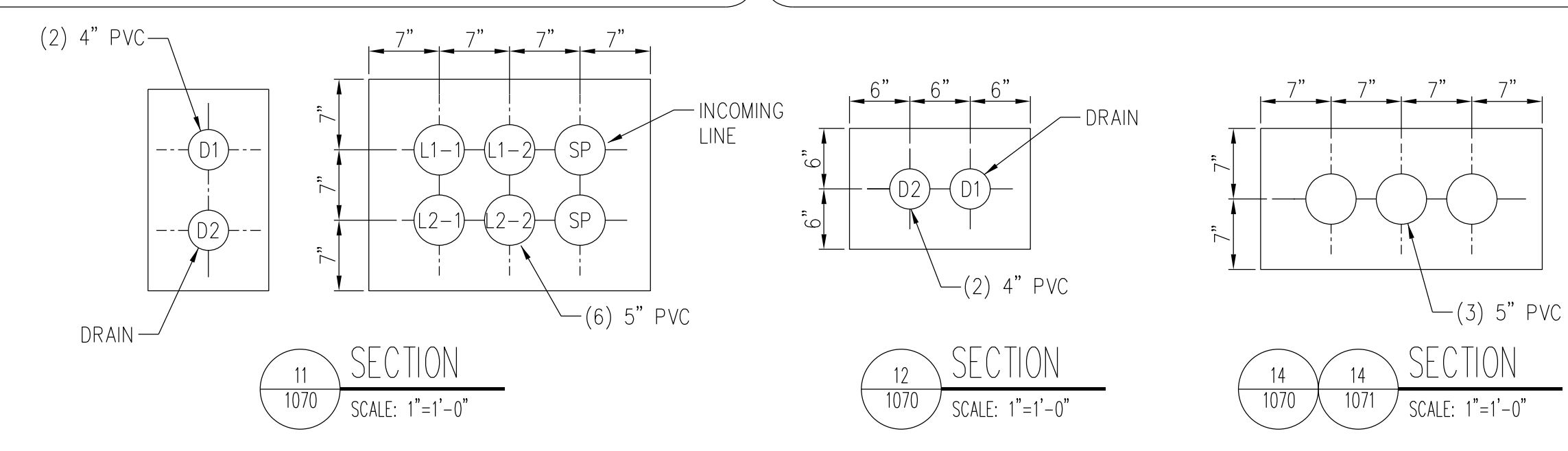
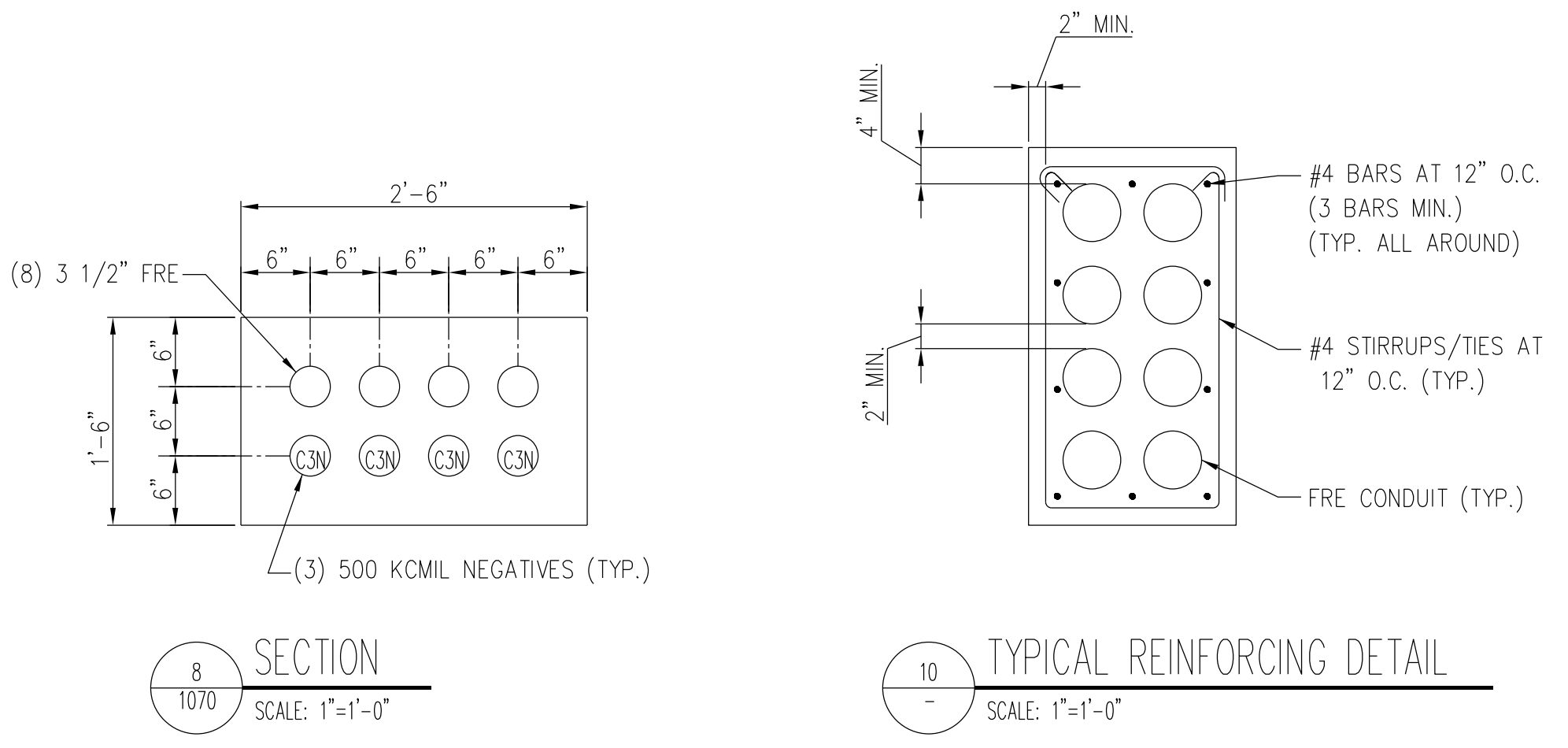
PROJECT NO. GW4254-57102002  
SHEET NO. SS-11.9-1072

MILE POST NO. 11.9





INSTALL DUCTBANKS PER COMED STANDARDS C4050, C4090 AND C4171



| CABLE TABLE  |   |   |
|--------------|---|---|
| CABLE I.D.   | FROM  | TO  |
| CE           | COMED SWITCHGEAR                              | 15KV AC SWITCHGEAR CUBICLE 2 OR 8             |
| P1, P2, ETC. | CATHODE BREAKERS IN DC SWITCHGEAR             | DC SWITCHGEAR IN TIE STATION                  |
| N1, N2, ETC. | RECTIFIER #1 OR #2                            | NEGATIVE ENCLOSURE ON TOP OF NEGATIVE MANHOLE |
| C3N          | NEGATIVE ENCLOSURE ON TOP OF NEGATIVE MANHOLE | TRACK-RUNNING RAIL                            |
| ML           | 15KV AC SWITCHGEAR CUBICLE 1 OR 9 (TOP)       | METRA LINE (FUTURE) 12KV                      |
| C1, C2       | CONTROL ROOM                                  | SCADA IN TIE STATION                          |
| C3, C4       | CATHODE BKR IN DC SWGR                        | SWITCH ENCLOSURES                             |
| C5           | AC PANEL                                      | NEGATIVE/DRAINAGE PANEL                       |
| C6           | AC PANEL                                      | AUX PWR TO TIE BKR STA                        |

NOTES:  
1. ALL DUCT BANKS INCLUDING COMED INCOMING LINES AND DRAIN SHALL BE REINFORCED.

| REV | DATE       | BY  | APP | DESCRIPTION           | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|-----|-----|-----------------------|-----|------|----|-----|-------------|
| 2   | 06-08-2018 | JMC | HS  | ISSUED FOR BID        |     |      |    |     |             |
| 1   | 03-30-2018 | HS  | HS  | ISSUED FOR ADDENDUM 1 |     |      |    |     |             |
| 0   | 12-19-2017 | HS  | HS  | ISSUED FOR BID        |     |      |    |     |             |

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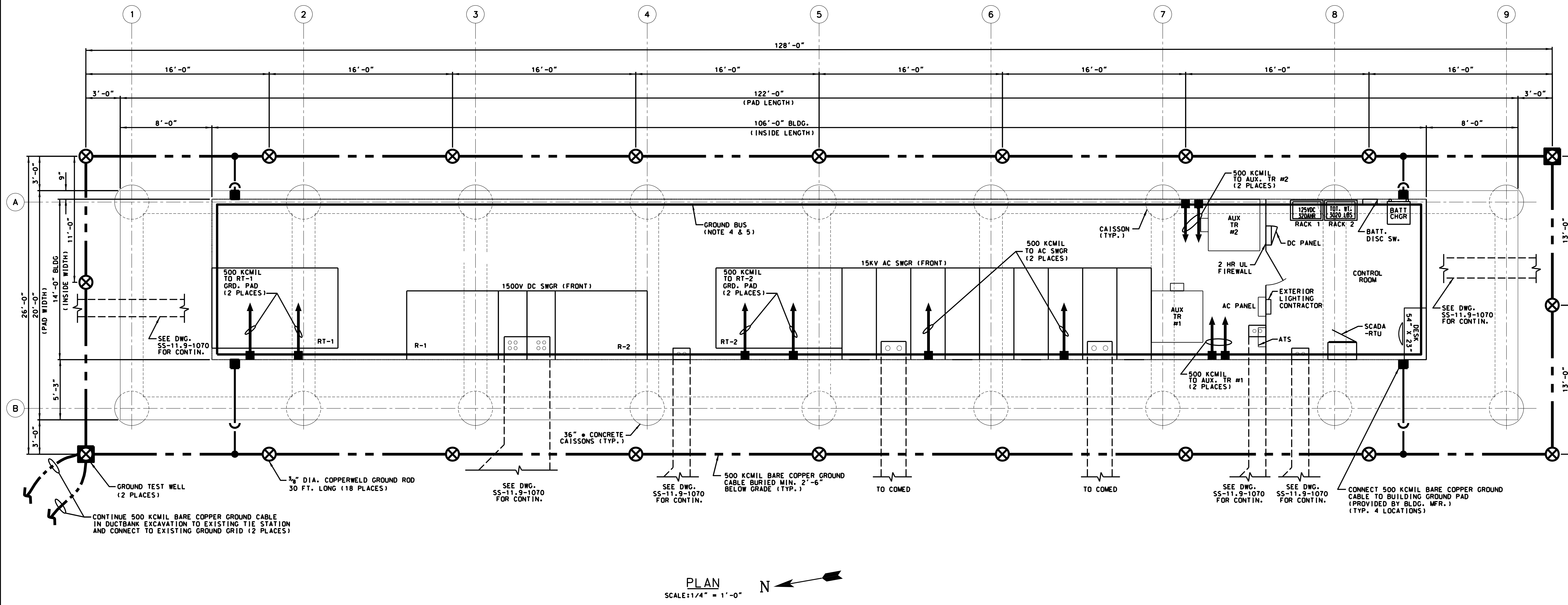
DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

**Metra**  
ENGINEERING DEPARTMENT  
547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

LOCATION NAME:  
**95TH STREET SUBSTATION**  
TITLE:  
**DUCTBANK DETAILS**

CAD FILE NUMBER: SS-11.9-1073.DGN  
SCALE: 1"=1'-0"  
DISTRICT: MED  
PROJECT NO. GW4254-57102002  
SHEET NO. SS-11.9-1073  
MILE POST NO. 11.9





PLAN  
SCALE: 1/4" = 1'-0" N

- LEGEND:**
- GROUND CABLE BURIED IN EARTH OR EMBEDDED IN CONCRETE
  - GROUND CADWELD CONNECTION
  - GROUND BOLTED CONNECTION
  - GROUND CABLE CHANGE OF ELEVATION
  - GROUND ROD  
3/4" DIA. 5' LONG COPPERWELD GROUND RODS, MIN. 30 FT. TOTAL LENGTH (6 SECTIONS)
  - GROUND TEST WELL  
3/4" DIA. 5' LONG COPPERWELD GROUND RODS, MIN. 30 FT. TOTAL LENGTH (6 SECTIONS)

- NOTES:**
1. BARE COPPER GROUND CABLE SHALL BE BURIED MINIMUM 2'-6" BELOW GRADE.
  2. ALL GROUNDING CONNECTIONS BELOW GRADE SHALL BE MADE USING CADWELD PROCESS. ONLY INSIDE TEST WELL CLAMP CONNECTIONS SHALL BE USED.
  3. GROUND ROD LOCATIONS SHOWN ARE APPROXIMATE. CONTRACTOR MAY RELOCATE RODS AS REQUIRED TO CLEAR FIELD OBSTRUCTIONS.
  4. 1/2" x 2" COPPER GROUND BUS SHALL BE INSTALLED AROUND THE ENTIRE BUILDING ON THE INSIDE FACE OF BUILDING WALL, AND SHALL BE CONNECTED TO GROUND PADS OF THE BUILDING AT FOUR LOCATIONS.
  5. ALL SUBSTATION EQUIPMENT REQUIRING GROUNDING SHALL BE CONNECTED TO SUBSTATION GROUND BUS PER NATIONAL ELECTRICAL CODE.
  6. ALL GROUNDING RISERS ABOVE GRADE FOR CONNECTION TO THE BUILDING GROUND PADS SHALL BE INSTALLED IN THE RIGID STEEL CONDUIT SUPPORTED ALONG THE CAISSONS.

PRINTED ON: SDATES

| REV | DATE       | BY | APP | DESCRIPTION    | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|----|-----|----------------|-----|------|----|-----|-------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |     |      |    |     |             |




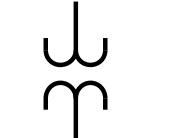

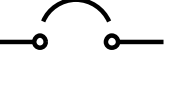

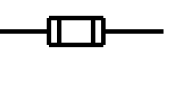
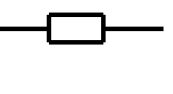
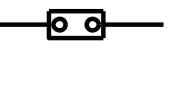
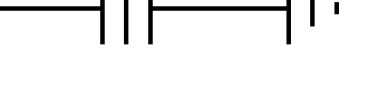

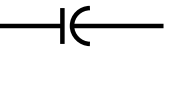

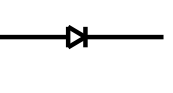
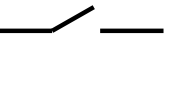

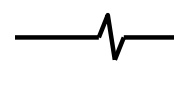
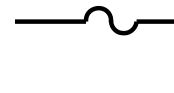





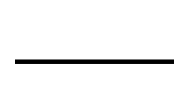








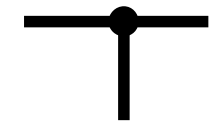





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METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

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LOCATION NAME:  
**95TH. STREET SUBSTATION**  
TITLE:  
**SUBSTATION GROUNDING LAYOUT**

CAD FILE NUMBER: SS-11.9-1075.DGN  
SCALE: 1/4" = 1'-0"  
PROJECT NO. GW4254-57102002  
MILE POST NO. 11.9  
DISTRICT: MED  
SHEET NO. SS-11.9-1075

| SYMBOLS  |   |   | GROUNDING NOTES   | GENERAL NOTES  |
|--|---|---|---|--|
| <p><b>GENERAL</b></p>  POWER TRANSFORMER<br> POTENTIAL TRANSFORMER<br> CURRENT TRANSFORMER<br> AIR CIRCUIT BREAKER<br> DRAWOUT TYPE<br> FUSE<br> RESISTOR<br> SHUNT<br> STATION CLASS ARRESTER<br> DISTRIBUTION CLASS ARRESTER<br> CAPACITOR FIXED<br> BATTERY<br> RECTIFIER<br> DISCONNECT SWITCH<br> AUTOMATIC TRANSFER SWITCH | <p><b>GENERAL CONT'D</b></p>  MAGNETIC OVERLOAD DEVICE<br> THERMAL OVERLOAD DEVICE<br> ELECTRICAL EQUIPMENT, SUCH AS CONTROL PANELS, PULLBOXES, ETC.<br> JUNCTION BOX (ALSO IDENTIFIED AS J.B. OR JCT. BOX)<br> POWER OUTLET<br> CONDUIT EMBEDDED IN CONCRETE OR BURIED IN EARTH.<br> CONDUIT EXPOSED<br> CONDUIT TURNING UP OR TOWARD OBSERVER<br> CONDUIT TURNING DOWN OR AWAY FROM OBSERVER<br> FLEXIBLE ELECTRICAL CONDUIT<br><p><b>METERING/INDICATING DEVICES</b></p>  AMMETER<br> VOLTMETER<br> AMMETER SWITCH<br> VOLTMETER SWITCH<br> INDICATING LIGHT<br>AIL-AMBER BIL-BLUE<br>GIL-GREEN RIL-RED<br>WIL-WHITE | <p><b>GROUNDING</b></p>  GROUND CABLE BURIED IN EARTH OR EMBEDDED IN CONCRETE<br> GROUND CADWELDED CONNECTION<br> GROUND BOLTED CONNECTION<br> GROUND CABLE CHANGE OF ELEVATION<br> GROUND ROD<br>$\frac{3}{4}$ " DIA. 5' LONG COPPERWELD GROUND RODS, MIN. 30 FT. TOTAL LENGTH (6 SECTIONS)<br> GROUND TEST WELL<br>$\frac{3}{4}$ " DIA. 5' LONG COPPERWELD GROUND RODS, MIN. 30 FT. TOTAL LENGTH (6 SECTIONS)<br> EXPOSED COPPER GROUND BAR BUS UNLESS OTHERWISE NOTED | <ol style="list-style-type: none"> <li>GROUND CABLE RUNS ARE SHOWN DIAGRAMMATICALLY. EXACT RUNS SHALL BE DETERMINED IN FIELD TO SUIT CONDITIONS.</li> <li>ALL OUTDOOR UNDERGROUND CABLE SHALL BE 500KCMIL BARE COPPER, UNLESS NOTED OTHERWISE.</li> <li>UNDERGROUND GRID TO BE RUN MINIMUM 2'-6" BELOW GRADE AND SHALL BE INSTALLED WITH SUFFICIENT SLACK TO PREVENT DAMAGE DUE TO GROUND FAULTS AND/OR EARTH SETTLEMENT.</li> <li>AT POINTS OF CROSSING, UNDERGROUND CABLE SHALL BE RUN ABOVE FOUNDATION FOOTINGS, EXISTING DUCTBANKS, SEWER LINES AND OTHER BURIED UTILITIES.</li> <li>GROUND WELLS AND RODS SHALL BE INSTALLED AT APPROXIMATE LOCATIONS SHOWN BY DRIVING (NOT DRILLING OR JETTING) USING DRIVING STUD FITTINGS TO ABSORB IMPACT.</li> <li>ALL SURFACES TO BE GROUNDED SHALL BE THOROUGHLY CLEANED TO BARE METAL BEFORE MAKING CONNECTIONS.</li> <li>ALL GROUND GRID CONNECTIONS BELOW GRADE SHALL BE CADWELD TYPE &amp; SHALL BE MADE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. ALL CADWELD CONNECTIONS SHALL BE INSPECTED BEFORE BACKFILLING. IF PUFFY OR POROUS WELDS ARE FOUND, THEY SHALL BE CUT OUT AND THE CONNECTIONS REMADE.</li> <li>ALL GROUNDING CABLE CONNECTIONS TO EQUIPMENT ABOVE GRADE AND INSIDE THE SUBSTATION BUILDING SHALL BE THE BOLTED TYPE.</li> <li>BAR TO BAR AND LUG TO BAR BOLTED CONNECTIONS SHALL BE MADE WITH <math>\frac{1}{2}</math>" SILICON BRONZE BOLTS, NUTS AND WASHERS. ALL CONNECTIONS SHALL BE MADE ELECTRICALLY CLEAN. SILVER-PLATE ALL BAR AND LUG CONNECTIONS.</li> <li>ALL METAL CONDUITS, EQUIPMENT AND JUNCTION BOXES SHALL BE GROUNDED WITH MINIMUM #2 COPPER CABLE. COAT GROUND CABLE CONNECTIONS TO ALUMINUM TRAY WITH NO-OXIDE COMPOUND.</li> <li>AFTER THE ENTIRE GROUNDING SYSTEM HAS BEEN INSTALLED, INCLUDING RODS, THE SYSTEM SHALL BE TESTED TO MEET SPECIFICATION REQUIREMENTS.</li> </ol> | <ol style="list-style-type: none"> <li>ALL DISTANCES OF EXISTING STRUCTURES SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL VERIFY DIMENSIONS BEFORE PROCEEDING WITH THE INSTALLATIONS.</li> <li>CONDUIT USED SHALL BE AS FOLLOWS:             <ol style="list-style-type: none"> <li>EXPOSED CONDUIT INSIDE SUBSTATION BUILDING SHALL BE IMC (INTERMEDIATE METAL CONDUIT), UNLESS NOTED OTHERWISE.</li> <li>OUTDOOR CONDUIT FOR GENERAL USE SHALL BE HOT-DIP GALVANIZED RIGID STEEL.</li> <li>CONDUIT FOR TRACTION POWER POSITIVE AND NEGATIVE FEEDERS, WHETHER EXPOSED OR CONCRETE ENCASED, SHALL BE FRE (FIBERGLASS REINFORCED EPOXY) AS SHOWN ON PLANS.</li> <li>CONCRETE ENCASED CONDUIT FOR INCOMING 12KV COMED FEEDERS SHALL BE FRE (FIBERGLASS REINFORCED EPOXY)</li> <li>WHEN CONDUITS OF VARIOUS SERVICES ARE ENCASED IN COMMON CONCRETE DUCTBANK, THE CONDUIT TYPE IS SPECIFIED ON PLANS.</li> <li>DIRECT BURIED UNDERGROUND CONDUIT SHALL BE HEAVY WALL PVC, TYPE DB-120, MANUFACTURED PER NEMA-6 AND 8.</li> </ol> </li> <li>EXPOSED CONDUIT SHALL BE SUPPORTED AT APPROX. 6'-0" INTERVALS (MAXIMUM INTERVAL NOT TO EXCEED 10'-0").</li> <li>RADIUS OF CURVATURE TO THE INSIDE EDGE OF FIELD BENDS SHALL BE A MINIMUM OF EIGHT-TIMES THE TRADE SIZE OF CONDUIT, UNLESS NOTED OTHERWISE.</li> <li>EXPOSED CONDUIT SHALL, IN GENERAL, BE RUN PARALLEL TO OR AT RIGHT ANGLES TO WALLS AND STRUCTURAL MEMBERS.</li> <li>CONDUITS INSTALLED PARALLEL TO HOT SURFACES SHALL BE RUN A MINIMUM OF 12 INCHES AWAY FROM SUCH SURFACES.</li> <li>AT EQUIPMENT ENCLOSURES, CONDUIT SHALL BE TERMINATED WITH 2-LOCKNUTS AND BUSHINGS OR INSULATED GROUNDING BUSHING INDOORS AND GASKETED CONDUIT HUB PLATES OUTDOORS, EXCEPT WHERE ENCLOSURES ARE FURNISHED WITH INTEGRAL THREADED HUBS.</li> <li>CONDUIT TERMINATIONS AT MOTORS, ELECTRICAL INSTRUMENTS AND WHERE SPECIFIED SHALL BE LIQUIDTITE (SEALTITE TYPE "UA" OR EQUAL) AND SHALL BE INSTALLED WITH LIQUIDTITE CONNECTORS, WITH A MAXIMUM LENGTH OF TWO FEET.</li> <li>ALL INDOOR JCT. &amp; TERM. BOXES SHALL BE NEMA 12 TYPE, ALL OUTDOOR BOXES NEMA 4R TYPE, UNLESS OTHERWISE NOTED, AND SHALL BE LOCATED CLEAR OF INTERFERENCES FOR READY ACCESS.</li> <li>UNLESS SPECIFIED, JUNCTION BOXES SHALL BE SIZED BY THE CONTRACTOR WHEN TOTAL DEGREES OF CONDUIT BENDS EXCEED 270°, CONTRACTOR SHALL ADD AND LOCATE PULL BOX AS NEEDED.</li> <li>WHEREVER THE TERMS "DRAWING" OR "SHEET" ARE USED FOR REFERENCE ON A DRAWING, THE TWO TERMS SHOULD BE CONSIDERED SYNONYMOUS.</li> </ol> |

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| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |     |      |    |     |             |  |
|-----|------------|----|-----|----------------|-----|------|----|-----|-------------|--|
| REV | DATE       | BY | APP | DESCRIPTION    | REV | DATE | BY | APP | DESCRIPTION |  |

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|                       |
|-----------------------|
| DESIGNED: HS          |
| DRAWN: JC             |
| CHECKED: FM           |
| METRA P.M.: R. CERANT |
| DATE: JUNE 12, 2017   |



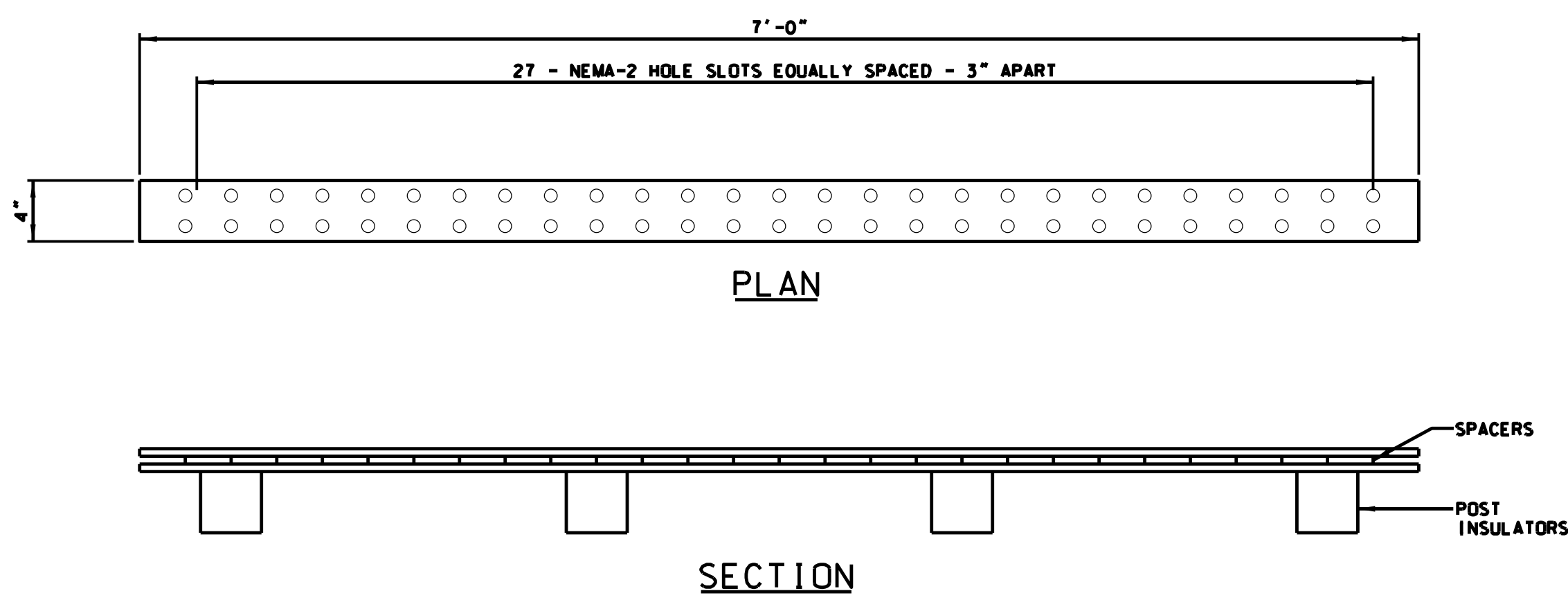
LOCATION NAME:  
**95TH. STREET SUBSTATION**

|   |                                  |
|---|----------------------------------|
| TITLE:<br><b>ELECTRICAL NOTES &amp; SYMBOLS</b> |                                  |
| SCALE:<br>NTS                                   | DISTRICT:<br>MED                 |
| PROJECT NO.<br>GW4254-57102002                  | SHEET NO.<br><b>SS-11.9-1080</b> |
| MILE POST NO.<br>11.9                           |                                  |

CAD FILE NUMBER: SS-11.9-1080.DGN

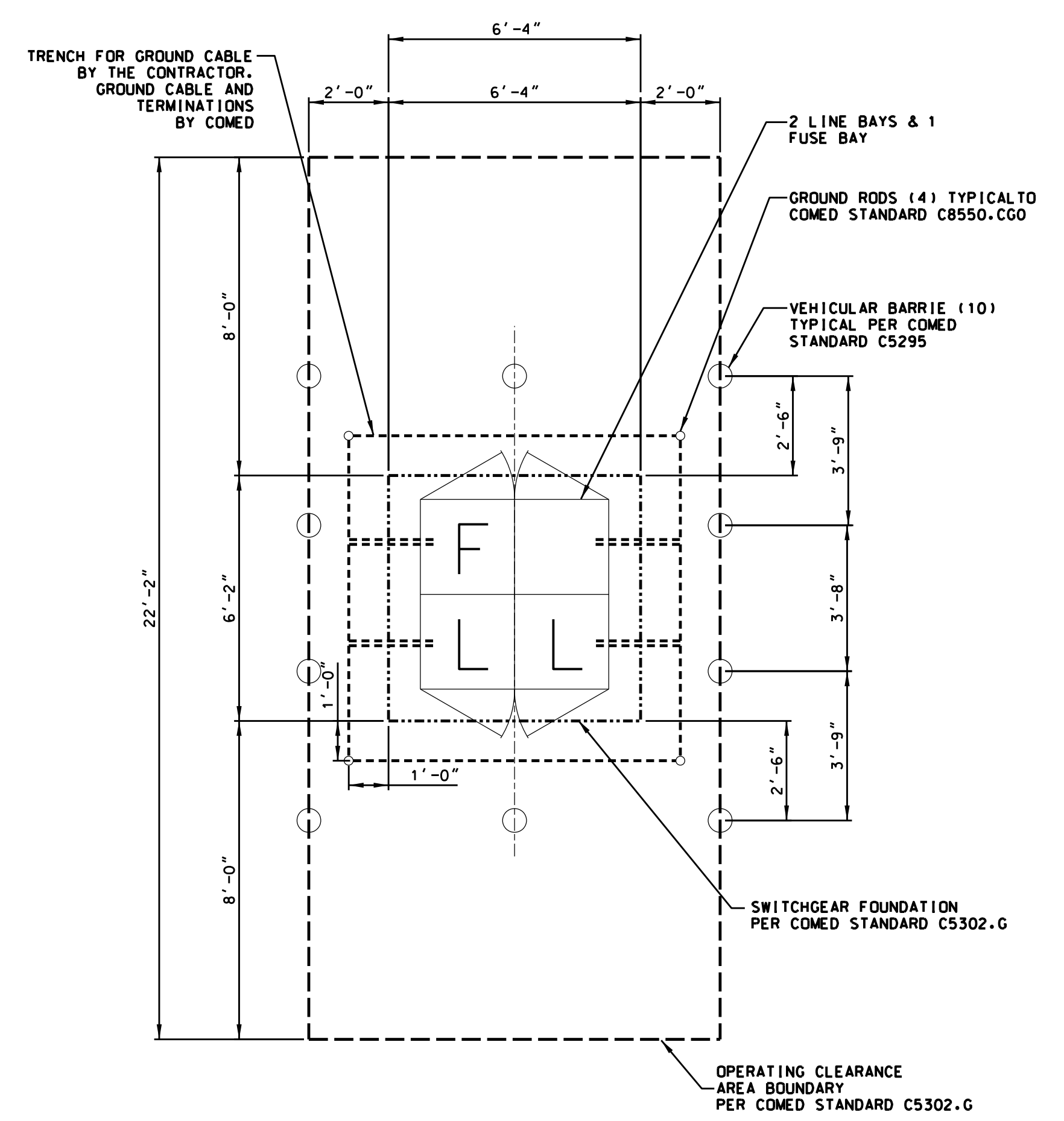
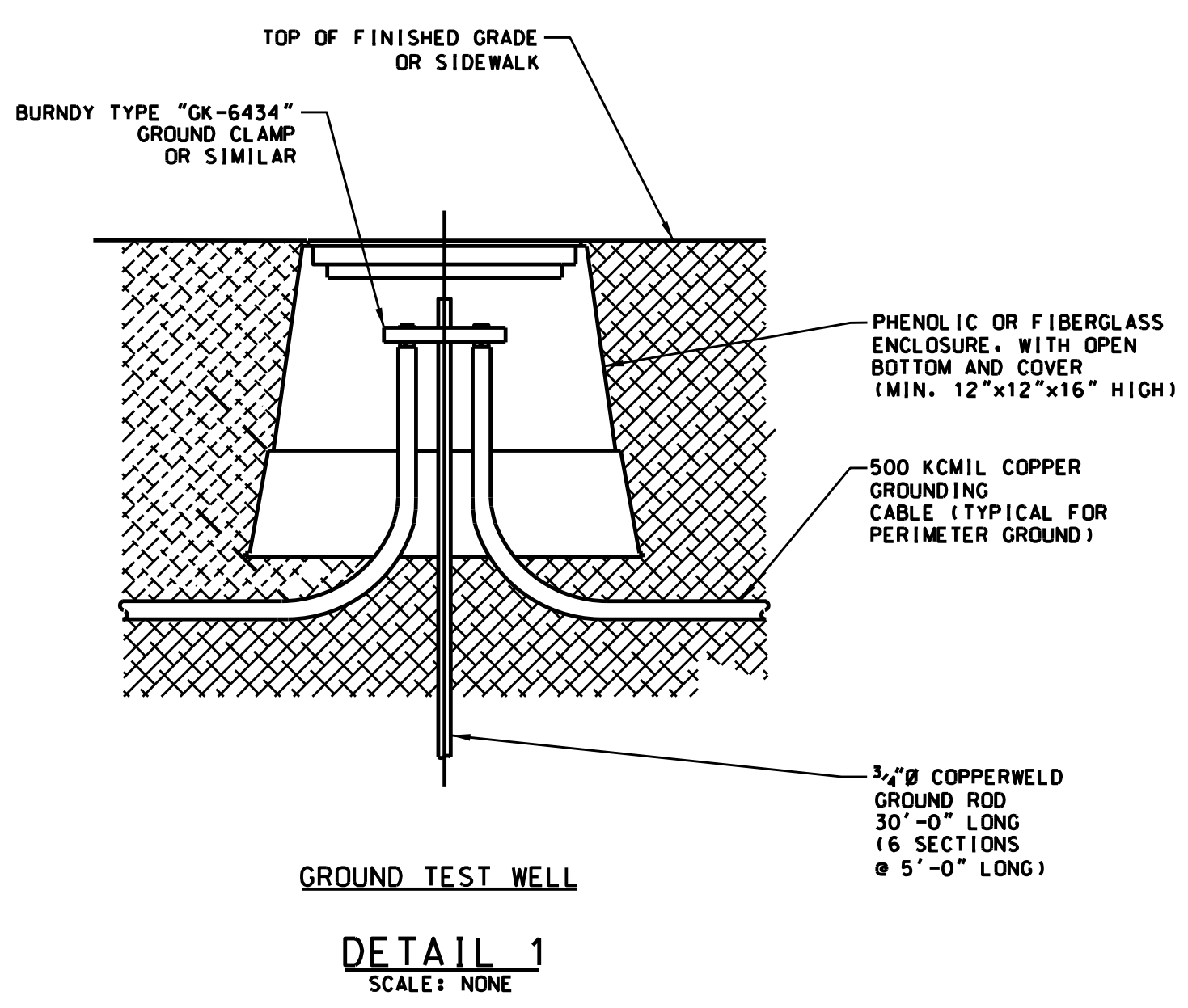


INSTALLATION DETAIL OF NEGATIVE BUS INSIDE WAYSIDE MANHOLE.



NOTES FOR INSTALLATION OF NEGATIVE BUS

1. INSTALL NEGATIVE BUS 12" BELOW MANHOLE CEILING
2. SILVER PLATED NEGATIVE COPPER BUS SHALL BE 7 FEET LONG\* WITH (2)-1/2" X 4" BUS BARS WITH 1/2" SPACER RATED FOR MINIMUM 4000 AMPS.
3. BUS BARS SHALL BE MOUNTED ON 5KV POST INSULATORS INSTALLED ON UNISTRUT MOUNTED ON MANHOLE WALL.
4. PROVIDE NEMA-2 NOLE PATTERN SLOT EQUALLY SPACED 3" APART.
5. INSTALL VIEW WINDOWS IN MANHOLE COVER.



PADMOUNT SWITCHGEAR FOUNDATION  
SCALE: NONE

NOTES FOR INSTALLATION OF INCOMING LINE AND DRAIN

1. VERIFY EXACT LOCATION OF COMED INCOMING LINES AND DRAIN DUCTS.
2. INTERCEPT COMED DRAIN DUCT AT LOCATION MARK (B) INSTALL (2) 4" PVC SCHD. 40 CONCRETE ENCASED CONDUITS BETWEEN MARK (B) AND NEGATIVE MANHOLE - APPROXIMATELY 210 LINEAR FEET.
3. MAKE TERMINATIONS COMED PROVIDED 1/C- 750 KCMIL CU EX DRAIN WIRE AND 1/C- #6 CU EX DRAIN SIGNAL WIRE IN THE DRAIN ENCLOSURE MOUNTED ON THE NEGATIVE MANHOLE.
4. INTERCEPT COMED INCOMING LINE-1 DUCT AT LOCATION MARK - (B) INSTALL (3) 5" PVC SCHD. 40 CONCRETE ENCASED CONDUIT BETWEEN MARK - (B) AND COMED SWITCHGEAR-1, APPROXIMATELY 225 LINEAR FEET.
5. INTERCEPT COMED INCOMING LINE-2 DUCT AT LOCATION MARK - (B) INSTALL (3) 5" PVC SCHD. 40 CONCRETE ENCASED CONDUIT BETWEEN MARK - (B) AND COMED SWITCHGEAR-2, APPROXIMATELY 245 LINEAR FEET.
6. INSTALL (2) 5" PVC SCHD CONCRETE ENCASED CONDUIT AND (1) 3/C- 650 KCMIL CU CABLE BETWEEN EACH OF THE COMED SWITCHGEAR 1 AND 2 TO INDOOR AC SWITCHGEAR CUBICLES AND MAKE TERMINATIONS IN THE INDOOR SWITCHGEAR CUBICLES.
7. INCOMING LINE CABLES FROM COMED MANHOLES TO COMED SWITCHGEAR 1 AND 2 WILL BE INSTALLED BY COMED.
8. ALL TERMINATIONS AT COMED EQUIPMENT WILL BE BY COMED.

| REV | DATE       | BY  | APP | DESCRIPTION           | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|-----|-----|-----------------------|-----|------|----|-----|-------------|
| 2   | 06-08-2018 | JMC | HS  | ISSUED FOR BID        |     |      |    |     |             |
| 1   | 03-30-2018 | JMC | HS  | ISSUED FOR ADDENDUM 1 |     |      |    |     |             |
| 0   | 12-19-2017 | HS  | HS  | ISSUED FOR BID        |     |      |    |     |             |



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**IDP** A Company of **Gannett Fleming**  
 Consulting Engineers  
 20 N. Wacker Dr. Ste. 1500 Chicago IL, 60606

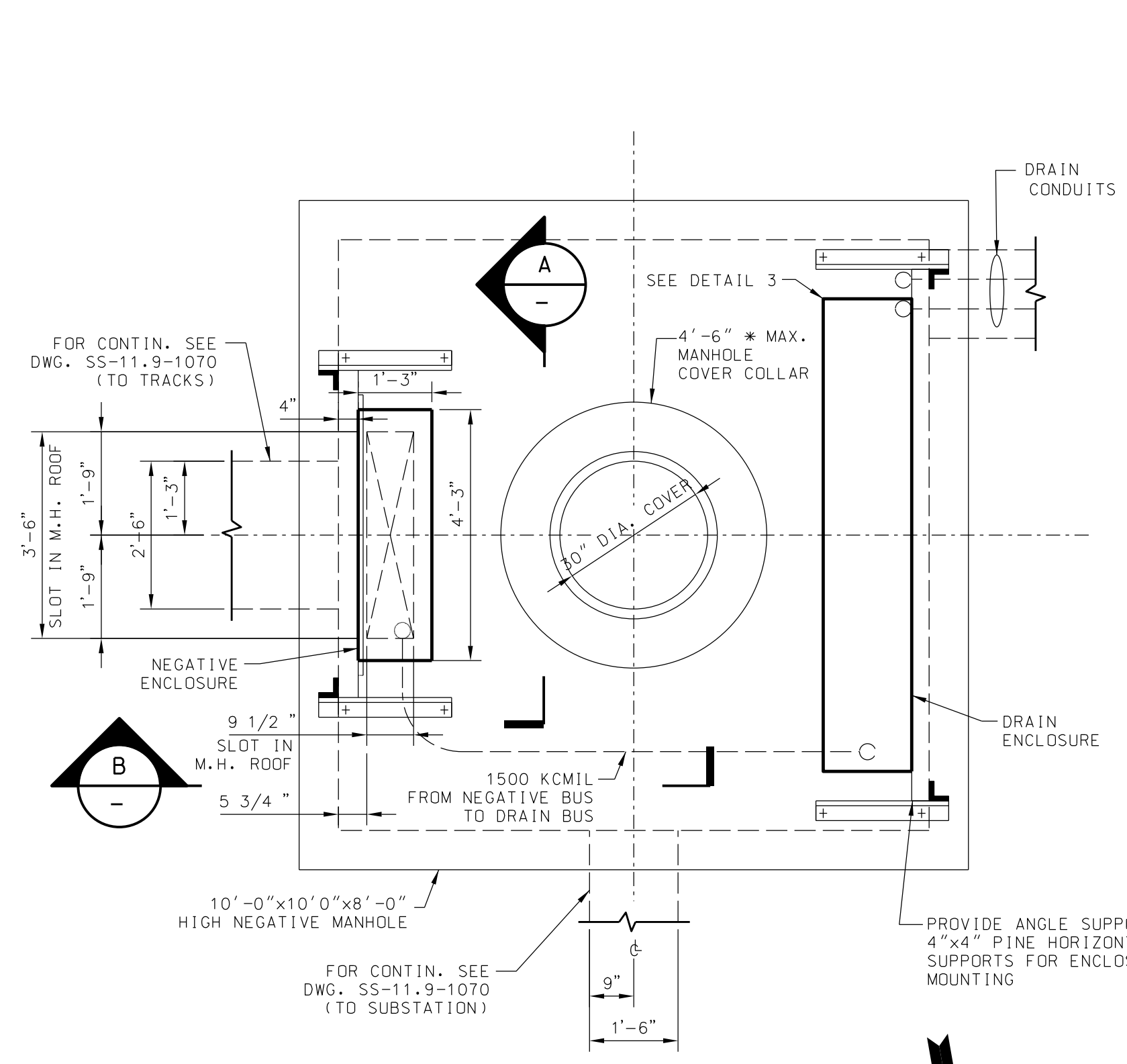
DESIGNED: HS  
 DRAWN: JC  
 CHECKED: FM  
 METRA P.M.: R. CERANT  
 DATE: JUNE 12, 2017

**Metra**  
 ENGINEERING DEPARTMENT  
 547 W. JACKSON BOULEVARD  
 CHICAGO, ILLINOIS 60661

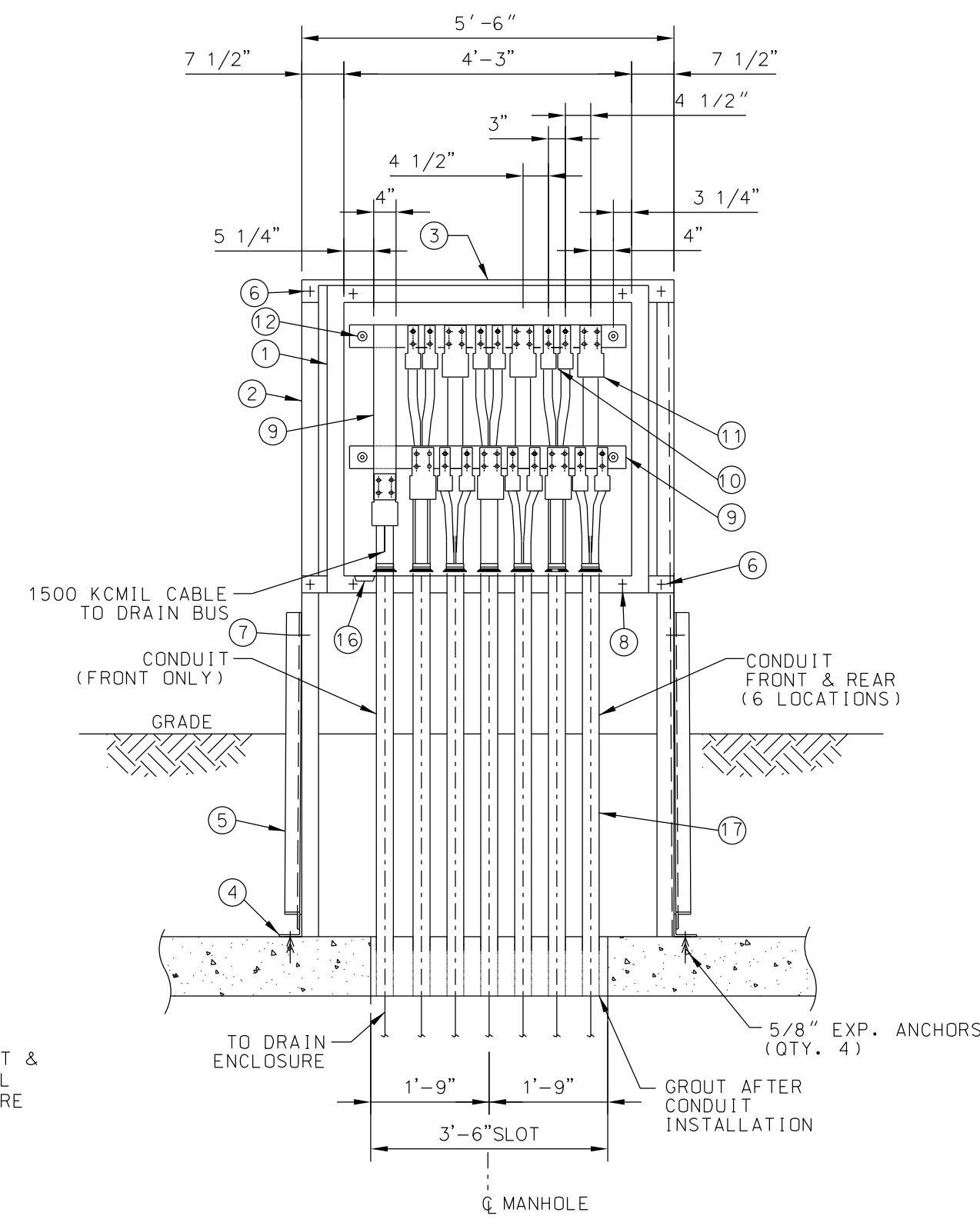
LOCATION NAME:  
**95TH. STREET SUBSTATION**  
 TITLE:  
**ELECTRICAL DETAILS**

CAD FILE NUMBER: SS-11.9-1081.DGN  
 SCALE: NTS  
 DISTRICT: MED  
 PROJECT NO. GW4254-57102002  
 SHEET NO. SS-11.9-1081  
 MILE POST NO. 11.9

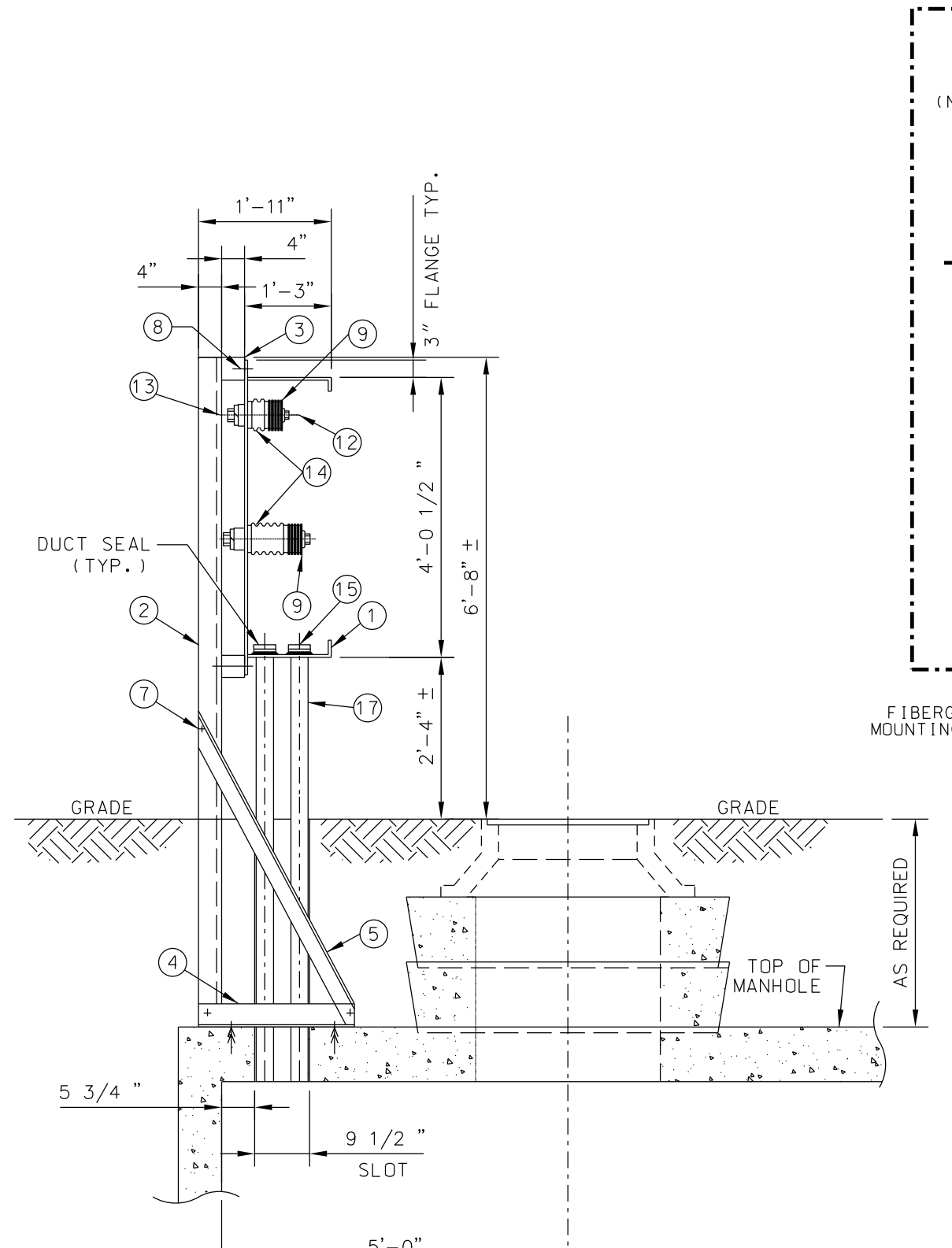
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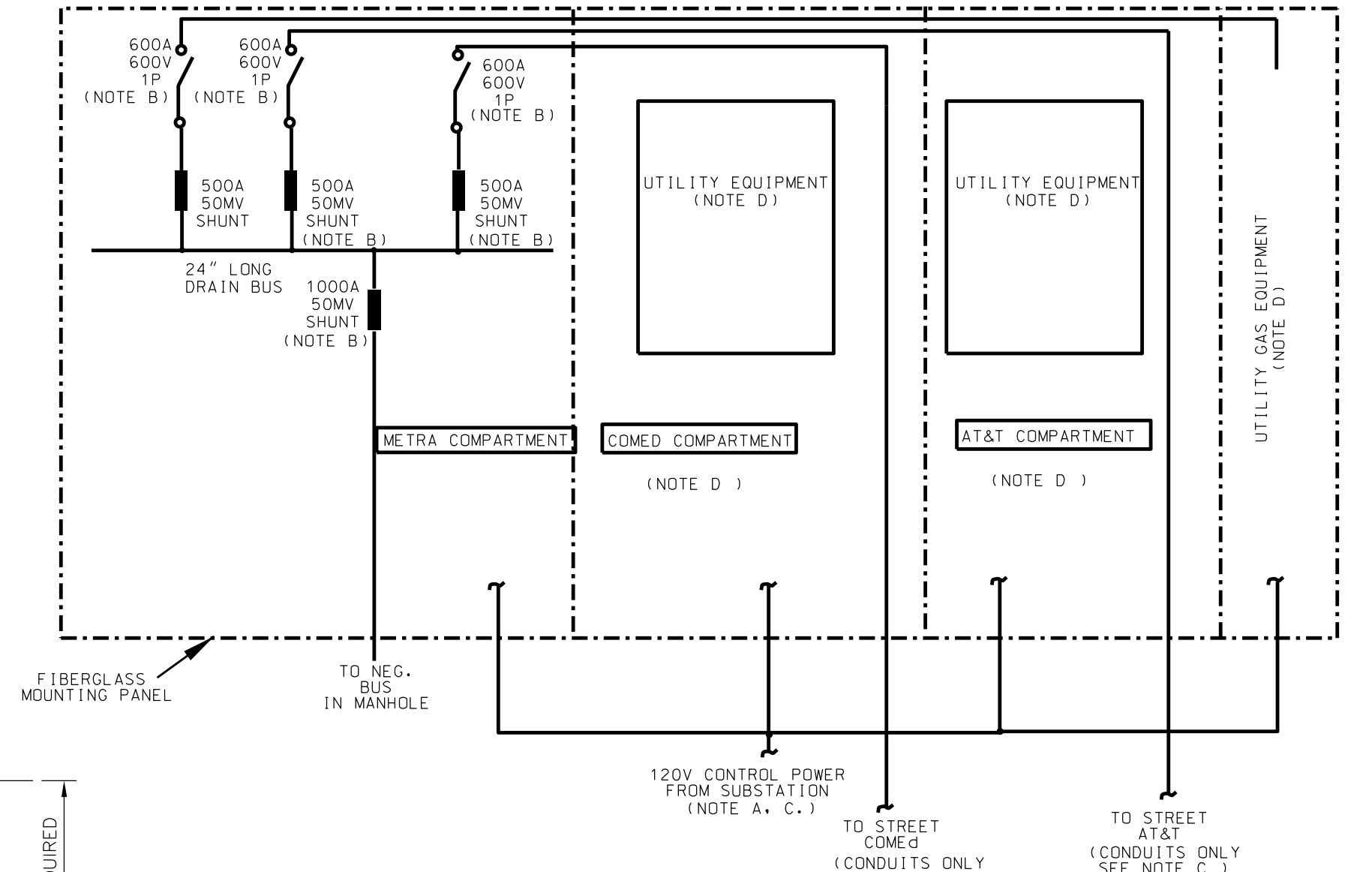
NEGATIVE MANHOLE PLAN  
SCALE: 1/2"=1'-0"



ELEVATION  
SCALE: 1/2"=1'-0"



SECTION  
SCALE: 1/2"=1'-0"



STRAY CURRENT DRAIN BUS  
EQUIPMENT MOUNTING PANEL (DRAIN ENCLOSURE)  
(SEE NOTES A, B, C, D.)

DETAIL  
SCALE: NONE

NOTES:

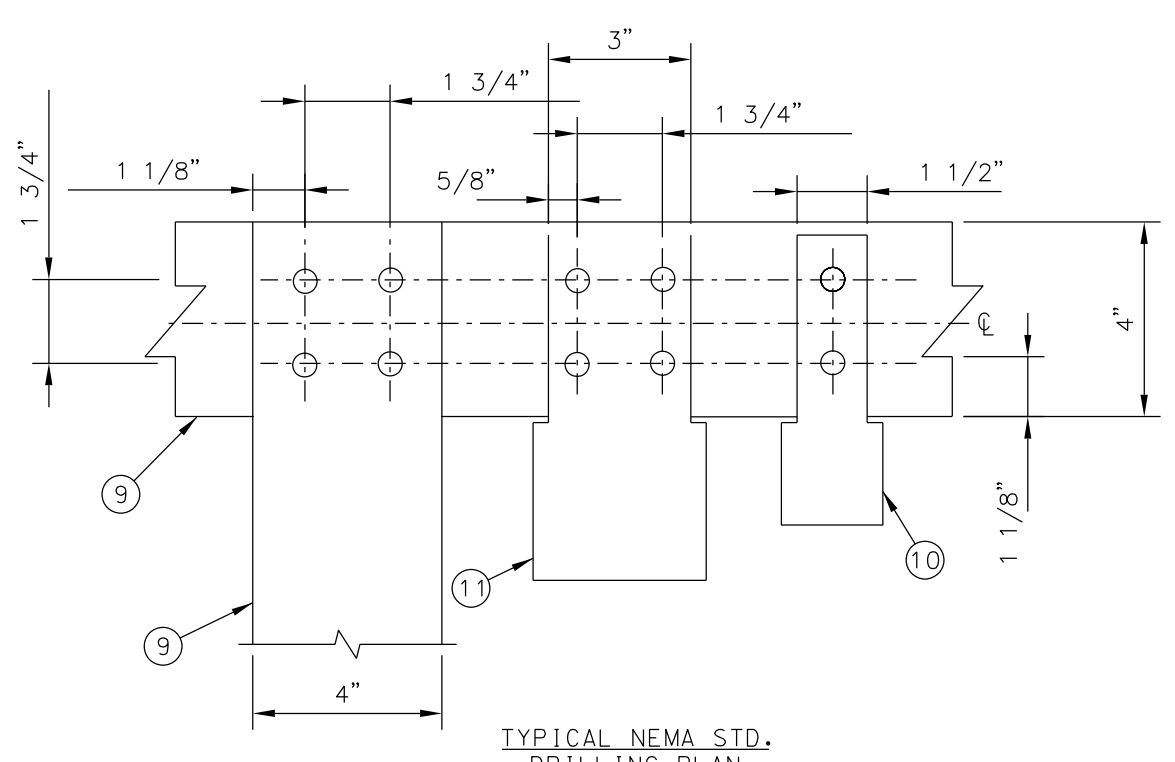
- A. THE CONTRACTOR SHALL PROVIDE A FIBERGLASS MOUNTING PANEL FOR THE UTILITIES DRAIN EQUIPMENT. THE NEW PANEL SHALL HAVE FOUR (4) COMPARTMENTS ONE EACH FOR METRA, AT&T, GAS, AND COMED. EACH COMPARTMENT SHALL BE 42"X24" WITH 120V, 15A DUPLEX OUTLET IN EACH COMPARTMENT.
- B. THE CONTRACTOR SHALL PROVIDE THE FOUR (4) SHUNTS AND THREE (3) DISCONNECT SWITCHES AS PER THIS SKETCH. THE DISCONNECT SWITCHES SHALL BE FILINOR TYPE A, CAT A-6716. THE SHUNTS SHALL BE CANADIAN SHUNT IND. E SERIES, MANIGAN SHUNTS. BOTH SHUNTS AND SWITCHES MANUFACTURERS ARE "OR APPROVED EQUAL".
- C. THE STRAY CURRENT CONDUITS SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR AND CABLES BY THE UTILITIES. THE 120V CONTROL POWER CIRCUITS SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR.
- D. THE UTILITIES WILL PROVIDE AND INSTALL THEIR DRAINAGE CABLES AND EQUIPMENT ON THIS PANEL.

BILL OF MATERIAL-NEGATIVE BUS ENCLOSURE

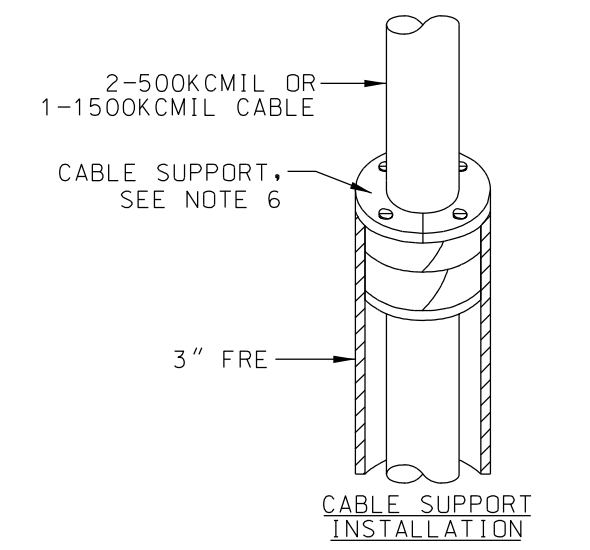
- ① (1) FIBERGLASS ENCLOSURE WITH FLANGE LIP 51" WIDE X 48 1/2" HIGH X 15" MIN. DEEP
- ② (2) 4" X 4" X 3/8" ANGLE, LENGTH AS REQUIRED (ASTM A36 STRUCTURAL STEEL) GALVANIZED
- ③ (2) 4" X 4" PINE 5'-6" LG. TREATED WITH AWP TYPE P1(95) FOR CREO-PINE
- ④ (2) 4" X 4" X 3/8" ANGLE, 2'-3" LG (ASTM A36 STRUCTURAL STEEL) GALVANIZED
- ⑤ (2) 3" X 3" X 1/4" (BRACE ANGLE), LENGTH AS REQUIRED (ASTM A36 STRUCTURAL STEEL) GALVANIZED
- ⑥ (4) 3/4" Ø THROBOLT, NUT & 2 WASHERS (IN 13/16" Ø HOLES) A307 GALVANIZED
- ⑦ (4) 1/2" Ø BOLT & WASHERS A307 GALVANIZED
- ⑧ (4) 1/2" Ø STAINLESS STEEL BOLT, NUT, SQUARE WASHER & LOCKWASHER
- ⑨ (4) 1/4" X 4" COPPER BUS BARS (44 FT. TOTAL NEEDED)
- ⑩ (12) COPPER ALLOY BOLTED POWER CONNECTOR FOR 500 KCMIL CABLE
- ⑪ (7) COPPER ALLOY BOLTED POWER CONNECTOR FOR 1500 KCMIL CABLE
- ⑫ (4) 5/8" HEX HEAD SILICON BRONZE BOLT WITH STAINLESS STEEL BELLEVILLE WASHER
- ⑬ (4) 3/4" HEX HEAD STAINLESS STEEL BOLT WITH FLAT & SPLIT WASHERS
- ⑭ (2) 7 1/2" & (2) 14" FIBERGLASS REINFORCED STANDOFF INSULATOR CLASS A-40
- ⑮ (13) CABLE SUPPORT, SEE DETAIL 2
- ⑯ (3) DRAIN PLUG
- ⑰ (13) 3" FRC CONDUIT LENGTH AS REQUIRED

NOTES:

- 1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
- 2. PROVIDE KNOCKOUTS IN BOTTOM OF ENCLOSURE FOR 3" FRC CONDUIT AS DIMENSIONED.
- 3. SEAL ALL MOUNTING BOLTS AND ANY PENETRATION THROUGH THE ENCLOSURE WITH RTV SILICON SEALER PER ENCLOSURE MANUFACTURER'S INSTRUCTIONS.
- 4. BUS SHALL BE ADEQUATELY BRACED. SPACING BETWEEN BUS BARS SHALL BE 1/4" AND MAINTAINED ENTIRE LENGTH.
- 5. ENCLOSURES DOORS ARE NOT SHOWN FOR CLARITY.
- 6. FOR CABLE SUPPORT USE CONDUIT SEALING BUSHING TYPE CSBE-300P-SEG (500KCMIL) AND CSBE-300P (1500KCMIL) MANUFACTURED BY O-Z/GEDNEY OR APPROVED EQUAL.
- 7. ALL MILD STEEL STRUCTURAL SHAPES, BOLTS, NUTS, AND WASHERS ARE TO BE GALVANIZED.
- 8. ALL EQUIPMENT SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR UNLESS NOTED OTHERWISE.



TYPICAL NEMA STD.  
DRILLING PLAN  
DETAIL  
SCALE: NONE



CABLE SUPPORT  
INSTALLATION  
DETAIL  
SCALE: NONE

PRINTED ON: \$DATES

| REV | DATE       | BY  | APP | DESCRIPTION           | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|-----|-----|-----------------------|-----|------|----|-----|-------------|
| 2   | 06-08-2018 | JMC | HS  | ISSUED FOR BID        |     |      |    |     |             |
| 1   | 03-30-2018 | JMC | HS  | ISSUED FOR ADDENDUM 1 |     |      |    |     |             |
| 0   | 07-28-2017 | HS  | HS  | ISSUED FOR BID        |     |      |    |     |             |

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Consulting Engineers  
20 N. Wacker Dr. Ste. 1500 Chicago IL 60606

DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

**Metra**

ENGINEERING DEPARTMENT  
547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

LOCATION NAME:  
**95TH. STREET SUBSTATION**

TITLE:  
**NEGATIVE AND DRAIN ENCLOSURES**

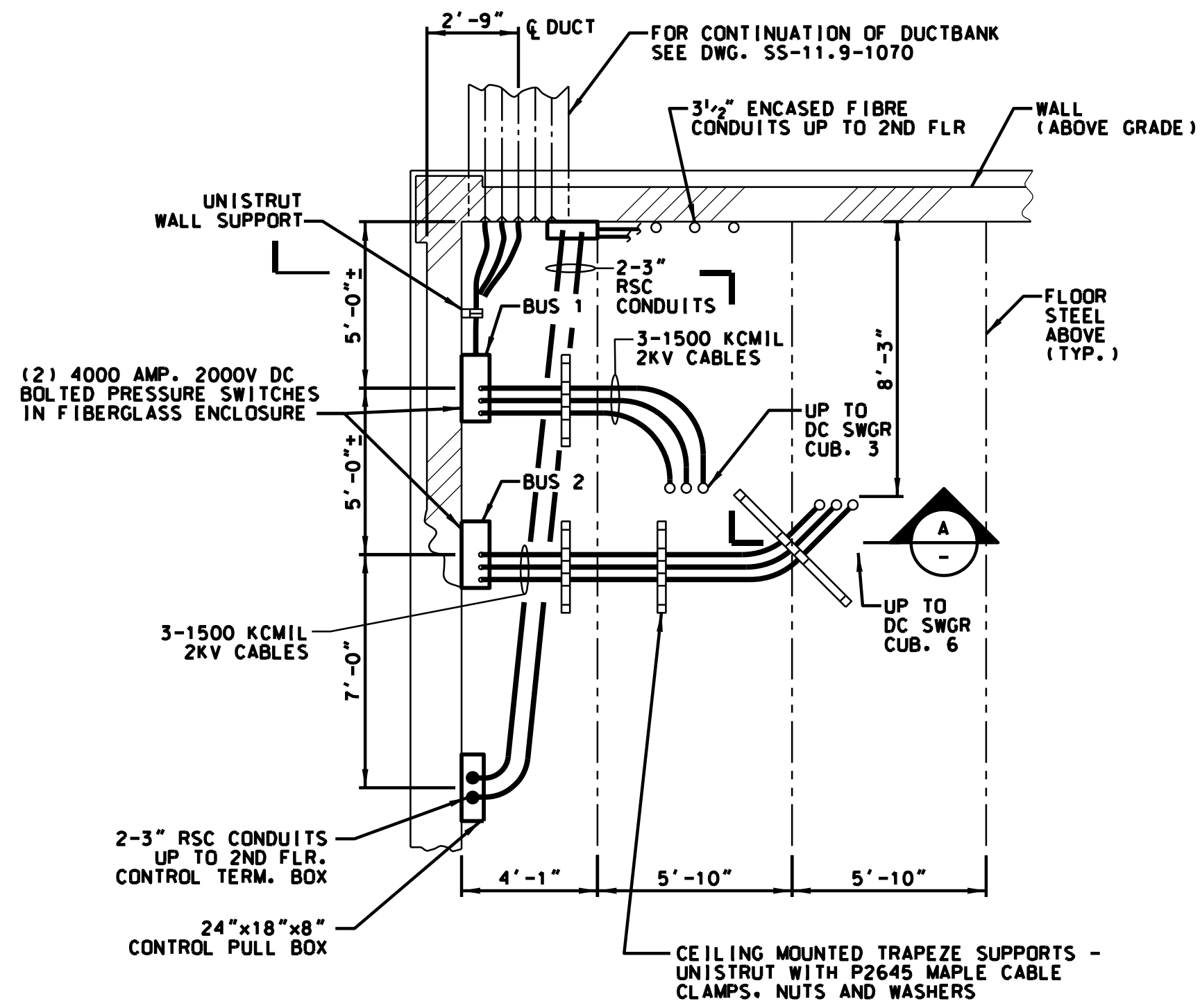
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SCALE: AS NOTED  
DISTRICT: MED

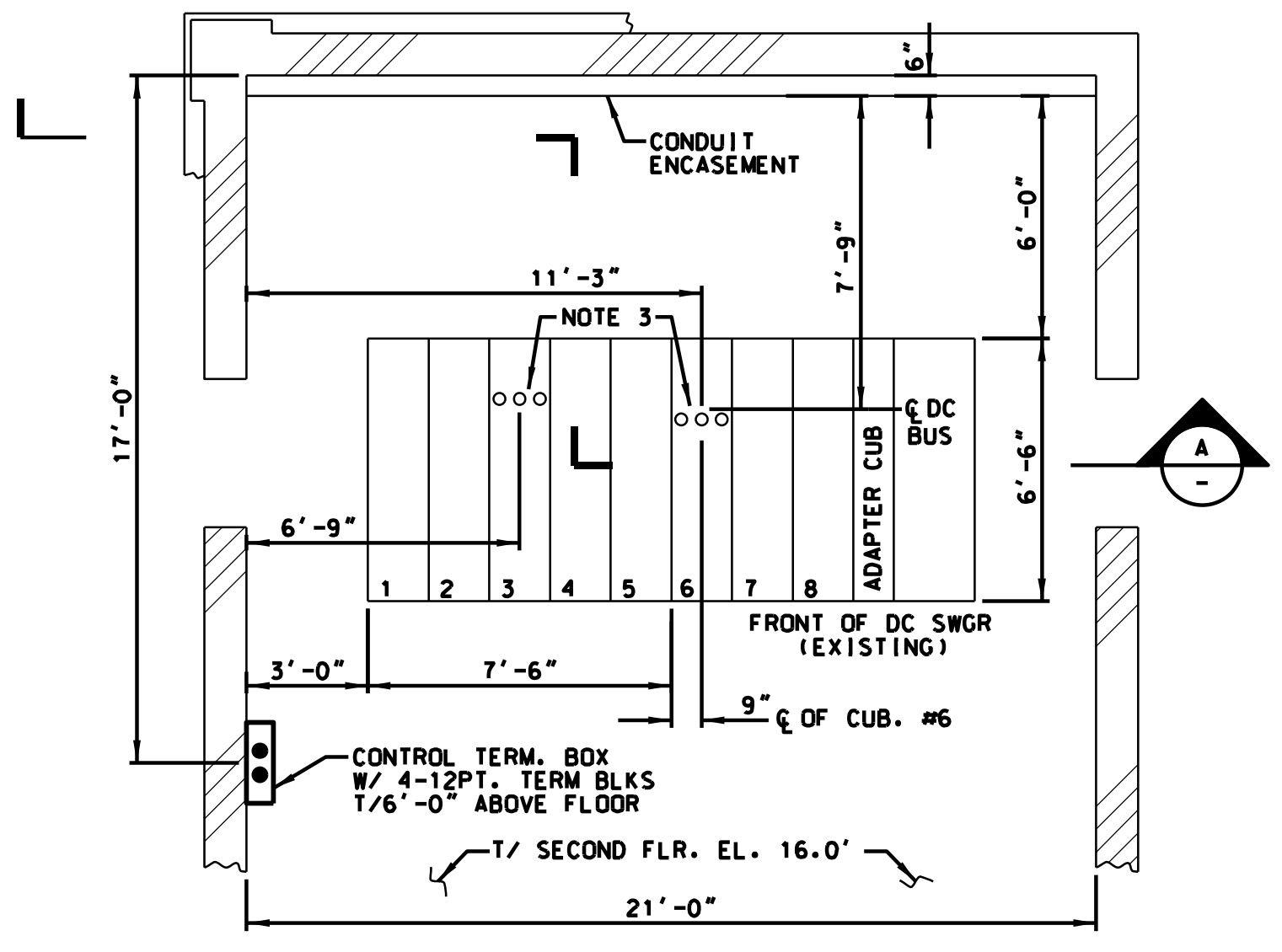
PROJECT NO. GW4254-57102002  
SHEET NO. **SS-11.9-1082**

MILE POST NO. 11.9

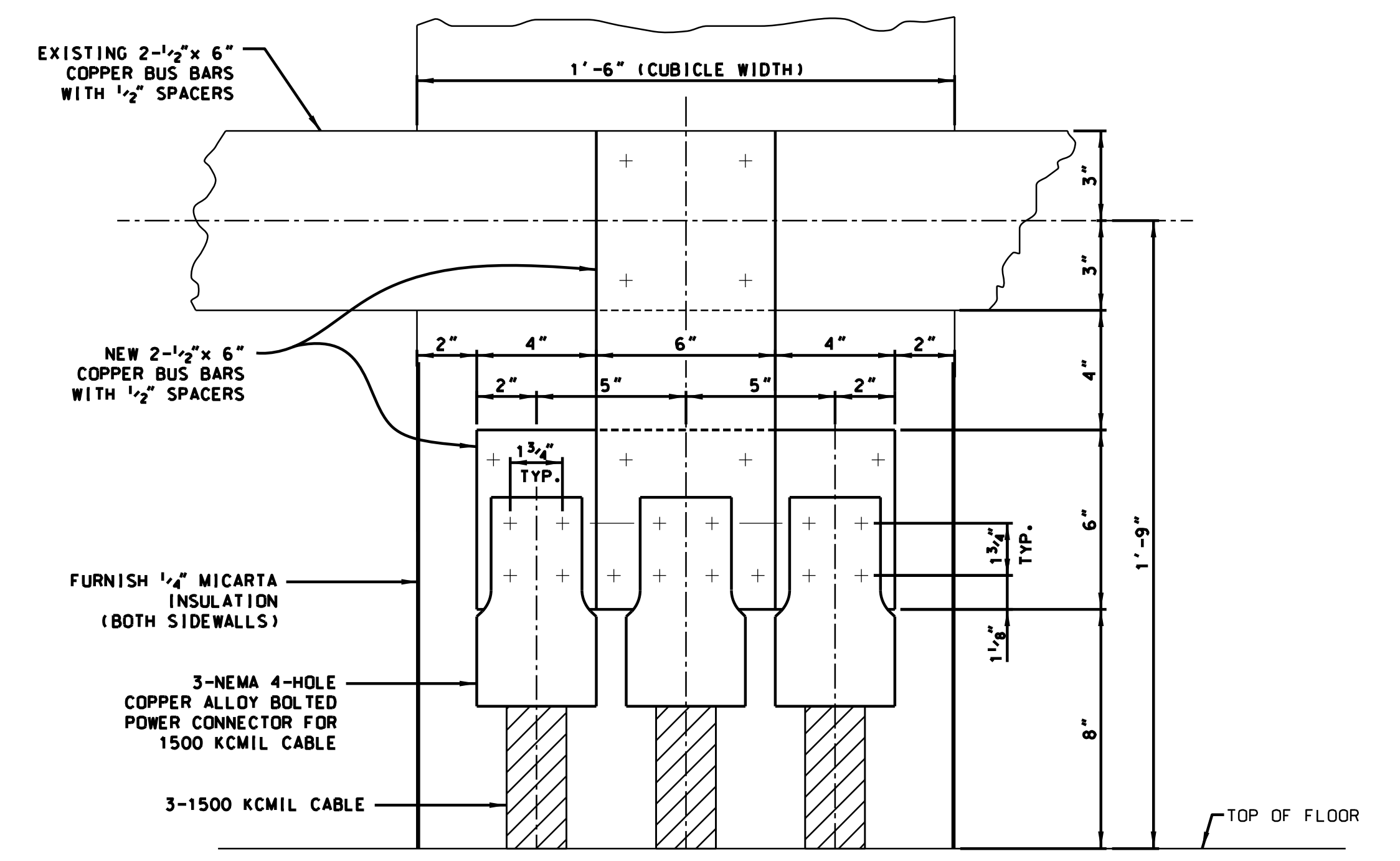




**FIRST FLOOR PLAN**  
SCALE: 1/4" = 1'-0"

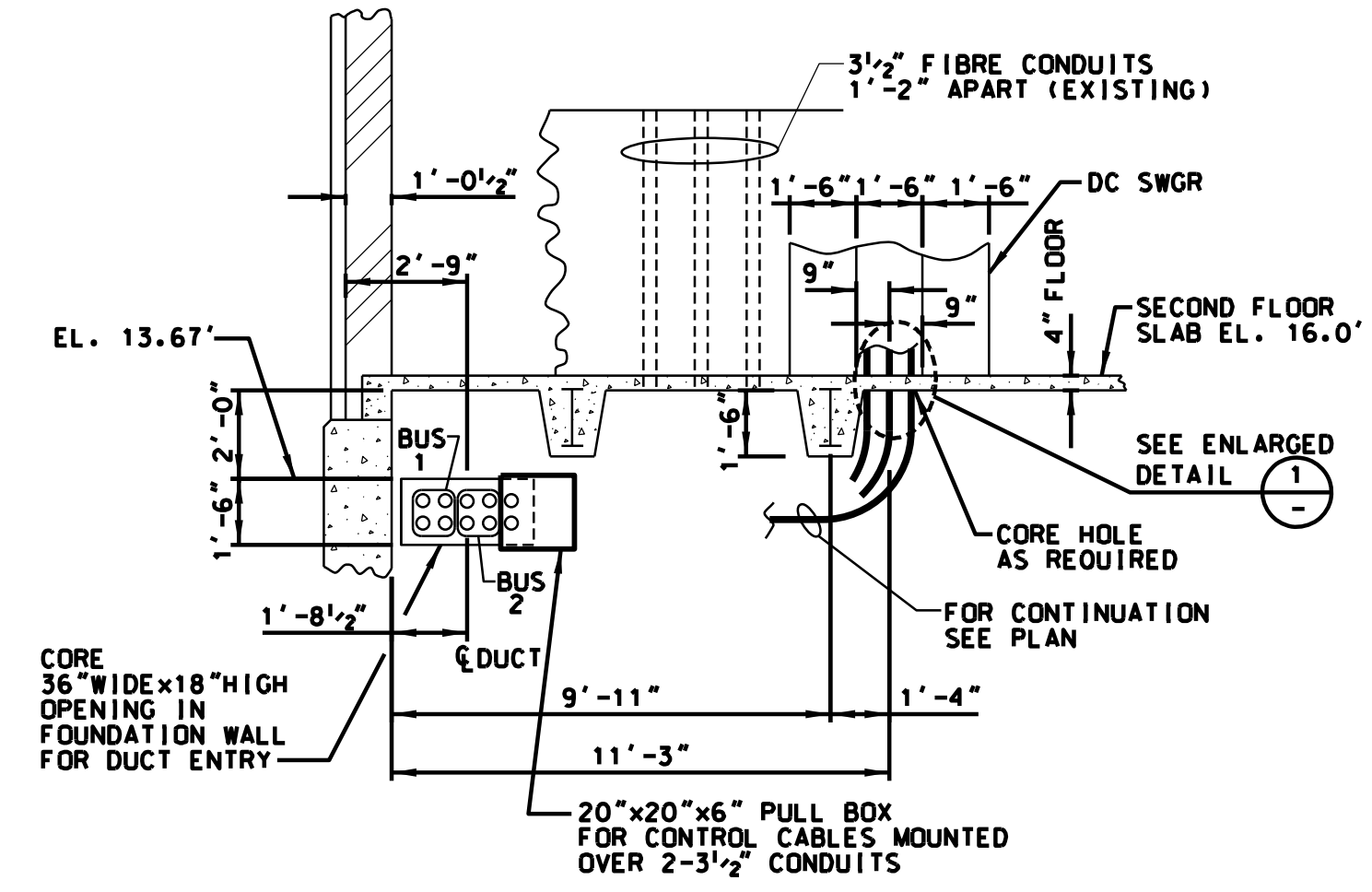


**SECOND FLOOR PLAN**  
SCALE: 1/4" = 1'-0"



**DC SWITCHGEAR HIGH VOLTAGE  
LOWER COMPARTMENT  
ELEVATION (CUB. 3 & 6)**

**1 DETAIL**  
SCALE: 1/4" = 1"



**A SECTION**  
SCALE: 1/4" = 1'-0"

**NOTES:**

1. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING INSTALLATIONS AND MAKE NECESSARY ADJUSTMENTS.
2. ALL EQUIPMENT SHOWN IS NEW, UNLESS IDENTIFIED AS EXISTING.
3. EXTEND SWITCHGEAR DC BUS PER DETAIL 1 ON THIS DRAWING, TERMINATE 3-1500KCMIL TO THE BUS EXTENSION.
4. REFERENCES TO BUS 1 AND BUS 2 (AT SWITCHES AND WITHIN DUCTBANK) ARE FOR FUTURE CONFIGURATION.

PRINTED ON: SDATES

| REV | DATE       | BY | APP | DESCRIPTION    | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|----|-----|----------------|-----|------|----|-----|-------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |     |      |    |     |             |

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DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

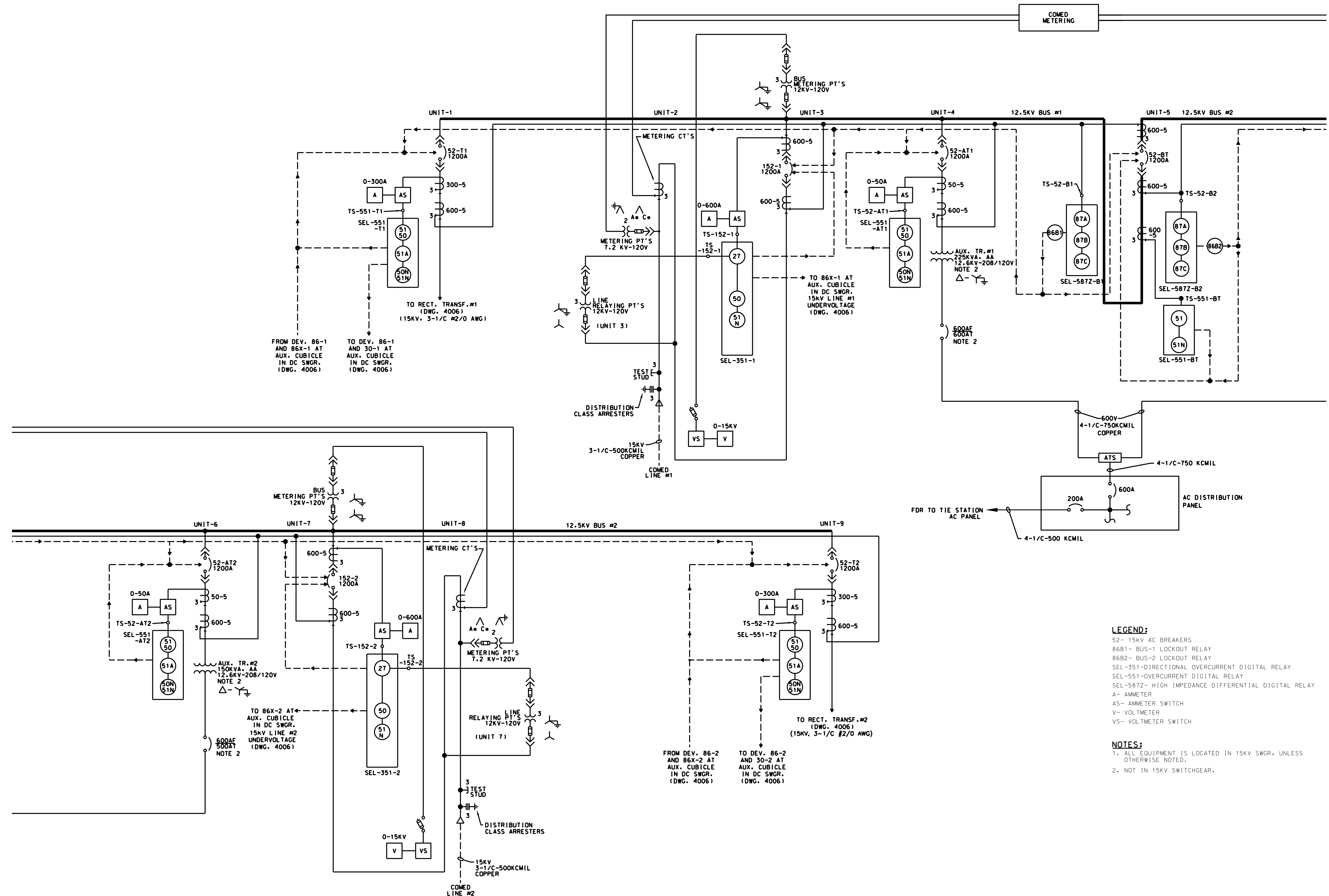


LOCATION NAME:  
**95TH. STREET SUBSTATION**

TITLE:  
**TIE STATION INCOMING  
FEEDER & CONTROL CABLES  
PLAN & SECTIONS**

CAD FILE NUMBER: SS-11.9-1085.DGN

|                                |                                  |
|--------------------------------|----------------------------------|
| SCALE:<br>AS NOTED             | DISTRICT:<br>MED                 |
| PROJECT NO.<br>GW4254-57102002 | SHEET NO.<br><b>SS-11.9-1085</b> |
| MILE POST NO.<br>11.9          |                                  |



CONTINUED BELOW

CONTINUED FROM ABOVE

- LEGEND:**
- 52- 15KV AC BREAKERS
  - 86B1- BUS-1 LOCKOUT RELAY
  - 86B2- BUS-2 LOCKOUT RELAY
  - SEL-351-DIRECTIONAL OVERCURRENT DIGITAL RELAY
  - SEL-551-OVERCURRENT DIGITAL RELAY
  - SEL-587Z- HIGH IMPEDANCE DIFFERENTIAL DIGITAL RELAY
  - A- AMMETER
  - AS- AMMETER SWITCH
  - V- VOLTMETER
  - VS- VOLTMETER SWITCH

- NOTES:**
1. ALL EQUIPMENT IS LOCATED IN 15KV SWGR, UNLESS OTHERWISE NOTED.
  2. NOT IN 15KV SWITCHGEAR.

PRINTED ON: SDATES

| REV | DATE       | BY | APP | DESCRIPTION    | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|----|-----|----------------|-----|------|----|-----|-------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |     |      |    |     |             |



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 METRA P.M.: R. CERANT  
 DATE: JUNE 12, 2017



LOCATION NAME:  
**95TH. STREET SUBSTATION**  
 TITLE:  
**12.5KV AC SINGLE LINE DIAGRAM**

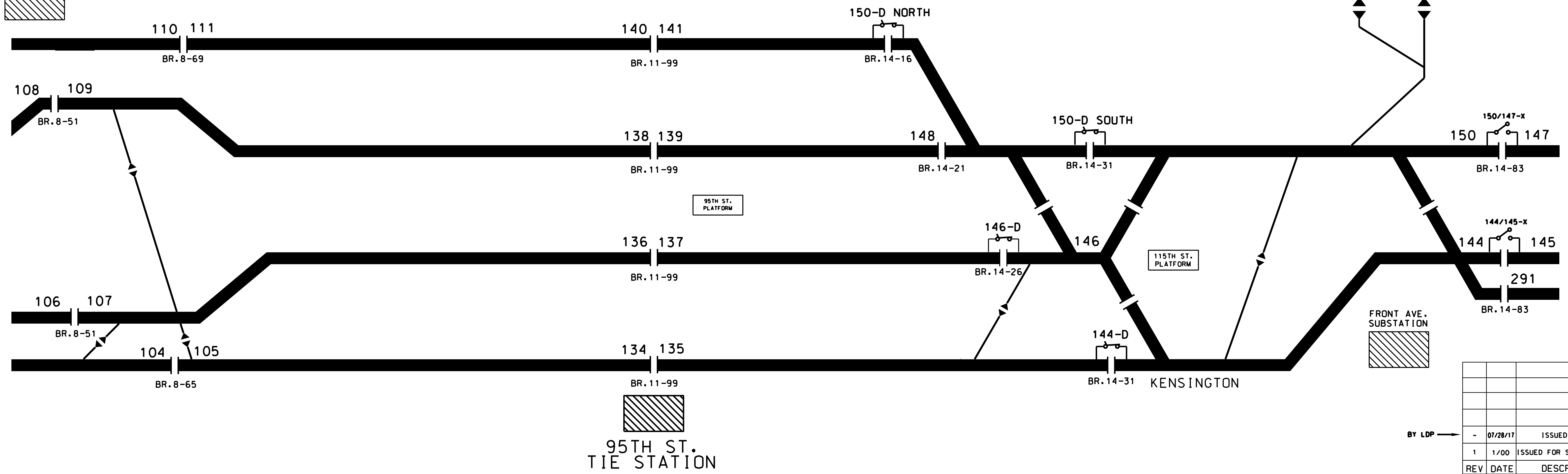
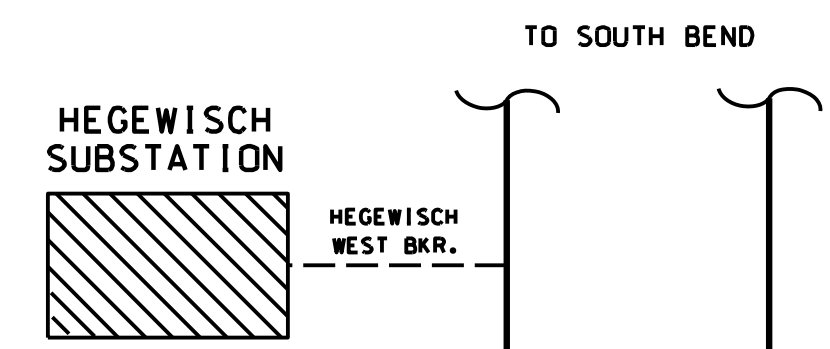
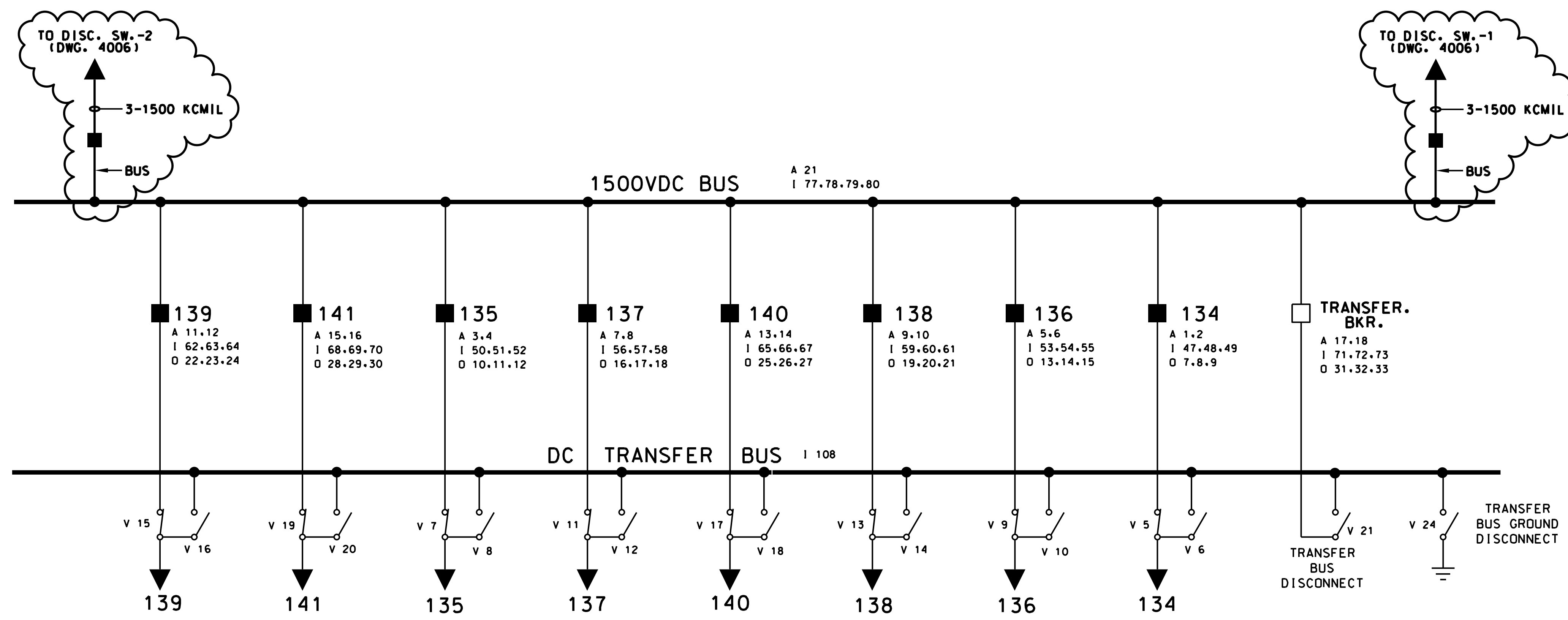
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 SCALE: NTS  
 PROJECT NO. GW4254-57102002  
 MILE POST NO. 11.9  
 DISTRICT: MED  
 SHEET NO. **SS-11.9-4001**



# 95th STREET TIE STATION

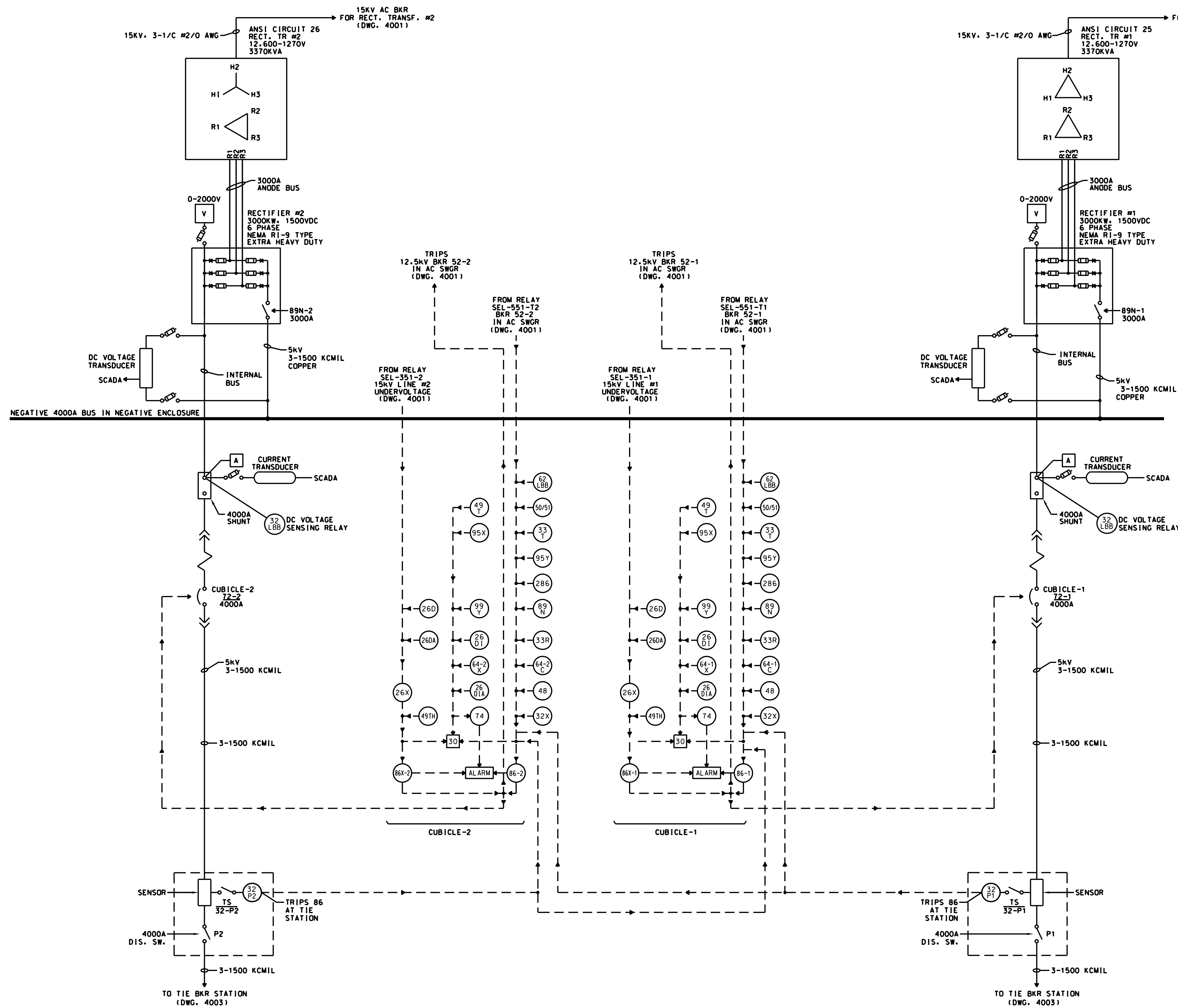
## FEEDER STRUCTURE 11-99

CIRCUIT WITHIN THE CLOUD INDICATES NEW WORK UNDER THIS CONTRACT



BY LDP

|  |          |                            |             |
|--|----------|----------------------------|-------------|
| REV  | DATE     | DESCRIPTION                | BY          |
| -  | 07/28/17 | ISSUED FOR BID             | HS          |
| 1  | 1/00     | ISSUED FOR SCADA AS-BUILT  | WPS         |
| <b>Metra</b> ENGINEERING DEPARTMENT<br>CHICAGO, ILLINOIS |          |                            |             |
| <b>TRACTION POWER ONE LINE DIAGRAM</b>                   |          |                            |             |
| <b>95th STREET TIE STATION</b>                           |          |                            |             |
| SCALE: NONE  |          |                            |             |
| CAD FILE NUMBER: F:\ELEC/EML/95th/4003.dgn               |          |                            | DATE: 10/95 |
| WDS  | WDS      | RAS                        | WPS         |
| DISTRICT: METRA ELECT.                                   |          | PRINT NUMBER: SS-11.9-4003 |             |



- LEGEND:**
- 26D- RECT. POS. OVERTEMP-SECOND STEP
  - 26DA- RECT. NEG. OVERTEMP- SECOND STEP
  - 26D1- RECT. POS. OVERTEMP-FIRST STEP
  - 26D1A- RECT. NEG. OVERTEMP- FIRST STEP
  - 26X- AUXILIARY TO 26D AND 26DA
  - 30- RECTIFIER ANNUNCIATOR
  - 32- REVERSE CURRENT TRIP DEVICE
  - 32LBB- CURRENT SENSING RELAY FOR DEV.32 CKT
  - 33R- RECT. COMPT.DOOR POSITION SWITCH
  - 33T- RECT. TR. DOOR POSITION SWITCH
  - 48- INCOMPLETE SEQ. RELAY
  - 49T- TRANS. WINDING OVERTEMP-FIRST STEP
  - 49TH-TRANS WINDING OVERTEMP-SECOND STEP
  - 62LBB- BREAKER BACK-UP TIMING RELAY
  - 64M- RECT. GRD. REL.-GROUNDED STRUCTURE
  - 64X- RECT. GRD. REL.-HOT STRUCTURE
  - 72- CATHODE BREAKER
  - 74- TROUBLE ALARM RELAY
  - 86S- LOCKOUT RELAY-DC SWGR STRUCTURE HOT
  - 86X- CONDITIONAL LOCKOUT RELAY
  - 86- HAND RESET LOCKOUT RELAY
  - 89N- RECTIFIER NEG. DISC. SW.
  - 129- LOAD MEASURING CONTACTOR
  - 150RR- RATE OF RISE DIGITAL RELAY
  - 164M- DC SWGR GRD RELAY-GROUNDED STRUCTURE
  - 164X- DC SWGR GRD RELAY-HOT STRUCTURE
  - 164XX-AUX RELAY TO DEVICE 164X

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| REV | DATE       | BY | APP | DESCRIPTION    | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|----|-----|----------------|-----|------|----|-----|-------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |     |      |    |     |             |

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Consulting Engineers  
20 N. Wacker Dr. Ste. 1500 Chicago IL 60606

DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017



LOCATION NAME:  
**95TH. STREET SUBSTATION**

TITLE:  
**TRANSF'S, RECTIFIERS & DC SWGR  
SINGLE LINE DIAGRAM**

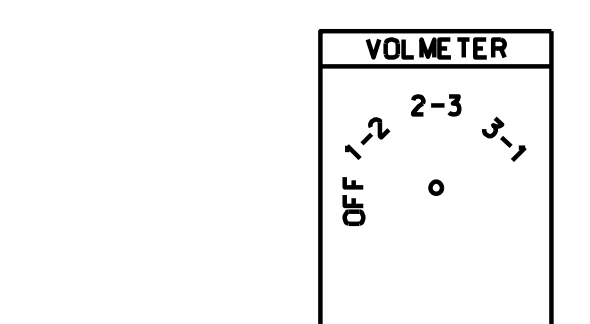
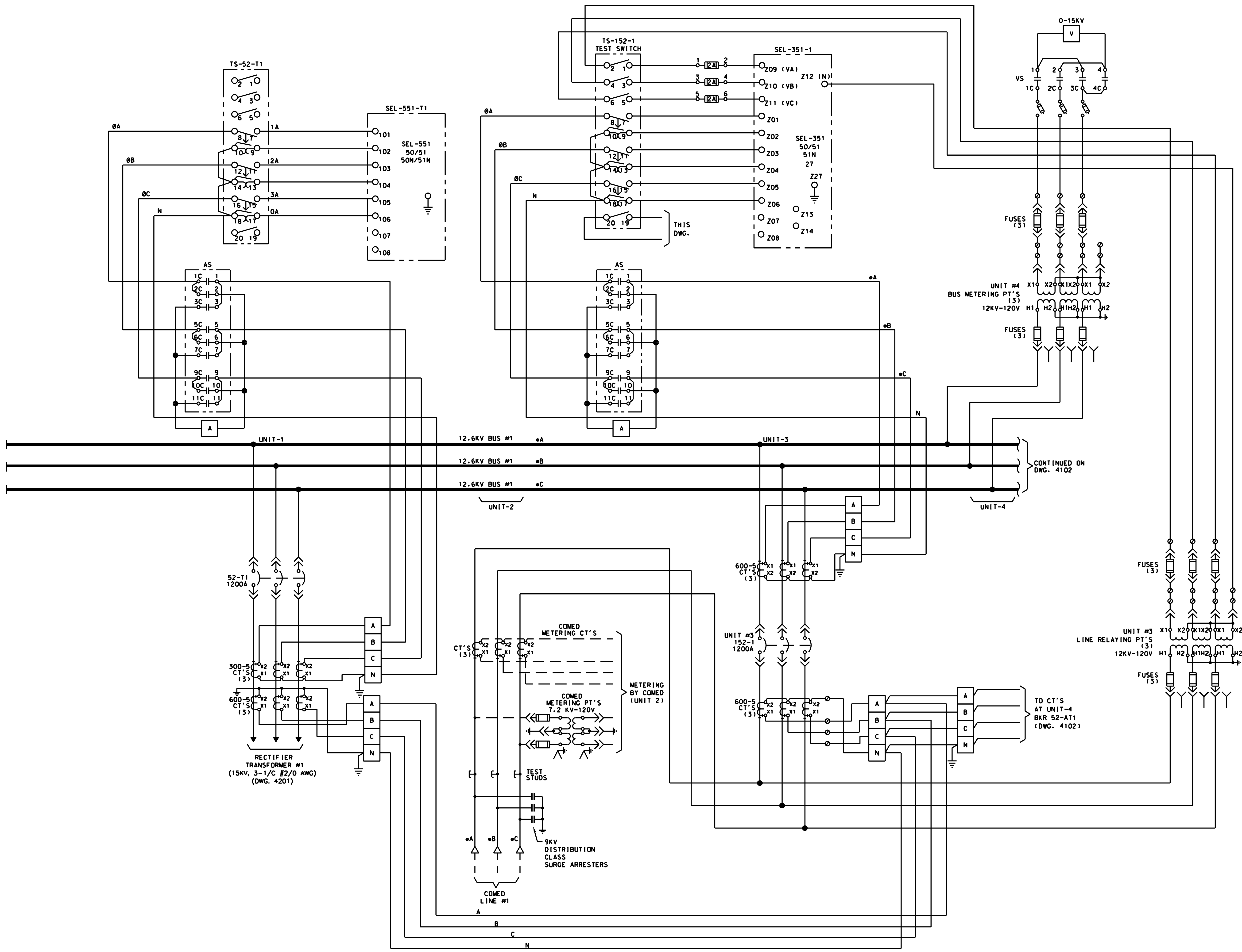
CAD FILE NUMBER: SS-11.9-4006.DGN

SCALE: NTS  
DISTRICT: MED

PROJECT NO. GW4254-57102002  
SHEET NO. SS-11.9-4006

MILE POST NO. 11.9





GE TYPE:165B1CF11

| CONTACTS HANDLE END | POSITIONS |     |     |    |
|---------------------|-----------|-----|-----|----|
|                     | 3-1       | 2-3 | 1-2 | DF |
| 1                   | X         |     | X   |    |
| 2                   |           | X   | X   |    |
| 3                   |           | X   |     | X  |
| 4                   | X         |     |     |    |

GE TYPE:165B1CF15

| CONTACTS HANDLE END | POSITIONS |   |    |   |   |   |    |   |
|---------------------|-----------|---|----|---|---|---|----|---|
|                     | 3         | • | DF | • | 2 | • | DF | • |
| 1                   | X         | X | X  | X | X | X | X  | X |
| 2                   |           |   |    |   |   |   |    | X |
| 3                   |           |   |    |   |   |   |    | X |
| 5                   | X         | X | X  | X |   | X | X  | X |
| 6                   |           |   |    | X | X | X |    |   |
| 7                   |           |   |    | X | X | X |    |   |
| 9                   |           | X | X  | X | X | X | X  | X |
| 10                  | X         | X |    |   |   |   |    |   |
| 11                  | X         | X |    |   |   |   |    |   |

**LEGEND:**  
 52 OR 152- 15KV AC BREAKER  
 SEL-351- DIRECTIONAL OVERCURRENT DIGITAL RELAY  
 SEL-551- OVERCURRENT DIGITAL RELAY  
 TS/52 OR 152- TEST SWITCH  
 AS- AMMETER SWITCH  
 A- AMMETER  
 VS-VOLTMETER SWITCH  
 V- VOLTMETER

**NOTES:**  
 1. ALL EQUIPMENT IS LOCATED IN 15KV SWGR. UNLESS OTHERWISE NOTED.  
 2. ALL CTS SHALL BE WIRED TO A SHORTING TERMINAL BLOCK PRIOR TO CONNECTING TO A DEVICE.

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| REV | DATE       | BY | APP | DESCRIPTION    |
|-----|------------|----|-----|----------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |

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DESIGNED: HS  
 DRAWN: JC  
 CHECKED: FM  
 METRA P.M.: R. CERANT  
 DATE: JUNE 12, 2017

ENGINEERING DEPARTMENT  
 547 W. JACKSON BOULEVARD  
 CHICAGO, ILLINOIS 60661

LOCATION NAME:  
**95TH. STREET SUBSTATION**

TITLE:  
**12.5KV AC THREE LINE DIAGRAM  
 SHEET 1 OF 3**

CAD FILE NUMBER: SS-11.9-4101

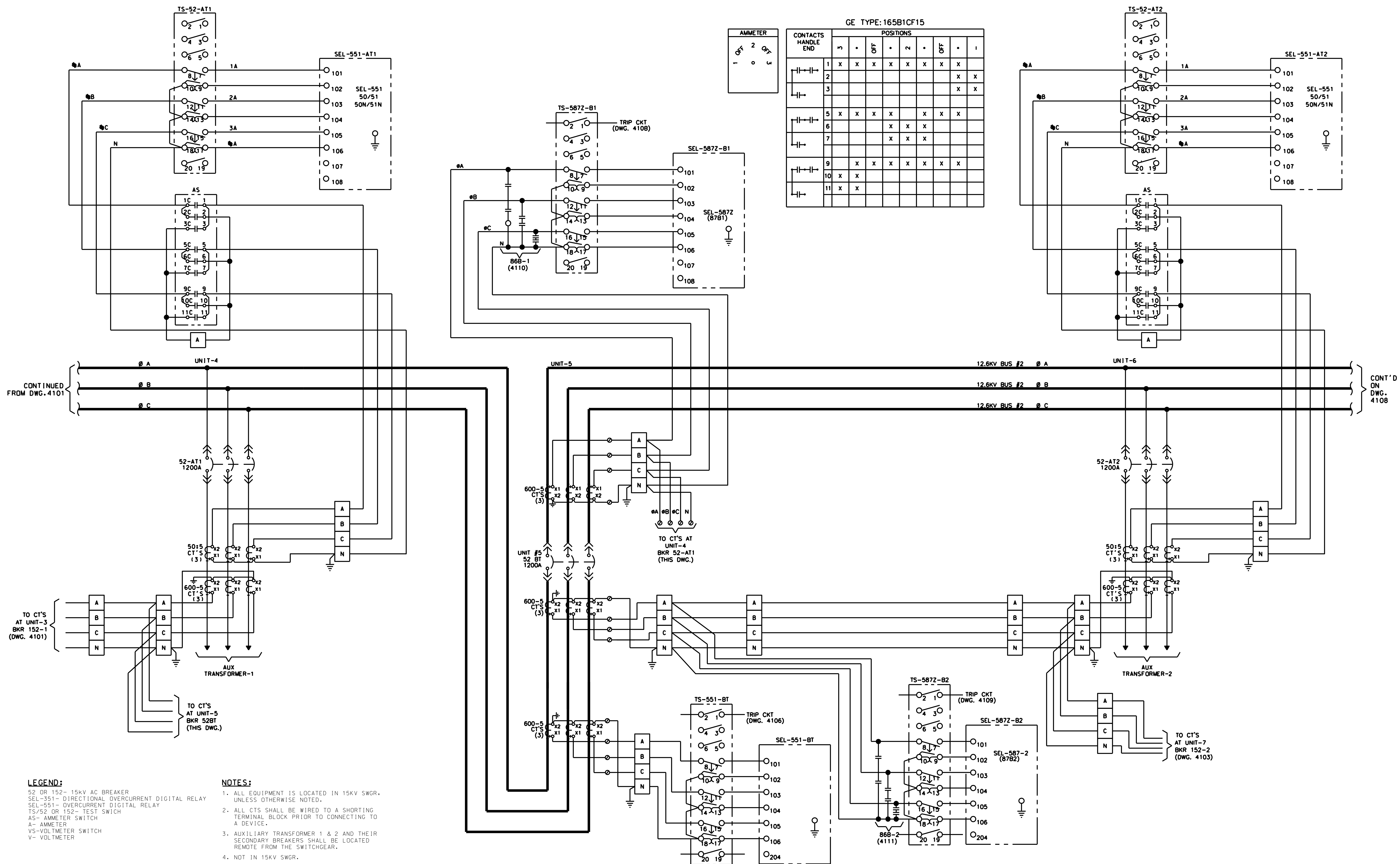
SCALE:  
 NTS

DISTRICT:  
 MED

PROJECT NO.  
 GW4254-57102002

SHEET NO.  
**SS-11.9-4101**

MILE POST NO.  
 11.9



AMMETER

|     |   |     |
|-----|---|-----|
| OFF | 2 | OFF |
| 1   | 0 | 3   |

GE TYPE: 165B1CF15

| CONTACTS<br>HANDLE<br>END | POSITIONS |   |     |   |   |   |     |   |   |   |   |
|---------------------------|-----------|---|-----|---|---|---|-----|---|---|---|---|
|                           | 5         | • | OFF | • | 2 | • | OFF | • | 1 |   |   |
| 1                         | X         | X | X   | X | X | X | X   | X | X | X | X |
| 2                         |           |   |     |   |   |   |     |   |   | X | X |
| 3                         |           |   |     |   |   |   |     |   |   |   |   |
| 5                         | X         | X | X   | X | X | X | X   | X | X | X | X |
| 6                         |           |   |     | X | X | X | X   | X | X |   |   |
| 7                         |           |   |     | X | X | X | X   | X |   |   |   |
| 9                         | X         | X | X   | X | X | X | X   | X | X | X | X |
| 10                        | X         | X |     |   |   |   |     |   |   |   |   |
| 11                        | X         | X |     |   |   |   |     |   |   |   |   |

**LEGEND:**  
 52 OR 152- 15KV AC BREAKER  
 SEL-351- DIRECTIONAL OVERCURRENT DIGITAL RELAY  
 SEL-551- OVERCURRENT DIGITAL RELAY  
 TS/52 OR 152- TEST SWITCH  
 AS- AMMETER SWITCH  
 A- AMMETER  
 VS-VOLTMETER SWITCH  
 V- VOLTMETER

**NOTES:**  
 1. ALL EQUIPMENT IS LOCATED IN 15KV SWGR, UNLESS OTHERWISE NOTED.  
 2. ALL CTS SHALL BE WIRED TO A SHORTING TERMINAL BLOCK PRIOR TO CONNECTING TO A DEVICE.  
 3. AUXILIARY TRANSFORMER 1 & 2 AND THEIR SECONDARY BREAKERS SHALL BE LOCATED REMOTE FROM THE SWITCHGEAR.  
 4. NOT IN 15KV SWGR.

PRINTED ON: SDATES

|     |            |    |     |                |     |      |    |     |             |
|-----|------------|----|-----|----------------|-----|------|----|-----|-------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |     |      |    |     |             |
| REV | DATE       | BY | APP | DESCRIPTION    | REV | DATE | BY | APP | DESCRIPTION |



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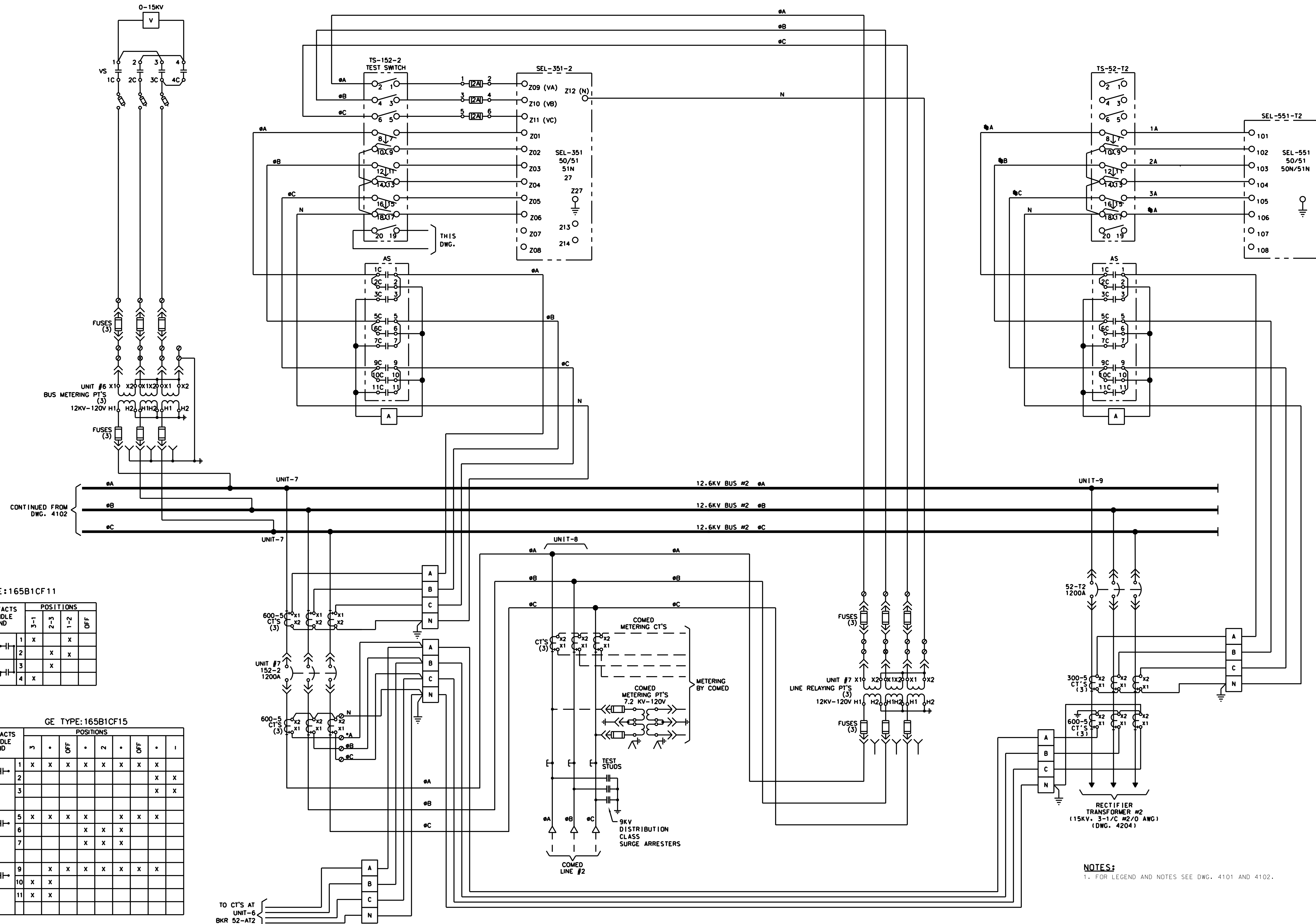
DESIGNED: HS  
 DRAWN: JC  
 CHECKED: FM  
 METRA P.M.: R. CERANT  
 DATE: JUNE 12, 2017

**Metra**  
 ENGINEERING DEPARTMENT  
 547 W. JACKSON BOULEVARD  
 CHICAGO, ILLINOIS 60661

LOCATION NAME:  
**95TH. STREET SUBSTATION**  
 TITLE:  
**12.5KV AC THREE LINE DIAGRAM  
 SHEET 2 OF 3**

CAD FILE NUMBER: SS-11.9-4102.DGN  
 SCALE: NTS  
 DISTRICT: MED  
 PROJECT NO. GW4254-57102002  
 SHEET NO. SS-11.9-4102  
 MILE POST NO. 11.9





GE TYPE: 165B1CF11

| CONTACTS HANDLE END | POSITIONS |     |     |    |
|---------------------|-----------|-----|-----|----|
|                     | 3-1       | 2-3 | 1-2 | DF |
| 1                   | X         |     | X   |    |
| 2                   |           | X   |     | X  |
| 3                   |           |     | X   |    |
| 4                   | X         |     |     |    |

GE TYPE: 165B1CF15

| CONTACTS HANDLE END | POSITIONS |   |     |   |   |   |     |   |   |
|---------------------|-----------|---|-----|---|---|---|-----|---|---|
|                     | 3         | • | OFF | • | 2 | • | OFF | • | 1 |
| 1                   | X         | X | X   | X | X | X | X   | X | X |
| 2                   |           |   |     |   |   |   |     | X | X |
| 3                   |           |   |     |   |   |   |     | X | X |
| 5                   | X         | X | X   | X | X | X | X   | X | X |
| 6                   |           |   |     | X | X | X |     |   |   |
| 7                   |           |   |     | X | X | X |     |   |   |
| 9                   |           | X | X   | X | X | X | X   | X | X |
| 10                  | X         | X |     |   |   |   |     |   |   |
| 11                  | X         | X |     |   |   |   |     |   |   |

NOTES:  
1. FOR LEGEND AND NOTES SEE DWG. 4101 AND 4102.

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|-----|------------|----|-----|----------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |

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DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

**Metra**  
ENGINEERING DEPARTMENT  
547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

LOCATION NAME:  
**95TH. STREET SUBSTATION**

TITLE:  
**12.5KV AC THREE LINE DIAGRAM  
SHEET 3 OF 3**

CAD FILE NUMBER: SS-11.9-4103.DGN

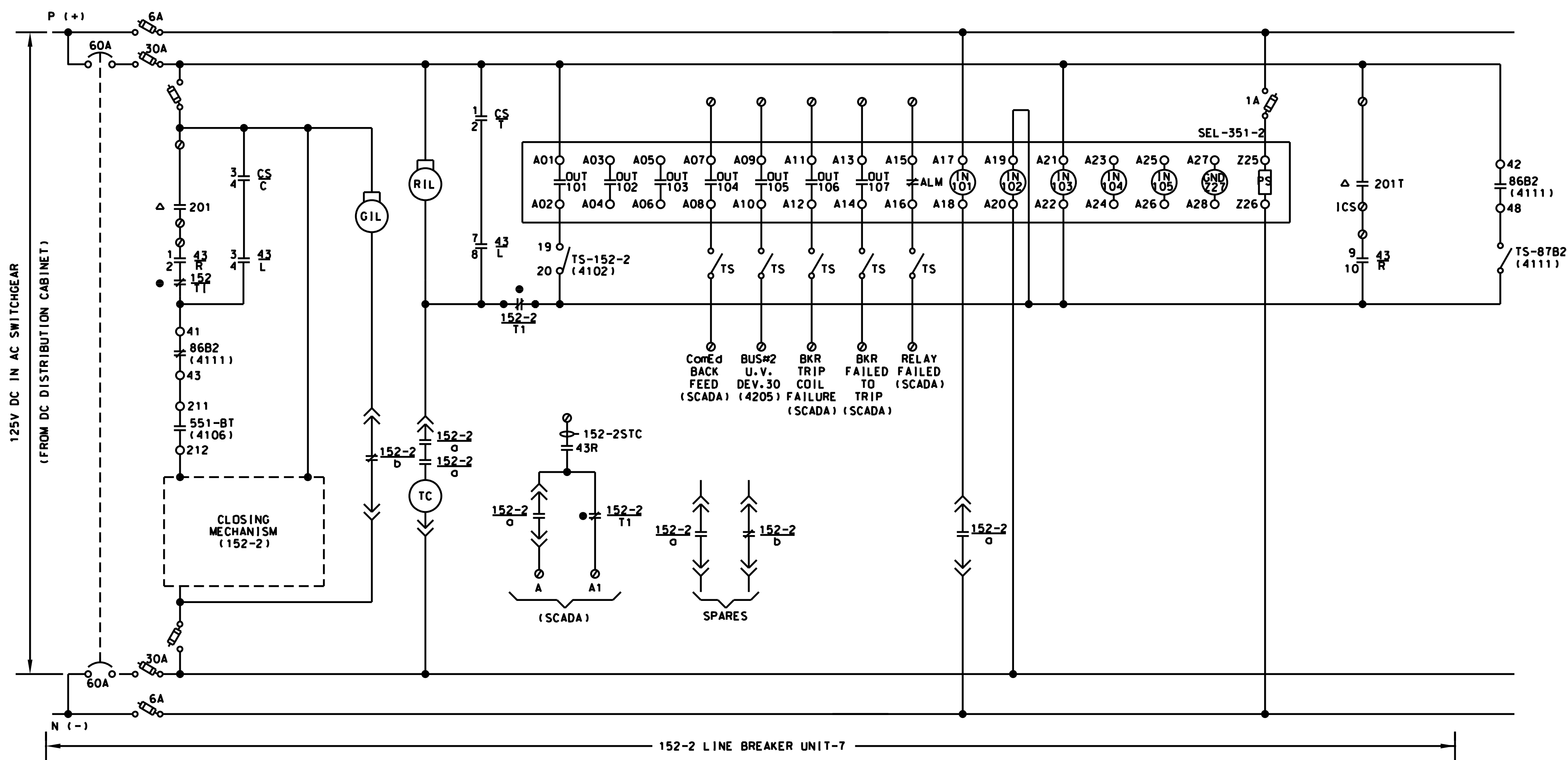
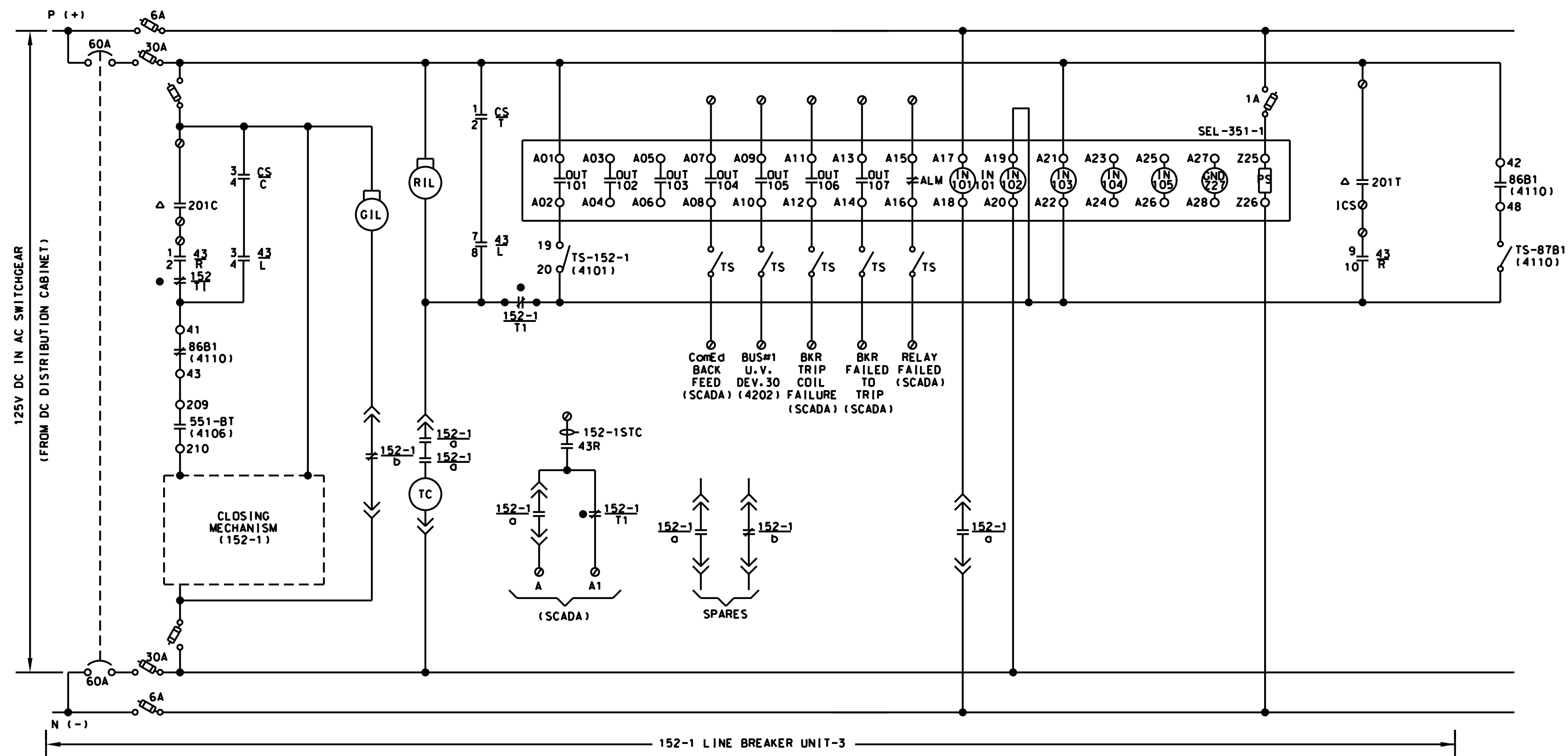
SCALE:  
NTS

DISTRICT:  
MED

PROJECT NO.  
GW4254-57102002

MILE POST NO.  
11.9

**SS-11.9-4103**



**CONTROL-SWITCH DEVICE-CS**

| CONTACTS | POSITION |                |       |
|----------|----------|----------------|-------|
|          | TRIP     | OFF AFTER TRIP | CLOSE |
| 1-2      | T        | X              |       |
| 3-4      | C        |                | X     |

SPRING RETURN TO "OFF"

**SELECTOR SWITCH DEVICE-43**

| CONTACTS | POSITION |       |
|----------|----------|-------|
|          | REMOTE   | LOCAL |
| 1-2      | R        | X     |
| 3-4      | L        | X     |
| 5-6      | R        | X     |
| 7-8      | L        | X     |
| 9-10     | R        | X     |
| 11-12    | L        | X     |

NON-SPRING RETURN.  
REMOTE POSITION AT 12 O' CLOCK.  
LOCAL POSITION CLOCKWISE WHEN FACING FRONT OF SWITCH

**LEGEND:**  
 ▲-LOCATED IN SCADA RTU CABINET  
 ●-CLOSED ONLY WITH BREAKER IN CONNECTED POSITION  
 ▲-OPEN ONLY WITH BREAKER IN CONNECTED POSITION  
 ○-TERMINAL BLOCK

**NOTES:**  
 1. ALL EQUIPMENT IS LOCATED IN 15KV SWGR. UNLESS OTHERWISE NOTED.  
 2. NUMBER IN PARENTHESIS REFERS TO A DRAWING NUMBER.

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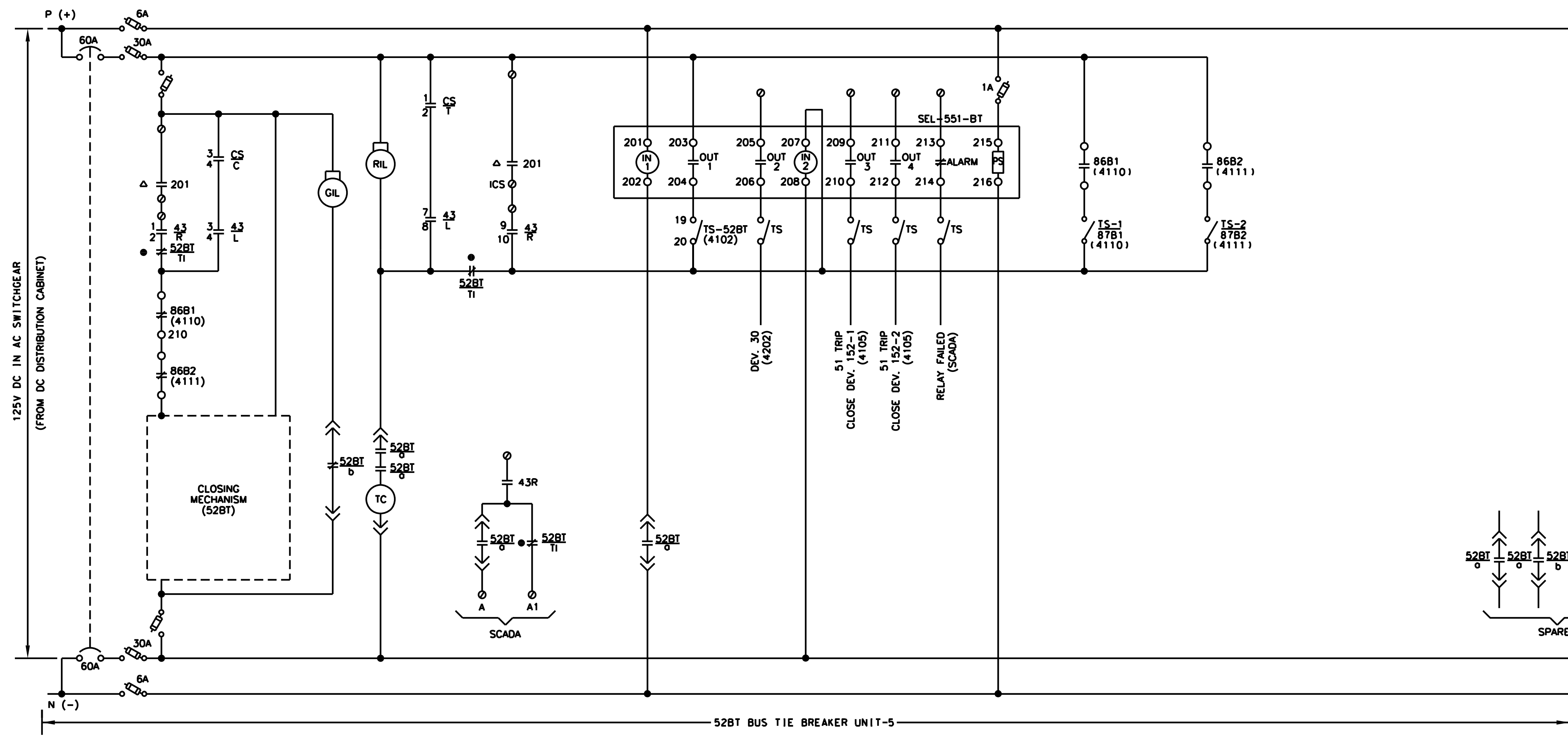
DESIGNED: HS  
 DRAWN: JC  
 CHECKED: FM  
 METRA P.M.: R. CERANT  
 DATE: JUNE 12, 2017



LOCATION NAME:  
**95TH. STREET SUBSTATION**  
 TITLE:  
**12.5KV AC SCHEMATIC DIAGRAM  
 INC. LINE BKRS. 152-1 & 152-2**

|                                   |                                  |
|-----------------------------------|----------------------------------|
| CAD FILE NUMBER: SS-11.9-4105.DGN |                                  |
| SCALE:<br>NTS                     | DISTRICT:<br>MED                 |
| PROJECT NO.<br>GW4254-57102002    | SHEET NO.<br><b>SS-11.9-4105</b> |
| MILE POST NO.<br>11.9             |                                  |





CONTROL-SWITCH DEVICE-CS

| CONTACTS | POSITION |                |       |
|----------|----------|----------------|-------|
|          | TRIP     | OFF AFTER TRIP | CLOSE |
| 1-2      | T        | X              |       |
| 3-4      | C        |                | X     |

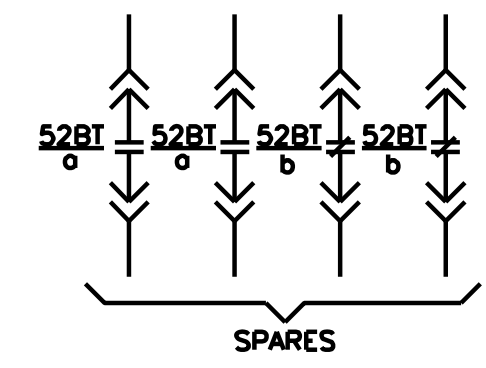
SPRING RETURN TO "OFF"

SELECTOR SWITCH DEVICE-43

| CONTACTS | POSITION |       |
|----------|----------|-------|
|          | REMOTE   | LOCAL |
| 1-2      | R        | X     |
| 3-4      | L        | X     |
| 5-6      | R        | X     |
| 7-8      | L        | X     |
| 9-10     | R        | X     |
| 11-12    | L        | X     |

NON-SPRING RETURN.  
REMOTE POSITION AT 12 O' CLOCK.  
LOCAL POSITION CLOCKWISE WHEN FACING FRONT OF SWITCH

**LEGEND:**  
 ▲-LOCATED IN SCADA RTU CABINET  
 ●-CLOSED ONLY WITH BREAKER IN CONNECTED POSITION  
 ▲-OPEN ONLY WITH BREAKER IN CONNECTED POSITION  
 ⊙-TERMINAL BLOCK



**NOTES:**  
 1. ALL EQUIPMENT IS LOCATED IN 15KV SWGR. UNLESS OTHERWISE NOTED.  
 2. NUMBER IN PARENTHESIS REFERS TO A DRAWING NUMBER.

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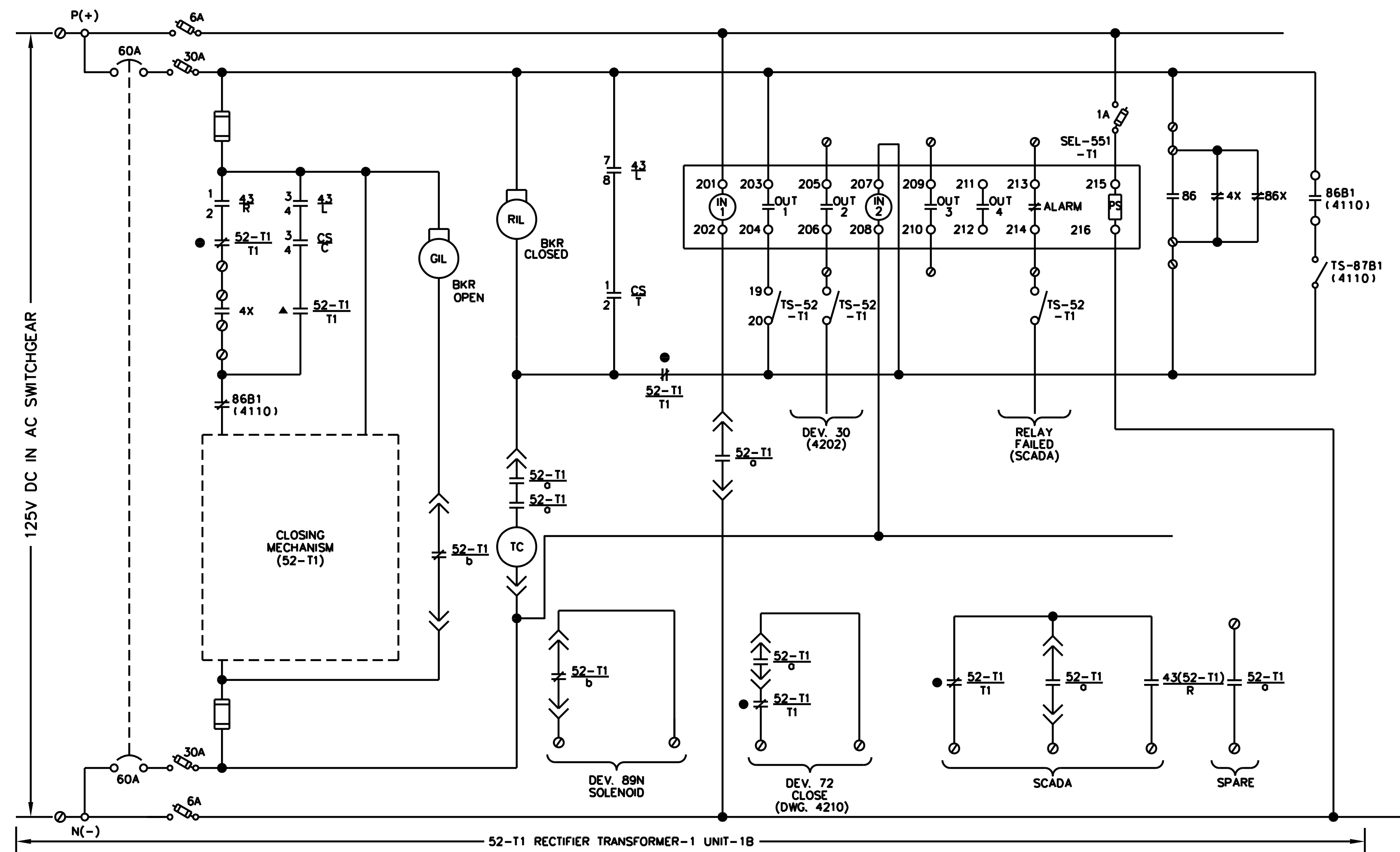
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**Gannett Fleming**  
 Consulting Engineers  
 20 N. Wacker Dr. Ste. 1500 Chicago IL 60606

DESIGNED: HS  
 DRAWN: JC  
 CHECKED: FM  
 METRA P.M.: R. CERANT  
 DATE: JUNE 12, 2017



LOCATION NAME:  
**95TH. STREET SUBSTATION**  
 TITLE:  
**12.5KV AC SCHEMATIC DIAGRAM  
 BUS TIE BKR. 52BT**

CAD FILE NUMBER: SS-11.9-4106.DGN  
 SCALE: NTS  
 PROJECT NO. GW4254-57102002  
 MILE POST NO. 11.9  
 DISTRICT: MED  
 SHEET NO. SS-11.9-4106



CONTROL-SWITCH DEVICE-CS

| CONTACTS | POSITION |                |       |
|----------|----------|----------------|-------|
|          | TRIP     | OFF AFTER TRIP | CLOSE |
| 1-2      | T        | X              |       |
| 3-4      | C        |                | X     |

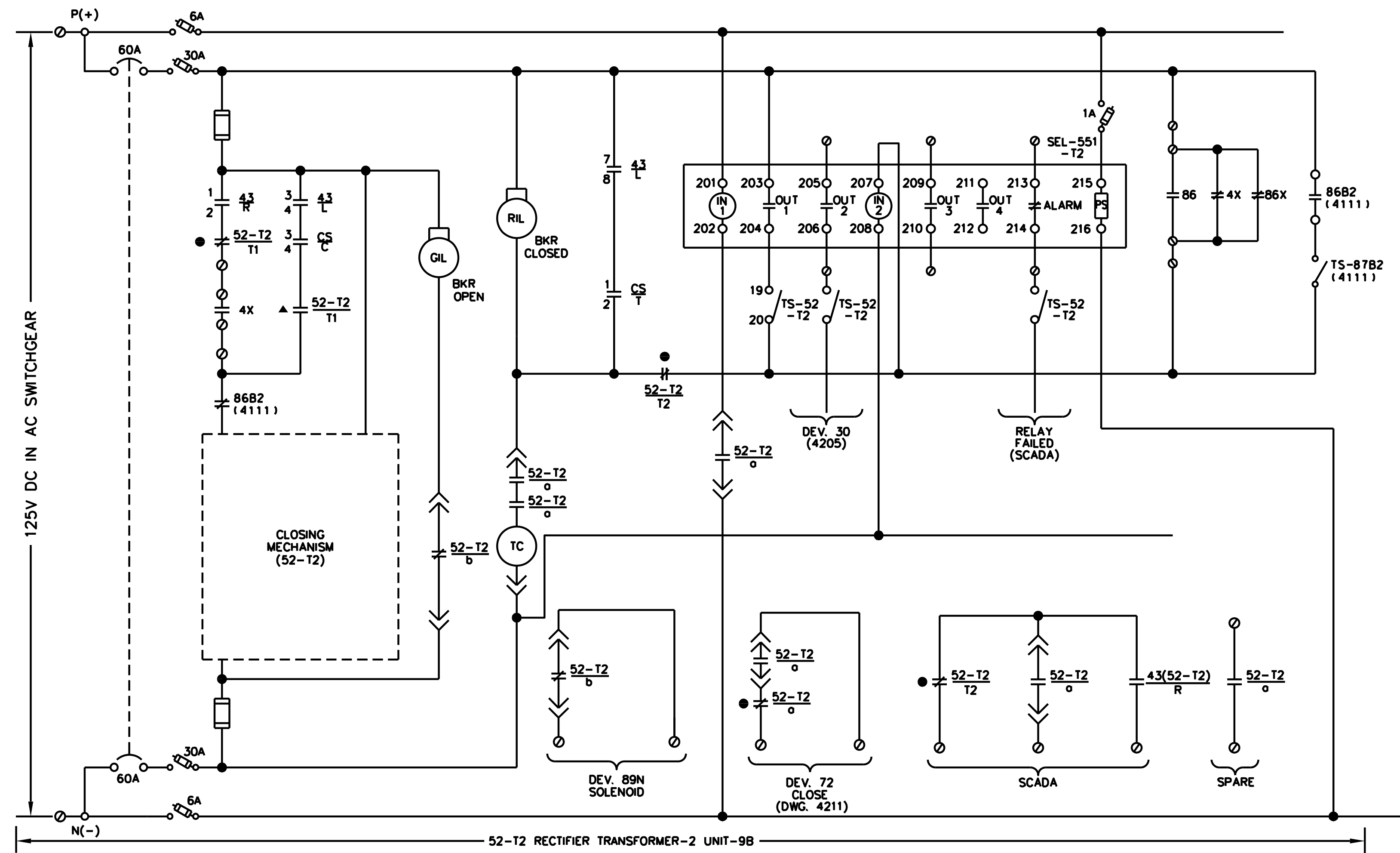
SPRING RETURN TO "OFF"

SELECTOR SWITCH DEVICE-43

| CONTACTS | POSITION |       |
|----------|----------|-------|
|          | REMOTE   | LOCAL |
| 1-2      | R        | X     |
| 3-4      | L        | X     |
| 5-6      | R        | X     |
| 7-8      | L        | X     |
| 9-10     | R        | X     |
| 11-12    | L        | X     |

NON-SPRING RETURN.  
REMOTE POSITION AT 12 O' CLOCK.  
LOCAL POSITION CLOCKWISE WHEN FACING FRONT OF SWITCH

LEGEND:  
▲-LOCATED IN SCADA RTU CABINET  
●-CLOSED ONLY WITH BREAKER IN CONNECTED POSITION  
▲-OPEN ONLY WITH BREAKER IN CONNECTED POSITION  
○-TERMINAL BLOCK



NOTES:  
1. ALL EQUIPMENT IS LOCATED IN 15KV SWGR. UNLESS OTHERWISE NOTED.  
2. NUMBER IN PARENTHESIS REFERS TO A DRAWING NUMBER.

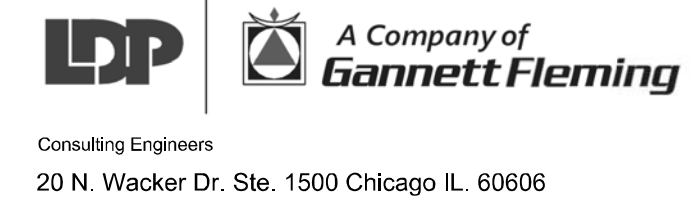
PRINTED ON: SDATES

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|-----|------------|----|-----|----------------|
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DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017



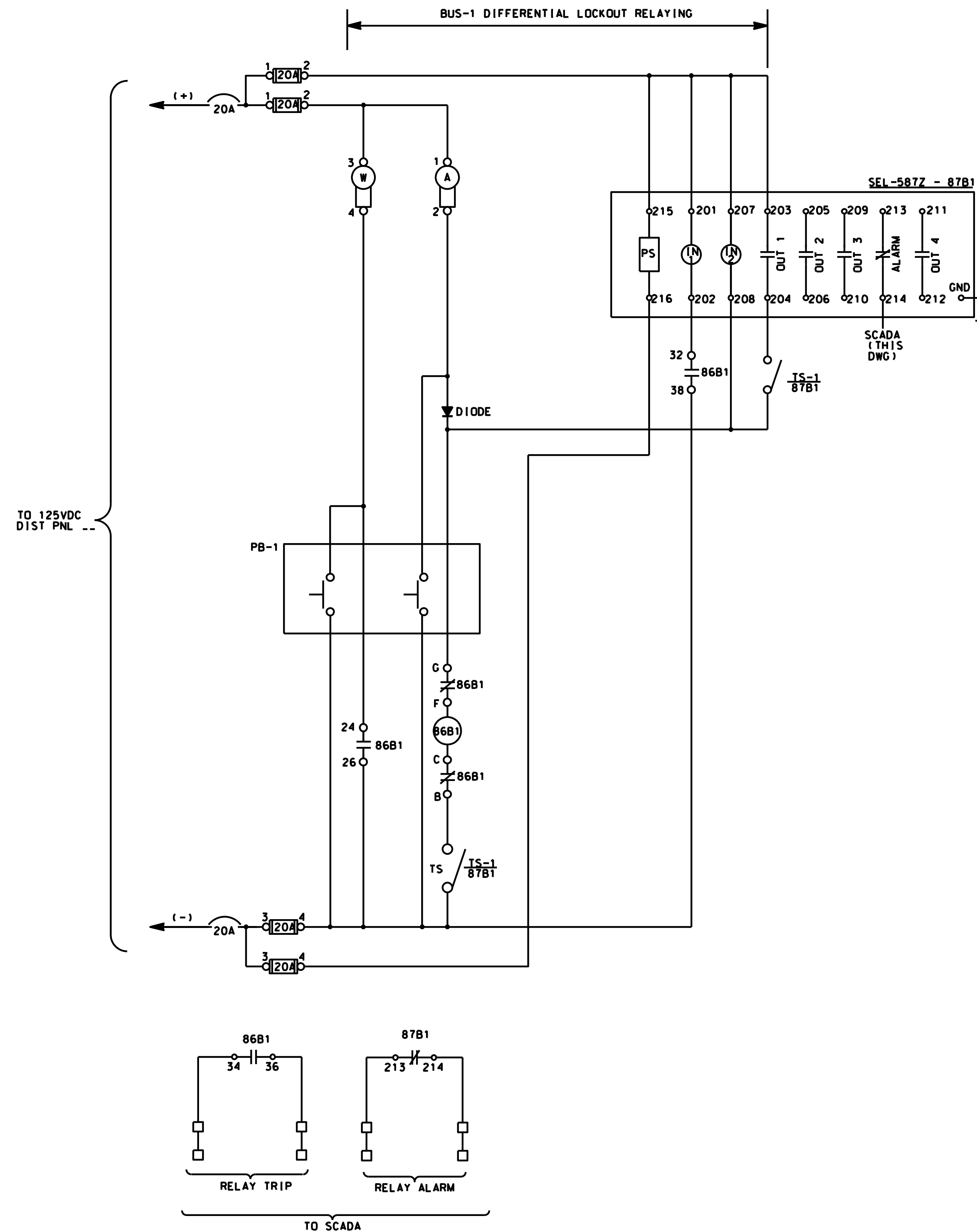
LOCATION NAME:  
95TH. STREET SUBSTATION

12.5KV AC SCHEMATIC DIAGRAM  
RECT. TRANSF. BKR. 52-T1 & 52-T2

CAD FILE NUMBER: SS-11.9-4107.DGN

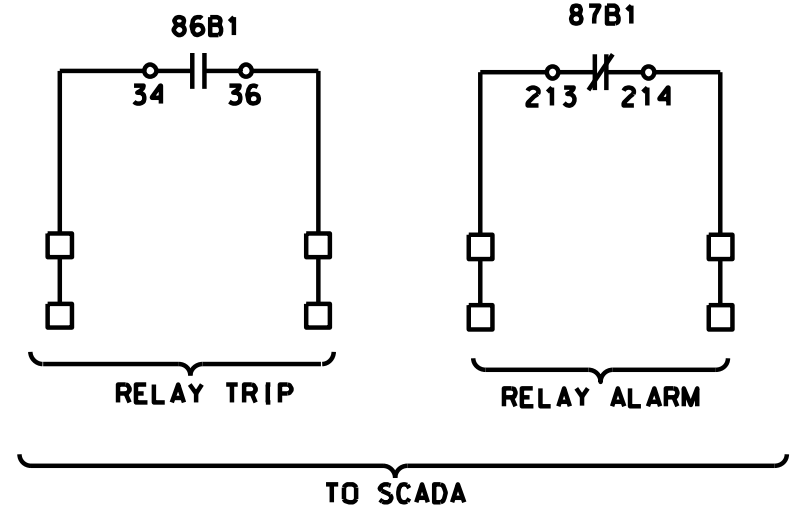
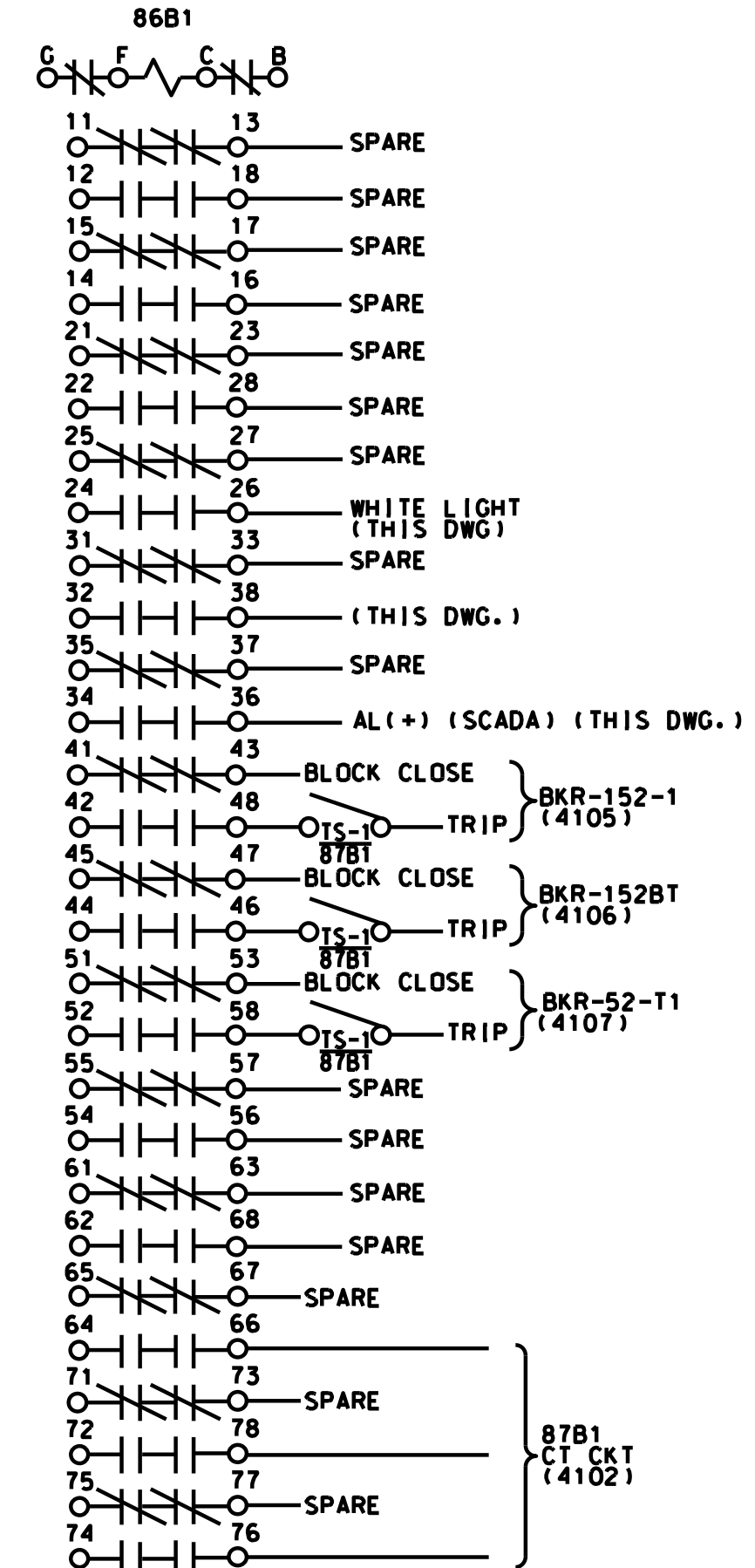
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|--------------------------------|---------------------------|
| SCALE:<br>NTS                  | DISTRICT:<br>MED          |
| PROJECT NO.<br>GW4254-57102002 | SHEET NO.<br>SS-11.9-4107 |
| MILE POST NO.<br>11.9          |                           |





LOCKOUT RELAY 86B1  
X - DENOTES CLOSED IN POSITION

| DECK | CONTACTS    | POSITION |
|------|-------------|----------|
|      |             | TRIP     |
| 1    | 110-111-013 | X        |
| 1    | 120-111-018 | X        |
| 1    | 150-111-017 | X        |
| 1    | 140-111-016 | X        |
| 2    | 210-111-023 | X        |
| 2    | 220-111-028 | X        |
| 2    | 250-111-027 | X        |
| 2    | 240-111-026 | X        |
| 3    | 310-111-033 | X        |
| 3    | 320-111-038 | X        |
| 3    | 350-111-037 | X        |
| 3    | 340-111-036 | X        |
| 4    | 410-111-043 | X        |
| 4    | 420-111-048 | X        |
| 4    | 450-111-047 | X        |
| 4    | 440-111-046 | X        |
| 5    | 510-111-053 | X        |
| 5    | 520-111-058 | X        |
| 5    | 550-111-057 | X        |
| 5    | 540-111-056 | X        |
| 6    | 610-111-063 | X        |
| 6    | 620-111-068 | X        |
| 6    | 650-111-067 | X        |
| 6    | 640-111-066 | X        |
| 7    | 710-111-073 | X        |
| 7    | 720-111-078 | X        |
| 7    | 750-111-077 | X        |
| 7    | 740-111-076 | X        |



**LEGEND:**  
 87B1 BUS-1 DIFFERENTIAL RELAY  
 86B1 BUS-1 LOCKOUT RELAY  
 TS-1 TEST SWITCH FOR BUS DIFFERENTIAL AND LOCKOUT RELAY FOR BUS-1  
 PB MOMENTARY TEST PUSHBUTTON

**NOTES:**  
 1. NUMBER IN PARENTHESIS REFERS TO A DRAWING NUMBER

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|-----|------------|----|-----|----------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |

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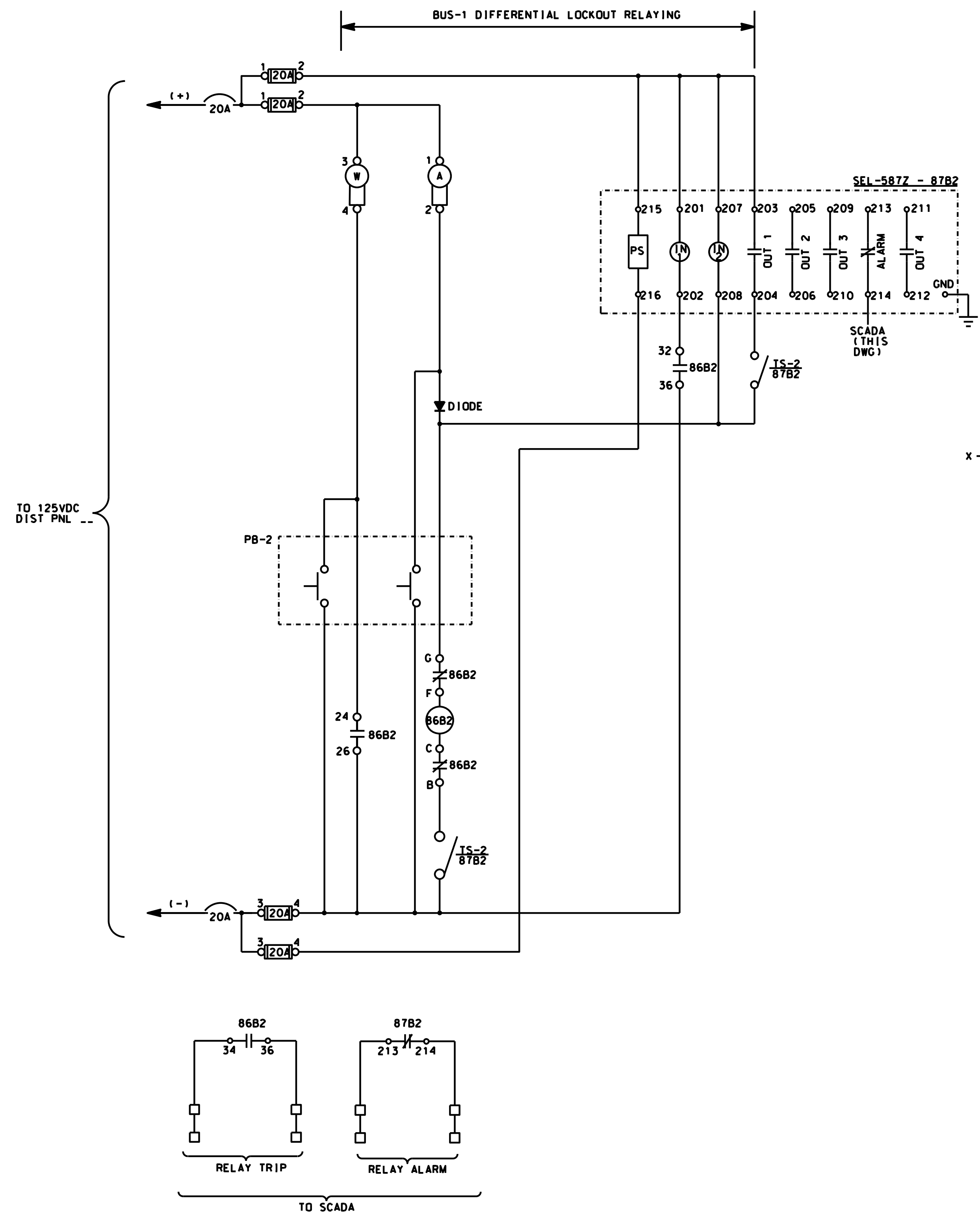
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DESIGNED: HS  
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 CHECKED: FM  
 METRA P.M.: R. CERANT  
 DATE: JUNE 12, 2017

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 ENGINEERING DEPARTMENT  
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 CHICAGO, ILLINOIS 60661

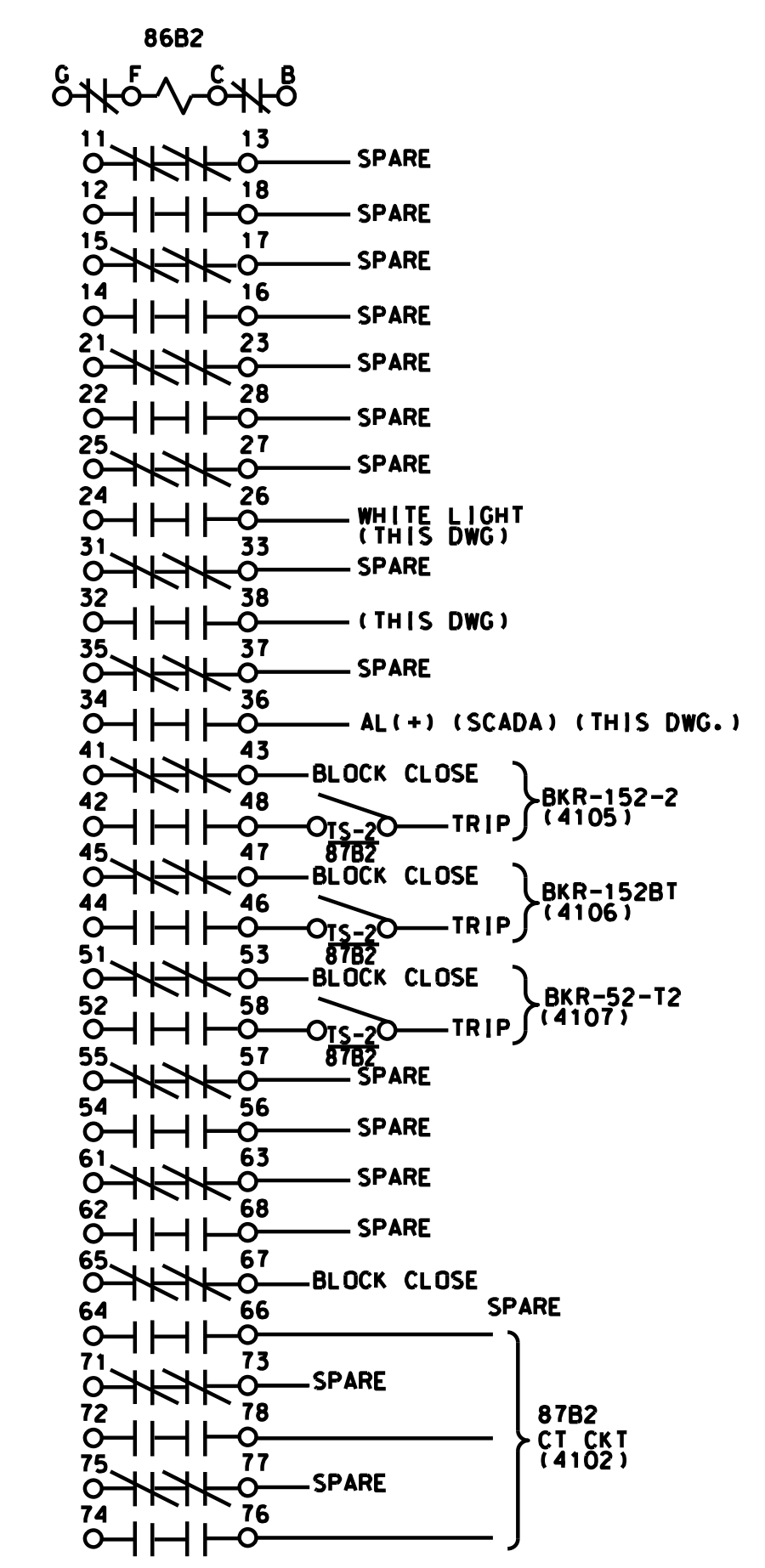
LOCATION NAME:  
**95TH. STREET SUBSTATION**  
 TITLE:  
**12.5KV AC SCHEMATIC DIAGRAM  
 BUS-1 DIFFERENTIAL LOCKOUT**

CAD FILE NUMBER: SS-11.9-4110.DGN  
 SCALE: NTS  
 PROJECT NO. GW4254-57102002  
 MILE POST NO. 11.9  
 DISTRICT: MED  
 SHEET NO. SS-11.9-4110



**LOCKOUT RELAY 86B2**  
X - DENOTES CLOSED IN POSITION

| DECK | CONTACTS     | POSITION |
|------|--------------|----------|
| 1    | 11 0-1-1-013 | X        |
|      | 12 0-1-1-018 | X        |
|      | 15 0-1-1-017 | X        |
|      | 14 0-1-1-016 | X        |
| 2    | 21 0-1-1-023 | X        |
|      | 22 0-1-1-028 | X        |
|      | 25 0-1-1-027 | X        |
|      | 24 0-1-1-026 | X        |
| 3    | 31 0-1-1-033 | X        |
|      | 32 0-1-1-038 | X        |
|      | 35 0-1-1-037 | X        |
|      | 34 0-1-1-036 | X        |
| 4    | 41 0-1-1-043 | X        |
|      | 42 0-1-1-048 | X        |
|      | 45 0-1-1-047 | X        |
|      | 44 0-1-1-046 | X        |
| 5    | 51 0-1-1-053 | X        |
|      | 52 0-1-1-058 | X        |
|      | 55 0-1-1-057 | X        |
|      | 54 0-1-1-056 | X        |
| 6    | 61 0-1-1-063 | X        |
|      | 62 0-1-1-068 | X        |
|      | 65 0-1-1-067 | X        |
|      | 64 0-1-1-066 | X        |
| 7    | 71 0-1-1-073 | X        |
|      | 72 0-1-1-078 | X        |
|      | 75 0-1-1-077 | X        |
|      | 74 0-1-1-076 | X        |



**LEGEND:**  
 87B2 BUS-2-DIFFERENTIAL RELAY  
 86B2 BUS-2-LOCKOUT RELAY  
 TS-2 TEST SWITCH FOR BUS DIFFERENTIAL AND LOCKOUT RELAY FOR BUS-2  
 PB MOMENTARY TEST PUSHBUTTON

**NOTES:**  
 1. NUMBER IN PARENTHESIS REFERS TO A DRAWING NUMBER

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|-----|------------|----|-----|----------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |
|     |            |    |     |                |
|     |            |    |     |                |
|     |            |    |     |                |

| REV | DATE | BY | APP | DESCRIPTION |
|-----|------|----|-----|-------------|
|     |      |    |     |             |
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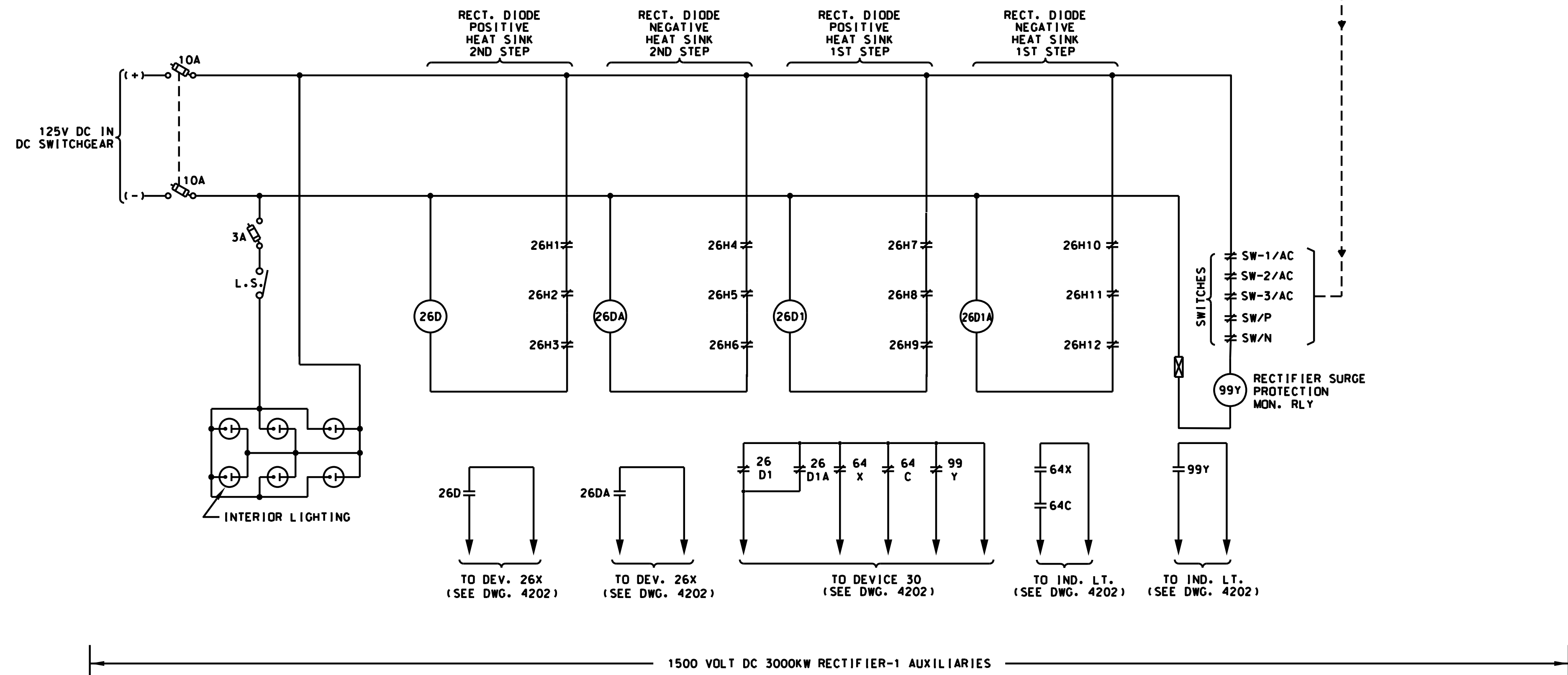
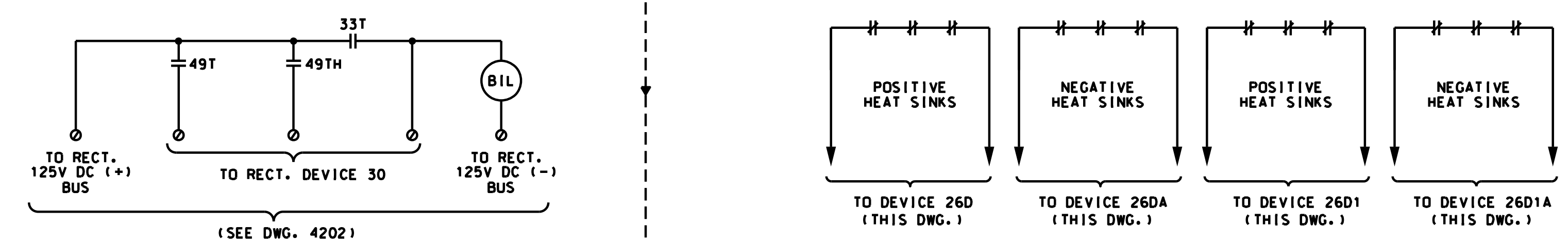
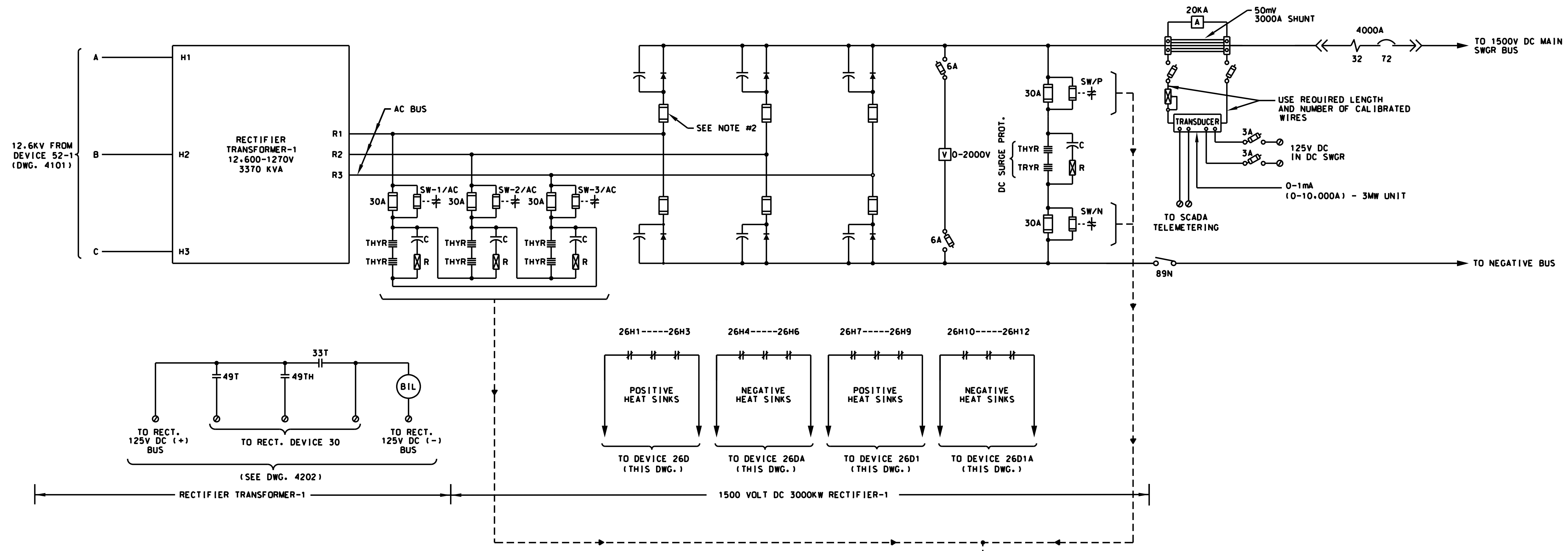
DESIGNED: HS  
 DRAWN: JC  
 CHECKED: FM  
 METRA P.M.: R. CERANT  
 DATE: JUNE 12, 2017



LOCATION NAME:  
**95TH. STREET SUBSTATION**  
 TITLE:  
**12.5KV AC SCHEMATIC DIAGRAM  
 BUS-2 DIFFERENTIAL LOCKOUT**

|                                   |                                  |
|-----------------------------------|----------------------------------|
| CAD FILE NUMBER: SS-11.9-4111.DGN |                                  |
| SCALE:<br>NTS                     | DISTRICT:<br>MED                 |
| PROJECT NO.<br>GW4254-57102002    | SHEET NO.<br><b>SS-11.9-4111</b> |
| MILE POST NO.<br>11.9             |                                  |





**NOTES:**

1. DIODE THERMAL DEVICES CONNECTED TOGETHER MUST BE ON HEAT SINKS OF THE SAME POLARITY UNDER ALL CONDITIONS.
2. PROVIDE TRIGGER TARGET TYPE DIODE FUSES.
3. CONTACT WILL CLOSE IN NORMAL CONDITION & WILL OPEN IN FAULT CONDITION.

**SYMBOLS:**

- ◯ TERMINAL BLOCK

PRINTED ON: SDATES

| REV | DATE       | BY | APP | DESCRIPTION    | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|----|-----|----------------|-----|------|----|-----|-------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |     |      |    |     |             |

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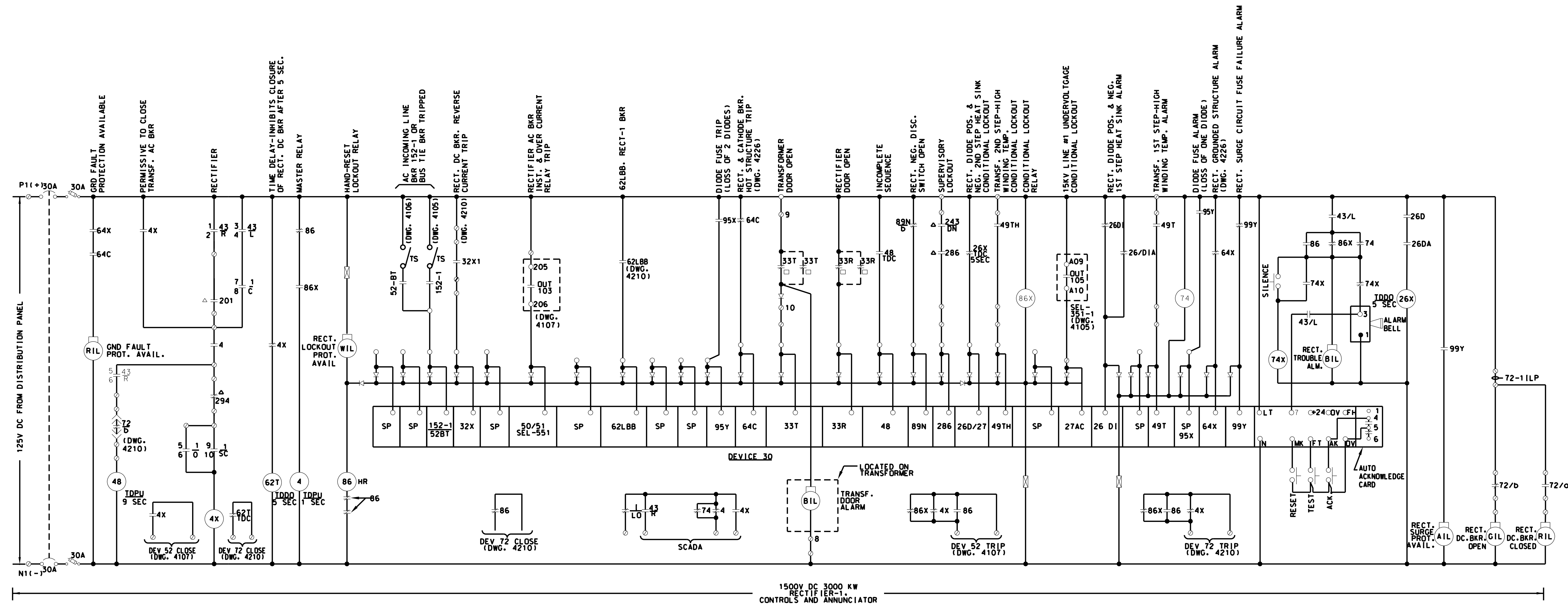
DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

**Metra**  
ENGINEERING DEPARTMENT  
547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

LOCATION NAME:  
**95TH. STREET SUBSTATION**

TITLE:  
**1500V DC SCHEMATIC DIAGRAM  
RECTIFIER-1 POWER & AUXILIARIES**

|                                   |                                  |
|-----------------------------------|----------------------------------|
| CAD FILE NUMBER: SS-11.9-4201.DGN |                                  |
| SCALE:<br>NTS                     | DISTRICT:<br>MED                 |
| PROJECT NO.<br>GW4254-57102002    | SHEET NO.<br><b>SS-11.9-4201</b> |
| MILE POST NO.<br>11.9             |                                  |



**SYMBOLS:**

- △ LOCATED IN SCADA RTU CABINET
- CLOSED ONLY WITH BREAKER IN CONNECTED POS.
- ▲ OPEN ONLY WITH BREAKER IN CONNECTED POS.
- ◊ TERMINAL BLOCK
- RTU-INDICATES SCADA REMOTE TERMINAL UNIT.

**MASTER CONTROL SWITCH  
DEVICE-1**

| CONTACTS | POSITION |      |                |       |
|----------|----------|------|----------------|-------|
|          | PULL OUT | TRIP | OFF AFTER TRIP | CLOSE |
| 1-2      | LO       | X    | X              | X     |
| 3-4      | T        | X    |                |       |
| 5-6      | O        |      | X              | X     |
| 7-8      | C        |      |                | X     |
| 9-10     | SC       |      | X              | X     |

SPRING RETURN TO "OFF"

**SELECTOR SWITCH  
DEVICE-43**

| CONTACTS | POSITION |       |
|----------|----------|-------|
|          | REMOTE   | LOCAL |
| 1-2      | R        | X     |
| 3-4      | L        | X     |
| 5-6      | R        | X     |
| 7-8      | L        | X     |
| 9-10     | R        | X     |
| 11-12    | L        | X     |

NON-SPRING RETURN.  
REMOTE POSITION AT 12 O' CLOCK.  
LOCAL POSITION CLOCKWISE WHEN FACING FRONT OF SWITCH.

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|-----|------------|----|-----|----------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |

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DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

**Metra**

ENGINEERING DEPARTMENT  
547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

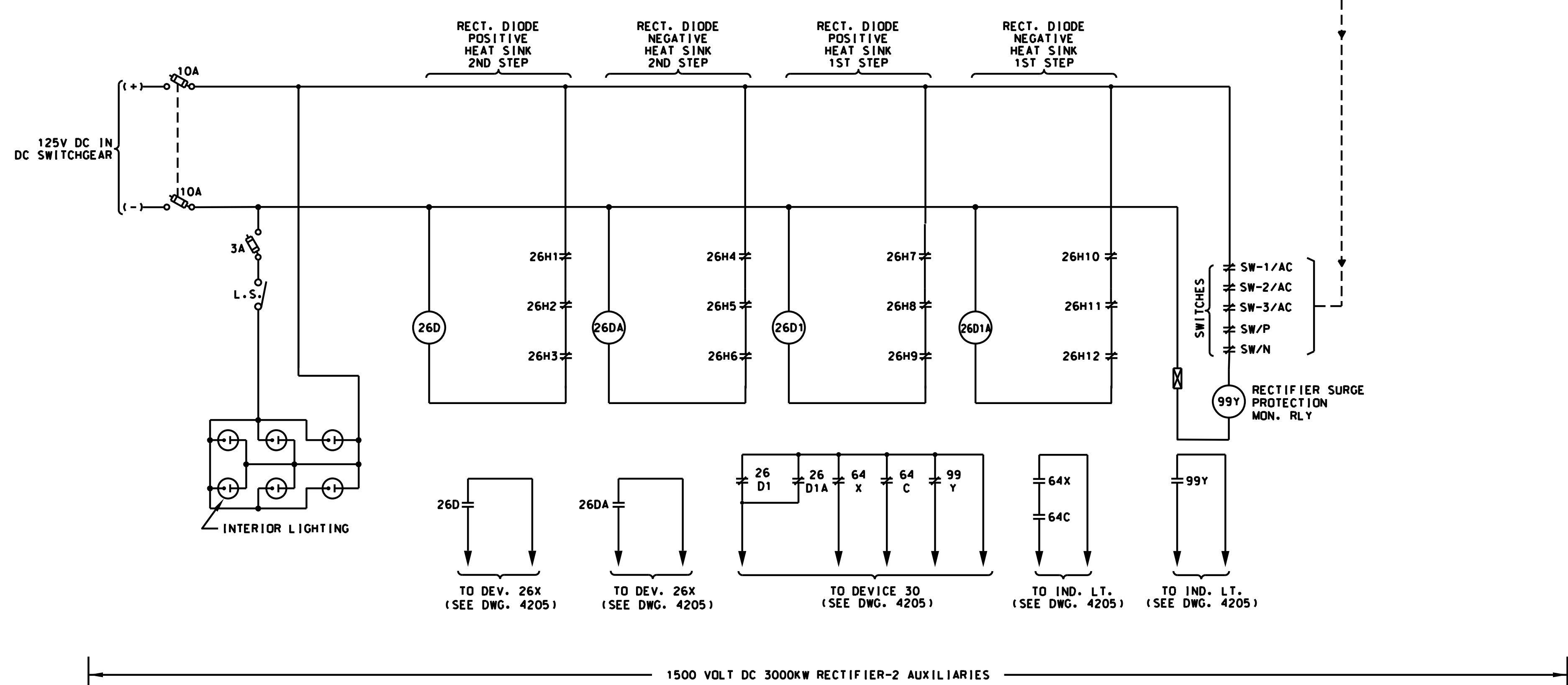
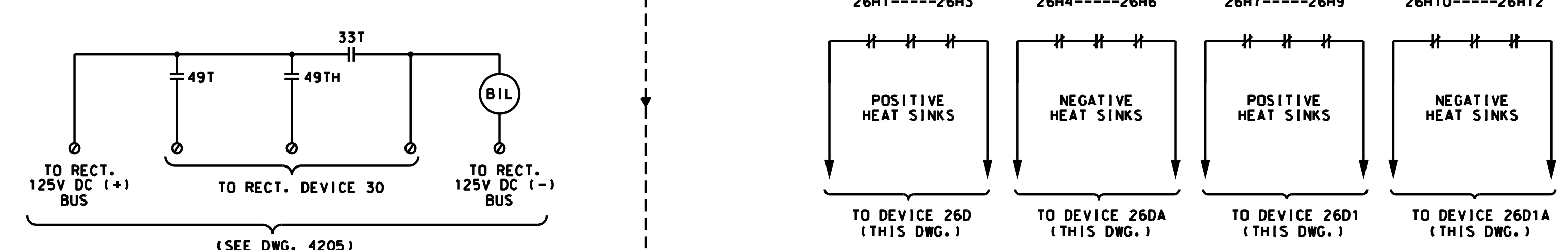
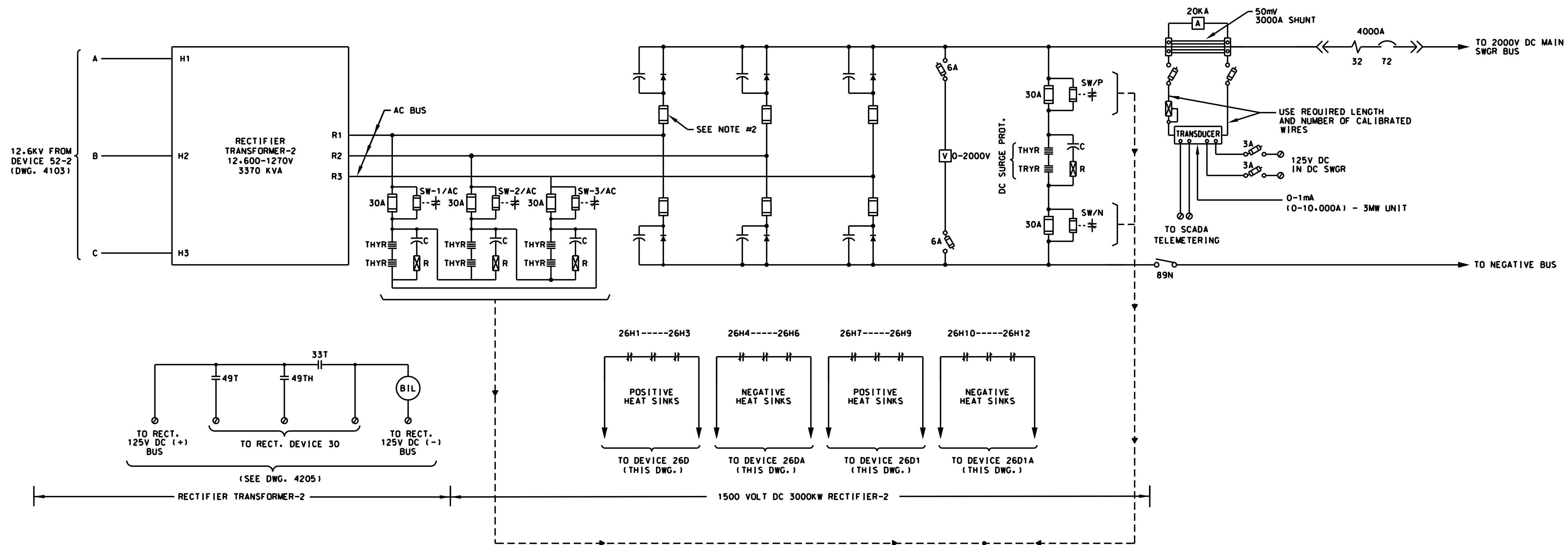
LOCATION NAME:  
**95TH. STREET SUBSTATION**

TITLE:  
**1500V DC SCHEMATIC DIAGRAM  
RECTIFIER-1 CONTROLS & ANNUNCIATOR**

CAD FILE NUMBER: SS-11.9-4202.DGN

SCALE: NTS  
PROJECT NO. GW4254-57102002  
MILE POST NO. 11.9

DISTRICT: MED  
SHEET NO. **SS-11.9-4202**



**NOTES:**

1. DIODE THERMAL DEVICES CONNECTED TOGETHER MUST BE ON HEAT SINKS OF THE SAME POLARITY UNDER ALL CONDITIONS.
2. PROVIDE TRIGGER TARGET TYPE DIODE FUSES.
3. CONTACT WILL CLOSE IN NORMAL CONDITION & WILL OPEN IN FAULT CONDITION.

**SYMBOLS:**

- ⊙ TERMINAL BLOCK

PRINTED ON: SDATES

| REV | DATE       | BY | APP | DESCRIPTION    |
|-----|------------|----|-----|----------------|
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|     |            |    |     |                |
|     |            |    |     |                |
|     |            |    |     |                |

| REV | DATE | BY | APP | DESCRIPTION |
|-----|------|----|-----|-------------|
|     |      |    |     |             |
|     |      |    |     |             |
|     |      |    |     |             |

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Consulting Engineers  
20 N. Wacker Dr. Ste. 1500 Chicago IL 60606

DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

**Metra**

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547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

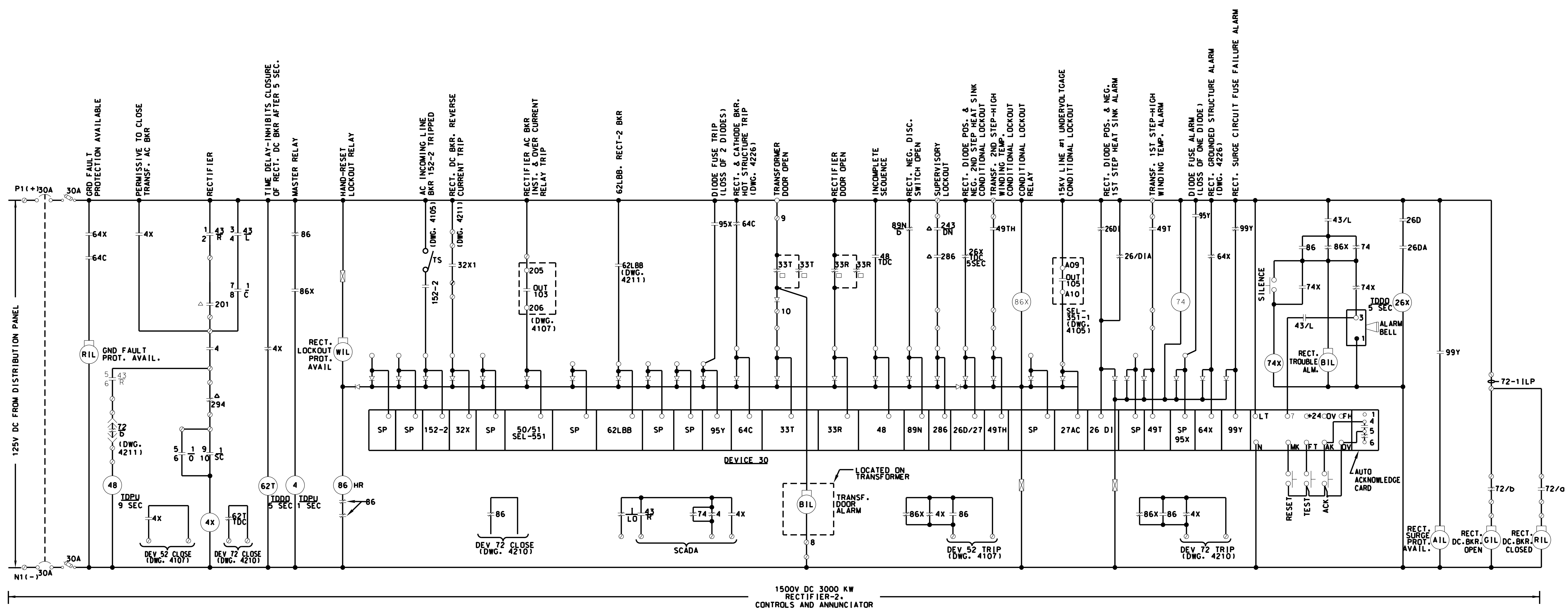
LOCATION NAME:  
**95TH. STREET SUBSTATION**

TITLE:  
**1500V DC SCHEMATIC DIAGRAM  
RECTIFIER-2 POWER & AUXILIARIES**

CAD FILE NUMBER: SS-11.9-4204.DGN

|                                |                                  |
|--------------------------------|----------------------------------|
| SCALE:<br>NTS                  | DISTRICT:<br>MED                 |
| PROJECT NO.<br>GW4254-57102002 | SHEET NO.<br><b>SS-11.9-4204</b> |
| MILE POST NO.<br>11.9          |                                  |





**SYMBOLS:**

- △ LOCATED IN SCADA RTU CABINET
- CLOSED ONLY WITH BREAKER IN CONNECTED POS.
- ▲ OPEN ONLY WITH BREAKER IN CONNECTED POS.
- ⊙ TERMINAL BLOCK
- RTU-INDICATES SCADA REMOTE TERMINAL UNIT.

**MASTER CONTROL SWITCH  
DEVICE-1**

| CONTACTS | POSITION |      |                |       |
|----------|----------|------|----------------|-------|
|          | PULL OUT | TRIP | OFF AFTER TRIP | CLOSE |
| 1-2 LO   | X        | X    | X              | X     |
| 3-4 T    | X        |      |                |       |
| 5-6 O    |          | X    | X              |       |
| 7-8 C    |          |      |                | X     |
| 9-10 SC  |          |      | X              | X     |

SPRING RETURN TO "OFF"

**SELECTOR SWITCH  
DEVICE-43**

| CONTACTS | POSITION |       |
|----------|----------|-------|
|          | REMOTE   | LOCAL |
| 1-2      | R        | X     |
| 3-4      | L        | X     |
| 5-6      | R        | X     |
| 7-8      | L        | X     |
| 9-10     | R        | X     |
| 11-12    | L        | X     |

NON-SPRING RETURN:  
REMOTE POSITION AT 12 O' CLOCK.  
LOCAL POSITION CLOCKWISE WHEN FACING FRONT OF SWITCH.

PRINTED ON: SDATES

| REV | DATE       | BY | APP | DESCRIPTION    | REV | DATE | BY | APP | DESCRIPTION |
|-----|------------|----|-----|----------------|-----|------|----|-----|-------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |     |      |    |     |             |

CONSULTANT SEAL & SIGNATURE



CONSULTANT



DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017



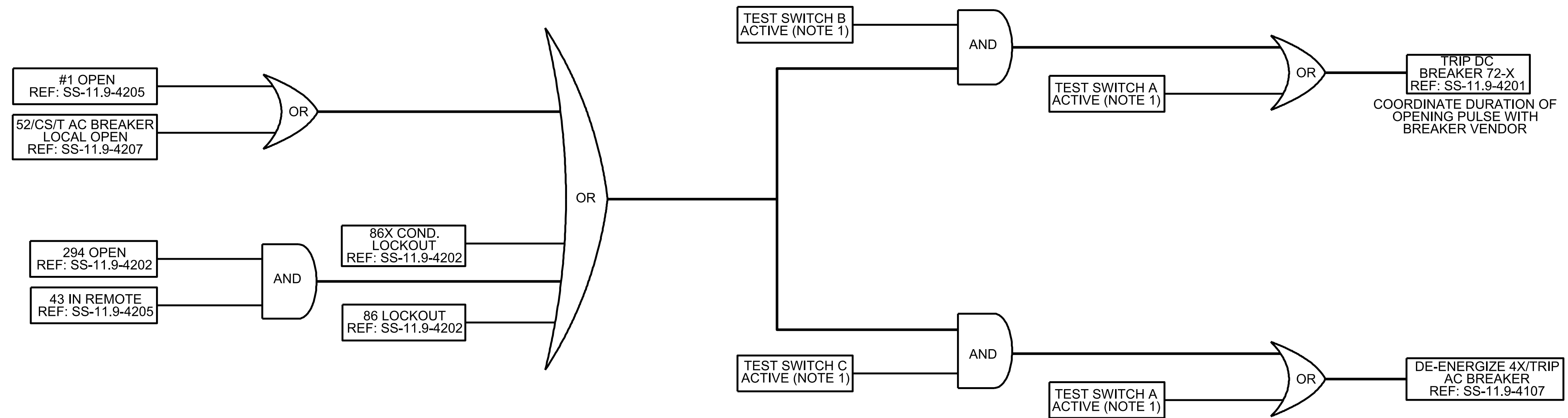
LOCATION NAME:  
95TH. STREET SUBSTATION

TITLE:  
**1500V DC SCHEMATIC DIAGRAM  
RECTIFIER-2 CONTROLS & ANNUNCIATOR**

CAD FILE NUMBER: SS-11.9-4205.DGN

|                                |                                  |
|--------------------------------|----------------------------------|
| SCALE:<br>NTS                  | DISTRICT:<br>MED                 |
| PROJECT NO.<br>GW4254-57102002 | SHEET NO.<br><b>SS-11.9-4205</b> |
| MILE POST NO.<br>11.9          |                                  |

AC BREAKER/CATHODE TRIP



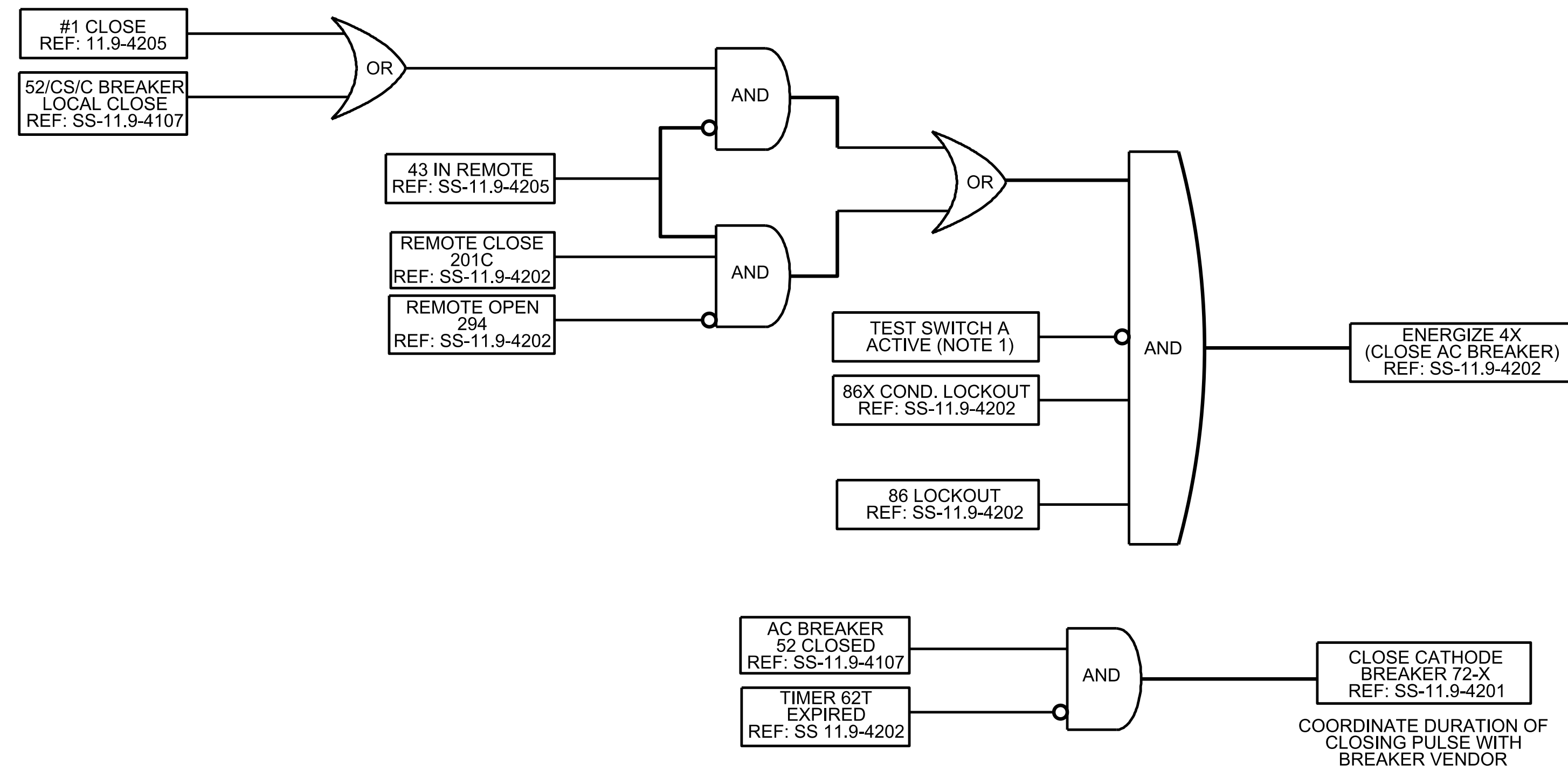
NOTES:

- TEST SWITCHES SHOWN IN THE LOGIC DIAGRAM SHALL BE SOFT KEYS PROGRAMMED ON THE HMI USED FOR THE ANNUNCIATOR. THE FOLLOWING KEYS SHALL BE AVAILABLE:
  - A TRIP AND BLOCK 52R AND 172R
  - B ENABLE TRIP TO 172R
  - C ENABLE TRIP TO 52R
  - D RESET 48 INCOMPLETE SEQUENCE
  - E ENABLE 48 INCOMPLETE SEQUENCE
  - F ENABLE 86 LOCKOUT
- ALL LOGIC DIAGRAMS ARE FOR INFORMATION ONLY. THE SUPPLIER SHALL ENSURE THAT THE PLC CODE MATCHES ALL CONTRACTUAL REQUIREMENTS BASED ON THE EQUIPMENT PROVIDED

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|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  |                          |  |  |  |                                       |  |  |  |                             |  |  |  |            |  |  |  |
|---|-----------|----|----|----------------|--|--|--|------------------------------------|------|----|-----|--------------------|--|--|--|--------------------------|--|--|--|---------------------------------------|--|--|--|-----------------------------|--|--|--|------------|--|--|--|
|   |           |    |    | SUB CONSULTANT |  |  |  | PRIMARY CONSULTANT SEAL/ SIGNATURE |      |    |     | PRIMARY CONSULTANT |  |  |  | DESIGNED: A. ACHHAMMER   |  |  |  | LOCATION NAME: 95TH STREET SUBSTATION |  |  |  | CAD FILE NUMBER: \$FILES\$  |  |  |  |            |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  | DRAWN: N. DIAZ           |  |  |  |                                       |  |  |  | TITLE:                      |  |  |  | SCALE: NTS |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  | ENGINEERING DEPARTMENT   |  |  |  | RECTIFIER PLC LOGIC DIAGRAM           |  |  |  | PROJECT NO. GW4254-57102002 |  |  |  |            |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  | 547 W. JACKSON BOULEVARD |  |  |  | AC BREAKER/CATHODE TRIP               |  |  |  | MILE POST NO. 11.9          |  |  |  |            |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  | CHICAGO, ILLINOIS 60661  |  |  |  | SHEET 1 OF 4                          |  |  |  | SS-11.9-4206                |  |  |  |            |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  | DATE: JUNE 12, 2017      |  |  |  |                                       |  |  |  |                             |  |  |  |            |  |  |  |
| 0 | 7/28/2017 | AA | ER | ISSUED FOR BID |  |  |  | REV                                | DATE | BY | APP | DESCRIPTION        |  |  |  |                          |  |  |  |                                       |  |  |  |                             |  |  |  |            |  |  |  |

AC BREAKER/CATHODE CLOSE



NOTES:

- TEST SWITCHES SHOWN IN THE LOGIC DIAGRAM SHALL BE SOFT KEYS PROGRAMMED ON THE HMI USED FOR THE ANNUNCIATOR. THE FOLLOWING KEYS SHALL BE AVAILABLE:
  - A TRIP AND BLOCK 52R AND 172R
  - B ENABLE TRIP TO 172R
  - C ENABLE TRIP TO 52R
  - D RESET 48 INCOMPLETE SEQUENCE
  - E ENABLE 48 INCOMPLETE SEQUENCE
  - F ENABLE 86 LOCKOUT
- ALL LOGIC DIAGRAMS ARE FOR INFORMATION ONLY. THE SUPPLIER SHALL ENSURE THAT THE PLC CODE MATCHES ALL CONTRACTUAL REQUIREMENTS BASED ON THE EQUIPMENT PROVIDED.

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|   |           |    |    |                |  |  |  |                                       |      |    |     |                    |  |  |  |                        |  |  |  |   |  |  |  |                               |  |  |  |                       |  |  |  |
|---|-----------|----|----|----------------|--|--|--|---------------------------------------|------|----|-----|--------------------|--|--|--|------------------------|--|--|--|---|--|--|--|-------------------------------|--|--|--|-----------------------|--|--|--|
|   |           |    |    | SUB CONSULTANT |  |  |  | PRIMARY CONSULTANT<br>SEAL/ SIGNATURE |      |    |     | PRIMARY CONSULTANT |  |  |  | DESIGNED: A. ACHHAMMER |  |  |  | LOCATION NAME:<br>95TH STREET SUBSTATION  |  |  |  | CAD FILE NUMBER:<br>\$FILES\$ |  |  |  |                       |  |  |  |
|   |           |    |    |                |  |  |  |                                       |      |    |     |                    |  |  |  |                        |  |  |  | TITLE:<br><br><b>RECTIFIER PLC LOGIC DIAGRAMS<br/>AC BREAKER/CATHODE CLOSE<br/>SHEET 2 OF 4</b> |  |  |  | SCALE:<br>NTS                 |  |  |  | DISTRICT:<br>MED      |  |  |  |
|   |           |    |    |                |  |  |  |                                       |      |    |     |                    |  |  |  |                        |  |  |  |   |  |  |  |                               |  |  |  |                       |  |  |  |
|   |           |    |    |                |  |  |  |                                       |      |    |     |                    |  |  |  |                        |  |  |  |   |  |  |  |                               |  |  |  | MILE POST NO.<br>11.9 |  |  |  |
| 0 | 7/28/2017 | AA | ER | ISSUED FOR BID |  |  |  | REV                                   | DATE | BY | APP | DESCRIPTION        |  |  |  |                        |  |  |  |   |  |  |  |                               |  |  |  |                       |  |  |  |

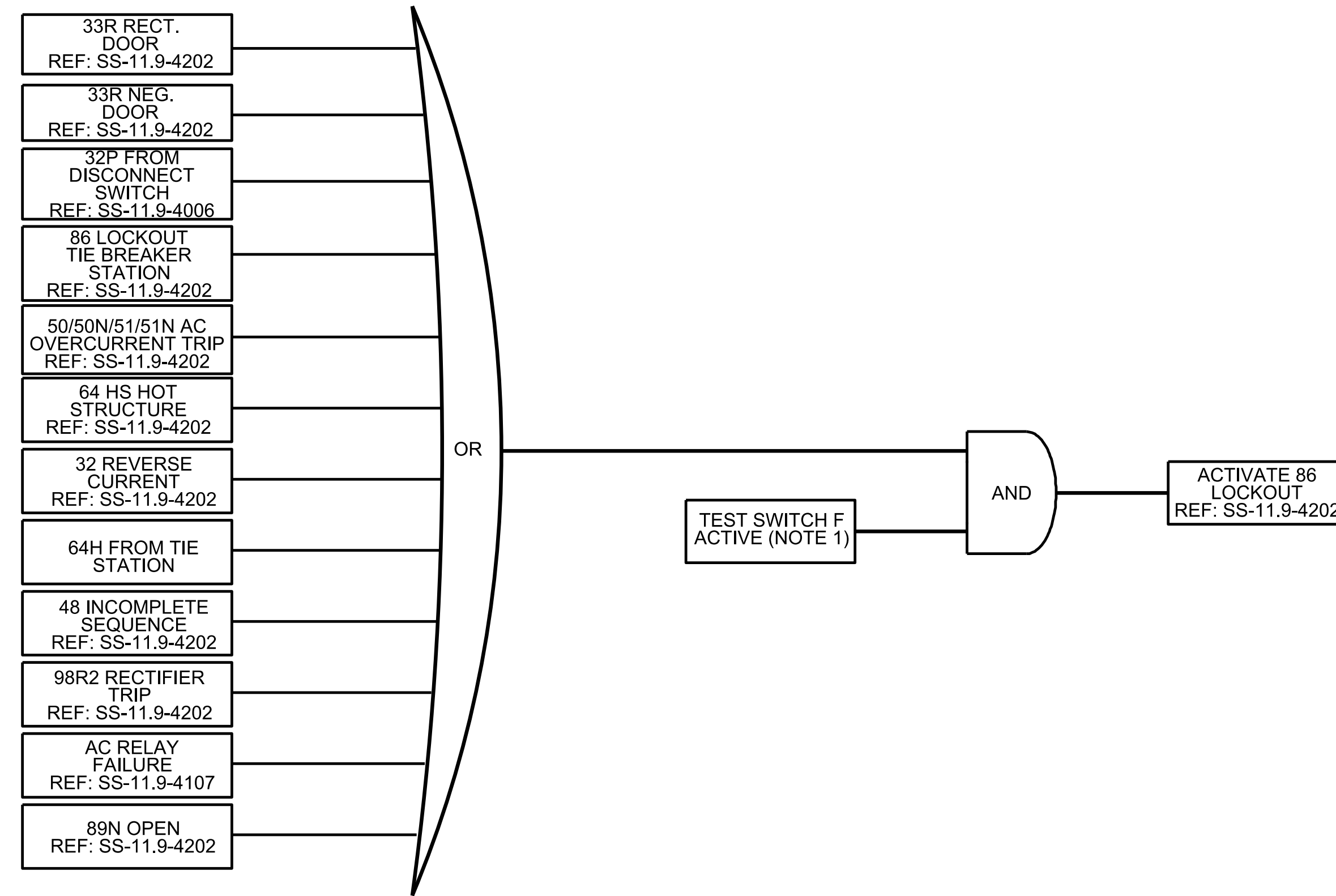
DRAWN: N. DIAZ  
CHECKED: E. ROWE  
METRA P.M. R. CERANT  
DATE: JUNE 12, 2017

ENGINEERING DEPARTMENT  
547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

ENGINEERING DEPARTMENT  
547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661



LOCKOUT LOGIC



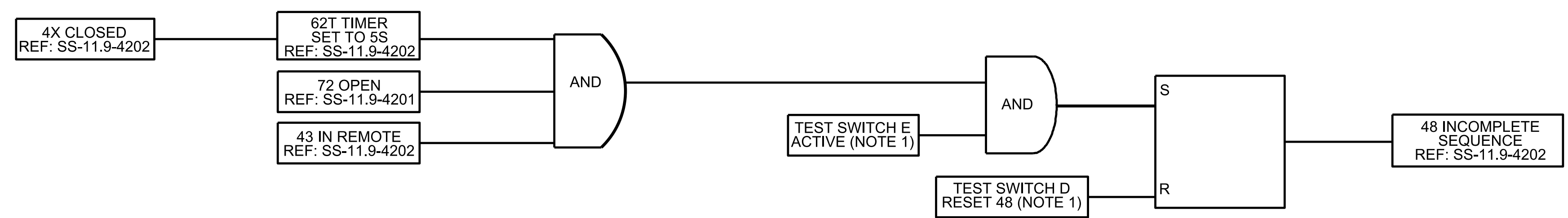
NOTES:

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  - E ENABLE 48 INCOMPLETE SEQUENCE
  - F ENABLE 86 LOCKOUT
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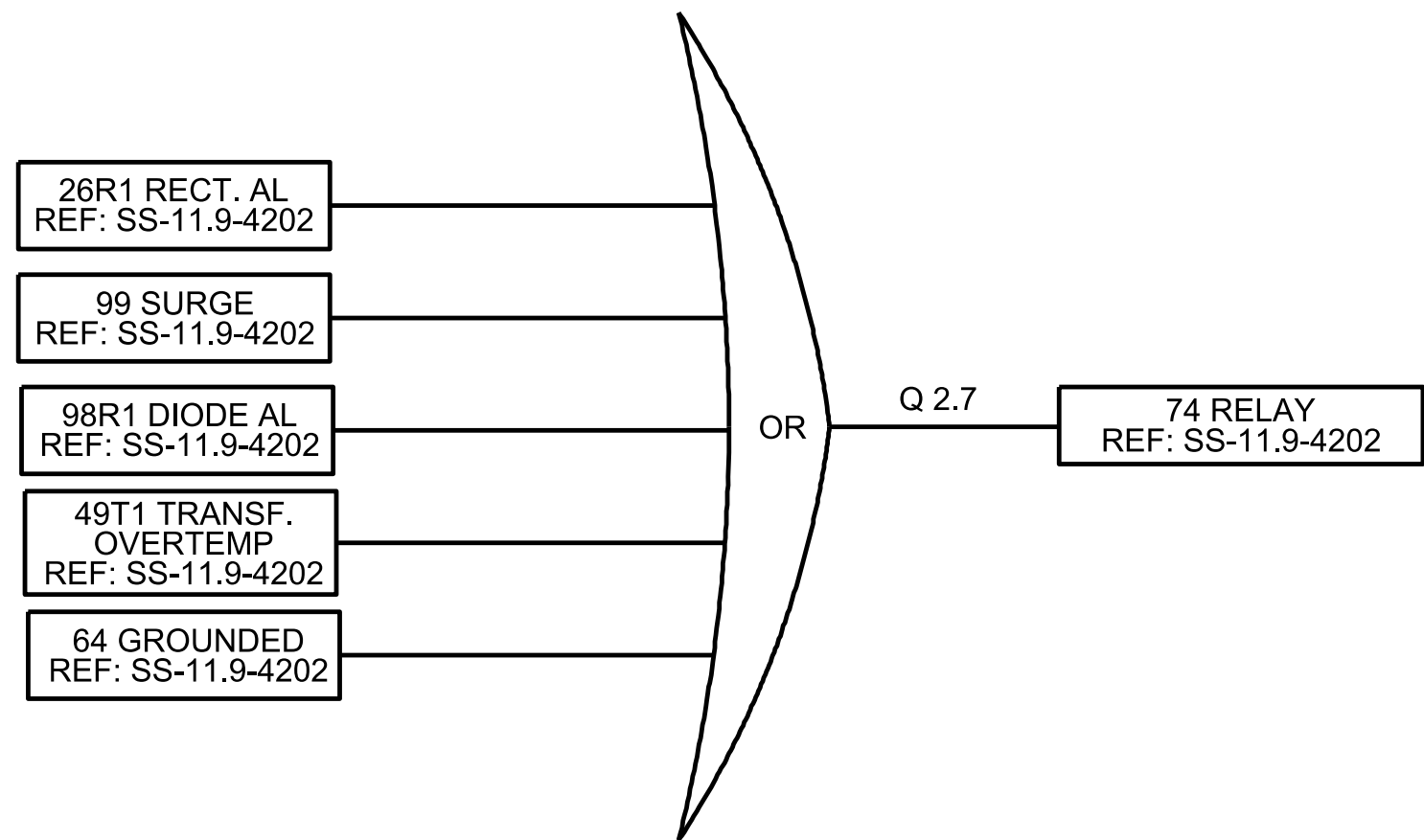
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|----------------------------------|------|----|-----|----------------|-----|------|----|------------------------------------|-------------|--|--|--------------------|--|--|--|------------------------|--|--|--|--|--|--|--|----------------------------|--|--|--|-----------------------------|--|--|--|
|                                  |      |    |     | SUB CONSULTANT |     |      |    | PRIMARY CONSULTANT SEAL/ SIGNATURE |             |  |  | PRIMARY CONSULTANT |  |  |  | DESIGNED: A. ACHHAMMER |  |  |  | LOCATION NAME: 95TH STREET SUBSTATION                                  |  |  |  | CAD FILE NUMBER: \$FILES\$ |  |  |  |                             |  |  |  |
|                                  |      |    |     |                |     |      |    |                                    |             |  |  |                    |  |  |  |                        |  |  |  | TITLE: RECTIFIER PLC LOGIC DIAGRAM<br>86 LOCKOUT LOGIC<br>SHEET 3 OF 4 |  |  |  | SCALE: NTS                 |  |  |  | DISTRICT: MED               |  |  |  |
|                                  |      |    |     |                |     |      |    |                                    |             |  |  |                    |  |  |  |                        |  |  |  |  |  |  |  |                            |  |  |  | PROJECT NO. GW4254-57102002 |  |  |  |
| 0 7/28/2017 AA ER ISSUED FOR BID |      |    |     |                |     |      |    |                                    |             |  |  |                    |  |  |  |                        |  |  |  |  |  |  |  | MILE POST NO. 11.9         |  |  |  |                             |  |  |  |
| REV                              | DATE | BY | APP | DESCRIPTION    | REV | DATE | BY | APP                                | DESCRIPTION |  |  |                    |  |  |  |                        |  |  |  |  |  |  |  |                            |  |  |  |                             |  |  |  |

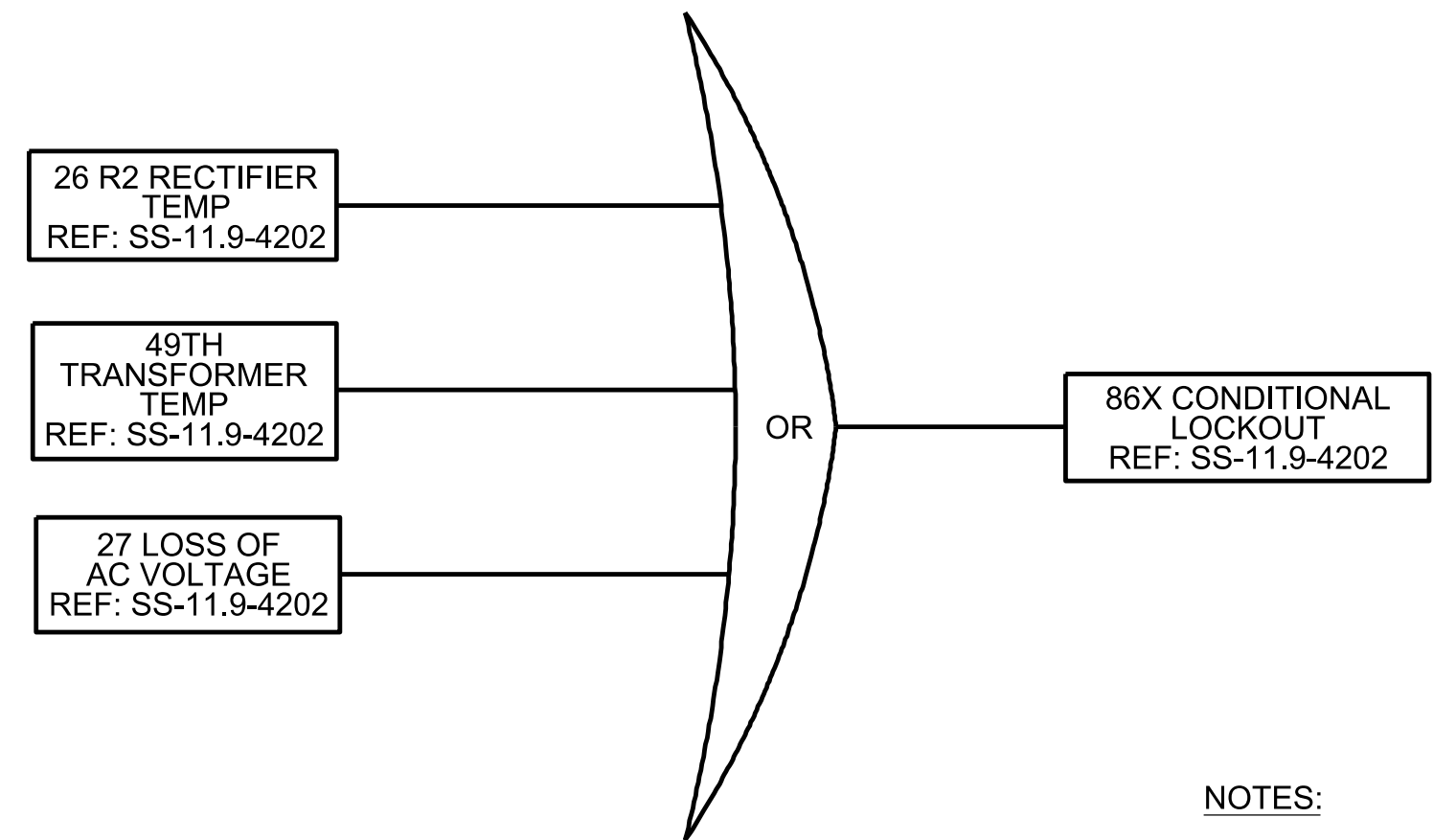
INCOMPLETE SEQUENCE



74 RELAY TROUBLE



CONDITIONAL LOCKOUT

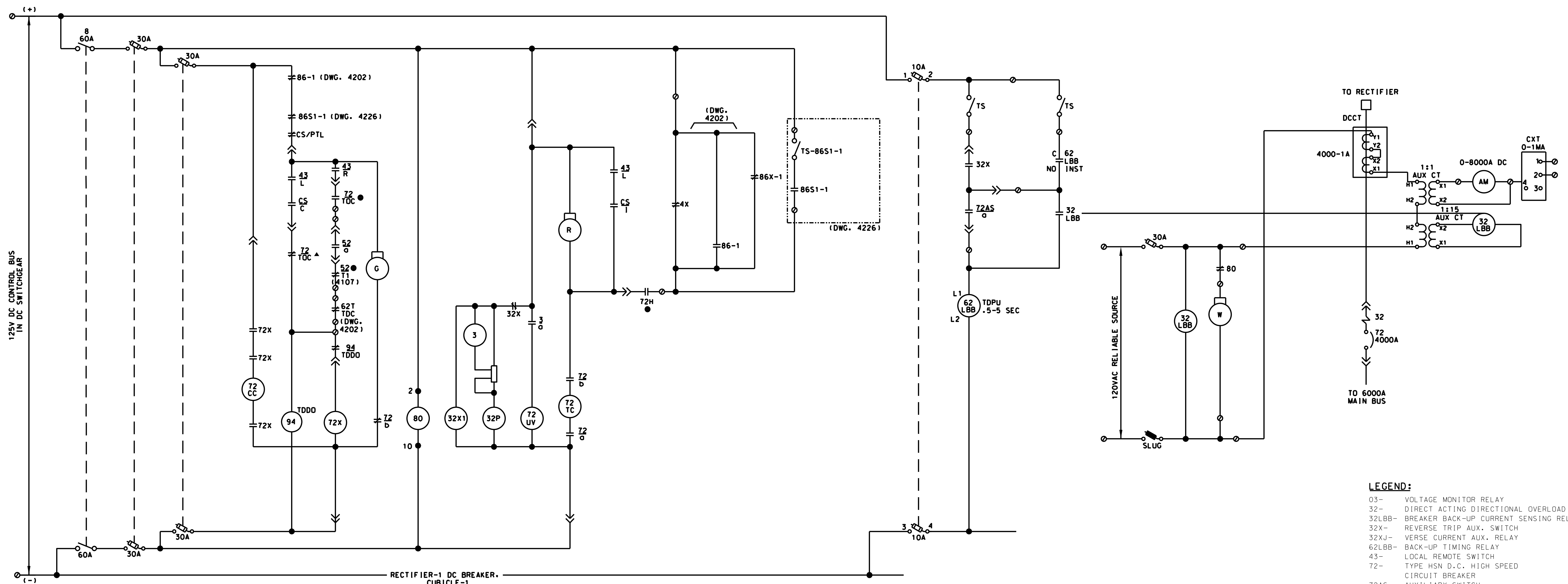


NOTES:

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|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  |                          |  |  |  |                                       |  |  |  |                           |  |  |  |               |  |  |  |
|---|-----------|----|----|----------------|--|--|--|------------------------------------|------|----|-----|--------------------|--|--|--|--------------------------|--|--|--|---------------------------------------|--|--|--|---------------------------|--|--|--|---------------|--|--|--|
|   |           |    |    | SUB CONSULTANT |  |  |  | PRIMARY CONSULTANT SEAL/ SIGNATURE |      |    |     | PRIMARY CONSULTANT |  |  |  | DESIGNED: A. ACHHAMMER   |  |  |  | LOCATION NAME: 95TH STREET SUBSTATION |  |  |  | CAD FILE NUMBER: \$FILESS |  |  |  |               |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  | DRAWN: N. DIAZ           |  |  |  |                                       |  |  |  | TITLE:                    |  |  |  | SCALE: NTS    |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  |                          |  |  |  |                                       |  |  |  | CHECKED: E. ROWE          |  |  |  | DISTRICT: MED |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  | ENGINEERING DEPARTMENT   |  |  |  | PROJECT NO. GW4254-57102002           |  |  |  | SHEET NO. SS-11.9-4209    |  |  |  |               |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  | 547 W. JACKSON BOULEVARD |  |  |  | MILE POST NO. 11.9                    |  |  |  |                           |  |  |  |               |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  | CHICAGO, ILLINOIS 60661  |  |  |  |                                       |  |  |  |                           |  |  |  |               |  |  |  |
|   |           |    |    |                |  |  |  |                                    |      |    |     |                    |  |  |  | DATE: JUNE 12, 2017      |  |  |  |                                       |  |  |  |                           |  |  |  |               |  |  |  |
| 0 | 7/28/2017 | AA | ER | ISSUED FOR BID |  |  |  | REV                                | DATE | BY | APP | DESCRIPTION        |  |  |  |                          |  |  |  |                                       |  |  |  |                           |  |  |  |               |  |  |  |



- LEGEND:**
- 03- VOLTAGE MONITOR RELAY
  - 32- DIRECT ACTING DIRECTIONAL OVERLOAD
  - 32LBB- BREAKER BACK-UP CURRENT SENSING RELAY
  - 32X- REVERSE TRIP AUX. SWITCH
  - 32XJ- VERSE CURRENT AUX. RELAY
  - 62LBB- BACK-UP TIMING RELAY
  - 43- LOCAL REMOTE SWITCH
  - 72- TYPE HSN D.C. HIGH SPEED CIRCUIT BREAKER
  - 72AS- AUXILIARY SWITCH
  - 72CC- CLOSING SOLENOID
  - CS- CONTROL SWITCH
  - 72TC- SHUNT TRIP
  - 72UV- UNDER VOLTAGE COIL
  - 72X- CLOSING CONTACTOR
  - 76- DIRECT ACTING OVERLOAD
  - INST- INSTANTANEOUS
  - T00- TIME DELAY OPEN
  - A- AMBER INDICATING LIGHT
  - G- GREEN INDICATING LIGHT
  - R- RED INDICATING LIGHT

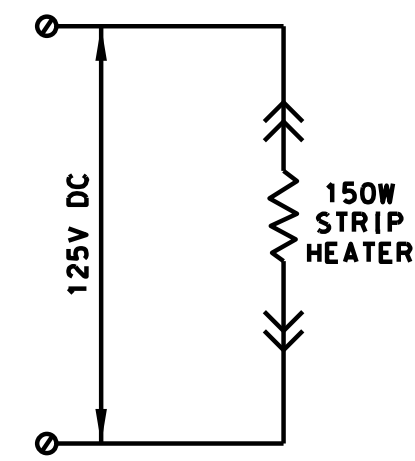
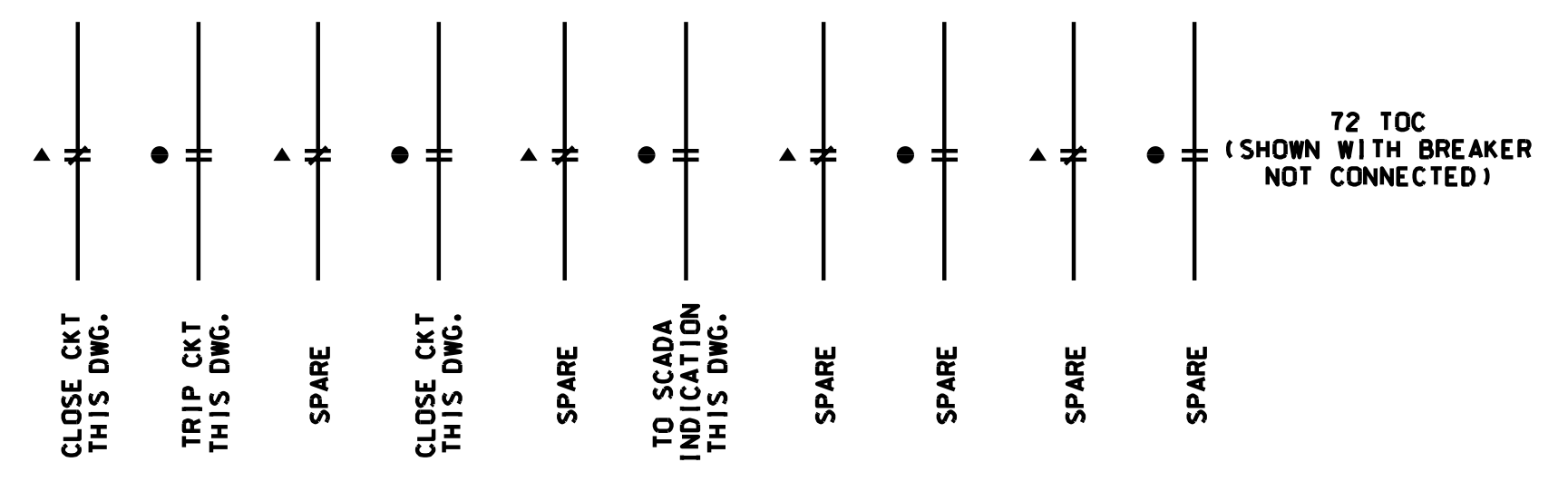
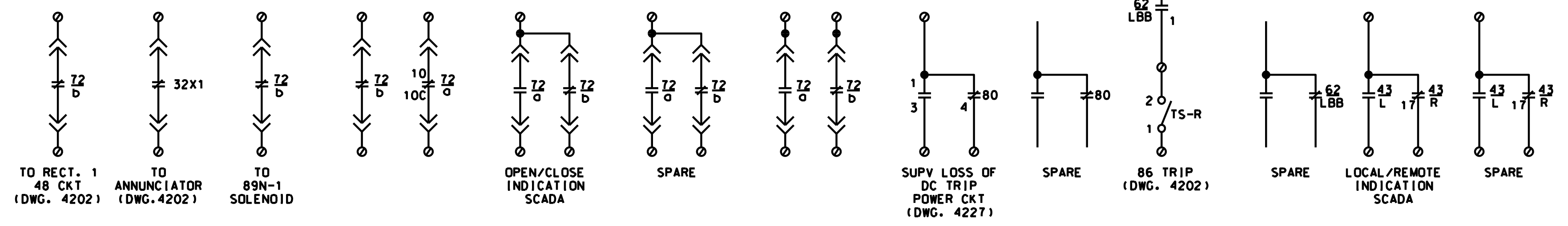
**CONTROL SWITCH DEVICE-65**

| CONTACTS | POSITION |      |          |             |       |
|----------|----------|------|----------|-------------|-------|
|          | PULL OUT | TRIP | OFF TRIP | AFTER CLOSE | CLOSE |
| 1-2      | L0       | X    | X        | X           | X     |
| 3-4      | T        | X    |          |             | X     |
| 5-6      | O        |      | X        | X           |       |
| 7-8      | C        |      |          |             | X     |
| 9-10     | SC       |      |          | X           | X     |

**SELECTOR SWITCH DEVICE-43**

| CONTACTS | POSITION |       |
|----------|----------|-------|
|          | REMOTE   | LOCAL |
| 1-2      | R        | X     |
| 3-4      | L        | X     |
| 5-6      | R        | X     |
| 7-8      | L        | X     |
| 9-10     | R        | X     |
| 11-12    | L        | X     |

NON-SPRING RETURN.  
REMOTE POSITION AT 12 O' CLOCK.  
LOCAL POSITION CLOCKWISE WHEN FACING FRONT OF SWITCH.



PRINTED ON: SDATES

| REV | DATE       | BY | APP | DESCRIPTION    |
|-----|------------|----|-----|----------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |



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CONSULTANT  
**LDP**  
A Company of  
**Gannett Fleming**  
Consulting Engineers  
20 N. Wacker Dr. Ste. 1500 Chicago IL 60606

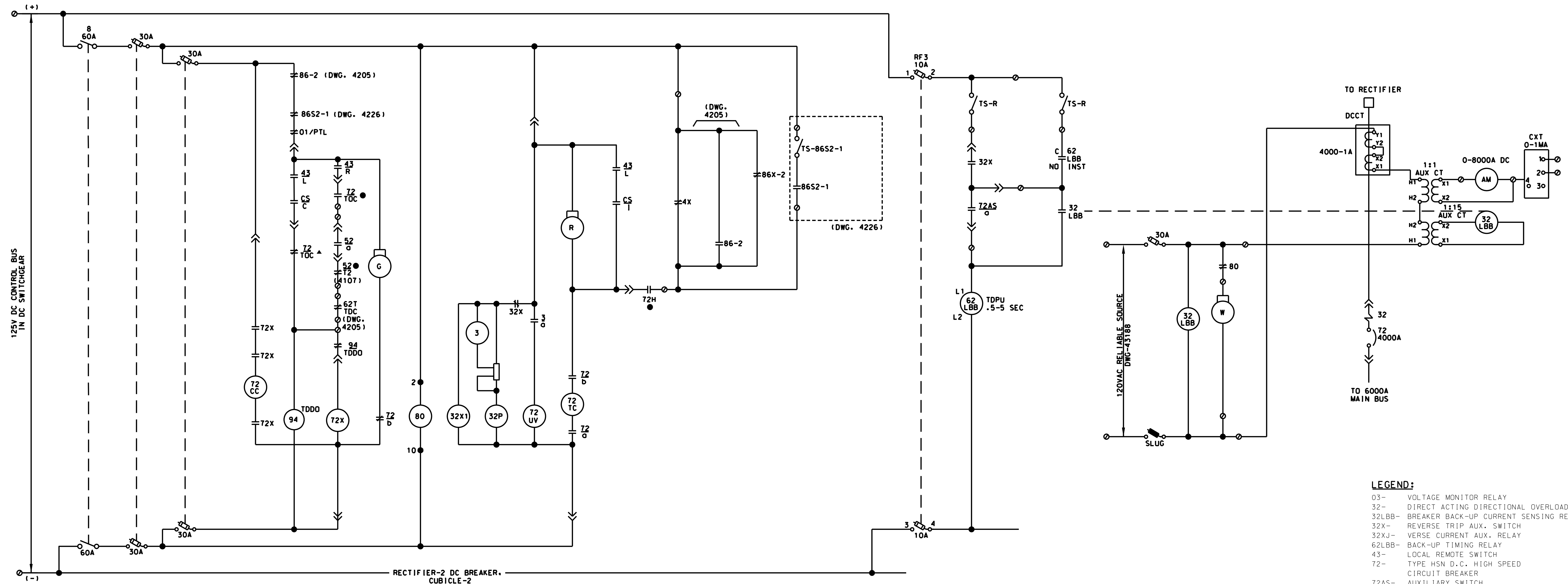
DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017



LOCATION NAME:  
**95TH. STREET SUBSTATION**  
TITLE:  
**1500V DC SCHEMATIC DIAGRAM  
RECTIFIER-1 BREAKER 72-1**

|                                   |                                  |
|-----------------------------------|----------------------------------|
| CAD FILE NUMBER: SS-11.9-4210.DGN |                                  |
| SCALE:<br>NTS                     | DISTRICT:<br>MED                 |
| PROJECT NO.<br>GW4254-57102002    | SHEET NO.<br><b>SS-11.9-4210</b> |
| MILE POST NO.<br>11.9             |                                  |





- LEGEND:**
- 03- VOLTAGE MONITOR RELAY
  - 32- DIRECT ACTING DIRECTIONAL OVERLOAD
  - 32LBB- BREAKER BACK-UP CURRENT SENSING RELAY
  - 32X- REVERSE TRIP AUX. SWITCH
  - 32XJ- VERSE CURRENT AUX. RELAY
  - 62LBB- BACK-UP TIMING RELAY
  - 43- LOCAL REMOTE SWITCH
  - 72- TYPE HSN D.C. HIGH SPEED CIRCUIT BREAKER
  - 72AS- AUXILIARY SWITCH
  - 72CC- CLOSING SOLENOID
  - CS- CONTROL SWITCH
  - 72TC- SHUNT TRIP
  - 72UV- UNDER VOLTAGE COIL
  - 72X- CLOSING CONTACTOR
  - 76- DIRECT ACTING OVERLOAD
  - INST- INSTANTANEOUS
  - TDO- TIME DELAY OPEN
  - A- AMBER INDICATING LIGHT
  - G- GREEN INDICATING LIGHT
  - R- RED INDICATING LIGHT

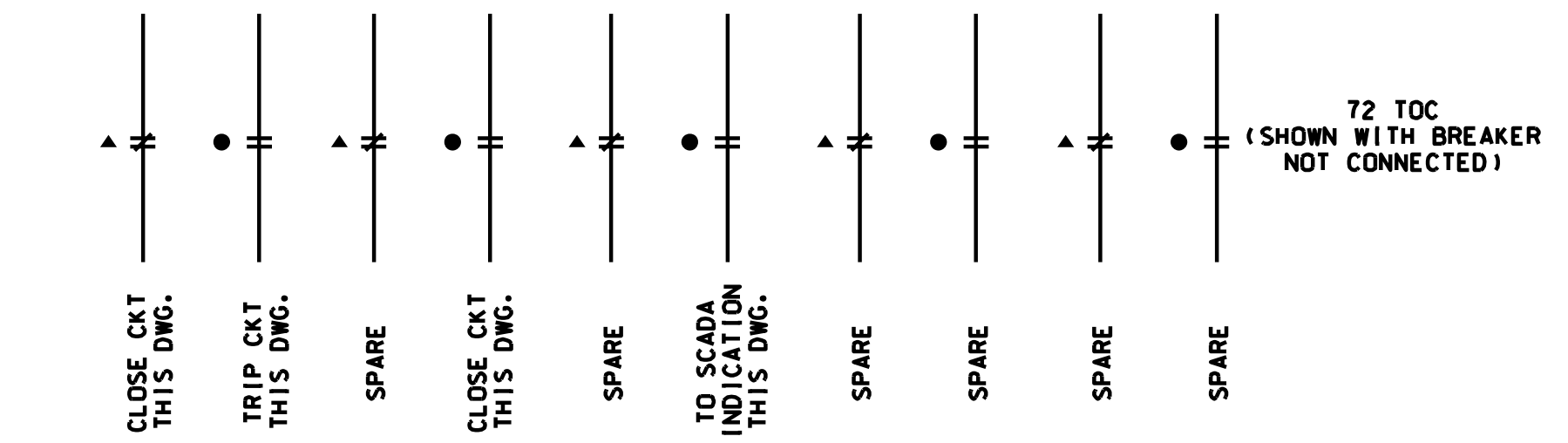
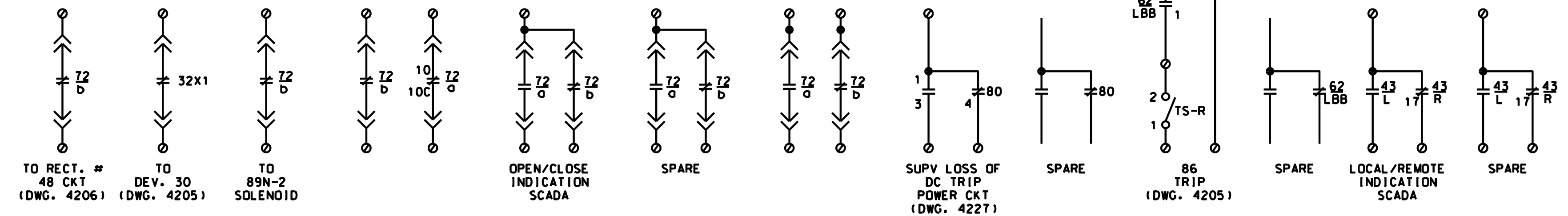
**CONTROL SWITCH DEVICE-CS**

| CONTACTS | POSITION |      |          |             |
|----------|----------|------|----------|-------------|
|          | PULL OUT | TRIP | OFF TRIP | AFTER CLOSE |
| 1-2      | X        | X    | X        | X           |
| 3-4      | X        |      |          | X           |
| 5-6      |          |      | X        | X           |
| 7-8      |          |      |          | X           |
| 9-10     |          |      | X        | X           |

**SELECTOR SWITCH DEVICE-43**

| CONTACTS | POSITION |       |
|----------|----------|-------|
|          | REMOTE   | LOCAL |
| 1-2      | X        |       |
| 3-4      |          | X     |
| 5-6      | X        |       |
| 7-8      |          | X     |
| 9-10     | X        |       |
| 11-12    |          | X     |

NON-SPRING RETURN.  
REMOTE POSITION AT 12 O' CLOCK.  
LOCAL POSITION CLOCKWISE WHEN FACING FRONT OF SWITCH.



PRINTED ON: SDATES

| REV | DATE       | BY | APP | DESCRIPTION    |
|-----|------------|----|-----|----------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |

CONSULTANT SEAL & SIGNATURE



CONSULTANT



DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017

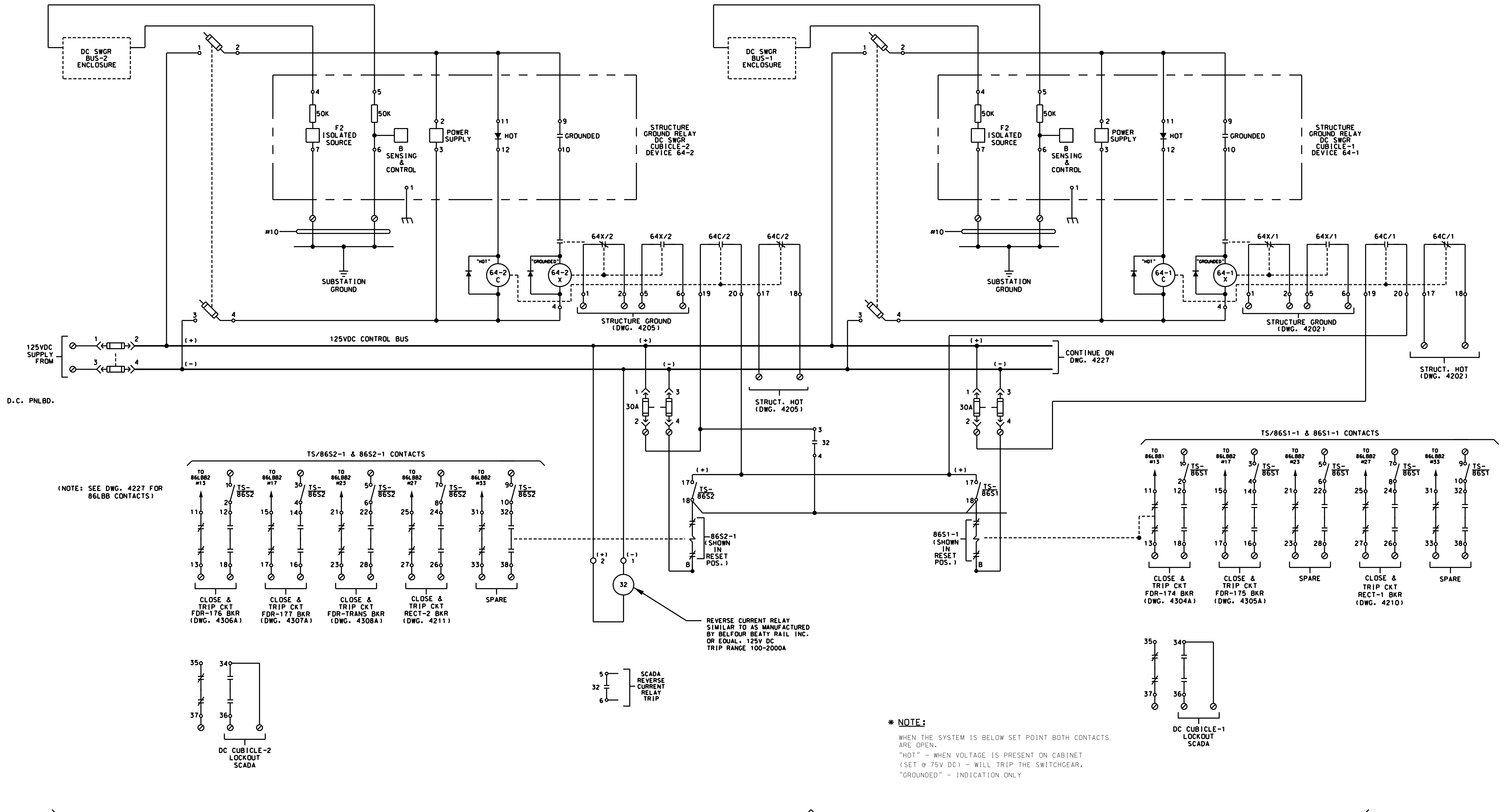


LOCATION NAME:  
**95TH. STREET SUBSTATION**

TITLE:  
**1500V DC SCHEMATIC DIAGRAM  
RECTIFIER-2 BREAKER 72-2**

CAD FILE NUMBER: SS-11.9-4211.DGN

SCALE: NTS  
PROJECT NO. GW4254-57102002  
MILE POST NO. 11.9  
DISTRICT: MED  
SHEET NO. SS-11.9-4211



DC SWGR-STRUCTURE GRD RELAY, CUBICLE-2

DC SWGR-STRUCTURE GRD RELAY, CUBICLE-1

PRINTED ON: 07/28/2017

| REV | DATE       | BY | APP | DESCRIPTION    |
|-----|------------|----|-----|----------------|
| 0   | 07-28-2017 | HS | HS  | ISSUED FOR BID |
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|     |            |    |     |                |
|     |            |    |     |                |
|     |            |    |     |                |

CONSULTANT SEAL & SIGNATURE

CONSULTANT



**IDP** A Company of **Gannett Fleming**

Consulting Engineers  
20 N. Wacker Dr. Ste. 1500 Chicago IL 60606

DESIGNED: HS  
DRAWN: JC  
CHECKED: FM  
METRA P.M.: R. CERANT  
DATE: JUNE 12, 2017



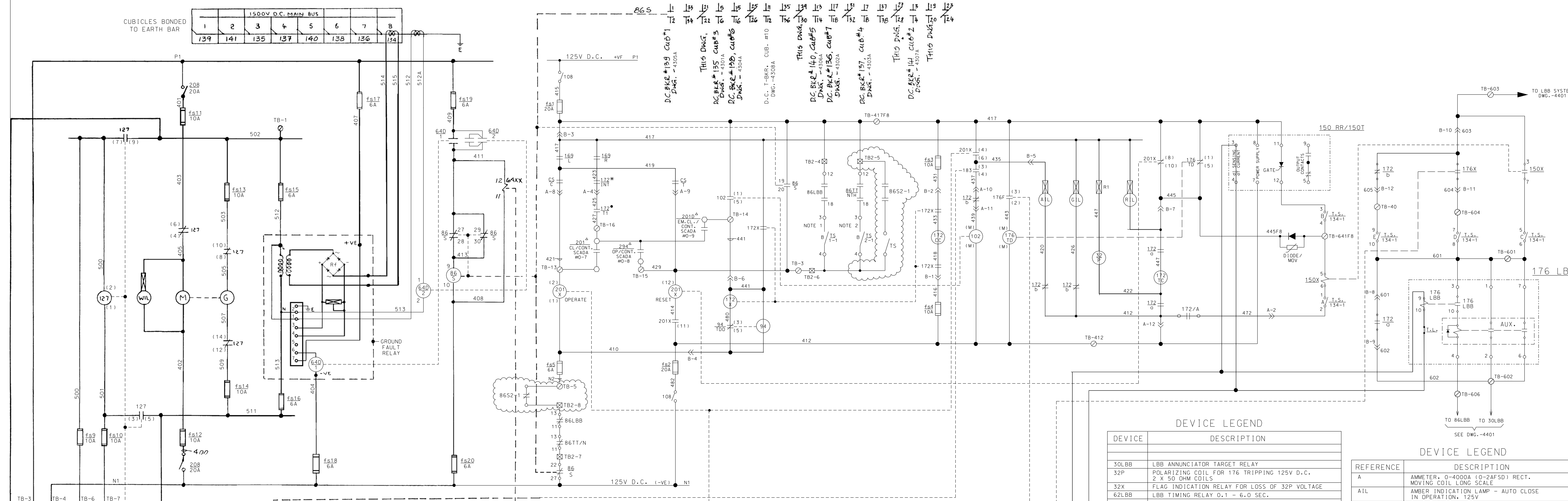
LOCATION NAME:  
**95TH. STREET SUBSTATION**

TITLE:  
**1500V DC SCHEMATIC DIAGRAM  
DC SWITCHGEAR  
GROUND RELAY**

CAD FILE NUMBER: SS-11.9-4226.DGN

SCALE: NTS  
PROJECT NO. GW4254-57102002  
MILE POST NO. 11.9

DISTRICT: MED  
SHEET NO. SS-11.9-4226



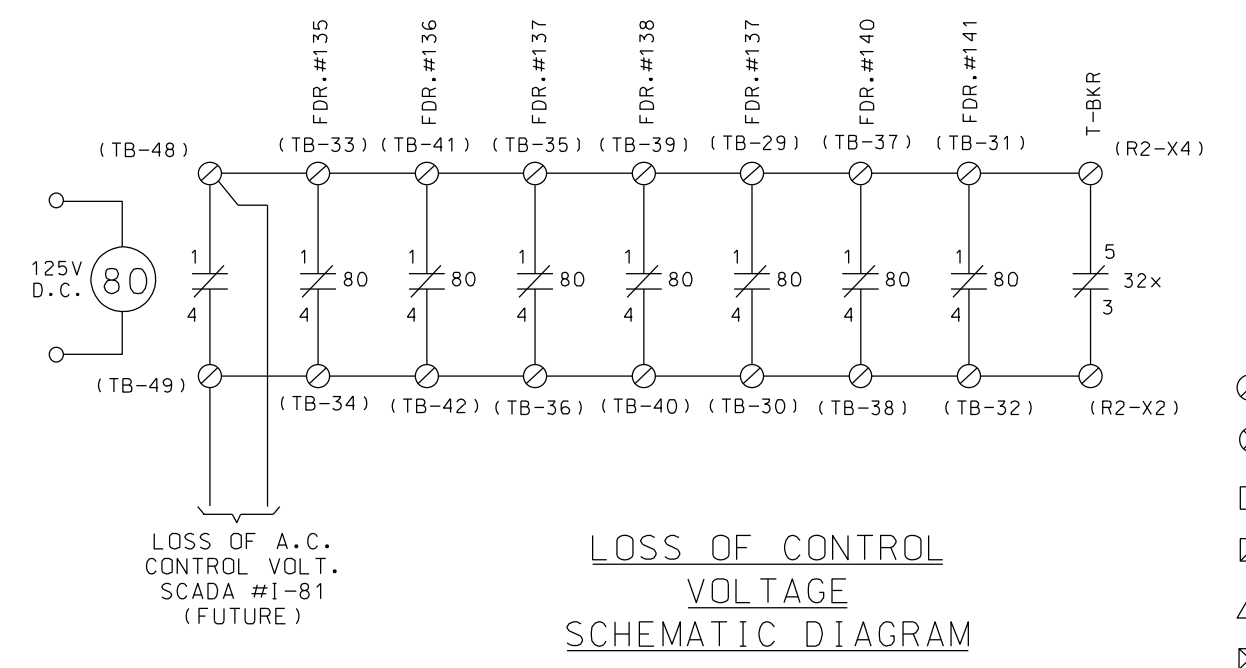
**DEVICE LEGEND**

| DEVICE | DESCRIPTION  |
|--------|--|
| 30LBB  | LBB ANNUNCIATOR TARGET RELAY                                 |
| 32P    | POLARIZING COIL FOR 176 TRIPPING 125V D.C. 2 X 50 OHM COILS  |
| 62LBB  | LBB TIMING RELAY 0.1 - 6.0 SEC.                              |
| 64D1   | GROUND FAULT SENSING RELAY (BUS 1)                           |
| 64D2   | GROUND FAULT SENSING RELAY (BUS 2)                           |
| 64XX   | AUX. RELAY FOR GROUND FAULT TRANSFER TRIP                    |
| 86/S   | LOCKOUT RELAY  |
| 86LBB  | BREAKER BACKUP LOCKOUT RELAY (MANUAL RESET)                  |
| 86TT   | TRANSFER TRIP LOCKOUT RELAY (ELECT. RESET)                   |
| 94     | CLOSING COIL CUT OFF (ANTI-PUMP) RELAY, 125V D.C., 7000 OHMS |
| 94TT   | TRANSFER TRIP OUTPUT RELAY                                   |
| 102    | RECLOSED TIMER   |
| 108    | DISCONNECT SWITCH  |
| 12T    | A.C. SUPPLY CHANGE OVER RELAY                                |
| 150RR  | RATE OF RISE OVERCURRENT RELAY                               |
| 150T   | TIME OVERCURRENT RELAY                                       |
| 150X   | AUXILIARY RELAY FOR LBB ON 150RR/150T                        |
| 169    | LOCAL - REMOTE SWITCH  |
| 172    | D.C. FEEDER BREAKER  |
| 172D   | BREAKER OPEN-CLOSE STATUS SWITCH                             |
| 172C   | BREAKER CLOSING COIL, 125V D.C., 1.0 OHM                     |
| 172/TI | BREAKER CARRIAGE POSITION SWITCH, TRUCK INTERLOCK TRIP       |
| 172TC  | SHUNT TRIP COIL, 125V D.C., 20 OHMS                          |
| 172X   | AUXILIARY CLOSING CONTACTOR, 125V D.C., 650 OHMS             |
| 176    | MAGNETIC SERIES TRIP D/C DEVICE CAL. 3.5-4-5-6-7-8           |
| 176F   | D/C RELAY (0-6000A. SCALE) 120V, 60HZ, HIGH SET POINT        |
| 176LBB | LBB D.C. CURRENT SENSING RELAY                               |
| 176TD  | D/C RL. TIMER, 125V D.C. (SET AT 20 SEC.) IN CASE WITH 176F  |
| 176X   | AUXILIARY RELAY FOR MAGNETIC SERIES TRIP                     |
| 183    | VOLTAGE MEASURING TRANSFER RELAY                             |
| 201    | SUPERVISORY CLOSE RELAY (REMOTE CONTACT)                     |
| 201D   | EMERGENCY CLOSE RELAY (REMOTE CONTACT)                       |
| 201X   | BREAKER MASTER CONTROL RELAY (LATCHING TYPE)                 |
| 294    | SUPERVISORY TRIP RELAY (REMOTE CONTACT)                      |
| 301TT  | CONTROL SWITCH (OR TRANSFER TRIP BY-PASS)                    |

**DEVICE LEGEND**

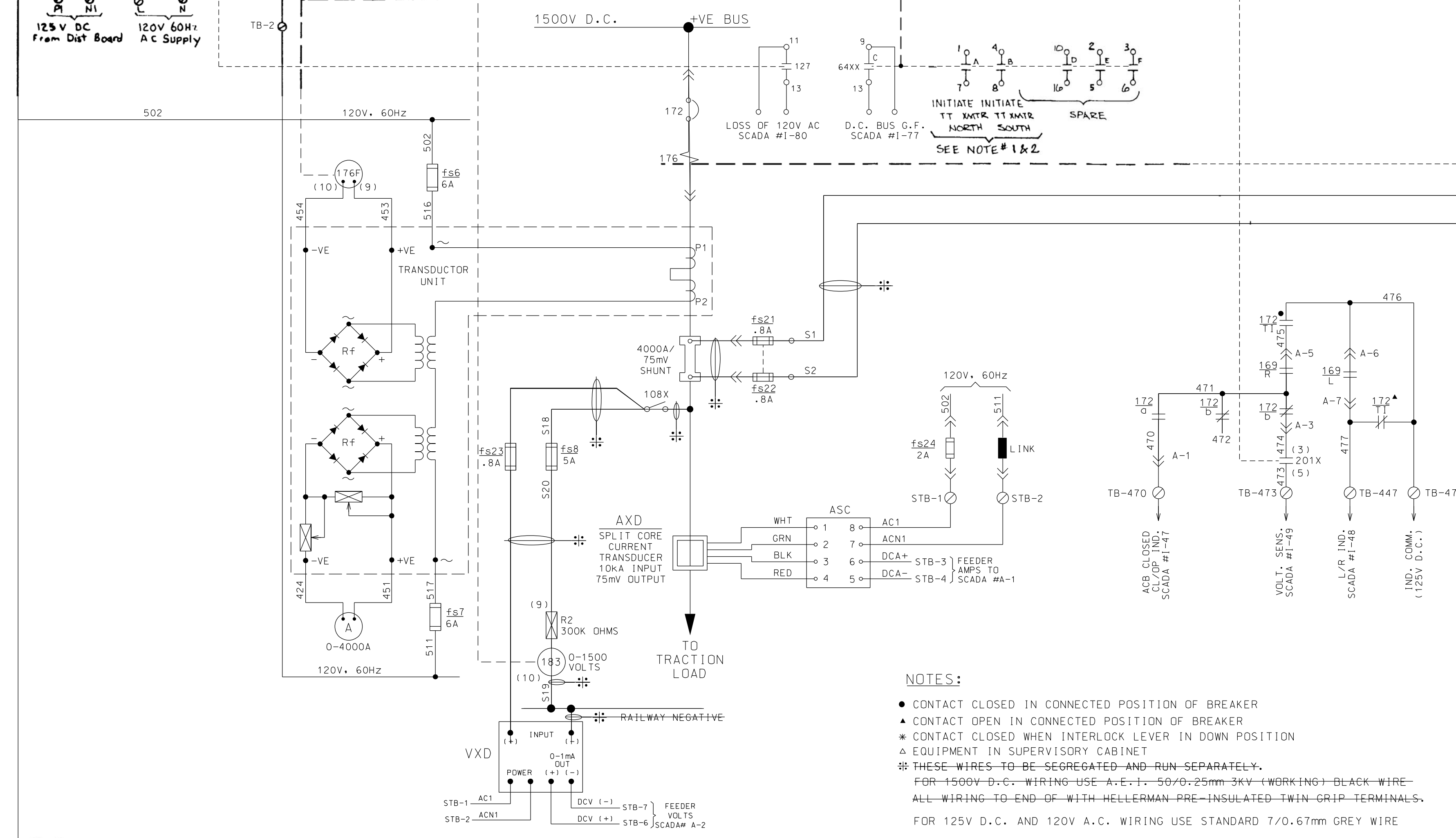
| REFERENCE | DESCRIPTION  |
|-----------|--|
| A         | AMMETER, 0-4000A (0-2AFSD) RECT. MOVING COIL LONG SCALE  |
| ATL       | AMBER INDICATION LAMP - AUTO CLOSE IN OPERATION, 125V    |
| ASC       | D.C. CURRENT SIGNAL CONDITIONER                          |
| AXD       | SPLIT CORE D.C. CURRENT TRANSDUCER                       |
| C         | CLOSE  |
| CC        | CLOSING COIL   |
| CS        | CONTROL SWITCH, TRIP-NEUTRAL-CLOSE                       |
| DCSC      | D.C. CURRENT SIGNAL CONDITIONER                          |
| DCVC      | D.C. VOLTS CALIBRATOR                                    |
| DCVT      | D.C. VOLTS TRANSDUCER                                    |
| DIODE/MOV | DIRECTIONAL BLOCKING DIODE/METAL OXIDE VARISTOR          |
| GIL       | GREEN INDICATION LAMP - C.B. OPEN, 125V                  |
| I.C.T.    | IMPULSE TYPE CURRENT TRANSFORMER                         |
| L         | LOCAL CONTROL MODE                                       |
| LBB       | LOCAL BREAKER BACKUP                                     |
| OP        | OPERATE  |
| R         | REMOTE CONTROL MODE OR RESISTOR                          |
| RE        | RESET  |
| RIL       | RED INDICATION LAMP - C.B. CLOSED, 125V                  |
| SHUNT     | SWITCHBOARD D.C. SHUNT                                   |
| T         | TRIP   |
| TL        | TEST LINK  |
| T.S.      | TEST SWITCH  |
| TT        | TRANSFER TRIP  |
| V         | VOLTMETER, 0-2000V MOVING COIL LONG SCALE DIRECT READING |
| VR1       | ATTENUATOR, 20W, 0.2 OHM VARIABLE                        |
| VXD       | FEEDER VOLTAGE TRANSDUCER                                |
| WIL       | WHITE INDICATING LIGHT-CLOSING SEQUENCE IN PROGRESS      |

CIRCUIT WITHIN THE CLOUD INDICATES NEW WORK UNDER THIS CONTRACT



- NOTES:**
- LBB SYSTEM SCHEMATIC DIAGRAM, DWG. SS-11.9-4401.
  - TRANSFER TRIP SYSTEM SCHEMATIC DIAGRAM, DWG. SS-11.9-4402.

- LEGEND**
- ⊙ TERMINAL POINT AT 1500 V D.C. SWITCHGEAR
  - ⊗ TERMINAL POINT AT 12.4 KV A.C. SWITCHGEAR
  - ⊠ TERMINAL POINT AT 4 KV A.C. SWITCHGEAR
  - ⊡ TERMINAL POINT AT RECTIFIER CONTROL PANEL
  - ⊔ TERMINAL POINT AT TRANSFORMER CONTROL PANEL
  - ⊞ TERMINAL POINT AT TRANSFER TRIP & LBB SWITCHBOARD
  - TERMINAL POINT AT SUPERVISORY CONTROL CABINET
  - ⊞ TERMINAL POINT AT BUS FAULT RELAY PANEL OR CONTROL SWITCHBOARD OR OTHER MISC. PANELS.



- NOTES:**
- CONTACT CLOSED IN CONNECTED POSITION OF BREAKER
  - ▲ CONTACT OPEN IN CONNECTED POSITION OF BREAKER
  - \* CONTACT CLOSED WHEN INTERLOCK LEVER IN DOWN POSITION
  - ▲ EQUIPMENT IN SUPERVISORY CABINET
  - \*\* THESE WIRES TO BE SEGREGATED AND RUN SEPARATELY.
- FOR 1500V D.C. WIRING USE A.E. 1. 50/0.25mm 3KV (WORKING) BLACK WIRE - ALL WIRING TO END OF WITH HELLERMAN PRE-INSULATED TWIN GRIP TERMINALS.
- FOR 125V D.C. AND 120V A.C. WIRING USE STANDARD 7/0.67mm GREY WIRE

| REV. | DATE     | BY   | DESCRIPTION   |
|------|----------|------|---|
| 1    | 2-10-74  | R.V. | Drawn   |
| 2    | 3-2-75   | R.V. | Resistor R2 was prev. shown external to relay 193.                  |
| 3    | 3-2-75   | R.V. | Wire N-429 was prev. common to lamps ATL and GIL.                   |
| 4    | 11-2-75  | R.V. | Transducer Unit: terminal markings +ve & -ve, P1 & P2 were added.   |
| 5    | 11-2-75  | R.V. | Relay 123 terminal markings added.                                  |
| 6    | 11-2-75  | R.V. | N/C 172/11 contact (wire 172 & 477) modified. Resistor R3 modified. |
| 7    | 14-11-91 | R.V. | ADD LBB AND TT BY SCI   |
| 8    | 1-97     | WPS  | GENERAL REVISION  |

| REV | DATE     | DESCRIPTION                 | BY  |
|-----|----------|-----------------------------|-----|
| -   | 07/28/17 | ISSUED FOR BID              | HS  |
| -   | 7/11     | MINOR CORRECTIONS           | LB  |
| -   | 7/07     | MINOR CORRECTIONS           | WPS |
| -   | 2/06     | MINOR CORRECTIONS           | WPS |
| -   | 9/04     | GENERAL REVISION            | WPS |
| -   | 5/03     | FIELD CORRECTIONS, AS-BUILT | WPS |
| -   | 1/00     | ISSUED FOR SCADA AS-BUILT   | WPS |

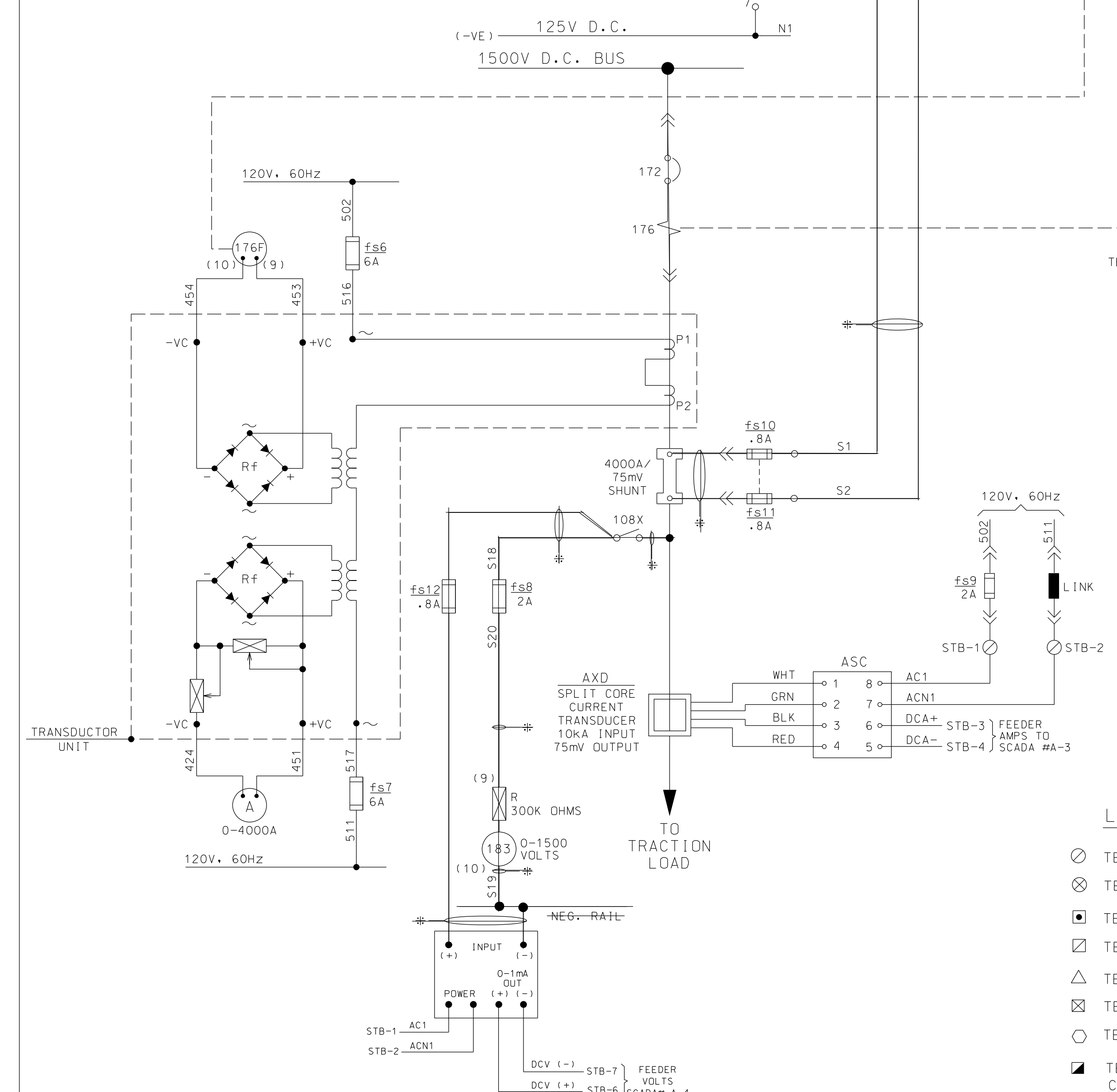
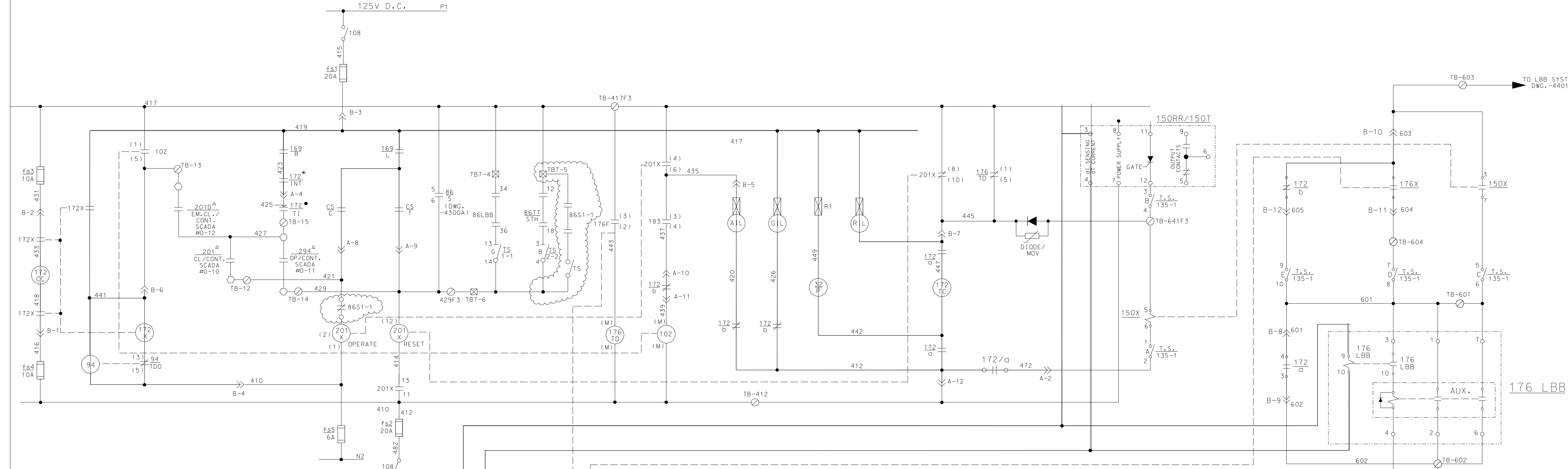
**Metra** ENGINEERING DEPARTMENT  
CHICAGO, ILLINOIS

1500V D.C. SWITCHGEAR  
D.C. FDR. BKR., SEC. 134, CUB. NO. 8  
SCHEMATIC DIAGRAM

95th STREET TIE STATION

SCALE: NONE DATE: -  
CAD FILE NUMBER: F:\electrical\eml\95thst\hyb\4300a.hyb -  
DESIGNED: CM DRAWN: WPS CHECKED: WPS APPROVED: WPS  
DISTRICT: M.E.D. PRINT NUMBER: SS-11.9-4300A





CIRCUIT WITHIN THE CLOUD INDICATES NEW WORK UNDER THIS CONTRACT

- LEGEND**
- TERMINAL POINT AT 1500 V D.C. SWITCHGEAR
  - ⊗ TERMINAL POINT AT 12.4 KV A.C. SWITCHGEAR
  - ◻ TERMINAL POINT AT 4 KV A.C. SWITCHGEAR
  - ◻ TERMINAL POINT AT RECTIFIER CONTROL PANEL
  - △ TERMINAL POINT AT TRANSFORMER CONTROL PANEL
  - ⊗ TERMINAL POINT AT TRANSFER TRIP & LBB SWITCHBOARD
  - TERMINAL POINT AT SUPERVISORY CONTROL CABINET
  - ◻ TERMINAL POINT AT BUS FAULT RELAY PANEL OR CONTROL SWITCHBOARD OR OTHER MISC. PANELS.

- NOTES:**
- CONTACT CLOSED IN CONNECTED POSITION OF BREAKER
  - ▲ CONTACT OPEN IN CONNECTED POSITION OF BREAKER
  - \* CONTACT CLOSED WHEN INTERLOCK LEVER IN DOWN POSITION
  - ▲ EQUIPMENT IN SUPERVISORY CABINET
  - \* THESE WIRES TO BE SEGREGATED AND RUN SEPARATELY.
  - FOR 1500V D.C. WIRING USE A.T.T. 50/0.25mm 3KV (WORKING) BLACK WIRE
  - ALL WIRING TO END OF WITH HELFERMAN PRE-INSULATED TWIN GRIP TERMINALS
  - FOR 125V D.C. AND 120V A.C. WIRING USE STANDARD 7/0.67mm GREY WIRE

**DEVICE LEGEND**

| REFERENCE | DESCRIPTION  |
|-----------|--|
| A         | AMMETER, 0-4000A (0-2AFSD) RECT. MOVING COIL LONG SCALE  |
| A1L       | AMBER INDICATION LAMP - AUTO CLOSE IN OPERATION, 125V    |
| ASC       | D.C. CURRENT SIGNAL CONDITIONER                          |
| AXD       | SPLIT CORE D.C. CURRENT TRANSDUCER                       |
| C         | CLOSE  |
| CC        | CLOSING COIL   |
| CS        | CONTROL SWITCH, TRIP-NEUTRAL-CLOSE                       |
| DCCT      | D.C. CURRENT TRANSDUCER, 3000/1A, 120V, 60HZ             |
| DCSC      | D.C. CURRENT SIGNAL CONDITIONER                          |
| DCVC      | D.C. VOLTS CALIBRATOR                                    |
| DCVT      | D.C. VOLTS TRANSDUCER                                    |
| D         | DIRECTIONAL BLOCKING DIODE/METAL OXIDE VARISTOR          |
| GIL       | GREEN INDICATION LAMP - C.B. OPEN, 125V                  |
| I.C.T.    | IMPULSE TYPE CURRENT TRANSFORMER                         |
| L         | LOCAL CONTROL MODE                                       |
| LBB       | LOCAL BREAKER BACKUP                                     |
| OP        | REMOTE CONTROL MODE                                      |
| RE        | RESET  |
| RIL       | RED INDICATION LAMP - C.B. CLOSED, 125V                  |
| SHUNT     | SWITCHBOARD D.C. SHUNT                                   |
| T         | TRIP   |
| TL        | TEST LINK  |
| T.S.      | TEST SWITCH  |
| TT        | TRANSFER TRIP  |
| V         | VOLTMETER, 0-2000V MOVING COIL LONG SCALE DIRECT READING |
| VR1       | ATTENUATOR, 20W, 0.2 OHM VARIABLE                        |
| VXD       | FEEDER VOLTAGE TRANSDUCER                                |

**DEVICE LEGEND**

| DEVICE | DESCRIPTION   |
|--------|---|
| 30LBB  | LBB ANNUNCIATOR TARGET RELAY                                  |
| 32P    | POLARIZING COIL FOR 176 TRIPPING 125V D.C. 2 X 50 OHM COILS   |
| 32X    | FLAG INDICATION RELAY FOR LOSS OF 32P VOLTAGE                 |
| 62LBB  | LBB TIMING RELAY 0.1 - 6.0 SEC.                               |
| 64D2   | GROUND FAULT SENSING RELAY (BUS 2)                            |
| 64XX   | AUX. RELAY FOR GROUND FAULT TRANSFER TRIP                     |
| 86/S   | LOCKOUT RELAY   |
| 86LBB  | BREAKER BACKUP LOCKOUT RELAY (MANUAL RESET)                   |
| 86TT   | TRANSFER TRIP LOCKOUT RELAY (ELECT. RESET)                    |
| 94     | CLOSING COIL CUT OFF (ANTI-PUMP) RELAY, 125V D.C., 7000 OHMS  |
| 94TT   | TRANSFER TRIP OUTPUT RELAY                                    |
| 102    | RECLOSE TIMER   |
| 108    | 125V D.C. CONTROL ISOLATOR                                    |
| 108X   | 1500V D.C. VOLTAGE MEASURING ISOLATOR                         |
| 127    | A.C. SUPPLY CHANGE OVER RELAY                                 |
| 150RR  | RATE OF RISE OVERCURRENT RELAY "SWARTZ"                       |
| 150T   | TIME OVERCURRENT RELAY  |
| 150X   | AUXILIARY RELAY FOR LBB ON 150RR/150T                         |
| 169    | LOCAL - REMOTE SWITCH   |
| 172    | D.C. FEEDER BREAKER   |
| 1720-b | BREAKER OPEN-CLOSE STATUS SWITCH                              |
| 172CC  | BREAKER CLOSING COIL, 125V D.C., 1.0 OHM                      |
| 172TI  | BREAKER CARRIAGE POSITION SWITCH                              |
| 172TT  | SHUNT TRIP COIL, 125V D.C., 20 OHMS                           |
| 172X   | AUXILIARY CLOSING CONTACTOR, 125V D.C., 650 OHMS              |
| 176    | MAGNETIC SERIES TRIP O/C DEVICE CAL. 3.5-4.5-6-7-8            |
| 176F   | O/C RELAY (0-6000A. SCALE) 120V, 60HZ, HIGH SET POINT         |
| 176LBB | LBB D.C. CURRENT SENSING RELAY                                |
| 176TD  | O/C RL.T. TIMER, 125V D.C. (SET AT 20 SEC.) IN CASE WITH 176F |
| 176X   | AUXILIARY RELAY FOR MAGNETIC SERIES TRIP                      |
| 183    | VOLTAGE MEASURING TRANSFER RELAY                              |
| 201    | SUPERVISORY CLOSE RELAY (REMOTE CONTACT)                      |
| 201D   | EMERGENCY CLOSE RELAY (REMOTE CONTACT)                        |
| 201X   | BREAKER MASTER CONTROL RELAY (LATCHING TYPE)                  |
| 294    | SUPERVISORY TRIP RELAY (REMOTE CONTACT)                       |
| 301TT  | CONTROL SWITCH (OR TRANSFER TRIP BY-PASS)                     |

BY LDP

| REV | DATE     | DESCRIPTION                 | BY     |
|-----|----------|-----------------------------|--------|
| -   | 07/28/17 | ISSUED FOR BID              | HS     |
| -   | 7/11     | MINOR CORRECTIONS           | LB WPS |
| -   | 2/06     | MINOR CORRECTIONS           | WPS    |
| -   | 9/04     | GENERAL REVISION            | WPS    |
| -   | 5/03     | FIELD CORRECTIONS, AS-BUILT | WPS    |
| -   | 1/00     | ISSUED FOR SCADA AS-BUILT   | WPS    |

**Metra** ENGINEERING DEPARTMENT  
CHICAGO, ILLINOIS

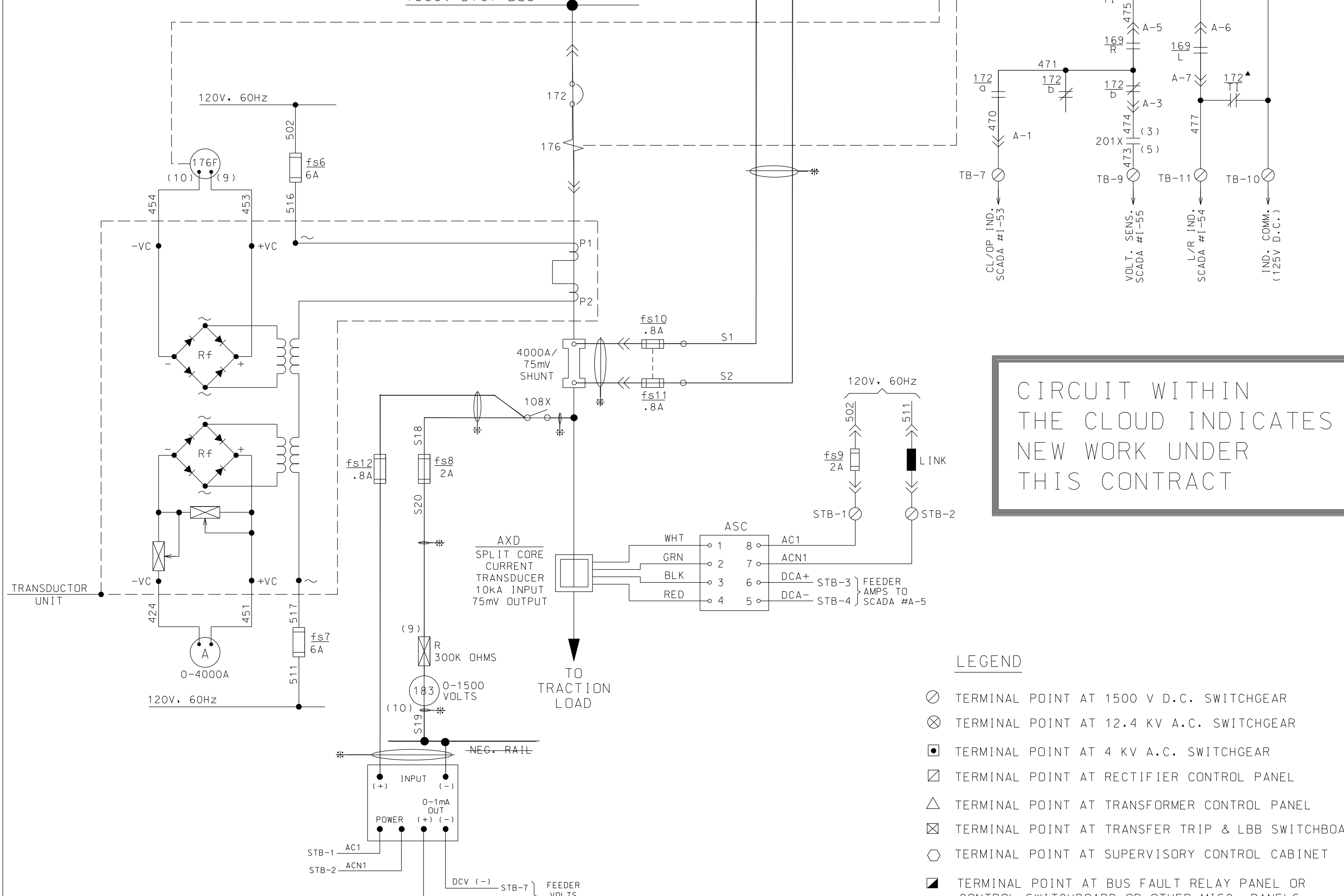
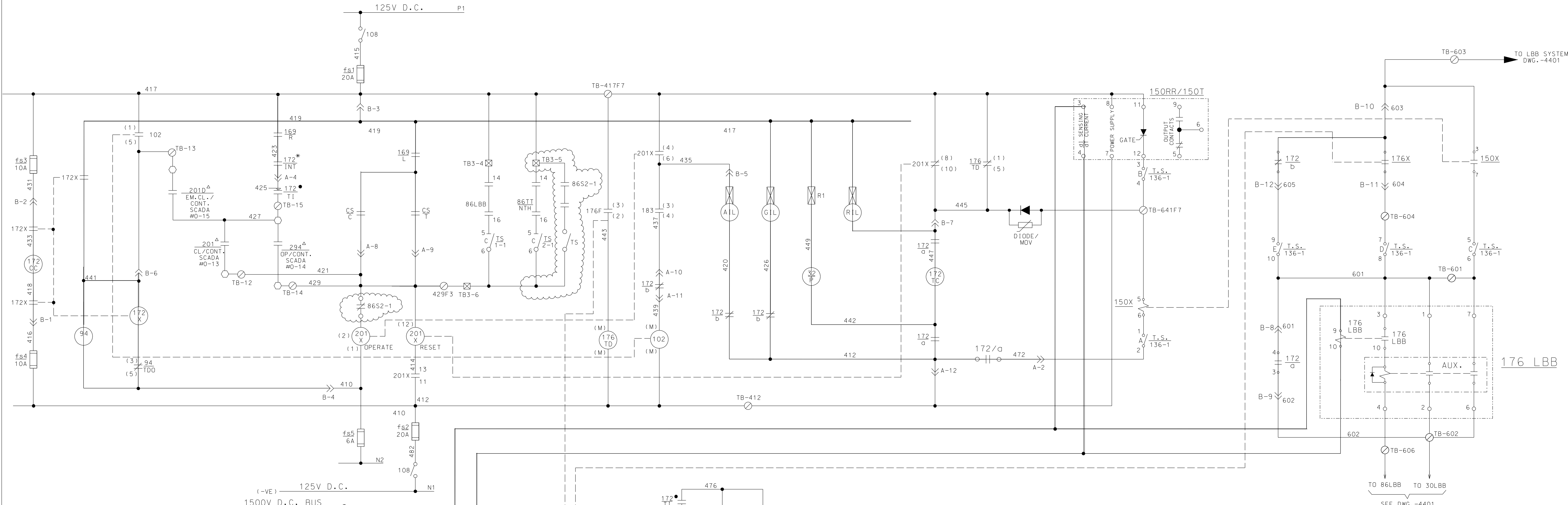
1500V D.C. SWITCHGEAR  
D.C. FDR. BKR. SEC. NO.135. CUB. NO.3  
SCHEMATIC DIAGRAM

95th STREET TIE STATION

SCALE: NONE DATE: \_\_\_\_\_

DESIGNED: RC DRAWN: WPS CHECKED: WPS APPROVED: WPS

DISTRICT: M.E.D. PRINT NUMBER: SS-11.9-4301A



CIRCUIT WITHIN THE CLOUD INDICATES NEW WORK UNDER THIS CONTRACT

**NOTES:**

- CONTACT CLOSED IN CONNECTED POSITION OF BREAKER
- ▲ CONTACT OPEN IN CONNECTED POSITION OF BREAKER
- \* CONTACT CLOSED WHEN INTERLOCK LEVER IN DOWN POSITION
- ▲ EQUIPMENT IN SUPERVISORY CABINET

**\*\*\* THESE WIRES TO BE SEGREGATED AND RUN SEPARATELY. \*\*\***

FOR 1500V D.C. WIRING USE A.E.T. 50/0.25mm 3KV (WORKING) BLACK WIRE  
 ALL WIRING TO END OF WITH HELLERMAN PRE-INSULATED TWIN GRIP TERMINALS.

FOR 125V D.C. AND 120V A.C. WIRING USE STANDARD 7/0.67mm GREY WIRE

**DEVICE LEGEND**

| REFERENCE | DESCRIPTION  |
|-----------|--|
| A         | AMMETER, 0-4000A (0-2AF5D) RECT. MOVING COIL LONG SCALE  |
| AIL       | AMBER INDICATION LAMP - AUTO CLOSE IN OPERATION, 125V    |
| ASC       | D.C. CURRENT SIGNAL CONDITIONER                          |
| AXD       | SPLIT CORE D.C. CURRENT TRANSDUCER                       |
| C         | CLOSE  |
| CC        | CLOSING COIL   |
| DCCT      | D.C. CURRENT TRANSDUCER, 3000/1A, 120V, 60Hz             |
| DCSC      | D.C. CURRENT SIGNAL CONDITIONER                          |
| DCVC      | D.C. VOLTS CALIBRATOR                                    |
| DCVT      | D.C. VOLTS TRANSDUCER                                    |
| DIODE/MOV | DIRECTIONAL BLOCKING DIODE/METAL OXIDE VARISTOR          |
| GIL       | GREEN INDICATION LAMP - C.B. OPEN, 125V                  |
| I.C.T.    | IMPULSE TYPE CURRENT TRANSFORMER                         |
| L         | LOCAL CONTROL MODE                                       |
| LBB       | LOCAL BREAKER BACKUP                                     |
| OP        | OPERATE  |
| R         | REMOTE CONTROL MODE                                      |
| RE        | RESET  |
| RIL       | RED INDICATION LAMP - C.B. CLOSED, 125V                  |
| SHUNT     | SWITCHBOARD D.C. SHUNT                                   |
| T         | TRIP   |
| TL        | TEST LINK  |
| T.S.      | TEST SWITCH  |
| TT        | TRANSFER TRIP  |
| V         | VOLTMETER, 0-2000V MOVING COIL LONG SCALE DIRECT READING |
| VR1       | ATTENUATOR, 20W, 0.2 OHM VARIABLE                        |
| VXD       | FEEDER VOLTAGE TRANSDUCER                                |

- LEGEND**
- TERMINAL POINT AT 1500 V D.C. SWITCHGEAR
  - ⊗ TERMINAL POINT AT 12.4 KV A.C. SWITCHGEAR
  - ◻ TERMINAL POINT AT 4 KV A.C. SWITCHGEAR
  - ◻ TERMINAL POINT AT RECTIFIER CONTROL PANEL
  - △ TERMINAL POINT AT TRANSFORMER CONTROL PANEL
  - ⊗ TERMINAL POINT AT TRANSFER TRIP & LBB SWITCHBOARD
  - TERMINAL POINT AT SUPERVISORY CONTROL CABINET
  - ◼ TERMINAL POINT AT BUS FAULT RELAY PANEL OR CONTROL SWITCHBOARD OR OTHER MISC. PANELS.

**DEVICE LEGEND**

| DEVICE | DESCRIPTION   |
|--------|---|
| 30LBB  | LBB ANNUNCIATOR TARGET RELAY                                  |
| 32P    | POLARIZING COIL FOR 176 TRIPPING 125V D.C. 2 X 50 OHM COILS   |
| 32X    | FLAG INDICATION RELAY FOR LOSS OF 32P VOLTAGE                 |
| 62LBB  | LBB TIMING RELAY 0.1 - 6.0 SEC.                               |
| 64DZ   | GROUND FAULT SENSING RELAY (BUS 2)                            |
| 64XX   | AUX. RELAY FOR GROUND FAULT TRANSFER TRIP                     |
| 86/S   | LOCKOUT RELAY   |
| 86LBB  | BREAKER BACKUP LOCKOUT RELAY (MANUAL RESET)                   |
| 86TT   | TRANSFER TRIP LOCKOUT RELAY (ELECT. RESET)                    |
| 94     | CLOSING COIL CUT OFF (ANTI-PUMP) RELAY, 125V D.C., 7000 OHMS  |
| 94TT   | TRANSFER TRIP OUTPUT RELAY                                    |
| 102    | RE-CLOSING TIMER  |
| 108    | 125V D.C. CONTROL ISOLATOR                                    |
| 108X   | 1500V D.C. VOLTAGE MEASURING ISOLATOR                         |
| 127    | A.C. SUPPLY CHANGE OVER RELAY                                 |
| 150RR  | RATE OF RISE OVERCURRENT RELAY "SWARTZ"                       |
| 150T   | TIME OVERCURRENT RELAY  |
| 150X   | AUXILIARY RELAY FOR LBB ON 150RR/150T                         |
| 169    | LOCAL - REMOTE SWITCH   |
| 172    | D.C. FEEDER BREAKER   |
| 172a-b | BREAKER OPEN-CLOSE STATUS SWITCH                              |
| 172CC  | BREAKER CLOSING COIL, 125V D.C., 1.0 OHM                      |
| 172T   | BREAKER CARRIAGE POSITION SWITCH                              |
| 172TC  | SHUNT TRIP COIL, 125V D.C., 20 OHMS                           |
| 172X   | AUXILIARY CLOSING CONTACTOR, 125V D.C., 650 OHMS              |
| 176    | MAGNETIC SERIES TRIP O/C DEVICE CAL. 3.5-4-5-6-7-8            |
| 176F   | O/C RELAY (0-6000A. SCALE) 120V, 60Hz, HIGH SET POINT         |
| 176LBB | LBB D.C. CURRENT SENSING RELAY                                |
| 176TD  | O/C RL.T. TIMER, 125V D.C. (SET AT 20 SEC.) IN CASE WITH 176F |
| 176X   | AUXILIARY RELAY FOR MAGNETIC SERIES TRIP                      |
| 183    | VOLTAGE MEASURING TRANSFER RELAY                              |
| 201    | SUPERVISORY CLOSE RELAY (REMOTE CONTACT)                      |
| 201D   | EMERGENCY CLOSE RELAY (REMOTE CONTACT)                        |
| 201X   | BREAKER MASTER CONTROL RELAY (LATCHING TYPE)                  |
| 294    | SUPERVISORY TRIP RELAY (REMOTE CONTACT)                       |
| 301TT  | CONTROL SWITCH (OR TRANSFER TRIP BY-PASS)                     |

BY LOP

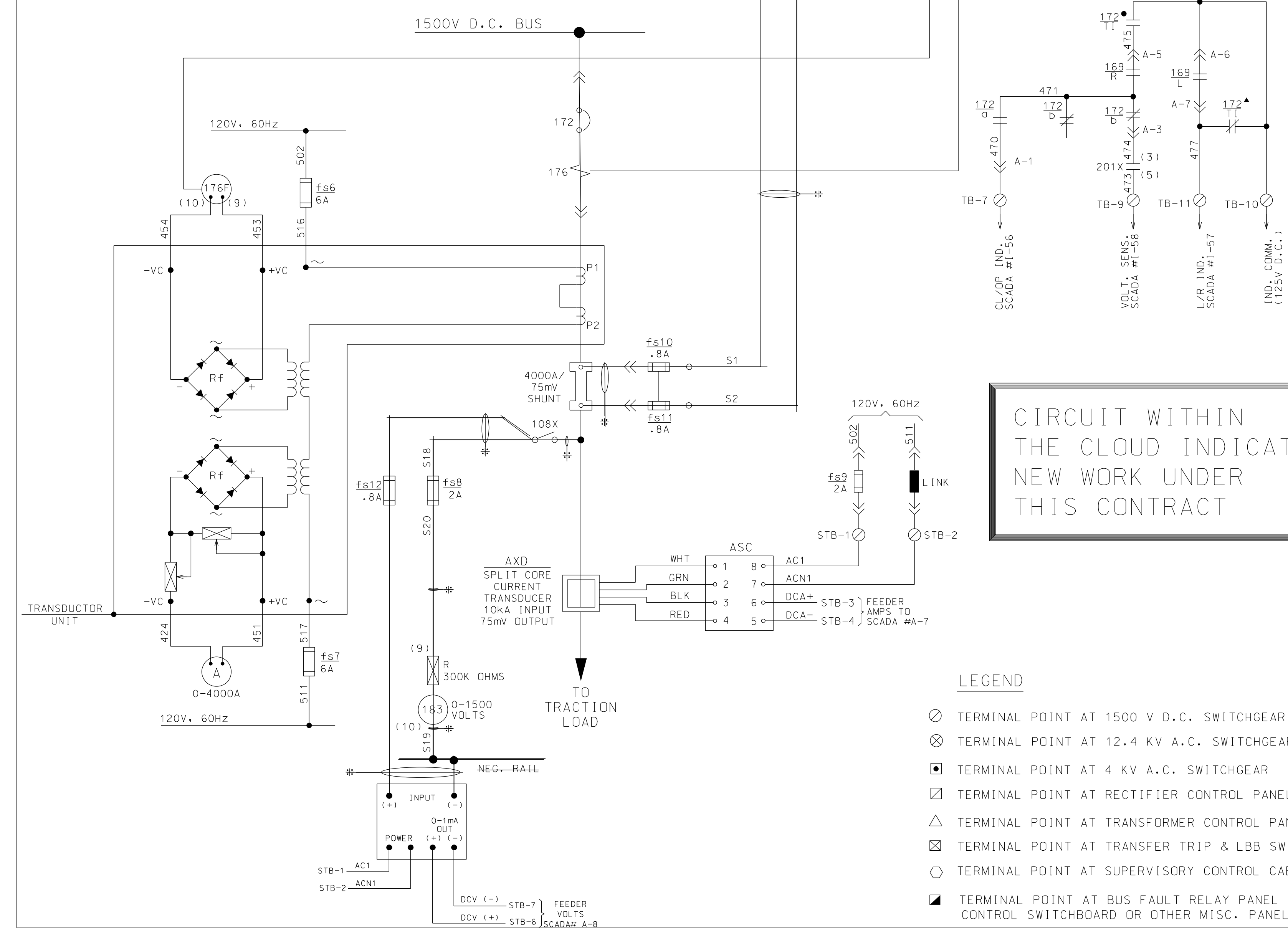
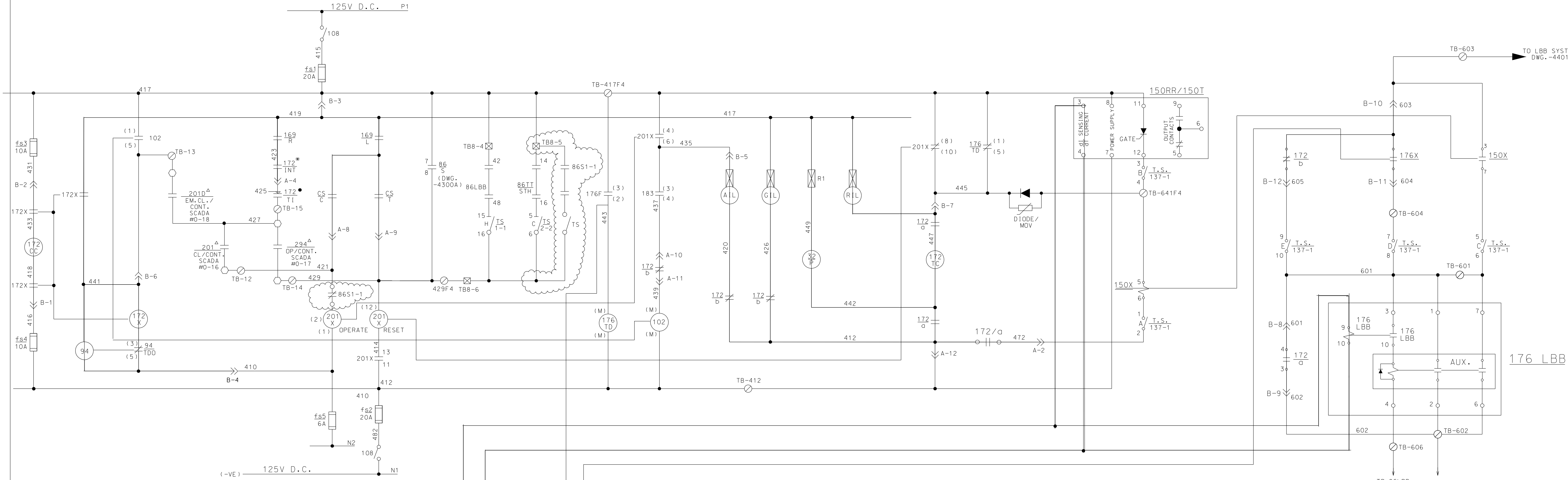
| REV | DATE     | DESCRIPTION                 | BY     |
|-----|----------|-----------------------------|--------|
| -   | 07/28/17 | ISSUED FOR BID              | HS     |
| -   | 7/11     | MINOR CORRECTIONS           | LB WPS |
| -   | 2/06     | MINOR CORRECTIONS           | WPS    |
| -   | 9/04     | GENERAL REVISION            | WPS    |
| -   | 5/03     | FIELD CORRECTIONS, AS-BUILT | WPS    |
| -   | 1/00     | ISSUED FOR SCADA AS-BUILT   | WPS    |

|   |       |               |          |
|---|-------|---------------|----------|
| SCALE: NONE   |       | DATE:         |          |
| CAD FILE NUMBER: F:\e\sc\1\eml\95\hst\hyb\4302a.hyb |       |               |          |
| DESIGNED  | DRAWN | CHECKED       | APPROVED |
| -   | RC    | WPS           | WPS      |
| DISTRICT  |       | PRINT NUMBER  |          |
| M.E.D.  |       | SS-11.9-4302A |          |

**Metra** ENGINEERING DEPARTMENT  
CHICAGO, ILLINOIS

1500V D.C. SWITCHGEAR  
D.C. FDR. BKR. SEC. NO.136. CUB. NO.7  
SCHEMATIC DIAGRAM

95th STREET TIE STATION



CIRCUIT WITHIN THE CLOUD INDICATES NEW WORK UNDER THIS CONTRACT

**NOTES:**

- CONTACT CLOSED IN CONNECTED POSITION OF BREAKER
- ▲ CONTACT OPEN IN CONNECTED POSITION OF BREAKER
- \* CONTACT CLOSED WHEN INTERLOCK LEVER IN DOWN POSITION
- △ EQUIPMENT IN SUPERVISORY CABINET
- ⊠ THESE WIRES TO BE SEGREGATED AND RUN SEPARATELY.
- FOR 1500V D.C. WIRING USE A.E.L. 50/0.25mm 3KV (WORKING) BLACK WIRE
- ALL WIRING TO END OF WITH HELLERMAN PRE-INSULATED TWIN GRIP TERMINALS.
- FOR 125V D.C. AND 120V A.C. WIRING USE STANDARD 7/0.67mm GREY WIRE

- LEGEND**
- TERMINAL POINT AT 1500 V D.C. SWITCHGEAR
  - ⊗ TERMINAL POINT AT 12.4 KV A.C. SWITCHGEAR
  - ⊠ TERMINAL POINT AT 4 KV A.C. SWITCHGEAR
  - ⊡ TERMINAL POINT AT RECTIFIER CONTROL PANEL
  - △ TERMINAL POINT AT TRANSFORMER CONTROL PANEL
  - ⊞ TERMINAL POINT AT TRANSFER TRIP & LBB SWITCHBOARD
  - TERMINAL POINT AT SUPERVISORY CONTROL CABINET
  - ⊠ TERMINAL POINT AT BUS FAULT RELAY PANEL OR CONTROL SWITCHBOARD OR OTHER MISC. PANELS.

**DEVICE LEGEND**

| REFERENCE | DESCRIPTION  |
|-----------|--|
| A         | AMMETER, 0-4000A (0-2AFSD) RECT. MOVING COIL LONG SCALE  |
| A1L       | AMBER INDICATION LAMP - AUTO CLOSE IN OPERATION, 125V    |
| ASC       | D.C. CURRENT SIGNAL CONDITIONER                          |
| AXD       | SPLIT CORE D.C. CURRENT TRANSDUCER                       |
| C         | CLOSE  |
| CC        | CLOSING COIL   |
| CS        | CONTROL SWITCH, TRIP-NEUTRAL-CLOSE                       |
| DCCT      | D.C. CURRENT TRANSDUCER, 3000/1A, 120V, 60HZ             |
| DCSC      | D.C. CURRENT SIGNAL CONDITIONER                          |
| DCVC      | D.C. VOLTS CALIBRATOR                                    |
| DCVT      | D.C. VOLTS TRANSDUCER                                    |
| DIODE/MOV | DIRECTIONAL BLOCKING DIODE/METAL OXIDE VARISTOR          |
| GIL       | GREEN INDICATION LAMP - C.B. OPEN, 125V                  |
| I.C.T.    | IMPULSE TYPE CURRENT TRANSFORMER                         |
| L         | LOCAL CONTROL MODE                                       |
| LBB       | LOCAL BREAKER BACKUP                                     |
| OP        | OPERATE  |
| R         | REMOTE CONTROL MODE                                      |
| RE        | RESET  |
| RIL       | RED INDICATION LAMP - C.B. CLOSED, 125V                  |
| SHUNT     | SWITCHBOARD D.C. SHUNT                                   |
| T         | TRIP   |
| TL        | TEST LINK  |
| T.S.      | TEST SWITCH  |
| TT        | TRANSFER TRIP  |
| V         | VOLTMETER, 0-2000V MOVING COIL LONG SCALE DIRECT READING |
| VR1       | ATTENUATOR, 20W, 0.2 OHM VARIABLE                        |
| VXD       | FEEDER VOLTAGE TRANSDUCER                                |

**DEVICE LEGEND**

| DEVICE | DESCRIPTION   |
|--------|---|
| 30LBB  | LBB ANNUNCIATOR TARGET RELAY                                  |
| 32P    | POLARIZING COIL FOR 176 TRIPPING 125V D.C. 2 X 50 OHM COILS   |
| 32X    | FLAG INDICATION RELAY FOR LOSS OF 32P VOLTAGE                 |
| 62LBB  | LBB TIMING RELAY 0.1 - 6.0 SEC.                               |
| 64D2   | GROUND FAULT SENSING RELAY (BUS 2)                            |
| 64XX   | AUX. RELAY FOR GROUND FAULT TRANSFER TRIP                     |
| 86/S   | LOCKOUT RELAY   |
| 86LBB  | BREAKER BACKUP LOCKOUT RELAY (MANUAL RESET)                   |
| 86TT   | TRANSFER TRIP LOCKOUT RELAY (ELECT. RESET)                    |
| 94     | CLOSING COIL CUT OFF (ANTI-PUMP) RELAY, 125V D.C., 7000 OHMS  |
| 94TT   | TRANSFER TRIP OUTPUT RELAY                                    |
| 102    | RE-CLOSING TIMER  |
| 108    | 125V D.C. CONTROL ISOLATOR                                    |
| 108X   | 1500V D.C. VOLTAGE MEASURING ISOLATOR                         |
| 127    | A.C. SUPPLY CHANGE OVER RELAY                                 |
| 150RR  | RATE OF RISE OVERCURRENT RELAY "SWARTZ"                       |
| 150T   | TIME OVERCURRENT RELAY  |
| 150X   | AUXILIARY RELAY FOR LBB ON 150RR/150T                         |
| 169    | LOCAL - REMOTE SWITCH   |
| 172    | D.C. FEEDER BREAKER   |
| 172a-b | BREAKER OPEN-CLOSE STATUS SWITCH                              |
| 172CC  | BREAKER CLOSING COIL, 125V D.C., 1.0 OHM                      |
| 172T   | BREAKER CARRIAGE POSITION SWITCH                              |
| 172TC  | SHUNT TRIP COIL, 125V D.C., 20 OHMS                           |
| 172X   | AUXILIARY CLOSING CONTACTOR, 125V D.C., 650 OHMS              |
| 176    | MAGNETIC SERIES TRIP O/C DEVICE CAL. 3,5-4-5-6-7-8            |
| 176F   | O/C RELAY (0-6000A, SCALE) 120V, 60HZ, HIGH SET POINT         |
| 176LBB | LBB D.C. CURRENT SENSING RELAY                                |
| 176TD  | O/C RL.T. TIMER, 125V D.C. (SET AT 20 SEC.) IN CASE WITH 176F |
| 176X   | AUXILIARY RELAY FOR MAGNETIC SERIES TRIP                      |
| 183    | VOLTAGE MEASURING TRANSFER RELAY                              |
| 201    | SUPERVISORY CLOSE RELAY (REMOTE CONTACT)                      |
| 201D   | EMERGENCY CLOSE RELAY (REMOTE CONTACT)                        |
| 201X   | BREAKER MASTER CONTROL RELAY (LATCHING TYPE)                  |
| 294    | SUPERVISORY TRIP RELAY (REMOTE CONTACT)                       |
| 301TT  | CONTROL SWITCH (OR TRANSFER TRIP BY-PASS)                     |

BY LDP

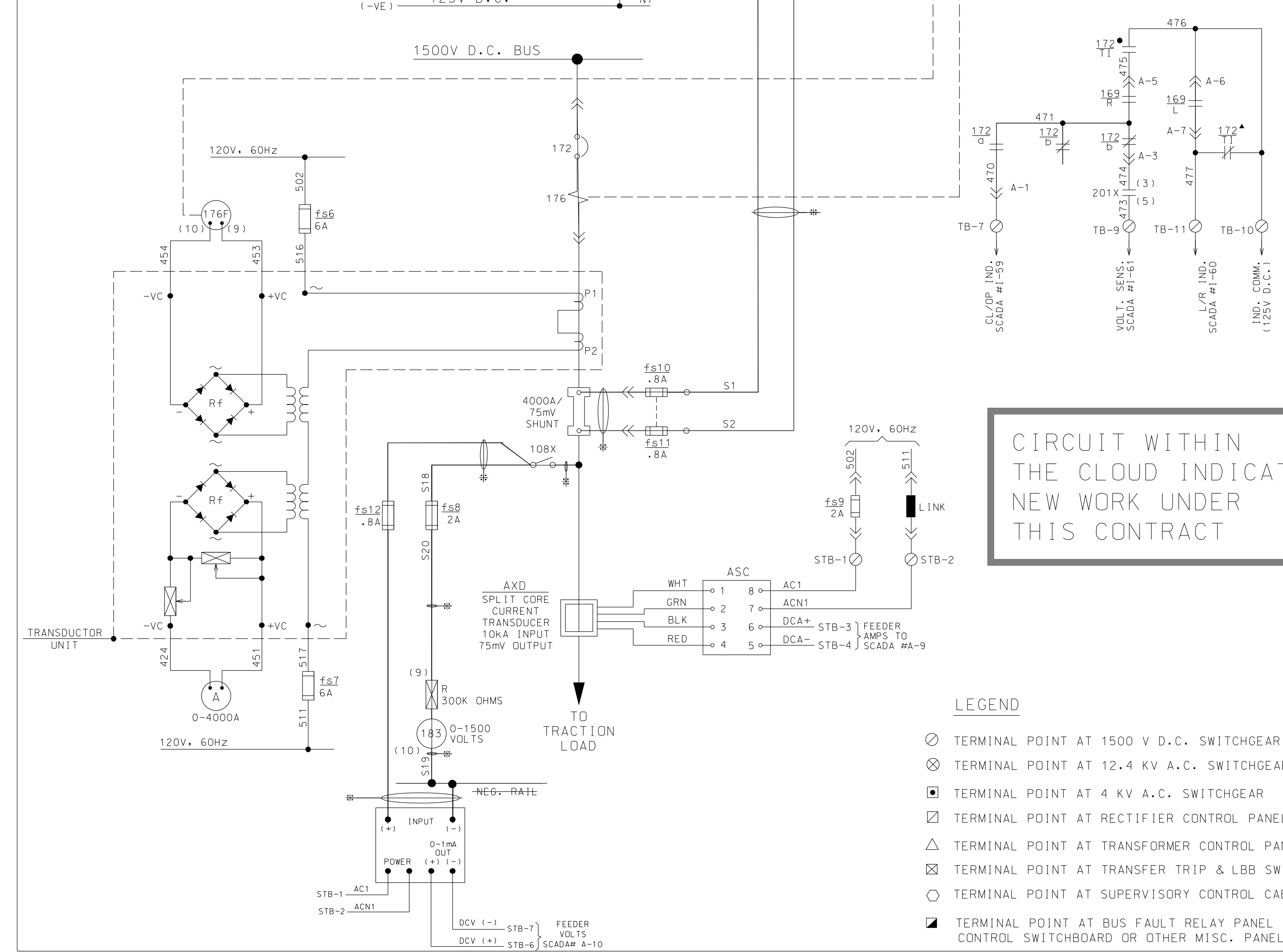
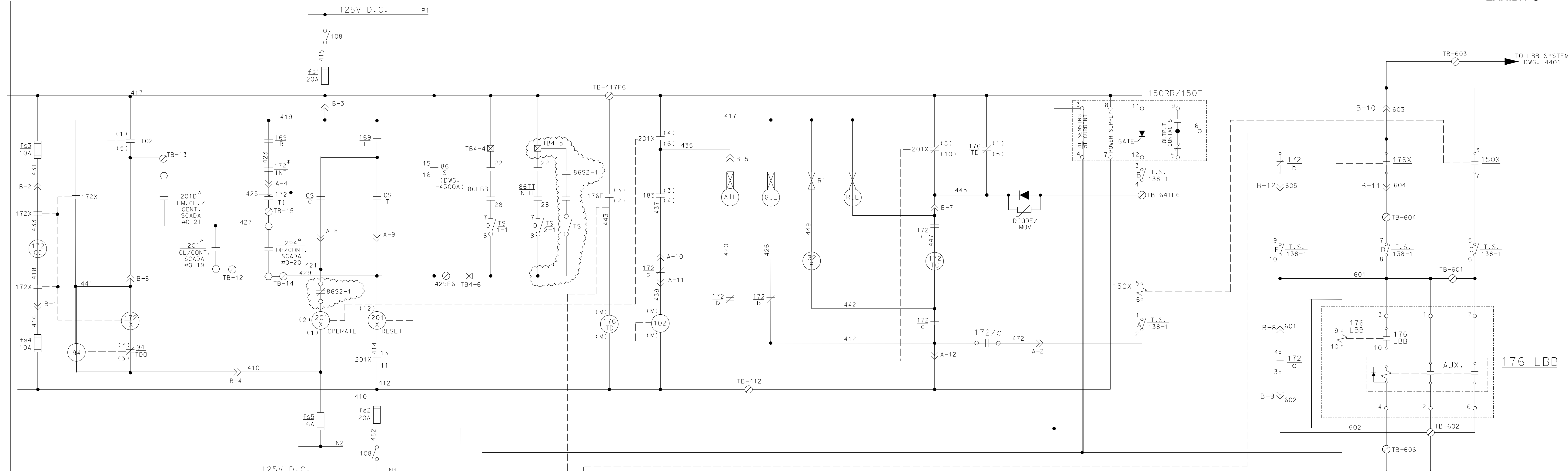
| REV | DATE     | DESCRIPTION                 | BY     |
|-----|----------|-----------------------------|--------|
| -   | 07/28/17 | ISSUED FOR BID              | HS     |
| -   | 7/11     | MINOR CORRECTIONS           | LB WPS |
| -   | 2/06     | MINOR CORRECTIONS           | WPS    |
| -   | 9/04     | GENERAL REVISION            | WPS    |
| -   | 5/03     | FIELD CORRECTIONS, AS-BUILT | WPS    |
| -   | 1/00     | ISSUED FOR SCADA AS-BUILT   | WPS    |

|          |       |               |          |
|----------|-------|---------------|----------|
| DESIGNED | DRAWN | CHECKED       | APPROVED |
|          | RC    | WPS           | WPS      |
| DISTRICT |       | PRINT NUMBER  |          |
| M.E.D.   |       | SS-11.9-4303A |          |

**Metra** ENGINEERING DEPARTMENT  
CHICAGO, ILLINOIS

1500V D.C. SWITCHGEAR  
D.C. FDR. BKR. SEC. NO.137. CUB. NO.4  
SCHEMATIC DIAGRAM

95th STREET TIE STATION



**NOTES:**

- CONTACT CLOSED IN CONNECTED POSITION OF BREAKER
- ▲ CONTACT OPEN IN CONNECTED POSITION OF BREAKER
- \* CONTACT CLOSED WHEN INTERLOCK LEVER IN DOWN POSITION
- ▲ EQUIPMENT IN SUPERVISORY CABINET
- ~~≠ THESE WIRES TO BE SEGREGATED AND RUN SEPARATELY.~~
- FOR 1500V D.C. WIRING USE A.E.L. 50/0.25mm 3KV (WORKING) BLACK WIRE
- ALL WIRING TO END OF WITH HEILERMANN PRE-INSULATED TWIN GRIP TERMINALS.

FOR 125V D.C. AND 120V A.C. WIRING USE STANDARD 7/0.67mm GREY WIRE

CIRCUIT WITHIN THE CLOUD INDICATES NEW WORK UNDER THIS CONTRACT

**DEVICE LEGEND**

| REFERENCE | DESCRIPTION  |
|-----------|--|
| A         | AMMETER, 0-4000A (0-2AFSD) RECT. MOVING COIL LONG SCALE  |
| AIL       | AMBER INDICATION LAMP - AUTO CLOSE IN OPERATION, 125V    |
| ASC       | D.C. CURRENT SIGNAL CONDITIONER                          |
| AXD       | SPLIT CORE D.C. CURRENT TRANSDUCER                       |
| C         | CLOSE  |
| CC        | CLOSING COIL   |
| CS        | CONTROL SWITCH, TRIP-NEUTRAL-CLOSE                       |
| DCCT      | D.C. CURRENT TRANSDUCER, 3000/1A, 120V, 60Hz             |
| DCSC      | D.C. CURRENT SIGNAL CONDITIONER                          |
| DCVC      | D.C. VOLTS CALIBRATOR                                    |
| DCVT      | D.C. VOLTS TRANSDUCER                                    |
| DIODE/MOV | DIRECTIONAL BLOCKING DIODE/METAL OXIDE VARISTOR          |
| GIL       | GREEN INDICATION LAMP - C.B. OPEN, 125V                  |
| I.C.T.    | IMPULSE TYPE CURRENT TRANSFORMER                         |
| L         | LOCAL CONTROL MODE                                       |
| LBB       | LOCAL BREAKER BACKUP                                     |
| OP        | OPERATE  |
| R         | REMOTE CONTROL MODE                                      |
| RE        | RESET  |
| RIL       | RED INDICATION LAMP - C.B. CLOSED, 125V                  |
| SHUNT     | SWITCHBOARD D.C. SHUNT                                   |
| T         | TRIP   |
| TL        | TEST LINK  |
| T.S.      | TEST SWITCH  |
| TT        | TRANSFER TRIP  |
| V         | VOLTMETER, 0-2000V MOVING COIL LONG SCALE DIRECT READING |
| VR1       | ATTENUATOR, 20W, 0.2 OHM VARIABLE                        |
| VXD       | FEEDER VOLTAGE TRANSDUCER                                |

- LEGEND**
- TERMINAL POINT AT 1500 V D.C. SWITCHGEAR
  - ⊗ TERMINAL POINT AT 12.4 KV A.C. SWITCHGEAR
  - ◼ TERMINAL POINT AT 4 KV A.C. SWITCHGEAR
  - ☒ TERMINAL POINT AT RECTIFIER CONTROL PANEL
  - △ TERMINAL POINT AT TRANSFORMER CONTROL PANEL
  - ⊠ TERMINAL POINT AT TRANSFER TRIP & LBB SWITCHBOARD
  - TERMINAL POINT AT SUPERVISORY CONTROL CABINET
  - ◼ TERMINAL POINT AT BUS FAULT RELAY PANEL OR CONTROL SWITCHBOARD OR OTHER MISC. PANELS.

**DEVICE LEGEND**

| DEVICE | DESCRIPTION   |
|--------|---|
| 30LBB  | LBB ANNUNCIATOR TARGET RELAY                                  |
| 32P    | POLARIZING COIL FOR 176 TRIPPING 125V D.C. 2 X 50 OHM COILS   |
| 32X    | FLAG INDICATION RELAY FOR LOSS OF 32P VOLTAGE                 |
| 62LBB  | LBB TIMING RELAY 0.1 - 6.0 SEC.                               |
| 64D2   | GROUND FAULT SENSING RELAY (BUS 2)                            |
| 64XX   | AUX. RELAY FOR GROUND FAULT TRANSFER TRIP                     |
| 86/S   | LOCKOUT RELAY   |
| 86LBB  | BREAKER BACKUP LOCKOUT RELAY (MANUAL RESET)                   |
| 86TT   | TRANSFER TRIP LOCKOUT RELAY (ELECT. RESET)                    |
| 94     | CLOSING COIL CUT OFF (ANTI-PUMP) RELAY, 125V D.C., 7000 OHMS  |
| 94TT   | TRANSFER TRIP OUTPUT RELAY                                    |
| 102    | RE-CLOSING TIMER  |
| 108    | 125V D.C. CONTROL ISOLATOR                                    |
| 108X   | 1500V D.C. VOLTAGE MEASURING ISOLATOR                         |
| 127    | A.C. SUPPLY CHANGE OVER RELAY                                 |
| 150RR  | RATE OF RISE OVERCURRENT RELAY "SWARTZ"                       |
| 150T   | TIME OVERCURRENT RELAY  |
| 150X   | AUXILIARY RELAY FOR LBB ON 150RR/150T                         |
| 169    | LOCAL - REMOTE SWITCH   |
| 172    | D.C. FEEDER BREAKER   |
| 172a-b | BREAKER OPEN-CLOSE STATUS SWITCH                              |
| 172CC  | BREAKER CLOSING COIL, 125V D.C., 1.0 OHM                      |
| 172TI  | BREAKER CARRIAGE POSITION SWITCH                              |
| 172TC  | SHUNT TRIP COIL, 125V D.C., 20 OHMS                           |
| 172X   | AUXILIARY CLOSING CONTACTOR, 125V D.C., 650 OHMS              |
| 176    | MAGNETIC SERIES TRIP O/C DEVICE CAL. 3,5-4-5-6-7-8            |
| 176F   | O/C RELAY (0-6000A. SCALE) 120V, 60Hz, HIGH SET POINT         |
| 176LBB | LBB D.C. CURRENT SENSING RELAY                                |
| 176TD  | O/C RL.T. TIMER, 125V D.C. (SET AT 20 SEC.) IN CASE WITH 176F |
| 176X   | AUXILIARY RELAY FOR MAGNETIC SERIES TRIP                      |
| 183    | VOLTAGE MEASURING TRANSFER RELAY                              |
| 201    | SUPERVISORY CLOSE RELAY (REMOTE CONTACT)                      |
| 201D   | EMERGENCY CLOSE RELAY (REMOTE CONTACT)                        |
| 201X   | BREAKER MASTER CONTROL RELAY (LATCHING TYPE)                  |
| 294    | SUPERVISORY TRIP RELAY (REMOTE CONTACT)                       |
| 301TT  | CONTROL SWITCH (OR TRANSFER TRIP BY-PASS)                     |

BY LDP

| REV | DATE     | DESCRIPTION                 | BY     |
|-----|----------|-----------------------------|--------|
| -   | 07/28/17 | ISSUED FOR BID              | HS     |
| -   | 7/11     | MINOR CORRECTIONS           | LB WPS |
| -   | 2/06     | MINOR CORRECTIONS           | WPS    |
| -   | 9/04     | GENERAL REVISION            | WPS    |
| -   | 5/03     | FIELD CORRECTIONS, AS-BUILT | WPS    |
| -   | 1/00     | ISSUED FOR SCADA AS-BUILT   | WPS    |

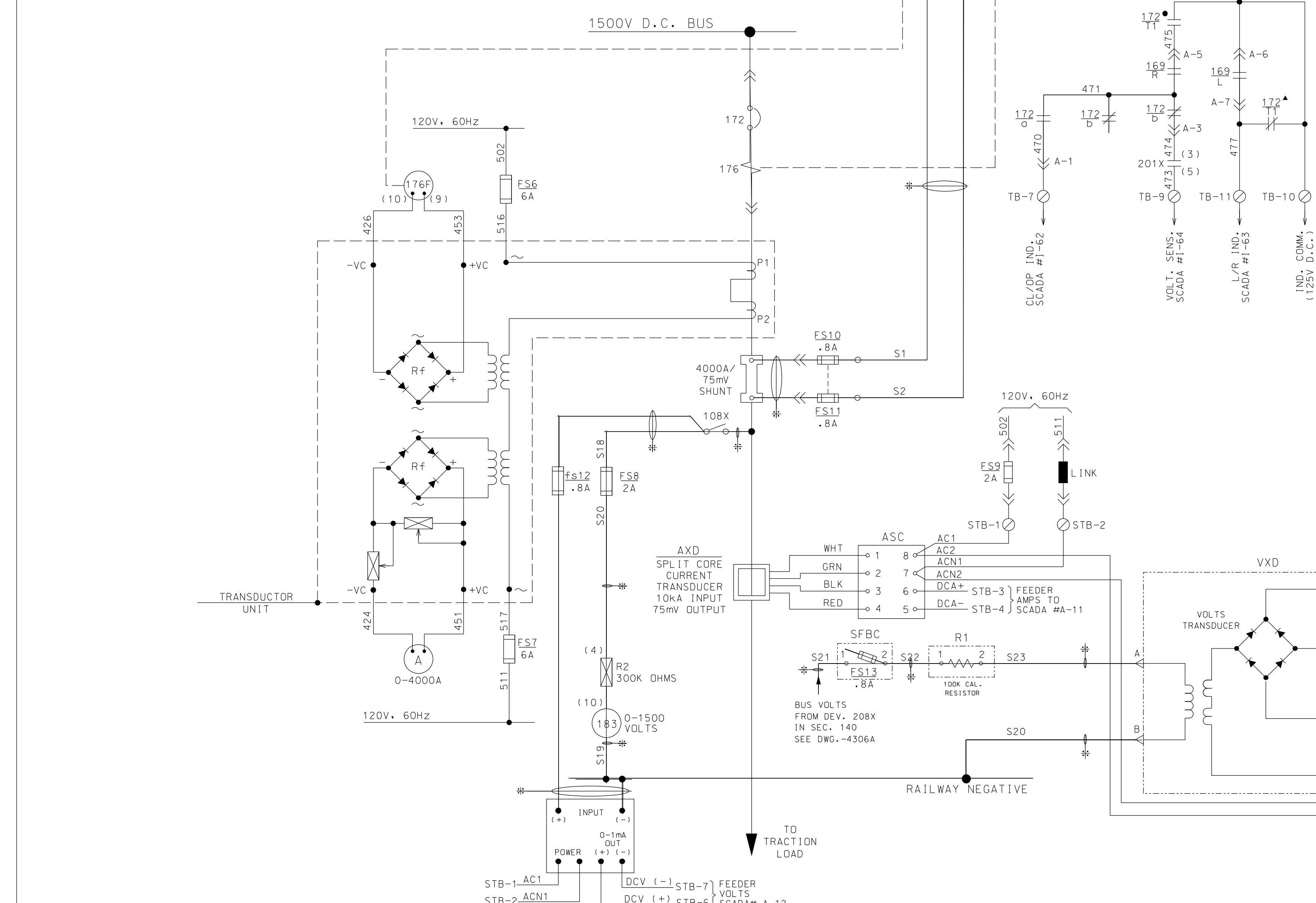
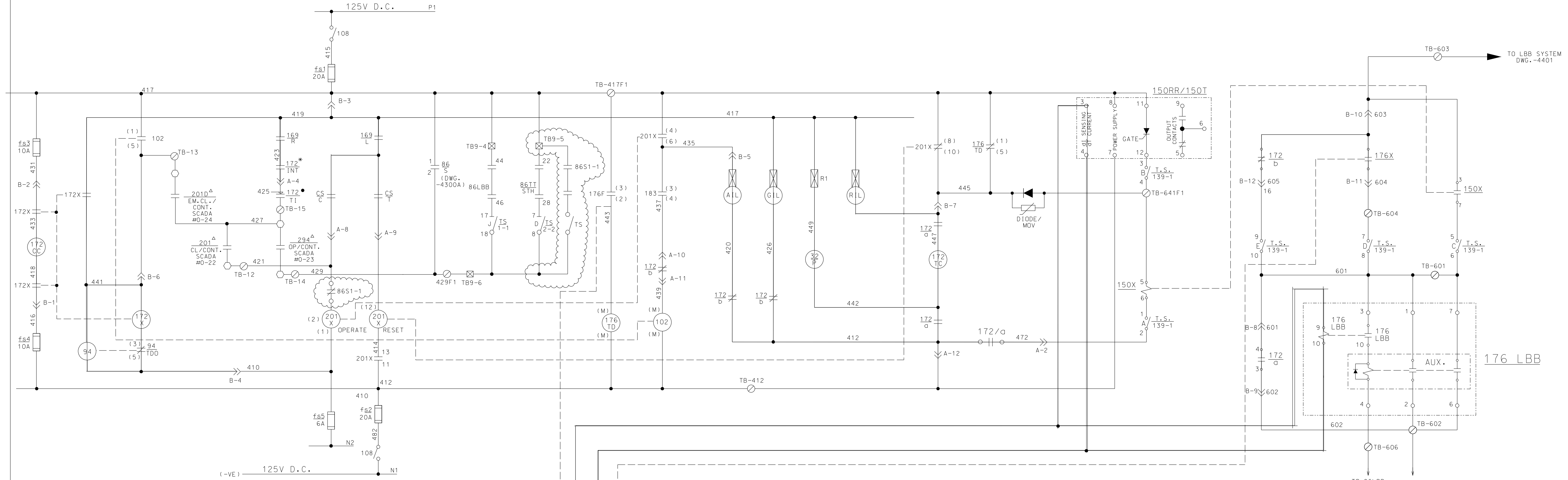
**Metra** ENGINEERING DEPARTMENT  
CHICAGO, ILLINOIS

1500V D.C. SWITCHGEAR  
D.C. FDR. BKR. SEC. NO.138. CUB. NO.6  
SCHEMATIC DIAGRAM

95th STREET TIE STATION

SCALE: NONE DATE: \_\_\_\_\_  
 CAD FILE NUMBER: T:\scadr\1col1\eml\95hst\hyb\4304a.hyb -  
 DESIGNED: RC DRAWN: WPS CHECKED: WPS APPROVED: WPS  
 DISTRICT: M.E.D. PRINT NUMBER: SS-11.9-4304A





**NOTES:**

- CONTACT CLOSED IN CONNECTED POSITION OF BREAKER
- ▲ CONTACT OPEN IN CONNECTED POSITION OF BREAKER
- \* CONTACT CLOSED WHEN INTERLOCK LEVER IN DOWN POSITION
- ▲ EQUIPMENT IN SUPERVISORY CABINET
- THESE WIRES TO BE SEGREGATED AND RUN SEPARATELY.

FOR 1500V D.C. WIRING USE A.E.T. 50/0.25mm 3KV (WORKING) BLACK WIRE  
 ALL WIRING TO END OF WITH HELLERMAN PRE-INSULATED TWIN GRIP TERMINALS.

FOR 125V D.C. AND 120V A.C. WIRING USE STANDARD 7/0.67mm GREY WIRE

CIRCUIT WITHIN THE CLOUD INDICATES NEW WORK UNDER THIS CONTRACT

**DEVICE LEGEND**

| DEVICE | DESCRIPTION  |
|--------|--|
| 30LBB  | LBB ANNUNCIATOR TARGET RELAY                                 |
| 32P    | POLARIZING COIL FOR 176 TRIPPING 125V D.C. 2 X 50 OHM COILS  |
| 32X    | FLAG INDICATION RELAY FOR LOSS OF 32P VOLTAGE                |
| 62LBB  | LBB TIMING RELAY 0.1 - 6.0 SEC.                              |
| 64D2   | GROUND FAULT SENSING RELAY (BUS 2)                           |
| 64XX   | AUX. RELAY FOR GROUND FAULT TRANSFER TRIP                    |
| 86/S   | LOCKOUT RELAY  |
| 86LBB  | BREAKER BACKUP LOCKOUT RELAY (MANUAL RESET)                  |
| 86TT   | TRANSFER TRIP LOCKOUT RELAY (ELECT. RESET)                   |
| 94     | CLOSING COIL CUT OFF (ANTI-PUMP) RELAY. 125V D.C. 7000 OHMS  |
| 94TT   | TRANSFER TRIP OUTPUT RELAY                                   |
| 102    | RE-CLOSING TIMER   |
| 127    | A.C. SUPPLY CHANGE OVER RELAY                                |
| 150RR  | RATE OF RISE OVERCURRENT RELAY                               |
| 150T   | TIME OVERCURRENT RELAY                                       |
| 150X   | AUXILIARY RELAY FOR LBB ON 150RR/150T                        |
| 169    | LOCAL - REMOTE SWITCH  |
| 172    | D.C. FEEDER BREAKER  |
| 172a-b | BREAKER OPEN-CLOSE STATUS SWITCH                             |
| 172C   | BREAKER CLOSING COIL - 125V D.C. 1.0 OHM                     |
| 172T   | BREAKER CARRIAGE POSITION SWITCH                             |
| 172TC  | SHUNT TRIP COIL. 125V D.C. 20 OHMS                           |
| 172X   | AUXILIARY CLOSING CONTACTOR. 125V D.C. 650 OHMS              |
| 176    | MAGNETIC SERIES TRIP O/C DEVICE CAL. 3.5-4-5-6-7-8           |
| 176F   | O/C RELAY (0-6000A. SCALE) 120V. 60HZ. HIGH SET POINT        |
| 176LBB | LBB D.C. CURRENT SENSING RELAY                               |
| 176TD  | O/C RLT. TIMER. 125V D.C. (SET AT 20 SEC.) IN CASE WITH 176F |
| 176X   | AUXILIARY RELAY FOR MAGNETIC SERIES TRIP                     |
| 183    | VOLTAGE MEASURING TRANSFER RELAY                             |
| 201    | SUPERVISORY CLOSE RELAY (REMOTE CONTACT)                     |
| 201D   | EMERGENCY CLOSE RELAY (REMOTE CONTACT)                       |
| 201X   | BREAKER MASTER CONTROL RELAY (LATCHING TYPE)                 |
| 294    | SUPERVISORY TRIP RELAY (REMOTE CONTACT)                      |
| 301TT  | CONTROL SWITCH (OR TRANSFER TRIP BY-PASS)                    |

**DEVICE LEGEND**

| REFERENCE | DESCRIPTION  |
|-----------|--|
| A         | AMMETER, 0-6000A (0-2AFSD) RECT. MOVING COIL LONG SCALE  |
| AIL       | AMBER INDICATION LAMP - AUTO CLOSE IN OPERATION. 125V    |
| ASC       | D.C. CURRENT SIGNAL CONDITIONER                          |
| AXD       | SPLIT CORE D.C. CURRENT TRANSDUCER                       |
| C         | CLOSE  |
| CC        | CLOSING COIL   |
| CS        | CONTROL SWITCH. TRIP-NEUTRAL-CLOSE                       |
| DCCT      | D.C. CURRENT TRANSFORMER. 3000/1A. 120V. 60HZ            |
| DCSC      | D.C. CURRENT SIGNAL CONDITIONER                          |
| DCVC XCA  | D.C. VOLTS CALIBRATOR                                    |
| DCVT      | D.C. VOLTS TRANSDUCER                                    |
| DIODE/MOV | DIRECTIONAL BLOCKING DIODE/METAL OXIDE VARISTOR          |
| GIL       | GREEN INDICATION LAMP - C.B. OPEN. 125V                  |
| I.C.T.    | IMPULSE TYPE CURRENT TRANSFORMER                         |
| L         | LOCAL CONTROL MODE                                       |
| LBB       | LOCAL BREAKER BACKUP                                     |
| OP        | OPERATE  |
| R         | REMOTE CONTROL MODE                                      |
| RESET     | RESET  |
| RIL       | RED INDICATION LAMP - C.B. CLOSED. 125V                  |
| SHUNT     | SWITCHBOARD D.C. SHUNT                                   |
| T         | TRIP   |
| TL        | TEST LINK  |
| T.S.      | TEST SWITCH  |
| TT        | TRANSFER TRIP  |
| V         | VOLTMETER, 0-2000V MOVING COIL LONG SCALE DIRECT READING |
| VR1       | ATTENUATOR, 20W. 0.2 OHM VARIABLE                        |
| VXD       | FEEDER VOLTAGE TRANSDUCER                                |

**LEGEND**

- TERMINAL POINT AT 1500 V D.C. SWITCHGEAR
- ⊗ TERMINAL POINT AT 12.4 KV A.C. SWITCHGEAR
- TERMINAL POINT AT 4 KV A.C. SWITCHGEAR
- TERMINAL POINT AT RECTIFIER CONTROL PANEL
- △ TERMINAL POINT AT TRANSFORMER CONTROL PANEL
- ◇ TERMINAL POINT AT TRANSFER TRIP & LBB SWITCHBOARD
- TERMINAL POINT AT SUPERVISORY CONTROL CABINET
- TERMINAL POINT AT BUS FAULT RELAY PANEL OR CONTROL SWITCHBOARD OR OTHER MISC. PANELS.

| REV | DATE     | DESCRIPTION                 | BY     |
|-----|----------|-----------------------------|--------|
| -   | 07/28/17 | ISSUED FOR BID              | HS     |
| -   | 7/11     | MINOR CORRECTIONS           | LB WPS |
| -   | 9/04     | GENERAL REVISION            | WPS    |
| -   | 5/03     | FIELD CORRECTIONS, AS-BUILT | WPS    |
| -   | 1/00     | ISSUED FOR SCADA AS-BUILT   | WPS    |

**Metra** ENGINEERING DEPARTMENT  
CHICAGO, ILLINOIS

1500V D.C. SWITCHGEAR  
D.C. FDR. BKR. SEC. NO.139. CUB. NO.1  
SCHEMATIC DIAGRAM

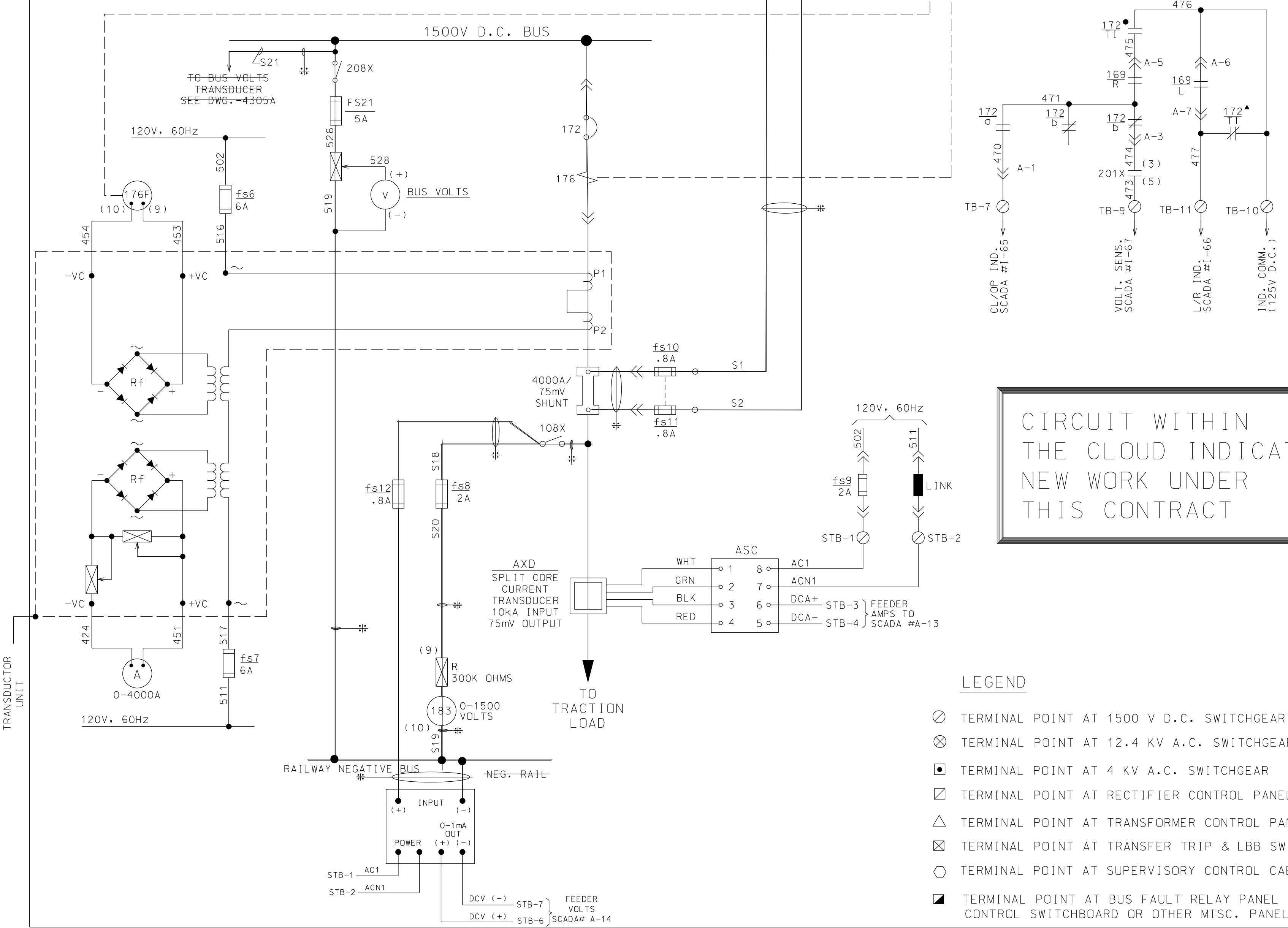
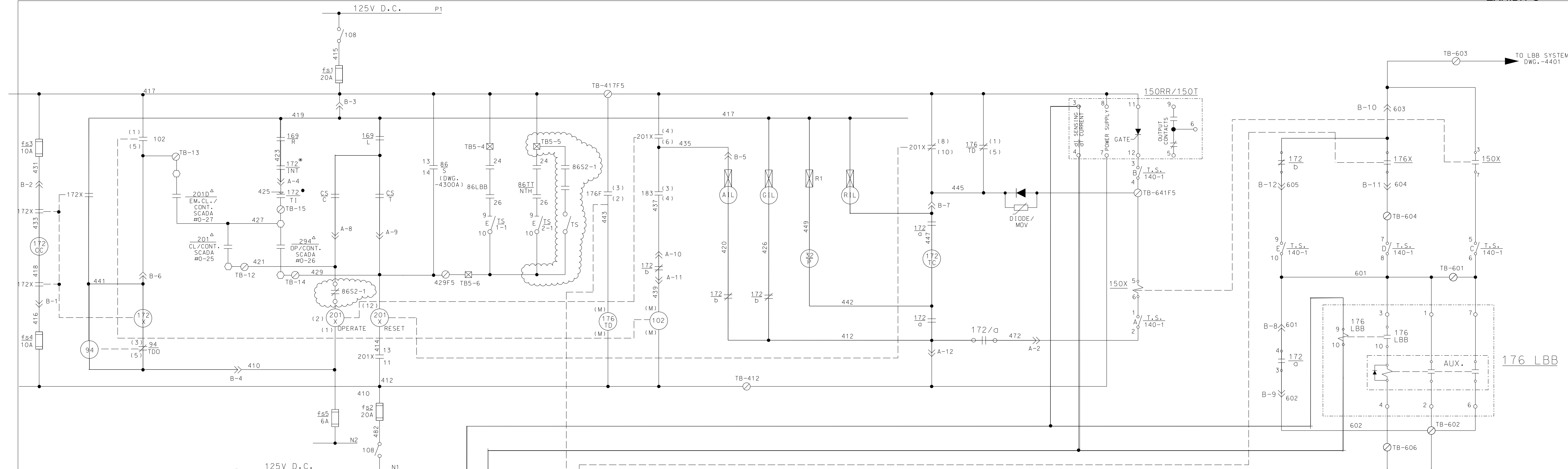
95th STREET TIE STATION

SCALE: NONE DATE: \_\_\_\_\_

DESIGNED: RC DRAWN: \_\_\_\_\_ CHECKED: \_\_\_\_\_ APPROVED: \_\_\_\_\_

DISTRICT: \_\_\_\_\_ PRINT NUMBER: \_\_\_\_\_

M.E.D. SS-11.9-4305A



**NOTES:**

- CONTACT CLOSED IN CONNECTED POSITION OF BREAKER
- ▲ CONTACT OPEN IN CONNECTED POSITION OF BREAKER
- \* CONTACT CLOSED WHEN INTERLOCK LEVER IN DOWN POSITION
- ▲ EQUIPMENT IN SUPERVISORY CABINET
- ⊠ THESE WIRES TO BE SEGREGATED AND RUN SEPARATELY.

FOR 1500V D.C. WIRING USE A.E.I. 50/0.25mm 3KV (WORKING) BLACK WIRE  
 ALL WIRING TO END OF WITH HELLERMAN PRE-INSULATED TWIN GRIP TERMINALS.

FOR 125V D.C. AND 120V A.C. WIRING USE STANDARD 7/0.67mm GREY WIRE

**CIRCUIT WITHIN THE CLOUD INDICATES NEW WORK UNDER THIS CONTRACT**

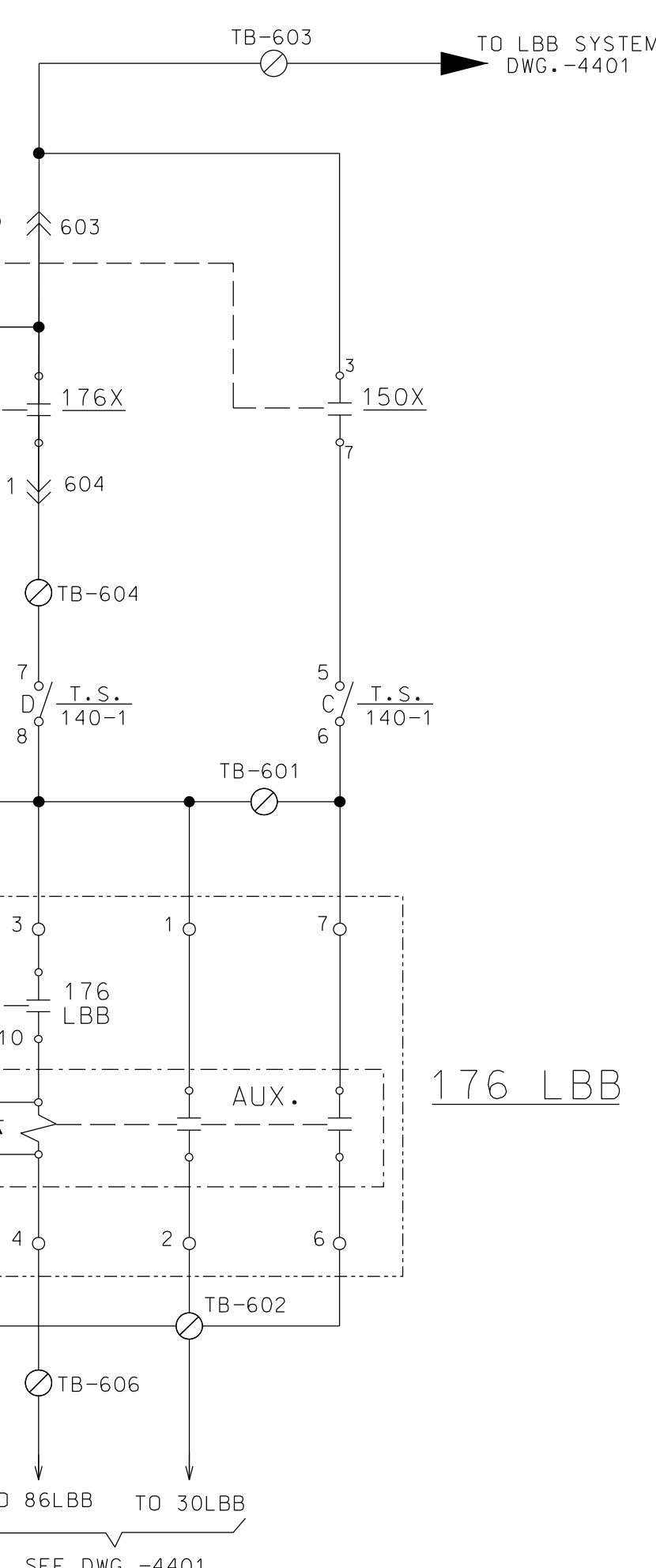
- LEGEND**
- ⊙ TERMINAL POINT AT 1500 V D.C. SWITCHGEAR
  - ⊗ TERMINAL POINT AT 12.4 KV A.C. SWITCHGEAR
  - ⊠ TERMINAL POINT AT 4 KV A.C. SWITCHGEAR
  - ⊡ TERMINAL POINT AT RECTIFIER CONTROL PANEL
  - △ TERMINAL POINT AT TRANSFORMER CONTROL PANEL
  - ⊞ TERMINAL POINT AT TRANSFER TRIP & LBB SWITCHBOARD
  - ⊙ TERMINAL POINT AT SUPERVISORY CONTROL CABINET
  - ⊡ TERMINAL POINT AT BUS FAULT RELAY PANEL OR CONTROL SWITCHBOARD OR OTHER MISC. PANELS.

**DEVICE LEGEND**

| REFERENCE | DESCRIPTION  |
|-----------|--|
| A         | AMMETER, 0-4000A (0-2AFSD) RECT. MOVING COIL LONG SCALE  |
| AIL       | AMBER INDICATION LAMP - AUTO CLOSE IN OPERATION, 125V    |
| ASC       | D.C. CURRENT SIGNAL CONDITIONER                          |
| AXD       | SPLIT CORE D.C. CURRENT TRANSDUCER                       |
| C         | CLOSE  |
| CC        | CLOSING COIL   |
| CS        | CONTROL SWITCH, TRIP-NEUTRAL-CLOSE                       |
| DCCT      | D.C. CURRENT TRANSDUCER, 3000/1A, 120V, 60HZ             |
| DCSC      | D.C. CURRENT SIGNAL CONDITIONER                          |
| DCVC      | D.C. VOLTS CALIBRATOR                                    |
| DCVT      | D.C. VOLTS TRANSDUCER                                    |
| DIODE/MOV | DIRECTIONAL BLOCKING DIODE/METAL OXIDE VARISTOR          |
| GIL       | GREEN INDICATION LAMP - C.B. OPEN, 125V                  |
| I.C.T.    | IMPULSE TYPE CURRENT TRANSFORMER                         |
| L         | LOCAL CONTROL MODE                                       |
| LBB       | LOCAL BREAKER BACKUP                                     |
| OP        | OPERATE  |
| R         | REMOTE CONTROL MODE                                      |
| RE        | RESET  |
| RIL       | RED INDICATION LAMP - C.B. CLOSED, 125V                  |
| SHUNT     | SWITCHBOARD D.C. SHUNT                                   |
| T         | TRIP   |
| TL        | TEST LINK  |
| T.S.      | TEST SWITCH  |
| TT        | TRANSFER TRIP  |
| V         | VOLTMETER, 0-2000V MOVING COIL LONG SCALE DIRECT READING |
| VR1       | ATTENUATOR, 20W, 0.2 OHM VARIABLE                        |
| VXD       | FEEDER VOLTAGE TRANSDUCER                                |

**DEVICE LEGEND**

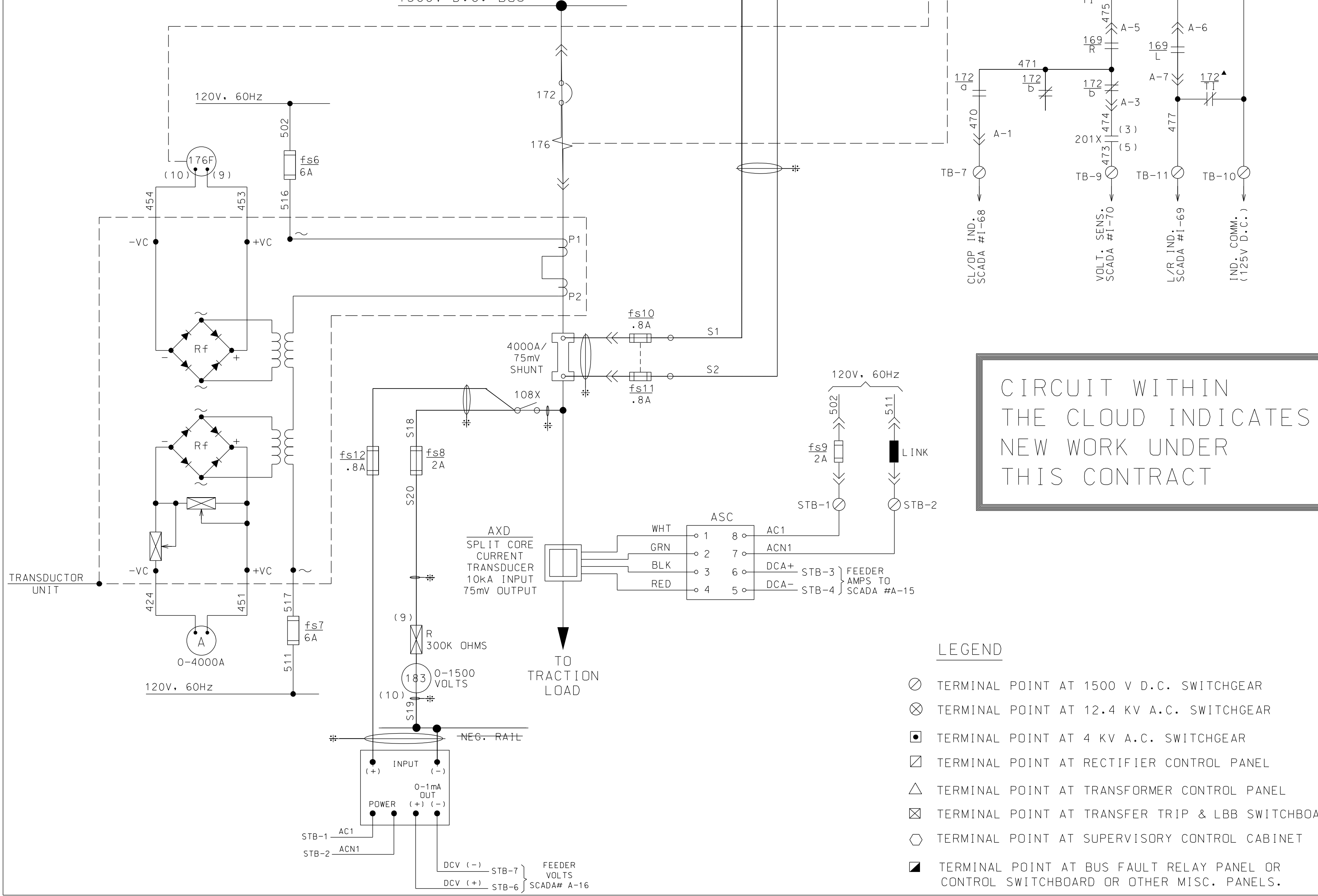
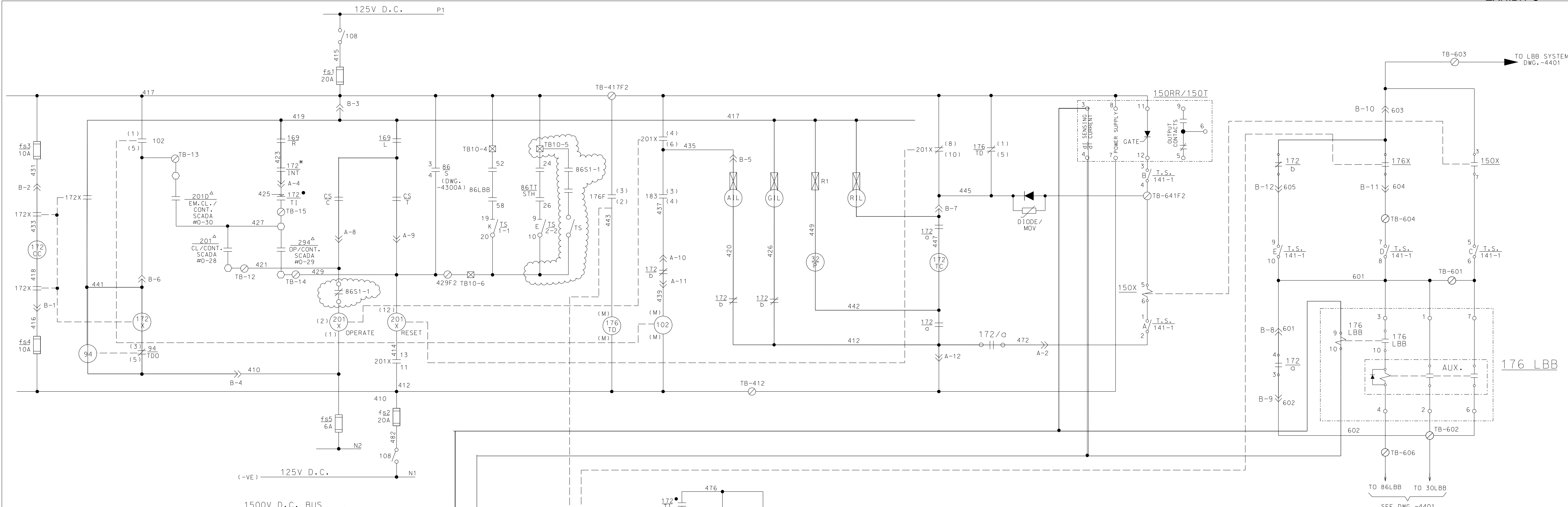
| DEVICE | DESCRIPTION   |
|--------|---|
| 30LBB  | LBB ANNUNCIATOR TARGET RELAY                                  |
| 32P    | POLARIZING COIL FOR 176 TRIPPING 125V D.C. 2 X 50 OHM COILS   |
| 32X    | FLAG INDICATION RELAY FOR LOSS OF 32P VOLTAGE                 |
| 62LBB  | LBB TIMING RELAY 0.1 - 6.0 SEC.                               |
| 64D2   | GROUND FAULT SENSING RELAY (BUS 2)                            |
| 64XX   | AUX. RELAY FOR GROUND FAULT TRANSFER TRIP                     |
| 86/S   | LOCKOUT RELAY   |
| 86LBB  | BREAKER BACKUP LOCKOUT RELAY (MANUAL RESET)                   |
| 86TT   | TRANSFER TRIP LOCKOUT RELAY (ELECT. RESET)                    |
| 94     | CLOSING COIL CUT OFF (ANTI-PUMP) RELAY, 125V D.C., 7000 OHMS  |
| 94TT   | TRANSFER TRIP OUTPUT RELAY                                    |
| 102    | RE-CLOSING TIMER  |
| 108    | 125V D.C. CONTROL ISOLATOR                                    |
| 108X   | 1500V D.C. VOLTAGE MEASURING ISOLATOR                         |
| 127    | A.C. SUPPLY CHANGE OVER RELAY                                 |
| 150RR  | RATE OF RISE OVERCURRENT RELAY "SWARTZ"                       |
| 150T   | TIME OVERCURRENT RELAY  |
| 150X   | AUXILIARY RELAY FOR LBB ON 150RR/150T                         |
| 169    | LOCAL - REMOTE SWITCH   |
| 172    | D.C. FEEDER BREAKER   |
| 172a-b | BREAKER OPEN-CLOSE STATUS SWITCH                              |
| 172CC  | BREAKER CLOSING COIL, 125V D.C., 1.0 OHM                      |
| 172TI  | BREAKER CARRIAGE POSITION SWITCH                              |
| 172TC  | SHUNT TRIP COIL, 125V D.C., 20 OHMS                           |
| 172X   | AUXILIARY CLOSING CONTACTOR, 125V D.C., 650 OHMS              |
| 176    | MAGNETIC SERIES TRIP O/C DEVICE CAL. 3,5-4-5-6-7-8            |
| 176F   | O/C RELAY (0-6000A. SCALE) 120V, 60HZ, HIGH SET POINT         |
| 176LBB | LBB D.C. CURRENT SENSING RELAY                                |
| 176TD  | O/C RL.T. TIMER, 125V D.C. (SET AT 20 SEC.) IN CASE WITH 176F |
| 176X   | AUXILIARY RELAY FOR MAGNETIC SERIES TRIP                      |
| 183    | VOLTAGE MEASURING TRANSFER RELAY                              |
| 201    | SUPERVISORY CLOSE RELAY (REMOTE CONTACT)                      |
| 201E   | EMERGENCY CLOSE RELAY (REMOTE CONTACT)                        |
| 201X   | BREAKER MASTER CONTROL RELAY (LATCHING TYPE)                  |
| 294    | SUPERVISORY TRIP RELAY (REMOTE CONTACT)                       |
| 301TT  | CONTROL SWITCH (OR TRANSFER TRIP BY-PASS)                     |



BY LBB

| REV | DATE     | DESCRIPTION                 | BY     |
|-----|----------|-----------------------------|--------|
| -   | 07/28/17 | ISSUED FOR BID              | HS     |
| -   | 7/11     | MINOR CORRECTIONS           | LB WPS |
| -   | 2/06     | MINOR CORRECTIONS           | WPS    |
| -   | 9/04     | GENERAL REVISION            | WPS    |
| -   | 5/03     | FIELD CORRECTIONS, AS-BUILT | WPS    |
| -   | 1/00     | ISSUED FOR SCADA AS-BUILT   | WPS    |

**Metra** ENGINEERING DEPARTMENT  
 CHICAGO, ILLINOIS  
 1500V D.C. SWITCHGEAR  
 D.C. FDR. BKR. SEC. NO.140. CUB. NO.5  
 SCHEMATIC DIAGRAM  
 95th STREET TIE STATION  
 SCALE: NONE DATE: \_\_\_\_\_  
 CAD FILE NUMBER: I:/e/actr/1col/eml/95hst/hyb/4306a.hyb  
 DESIGNED: RC DRAWN: WPS CHECKED: WPS APPROVED: WPS  
 DISTRICT: M.E.D. PRINT NUMBER: SS-11.9-4306A



CIRCUIT WITHIN THE CLOUD INDICATES NEW WORK UNDER THIS CONTRACT

- NOTES:**
- CONTACT CLOSED IN CONNECTED POSITION OF BREAKER
  - ▲ CONTACT OPEN IN CONNECTED POSITION OF BREAKER
  - \* CONTACT CLOSED WHEN INTERLOCK LEVER IN DOWN POSITION
  - △ EQUIPMENT IN SUPERVISORY CABINET
  - ≡ THESE WIRES TO BE SEGREGATED AND RUN SEPARATELY -
  - FOR 1500V D.C. WIRING USE A.E.I. 50/0.25mm 3KV (WORKING) BLACK WIRE
  - ALL WIRING TO END OF WITH HELLERMAN PRE-INSULATED TWIN GRIP TERMINALS.
- FOR 125V D.C. AND 120V A.C. WIRING USE STANDARD 7/0.67mm GREY WIRE

**DEVICE LEGEND**

| REFERENCE | DESCRIPTION  |
|-----------|--|
| A         | AMMETER, 0-4000A (0-2AFSD) RECT. MOVING COIL LONG SCALE  |
| A1L       | AMBER INDICATION LAMP - AUTO CLOSE IN OPERATION, 125V    |
| ASC       | D.C. CURRENT SIGNAL CONDITIONER                          |
| AXD       | SPLIT CORE D.C. CURRENT TRANSDUCER                       |
| C         | CLOSE  |
| CC        | CLOSING COIL   |
| CS        | CONTROL SWITCH, TRIP-NEUTRAL-CLOSE                       |
| DCCT      | D.C. CURRENT TRANSDUCER, 3000/1A, 120V, 60Hz             |
| DCSC      | D.C. CURRENT SIGNAL CONDITIONER                          |
| DCVC      | D.C. VOLTS CALIBRATOR                                    |
| DCVT      | D.C. VOLTS TRANSDUCER                                    |
| DIODE/MOV | DIRECTIONAL BLOCKING DIODE/METAL OXIDE VARISTOR          |
| GIL       | GREEN INDICATION LAMP - C.B. OPEN, 125V                  |
| I.C.T.    | IMPULSE TYPE CURRENT TRANSFORMER                         |
| L         | LOCAL CONTROL MODE                                       |
| LBB       | LOCAL BREAKER BACKUP                                     |
| OP        | OPERATE  |
| R         | REMOTE CONTROL MODE                                      |
| RE        | RESET  |
| RIL       | RED INDICATION LAMP - C.B. CLOSED, 125V                  |
| SHUNT     | SWITCHBOARD D.C. SHUNT                                   |
| T         | TRIP   |
| TL        | TEST LINK  |
| T.S.      | TEST SWITCH  |
| TT        | TRANSFER TRIP  |
| V         | VOLTMETER, 0-2000V MOVING COIL LONG SCALE DIRECT READING |
| VR1       | ATTENUATOR, 20W, 0.2 OHM VARIABLE                        |
| VXD       | FEEDER VOLTAGE TRANSDUCER                                |

- LEGEND**
- TERMINAL POINT AT 1500 V D.C. SWITCHGEAR
  - ⊗ TERMINAL POINT AT 12.4 KV A.C. SWITCHGEAR
  - ◻ TERMINAL POINT AT 4 KV A.C. SWITCHGEAR
  - ▣ TERMINAL POINT AT RECTIFIER CONTROL PANEL
  - ⊠ TERMINAL POINT AT TRANSFER TRIP & LBB SWITCHBOARD
  - △ TERMINAL POINT AT TRANSFORMER CONTROL PANEL
  - ⊞ TERMINAL POINT AT SUPERVISORY CONTROL CABINET
  - TERMINAL POINT AT BUS FAULT RELAY PANEL OR CONTROL SWITCHBOARD OR OTHER MISC. PANELS.

**DEVICE LEGEND**

| DEVICE | DESCRIPTION   |
|--------|---|
| 30LBB  | LBB ANNUNCIATOR TARGET RELAY                                  |
| 32P    | POLARIZING COIL FOR 176 TRIPPING 125V D.C. 2 X 50 OHM COILS   |
| 32X    | FLAG INDICATION RELAY FOR LOSS OF 32P VOLTAGE                 |
| 62LBB  | LBB TIMING RELAY 0.1 - 6.0 SEC.                               |
| 64D2   | GROUND FAULT SENSING RELAY (BUS 2)                            |
| 64XX   | AUX. RELAY FOR GROUND FAULT TRANSFER TRIP                     |
| 86/S   | LOCKOUT RELAY   |
| 86LBB  | BREAKER BACKUP LOCKOUT RELAY (MANUAL RESET)                   |
| 86TT   | TRANSFER TRIP LOCKOUT RELAY (ELECT. RESET)                    |
| 94     | CLOSING COIL CUT OFF (ANTI-PUMP) RELAY, 125V D.C., 7000 OHMS  |
| 94TT   | TRANSFER TRIP OUTPUT RELAY                                    |
| 102    | RECLOSEING TIMER  |
| 108    | 125V D.C. CONTROL ISOLATOR                                    |
| 108X   | 1500V D.C. VOLTAGE MEASURING ISOLATOR                         |
| 127    | A.C. SUPPLY CHANGE OVER RELAY                                 |
| 150RR  | RATE OF RISE OVERCURRENT RELAY "SWARTZ"                       |
| 150T   | TIME OVERCURRENT RELAY  |
| 150X   | AUXILIARY RELAY FOR LBB ON 150RR/150T                         |
| 169    | LOCAL - REMOTE SWITCH   |
| 172    | D.C. FEEDER BREAKER   |
| 1720-b | BREAKER OPEN-CLOSE STATUS SWITCH                              |
| 172CC  | BREAKER CLOSING COIL, 125V D.C., 1.0 OHM                      |
| 172T   | BREAKER CARRIAGE POSITION SWITCH                              |
| 172TC  | SHUNT TRIP COIL, 125V D.C., 20 OHMS                           |
| 172X   | AUXILIARY CLOSING CONTACTOR, 125V D.C., 650 OHMS              |
| 176    | MAGNETIC SERIES TRIP O/C DEVICE CAL. 3,5-4-5-6-7-8            |
| 176F   | O/C RELAY (0-6000A. SCALE) 120V, 60Hz, HIGH SET POINT         |
| 176LBB | LBB D.C. CURRENT SENSING RELAY                                |
| 176TD  | O/C RL.T. TIMER, 125V D.C. (SET AT 20 SEC.) IN CASE WITH 176F |
| 176X   | AUXILIARY RELAY FOR MAGNETIC SERIES TRIP                      |
| 183    | VOLTAGE MEASURING TRANSFER RELAY                              |
| 201    | SUPERVISORY CLOSE RELAY (REMOTE CONTACT)                      |
| 201D   | EMERGENCY CLOSE RELAY (REMOTE CONTACT)                        |
| 201X   | BREAKER MASTER CONTROL RELAY (LATCHING TYPE)                  |
| 294    | SUPERVISORY TRIP RELAY (REMOTE CONTACT)                       |
| 301TT  | CONTROL SWITCH (OR TRANSFER TRIP BY-PASS)                     |

BY LDP

| REV | DATE     | DESCRIPTION                 | BY     |
|-----|----------|-----------------------------|--------|
| -   | 07/28/17 | ISSUED FOR BID              | HS     |
| -   | 7/11     | MINOR CORRECTIONS           | LB WPS |
| -   | 2/06     | MINOR CORRECTIONS           | WPS    |
| -   | 9/04     | GENERAL REVISION            | WPS    |
| -   | 5/03     | FIELD CORRECTIONS, AS-BUILT | WPS    |
| -   | 1/00     | ISSUED FOR SCADA AS-BUILT   | WPS    |

**Metra** ENGINEERING DEPARTMENT  
CHICAGO, ILLINOIS

1500V D.C. SWITCHGEAR  
D.C. FDR. BKR. SEC. NO.141. CUB. NO.2  
SCHEMATIC DIAGRAM

95th STREET TIE STATION

SCALE: NONE DATE: \_\_\_\_\_  
CAD FILE NUMBER: F:\electr\c01\eml\95thst\hyb\4307a-hyb -  
DESIGNED: \_\_\_\_\_ DRAWN: \_\_\_\_\_ CHECKED: \_\_\_\_\_ APPROVED: \_\_\_\_\_  
DISTRICT: M.E.D. PRINT NUMBER: SS-11.9-4307A

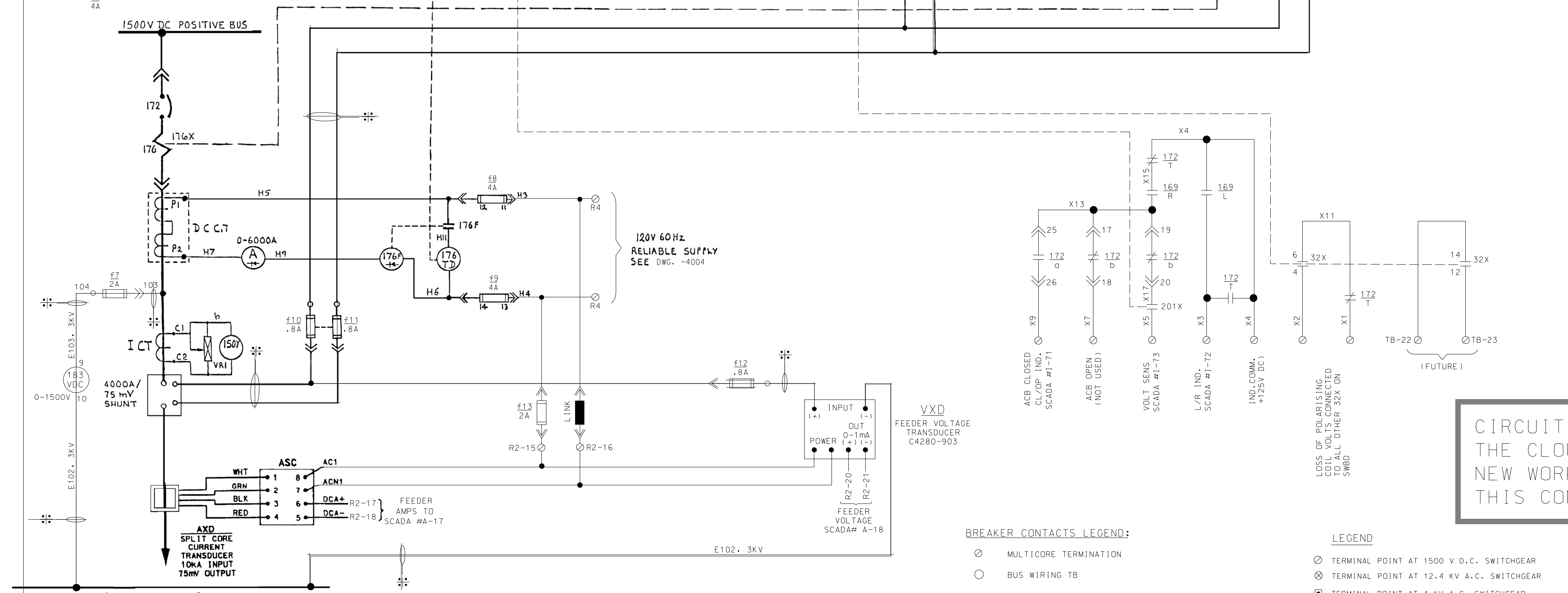
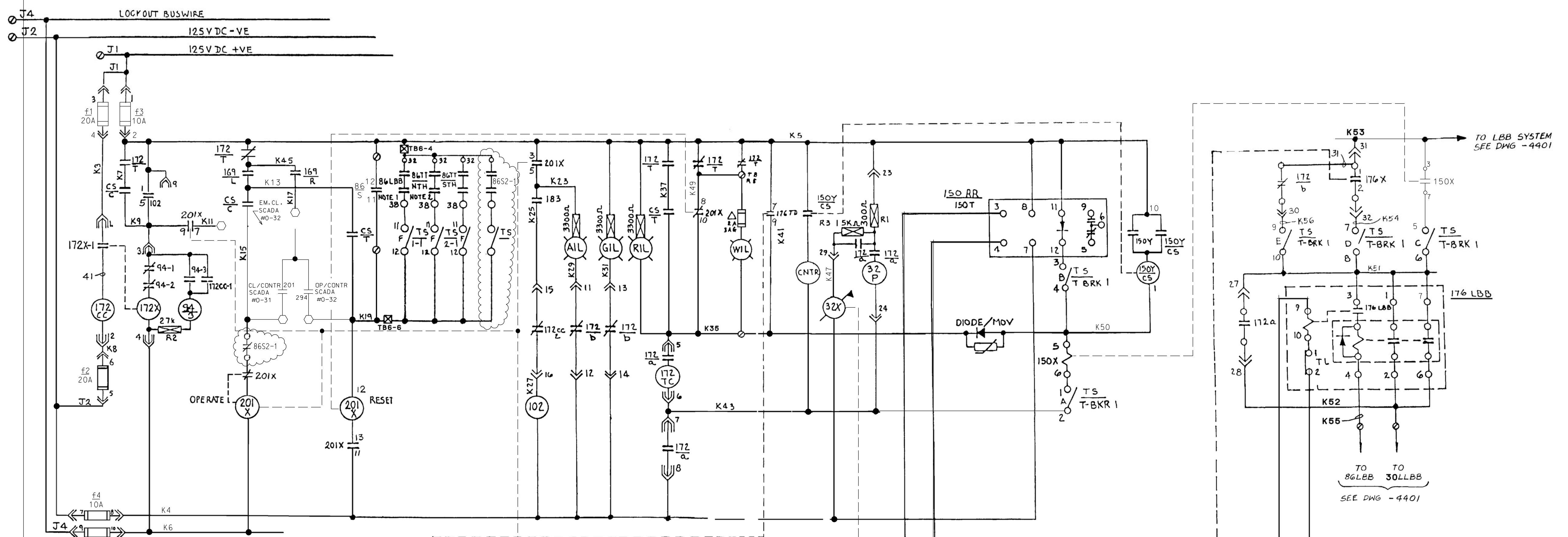


DEVICE LEGEND

| DEVICE | DESCRIPTION   |
|--------|---|
| 30LBB  | LBB Annunciator Target Relay                            |
| 32P    | Polarizing Coil for 176 Tripping 125VDC 2x30 ohm coils  |
| 32X    | Flag Indication Relay for Loss of 32P Voltage           |
| 62LBB  | LBB Timing Relay 0.1 6.0 Sec.                           |
| 62TT   | TT Timing Relay 0.1 6.0 Sec.                            |
| 64D    | Ground Fault Sensing Relay                              |
| 64XX   | Aux. Relay for Ground Fault Transfer Trip               |
| 86L    | Lockout Relay   |
| 86LBB  | Breaker Backup Lockout Relay (Manual Reset)             |
| 86TT   | Transfer Trip Lockout Relay (Elect. Reset)              |
| 94     | Closing Coil Cut Off (Anti Pump) Riv. 125V.DC 7000 ohm  |
| 94TT   | Transfer Trip Output Relay                              |
| 102    | Reclosing Timer   |
| 127    | AG Supply Change Over Relay                             |
| 130BR  | Rate of Rise Overcurrent Relay                          |
| 130T   | Time Overcurrent Relay                                  |
| 150X   | Auxiliary Relay for LBB on 130BR/150T                   |
| 150Y   | Impulse Tripping Relay (Rate of Rise)                   |
| 150YCS | Auxiliary Relay on 150Y (in same case as 150Y)          |
| 162    | Local Remote Switch                                     |
| 172    | D. C. Feeder Breaker                                    |
| 172a   | Breaker Open Close Status Switch                        |
| 172CC  | Breaker Closing Coil 125VDC 1.8 ohm                     |
| 172T   | Breaker Position Switch                                 |
| 172TC  | Shunt Trip Coil 125VDC 20 ohm                           |
| 172X   | Auxiliary Closing Contactor 125VDC 630 ohm              |
| 176    | Magnetic Series Trip O/C Device Cal. 3.5 4.5 6 7 8      |
| 176F   | O/C Relay (0.6000A, Scale) 120V 60HZ, High Set Point    |
| 176LBB | LBB D. C. Current Sensing Relay                         |
| 176TD  | O/C Relay, Timer 125VDC (Set at 20s.) in case with 176F |
| 176X   | Auxiliary Relay for Magnetic Series Trip                |
| 183    | Voltage Measuring Transfer Relay                        |
| 201    | Supervisory Close Relay (Remote Contact)                |
| 201D   | Emergency Close Relay (Remote Contact)                  |
| 201X   | Breaker Master Control Relay (Latching Type)            |
| 296    | Supervisory Trip Relay (Remote Contact)                 |
| 301TT  | Control Switch for Transfer Trip By Pass                |

DEVICE LEGEND

| REF       | DESCRIPTION  |
|-----------|--|
| A         | Ammeter 0 6000A (0.2AFSD) Rest. Moving Coil Long Scale |
| AIL       | Amber Indication Lamp Auto Close in Operation 125V     |
| C         | Close  |
| CC        | Closing Coil   |
| GNTR      | Operation Counter 150V                                 |
| GS        | Control Switch TRIP Neutral Close                      |
| DCGT      | D. C. Current Transducer 3000/1A 120V 60HZ             |
| DCSC      | D. C. Current Signal Conditioner                       |
| DCVC      | D. C. Volts Calibrator                                 |
| DCVT      | D. C. Volts Transducer                                 |
| DIODE/MOV | Directional Blocking Diode/Metal Oxide Varistor        |
| GIL       | Green Indication Lamp C.B. Open 125V                   |
| I.C.T.    | Impulse Type Current Transformer                       |
| L         | Local Control Mode                                     |
| LBB       | Local Breaker Backup                                   |
| OP        | Operate  |
| R         | Remote Control Mode                                    |
| RE        | Reset  |
| RIL       | Red Indication Lamp C.B. Closed 125 V.                 |
| Shunt     | Switchboard D. C. Shunt                                |
| Trip      | Trip   |
| T.S.      | Test Switch  |
| TT        | Transfer Trip  |
| V         | Voltmeter 0 2000V Moving Coil Longscale Direct Reading |
| VR1       | Attenuator 20W 0.2 ohm variable                        |
| TL        | T&T LINK   |
| ASC       | CURRENT SIGNAL CONDITIONER                             |
| AXD       | SPLIT CORE CURRENT TRANSDUCER                          |
| VXD       | FEEDER VOLTAGE TRANSDUCER                              |



CIRCUIT WITHIN THE CLOUD INDICATES NEW WORK UNDER THIS CONTRACT

NOTES:  
 \* THESE WIRES TO BE SEGREGATED AND RUN SEPARATELY FOR 1500V D.C. WIRING USE A.E.T. 50/0.25mm 3KV (WORKING) BLACK WIRE - ALL WIRING TO END OF WITH HELLERMAN PRE-INSULATED TWIN GRIP TERMINALS - FOR 125V D.C. AND 120V A.C. WIRING USE STANDARD 7/0.67mm GREY WIRE

BREAKER CONTACTS LEGEND:

- ⊙ MULTICORE TERMINATION
- BUS WIRING TB
- △ LOCATED IN SEPARATE ENCLOSURE
- 172 ⊕ CARRIAGE SWITCH OPEN IN SERVICE
- 172 ⊖ CARRIAGE SWITCH CLOSED IN SERVICE POSITION
- 172 ⊕ ⊖ AUX. SWITCH OPEN IN CB OPEN POSITION  
AUX. SWITCH CLOSED IN CB CLOSED POSITION
- 172 ⊖ ⊕ AUX. SWITCH CLOSED IN CB OPEN POSITION  
AUX. SWITCH OPEN IN CB CLOSED POSITION
- ⊏ MINOR DISCONNECT CONTACT CLOSED ONLY WHEN CIRCUIT BREAKER IS IN 'SERVICE' POSITION
- ⊏ MINOR DISCONNECT CONTACT CLOSED WHEN CIRCUIT BREAKER IS IN 'TEST' POSITION AND 'SERVICE' POSITION

LEGEND

- ⊙ TERMINAL POINT AT 1500 V D.C. SWITCHGEAR
- ⊗ TERMINAL POINT AT 12.4 KV A.C. SWITCHGEAR
- ⊠ TERMINAL POINT AT 4 KV A.C. SWITCHGEAR
- ⊡ TERMINAL POINT AT RECTIFIER CONTROL PANEL
- ⊢ TERMINAL POINT AT TRANSFORMER CONTROL PANEL
- ⊣ TERMINAL POINT AT TRANSFER TRIP & LBB SWITCHBOARD
- TERMINAL POINT AT SUPERVISORY CONTROL CABINET
- ⊤ TERMINAL POINT AT BUS FAULT RELAY PANEL OR CONTROL SWITCHBOARD OR OTHER MISC. PANELS.

| NO | REVISION  |
|----|---|
| 1  | C. JACKSON  |
| 2  | 172X AUX CONTACT REMOVED FROM SCHEMATIC   |
| 3  | RH  |
| 4  | 2 NO BKR AUX SWS AND R3 ADDED TO POLARISING CIRCUIT   |
| 5  | CB AUX SWITCH ON WFS 15.816 IS NEW A LATE BREAK SW TYPE SFA   |
| 6  | 443 ON 32X IS NOW 4.4 NIC CARATING COIL CONTACT ADDED IN SERIES WITH 20K FAULT CONTACT NOTE X ADDED |
| 7  | WIRE AWG 18 REMOVED CORRECT INTERNAL WIRING OF 150Y NOW SHOWN                                       |
| 8  | 3-9-83 AS BUILT   |
| 9  | 5-14-84 LAMP ADDED  |
| 10 | ADD LBB AND TRANSFER TRIP   |
| 11 | JAN 97  |
| 12 | MPS   |
| 13 | GENERAL REVISION  |

| REV | DATE     | DESCRIPTION                 | BY  |
|-----|----------|-----------------------------|-----|
| -   | 07/28/17 | ISSUED FOR BID              | HS  |
| -   | 2/06     | MINOR CORRECTIONS           | WPS |
| -   | 9/04     | GENERAL REVISION            | WPS |
| -   | 5/03     | FIELD CORRECTIONS, AS-BUILT | WPS |
| -   | 1/00     | ISSUED FOR SCADA AS-BUILT   | WPS |

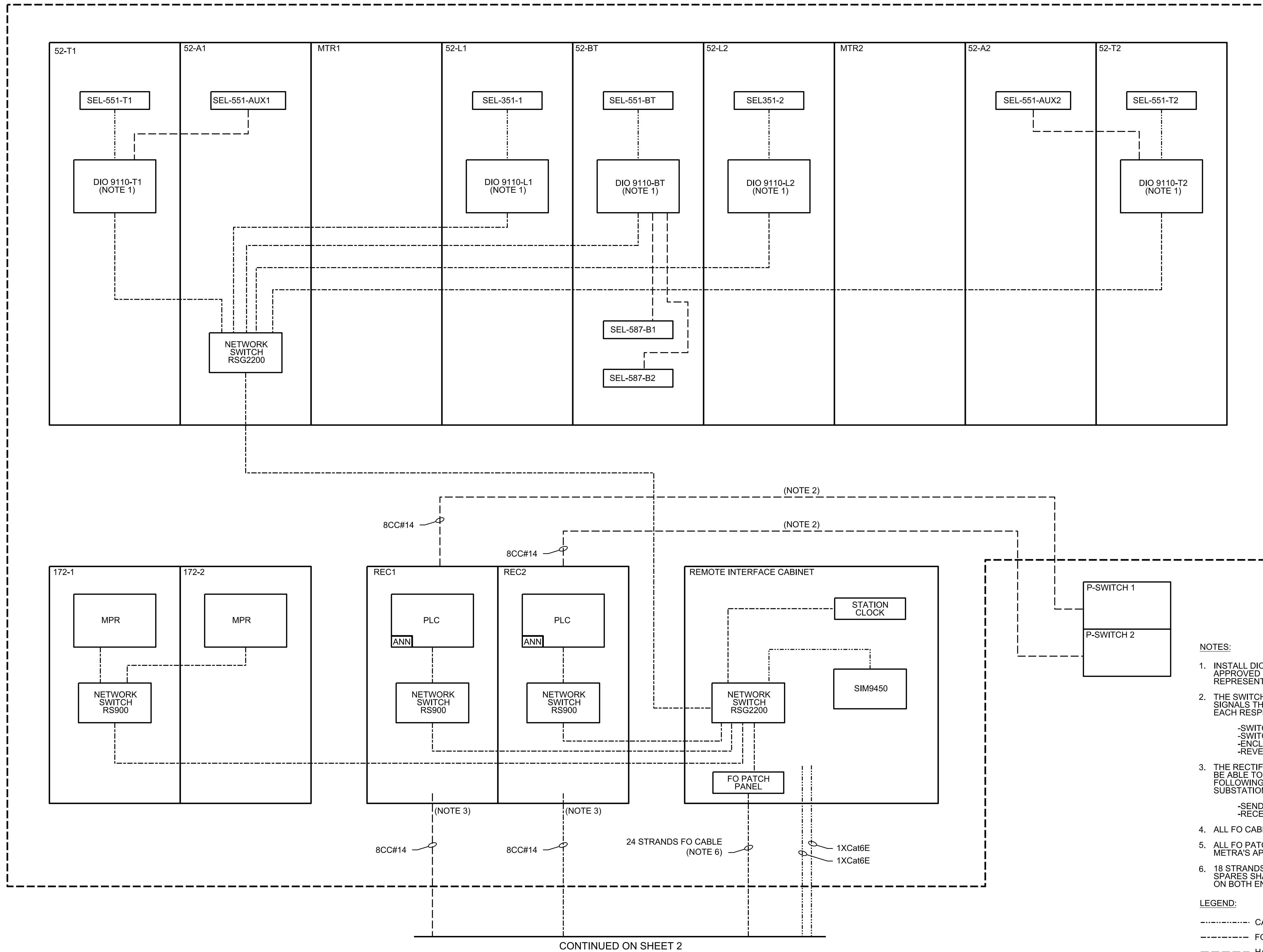
BY LDP

**Metra** ENGINEERING DEPARTMENT  
 CHICAGO, ILLINOIS  
 1500V D.C. SWITCHGEAR  
 D.C. FDR. BKR. SEC.  
 T-BKR CUB. #10  
 SCHEMATIC DIAGRAM  
 95th ST. TIE STATION  
 SCALE: NONE DATE:  
 CAD FILE NUMBER: 5-27-74  
 DESIGNED: DRAWN: CHECKED: APPROVED:  
 DISTRICT: PRIORITY NUMBER:  
 M.F.E.D. SS-11.9-4308A  
 MFG. BY WHIPP & BOURNE LTD. W & B DWG. NO. 418766

LAST NO USED K56



NEW PREFABRICATED SUBSTATION



NOTES:

- INSTALL DIO MODULES AS NEEDED AND AS APPROVED BY METRA'S AUTHORIZED REPRESENTATIVE.
- THE SWITCH SHALL SEND THE FOLLOWING SIGNALS THROUGH DRY CONTACTS TO EACH RESPECTIVE CONTROL CABINET:
  - SWITCH OPENED
  - SWITCH CLOSED
  - ENCLOSURE DOOR OPEN
  - REVERSE CURRENT
- THE RECTIFIER CONTROL CABINET SHALL BE ABLE TO SEND/RECEIVE THE FOLLOWING SIGNALS TO THE EXISTING SUBSTATION:
  - SEND TRIP DC LOCKOUT
  - RECEIVE TRIP FROM 64HS
- ALL FO CABLES USED SHALL BE MULTIMODE.
- ALL FO PATCH PANELS SHALL BE SUBJECT TO METRA'S APPROVAL.
- 18 STRANDS SHALL BE KEPT AS SPARES. ALL SPARES SHALL BE PROPERLY TERMINATED ON BOTH ENDS FOR FUTURE USE.

LEGEND:

- CAT 6E
- FO CABLE
- HARDWIRED

CONTINUED ON SHEET 2

PRINTED ON: SDATES

| REV | DATE      | BY | APP | DESCRIPTION    |
|-----|-----------|----|-----|----------------|
| 0   | 7/28/2017 | AA | ER  | ISSUED FOR BID |

SUB CONSULTANT

PRIMARY CONSULTANT  
SEAL/ SIGNATURE  
MICHAEL S. CONDEI  
062-067213  
OF ILLINOIS

PRIMARY CONSULTANT  
DESIGNED: A. ACHHAMMER  
DRAWN: N. DIAZ  
CHECKED: E. ROWE  
METRA P.M. R. CERANT  
DATE: JUNE 12, 2017



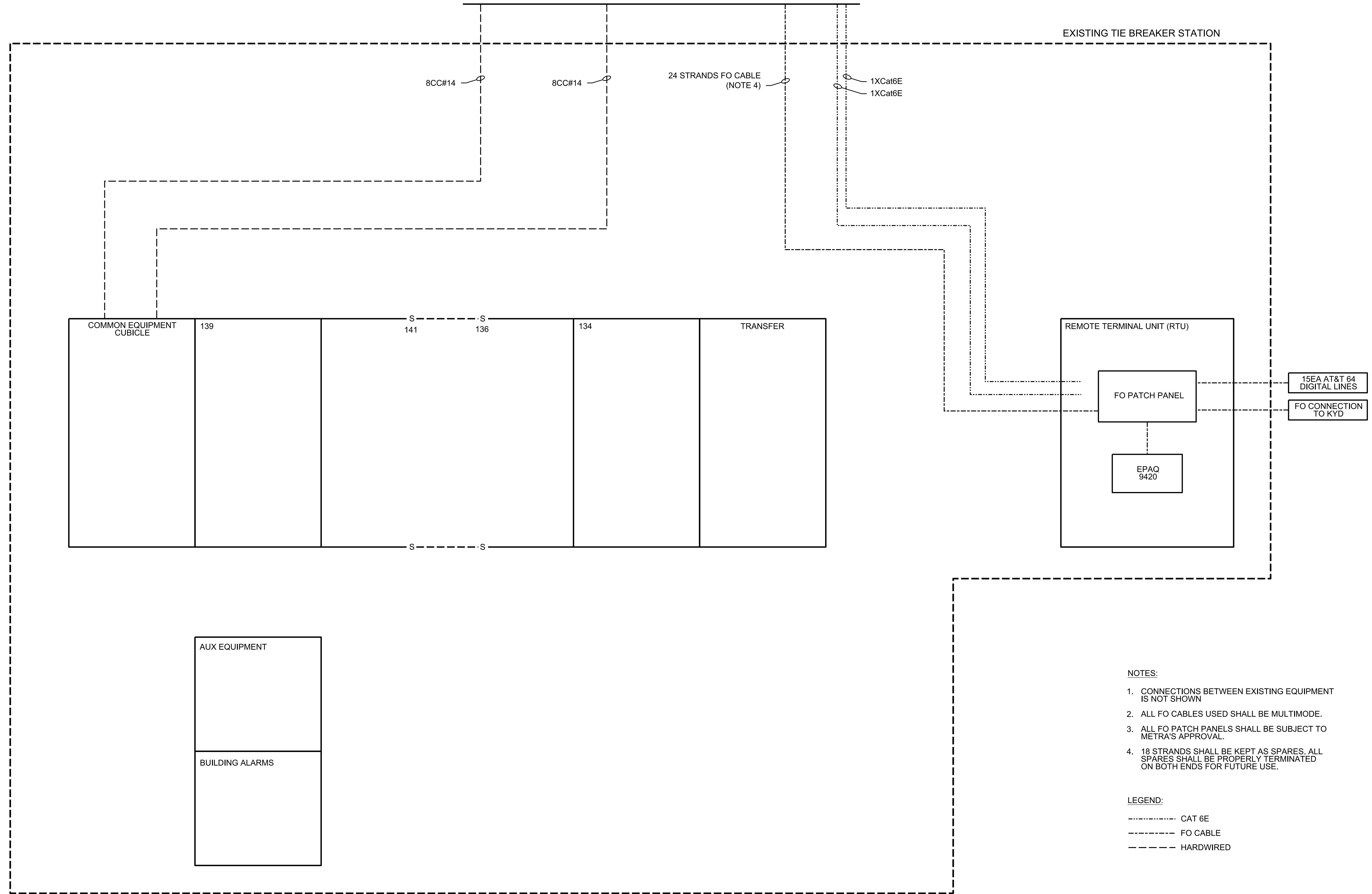
**Metra**  
ENGINEERING DEPARTMENT  
547 W. JACKSON BOULEVARD  
CHICAGO, ILLINOIS 60661

LOCATION NAME:  
**95TH STREET SUBSTATION**  
TITLE:  
**STATION CONTROL ARCHITECTURE  
NEW BUILDING AND INTERFACES  
SHEET 1 OF 2**

CAD FILE NUMBER:  
SFILES5  
SCALE:  
NTS  
PROJECT NO.  
GW4254-57102002  
MILE POST NO.  
11.9  
DISTRICT:  
MED  
SHEET NO.  
SS-11.9-5000

CONTINUED ON SHEET 1

EXISTING TIE BREAKER STATION



NOTES:

1. CONNECTIONS BETWEEN EXISTING EQUIPMENT IS NOT SHOWN
2. ALL FO CABLES USED SHALL BE MULTIMODE.
3. ALL FO PATCH PANELS SHALL BE SUBJECT TO METRA'S APPROVAL.
4. 18 STRANDS SHALL BE KEPT AS SPARES. ALL SPARES SHALL BE PROPERLY TERMINATED ON BOTH ENDS FOR FUTURE USE.

LEGEND:

- - - - - CAT 6E
- - - - - FO CABLE
- - - - - HARDWIRED

PRINTED ON: SDATES

|   |           |    |    |                |  |  |  |  |      |    |     |   |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |                               |  |  |  |
|---|-----------|----|----|----------------|--|--|--|--|------|----|-----|---|--|--|--|---|--|--|--|---|--|--|--|---|--|--|--|-------------------------------|--|--|--|
|   |           |    |    | SUB CONSULTANT |  |  |  | PRIMARY CONSULTANT SEAL/ SIGNATURE<br> |      |    |     | PRIMARY CONSULTANT<br><b>LTK Engineering Services</b> |  |  |  | DESIGNED: A. ACHHAMMER<br>DRAWN: N. DIAZ<br>CHECKED: E. ROWE<br>METRA P.M. R. CERANT<br>DATE: JUNE 12, 2017 |  |  |  | <br>ENGINEERING DEPARTMENT<br>547 W. JACKSON BOULEVARD<br>CHICAGO, ILLINOIS 60661 |  |  |  | LOCATION NAME:<br><b>95TH STREET SUBSTATION</b> |  |  |  | CAD FILE NUMBER:<br>\$FILES\$ |  |  |  |
|   |           |    |    |                |  |  |  |  |      |    |     |   |  |  |  | TITLE:<br><b>STATION CONTROL ARCHITECTURE<br/>EXISTING BUILDING AND INTERFACES<br/>SHEET 2 OF 2</b>         |  |  |  | SCALE:<br>NTS   |  |  |  | DISTRICT:<br>MED                                |  |  |  |                               |  |  |  |
|   |           |    |    |                |  |  |  |  |      |    |     |   |  |  |  |   |  |  |  | PROJECT NO.<br>GW4254-57102002  |  |  |  | SHEET NO.<br><b>SS-11.9-5001</b>                |  |  |  |                               |  |  |  |
|   |           |    |    |                |  |  |  |  |      |    |     |   |  |  |  |   |  |  |  | MILE POST NO.<br>11.9   |  |  |  |   |  |  |  |                               |  |  |  |
| 0 | 7/28/2017 | AA | ER | ISSUED FOR BID |  |  |  | REV                                    | DATE | BY | APP | DESCRIPTION   |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |                               |  |  |  |